HỘI NGHỊ TOÁN HỌC PHỐI HỢP VIỆT - PHÁP

CONGRÈS COMMUN SMF-VMS DE MATHÉMATIQUES

VMS – SMF JOINT CONGRESS

Hue, August 20-24, 2012

PROGRAM & ABSTRACTS

Société Mathématique de France

SMF

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Contents

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LOCATION

College of Education, Hue University

32 Le Loi, Hue city.

ORGANIZERS

Vietnam Mathematical Society (VMS)

French Mathematical Society (SMF)

Hue University (HU)

Vietnam Institute for Advanced Study in Mathematics (VIASM)

MAIN SPONSORS

- VIASM, Hue University, Vietnam Academy of Science and Technology, Institute of Mathematics, National Foundation for Science & Technology Development (NAFOSTED).
- LIA CNRS Formath-Vietnam, GDRI CNRS Singularity, the program ARCUS MAE-régions IDF/Midi pyrénées.

PLENARY SPEAKERS

Ngo Bao Chau (Chicago-Hanoi), Dinh Tien Cuong (Paris 6), Hélène Esnault (Duisburg-Essen), Patrick Gérard (Paris 11), Benedict Gross (Harvard), Nguyen Huu Viet Hung (VNU Hanoi), Jean Bernard Lasserre (Toulouse), Pierre Mathieu (Marseille), Huynh Van Ngai (Quy Nhon), Sylvain Sorin (Paris 6), Ngo Viet Trung (IM Hanoi), Vu Ha Van (Yale), Jean Christophe Yoccoz (Collége de France, Paris).

PUBLIC LECTURER

Pierre Cartier (IHÉS, Paris)

PARALLEL SESSIONS

Commutative algebra

Chairs: Marcel Morales (Grenoble), Ngo Viet Trung (IM Hanoi)

Complex analysis and geometry

Chairs: Dinh Tien Cuong (Paris 6), Do Duc Thai, (HNUE), Pascal Thomas (Toulouse)

DC Programming and DCA: Theory, algorithms and applications

Chairs: Le Thi Hoai An (Lorraine), Pham Dinh Tao (INSA-Rouen), Nguyen Dong Yen (IM Hanoi)

Discrete mathematics

Chairs: Phan Thi Ha Duong (IM Hanoi), Christophe Crespelle (Orléans)

Geometry and singularities

Chairs: Jean-Paul Brasselet (Marseille), Nguyen Viet Dung (IM Hanoi)

Mathematical modeling of biological and ecological systems

Chairs: Pierre Auger (IRD), Paul-Henry Cournède (Centrale-INRIA Saclay), Nguyen Huu Tri (IRD)

Numerical analysis and applied mathematics

Chairs: Laurence Halpern (Paris 13), Vu Ngoc Phat (IM Hanoi)

Optimisation

Chairs: Phan Quoc Khanh (VNU-HCM), Dinh The Luc (Avignon), Michel Théra (Limoges)

Partial differential equations

Chairs: Fabrice Planchon (Nice), Frédéric Klopp (Paris 6), Nguyen Minh Tri (IM Hanoi)

Probability theory

Chairs: Fabienne Castell (LATP, Marseille), Nguyen Huu Du (HUS, VNU-Hanoi), Pierre Mathieu (LATP, Marseille)

Real and complex analysis

Chairs: Dinh Thanh Duc (Quy Nhon), Sandrine Grellier (Orléans)

Representation theory

Chairs: Ngo Bao Chau (Chicago-Hanoi), Ngo Dac Tuan (Paris 13), Phung Ho Hai (IM Hanoi)

Stochastic analysis and statistics in finance

Chairs: Pham Huyên (Paris 7), Nguyen Tien Zung (Toulouse)

Topology, homotopy theory

Chairs: Nguyen Huu Viet Hung (HUS, VNU Hanoi), Lionel Schwartz (Paris 13)

SCIENTIFIC COMMITTEE

Jean-Paul Brasselet (Marseille), Marc Bui (EPHE), Patrick Louis Combettes (Paris 6), Nguyen Huu Du (VNU Hanoi), Le Tuan Hoa (VIASM, Hanoi), Phan Quoc Khanh (VNU-Hochiminh city), Ha Huy Khoai (IM Hanoi), Etienne Pardoux (Marseille), Lionel Schwartz (Paris 13), Do Duc Thai (HNUE Hanoi), Michel Zinsmeister (Orléans).

ORGANISATION COMMITTEE

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PROGRAM

CODES

AG:	Complex analysis and geometry
AN:	Real and complex analysis
AT:	Topology, homotopy theory
BE:	Mathematical modeling of biological and ecological systems
CA:	Commutative algebra
DC:	DC Programming and DCA: Theory, algorithms and applications
DM:	Discrete mathematics
GS:	Geometry and singularities
H:	Historical note
NA:	Numerical analysis and applied mathematics
OP:	Optimization
PDE:	Partial differential equations
PT:	Probability theory
RT:	Representation theory
SF:	Stochastic analysis and statistics in finance

Code of a talk: consists of session code and its numbering in the session. The small "s" after some session codes means a short talk.

Program day by day

Monday, August 20, 2012

Morning

07:00 – 08:15 Registration
08:30 – 09:15 Opening ceremony

Chairman: Lê Dũng Tráng (Université de Marseille) Lecture Hall I
09:15 – 10:30 J. C. Yoccoz (Collége de France, Paris)
Circle diffeomorphisms and interval exchange maps p. 45
10:30 – 10:45 Break
10:45 – 11:45 H. Esnault (University of Duisburg-Essen)
Flat bundles in characteristic 0 *and* $p > 0$ p. 45

Afternoon

Chairman: J. P. Brasselet (IML, CNRS, Marseille) Lecture Hall I
14:00–15:00 Ngo Viet Trung (Institute of Mathematics, Hanoi)
Combinatorial optimization: a bridge between combinatorics and algebra p. 45
15:00–15:10 Break

Parallel sessions

Room	15:15-15:45	15:45-16:15	16:15-16:30	16:30-17:00	17:00-17:30	17:30-18:00
1	CA1	CA2	Break	CA3	CAs1+CAs2	
2	AG1	AG2	Break	AG3		
3	DC1		Break	DC2	DCs1+DCs2	
4	DM1	DM2	Break	DM3	DM4	DMs1
5	GS1		Break	GS2		
6	BE1	BE2	Break	BE3		
7	NA1	NA2	Break	NA3	NAs1+NAs2	
8	OP1	OP2	Break	OP3	OPs1+OPs2	
9	PT1		Break	PT2	PT3	
10	AN1	AN2	Break	AN3		
11	RT1	RTs1	Break	RT2	RT3	
12	SF1	SF2	Break	SF3	SFs1+SFs2	
13	AT1	AT2	Break		AT3	

19:00 **Social activity** Lecture Hall I
Meeting with students of Hue University (Topic: On the National Program for Developing Mathematics in Vietnam until 2020)

Tuesday, August 21, 2012

Morning

Chairman: Nguyen Huu Du (HUS, VNU-Hanoi) Lecture Hall I

08:30 – 09:30 Vu Ha Van (Yale University)
Recent progresses in the theory of random matrices p. 45

09:30 – 09:45 Break

09:45 – 10:45 J. B. Lasserre (LAAS-CNRS)
Tractable characterizations of polynomials nonnegative on a closed set p. 46

10:45 – 11:00 Break

Parallel sessions

Room	11:00-11:30	11:30-12:00	12:00-12:15
1	CA4	CA5	
2	AG4		
3	DC3	DC4	
4	DM5	DM6	DMs2
5	GS3		GSs1
6	BE4	BE5	
7	NA4	NA5	
8	OP4	OP5	
9	PT4		
10	AN4	AN5	
11	RT4		
12	SF4	SF5	
13	AT4	AT5	

Afternoon

Chairman: P. Auger (IRD) Lecture Hall I

14:00–15:00 P. Gérard (Université Paris 11)
An integrable Hamiltonian system and its connections to harmonic analysis and partial differential equations p. 46

15:00–15:15 Break

Parallel sessions

Room	15:15-15:45	15:45-16:15	16:15-16:30	16:30-17:00	17:00-17:30	17:30-18:00
1	CA6	CA7	Break	CA8	CAs3+CAs4	
2	AG5		AG6	Break	AG7	
3	DC5	DC6	Break	DCs3+DCs4	DCs5	
4	DM7	DM8	Break	DM9	DM10	DMs3+DMs4
5	GS4		Break	GSs2	GS5	
6	BE6	BEs1+BEs2				
7	NA6	NA7	Break	NA8	NAs3+NAs4	
8	OP6	OP7	Break	OP8	OPs3+OPs4	
9	PT5	PT6	Break	PT7	PT8	
10	AN6	AN7	Break	ANs1+ANs2		
11	RTs2	RTs3	Break	RT5		RT6
12	SF6	SF7	Break	SF8	SFs3+SFs4	
13	AT6		Break	AT7	AT8	

Wednesday, August 22, 2012

Morning

Chairman: Nguyen Thanh Van (Inst. Math. Toulouse) Lecture Hall I

08:30 – 09:30 Ngo Bao Chau (University of Chicago and VIASM)
On automorphic L-functions p. 46

09:30 – 09:45 Break

09:45 – 10:45 B. Gross (Harvard University)
On the arithmetic of elliptic curves p. 47

10:45 – 11:00 Break

11:00 – 12:00

Lecture Hall I	Meeting room, 2nd Floor, College Headquartes Buiding
Chairman: J. Mesirov (MIT and Harvard University)	**Chairman: L. Schwarzt** (Université Paris 13)
P. Cartier (IHÉS, Paris) *The Mathematics of the 21st century: Are they really different?*	*Round table on the role of Mathematics.*

Afternoon

13:30–17:00 **Excursion**

18:30 **Banquet**, Huong Giang Resort & Spa, 51 Le Loi, Hue City.

Thursday, August 23, 2012

Morning

Chairman: M. Théra (Université de Limoges) Lecture Hall I

08:30 – 09:30 Dinh Tien Cuong (Université Paris 6)
Equidistribution of varieties in complex dynamics p. 47

09:30 – 09:45 Break

09:45 – 10:45 S. Sorin (Université Paris 6)
Recent advances in zero-sum repeated games p. 47

10:45 – 11:00 Break

Parallel sessions

Room	11:00-11:30	11:30-12:00	12:00-12:15
1	CA9	CA10	
2	AG8		
3	DC7	DC8	
4	DM11	DM12	DMs5
5	GS6		
6	PDE1	PDEs1	
7	NA9	NA10	
8	OP9	OP10	
9	PT9		
10	AN8	ANs3+ANs4	
11	RT7		
12	SF9	SF10	
13	AT9	H1	

Afternoon

Chairman: Phan Quoc Khanh (Inter. Uni., VNU-HCMC) Lecture Hall I

14:00–15:00 Nguyen Huu Viet Hung (HUS, VNU-Hanoi)
The Lannes-Zarati homomorphism and the Singer transfer p. 48

15:00–15:15 Break

Parallel sessions

Room	15:15-15:45	15:45-16:15	16:15-16:30	16:30-17:00	17:00-17:30	17:30-18:00
1						
2	AG9	AG10		Break	AG11	
3						
4	DM13	DM14	Break	DM15	DM16	DMs6+DMs7
5	GS7		Break	GS8	GS9	
6	PDE2	PDE3		PDE4	PDE5	
7	NA11	NA12	Break	NA13	NAs5+NAs6	
8	OP11	OP12	Break	OP13	OPs5+OPs6	
9	PT10		Break	PT11	PT12	
10	AN9	AN10	Break	ANs5+ANs6		
11	RTs4	RTs5	Break	RT8		RT9
12			Break			
13	PTs1+PTs2	PTs3+PTs4	Break	PTs5+PTs6	PTs7	

Friday, August 24, 2012

Morning

Chairman: M. Zinsmeister (Université d'Orléans) Lecture Hall I

08:30 – 09:30 P. Mathieu (Université de Provence)
Random walks on (hyperbolic) groups. p. 48

09:30 – 09:45 Break

09:45 – 10:45 Huynh Van Ngai (Quy Nhon University)
Metric regularity of multifunctions and applications p. 48

10:45 – 11:00 Break

Parallel sessions

Room	11:00-11:30	11:30-12:00	12:00-12:30	12:30-12:45
1				
2	AG12	AG13		
3				
4	DM17	DM18	DMs8+DMs9	DMs10
5				
6	PDE6	PDE7		
7	NA14	NAs7+ NAs8	NAs9+ NAs10	NAs11
8	OPs7+OPs8	OPs9+OPs10	OPs11+OPs12	
9	PT13	PT14		
10	AN11	ANs7+ANs8		
11	RT10			
12				
13	PTs8+PTs9			

Parallel sessions

AG: Complex analysis and geometry

Room 2

Monday, August 20, 2012

Afternoon

Chairman: Do Duc Thai (HNUE)

15:15 – 15:55 X. Ma (Institut de Mathématiques de Jussieu)
AG1 *Analytic torsion and Toeplitz operators* p. 49

15:55 – 16:35 T. Terasoma (University of Tokyo)
AG2 *Hodge realization of Bloch-Kriz mixed Tate motives* p. 49

16:35 – 16:50 Break

16:50 – 17:30 Duong Ngoc Son (University of California at San Diego)
AG3 *Transversality of holomorphic mappings between real submanifolds in complex spaces* p. 49

Tuesday, August 21, 2012

Morning

Chairman: T. Masaki (Kyoto University)

11:00 – 11:40 J. P. Demailly (Université de Grenoble I, Institut Fourier)
AG4 *A structure theorem for compact Kähler manifolds with semipositive Ricci curvature* p. 49

Afternoon

Chairman: Nguyen Quang Dieu (HNUE)

15:15 – 15:55 P. Eyssidieux (Université de Grenoble I, Institut Fourier)
AG5 *Uniformization in Several Complex variables* p. 50

15:55 – 16:35 J.-H. Keum (School of Mathematics, KIAS)
AG6 *Orders of automorphisms of $K3$ surfaces* p. 50

16:35 – 16:50 Break

16:50 – 17:30 Pham Hoang Hiep (HNUE)
AG7 *A sharp lower bound for the log canonical threshold* p. 50

Thursday, August 23, 2012

Morning

Chairman: P. Thomas (Institut de Mathématiques de Toulouse)

11:00 – 11:40 M. Wolff (Institut de Mathématiques de Jussieu, Université Paris 6)
AG8 *Some questions about non Teichmüller representations of surface groups in $PSL(2,\mathbb{R})$* p. 51

Afternoon

Chairman: Le Mau Hai (HNUE)

15:15 – 15:55 Tran Vu Khanh (Tan Tao University)
AG9 *Necessary geometric and analytic conditions for general estimates in the d-bar-Neumann problem* p. 50

15:55 – 16:35 S. Diverio (Institut de Mathématiques de Jussieu - CNRS)
AG10 *Kobayashi hyperbolicity and positivity properties of the canonical bundle* p. 51

16:35 – 16:50 Break

16:50 – 17:30 Nguyen Viet Anh (Université Paris 11)
AG11 *On the dynamical degrees of meromorphic maps preserving a fibration* p. 52

Friday, August 24, 2012

Morning

Chairman: G. Courtois (Université Paris 6)

11:00 – 11:40 J. Noguchi (Graduate School of Mathematical Sciences, University of Tokyo)
AG12 *Entire curves, logarithmic differentils and related topics* p. 52

11:40 – 12:20 G. Dethloff (Université de Brest)
AG13 *The Cartan-Nochka Second Main Theorem for Hypersurfaces in Sub-general Position in Projective Algebraic Varieties* p. 52

AN: Real and complex analysis

Room 10

Monday, August 20, 2012

Afternoon

Chairman: Thai Thuan Quang (Quy Nhon University)

15:15 – 15:45 J. Leblond (INRIA Sophia-Antipolis)
AN1 *Best approximation issues in Hardy spaces, with applications* p. 53

15:45 – 16:15 Luong Dang Ky (University of Orleans)
AN2 *Bilinear decompositions for $H^1 \times BMO$ and related problems* p. 53

16:15 – 16:30 Break

16:30 – 17:00 Le Thanh Hoang Nhat (Laboratory MAPMO, Orleans's university)
AN3 *On Minkowski dimension of Jordan curves* p. 54

Tuesday, August 21, 2012

Morning

Chairman: E. Russ (Institut Fourier, Université Grenoble)

11:00 – 11:30 Dinh Thanh Duc (Quy Nhon University)
AN4 *Some weighted norm inequalities and their applications* p. 55

11:30 – 12:00 Nguyen Du Vi Nhan (Quy Nhon University)
AN5 *Inequalities for differences and their applications* p. 55

Afternoon

Chairman: Nguyen Xuan Thao (School of Applied Mathematics, HUST)

15:15 – 15:45 S. Grellier (MAPMO/FDP)
AN6 *Spectral inverse problems for compact Hankel operators* p. 55

15:45 – 16:15 P. Portal (Australian National University and Université Lille 1)
AN7 *Gaussian Hardy spaces* p. 55

16:15 – 16:30 Break

16:30 – 16:45 Le Khanh Hung (Vinh University)
ANs1 *On the coupled fixed point theorems in uniform spaces and applications* p. 57

16:45 – 17:00 Nguyen Quang Dieu (HNUE)
ANs2 *Weighted Bernstein-Markov inequality on unbounded sets in $\mathbb{C}^n$* p. 58

Thursday, August 23, 2012

Morning

Chairman: J. Leblond (INRIA Sophia-Antipolis)

11:00 – 11:30 M. Zinsmeister (Université d'Orléans)
AN8 *Coefficient estimates for whole plane SLE* p. 56

11:30 – 11:45 Pham Ngoc Hoa (Hai Duong College)
ANs3 *Value sharing problem for p-adic several variables difference polynomials* p. 58

11:45 – 12:00 Tran Duc Thanh (Vinh University)
ANs4 *On a new class of partial metric space and applications* p. 59

Afternoon

Chairman: Dinh Thanh Duc (Quy Nhon University)

15:15 – 15:45 E. Russ (Institut Fourier, Université Grenoble)
AN9 *Some results on the inversion of the divergence operator* p. 56

15:45 – 16:15 Nguyen Xuan Thao (School of Applied Mathematics, HUST)
AN10 *The generalized convolutions with a weight function for the Fourier cosine, Fourier sine and Laplace transforms* p. 57

16:15 – 16:30 Break

16:30 – 16:45 Hoang Thi Van Anh (Food Industry College)
ANs5 *On the generalized convolution inequalities for the Hartley, Fourier cosine and Fourier sine transforms* p. 59

16:45 – 17:00 Le Xuan Huy (University of Economics and Technical Industries, HCMC)
ANs6 *On the generalized convolution transforms for the Fourier cosine, Laplace and Fourier sine transforms* p. 60

Friday, August 24, 2012

Morning

Chairman: P. Gérard (Université Paris 11)

11:00 – 11:30 Thai Thuan Quang (Quy Nhon University)
AN11 *Some o types of weakly holomorphic functions and their holomorphic extension* p. 57

11:30 – 11:45 Nguyen Hoang (College of Education, Hue University)
ANs7 *Hopf-type formula defines solution for Hamilton-Jacobi equations with t-dependence Hamiltonian* p. 60

11:45 – 12:00 Phi Thi Van Anh (Hanoi University of Transport and Communications)
ANs8 *On the polyconvolution for Fourier and Hartley transforms* p. 60

AT: Topology, homotopy theory

Room 13

Monday, August 20, 2012

Afternoon

Chairman: Nguyen Sum (Quy Nhon University)

15:15 – 15:45 Nguyen Dang Ho Hai (College of Sciences, Hue University)
AT1 *The hit problem for the Steinberg module over the Steenrod algebra revisited* p. 61

15:45 – 16:15 Vo Thanh Tung (Center of Research and Development, Duy Tan University, Danang)
AT2 *The computation of Steenrod operations on the mod-2 cohomology rings of finite groups* p. 61

16:15 – 17:00 Break

17:00 – 17:30 V. Franjou (Université de Nantes)
AT3 *Finite cohomological generation for p-compact groups* p. 61

Tuesday, August 21, 2012

Morning

Chairman: M. Livernet (Université Paris 13)

11:00 – 11:30 Vo Thi Nhu Quynh (HUS, VNU-Hanoi)
AT4 *The squaring operation on the Dickson algebra and the Lannes-Zarati homomorphism* p. 61

11:30 – 12:00 Nguyen The Cuong (University Paris 13)
AT5 *La cohomologie d'une n-tour de Postnikov et la filtration de Krull dans la catégorie des modules instables sur l'algèbre de Steenrod* p. 62

Afternoon

Chairman: V. Franjou (Université de Nantes)

15:15 – 15:45 Nguyen Sum (Quy Nhon University)
AT6 *On the Peterson hit problem* p. 62

15:45 – 16:30 Break

16:30 – 17:00 Phan Hoang Chon (Sai Gon University)
AT7 *The algebraic transfer in the language of the May spectral sequence* p. 66

17:00 – 17:30 Le Minh Ha (HUS, VNU-Hanoi)
AT8 *On strict polynomial functors and the Steenrod algebra* p. 66

Thursday, August 23, 2012

Morning

Chairman: Le Minh Ha (HUS, VNU-Hanoi)

11:00 – 11:30 M. Livernet (Université Paris 13)
AT9 *Associative algebras up to homotopy over a ring* p. 67

11:30 – 11:45 Nguyen Thanh Van (Institut de Mathematiques de Toulouse)
H1 *André Martineau Remembering* p. 67

BE: Mathematical modeling of biological and ecological systems

Room 6

Monday, August 20, 2012

Afternoon

Chairman: P. Auger (IRD)

15:15 – 15:45 B. S. Goh (Institute of Mathematical Sciences, University of Malaya)
BE1 *Robust Maximum Sustainable Policies for Managing Biological Populations* p. 68

15:45 – 16:15 Nguyen Huu Tri (IRD)
BE2 *Analysis of herbivore population dynamics in Amboseli National Park (Kenya) using aggregation of variable methods* p. 68

16:15 – 16:30 Break

16:30 – 17:00 Tran Thi Kim Oanh (School of Applied Mathematics and Informatics, HUST)
BE3 *Effects of density dependent migration on interference competition dynamics* p. 69

Tuesday, August 21, 2012

Morning

Chairman: Nguyen Huu Tri (IRD)

11:00 – 11:30 Nguyen Ngoc Doanh (School of Applied Mathematics and Informatics, HUST)
BE4 *Effects of refuges and density dependent dispersal on interspecific competition dynamics* p. 69

11:30 – 12:00 P. Auger (IRD)
BE5 *Mathematical modeling of fishery dynamics : Application to the sardine fishery in Morocco* p. 70

Afternoon

Chairman: B. S. Goh (Inst. Math. Sciences, University of Malaya)

15:15 – 15:45 Dao Tuan Anh (School of Appl. Math. and Informatics, HUST)
BE6 *Effects of refuges and density independent migration on the dynamics of pradator-prey system* p. 71

15:45 – 16:00 Dinh Cong Huong (Quy Nhon University)
BEs1 *On a nonlinear difference equation with variable delay* p. 72

16:00 – 16:15 Pham Quang Khoai (Laboratoire de Mathématiques, Université de Bretagne Sud et CNRS)
BEs2 *Probabilités des Évenements Rares sur des Séries Temporelles Environnementales* p. 72

CA: Commutative Algebra

Room 1

Monday, August 20, 2012

Afternoon

Chairman: M. Morales (Institut Fourier, Université Grenoble)

15:15 – 15:45 S. Zarzuela (Universitat de Barcelona)
CA1 *Frobenius Algebras of Stanley-Reisner rings* p. 74

15:45 – 16:15 Tran Nam Trung (Institute of Mathematics, Hanoi)
CA2 *A characterization of Gorenstein triangle-free graphs* p. 74

16:15 – 16:30 Break

Chairman: J. K. Verma (Indian Institute Technology, Bombay)

16:30 – 17:00 Le Dinh Nam (School Applied Mathematics and Informatics, HUST)
CA3 *The divisor class group of algebra of t-minors of Hankel extended matrices* p. 75

17:00 – 17:15 Tran Do Minh Chau (Thai Nguyen High School For Gifted Students)
CAs1 *On the top local cohomology modules* p. 79

17:15 – 17:30 Nguyen Thi Hong Loan (Vinh University)
CAs2 *On generalized Cohen-Macaulay canonical module* p. 80

Tuesday, August 21, 2012

Morning

Chairman: S. Zarzuela (Universitat de Barcelona)

11:00 – 11:30 S. Kwak (KAIST)
CA4 *Partial elimination theory and syzygetic application to quadratic schemes* p. 76

11:30 – 12:00 Tran Tuan Nam (Ho Chi Minh City University of Pedagogy)
CA5 *Some properties of generalized local homology modules* p. 76

Afternoon

Chairman: Nguyen Tu Cuong (Institute of Mathematics, Hanoi)

15:15 – 15:45 J. K. Verma (Indian Institute of Technology, Bombay)
CA6 *Local Cohomology of bigraded Rees algebras and normal Hilbert polynomials* p. 77

15:45 – 16:15 Hoang Le Truong (Institute of Mathematics, Hanoi)
CA7 *Hilbert coefficient and sequentially Cohen-Macaulay modules* p. 77

16:15 – 16:30 Break

Chairman: S. Kwak (KAIST)

16:30 – 17:00 Phan Van Thien (College of Education, Hue University)
CA8 *Sharp upper bound for the regularity index of fat points* p. 77

17:00 – 17:15 Nguyen Thi Kieu Nga (Hanoi Pedagogical University II, Xuan Hoa)
CAs3 *Some loci of finitely generated modules over Noetherian local rings* p. 80

17:15 – 17:30 Nguyen Van Sanh (Mahidol University)
CAs4 *A generalization of Cohen Theorem* p. 80

Thursday, August 23, 2012

Morning

Chairman: Ngo Viet Trung (Institute of Mathematics, Hanoi)

11:00 – 11:30 M. Morales (Institut Fourier, Université Grenoble)
CA9 *Betti numbers and the Green $N_{2,p}$ property for binomial ideals* p. 78

11:30 – 12:00 Le Thanh Nhan (College of Science, Thai Nguyen University)
CA10 *On Cohen-Macaulay canonical modules* p. 79

DC: DC Programming and DCA: Theory, algorithms and applications

Room 3

Monday, August 20, 2012

Afternoon

Chairman: Nguyen Van Thoai (University of Trier)

15:15 – 16:15 Le Thi Hoai An (University of Lorraine) and Pham Dinh Tao (INSA-Rouen)

DC1 *Recent Advances in DC programming and DCA. Applications in Data Mining-Machine Learning and Finance* p. 81

16:15 – 16:30 Break

Chairman: Pham Dinh Tao

16:30 – 17:00 Pham Ngoc Anh (Posts and Telecom. Inst. of Technology, Hanoi)

DC2 *DC Optimization Schemes for Generalized Ky Fan Inequalities* p. 81

17:00 – 17:15 Nguyen Thi Van Hang (Institute of Mathematics, Hanoi)

DCs1 *Penalty function method and exact penalty functions* p. 84

17:15 – 17:30 Nguyen Thi Thu Huong (Le Quy Don University, Hanoi)

DCs2 *Multivalued Tikhonov Trajectories of General Affine Variational Inequalities* p. 84

Tuesday, August 21, 2012

Morning

Chairman: Le Thi Hoai An (University of Lorraine)

11:00 – 11:30 Tran Duc Quynh (Faculty of Infomation Technology, Hanoi University of Agriculture)

DC3 *Optimization of a multi-stage production/inventory system with bottleneck by DC programming based approaches* p. 82

11:30 – 12:00 Nguyen Van Thoai (University of Trier)

DC4 *Global Minimization of Increasing Positively Homogeneous Functions* p. 82

Afternoon

Chairman: Pham Dinh Tao (INSA-Rouen)

15:15 – 15:45 Nguyen Nang Tam (Hanoi Pedagogical University II, Xuan Hoa)
DC5 *Stability of the subproblem of the trust-region method* p. 82

15:45 – 16:15 Pham Duy Khanh (Ho Chi Minh City University of Pedagogy)
DC6 *Convergence Rate of a Modified Extragradient Method for Pseudomonotone Variational Inequalities* p. 83

16:15 – 16:30 Break

Chairman: Nguyen Nang Tam (Hanoi Pedagogical University II, Xuan Hoa)

16:30 – 16:45 Tran Thai Duong (International University, VNU-HCMC)
DCs3 *Regular polynomials and their applications to DC representations* p. 84

16:45 – 17:00 Nguyen Thi Hong Linh (International University, VNU-HCMC)
DCs4 *Generalized Convex Functions* p. 85

17:00 – 17:15 Nguyen Duc Hien (Duy Tan University, Danang)
DCs5 *The extragradient-Armijo method for pseudomonotone equilibrium problems and strict pseudocontractions* p. 85

Thursday, August 23, 2012

Morning

Chairman: Pham Ngoc Anh (Posts and Telecom. Inst. of Technology, Hanoi)

11:00 – 11:30 Hoang Ngoc Tuan (Hanoi Pedagogical University II, Xuan Hoa)
DC7 *Boundedness of the DCA iterative sequences in quadratic programming* p. 83

11:30 – 12:00 Tran Hong Mo (Tien Giang University)
DC8 *Farkas-type results for nonconvex system involving composite functions with applications* p. 83

DM: Discrete mathematics

Room 4

Monday, August 20, 2012

Afternoon

Chairman: C. Carlet (Universite Paris 8)

15:15 – 15:45 N. Schabanel (CNRS - Université Paris 7)
DM1 *Search algorithms in small worlds* p. 86

15:45 – 16:15 Tran Vinh Linh (Institute of Mathematics, Hanoi and University of Washington)
DM2 *Comparison method for spectral properties of large random graphs* p. 87

16:15 – 16:30 Break

16:30 – 17:00 V. Berthé (CNRS- Université Paris 7)
DM3 *Gcd computations and multidimensional continued fractions* p. 88

17:00 – 17:30 Tran Dan Thu (School of Information Technology, University of Science, VNU-HCMC)
DM4 *On identities for Combinatorial Extremal Theory* p. 88

17:30 – 17:45 Tran Vinh Duc (HUST)
DMs1 *One-relation languages and code generators* p. 95

Tuesday, August 21, 2012

Morning

Chairman: Phan Thi Ha Duong (Institute of Mathematics, Hanoi)

11:00 – 11:30 S. Thomassé (ENS Lyon)
DM5 *Graph coloring, communication complexity, and the stubborn problem* p. 88

11:30 – 12:00 Bui Xuan Binh Minh (CNRS, Université Paris 6)
DM6 *Tree structure of subsets* p. 89

12:00 – 12:15 Le Tien Nam (K54 Advanced Mathematics Program, HUS, VNU-Hanoi)
DMs2 *Subgraphs of the odd distance graph* p. 96

Afternoon

Chairman: S. Thomassé (ENS Lyon)

15:15 – 15:45 C. Carlet (Université Paris 8)
DM7 *Highly Nonlinear Boolean Functions with Optimal Algebraic Immunity* p. 90

15:45 – 16:15 Phan Duong Hieu (University of Paris 8 and École Normale Supérieure)
DM8 *A Code for Trace and Revoke Systems* p. 90

16:15 – 16:30 Break

16:30 – 17:00 J. C. Bajard (LIP6 UPMC CNRS)
DM9 *Number systems and Cryptography* p. 91

17:00 – 17:30 Nguyen Dinh Thuc (University of Science, VNU-HCMC)
DM10 *3Tav-An Efficient Public Key Cryptography* p. 92

17:30 – 17:45 Pham Van Trung (Institute of Mathematics, Hanoi)
DMs3 *Lattices generated by Chip Firing Game models: characterizations and recognition algorithm* p. 97

17:45 – 18:00 Le Manh Ha (College of Education, Hue University)
DMs4 *On the relation between Chip Firing Games and Petri Nets* p. 97

Thursday, August 23, 2012

Morning

Chairman: C. Crespelle (Université Lyon 1)

11:00 – 11:30 B. Courcelle (Université Bordeaux-1, Institut Universitaire de France)
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11:30 – 12:00 Ngo Dac Tan (Institute of Mathematics, Hanoi)
DM12 *Maximal nonhamiltonian Burkard-Hammer graphs with a large minimum degree* p. 93

12:00 – 12:15 Dang Hai Van (University of Science, VNU-HCMC)
DMs5 *Public-key Encryption with Keyword Search using Pseudo-inverse Matrix* p. 97

Afternoon

Chairman: Ngo Dac Tan (Institute of Mathematics, Hanoi)

15:15 – 15:45 Frédérique Bassino (LIPN, Université Paris 13)
DM13 *Random subgroups of a free group and automata* p. 93

15:45 – 16:15 G. H. E. Duchamp (LIPN)
DM14 *An Interface between Physics and Number Theory* p. 93

16:15 – 16:30 Break

16:30 – 17:00 Hoang Ngoc Minh (LIPN - UMR 7030, CNRS)
DM15 *Polyzêtas and irreducible Lyndon words* p. 94

17:00 – 17:30 Phan Trung Huy (Hanoi University of Science and Technology)
DM16 *Application of module method in steganography* p. 94

17:30 – 17:45 Nguyen Dinh Han (Hung Yen University of Technology and Education)
DMs6 *Effective algorithms based on automata and algebraic techniques to verify codes of infinite and bi-infinite words* p. 98

17:45 – 18:00 Dao Thi Thu Ha (PriSM, CNRS-UVSQ)
DMs7 *Queueing network and some types of Customers and Signals* p. 98

Friday, August 24, 2012

Morning

Chairman: V. Berthé (CNRS- Université Paris 7)

11:00 – 11:30 N. Trotignon (CNRS, LIP, ENS Lyon)
DM17 *Coloring perfect graphs with no balanced skew partition* p. 94

11:30 – 12:00 Le Anh Vinh (HUS, VNU-Hanoi)
DM18 *Explictily construction of existentially closed graphs from permutation polynomials over finite fields* p. 95

12:00 – 12:15 Pham Van Thang (HUS, VNU-Hanoi)
DMs8 *Some Combinatorial Problems in Vector Spaces over Finite Cyclic Rings* p. 98

12:15 – 12:30 Bui Vu Anh (HUS, VNU-Hanoi)
DMs9 *A Zero-Knowledge protocol based on a product of durations* p. 98

12:30 – 12:45 Ho Ngoc Vinh (Vinh University of Technology and Education)
DMs10 *Effective algorithms based on automata and algebraic techniques to verify codes of words and bounded words* p. 99

GS: Geometry and singularities

Room 5

Monday, August 20, 2012

Afternoon

Chairman: J. P. Brasselet (IML, CNRS, Marseille)

15:15 – 16:15 Lê Dũng Tráng (Université de Marseille)
GS1 *Vanishing Fibers and Singularities* p. 100

16:15 – 16:30 Break

16:30 – 17:30 Vu The Khoi (Institute of Mathematics, Hanoi)
GS2 *The Seifert volume of 3-manifolds: computation and application* p. 100

Tuesday, August 21, 2012

Morning

Chairman: Ta Le Loi (Dalat University)

11:00 – 12:00 M. Merle (Université Nice Sophia-Antipolis)
GS3 *Arc Spaces and Motivic Milnor fiber* p. 100

12:00 – 12:15 Luu Ba Thang (HNUE)
GSs1 *The matrix based representations of the intersection curves* p. 102

Afternoon

Chairman: Nguyen Viet Dung (Institute of Mathematics, Hanoi)

15:15 – 16:15 M. Oka (Tokyo University of Science)
GS4 *Contact structure on mixed singularity links* p. 100

16:15 – 16:30 Break

16:30 – 16:45 Pho Duc Tai (HUS, VNU-Hanoi)
GSs2 *Geometry of smooth quartics and their dual curves* p. 103

16:45 – 17:15 Nguyen Hong Duc (Institute of Mathematics, Hanoi)
GS5 *Right simple singularities in positive characteristic* p. 101

Thursday, August 23, 2012

Morning

Chairman: Pham Tien Son (Université de Dalat)

11:00 – 12:00 Ta Le Loi (Université de Dalat)
GS6 *A chapter of singularities for numerical analysis* p. 101

Afternoon

Chairman: Ha Huy Vui (Institute of Mathematics, Hanoi)

15:15 – 16:15 D. Trotman (Aix-Marseille-Université)
GS7 *Controlling the multiplicities in a Milnor number constant family of complex hypersurfaces.* p. 101

16:15 – 16:30 Break

16:30 – 17:00 Nguyen Thi Bich Thuy (IML Marseille)
GS8 *Etude d'un ensemble singulier associé à une application polynomiale* p. 101

17:00 – 17:30 Dinh Si Tiep (Institute of Mathematics, Hanoi)
GS9 *Lojasiewicz inequality on non-compact domains* p. 102

NA: Numerical analysis and applied mathematics

Room 7

Monday, August 20, 2012

Afternoon

Chairman: Vu Ngoc Phat (Institute of Mathematics, Hanoi)

15:15 – 15:45 Nguyen Khoa Son (Institute of Mathematics, Hanoi)
NA1 *Robustness of stability and controllability of dynamical systems* p. 104

15:45 – 16:15 P. Omnes (LAGA, Université Paris 13)
NA2 *An a posteriori error estimation for the discrete duality finite volume discretization of the Stokes equations* p. 104

16:15 – 16:30 Break

Chairman: P. Omnes (LAGA, Université Paris 13)

16:30 – 17:00 Dang Quang A (Institute of Information Technology, Hanoi)
NA3 *Mathematical modeling and algorithms for the problem of oil pollution* p. 104

17:00 – 17:15 Nguyen Thanh Nam (Université Paris 11)
NAs1 *Large time behavior of solutions of nonlocal evolution problems* p. 109

17:15 – 17:30 Nguyen Thi Hai Yen (CNRM)
NAs2 *Atmospheric simulation of a heavy precipitation event over the Southeast of France* p. 110

Tuesday, August 21, 2012

Morning

Chairman: L. Halpern (LAGA, Université Paris 13)

11:00 – 11:30 Vu Ngoc Phat (Institute of Mathematics, Hanoi)
NA4 *Stability and control of neural networks* p. 105

11:30 – 12:00 S. Labbé (Université Joseph Fourier)
NA5 *Modeling and simulation for ferromagnetism materials* p. 105

Afternoon

Chairman: Nguyen Khoa Son (Institute of Mathematics, Hanoi)

15:15 – 15:45 Do Le (Paul) Minh (California State University)
NA6 *Understanding the Hastings Algorithm* p. 106

15:45 – 16:15 Ta Duy Phuong (Institute of Mathematics, Hanoi)
NA7 *Some theoretical results and numerical methods for solving the differential-algebraic equations* p. 106

16:15 – 16:30 Break

Chairman: Vu Hoang Linh (HUS, VNU-Hanoi)

16:30 – 17:00 Mai Duc Thanh (International University, VNU-HCMC)
NA8 *A well-balanced two stage Roe-type numerical scheme for a model of two phase flows.* p. 107

17:00 – 17:15 Phan Thanh Nam (Quy Nhon University)
NAs3 *On the reachable set bounding for linear discrete-time systems with delays and bounded disturbances* p. 110

17:15 – 17:30 Ta Thi Huyen Trang (Institute of Mathematics, Hanoi)
NAs4 *Guaranteed cost control problem of linear systems with delayed state and control via static output feedback* p. 111

Thursday, August 23, 2012

Morning

Chairman: S. Labbé (Université Joseph Fourier)

11:00 – 11:30 Vu Hoang Linh (HUS, VNU-Hanoi)
NA9 *Numerical integration of non-stiff differential-algebraic equations by half-explicit methods* p. 107

11:30 – 12:00 Tran Minh Binh (BCAM-Spain)
NA10 *Convergence to Equilibrium of Some Kinetic Models* p. 107

Afternoon

Chairman: Mai Duc Thanh (International University, VNU-HCMC)

15:15 – 15:45 L. Halpern (LAGA, Université Paris 13)
NA11 *Optimized Schwarz Waveform Relaxation for domain decomposition* p. 108

15:45 – 16:15 Nguyen Dinh Phu (University of Science, VNU-HCMC)
NA12 *The Interval- valued Differential Equations and Applications* p. 108

16:15 – 16:30 Break

Chairman: Tran Minh Binh (BCAM-Spain)

16:30 – 17:00 Y. Kimura (Graduate School of Mathematics, Nagoya University)
NA13 *Chaotic advection of particles by a 3D vortex soliton* p. 108

17:00 – 17:15 Do Vu Huy Cuong (Université Paris 11)
NAs5 *A hybrid finite volume method for complex groundwater flow modeling* p. 111

17:15 – 17:30 Nguyen Minh Quan (VNU-HCMC)
NAs6 *Effects of dissipation and interaction on optical solitons of the nonlinear Schrödinger equation* p. 112

Friday, August 24, 2012

Morning

Chairman: Dang Quang A (Institute of Information Technology, Hanoi)

11:00 – 11:30 Tran Dinh Ke (HNUE)
NA14 *Stability for Fractional Differential Equations by Means of Fixed Point Theory* p. 109

11:30 – 11:45 Le Duc Thang (Ho Chi Minh City Industry and Trade College)
NAs7 *On the Interval-valued Integro-differential Equations* p. 112

11:45 – 12:00 Ngo Van Hoa (University of Science, VNU-HCMC)
NAs8 *On the Solutions of Fuzzy Interval-valued Control Differential Equations* p. 112

12:00 – 12:15 Nguyen Van Dung (Dong Thap University)
NAs9 *On Berinde's theorems and related results* p. 112

12:15 – 12:30 Nguyen Ngoc Tuan (Hung Yen University of Technology and Educations)
NAs10 *Asymptotic integration of linear differential-algebraic equations* p. 113

12:30 – 12:45 Tran Nhan Tam Quyen (Da Nang University of Education)
NAs11 *Convergence Rates for the Tikhonov Regularization of a Coefficient Identification Problem in an Elliptic Boundary Value Problem* p. 113

OP: Optimization

Room 8

Monday, August 20, 2012

Afternoon

Chairman: A. Kruger (University of Ballarat)

15:15 – 15:45 M. Théra (XLIM and University of Limoges)
OP1 *Implicit Multifunctions Theorems: recent developments* p. 115

15:45 – 16:15 M. H. Geoffroy (Université des Antilles et de la Guyane)
OP2 *Characterization of metric regularity of subdifferentials* p. 116

16:15 – 16:30 Break

Chairman: Nguyen Dinh (International University, VNU-HCMC)

16:30 – 17:00 Bao Truong (Northern Michigan University)
OP3 *To dual-space theory of set-valued optimization* p. 116

17:00 – 17:15 V. Laha (Banaras Hindu University)
OPs1 *On Approximate Convexity and Vector Variational Inequalities* p. 121

17:15 – 17:30 V. Singh (Banaras Hindu University)
OPs2 *On optimality and duality in nondifferentiable multiobjective optimization involving pseudo d-invexity* p. 121

Tuesday, August 21, 2012

Morning

Chairman: Phan Quoc Khanh (International University, VNU-HCMC)

11:00 – 11:30 G. Bouchitté (IMATH, Université du Sud-Toulon-Var)
OP4 *A free boundary problem arising in optimal design of thin torsion rods* p. 117

11:30 – 12:00 Bui Trong Kien (Hanoi National University of Civil Engineering)
OP5 *Lower semicontinuity of the solution set to a parametric optimal control problem* p. 117

Afternoon

Chairman: M. Théra (XLIM and University of Limoges)

15:15 – 15:45 A. Kruger (University of Ballarat)
OP6 *About an infinite intersection rule* p. 117

15:45 – 16:15 Nguyen Dinh (International University, VNU-HCMC)
OP7 *Some extensions of Farkas lemma and Hahn-Banach theorem* p. 119

16:15 – 16:30 Break

Chairman: M. H. Geoffroy (Université des Antilles et de la Guyane)

16:30 – 17:00 Lam Quoc Anh (Can Tho University)
OP8 *On Hölder continuity of approximate solution sets of parametric equilibrium problems* p. 119

17:00 – 17:15 Le Ba Khiet (XLIM, Université de Limoges)
OPs3 *Well-posedness, Robustness and Stability Analysis of a Set-Valued Controller for Lagrangian Systems* p. 122

17:15 – 17:30 Huynh Thi Hong Diem (College of Can Tho)
OPs4 *Optimality conditions for a class of relaxed quasiconvex minimax problems* p. 122

Thursday, August 23, 2012

Morning

Chairman: G. Bouchitté (IMATH, Université du Sud-Toulon-Var)

11:00 – 11:30 S. Adly (XLIM, Université de Limoges)
OP9 *Quantitative stability of a generalized equation. Application to non-regular electrical circuits* p. 119

11:30 – 12:00 Truong Xuan Duc Ha (Institute of Mathematics, Hanoi)
OP10 *Optimality conditions for vector optimization problems with variable ordering structures* p. 120

Afternoon

Chairman: S. Adly (XLIM, Université de Limoges)

15:15 – 15:45 Nguyen Quang Huy (Hanoi Pedagogical University II, Xuan Hoa)
OP11 *Large Calculations for Coderivatives of the Normal Cone Mapping to Polyhedral Convex Sets with Linear Perturbations* p. 120

15:45 – 16:15 Phan Nhat Tinh (College of Science, Hue University)
OP12 *On second-order conditions for nonsmooth problems with constraints* p. 120

16:15 – 16:30 Break

Chairman: Truong Xuan Duc Ha (Institute of Mathematics, Hanoi)

16:30 – 17:00 Le Thanh Tung (College of Sciences, Cantho University)
OP13 *On higher-order sensitivity analysis in nonsmooth vector optimization* p. 120

17:00 – 17:15 Nguyen Huu Tron (XLIM, Universite de Limoges)
OPs5 *TBA* p. 123

17:15 – 17:30 Vo Si Trong Long (Cao Thang Technology College)
OPs6 *General existence theorems in GFC-spaces and applications* p. 123

Friday, August 24, 2012

Morning

Chairman: Bui Trong Kien (Hanoi National University of Civil Engineering)

11:00 – 11:15 Dao Ngoc Minh (Institut de Mathématiques, Université de Toulouse)
OPs7 *Minimizing the memory of a system* p. 123

11:15 – 11:30 Nguyen Hieu Thao (University of Ballarat)
OPs8 *About Hölder-type regularity properties of collections of sets* p. 124

11:30 – 11:45 Tran Trinh Minh Son (Thang Long Gifted High School, Dalat)
OPs9 *On the stability of weak Pareto-Nash equilibrium points for parametric multi-objective generalized games* p. 125

11:45 – 12:00 Nguyen Van Hung (Dong Thap University)
OPs10 *Semicontinuity of solution sets to parametric vector equilibrium problems with equilibrium constraints* p. 125

12:00 – 12:15 Tran Quoc Duy (Cantho Technical and Economic College)
OPs11 *On stability for parametric lexicographic equilibrium problems* p. 126

12:15 – 12:30 Phan Quoc Khanh (International University, VNU-HCMC)
OPs12 *Variational convergence of finite valued bifunctions* p. 126

PDE: Partial differential equations

Room 6

Thursday, August 23, 2012

Morning

Chairman: F. Planchon (Université de Nice Sophia-Antipolis)

11:00 – 11:45 P. Raphäel (Université Paul Sabatier)
PDE1 *Collapsing ring solutions to the mass super critical NLS* p. 127

11:45 – 12:00 Phan Thanh Nam (University of Cergy-Pontoise)
PDEs1 *Existence and non-existence of solutions to Schrödinger equation for atoms* p. 128

Afternoon

Chairman: Nguyen Minh Tri (Institute of Mathematics, Hanoi)

15:15 – 16:00 D. O. Ivanovici (Université de Nice Sophia-Antipolis)
PDE2 *Dispersive effects for waves on domains* p. 127

16:00 – 16:30 Ha Tien Ngoan (Institute of Mathematics, Hanoi)
PDE3 *Characteristic systems for general Monge-Ampere equations* p. 127

16:30 – 17:00 Ngo Van Sang (LMRS Université de Rouen)
PDE4 *Global existence for fast rotating fluids with small viscosity* p. 127

17:00 – 17:30 Dang Dinh Chau (HUS, VNU-Hanoi)
PDE5 *On the asymptotic behavior of of the evolution equations* p. 128

Friday, August 24, 2012

Morning

Chairman: F. Klopp (Université Paris 6)

11:00 – 11:45 M. Lewin (CNRS and University of Cergy-Pontoise)
PDE6 *Lack of compactness in nonlinear many body quantum systems* p. 128

11:45 – 12:15 Nguyen Minh Tri (Institute of Mathematics, Hanoi)
PDE7 *Long time behavor of solutions to semilinear parabolic equations involving strongly degenerate elliptic differential operators* p. 128

PT: Probability theory

Room 9

Monday, August 20, 2012

Afternoon

Chairman: Nguyen Huu Du (HUS, VNU-Hanoi)

15:15 – 16:15 Tran Viet Chi (Université de Lille)
PT1 *Limit theorems of historical processes in population dynamics* p. 129

16:15 – 16:30 Break

16:30 – 17:00 Nguyen Hai Dang (HUS, VNU-Hanoi)
PT2 *Kolmogorov systems under the telegraph noise* p. 129

17:00 – 17:30 Le Vi (Université d'Aix-Marseille)
PT3 *Trees under attack* p. 129

Tuesday, August 21, 2012

Morning

Chairman: Tran Hung Thao (Institute of Mathematics, Hanoi)

11:00 – 12:00 P. Doukhan (Université de Cergy-Pontoise and IUF)
PT4 *Applications of weak dependence to non-linear time series analysis* p. 130

Afternoon

Chairman: J. S. Dhersin (Université Paris 13)

15:15 – 15:45 Nguyen Huu Du (HUS, VNU-Hanoi)
PT5 *Stochastic dynamic equations on disconnected sets* p. 130

15:45 – 16:15 Tran Hung Thao (Institute of Mathematics, Hanoi)
PT6 *A practical approach to fractional stochastic calculus and applications* p. 131

16:15 – 16:30 Break

16:30 – 17:00 Dang Hung Thang (HUS, VNU-Hanoi)
PT7 *Probabilistic Linear Operators on Probabilistic Hilbert spaces* p. 131

17:00 – 17:30 Pham Cong Zan (Université d'Aix-Marseille)
PT8 *A new proof of the monotonicity of the speed of an excited random walk in high dimensions using cut times* p. 132

Thursday, August 23, 2012

Morning

Chairman: P. Doukhan (Université de Cergy-Pontoise and IUF)

11:00 – 12:00 J. S. Dhersin (Université Paris 13)
PT9 *Length of branches of some Λ Coalescent* p. 132

Afternoon

PT-subsection A

Room 9

Chairman: Tran Viet Chi (Université de Lille)

15:15 – 16:15 F. Gautero (Université de Nice)
PT10 *Poisson boundary and certain extensions of free groups* p. 133

16:15 – 16:30 Break

16:30 – 17:00 Nguyen Tran Thuan (Vinh University)
PT11 *Laws of large numbers for arrays of random variables in metric space* p. 133

17:00 – 17:30 Nguyen Ngoc Bien (Université d'Aix-Marseille)
PT12 *Adaptation via L_p-norm in the regression model* p. 133

PT-subsection B

Room 13

Chairman: Nguyen Van Quang (Vinh University)

15:15 – 15:30 Cao Van Nuoi (Da Nang University of Education)
PTs1 *Strictly stationary type processes generated by hyper groups* p. 134

15:30 – 15:45 Nguyen Thi The (TU Dresden and Vinh University)
PTs2 *Lyapunov spectrum of nonautonomous linear stochastic differential algebraic equations of index 1* p. 134

15:45 – 16:00 Nguyen Thi Thuy Quynh (Academy of Finance and Institute of Mathematics, Hanoi)
PTs3 *Coincidence of Lyapunov exponents and central exponents of linear Ito stochastic differential equations with nondegenerate stochastic term* p. 135

16:00 – 16:15 Pham Tri Nguyen (Electric Power University, Hanoi)
PTs4 *On complete convergence for arrays of rowwise independent of random variables in convex combination spaces* p. 135

16:15 – 16:30 Break

16:30 – 16:45 Tran Loc Hung (University of Finance & Marketing, HCMC)
PTs5 *On the Rate of Approximation in the Weierstrass Approximation Theorem by Bernstein's Polynomials of random degree* p. 135

16:45 – 17:00 Vu Thi Thao (University of Finance & Marketing, HCMC)
PTs6 *Bounds for the Approximation of Poisson-binomial distribution by Poisson distribution* p. 135

17:00 – 17:15 Tran Van San (Ho Chi Minh City Industry and Trade College)
PTs7 *Stationary Processes Generated by Orthogonal Polynomials* p. 136

Friday, August 24, 2012

Morning

PT-subsection A

Room 9

Chairman: F. Gautero (Université de Nice)

11:00 – 11:30 Tran Ngoc Khue (Université Paris 13)

PT13 *Parametric estimation for ergodic diffusion processes with jumps* p. 134

11:30 – 12:00 Nguyen Van Quang (Vinh University)

PT14 *Some laws of large numbers for arrays in probability theory* p. 134

PT-subsection B

Room 13

Chairman: Dang Hung Thang (HUS, VNU-Hanoi)

11:00 – 11:15 Ho Dang Phuc (Institute of Mathematics, Hanoi)

PTs8 *Domains of operator semi-attraction of probability measures on Banach spaces* p. 136

11:15 – 11:30 Nguyen Thanh Dieu (Vinh University)

PTs9 *On the stochastic dynamic equations on time scale* p. 136

RT: Representation theory

Room 11

Monday, August 20, 2012

Afternoon

Chairman: M. Van der Put (University of Groningen)

15:15 – 16:00 V. B. Mehta (University of Mumbai)
RT1 *Theta Divisors for Vector Bundles on Curves* p. 138

16:00 – 16:15 Duong Minh Thanh (Ho Chi Minh City University of Pedagogy)
RTs1 *Singular quadratic Lie superalgebras* p. 80

16:15 – 16:30 Break

16:30 – 17:15 Nguyen Quoc Thang (Institute of Mathematics, Hanoi)
RT2 *On some arithmetic aspects of representation theory of algebraic groups* p. 138

17:15 – 18:00 Do Ngoc Diep (Institute of Mathematics, Hanoi)
RT3 *Harish-Chandra operators and quantization of fields* p. 142

Tuesday, August 21, 2012

Morning

Chairman: Nguyen Quoc Thang (Institute of Mathematics, Hanoi)

11:00 – 12:00 Ngo Dac Tuan (CNRS - University of Paris 13)
RT4 *On a fixed point formula for shtukas* p. 139

Afternoon

Chairman: Ngo Dac Tuan

15:15 – 15:30 Le Anh Vu (University of Economics and Law, VNU-HCMC)
RTs2 *On a Special Class of Real Solvable Lie Groups and Corresponding Co-adjoint Representation* p. 144

15:45 – 16:00 Duong Quang Hoa (University of Economics and Law, VNU-HCMC)
RTs3 *Co-adjoint Representation of a class of Real Solvable Lie groups and Foliations assocated to them* p. 144

16:15 – 16:30 Break

16:30 – 17:15 Benoit Stroh (CNRS - University Paris 13)
RT5 *Center of Hecke algebras and nearby cycles* p. 139

17:15 – 18:00 Lê Quy Thuong (HUS, VNU-Hanoi and Université Paris 6)
RT6 *On the Kontsevich-Soibelman integral identity conjecture* p. 139

Thursday, August 23, 2012

Morning

Chairman: Vikram B. Mehta (University of Mumbai)

11:00 – 12:00 Phung Ho Hai (Institute of Mathematics, Hanoi)
RT7 *Stratified fundamental groups of algebraic schemes* p. 141

Afternoon

Chairman: Phung Ho Hai (Institute of Mathematics, Hanoi)

15:15 – 15:30 Bui Xuan Hai (University of Science, VNU-HCMC)
RTs4 *Maximal Subgroups in skew linear groups* p. 144

15:45 – 16:15 Nguyen Dai Duong (Institute of Mathematics, Hanoi)
RTs5 *Tannaka characterization of surjective and injective homomorphisms of affine group schemes over DVR* p. 144

16:15 – 16:30 Break

16:30 – 17:15 Lars Kindler (Universität Duisburg-Essen)
RT8 *Regular singular stratified bundles and tame ramification* p. 141

17:15 – 18:00 Do Viet Cuong (Université de Lorraine)
RT9 *The metaplectic fundamental lemma of Jacquet and Mao in equal characteristic* p. 141

Friday, August 24, 2012

Morning

Chairman: Bui Xuan Hai (University of Science, VNU-HCMC)

11:00 – 12:00 M. van der Put (University of Groningen)
RT10 *Stokes matrices for the quantum differential equations of some Fano varieties* p. 141

SF: Stochastic analysis and statistics in finance

Room 12

Monday, August 20, 2012

Afternoon

Chairman: M. Rosenbaum (Université Paris 6)

15:15 – 15:45 L. Campi (Université Paris 13)
SF1 *On existence of shadow prices* p. 146

15:45 – 16:15 Nguyen Huu Thai (University of Economics HCMC)
SF2 *Limit theorem for Leland's strategy with stochastic volatility* p. 146

16:15 – 16:30 Break

16:30 – 17:00 Duong Dang Xuan Thanh (John Von Neumann Institute, VNU-HCMC)
SF3 *Discrete hedging in Heston model with liquidity costs* p. 148

17:00 – 17:15 Nguyen Huy Hoang (National Economics University, Hanoi)
SFs1 *Ruin Probability for risk models with dependent random variables* p. 152

17:15 – 17:30 Le Si Dong (University of Banking, HCMC)
SFs2 *On the Interval- valued Stochastic Differential Equations and Applications* p. 152

Tuesday, August 21, 2012

Morning

Chairman: Nguyen Van Thu (International University, VNU-HCMC)

11:00 – 11:30 S. Crépey (Université d'Evry)
SF4 *Dynamized copulas and application to counterparty risk modeling* p. 148

11:30 – 12:00 Nguyen Thanh Thien (Université Toulouse III et HNUE)
SF5 *Second-order dynamical models for securities prices* p. 148

Afternoon

Chairman: L. Campi (Université Paris 13)

15:15 – 15:45 M. Rosenbaum (Université Paris 6)
SF6 *Optimal discretization of hedging strategies with jumps* p. 148

15:45 – 16:15 Hoang Thi Phuong Thao (HUS, VNU-Hanoi)
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16:15 – 16:30 Break

16:30 – 17:00 Nguyen Quang (John Von Neumann Institute, VNU-HCMC)
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17:00 – 17:15 Hoang Duc Manh (Faculty of Math. Economics, NEU-Hanoi)
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17:15 – 17:30 W. Horrigue (Université du Littoral Cote d'Opale Calais)
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Thursday, August 23, 2012

Morning

Chairman: Nguyen Quang (John Von Neumann Institute, VNU-HCMC)

11:00 – 11:30 Nguyen Van Thu (International University, VNU-HCMC)
SF9 *Series representation of the norm of Brownian motions and norm-normal approximations* p. 150

11:30 – 12:00 Tran Trong Nguyen (National Economics University, Hanoi)
SF10 *Measuring the Foreign Exchange Risk by using EVT method* p. 151

ABSTRACTS

Plenary lectures and Public lecture

PL1: Circle diffeomorphisms and interval exchange maps

Jean-Christophe Yoccoz

Collége de France, Paris

After reviewing the main features of the dynamics of circle diffeomorphisms, we will discuss how some of the main results extend to the context of interval exchange maps.

PL2: Flat bundles in characteristic 0 and $p > 0$

Hélène Esnault

University of Duisburg-Essen

We discuss analogies between the fundamental groups of flat bundles in characteristic 0 and $p > 0$.

PL3: Combinatorial Optimization: a Bridge between Combinatorics and Algebra

Ngo Viet Trung

Institute of Mathematics, Hanoi

This lecture is an introduction to some recent results and open problems in Combinatorial Commutative Algebra. The main theme is that there are strong relationships between well known classes of hypergraphs in Combinatorics and monomial ideals in Algebra via techniques of Combinatorial Optimization. By these relationships, several new results on monomial ideals can be recovered by earlier results on hypergraphs. On the other hand, some open combinatorial problems can be translated to purely algebraic problems.

PL4: Recent progresses in the theory of random matrices

Vu Ha Van

Yale University

I am going to give a brief survey on recent progresses in the theory of random matrices.
The main theme of the talk is the Universality phenomenon, which asserts that limiting distributions concerning the eigenvalues of a random matrix should not depend too much on the distribution of the entries. The focus of the talk will be the Four Moment theorem, obtained recently with Terence Tao.

PL5: Tractable characterizations of polynomials nonnegative on a closed set

Jean B. Lasserre

LAAS-CNRS

Characterizing polynomials (and more generally, functions) that are nonnegative on a closed subset K of R^n is a challenging problem with many important practical applications. Indeed, such characterizations are highly desirable to help solve (or at least approximate) many important problems in various areas, and in particular, the global optimization problem: P : $\min\{f(x) : x \in K\}$ because solving P is equivalent to solving $\max\{t : f(x) - t >= 0 on K\}$. Ideally, one would like to obtain "certificates of nonnegativity (or even positivity)" that are tractable, i.e. amenable to practical computation. In this talk we will describe two such characterizations when K is a basic closed semi-algebraic set, and how they can be used in Polynomial Optimization.

In a first approach the semi-algebraic set K is known through its defining polynomials. We will present the powerful and celebrated Positivstellensatze (or positivity certificates) of Schmudgen and Putinar introduced in the nineties for compact basic semi-algebraic sets, and based on sums of squares. They provide inner approximations of the convex cone $C(K)$ of polynomials nonnegative on K and we will show how they can be used in global optimization by solving an appropriate hierarchy of semidefinite programs (a powerful technique of convex optimization) which provide a monotone sequence of lower bounds converging to the global optimum.

In another approach to nonnegativity on a set K, our knowledge on K is through moments of a finite Borel measure whose support is K. We provide another characterization of polynomials nonnegative on K which also use sums of squares but now permits to provide outer approximations of the convex cone $C(K)$. Checking membership in $C(K)$ reduces to solving a sequence of generalized eigenvalue problems involving two symmetric matrices. When applied to global optimization one obtains a monotone sequence of upper bounds converging to the global optimum.

PL6: An integrable Hamiltonian system and its connections to harmonic analysis and partial differential equations

Patrick Gérard

Université Paris 11

I shall introduce the cubic Szegö equation, a Hamiltonian system on the Hardy space of the disc, and describe how the existence of a Lax pair for this system links to spectral theory of Hankel operators and weak turbulence for nonlinear wave equations.

PL7: On automorphic L-functions

Ngo Bao Chau

University of Chicago and VIASM

We will review Tate's construction of automorphic L-function and its generalization by

Tamagawa-Godement-Jacquet for principal L-functions attached to automorphic forms on GL(n). I will explain an idea that may lead to a geometric construction of general automorphic L-functions.

PL8: On the arithmetic of elliptic curves

Benedict Gross

Harvard University

I will give a general talk on cubic equations over the rational numbers, concentrating on the fundamental problem of determining the group of rational points. I will review the progress that has been made on the conjecture of Birch and Swinnerton-Dyer, then discuss some recent work of Bhargava on the average rank.

PL9: Equidistribution of varieties in complex dynamics

Dinh Tien Cuong

Université Paris 6

Let f be a non-invertible holomorphic endomorphism of the projective space CP^k. We will discuss the equidistribution of the negative orbit of a variety under the action of f. Statistical dynamical properties like exponential mixing, central limit theorem and large deviations theorem for the measure of maximal entropy can be obtained as consequences. This talk is based on work by Fornaess-Sibony, Taflin and my work in collaboration with V.A. Nguyen and N. Sibony.

PL10: Recent advances in zero-sum repeated games

Sylvain Sorin

Université Paris 6

We will describe several recent results in the theory of two person zero-sum repeated games. Topics include: approachability, asymptotic approach: generalized Shapley operator, incomplete information and dual game, limit game, uniform approach ... We will in particular elaborate on the relation with games in continuous time and differential games.

2011 Zero-sum repeated games: recent advances and new links with differential games, Dynamic Games and Applications, 1, 172-207.

PL11: The Lannes-Zarati homomorphism and the Singer transfer

Nguyen Huu Viet Hung

HUS, VNU-Hanoi

In this talk, we discuss on the application of Modular Invariant Theory in the study of our two open conjectures on spherical classes and on the (classical) squaring operation.

PL12: Random walks on (hyperbolic) groups.

P. Mathieu

Université de Provence

Some recent developments about random walks on hyperbolic groups deal with fluctuations (Central limit theorems or fluctuations of the entropy/rate of escape). Before describing these, there will be a gentle introduction to the subject of random walks on groups, in particular hyperbolic groups.

PL13: Metric Regularity of Multifunctions and Applications

Huynh Van Ngai

Quy Nhon University

The metric regularity of multifunctions is one of the central themes in variational analysis and in optimization. This concept goes back to the classical regularity theory, such as the surjectivity of a linear continuous mapping in the Banach Open Mapping Theorem; its extension to nonlinear operators known as the Lyusternik & Graves Theorem and implicit function theorems.

In this talk, we present the recent results concerning regularity criteria; quantitative estimations of regularity and stability of the metric regularity, as well as their applications in optimization

PL: The Mathematics of the 21st century: Are they really different?

Pierre Cartier

IHÉS, Paris

The Mathematics of the 20th century were dominated by the trends of abstraction, axiomatisation and generalization. For many mathematicians it was more fashionable to work in pure Mathematics than in applied Mathematics. The frontier between these two main branches is now blurred, especially because of the development of computers and internet. Sociological changes have also occurred in the community of mathematicians, under the influence of various factors: internationalization as well as the fantastic development of higher education in all countries. Another aspect is the occurrence of more and more computer-assisted proofs which tend to become monsters difficult to tame.

AG: Complex analysis and geometry

AG1: Analytic torsion and Toeplitz operators

Xiaonan Ma

Institut de Mathématiques de Jussieu

If X is an odd dimensional compact Riemannian manifold and F is a complex flat vector bundle on X such that its cohomology is zero, then the Ray-Singer analytic torsion is a real spectral invariant which by different versions of Cheeger-Müller theorem, can be computed by the combinatorial torsion, which gives the information on the size of the torsion group in the cohomology in the arithmetic case.
We use Toeplitz operators to evaluate the leading term in the asymptotics of the analytic torsion associated with a family of flat vector bundles F_p, thus extending results obtained by Müller for the analytic torsion on 3-dimensional hyperbolic manifolds. For $p \in \mathbb{N}$, the flat vector bundle F_p is the direct image of L^p, where L is a holomorphic positive line bundle on the fibres of a flat fibration by compact Kähler manifolds. The leading term of the analytic torsion is the integral of a locally defined differential form.
This is a joint work with Jean-Michel Bismut and Weiping Zhang.

AG2: Hodge realization of Bloch-Kriz mixed Tate motives

Tomohide Terasoma

University of Tokyo

Bloch and Kriz defined mixed Tate motives and they developped some method to compute period of its Hodge realization under some assumption. We prove that this assuption always holds if we consider topological cycles consisting of semi-algebraic set. Moreover we justify the method of Bloch-Kriz using Bar complex of Deligne algebra.

AG3: Transversality of holomorphic mappings between real submanifolds in complex spaces

Duong Ngoc Son

University of California at San Diego

The classical Hopf lemma implies that any non-constant holomorphic mapping sending a strictly pseudoconvex hypersurface into such another is necessarily transversal to the target. The transversality also holds for "non-degenerate" mappings between CR submanifolds satisfying mild conditions (e.g., finite type condition). In this talk, we will discuss several recent, more general results in this direction. This is a joint work with Peter Ebenfel

AG4: A structure theorem for compact Kähler manifolds with semipositive Ricci curvature

Jean-Pierre Demailly

Université de Grenoble I, Institut Fourier

We prove a splitting theorem for the universal covering of a compact Kähler manifold with semipositive Ricci curvature, showing that the basic blocks are Ricci flat Kähler manifolds (complex tori, hyperkähler and Calabi-Yau manifolds) in the flat directions, along with certain rationally connected varieties in the semipositive directions. The latter are obtained through a new characterization of rationally connected varieties via holomorphic tensors. The talk is based on joint work with Frédéric Campana and Thomas Peternell.

AG5: Uniformization in Several Complex variables

Philippe Eyssidieux

Université de Grenoble I, Institut Fourier

We survey recent work on the Shafarevich and the Toledo conjectures on uniformization. The Shafarevich conjecture claims that the universal covering space of a complex projective manifold should be holomorphically convex and the Toledo conjecture that a Kähler group G should have $b_2(G) \neq 0$.

AG6: Orders of automorphisms of $K3$ surfaces

Jong-Hae Keum

School of Mathematics, Korea Institute for Advanced Study

We determine all possible orders of automorphisms of finite order of complex $K3$ surfaces or of $K3$ surfaces in characteristic $p > 3$. E.g., a positive integer N is the order of an automorphism of a complex $K3$ surface if and only if $\phi(N) \leq 20$ where ϕ is the Euler function.

AG7: A sharp lower bound for the log canonical threshold

Pham Hoang Hiep

Hanoi National University of Education

In this talk, we prove a sharp lower bound for the log canonical threshold of a plurisubharmonic function φ with an isolated singularity at 0 in an open subset of $\mathbb{C}^n$. This threshold is defined as the supremum of constants $c > 0$ such that $e^{-2c\varphi}$ is integrable on a neighborhood of 0. We relate $c(\varphi)$ with the intermediate multiplicity numbers $e_j(\varphi)$, defined as the Lelong numbers of $(dd^c\varphi)^j$ at 0 (so that in particular $e_0(\varphi) = 1$). Our main result is that $c(\varphi) \geq \sum e_j(\varphi)/e_{j+1}(\varphi)$, $0 \leq j \leq n-1$. This inequality is shown to be sharp; it simultaneously improves the classical result $c(\varphi) \geq 1/e_1(\varphi)$ due to Skoda, as well as the lower

estimate $c(\varphi) \geq n/e_n(\varphi)^{1/n}$ which has received crucial applications to birational geometry in recent years. The proof consists in a reduction to the toric case, i.e. singularities arising from monomial ideals. Finally we post some open questions.

AG8: Some questions about non Teichmüller representations of surface groups in PSL(2,R)

Maxime Wolff

Institut de Mathématiques Jussieu, Université Pierre-Marie Curie

I intend to make a survey on the non Teichmüller connected components of representations of surface groups in PSL(2,R); these connected components began to be described in the late 80's in the work of William Goldman. Many questions concerning these representations remain open, and I will try to relate some of them.

AG9: Necessary geometric and analytic conditions for general estimates in the d-bar-Neumann problem

Tran Vu Khanh

Tan Tao University

We will talk about the geometric and analytic consequences of a general estimate in the d-bar-Neumann problem: a "gain" in the estimate yields a bound in the "type" of the boundary, that is, in its order of contact with an analytic curve as well as in the rate of the Bergman metric. We also discuss the potential-theoretical consequence: a gain implies a lower bound for the Levi form of a bounded weight. (this is joint work with G. Zampieri).

AG10: Kobayashi hyperbolicity and positivity properties of the canonical bundle

Simone Diverio

Institut de Mathématiques de Jussieu - CNRS

Let X be a smooth projective manifold. In this talk we will describe the conjectural equivalence (due, among others, to Lang) between the analytic property of being Kobayashi hyperbolic and the algebraic property for X of being of general type together with all its subvarieties.
We shall try then to give some evidences toward this equivalence, possibly in both directions. In particular we will concentrate on the following sub-conjecture in dimension three: if a projective threefold is hyperbolic, then its canonical bundle is ample.

AG11: On the dynamical degrees of meromorphic maps preserving a fibration

Nguyen Viet Anh

Université Paris 11

Let f be a dominant meromorphic self-map on a compact Kähler manifold X which preserves a meromorphic fibration $\pi : X \to Y$ of X over a compact Kähler manifold Y. We compute the dynamical degrees of f in term of its dynamical degrees relative to the fibration and the dynamical degrees of the map $g : Y \to Y$ induced by f. We derive from this result new properties of some fibrations intrinsically associated to X when this manifold admits an interesting dynamical system.
This is a joint-work with Tien Cuong Dinh (Université de Paris VI, France) and Tuyen Trung Truong (Indiana University Bloomington, USA).

AG12: Entire curves, logarithmic differentils and related topics

Junjiro Noguchi

Graduate School of Mathematical Sciences, University of Tokyo

I recall the developments of the second main theorem for meromorphic functions and entire curves. I will discuss some general second main theorem with respect to some special C^∞ connection and totally geodesic divisors, which at least gives the geometirc proof of Cartan's second main theorem. Then I will discuss entire curves into semi-abelian varieties and the applications.

AG13: The Cartan-Nochka Second Main Theorem for Hypersurfaces in Sub-general Position in Projective Algebraic Varieties

Gerd Dethloff

Université de Brest

In 1983, Nochka proved a conjecture of Cartan on defects of holomorphic curves in $\mathbb{P}^n(\mathbb{C})$ relative to a possibly degenerate set of hyperplanes. In this talk, which is on joint work with Do Duc Thai and Tan Van Tran from the ENS Hanoi, we show how to generalize Nochka's theorem to holomorphic curves in subvarieties of $\mathbb{P}^n(\mathbb{C})$ relative to hypersurfaces in sub-general position. At the same time our main result generalizes recent work of Min Ru (Annals of Math. 169, 2009) by passing from general to sub-general position. Finally I would like to speak about joint work with Do Duc Thai, Le Giang and Nguyen Huu Kien (all ENS Hanoi) about the number field case of the same result.

AN: Real and complex analysis

AN1: Best approximation issues in Hardy spaces, with applications

Juliette Leblond

INRIA Sophia-Antipolis

The following bounded extremal problems will be discussed, in Hardy spaces $H^p(\mathbb{D})$, where $\mathbb{D} \subset \mathbb{C}$ is the unit disc of the complex plane, and for $1 \leq p \leq \infty$. Let $I \subset \mathbb{T}$ be a proper subset of $\mathbb{T}$ (unit circle) and $J = \mathbb{T} \backslash I$, both with positive Lebesgue measure. Being given $h \in L^p(J)$, and $M > 0$, let

$$B = \{g \in H^p(\mathbb{D}), \|h - g\|_{L^p(J)} \leq M\}_{|I}$$

be the approximation class. For $f \in L^p(I)$, we look for a solution $g_* \in B$ to the bounded extremal problem:

$$\min_{g \in B} \|f - g\|_{L^p(I)} = \|f - g_*\|_{L^p(I)}$$

Existence and uniqueness properties will be described, together with constructive aspects that involve Toeplitz operators (with symbol the indicator function of J), in the Hilbertian situation $p = 2$[1, 2].
As applications we will consider:
- some properties of the associated truncated Toeplitz operators, related to polynomial classes,
- inverse problems for harmonic functions in planar domains (Cauchy transmission issues), from physical or engineering issues, [3].

Extensions to conformally equivalent or annular domains, other constraints, more general $\overline{\partial}$ equations (and elliptic partial differential equations), and to higher dimensional situations (in classes of gradients of harmonic functions) will be briefly presented.

References

[1] L. Baratchart, J. Leblond, Hardy approximation to L^p functions on subsets of the circle avec $1 \leq p < \infty$, *Constructive Approximation*, 14, 41-56, 1998.

[2] L. Baratchart, J. Leblond, J. R. Partington, Hardy approximation to L^∞ functions on subsets of the circle, *Constructive Approximation*, 12, 423-436, 1996.

[3] M. Jaoua, J. Leblond, M. Mahjoub, J. R. Partington, Robust numerical algorithms based on analytic approximation for the solution of inverse problems in annular domains, *IMA J. of Applied Math.*, 74, 481-506, 2009.

AN2: Bilinear decompositions for $H^1 \times BMO$ and related problems

Luong Dang Ky

University of Orleans

In this talk, we present a result on the products of functions in $H^1(\mathbb{R}^n)$ and $BMO(\mathbb{R}^n)$. In particular, we prove that the product space $H^1(\mathbb{R}^n) \times BMO(\mathbb{R}^n)$ can be decomposed

as the sum of two bilinear operators, one from this space into $L^1(\mathbb{R}^n)$, the other one into $H^{\log(\mathbb{R}^n)}$. Then, using this bilinear decomposition, we obtain some endpoint estimates for commutators of singular integral operators.
A new Hardy space of Musielak-Orlicz type is also given.

AN3: On Minkowski dimension of Jordan curves

Le Thanh Hoang Nhat

Laboratory MAPMO, Orleans's university

Let $\Omega \subsetneq \mathbb{C}$ be a simply connected domain containing 0: by the Riemann Mapping theorem, there is a unique conformal map f from the unit disk $D = \{|z| < 1\}$ onto Ω such that $f(0) = 0, f'(0) > 0$. In this work, we are interested in domains with fractal boundary and more precisely with the Hausdorff dimension of these boundaries. Well-known examples of fractal curves which have deserved a lot of investigations and attentions are the Julia sets and limit sets of quasifuchsian groups because of their dynamical properties. For instance, let us consider the family of quadratic polynomial $P_t(z) = z^2 + t, t \in \mathbb{C}$ in the neighborhood of $t = 0$. There is a smooth family of conformal map ϕ_t from $\overline{\mathbb{C}}\backslash\overline{\mathbb{D}}$ onto the basin of infinity of the polynomial $P_t(z) = z^2 + t$ (the component containing ∞ of its Fatou set) with $\phi_0(z) = z$ and conjugating P_0 to P_t on their basins of infinity. Using thermodynamic formalism, Ruelle [Rul] (see also [Zin]) proved that

$$\frac{d^2}{dt^2} H.\dim(J(P_t))\,|_{t=0} = \lim_{r\to 1} \frac{1}{4\pi} \frac{1}{\log\frac{1}{1-r}} \int_{|z|=r} |V'(z)|^2 |dz|$$

where $V(z) = \frac{\partial}{\partial t}\phi_t(z)\,|_{t=0}$. Using then the explicit formula of V, he could proved that

$$H.\dim(J(P_t)) = 1 + \frac{|t|^2}{4\log 2} + o(|t|^2)$$

for this particular family. In [McM], Mc Mullen proved the similar result for the more general case of the family of polynomial $P_t(z) = z^d + t(b_2 z^{d-2} + b_3 z^{d-3} + \cdots + b_d)$. Then, passing to the unit disk instead of its complement, he asked the following question: Under what general circumstances does a smooth family of conformal maps $\phi_t : \mathbb{D} \to \mathbb{C}$ with $H_0 = id$ satisfy:

$$\frac{d^2}{dt^2} H.\dim(\phi_t(\mathbb{T}))|_{t=0} = \lim_{r\to 1} \frac{1}{4\pi|\log(1-r)|} \int_{|z|=r} |\phi_0'(z)|^2 |dz|?$$

In this work, we give a positive answer for Mc Mullen's question with Hausdorff dimension replaced by Minkowski dimension and a counter-example for which (3) with Hausdorff dimension replaced by Minkowski dimension fails.

References

[Zin] Michel Zinsmeister Formalisme thermodynamique et systèmes dynamiques holomorphes, Panoramas et synthèses, Société Mathématique de France (1996).

[McM] Mc Mullen C. T. Thermodynamics, dimension and the Weil-Peterson metric, Invent. Math. 173, no. 2, 365-425 (2008).

[Rul] Ruelle David. Repellers for real analytic maps, Ergod. Th. 1 Dynam. Sys, 2,99-107 (1982).

AN4: Some weighted norm inequalities and their applications

Dinh Thanh Duc

Quy Nhon University

We present the main contributions of our recent works on norm inequalities for convolutions and products of functions in various weighted spaces and their applications to obtain the boundedness of integral transforms and various estimates for solutions of differential and difference equations.

AN5: Inequalities for differences and their applications

Nguyen Du Vi Nhan

Quy Nhon University

In this talk, we present various norm inequalities for the difference operator, some of which are analogous to several norm inequalities in Sobolev spaces. Our inequalities, which are derived by using Hölder's inequality, can be used to derive some discrete opial-type inequalities and estimate the Riemann zeta function and the solutions of difference equations.

AN6: Spectral inverse problems for compact Hankel operators

Sandrine Grellier

MAPMO/FDP

Given two arbitrary sequences $(\lambda_j)_{j\geq 1}$ and $(\mu_j)_{j\geq 1}$ of real numbers satisfying

$$|\lambda_1| > |\mu_1| > |\lambda_2| > |\mu_2| > \cdots > |\lambda_j| > |\mu_j| \to 0$$

we prove that there exists a unique sequence $c = (c_n)_{n\in\mathbb{Z}_+}$, real valued, such that the Hankel operators Γ_c and $\Gamma_{\widetilde{c}}$ of symbols $c = (c_n)_{n\geq 0}$ and $\widetilde{c} = (c_{n+1})_{n\geq 0}$ respectively, are selfadjoint compact operators on $\ell^2(\mathbb{Z}_+)$ and have the sequences $(\lambda_j)_{j\geq 1}$ and $(\mu_j)_{j\geq 1}$ respectively as non zero eigenvalues. Moreover, we give an explicit formula for c and we describe the kernel of Γ_c and of $\Gamma_{\widetilde{c}}$ in terms of the sequences $(\lambda_j)_{j\geq 1}$ and $(\mu_j)_{j\geq 1}$. This is a joint work with P. Gérard.

AN7: Gaussian Hardy spaces

Pierre Portal

Australian National University and Université Lille 1

Gaussian harmonic analysis deals with the Ornstein-Uhlenbeck operator $Lf(x) = -\Delta f(x) + x.\nabla f(x)$ acting on function spaces such as $L^2(\mathbb{R}^n, \gamma)$, where γ denotes the gaussian measure. This is motivated by stochastics, where the semigroup $(e^{-tL})_{t\geq 0}$ is used as one of the most basic examples of a transition semigroup, with γ as invariant measure. From the point of

view of harmonic analysis, this is particularly interesting because γ is non-doubling and e^{-tL} has a kernel that, in some sense, is far from being a standard Calderón-Zygmund kernel. It has been extensively studied, and specific techniques have been designed since the pioneering work of Muckenhoupt in the late 1960's.

In 2007, Mauceri and Meda introduced an atomic Hardy space $H^1_{at}(\mathbb{R}^n;\gamma)$ that provides a good end-point for interpolation, and is such that many operators associated with L are bounded from $H^1_{at}(\mathbb{R}^n;\gamma)$ to $L^1(\mathbb{R}^n;\gamma)$. However, in 2010, Mauceri, Meda and Sjögren realised that some Riesz transforms associated with L are bounded from $H^1_{at}(\mathbb{R}^n;\gamma)$ to $L^1(\mathbb{R}^n;\gamma)$ if and only if $n = 1$!

In this talk, we present an alternative Gaussian Hardy space $h^1(\mathbb{R}^n;\gamma)$ that can be defined through two equivalent norms - one involving a maximal function and one involving a square function - and that is such that the Riesz transforms are bounded from $h^1(\mathbb{R}^n;\gamma)$ to $L^1(\mathbb{R}^n;\gamma)$.

AN8: Coefficient estimates for whole plane SLE

Michel Zinsmeister

Université d'Orléans

We revisit Loewner'method to prove the $n = 3$ case of Bieberbach conjecture in the case of whole-plane SLE. We show in particular that we can explicitely compute expectation and variance of the coefficients in infinitely many cases. We also investigate multifractal spectrum of whole plane SLE. This is a joint work with B.Duplantier, Nguyen Thi Phuong Chi, Nguyen Thi Thuy Nga.

AN9: Some results on the inversion of the divergence operator

Emmanuel Russ

Institut Fourier, Université Grenoble

Let $\Omega \subset \mathbb{R}^n$ be an arbitrary bounded domain. Given a function $f \in L^p(\Omega)$, consider the equation div $u = f$ in Ω under various conditions on $\partial\Omega$. We give various results on this equation under quite general assumptions on the geometry of Ω. We also describe endpoint results for this equation.
These are joint works with Pierre Bousquet (Aix-Marseille), Ricardo Duran (Buenos Aires), Petru Mironescu (Lyon I), Maria-Amelia Muschietti (La Plata) and Philippe Tchamitchian (Aix-Marseille).

AN10: The generalized convolutions with a weight function for the Fourier cosine, Fourier sine and Laplace transforms

Nguyen Xuan Thao (join work with Le Xuan Huy and Trinh Tuan)

School of Applied Mathematics, HUST

Several generalized convolutions for the integral transfoms Fourier cosine, Fourier sine and Laplace are obtained. Convolution properties and its applications to solving integral equations and systems of integral equations are considered.

AN11: Some o types of weakly holomorphic functions and their holomorphic extension

Thai Thuan Quang

Quy Nhon University

Let E, F be locally convex spaces, D an open subset of E, W a subset of F'. This report presents some solutions of the following problems:
• **Problem 1.** *Let $f : D \to F$ be (F, W)-holomorphic.*
What in addition do we need to know about E, F, D, W, f so that we can conclude that f is a holomorphic function?
• **Problem 2.** *Let $A \subset D$ and $f : A \to F$ be such that for every $\varphi \in W$ the function $\varphi \circ f : A \to \mathbb{C}$ has an extension in $H(D)$.*
When does this imply that there is an extension $g \in H(D, F)$ of f?
We restrict our attention to

1. estabblisment some criterions for holomorphy of F-valued $\sigma(F, W)$-holomorphic functions which are bounded on bounded sets in a domain D of Fréchet spaces E (resp. $\mathbb{C}^n$) where $W \subset F'$ defines the topology of Fréchet space F;
2. the holomorphic extension of $(F, W)/\sigma(F, W)$-holomorphic functions from special subsets:
   – from non-rare subsets of D and from subsets of D which determines uniform convergence in $H(D)$;
   – from a non-pluripolar compact subset of a nuclear Fréchet space to some its neighbourhood;
3. a few application: theorems of Vitali type, Problem of Wrobel.

ANs1: On the coupled fixed point theorems in uniform spaces and applications

Le Khanh Hung (joint work with Tran Van An and Kieu Phuong Chi)

Vinh University

In this report, we give some coupled fixed point theorems in uniform spaces. As an application, we give some results about the existence of solution of some classes of nonlinear intergral equation on Banach spaces.

References

[1] V. G. Angelov, *Fixed point theorem in uniform spaces and applications*, Czechoslovak Math. J., 37(112) (1987), no. 1, 19-33.

[2] V. Berinde, *Coupled fixed point theorems for -contractive mixed monotone mappings in partially ordered metric spaces*, Nonlinear Analysis, 75 (2012), 3218-3228.

[3] V. Lakshmikantham and L. B. Ciric, *Coupled fixed point theorems for nonlinear contractions in partially ordered metric spaces*, Nonlinear Anal., 70 (2009) 4341-4349.

[4] Tran Van An, Kieu Phuong Chi and Le Khanh Hung, *On the coupled fixed point theorems in uniform spaces and applications*, (2012) preprint

ANs2: Weighted Bernstein-Markov inequality on unbounded sets in $\mathbb{C}^n$

Nguyen Quang Dieu

Hanoi National University of Education

Let E be a Borel (not necessarily bounded) non-pluripolar subset of $\mathbf{C}^n, \omega \geq 0$ be an upper-semicontinuous (usc. for short) function defined on E and μ be a positive Borel measure on E. We say that ω is an admissible weight if the following conditions hold.

(i) $\{\omega > 0\}$ is non-pluripolar.

(ii) $\sup_{z\in E} |z|\omega(z) < \infty$.

The aim of this talk is to study conditions under which the triple (E, μ, ω) satisfies the Bernstein-Markov property when E is unbounded. More precisely, for every $\varepsilon > 0$, there exists $C_\varepsilon > 0$ such that for every $P \in \mathbf{C}[z_1, \cdots, z_n]$, the ring of polynomials of n complex variables the following inequality holds

$$\|\omega^{\deg P} P\|_E \leq C_\varepsilon (1+\varepsilon)^d \|\omega^{\deg P} P\|_{L^2(E,\mu)}.$$

Here $\|\omega^d P\|_E$ and $\|\omega^d P\|_{L^2(E,\mu)}$ denotes the sup norm and the L^2 norm with respect to $d\mu$ of the weighted polynomial $\omega^d P$. The case when E is bounded has been studied thoroughly by Bloom and Levenberg. This is joint work with Pham Hoang Hiep.

ANs3: Value sharing problem for p-adic several variables difference polynomials

Pham Ngoc Hoa

Hai Duong College

In 1960, Hayman proposed the following conjecture.

Hayman Conjecture. *If an entire function f satisfies $f^n(z)f'(z) \neq 1$ for a positive integer n and all $z \in \mathbb{C}$, then f is a constant.*

In 1997, Yang and Hua [3] studied the unicity problem for meromorphic functions and differential monomials of the form $f^n f'$, when they share only one value.
For an analog of Hayman Conjecture for difference, Laine and Yang[2] investigated the value distribution of difference products of entire functions, and obtained the follwing theorem.

Theorem A. *Let $f(z)$ be a transcendental entire function of finite order, and c be a non-zero complex constant. Then $n \geq 2, f(z)^n f(z+c)$ assumes every non-zero value $a \in \mathbb{C}$ infinitely often.*

Ha Huy Khoai and Vu Hoai An [1] established a p-adic analog of Laine-Yangs result for p-adic meromorphic functions and their difference polynomials. In this paper, we prove a version of the Hayman Conjecture for p-adic several variables difference polynomials.

References

[1] Ha Huy Khoai and Vu Hoai An, *Value sharing problem for p-adic meromorphic functions and their difference polynomials*, Ucrain. Math. Journ, 2012, No. 2.

[2] I. Laine and C. C. Yang, *Value distribution of difference polynomials*, Proceedings of the Japan Academy. Series A, vol. 83, no. 8,pp.148-151 , 2007.

[3] C. C. Yang and X. H. Hua, *Uniqueness and value-sharing of meromorphic functions*, Ann. Acad. Sci. Fenn. Math. 22(1997), 395-406.

ANs4: On a new class of partial metric space and applications

Tran Duc Thanh (join work with Tran Van An and Kieu Phuong Chi)

Vinh University

In this report, we introduce a new class of partial metric space which generates by the measure. As an application, we give some relations of the partial metric topology and the properties of the measure.

References

[1] G. S. Mathews, *Partial metric topology*, Annals of the NewYork Academy of Sciences, Vol 728 (1994), 183-197.

[2] M. Bukatin, R. Kopperman, S. Matthews and H. Pajoohesh, *Partial metric spaces*, Amer. Math. Monthly, 116 (2009), no. 8, 708-718.

[3] Kieu Phuong Chi, Erdal Karapinar and Tran Duc Thanh, *A generalized contraction principle in partial metric spaces*, Mathematical and Computer Modelling, 55(2012), 1673-1681.

[4] Kieu Phuong Chi and Tran Duc Thanh, *On a new class of partial metric space and applications*, (2012), preprint

ANs5: On the generalized convolution inequalities for the Hartley, Fourier cosine and Fourier sine transforms

Hoang Thi Van Anh (join work with Nguyen Xuan Thao)

Food Industry College

Inequalities for the Hartley - Fourier cosine - Fourier sine generalized convolutions such as the Young type and Saitoh type inequalities are studied. Using these new inequalities, we give estimations of solution of various integral equations.

ANs6: On the generalized convolution transforms for the Fourier cosine, Laplace and Fourier sine transforms

Le Xuan Huy (joint work with Nguyen Xuan Thao and Nguyen Thanh Hong)

University of Economics and Technical Industries, HCMC

In this paper, we introduce a class of generalized convolution transformations which related to a generalized convolution for the Fourier cosine, Laplace and the Fourier sine integral transforms. The Watsons type theorem is proved. In application, we apply these transformation to solving a class of integro-differential equations.

ANs7: Hopf-type formula defines solution for Hamilton-Jacobi equations with t-dependence Hamiltonian

Nguyen Hoang

College of Education, Hue University

We construct an explicit representation of viscosity solutions of the Cauchy problem for the Hamilton-Jacobi equation (H, σ) on a given domain $\Omega = (0, T) \times \mathbb{R}^n$. We prove first that under some assumptions, the Hopf-type formula $u(t, x) = \max_{q \in \mathbb{R}^n} \{\langle x, q\rangle - \sigma^*(q) - \int_0^t H(\tau, q) d\tau\}$ defines a viscosity solution of the problem (H, σ) where the initial condition σ is convex but the Hamiltonian $H = H(t, p)$ is not necessarily convex in p. Then using the same assumptions for $H(t, p)$ on the subdomains $(t_i, t_{i+1}) \times \mathbb{R}^n \subset \Omega$, we are able to arrange "partial solutions" given by the Hopf-type formula to get a *layered viscosity solution* on the whole Ω. Finally, we prove that the viscosity solutions satisfy the semiconvexity condition on Ω.

ANs8: On the polyconvolution for Fourier and Hartley transforms

Phi Thi Van Anh (joint work with Nguyen Minh Khoa and Nguyen Xuan Thao)

Hanoi University of Transport and Communications

In this paper, we construct and study a new general polyconvolution for Fourier and Hartley transforms. Here, it is the first time four different integral transforms appear in the factorization equalities. Next, we get the norm inequalities for this polyconvolution operator in the function spaces $L_1(R)$, $L_p(R)$ and give applications to solve the integral equations and the systems of integral equations.

AT: Topology, Homotopy theory

AT1: The hit problem for the Steinberg module over the Steenrod algebra revisited

Nguyen Dang Ho Hai

College of Science, Hue University

Let $L_{n,k}$ be the Steinberg summand of the ideal generated by the k-th power of the top Dickson class of $H^*(B(\mathbb{Z}/2)^n; \mathbb{Z}/2)$. The module $L_{n,k}$ can be realised as the mod 2 cohomology of the Steinberg summand of a Thom spectrum over the classifying space $B(\mathbb{Z}/2)^n$. In this talk, we explain how to use the Kameko homomorphism and Takayasu short exact sequences to solve the hit problem for $L_{n,k}$, i.e. to construct a minimal generating set for $L_{n,k}$ as a module over the mod 2 Steenrod algebra. This generalises the result (and simplify the rather complicated method) of Masateru Inoue for the case $k = 0$.

AT2: The computation of Steenrod operations on the mod-2 cohomology rings of finite groups

Vo Thanh Tung

Center of Research and Development, Duy Tan University, Danang

We describe a method to compute Steenrod operations on the mod-2 cohomology rings of 2-groups. Then we show how to apply those results to compute the Steenrod operations on cohomology rings of non prime power groups, especially of Mathieu groups M_{22} and M_{23}. Finally, we describe the computation of the Evens norm map, which is used to calculate the Steenrod operations on the mod-2 cohomology rings of all 2-groups of order 32.

AT3: Finite cohomological generation for p-compact groups

Vincent Franjou

Université de Nantes

Half a century ago, Venkov, Evens et al. proved that the cohomology ring of a finite group is finitely generated. We discuss generalizations to p-compact groups, with an emphasis on integral coefficients. For general spaces, we investigate when finite generation over the integers follows from finite generation mod p.

AT4: The squaring operation on the Dickson algebra and the Lannes-Zarati homomorphism

Vo Thi Nhu Quynh

HUS, VNU-Hanoi

In this talk, we study the squaring operation Sq^0 on the dual of the minimal $\mathcal{A}$-generators

of the Dickson algebra. We show that this operation is isomorphic on its image. We also give vanishing results for this operation in some cases. As a consequence, we prove that the Lannes-Zarati homomorphism vanishes (1) on every element in any finite Sq^0-family in $Ext^*_{\mathcal{A}}(\mathbb{F}_2, \mathbb{F}_2)$ except possibly the family initial element, and (2) on almost all known elements in the Ext group. In particular, the fifth Lannes-Zarati homomorphism is zero in positive stems. These verify a part of the algebraic version of the classical conjecture on spherical classes.

AT5: La cohomologie d'une n-tour de Postnikov et la filtration de Krull dans la catégorie des modules instables sur l'algèbre de Steenrod

Nguyen The Cuong

University Paris 13

Après l'arrivée de l'algèbre de Steenrod on a une nouvelle structure pour les cohomologies modulo p des espaces topologiques. L'instabilité de l'action de l'algèbre de Steenrod sur la cohomologie nous donne la catégorie des modules instables. La catégorie est munie de la filtration de Krull qui permet de mesurer les cohomologies. Nicolas KUHN a conjecturé qu'il n'y a que deux possibilités pour la cohomologie d'un espace topologique : soit elle est très grande et n'appartient à aucun filtre de la filtration soit elle est toute petite qui se situe au premier filtre de la filtration. Lionel SCHWARTZ a démontré cette conjecture pour le cas $p = 2$ dans l'année 1998. Récemment, les auteurs N. Castellana, J. A. Crespo, and J. Scherer ont montré que le module des indécomposables de la cohomologie d'un H espace qui est aussi une $n + 1$-tour de Postnikov appartient au n-filtre de la filtration. Dans cette éxposé, je vais parler de la généralisation de ce résultat pour une n-tour de Postnikov et quelques propriétés de l'espace des applications pointés de $B\mathbb{Z}_2$.

AT6: On the Peterson hit problem

Nguyễn Sum

Quy Nhon University

Let V_k be an elementary abelian 2-group of rank k. Denote by BV_k the classifying space of V_k. It may be thought of as the product of k copies of the real projective space $\mathbb{RP}^\infty$. Then

$$P_k := H^*(BV_k) \cong \mathbb{F}_2[x_1, x_2, \ldots, x_k],$$

a polynomial algebra on k generators $x_1, x_2, \ldots, x_k$, each of degree 1. Here the cohomology is taken with coefficients in the prime field $\mathbb{F}_2$ of two elements.
Being the cohomology of a space, P_k is a module over the mod 2 Steenrod algebra $\mathcal{A}$. The action of $\mathcal{A}$ on P_k can explicitly be given by the formula

$$Sq^i(x_j) = \begin{cases} x_j, & i = 0, \\ x_j^2, & i = 1, \\ 0, & \text{otherwise}, \end{cases}$$

and subject to the Cartan formula

$$Sq^n(fg) = \sum_{i=0}^{n} Sq^i(f) Sq^{n-i}(g),$$

for $f, g \in P_k$.
A polynomial f in P_k is called *hit* if it can be written as a finite sum $f = \sum_{i>0} Sq^i(f_i)$ for some polynomials f_i. That means f belongs to $\mathcal{A}^+P_k$, where $\mathcal{A}^+$ denotes the augmentation ideal in $\mathcal{A}$. We are interested in the *hit problem*, set up by F. Peterson, of finding a minimal set of generators for the polynomial algebra P_k as a module over the Steenrod algebra. In other words, we want to find a basis of the $\mathbb{F}_2$-vector space $QP_k := P_k/\mathcal{A}^+.P_k = \mathbb{F}_2 \otimes_{\mathcal{A}} P_k$.
Let $GL_k = GL_k(\mathbb{F}_2)$ be the general linear group over the field $\mathbb{F}_2$. This group acts naturally on P_k by matrix substitution. Since the two actions of $\mathcal{A}$ and GL_k upon P_k commute with each other, there is an action of GL_k on QP_k. The subspace of degree n homogeneous polynomials $(P_k)_n$ and its quotient $(QP_k)_n$ are GL_k-subspaces of the spaces P_k and QP_k respectively.
The hit problem was first studied by Peterson [4], Wood [10], Singer [7], and Priddy [5], who showed its relationship to several classical problems respectively in cobordism theory, modular representation theory, Adams spectral sequence for the stable homotopy of spheres, and stable homotopy type of classifying spaces of finite groups. The vector space QP_k was explicitly calculated by Peterson [4] for $k = 1, 2$, by Kameko [2] for $k = 3$. The case $k = 4$ has been treated by Kameko. However the manuscript unpublished at the time of the writing.

Several aspects of the hit problem were then investigated by Boardman, Bruner, Hà, Hưng, Carlisle, Wood, Crabb, Hubbuck, Giambalvo, Peterson, Nam, Peterson, Janfada, Kameko, Minami, Repka, Selick, Singer, Silverman, Walker and others.

The μ-function is one of the numerical functions that have much been used in the context of the hit problem. For a positive integer n, by $\mu(n)$ one means the smallest number r for which it is possible to write $n = \sum_{1\leqslant i\leqslant r}(2^{d_i} - 1)$, where $d_i > 0$. A routine computation shows that $\mu(n) = s$ if and only if there exist integers $d_1 > d_2 > \ldots > d_{s-1} \geqslant d_s > 0$ such that

$$n = 2^{d_1} + 2^{d_2} + \ldots + 2^{d_{s-1}} + 2^{d_s} - s. \tag{1}$$

Peterson [4] made the following conjecture, which was subsequently proved by Wood [10].

Theorem 1 (Wood [10]). If $\mu(n) > k$, then $(QP_k)_n = 0$.

One of the main tools in the study of the hit problem is the dual of the Kameko squaring $Sq^0_* : (QP_k)^{GL_k} \to (QP_k)^{GL_k}$. This homomorphism is induced by the GL_k-homomorphism $\widetilde{Sq}^0_* : QP_k \to QP_k$. The latter is induced by the $\mathbb{F}_2$-linear map, also denoted by $\widetilde{Sq}^0_* : P_k \to P_k$, given by

$$\widetilde{Sq}^0_*(x) = \begin{cases} y, & \text{if } x = x_1x_2\ldots x_ky^2, \\ 0, & \text{otherwise,} \end{cases}$$

for any monomial $x \in P_k$. Note that $\widetilde{Sq}^0_*$ is not an $\mathcal{A}$-homomorphism. However,

$$\widetilde{Sq}^0_* Sq^{2t} = Sq^t \widetilde{Sq}^0_*,$$

for any nonnegative integer t.

Theorem 2 (Kameko [2])**.** Let m be a positive integer. If $\mu(2m + k) = k$, then $\widetilde{Sq}^0_* : (QP_k)_{2m+k} \to (QP_k)_m$ is an isomorphism of GL_k-modules.

Based on Theorems 1 and 2, the hit problem is reduced to the case of degree n with $\mu(n) = s < k$.

The hit problem in the case of degree n of the form (1) with $s = k - 1$, $d_{i-1} - d_i > 1$ for $2 \leqslant i < k$ and $d_{k-1} > 1$ was studied by Crabb-Hubbuck [1], Nam [3] and Repka-Selick [6].

In this paper, we explicitly determine the hit problem for the case $k = 4$. First, we study the hit problem for the cases of degree n of the form (1) for either $s = k - 1$ or $s = k - 2$. The following theorem gives an inductive formula for the dimension of $(QP_k)_n$ in this case.

Theorem 3. Let $n = \sum_{1\leqslant i\leqslant k-1}(2^{d_i} - 1)$ with d_i positive integers such that $d_1 > d_2 > \ldots > d_{k-2} \geqslant d_{k-1}$, and let $m = \sum_{1\leqslant i\leqslant k-2}(2^{d_i-d_{k-1}} - 1)$. If $d_{k-1} \geqslant k - 1 \geqslant 1$, then

$$\dim(QP_k)_n = (2^k - 1)\dim(QP_{k-1})_m.$$

For $d_{k-1} \geqslant k$, the theorem follows from the results in Nam [3] and the present author [9]. However, for $d_{k-1} = k - 1$, the theorem is new.

Based on Theorem 3, we explicitly compute QP_4.

Theorem 4. Let n be an arbitrary positive integer with $\mu(n) < 4$. The dimension of the $\mathbb{F}_2$-vector space $(QP_4)_n$ is given by the following table:

n	$s = 1$	$s = 2$	$s = 3$	$s = 4$	$s \geqslant 5$
$2^{s+1} - 3$	4	15	35	45	45
$2^{s+1} - 2$	6	24	50	70	80
$2^{s+1} - 1$	14	35	75	89	85
$2^{s+2} + 2^{s+1} - 3$	46	94	105	105	105
$2^{s+3} + 2^{s+1} - 3$	87	135	150	150	150
$2^{s+4} + 2^{s+1} - 3$	136	180	195	195	195
$2^{s+t+1} + 2^{s+1} - 3, t \geqslant 4$	150	195	210	210	210
$2^{s+1} + 2^s - 2$	21	70	116	164	175
$2^{s+2} + 2^s - 2$	55	126	192	240	255
$2^{s+3} + 2^s - 2$	73	165	241	285	300
$2^{s+4} + 2^s - 2$	95	179	255	300	315
$2^{s+5} + 2^s - 2$	115	175	255	300	315
$2^{s+t} + 2^s - 2, t \geqslant 6$	125	175	255	300	315
$2^{s+2} + 2^{s+1} + 2^s - 3$	64	120	120	120	120
$2^{s+3} + 2^{s+2} + 2^s - 3$	155	210	210	210	210
$2^{s+t+1} + 2^{s+t} + 2^s - 3, t \geqslant 3$	140	210	210	210	210
$2^{s+3} + 2^{s+1} + 2^s - 3$	140	225	225	225	225
$2^{s+u+1} + 2^{s+1} + 2^s - 3, u \geqslant 3$	120	210	210	210	210
$2^{s+u+2} + 2^{s+2} + 2^s - 3, u \geqslant 2$	225	315	315	315	315
$2^{s+t+u} + 2^{s+t} + 2^s - 3, u \geqslant 2, t \geqslant 3$	210	315	315	315	315.

Carlisle and Wood showed that the dimension of the vector space $(QP_k)_m$ is uniformly bounded by a number depended only on k. In 1990, Kameko made the following conjecture in his Johns Hopkins University PhD thesis [2].

Conjecture 5 (Kameko [2])**.** For every nonnegative integer m,

$$\dim(QP_k)_m \leqslant \prod_{1\leqslant i\leqslant k}(2^i - 1).$$

The conjecture was shown by Kameko himself for $k \leqslant 3$ in [2]. From Theorem 4, we see that the conjecture is also true for $k = 4$.

By induction on k, using Theorem 3, we obtain the following.

Corollary 6. Let $n = \sum_{1\leqslant i\leqslant k-1}(2^{d_i}-1)$ with d_i positive integers. If $d_1-d_2 \geqslant 2, d_{i-1}-d_i \geqslant i-1, 3 \leqslant i \leqslant k-1, d_{k-1} \geqslant k-1$, then

$$\dim(QP_k)_n = \prod_{1\leqslant i\leqslant k}(2^i-1).$$

For the case $d_{i-1}-d_i \geqslant i, 2 \leqslant i \leqslant k-1$, and $d_{k-1} \geqslant k$, this result is due to Nam [3]. This corollary also shows that Kameko's conjecture is true for the degree n as given in the corollary.

By induction on k, using Theorems 3, 4 and the fact that the dual of the Kameko squaring is an epimorphism, one get the following.

Corollary 7. Let $n = \sum_{1\leqslant i\leqslant k-2}(2^{d_i}-1)$ with d_i positive integers and let $d_{k-1} = 1,\ n_r = \sum_{1\leqslant i\leqslant r-2}(2^{d_i-d_{r-1}}-1)-1$ with $r = 5, 6, \ldots, k$. If $d_1-d_2 \geqslant 4,\ d_{i-2}-d_{i-1} \geqslant i$, for $4 \leqslant i \leqslant k$ and $k \geqslant 5$, then

$$\dim(QP_k)_n = \prod_{1\leqslant i\leqslant k}(2^i-1) + \sum_{5\leqslant r\leqslant k}\Big(\prod_{r+1\leqslant i\leqslant k}(2^i-1)\Big)\dim \mathrm{Ker}(\widetilde{Sq}^0_*)_{n_r},$$

where $(\widetilde{Sq}^0_*)_{n_r} : (QP_r)_{2n_r+r} \to (QP_r)_{n_r}$ denotes the squaring operation $\widetilde{Sq}^0_*$ in degree $2n_r+r$. Here, by convention, $\prod_{r+1\leqslant i\leqslant k}(2^i-1) = 1$ for $r = k$.

This corollary has been proved in [9] for the case $d_{i-2}-d_{i-1} > i+1$ with $3 \leqslant i \leqslant k$.

Since $(\mathrm{Ker}\widetilde{Sq}^0_*)_{n_r} \neq 0$, for any $5 \leqslant r \leqslant k$, Kameko's conjecture is not true in degree $n = 2n_k + k$ for any $k \geqslant 5$, where $n_k = 2^{d_1-1} + 2^{d_2-1} + \ldots + 2^{d_{k-2}-1} - k + 1$.

The first formulation of this paper was given in a 240-page preprint in 2007 [8], which was then publicized to a remarkable number of colleagues. One year latter, we found the negative answer to Kameko's conjecture on the hit problem [9]. Being led by the insight of this new study, we have reduced the length of the paper from 240 to approximately 60 pages. Now it seems to suite to publication.

References

[1] M. C. Crabb and J. R. Hubbuck, *Representations of the homology of BV and the Steenrod algebra II*, in: Algebraic Topology: New Trend in Localization and Periodicity, (Sant Feliu de Guíxols, 1994), in: Progr. Math., Birkhäuser Verlag, Basel, Switzerland, vol. 136, 1996, pp. 143-154. MR1397726.

[2] M. Kameko, *Products of projective spaces as Steenrod modules*, PhD Thesis, Johns Hopkins University, 1990.

[3] T. N. Nam, *$\mathcal{A}$-générateurs génériques pour l'algèbre polynomiale,* Adv. Math. 186 (2004) 334-362, MR2073910.

[4] F. P. Peterson, *Generators of $H^*(\mathbb{R}P^\infty \times \mathbb{R}P^\infty)$ as a module over the Steenrod algebra*, Abstracts Amer. Math. Soc. No. 833 (April 1987).

[5] S. Priddy, *On characterizing summands in the classifying space of a group, I*, Amer. Jour. Math. 112 (1990) 737-748, MR1073007.

[6] J. Repka and P. Selick, *On the subalgebra of $H_*((\mathbb{R}P^\infty)^n; \mathbb{F}_2)$ annihilated by Steenrod operations*, J. Pure Appl. Algebra 127 (1998) 273-288, MR1617199.

[7] W. M. Singer, *The transfer in homological algebra*, Math. Zeit. 202 (1989), 493-523, MR1022818.

[8] N. Sum, *The hit problem for the polynomial algebra of four variables*, University of Quy Nhơn, Việt Nam, Preprint, 2007, 240 pages.

[9] N. Sum, *The negative answer to Kameko's conjecture on the hit problem*, Adv. Math. 225 (2010), 2365-2390.

[10] R. M. W. Wood, *Steenrod squares of polynomials and the Peterson conjecture*, Math. Proc. Cambridge Phil. Soc. 105 (1989) 307-309, MR0974986.

AT7: The algebraic transfer in the language of the May spectral sequence

Phan Hoang Chon (join work with Le Minh Ha)

Sai Gon University

With the idea that we can study the cohomology of the Steenrod algebra through the modular invariant theory, in 1989, W. Singer defined, for each $s \geq 1$, a homomorphism, Tr_s, mapping from the coinvariants of certain GL_s-representations to the cohomology of the Steenrod algebra. This homomorphism is considered as an algebraic version of the geometrical transfer $\pi_*^S((BV_s)_+) \to \pi_*^S(S^0)$, so it is called the algebraic transfer. It is shown that Tr_s is an isomorphism for $s = 1, 2, 3$. Later, the image of the fourth algebraic transfer is completely defined. As the results together with the fact that the total homomorphism $Tr = \oplus_{s\geq 1} Tr_s$ is an algebra homomorphism show that the algebraic transfer can detected many non-trivial elements of the cohomology of the Steenrod algebra. Therefore, it is expected to be a useful tool to study the cohomology of the Steenrod algebra.

In this work, we explore the May spectral sequence as a tool for understanding the algebraic transfer. More detail, we will construct a version of the dual of the Singer's transfer in E^2-term of May spectral sequence and use this version to study the image of the algebraic transfer. By this method, beside recovering, with much less computation, some known results, we can show that the elements $p_i, i \geq 0$, are in the image of Tr_4, and that the elements $h_0^n i, 0 \leq n \leq 5$; and $h_0^n j, 0 \leq n \leq 2$, are not detected by the algebraic transfer.

Modifying this idea, we construct the representation of the algebraic transfer in the E_2-term of the May spectral sequence and use this construction to show that the elements $n_i; i \geq 0$, and $k_i, i \geq 1$, are detected by the algebraic transfer.

AT8: On strict polynomial functors and the Steenrod algebra

Le Minh Ha

HUS, VNU-Hanoi

Strict polynomial functors was defined by E. Friedlander and A. Suslin to prove finite generation of cohomology of finite group schemes over a field. Recently, Nguyen D. H. Hai constructed a functor $\overline{m} : \mathcal{P} \to \mathcal{U}$ from the category of strict polynomial functors $\mathcal{P}$ to the category of unstable modules over the Steenrod algebra which enjoys many good properties, in hope that this functor will lead to deeper insight into the structure of $\mathcal{U}$. In this talk, we give another construction of Hai's functor, based on G. Powell's interpretation of the category of unstable modules, and discuss some of its consequences.

AT9: Associative algebras up to homotopy over a ring

Muriel Livernet

Université Paris 13

In this talk we will present the notion of derived A infty algebras introduced by Sagave. It has been introduced to handle associative algebras up to homotopy which are not projective over a ring. We will explain how the operad theory can handle these objectrs, as well as obstruction theory A infty structures.

H1: André Martineau Remembering

Nguyen Thanh Van

Institut de Mathematiques de Toulouse

André Martinean was a bright mathematician who died young, in 1972. He was a pioneer of the mathematical cooperation France-Vietnam. In 1970, he gave in Hanoi courses on Analysis under American bombs.

BE: Mathematical modeling of biological and ecological systems

BE1: Robust Maximum Sustainable Policies for Managing Biological Populations

B. S. Goh

Institute of Mathematical Sciences, University of Malaya

Biologists divide populations into two groups, called the r-selected and K-selected species. K-selected species like a whale population can be modelled by the logistic equation or a delay discrete time nonlinear equation. Historically, the maximum sustainable yield (MSY) policy for harvesting such populations was based on an analysis of what is the best equilibrium state which will provide the maximum sustainable yield. It was logically a flawed analysis as a population is not at an equilibrium most of the time and no analysis of the stability of MSY equilibrium was possible. Goh (1969) applied optimal control theory and obtained the dynamic optimal feedback policies for a fish population modelled by the logistic model which is applicable to all states of the population with no assumption that the population is at an equilibrium. Furthermore, it was proposed that the MSY harvest rate should be reduced to provide stability relative to errors in the initial state and dynamics. However, many fish populations are r-selected with high fecundities. For example, the female Asian carp, which is now a major pest in USA, can lay more than one million eggs a year. The Beverton-Holt population model is needed to develop optimal policies to provide maximum biomass yield in the face of very large and unpredictable recruitments. To provide robust long term policies it is essential to conserve the breeding stocks by marine parks and/or other practical fisheries policies.

BE2: Analysis of herbivore population dynamics in Amboseli National Park (Kenya) using aggregation of variable methods

Nguyen Huu Tri

IRD

Aggregation of variables methods are mathematical methods that allow reducing the dimension of dynamical systems involving many coupled variables corresponding to various interacting organization levels. When the different organization levels are associated to different characteristic time scales, it is possible to build an approximate model with a lower number of equations and variables in order to obtain dynamics that can be handled analytically, and to determine properties emerging at global level. Such methods can be very useful for spatially explicit models in the context of population dynamics, as demography can often be considered as a slow time scale process, while dispersal can be considered as a fast time scale process.
We present aggregation methods for systems of Ordinary Differential Equations and analyse a spatially explicit model of herbivorous in Amboseli National Park (Kenya), based on an energy-budget demographic model, and which considers both dispersal of animals within Amboseli Park area and migration corridors with surrounding parks in Kenya and Tanzania. The purpose of this model is to determine if the reduction of migration corridors caused by human activities threatens biodiversity. The model is built according to field data collected

by the African Conservation Center based in Kenya, and thus is fit to take into account the constraints imposed by the field work: in particular, it considers the same spatial representation of the environment than the one that is used for data collection. The aggregation methods allow building a much simpler approximate model from which we can analytically determine the asymptotic dynamics and predict survival or extinction of species living in the park.

BE3: Effects of density dependent migration on interference competition dynamics

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We present a model of interference competition with explicit biotic resource. We consider two competing species living in two-patch environment. The species as well as the resource are able to migrate from patch to patch. We assumed species 1 is locally superior competitor (LSC) and species 2 is locally inferior competitor (LIC), i.e. without migration species 1 wins in competition while species 2 goes extinct on each patch. We study two cases. The first case considers a species density independent migration. The second case considers a species density dependent migration. We show that under some conditions the second case allows LIC to coexist with LSC.

Keywords: competition model, aggregation of variables, time scales, density dependent migration, biotic resource.

References

[1] Auger P., Brave de la Parra R., Poggiale J.C, Sanchez E., Nguyen Huu T., Aggregation of variables and application to population dynamics. In: P.Magal, S. Ruan(Eds), Structure population Models in Biology and Epidemiolog.

[2] Nguen-Ngoc D., Bravo de la Parra R., Zavala M., Auger P. , Competition and species coexistence in a metapopulation model: Can fast asymmetric migration reverse the outcome of competition in a homogeneous environment. Journal of Theoretical Biology, 266(2), 256-263, 2010.

[3] Amarasekare P., Interference competition and species coexistence. The Royal society, 269, 2541-2550, 2002.

BE4: Effects of refuges and density dependent dispersal on interspecific competition dynamics

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We present a classical interspecific competition model. Individuals compete for a resource on a common patch and can go to a refuge. It is assumed that if species would remain on the competition patch, species 1 survives and species 2 goes extinct. Therefore, species 1 is Locally Superior Competitor (LSC) and species 2 Locally Inferior Competitor (LIC). We study the effects of density dependent dispersal from the competition patch to the refuge

on the global outcome of competition. We study two cases. The first case considers LSC density dependent dispersal of the LIC trying to escape competition and going to its refuge when the LSC density is large. The second case considers aggressiveness of LIC leading to LIC density dependent dispersal of LSC. We show that under some conditions, tactics 2 can allow the LIC to survive and even provoke global extinction of the LSC.

Keywords: competition model, aggregation of variables, time scales, density-dependent dispersal.

References

[1] Auger P., Bravo de la Parra R., Poggiale J.C, Sanchez E., Nguyen-Huu T., *Aggregation of variables and applications to population dynamics.* In: P. Magal, S. Ruan (Eds.), Structure Population Models in Biology and Epidemiology, Lecture Notes in Mathematics, vol. 1936, Mathematcial Biosciences Subseries, Springer, Berlin, p. 209-263.

[2] Nguyen-Ngoc D., Bravo de la Parra R., Zavala M.A., Auger P., *Competition and species coexistence in a metapopulation model: can fast dispersal reverse the outcome of competition?* Journal of Theoretical Biology, 266, 256-263.

[3] Nguyen-Ngoc D., Nguyen-Huu T., Auger P., *Effects of refuges and density dependent dispersal on interspecific competition dynamics.* International Journal of Bifurcation and Chaos, 1250029, 22(2), 2012.

BE5: Mathematical modeling of fishery dynamics : Application to the sardine fishery in Morocco

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We present a general dynamical model of a muti-site fishery. Movements between sites are assumed to be fast in comparison to local interactions. The inclusion of two time scales in the dynamical system allows us the reduction of the system with the help of aggregation methods.

– We present a multi-site fishery model with Fish Aggregating Devices (FAD) and we show that there exists a number of sites that maximizes the total capture.
– We take into account fast fish price variation in the fishery model. We show that it leads to multi-stability with an equilibrium of over-exploitation and another one corresponding to long term viable fishery.
– We present a model of the fishery of sardine along the Atlantic coast of Morocco and we give recommendations to better manage this fishery.

References

[1] P. AUGER, R. BRAVO DE LA PARRA, J.C. POGGIALE, E. SANCHEZ & T. NGUYEN HUU, Aggregation of variables and applications to population dynamics. In: P. Magal, S. Ruan (Eds.), Structured Population Models in Biology and Epidemiology, Lecture Notes in Mathematics, vol. 1936, Mathematical Biosciences Subseries. Springer, Berlin, pp. 209-263, 2008.

[2] P. AUGER, R. BRAVO DE LA PARRA, J.C. POGGIALE, E. SANCHEZ & L. SANZ, Aggregation methods in dynamical systems variables and applications in population and community dynamics. *Physics of Life Reviews* 5, pp. 79-105, 2008.

[3] P. AUGER, R. MCHICH, N. RASSI & B. KOOI, Effects of market price on the dynamics of a spatial fishery model: Over-exploited fishery/traditional fishery. *Ecological Complexity* 7, pp. 13-20, 2010.

[4] P. AUGER, C. LETT, A. MOUSSAOUI & S. PIOCH, Optimal number of sites in artificial pelagic multi-site fisheries. *Canadian Journal of Fisheries and Aquatic Sciences* 67, pp. 296-303, 2010.

[5] N. CHAROUKI, R. MCHICH, P. AUGER & N. RAISSI, A management oriented competitive model with two time scales: The case of sardine fishery along the Atlantic coast between Cantin Cape and Blanc Cape. *Ecological Modelling* 222, pp. 1253-1261, 2011.

BE6: Effects of refuges and density independent migration on the dynamics of pradator-prey system

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School of Applied Mathematics and Informatics, Hanoi University of Science and Technology.

We investigate a three- patch predator- prey model which incorperates refuges for pradator and prey We assume that each individual uses density independent migration, i.e per capita migration rates are constant. We also assume that the two time scales are involved in this model, a fast one corresponds to patch migration, and a slow one corresponds to growth, mortality and predator- prey interaction. We take advantage of the two time scales to reduce the dimension of the model by using methods of aggregation of variables. The aim of this research is to study the effect of fast density independent migration on the dynamics of predator-prey system. We show that fast density independent migration can allow prey to avoid predation risk, even in some cases, prey is able to drive predator out. Too much migration to the refgue, however, can be detrimental to existence of the prey.

Keywords: predator-prey model, aggregation of variables, time scales, fast migration, refuge.

References

[1] Auger P., Bravo de la Parra R., Poggiale J.C, Sanchez E., Nguyen-Huu T., *Aggregation of variables and applications to population dynamics.* In: P. Magal, S. Ruan (Eds.), Structure Population Models in Biology and Epidemiology, Lecture Notes in Mathematics, vol. 1936, Mathematcial Biosciences Subseries, Springer, Berlin, p. 209-263.

[2] Auger P., Bravo de la Parra R., Elabdlaoui A., Mchich R.Kooi B.,*Effects of density-dependent migrations on stability of a two-patch predator- prey model.* Math. Biosciences. 210 (1), 335-354, 2007.

[3] Nguyen-Ngoc D., Nguyen-Huu T., Auger P., *Effects of refuges and density dependent dispersal on interspecific competition dynamics.* International Journal of Bifurcation and Chaos, 1250029, 22(2), 2012.

BEs1: On a nonlinear difference equation with variable delay

Dinh Cong Huong

Quy Nhon University

The properties of solutions of delay nonlinear difference equations have been studied extensively in recent years. In 2004, 2005, we obtained some results for the asymptotic behaviour of solutions of nonlinear difference equations with time-invariant delay of the form

$$x_{n+1} = \lambda x_n + F(x_{n-m}), \quad n = 0, 1, 2, \cdots$$

where $F : [0, \infty) \to [0, \infty)$ is a continuous function, and $m \geq 0$ is a fixed integer, $x_{-m}, x_{-m+1}, \ldots, x_0$ are the positive initial values and $\lambda \in (0, 1)$ is a given parameter. We applied these results to determine the extinction, persistence, global stability and periodicity conditions in some models of pupulation growth.
Motivated by the work above, in this paper, we aim to study the equi-boundedness of solutions, the stability of the zero and the existence of positive periodic solutions of nonlinear difference equation with variable delay

$$x_{n+1} = \lambda_n x_n + \alpha_n F(x_{n-m_n}), \quad n = 0, 1, \cdots$$

where the function α, λ are defined on the set of integers, the function m maps the set of integers to the set of positive integers, the function F is defined on the set of real numbers.

BEs2: Probabilités des Évenements Rares sur des Séries Temporelles Environnementales

Pham Quang Khoai (joint work with Gilles Durrieu, Ion Grama, Vronique Le Tilly and Jean-Charles Massabuau)

Laboratoire de Mathématiques, Université de Bretagne Sud et CNRS

Measurement of mollusks bivalves activity is a way to record the animal behavior and so to evaluate possible changes in the water quality. We propose a statistical method based on the theory of extreme values to estimate gobal changes (pollution, change of temperature) and so to contribute to the survey of aquatic systems.

References

[1] Durrieu, G. and Briollais L. (2009), Sequential Design for Microarray Experiments, *Journal of the American Statistical Association*, 104(486), 650-660.

[2] Grama, I. and Spokoiny, V. (2008) Statistics of extremes by oracle estimation, *Annals of Statistics*, 36(4), 1619-1648.

[3] Schmitt, F., De Rosa, M., Durrieu, G., Sow M., Ciret P., Tran D. and Massabuau, J.C. (2011), Statistical study of bivalve high frequency microclosing behavior: scaling properties and shot noise analysis, *International Journal of Bifurcation and Chaos*, 21(12), 3565-3576.

[4] Sow, M., Durrieu, G., Briollais, L., Ciret, P. et Massabuau, J. C. (2011) Water quality assessment by means of HFNI valvometry and high-frequency data, *Environmental Modeling and Assessment*, 182, 155-170.

[5] Tran, D., Nadau, A., Durrieu, G., Ciret, P., Parisot, J.C. and Massabuau J.C. (2011) Field Chronobiology of a Molluscan Bivalve: How the Moon and Sun Cycles Interact to Drive Oyster Activity Rhythms, *Chronobiology International*, 28(4), 307-317.

[6] Schwartzmann, C., Durrieu, G., Sow, M., Ciret, P., Lazareth, C. and Massabuau J.C. (2011) In situ giant clam growth rate behavior in relation to temperature, *Limnology and Oceanography*, 56(5), 1940-1951.

CA: Commutative Algebra

CA1: Frobenius Algebras of Stanley-Reisner rings

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Let R be a commutative ring of characteristic $p > 0$ and M an R-module. Let $\mathcal{F}(M) := \bigoplus_{e\geqslant 0} \mathcal{F}^e(M)$ the (graded, associative, not necessarily commutative) ring of Frobenius operators of M as defined by G. Lyubeznik and K. Smith in 2001. It is known that $\mathcal{F}(R)$ is principally generated as $(\mathcal{F}^0(R) = R)$-algebra, and that if $(R, \mathfrak{m})$ is a complete n-dimensional local Cohen-Macaulay ring, then $\mathcal{F}(H^n_{\mathfrak{m}}(R))$ is also principally generated as $(\mathcal{F}^0(H^n_{\mathfrak{m}}(R)) = R)$-algebra. M. Katzman gave in 2010 an example showing that this algebra may not be finitely generated. The ring R in Katzman's example is a non-Cohen-Macaulay quotient of a formal power series ring in three variables by a square-free monomial ideal, and the module M the injective envelope E_R of the residue field of R.

In this talk we explain how to extend Katzman's idea to study the ring of Frobenius operators of the injective envelope of the residue field of any Stanley-Reisner ring R over a field of prime characteristic $p > 0$. We give a precise description of $\mathcal{F}(E_R)$ that shows that this algebra can only be principally generated or infinitely generated depending on the minimal primary decomposition of the defining monomial ideal of R. Examples will be given showing that one may find both non Cohen-Macaulay ideals with principally generated Frobenius algebra and Cohen-Macaulay ideals with infinitely generated Frobenius algebra. Time permitting, we will see as an application that independently of the finite or non finite character of the Frobenius algebra $\mathcal{F}(E_R)$, its Matlis dual algebra $\mathcal{C}(R)$ of Cartier operators is always gauge bounded, a notion recently introduced by M. Bilckle which implies that the set of F-jumping numbers of the corresponding generalized test ideals is always a discrete set.

This is a joint work with Josep Àlvarez Montaner and Alberto Fernández Boix.

CA2: A characterization of Gorenstein triangle-free graphs

Tran Nam Trung (joint work with Do Trong Hoang)

Institute of Mathematics, Hanoi

Let G be a simple graph. Two vertices u and v of G are *adjacent* if uv is an edge of G. An independent set in G is a set of vertices no two of which are adjacent to each other. The graph G is well-covered if every maximal independent set is the same size, and G is a graph in the class W_2 if and only if G is well-covered and any two disjoint independent sets of G can be extended to disjoint maximal independent sets. If the length of every cycle in G is at least 4, then G is called *triangle-free*.

Let $R = k[x_1, \ldots, x_n]$ be a polynomial ring of n variables over a fixed field k, and let G be a simple graph on the vertex set $\{x_1, \ldots, x_n\}$. We associate to the graph G a quadratic squarefree monomial ideal

$$I(G) = (x_i x_j \mid x_i x_j \text{ is an edge of } G) \subseteq R,$$

which is called the *edge ideal* of G. We say that G is *Gorenstein* (over k) if $I(G)$ is Gorenstein (over k).

In this talk, we focus on characterizing triangle-free Gorenstein graphs. The main result is:

Theorem *Let G be a triangle-free graph without isolated vertices. Then, the following conditions are equivalent:*

1. *G is Gorenstein;*
2. *G is in W_2;*
3. *$I(G)^2$ is Cohen-Macaulay.*

CA3: The divisor class group of algebra of t-minors of Hankel extended matrices

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The extended Hankel matrices are defined as follows:

$$X_t = \begin{pmatrix} x_1 & x_2 & x_3 & \cdots & x_{n-(t-1)c} \\ x_{1+c} & x_{2+c} & x_{3+c} & \cdots & x_{n-(t-2)c} \\ x_{1+2c} & \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdot & \cdots & \cdot \\ x_{1+(t-1)c} & \cdot & \cdot & \cdots & x_n \end{pmatrix}$$

for $t = 1, ..., m = \left\lfloor \frac{n+1}{c+1} \right\rfloor$. Given a sequence of number $a = a_1, ..., a_s$ and a number t, we define $\gamma_t(a) = \sum_{i=1}^{s} \max\{a_i + 1 - t, 0\}$. We combine some results of minors of Hankel matrices to extend the definition of γ-functions to a polynomial of $S = k[x_1, x_2, ..., x_n]$. Denote by A_t the algebra of t-minors of Hankel extended matrices. The properties of A_t and the divisor class group of general case are well-known in [1,2,3,4]. We describe the structure of the divisor class group of A_t by using γ-functions and have the following:

Theorem: The divisor class group of is free of rank 1,

$$cl(A_t) = \mathbb{Z}$$

References

[1] W. Bruns and A. Conca, *Algebras of Minors*, J. Algebra. **246**, 311-330 (2001).

[2] J. Herzog and W. Vasconcelos, *On the divisor class group of Rees- Algebras*, J. Algebra. **9 3**, 182-188 (1985).

[3] L.D. Nam, *The determinantal ideals of extended Hankel matrices*, J. Pure Appl. Algebra. **215**, 1502-1515 (2011).

[4] A. Simis and N. V. Trung, *The divisor class group of ordinary and symbolic blow-ups*, Math. Z. **198**, 479-491 (1988).

CA4: Partial elimination theory and syzygetic application to quadratic schemes

Sijong Kwak
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We develop the partial elimination theory initiated by M. Green and mapping cone theorem asociated to the projection. As results, we get the upper bound of linear strand of projective varieties and the generalizede $K_{p,1}$ theorem due to M. Green. Moreover, we give other classical rigidity theorem on the simple linear syzygies.

CA5: Some properties of generalized local homology modules

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Let I be an ideal of a local noetherian commutative ring R and M, N $R-$modules. In [5] we defined the $i-$th generalized local homology module $H_i^I(M,N)$ of M, N with respect to I by

$$H_i^I(M,N) = \varprojlim_t \operatorname{Tor}_i^R(M/I^tM, N).$$

This definition is in some sense dual to J. Herzog's definition of generalized local cohomology modules [3] and in fact a generalization of the usual local homology modules

$$H_i^I(M) = \varprojlim_t \operatorname{Tor}_i^R(R/I^tR, M) \text{ ([1], [2])}.$$

In [4] Macdonald defined a non-zero $R-$module M to be secondary if its multiplication endomorphism by any element x of R is either surjective or nilpotent. It is immediate that the nil-radical of M is a prime ideal $\mathfrak{p}$ and M is call $\mathfrak{p}$ $-$secondary. A secondary representation for an $R-$module M is an expression for M as a finite sum of secondary modules. If such a representation exists, we will say that M is representable. For the convenient, a zero module is considered as a representable module. If M has a reduced secondary representation $M = M_1 + M_2 + ... + M_n$ and N_i is $\mathfrak{p}_i$ $-$secondary, we write $\operatorname{Att}(M) = \{\mathfrak{p}_1, \mathfrak{p}_2, ..., \mathfrak{p}_n\}$.
Recently, Rezaei [7] studied some properties of representable local homology modules $H_i^I(M)$ for artinian $R-$modules M. In this paper, we study representable generalized local homology modules $H_i^I(M,N)$ and give some general results. By duality, we get some properties of good or flat generalized local cohomology modules.

References

[1] N. T. Cuong, T. T. Nam, "The $I-$adic completion and local homology for Artinian modules", *Math. Proc. Camb. Phil. Soc.,* 131 (2001).

[2] N. T. Cuong, T. T. Nam, "A Local homology theory for linearly compact modules," *J. Algebra* 319(2008), 4712-4737.

[3] J. Herzog, "Komplexe, Auflösungen und dualität in der localen Algebra," *Habilitationschrift Univ. Regensburg* 1970.

[4] I. G. Macdonald, Secondary representation of modules over a commutative ring, Symposia Mathematica, 11, (1973), 23-43.

[5] T. T. Nam, "Generalized local homology for artinian modules," Algebra Colloquium (to appear).

[6] T. T. Nam, "Some properties of generalized local homology modules of artinian modules", (Preprint).

[7] S. Rezaei, "Some results on local homology and local cohomology modules," *Illinois Journal of Mathematics* (To appear).

CA6: Local Cohomology of bigraded Rees algebras and normal Hilbert polynomials

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Rees studied the normal Hilbert polynomials of two ideals to generalise Zariski's product theorem for complete ideals so that it is applicable to ideals in two dimensional local rings having rational singularities.
We approach Rees's theorem via a simple calculation of local cohomology of bigraded Rees algebras. As a consequence we show that Rees's theorem is really about vanshing of certain bigraded components of these local cohomology modules.
This generalisation enables us to relate the Cohen-Macaulay property of normalisation of bigraded Rees algebra of two m-primary ideals I and J with the constant term of the normal Hilbert polynomials of IJ.
This is joint work with Shreedevi Masuti.

CA7: Hilbert coefficient and sequentially Cohen-Macaulay modules

Hoang Le Truong

Institute of Mathematics, Hanoi

The purpose of this paper is to present a characterization of sequentially Cohen-Macaulay modules in terms of its Hilbert coefficients with respect to distinguished parameter ideals. The formulas involve arithmetic degrees. Among corollaries of the main result we obtain a short proof of Vasconcelos Vanishing Conjecture for modules and an upper bound for the first Hilbert coefficient.

CA8: Sharp upper bound for the regularity index of fat points

Phan Van Thien

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Let $P_1, \ldots, P_s$ be s distinct points in the projective space $\mathbb{P}^n := \mathbb{P}^n_k$, with k an algebraically closed of arbitrary characteristic; and let $m_1, \ldots, m_s$ be positive integers. We denote by $Z := m_1P_1 + \cdots + m_sP_s$ the set of fat points in $\mathbb{P}^n$. There has been much interest in computing the regularity index $\mathrm{reg}(Z)$ in terms of $m_1, \ldots, m_s$. But so far, it is a fairly difficult problem.
In 1961, B. Segre found the upper bound for generic points $Z = m_1P_1 + \cdots + m_sP_s$ in $\mathbb{P}^2$

with $m_1 \geq \cdots \geq m_s$:

$$\operatorname{reg}(Z) \leq \max\left\{m_1 + m_2 - 1, \left\lceil \frac{m_1 + \cdots + m_s}{2} \right\rceil\right\}.$$

In 1991, M.V. Catalisano extended Segre's result to fat points in general position in $\mathbb{P}^2$; and later in 1993, M.V. Catalisano et al. extended this result to fat points in general position in $\mathbb{P}^n$, they proved:

$$\operatorname{reg}(Z) \leq \max\left\{m_1 + m_2 - 1, \left\lceil (\sum_{i=1}^{s} m_i + n - 2)/n \right\rceil\right\}.$$

In 1996, N.V. Trung conjectured a sharp bound for the regularity index of arbitrary fat points in $\mathbb{P}^n$:

$$\operatorname{reg}(Z) \leq \max\{T_j |\ j = 1, \ldots, n\},$$

where

$$T_j = \max\left\{\left\lceil \frac{\sum_{l=1}^{q} m_{i_l} + j - 2}{j} \right\rceil |\ P_{i_1}, \ldots, P_{i_q} \text{ lie on a linear } j\text{-space}\right\}.$$

This conjecture was proved in some cases. But in general, N.V. Trung's conjecture is an open problem. We will show some recent results of this conjecture.

CA9: Betti numbers and the Green $N_{2,p}$ property for binomial ideals

Marcel Morales

Institut Fourier, Université Grenoble

This is a joint work with Hernan de Alba Casillas.
Let S be a polynomial ring with the standard graduation, and I be a graded ideal generated by quadrics, the study of betti numbers of I is a source of many interesting works. M. Green and Lazarfeld have considered the step where a minimal free resolution of I stops to be linear, this defines an invariant $p_2(I)$. In the case where I is a square free monomial ideal, Eisenbud et als [EGHP], have completely determined $p_2(I)$ in terms of the simplicial complex Γ defining I. In this talk we consider the class of binomial ideals called simplicial binomial ideals, introduced by Ha Minh Lam and Marcel Morales, namely to any simplicial complex Γ they associate a binomial ideal B_Γ by adding some scroll ideals. Lower bounds and upper bounds of $p_2(B_\Gamma)$ are given in terms of Γ and the new data. with appropiated hypothesis $p_2(B_\Gamma)$ can be computed effectively.

References

[EGHP] Eisenbud, David; Green, Mark; Hulek, Klaus; Popescu, Sorin, Restricting linear syzygies: algebra and geometry. Compos. Math. 141, No. 6, 1460-1478 (2005).

CA10: On Cohen-Macaulay canonical modules

Le Thanh Nhan

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This is a joint work with Markus Brodmann. Let $(R, \mathfrak{m})$ be a Noetherian local ring which is a homomorphic image of a local Gorenstein ring and let M be a finitely generated R-module of dimension $d > 0$. According to P. Schenzel 2004, M is called a *Cohen-Macaulay canonical* module if the canonical module $K(M)$ of M is Cohen-Macaulay. Using the notions of strictly f-sequence introduced by Cuong-Morales-Nhan 2004, polynomial type introduced by N. T. Cuong 1992, and ideal transform, we give some characterizations of CMC modules. We describe the non Cohen-Macaulay canonical locus nCMC(M) of M. If $d \leqslant 4$ then nCMC(M) is closed in Spec(R). For each $d \geqslant 5$ there are reduced geometric local rings R of dimension d such that nCMC(R) is not stable under specialization.

CAs1: On the top local cohomology modules

Tran Do Minh Chau

Thai Nguyen High School For Gifted Students

This is a joint work with Le Thanh Nhan. Let $(R, \mathfrak{m})$ be a Noetherian local ring and I an ideal of R. Let M be a finitely generated R-module with $\dim M = d$. It is clear by Matlis duality that if R is complete then $H^d_I(M)$ satisfies the following property:

$$\operatorname*{Ann}_R(0 :_{H^d_I(M)} \mathfrak{p}) = \mathfrak{p} \text{ for all prime ideals } \mathfrak{p} \supseteq \operatorname*{Ann}_R H^d_I(M). \qquad (*)$$

However, $H^d_I(M)$ does not satisfy the property (*) in general. In this talk, we characterize the property (*) of $H^d_I(M)$ in order to study the catenarity of the ring $R/\operatorname{Ann}_R H^d_I(M)$, the set of attached primes $\operatorname{Att}_R H^d_I(M)$, the co-support $\operatorname{Cos}_R(H^d_I(M)$, and the multiplicity of $H^d_I(M)$. We also show that if $H^d_I(M)$ satisfies the property (*) then $H^d_I(M) \cong H^d_{\mathfrak{m}}(M/N)$ for some submodule N of M.

References

[CN1] N. T. Cuong and L. T. Nhan, *On the Noetherian dimension of Artinian modules*, Vietnam J. Math., **(2)30** (2002), 121-130.

[NA] L. T. Nhan and T. N. An, *On the unmixedness and the universal catenaricity of local rings and local cohomology modules,* Journal of Algebra, **321** (2009), 303-311.

[R] R. N. Roberts, *Krull dimension for Artinian modules over quasi local commutative rings,* Quart. J. Math. Oxford, **26** (1975), 269-273.

[Sm] K. E. Smith, *Test ideals in local rings*, Trans. AMS., **347** (1995), 3453-3472.

CAs2: On generalized Cohen-Macaulay canonical module

Nguyen Thi Hong Loan (Joint work with L. T. Nhan)

Vinh University

Let $(R, \mathfrak{m})$ be a Noetherian local ring. A finitely generated R-module M is called generalized Cohen-Macaulay canonical if the canonical module $K(M)$ of M is generalized Cohen-Macaulay. In this talk, we give chatacterizations of generalized Cohen-Macaulay canonical modules in term of systems of parameters.

CAs3: Some loci of finitely generated modules over Noetherian local rings

Nguyen Thi Kieu Nga

Hanoi Pedagogical University II, Xuan Hoa

This is a joint work with Le Thanh Nhan and Pham Huu Khanh. Let M be a finitely generated module over a Noetherian local ring. In this paper, firstly we use pseudo supports defined by Brodmann-Sharp [BS1] and polynomial type defined by N. T. Cuong [C] to study the non Cohen-Macaulay locus and the non sequentially Cohen-Macaulay locus of M. Secondly, we introduce the notion of length support in order to describe the non generalized Cohen-Macaulay locus and the non sequentially generalized Cohen-Macaulay locus of M.

References

[BS1] M. Brodmann and R. Y. Sharp, *On the dimension and multiplicity of local cohomology modules*, Nagoya Math. J., **167** (2002), 217-233.

[C] N. T. Cuong, *On the least degree of polynomials bounding above the differences between lengths and multiplicities of certain systems of parameters in local rings*, Nagoya Math. J., **125** (1992), 105-114.

[CNN] N. T. Cuong , L. T. Nhan, N. T. K. Nga, *On pseudo supports and non-Cohen-Macaulay locus of finitely generateg modules*, J. Algebra 323 (2010), 3029-3038.

CAs4: A generalization of Cohen Theorem

Nguyen Van Sanh

Mahidol University

In this talk, we present a new notion of prime modules and some results related to the primeness in Module Category. We generalize some classical results in Ring Theory to modules, especially Cohen Theorem.

DC: DC Programming and DCA: Theory, Algorithms and Applications

DC1: Recent Advances in DC programming and DCA. Applications in Data Mining-Machine Learning and Finance

Le Thi Hoai An (University of Lorraine) and Pham Dinh Tao (INSA-Rouen, France)

(joint work with Huynh Van Ngai)

DC (Difference of Convex functions) Programming and DCA (DC Algorithms), which constitute the backbone of Nonconvex Programming and Global Optimization, were introduced by Pham Dinh Tao in their preliminary form in 1985 and extensively developed by Le Thi Hoai An and Pham Dinh Tao since 1994. (see for example http://lita.sciences.univmetz.fr/ lethi/).
DC Programming is a natural and logical extension of Convex Programming, sufficiently large to cover almost all nonconvex programs but not too in order to use the powerful arsenal of modern Convex Analysis and Convex Optimization. Note that most real world nonconvex programs are DC programs and with appropriate DC decompositions, DCA permit to recover, as special cases, most standard algorithms in Convex/Noncovex Programming. These theoretical and algorithmic tools have been successfully applied by researchers and practitioners to model and solve their nonconvex programs in different fields of Applied Sciences, in particular : Transport-Logistics, Telecommunication, Bioinformatics, Finance, Data Mining-Machine Learning, Cryptology, Mechanics, Image Processing, Robotics & Computer Vision, Petrochemistry, Optimal Control, Inverse Problems and Ill-Posed Problems, Multiobjective Programming, Multilevel Programming, Variational Inequalty Problems (VIP), Mathematical Programs with Equilibrium Constraints (MPEC) etc. The talk will be comprised of two parts. After a brief introduction to DC Programming and DCA, we present recent advances, mainly dealing with exact penalty techniques, convergence analysis of DCA with subanalytic data, extended DCA for general DC programs (with DC constraints instead of convex constraints as in standard DC programs) and DC relaxation for lower bounding in Branch-and-Bound techniques. The second part is devoted to applications of these theoretical and algorithmic tools to the modelling and solution of real world nonconvex programs, especially in Data Mining-Machine Learning and Finance.

DC2: DC Optimization Schemes for Generalized Ky Fan Inequalities

Pham Ngoc Anh (joint work with Le Thi Hoai An and Pham Dinh Tao)

Posts and Telecommunications Institute of Technology, Hanoi

Let C be a nonempty closed convex subset of $\mathcal{R}^n, \varphi : \mathcal{R}^n \to \mathcal{R}$, and f be a bifunction from $C \times C$ to $\mathcal{R}$. We consider the generalized Ky Fan inequalities (shortly $KF(f, C)$)):

$$\text{Find } x^* \in C \text{ such that } f(x^*, y) + \varphi(y) - \varphi(x^*) \geq 0 \text{ for all } y \in C.$$

In this paper, we propose new schemes for finding a critical point of a generalized Ky Fan inequality. The schemes are based on the idea of the DC (Difference of Convex functions) decomposition method. We show that the iterative sequences generated by the schemes converge to a critical point under mild assumptions on parameters. Application to the Cournot-Nash oligopolistic market model with piecewise concave cost functions.

DC3: Optimization of a multi-stage production/inventory system with bottleneck by DC programming based approaches

Tran Duc Quynh (joint work with Le Thi Hoai An and Pham Dinh Tao)

Faculty of Infomation Technology, Hanoi University of Agriculture

This work deals with optimizing the cost of set up, transportation and inventory of a multi-stage production system in presence of bottleneck. The considered optimization model is a mixed integer nonlinear program which is well known to be NP-hard. We propose two methods based on DC (Difference of Convex) programming and DCA (DC algorithm) - an innovative approach in nonconvex programming framework. The mixed integer nonlinear problem is first reformulated as a DC program and then DCA is developed to solve the resulting problem. In order to globally solve the problem, we combine DCA with a Branch and Bound algorithm (BB-DCA). A convex minorant of the objective function is introduced. DCA is used to compute upper bounds while lower bounds are calculated from a convex relaxation problem. The numerical results compared with that of COUENNE [20], a solver for mixed integer non convex programming, show the rapidity and the ϵ-globality of DCA in almost cases, as well as the efficiency of the combined DCA-Branch and Bound algorithm.

DC4: Global Minimization of Increasing Positively Homogeneous Functions

Nguyen Van Thoai

University of Trier

We consider the problem of globally minimizing an abstract convex function called increasing positively homogeneous (IPH) function over a compact convex subset of an $n-$dimensional Euclidean space, for short, IPH optimization problem.
A method for solving IPH optimization problems called cutting angle algorithm was proposed by Rubinov and others in 1999. The principle of cutting angle algorithm is a generalization of the cutting plane method for convex programming problems, where the convex objective function is iteratively approximated by the maximum of a family of affine functions defined by its subgradients. In this article, we propose a method for solving IPH optimization problems which is a combination of the cutting angle algorithm with a branch and bound scheme successfully used in global optimization.

DC5: Stability of the subproblem of the trust-region method

Nguyen Nang Tam

Hanoi Pedgogical University II, Xuan Hoa

This talk gives stability properties of the problem of minimizing a (nonconvex) linear-quadratic function over an Euclidean ball, known as the trust-region subproblem. We investigate in detail the case where the linear part of the objective function is perturbed and obtain necessary and sufficient conditions for the upper/lower semicontinuity of the Karush-Kuhn-Tucker point set map and the global solution map, explicit formulas for computing the directional derivative and the Fréchet derivative of the optimal value function. Stability of

the Karush-Kuhn-Tucker point set under the perturbation of the quadratic form is also studied.

DC6: Convergence Rate of a Modified Extragradient Method for Pseudomonotone Variational Inequalities

Pham Duy Khanh

Ho Chi Minh City University of Pedagogy

We establish R-linear convergence rate and Q-linear convergence rate of the iterative sequences generated by the modified extragradient method in [P. D. Khanh, A modified extragradient method for infinite-dimensional variational inequalities, Submitted]. By constructing a suitable example, we analyze the regularity assumption of P. Tseng [On linear convergence of iterative methods for the variational inequality problem, J. Compt. Appl. Math. 60 (1995), 237-252] and the need of it in the proof of our convergence rate result.

DC7: Boundedness of the DCA iterative sequences in quadratic programming

Hoang Ngoc Tuan

Hanoi Pedagogical University II, Xuan Hoa

We consider two cases where the iterative sequences generated by the DC (Difference-of-Convex functions) projection algorithm in quadratic programming are bounded. In the first case, when the quadratic program is convex, the DCA sequences are not only bounded, but also convergent. The second case, when the quadratic program is a two-dimensional one, the DCA sequences are also bounded. Our results give partial answers in the affirmative to a question raised by Professor Pham Dinh Tao.

DC8: Farkas-type results for nonconvex system involving composite functions with applications

Tran Hong Mo (joint work with Nguyen Dinh)

Tien Giang University

A new kind of closedness conditions (CC) is introduced. Several Farkas-type results and their characterizations for nonconvex systems involving DC and composite functions are established under/via this condition. As applications, the results are applied to get optimality conditions, duality results for classes of DC/convex problems.

DCs1: Penalty function method and exact penalty functions

Nguyen Thi Van Hang

Institute of Mathematics, Hanoi

The basic concept of penalty function involves solving constrained optimization problems by transforming them into a sequence of related unconstrained ones. In this report, we mention some ideas and well-known results on penalty function method for optimization problems and their extensions. Namely, we talk about the main idea and some theorems on convergence of this method. With the exact penalty property, rather than a sequence of subproblems, we can often find a solution or ε-solution by performing a single unconstrained problem. The existence of exact penalty property and its stability are considered in the next sections. Last, we show some applications of penalty function method in some special case of optimization problems.

DCs2: Multivalued Tikhonov Trajectories of General Affine Variational Inequalities

Nguyen Thi Thu Huong (joint work with Pham Duy Khanh and Nguyen Dong Yen)

Le Qui Don University, Hanoi

The Tikhonov trajectory of a general, not necessarily monotone, affine variational inequality is analyzed via the basic properties like single-valuedness, finite-valuedness, continuity, and convergence. We study the multivalued trajectory, which is obtained by the Tikhonov regularization method, on the whole parameter interval $\varepsilon \in (0, +\infty)$.

DCs3: Regular polynomials and their applications to DC representations

Tran Thai Duong

International University, VNU-Hochiminh City

In 1899, H. Poincaré defined a regular (regulier) polynomial as follows:
A polynomial of variables $X, Y, Z, T, U, \ldots$ is said to be *regular* if it can be expressed as a linear combination of powers of the form

$$(\alpha X + \beta Y + \gamma Z + \ldots)^p, \qquad p \in \mathbb{N}, \alpha, \beta, \gamma \in \mathbb{K}$$

Then Poincaré made a statement (without any proof) that every polynomial is equivallent to a regular polynomial. This fact can be applied to DC representation. The author of this talk has published a proof of this statement in 1999. In 2001, similar proofs were published again by Albert Ferrer, B. Brunat, and A. Montes (see the list of publication below). However, all the proofs mentioned were only for an *existence* of a regular representation of DC polynomials without showing how to find that representation in general. In this talk, the author will present a nice constructive formula for this representation. This will help the DC algorithms to actually apply the representation to practical applications.

Ton-That and Tran, Thai-Duong, Poincaré's Proof of the So-Called Birkhoff-Witt Theorem, Revue d'histoire des mathmatiques 5, n.2, Corollary 3.6, p. 263 (1999)

A. Ferrer-Biosca, Representation of a polynomial function as a difference of convex polynomials, with an application, Lecture Notes in Econom. and Math. Systems, 502, Springer, Berlin, pp. 189-207 (2001)
Josep M. Brunat and Antonio Montes, The Power-Compositions Determinant and its Application to Global Optimization, SIAM J. MATRIX ANAL. APPL. Vol. 23, No. 2, pp. 459-471 (2001)

DCs4: Generalized Convex Functions

Nguyen Thi Hong Linh

International University, VNU-Hochiminh City

Various needs have led mathematicians to introduce and study several notions of generalized convexity or concavity. Among the tools used to define or study these notions are the various subdifferentials of nonsmooth analysis, the convexificators, the pseudo-differentials, the normal cones to sublevel sets.
It is our purpose to study some classes of generalized convex functions, using a generalized differential approach. We also establish some links between the corresponding classes of pseudoconvex, quasiconvex. We devise some optimality conditions for constrained optimization problems.

DCs5: The extragradient-Armijo method for pseudomonotone equilibrium problems and strict pseudocontractions

Nguyen Duc Hien (joint work with Pham Ngoc Anh)

Duy Tan University, Danang

In this article, we present a new iteration method for finding a common element of the set of fixed points of p strict pseudocontractions and the set of solutions of equilibrium problems for pseudomonotone bifunctions without Lipschitz-type continuous conditions. The iterative process is based on the extragradient method and Armijo-type linesearch techniques. We obtain weak convergence theorems for the sequences generated by this process in a real Hilbert space.

DM: Discrete Mathematics

DM1: Search algorithms in small worlds

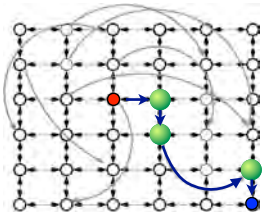
Nicolas Schabanel (joint work with Emmanuelle Lebhar & George Giakkoupis)
CNRS - Université Paris 7

Kleinberg's model. Kleinberg's small world model consists of a d-dimensional grid $\{-n, \ldots, n\}^d$ (representing local acquaintance between individuals, such as geographic or professional) augmented with one "long-range" directed link per node pointing to a random node at distance r chosen with probability proportional to $1/r^\alpha$ where α is a parameter of the model (each long-range link represents a random acquaintance met in the past for instance). Kleinberg defined a *decentralized* routing algorithm as an algorithm that tries to route *locally* a message from a node (the source) to another (the target), that is to say, by visiting only neighbors (local or long-range) of already visited nodes (starting from the source). Kleinberg's most striking result is that *no decentralized algorithm can find short paths if* $\alpha \neq d$ (i.e., path of length polylog(n) where n is the size of the grid), even when the diameter of the augmented graph is $\Theta(\log n)$ as it was shown later on by [5]. Only when $\alpha = d$, decentralized algorithms may find short paths between random pairs. Indeed, the simple greedy algorithm that simply routes the message to the closest neighbor (local or long-range) of the current message holder computes paths of expected length $O(\log^2 n)$ [3].

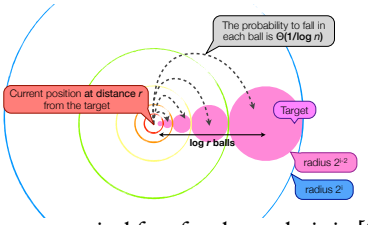
Two main types of questions. Kleinberg's model raises two main type of questions. First, from the algorithmic and peer-to-peer network design point of view: Can we beat greedy algorithm? Second, from the sociological point of view: What does this model tell us about real social networks?

Algorithmic and network design questions. This point is now almost fully understood. Several decentralized algorithms [1, 4, 2] have been proposed that computes much shorter paths to the target than the greedy for the smallworld case when $\alpha = d$. [1] proposes a *local exploration* based algorithm that explores the $O(\log n)$ closest local neighbors before routing the message: this leads to a path of expected length $O(\log^{1+1/d} n)$. [4, 2] propose a *non-local exploration* based algorithm which explores the $O(\log^{1+\varepsilon} n)$ closest (in hops) local and non-local contacts before routing the message, which lead to an expected path length of $\Theta(\log n \log\log n)$ hops when $d = 1$, and $\Theta(\log n)$ hops for all $d \geqslant 2$. These two bounds turned out to be optimal: indeed, [2] proves that no efficient decentralized can beat these bounds (even when $d = 1$ where the diameter is $\Theta(\log n)$).

The three main types of search algorithms. To try to answer these questions, one may want to study the characteristics of the paths constructed by the various algorithms proposed in the literature. These algorithms are essentially of three types: greedy [3], local exploration based [1] and non-local exploration based [4, 2]. One can observed some important differences between the paths they produce: the greedy path contains long-range links of all lengths while the two others tend to follow longer long-range links; the local exploration based algorithm tend to follow fewer long-range links than the non-local one and these are much longer. We can observed also some similarities between them: significant progresses toward the target are made by some very long long-range link that happend every so often. This last similarity was indeed proved to be true for every efficient decentralized algorithm: it is a corollary of the proof of the lower bound by [2].



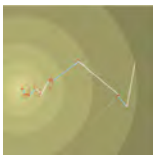
Kleinberg's network and a greedy path from red to blue



Key geometrical fact for the analysis in [2]

Greedy search algorithm

Local exploration search algorithm



Non-local exploration search algorithm

References

[1] Pierre Fraigniaud, Cyril Gavoille, and Christophe Paul. *Eclecticism shrinks even small worlds. In Proc. of ACM Symp. on Principles of Distributed Computing (PODC)*, pages 169-178, 2004.

[2] George Giakkoupis and Nicolas Schabanel. *Optimal path search in small worlds: Dimension matters. In Proc of ACM Symp. on Theory of Computing (STOC)*, volume 43, pages 393-402, 2011

[3] Jon M. Kleinberg, *The small-world phenomenon: an algorithmic perspective. In Proc. of ACM Symp. on Theory of Computing (STOC)*, pages 163-170, 2000.

[4] Emmanuelle Lebhar and Nicolas Schabanel. *Close to optimal decentralized routing in long-range contact networks. Theoretical Computer Science special issue on ICALP 2004*, 348(294-310), 2005.

[5] Charles Martel and Van Nguyen. *Analyzing and characterizing small-world graphs. In Proc. of ACM/SIAM Symp. On Discrete Algorithms (SODA)*, pages 311-320, 2005.

DM2: Comparison method for spectral properties of large random graphs

Tran Vinh Linh

Institute of Mathematics, Hanoi and University of Washington

I will talk about a method for proving properties of random regular graphs using similar properties of Erdos-Renyi random graphs. The method is applicable to the model of bipartite graph, lead to new results on convergence of spectral measure of bi-regular bipartite graphs. Several potential applications and open problems will be discussed.

DM3: Gcd computations and multidimensional continued fractions

V. Berthé

CNRS- Université Paris 7

This lecture is motivated by the question of the computation of the gcd for three or more numbers. The computation of the gcd for two integers can be performed and analyzed thanks to Euclid's algorithm. The lack of a canonical multidimensional generalization of Euclid's algorithm makes this question much more difficult when handling at least three numbers. We present here strategies based on the most classical unimodular multidimensional continued fraction algorithms. The aim of this lecture is to discuss how these strategies can be compared with respect to their average-case analysis. We use methods issued from Dynamical Analysis, which mixes tools from dynamical systems (notably, transfer operators) and tools from analytic combinatorics (for instance generating functions, here of Dirichlet type). This is a joint work with L. Lhote and B. Valle.

DM4: On identities for Combinatorial Extremal Theory

Tran Dan Thu

School of Information Technology, University of Science, VNU-Hochiminh City

The LYM inequality - a generalization of Sperner theorem (1928) for a family of incomparable sets, is published by Lubell - Yamamoto (1954) and Meschalkin (1963), is an important inequality in combinatorial extremal theory. Ahlswede and Zhang (1990) have found an elegant identity - called AZ identity which characterized non-trivial deficiency terms of the LYM inequality.
In this talk, we present our recent development to turn some classical inequalities in combinatorics into identities. We also discuss extremal cases of certain inequalities, i.e. the cases in which it happens equalities of these inequalities.

DM5: Graph coloring, communication complexity, and the stubborn problem.

Stéphan Thomassé (joint work with Nicolas Bousquet and Aurélie Lagoutte)

ENS Lyon

A classical result of Graham and Pollak asserts that the edge set of the complete graph on n vertices cannot be partitioned into less than $n-1$ complete bipartite graphs. A natural question is then to ask for some properties of graphs G_ℓ which are edge-disjoint unions of ℓ complete bipartite graphs. An attempt in this direction was proposed by Alon, Saks and Seymour, asking if the chromatic number of G_ℓ is at most $\ell+1$. This wild generalization of Graham and Pollak's theorem was however disproved by Huang and Sudakov who provided graphs with chromatic number $\Omega(\ell^{6/5})$. The $O(\ell^{\log \ell})$ upper-bound being routine to prove, this leaves as open question the *polynomial Alon-Saks-Seymour conjecture* asking if an $O(\ell^c)$ coloring exists for some fixed c.
A well-known communication complexity problem introduced by Yannakakis, involves a graph G of size n and the usual suspects Alice and Bob. Alice plays on the stable sets of G

and Bob plays on the cliques. Their goal is to exchange the minimum amount of information to decide if Alice's stable set S intersect Bob's clique K. In the nondeterministic version, one asks for the minimum size of a certificate one should give to Alice and Bob to decide whether S intersects K. If indeed S intersects K, the certificate consists in the vertex $x = S \cap K$, hence one just has to describe x, which cost is $\log n$. The problem becomes much harder if one want to certify that $S \cap K = \emptyset$ and this is the core of this problem. A natural question is to ask for a $O(\log n)$ upper bound. Yannakakis observed that this would be equivalent to the following *polynomial clique-stable separation conjecture*: There exists a c such that for any graph G on n vertices, there exists $O(n^c)$ vertex bipartitions of G such that for every disjoint stable set S and clique K, one of the bipartitions separates S from K.
A variant of Feder and Vardi celebrated dichotomy conjecture for Constrait Satisfaction Problems, the List Matrix Partition (LMP) problem asks whether all $(0, 1, *)$ CSP instances are NPcomplete or polytime solvable. The LMP was investigated for small matrices, and was completely solved in dimension 4, save for a unique case, known as the *stubborn problem*: Given a complete graph G which edges are labelled by 1,2, or 3, the question is to partition the vertices into three classes V_1, V_2, V_3 so that V_i does not span an edge labelled i. An easy branching majority algorithm computes $O(n^{\log n})$ 2-list-coloring of the vertices such that every solution of the stubborn problem is covered by at least one of these 2-list-coloring. The stubborn problem hence reduces to $O(n^{\log n})$ 2-SAT instances, yielding a pseudo polynomial algorithm. A polynomial algorithm was recently discovered by Cygan et al., but whether the original branching algorithm could be turned into a polynomial algorithm is still open. Precisely one can ask the *polynomial stubborn 2-list cover conjecture* asking if the set of solutions of any instance of the stubborn problem can be covered by $O(n^c)$ instances consisting of lists of size 2.

In this talk, I will show that the polynomial Alon-Saks-Seymour conjecture, the polynomial clique-stable separation conjecture and the polynomial stubborn 2-list cover conjecture are indeed equivalent. One of the implications linking the two first problems was already proved by Alon and Haviv.

DM6: Tree structure of subsets

Bui Xuan Binh Minh

CNRS, Université Paris 6

Numerous computational problems in graph theory is a "finding the right set" problem. This ranges from well known hard problems such as Hamiltonicity, Domination, Clique, and so on, to no less famous polynomial time solvable problems such as Shortest Path, Flow, Matching, etc. Even problems requiring only a number as output can in some sense be considered that way. An example that includes the famous game Sudoku as particular instance is Chromatic Number which basically asks for the optimal cardinality of a partition of the vertex set into independent ones. Our interest in subsets will be twofold. On the one hand, we focus on finding a way to order the input subsets into trees. This is because tree structures allow for easy, very fast, manipulations (visits, isomorphism, etc). On the other hand, starting from an input set V of n elements, there is an exponential number of possibilities to run into a subset of V. Assuming that exponents are bad, computing-wise, we also focus on cases when the target subsets can be bijectively mapped into an object of polynomial size. In this talk, we will see old and new results showing that many settings allow for a tree to be used as that "polynomial size object", thus fulfilling both our foci. The impact of these results can

be found in diverse areas such as bioinformatics, optimization, parameterized complexity, and graph theory.

DM7: Highly Nonlinear Boolean Functions with Optimal Algebraic Immunity

Claude Carlet

Université Paris 8

This talk will be devoted to Boolean functions for cryptography, and more precisely to those which can be used for filtering linear feedback shift registers, bringing nonlinearity in the pseudo random generators of stream ciphers using them.
After the improvement by Courtois and Meier in 2003 of the algebraic attacks on stream ciphers and the introduction in 2004 of the related notion of algebraic immunity, a first series of constructions of infinite classes of balanced Boolean functions with optimum algebraic immunity had been proposed. All of them gave functions whose nonlinearities are insufficient for allowing resistance to fast correlation attacks and whose behavior with respect to fast algebraic attacks (a new version of algebraic attacks, introduced by Courtois in 2003 as well) is not good either. An infinite class of balanced functions achieving optimum algebraic immunity, optimum algebraic degree and a much better nonlinearity than all the previously obtained infinite classes of functions was then proposed by the author and K. Feng at ASIACRYPT 2008. The computation of the nonlinearity for small numbers of variables (small, but quite sufficient for cryptographic applications) gives good results but all the lower bounds which could be proved mathematically, and are then valid for any numbers of variables, did not allow ensuring a good nonlinearity. Similarly, the resistance to fast algebraic attacks could be checked, by computer, for small numbers of variables only.
Two researchers, Tu and Deng, proposed later a modification of these functions which allowed to reach a still much better nonlinearity and to keep optimum algebraic immunity. Unfortunately, it was proved by Johansson and Wang at INSCRYPT 2010 that these functions (and all functions based on the same principle of construction) had bad behavior against fast algebraic attacks.
We shall propose in this talk a construction, obtained in a collaboration with Deng Tang and Xiaohu Tang, of an infinite class of balanced Boolean functions based on a further modification of the Tu-Deng construction. The functions in this class present, among all currently known constructions, the best provable trade-off between all the important cryptographic criteria and the actual tradeoff computed for small numbers n of variables is the best known for many such n.

DM8: A Code for Trace & Revoke Systems

Phan Duong Hieu (joint work with Ngô Quang Hung and David Pointcheval)

University of Paris 8 and École normale supérieure

Broadcast Encryption enables a center to broadcast digital information to a specific set of subscribers for decrypting contents (we found it in many real-world applications such as Pay-TV, satellite radio, and the distribution of copyrighted materials). Two natural requirements arise in such settings. Firstly, the broadcast system should be able to revoke the receiving rights of an arbitrary subset of subscribers, either because they have unsubscribed from the

service or have violated some rules. Secondly, as users might collude to build and distribute pirate decoders, it is desirable for the system to be able to trace at least one traitor by examining the pirate decoder. Among the combinatorial schemes in the literature, those based on codes (collusion-secure codes, IPP codes) support black-box tracing capacity but not revocation, while those based on ESS (exclusive set systems) mainly support revocation.

In this talk, we address the problem of designing an efficient broadcast encryption scheme which is capable of simultaneously revoking users and tracing traitors. We first introduce a code framework that generalizes both IPP codes and ESS. We then propose a construction for a class of k-conjunction code that fits our framework and finally, we combine the proposed code with a k-out of -n secret sharing to achieve a black-box trace and revoke system.

DM9: Number systems and Cryptography

Jean Claude Bajard

LIP6 UPMC CNRS

Public key cryptography uses inside its algorithms a core of modular arithmetic (Diffie-Hellman, RSA, ECC, pairing...). The most basic operations occurring in such protocols are modular multiplications and exponentiations. The main challenge is to be the most efficient and the most secure as possible. Some works study how numbers systems and the algorithms associated can answer to these needs.
RSA which is very popular, is based on a modular exponentiation with a modulo equals to a product of two huge prime number $N = p*q$. Thus, as the modulo is fixed, the first reduction methods, as Montgomery and Barret algorithms, use this particularity. They precompute some values for offering a reduction without any division. In other hand, cryptosystems as Diffie-Hellmann or those based on elliptic or hyperelliptic curves work on finite fields (characteristic p a prime number). Here the choice of p is given, thus we can select a p with particular form like the pseudo mersenne one. In order to generalize this approach, Thomas Plantard had proposed in his PhD a number systems adapted to p such that p can be written as a pseudo-mersenne. His approach uses the fact that modular reduction can be seen as a lattice reduction problem. Then, with the evolution of the hardware (multicore architecture, GPU, etc) some number systems as Residue Number Systems (based on the Chinese Remainder Theorem) which are intrinsically parallel offer good performances for the modular arithmetic.
Most of the time, the secret key is used as an exponent. The most known algorithms are based on square and multiply paradigm. Hence, the complexity was due to the number of non nul digits which correspond to a multiplication. Thus, for minimizing the number of non nul digit we can use some representations like Non Adjacent Form systems, where each non nul digits are separated by a minimal number of zeros.
The main drawback of these cryptosystems based on exponentiation is that if we can discern square from the multiplication, then it is possible, through the analyze of side channel leaks, to obtain the key. One solution can be to perform a product at each step like in the Montgomery pad approach. But there is a cost. Another way is to use redundant number systems where a number has different representations. For example, we can use signed digits redundant number systems which are close to NAF, or double bases systems where a number is represented by a matrix (the rows are in one base, and the columns in the other).

DM10: 3Tav-An Efficient Public Key Cryptography

Nguyen Dinh Thuc (joint work with Ton That Tri, Tran D. Thu and Dang H. Van)
University of Science, VNU-Hochiminh City

The most popular cryptosystems, such as RSA and Diffie-Hellman, rely on hard problems in numerical theory, such as the prime factorization problems and the discrete logarithm problems. To obtain a necessary level of security, the keys size must be large. In addition, with the permanently evolution of the computer, to ensure necessary security level, size of keys and messages must also increases continuously. We propose public key primitives that can be implemented efficiently and securely using a high order subgroup of general linear group and homogeneous polynomials of the first degree. Techniques for computing discrete logarithms are not applicable, since underlying hard problems are neither the prime factorization problems nor the discrete logarithm problems.

DM11: The verification of monadic second-order properties of structured graphs

Bruno Courcelle
Université Bordeaux-1, Institut Universitaire de France

Graphs can be handled as relational structures and, alternatively, as elements of (abstract) algebras. The former way allows to express their properties by logical formulas. The latter yields a denotation by algebraic terms of finite graphs, and a method to check their properties with some tools of Language Theory (e.g., finite automata). Tree-width and clique-width are graph complexity measures based on the algebraic view. Monadic second-order formulas can express many interesting graph properties. They can be translated (compiled) into finite automata over the corresponding terms that check in linear time the validity of the formulas they implement ([1], [2], [4] and Chapter 6 of [3]). The lecture will survey the definitions and the construction of automata.
The automata approach to monadic second-order model-checking is flexible in that it is not problem specific, however, the practical use of the construction faces the problem that the automata are huge. The number of states is typically an h-iterated exponential where h is the quantifier alternation depth. In order to overcome this difficulty, at least in some cases, we use automata called *fly-automata* (introduced in common work with I. Durand, see [2]) whose states are *described* in an appropriate syntax (and not listed) and whose transitions are *computed only when needed* (and not compiled in unmanageable tables). These automata can take as input terms denoting graphs having a tree-width or a clique-width that is not *a priori* bounded.

References

[1] B. Courcelle, On the model-checking of monadic second-order formulas with edge set quantifications, *Discrete Applied Mathematics* **160** (2012) 866-887.

[2] B. Courcelle and I. Durand, Automata for the verification of monadic second-order graph properties, 2011, J. of Applied Logic, To appear.

[3] B. Courcelle and J. Engelfriet, *Graph structure and monadic second-order logic, a language theoretic approach*, (2006-2011), Cambridge University Press, May 2012.

[4] B. Courcelle, J. Makowsky and U. Rotics, On the fixed parameter complexity of graph enumeration problems definable in monadic second-order logic, *Discrete Applied Mathematics* **108** (2001) 23–52.

DM12: Maximal nonhamiltonian Burkard-Hammer graphs with a large minimum degree

Ngo Dac Tan

Institute of Mathematics, Hanoi

A graph $G = (V, E)$ is called a split graph if there exists a partition $V = I \cup K$ such that the subgraphs $G[I]$ and $G[K]$ of G induced by I and K are empty and complete graphs, respectively. In 1980, Burkard and Hammer gave a necessary condition for a split graph G with $|I| < |K|$ to be hamiltonian. We will call a split graph G with $|I| < |K|$ satisfying this condition a Burkard-Hammer graph. Further, a split graph G is called a maximal nonhamiltonian split graph if G is nonhamiltonian but $G + uv$ is hamiltonian for every $uv \notin E$ where $u \in I$ and $v \in K$.
In this talk, we will consider maximal nonhamiltonian Burkard-Hammer graphs G with minimum degree $\delta(G) \geq |I| - 4$. The complete classification of these graphs have been obtained recently. Namely, Ngo Dac Tan and Le Xuan Hung have classified maximal nonhamiltonian Burkard-Hammer graphs G with minimum degree $\delta(G) \geq |I| - 3$; Ngo Dac Tan and Iamjaroen have classified maximal nonhamiltonian Burkard-Hammer graphs with $|I| \neq 6, 7$ and $\delta(G) = |I| - 4$; Finally, Ngo Dac Tan has classified these graphs G with $|I| = 6, 7$ and $\delta(G) = |I| - 4$.

DM13: Random subgroups of a free group and automata

Frédérique Bassino

Laboratoire d'Informatique de Paris Nord, Université Paris 13

Let A be a finite alphabet. The free group $F(A)$ is the set of finite reduced words made of letters from A and their (formal) inverses. In this talk we show how one can study with probabilistic and combinatorial methods algebraic properties of a random finitely genrated subgroup of $F(A)$.
One of the key tool is the representation of such a subgroup by a special automaton obtained by Stalling's foldings. We shall compare compare the behaviour of finitely generated random subgroups under some natural probability distributions.

DM14: An Interface between Physics and Number Theory

Gérard H. E. Duchamp

Laboratoire d'Informatique de Paris Nord

The aim of our talk is to show examples of an interplay between
(a) Hopf algebras of diagrams coming from physics
(b) Combinatorial Hopf algebras (mainly noncommutative symmetric functions) and
(c) Number Theory, namely polyzeta values

in order to get a unified and elegant way to compute these special functions, we use non-commutative integrable systems.
References : arXiv:1101.4497, arXiv:1011.0523v2 [math-ph]

DM15: Polyzêtas and irreducible Lyndon words

Hoang Ngoc Minh

LIPN - UMR 7030, CNRS

Euler was the first to use his summation formula for the asymptotic expansion of classical harmonic sums and he put in light some constants, such as gamma constant and the value at positive integer of the Riemman zeta function whose arithmetic nature remains to be elucidated.
These sums were recently generalized into nested sums whose words give efficient algorithms to determine their asymptotic behavior. The coefficients of these expansions belong to an algebra of special numbers generated by the gamma constant and the value at positive integer multi - indices of the function Riemman polyzêta whose their non relations can be explained through the irreducible Lyndon words.
If time allows, I will give the proof of the freedom of polyzêtas encoded by irreducible Lyndon words, by indiscernability under a group of associators.

DM16: Application of module method in steganography

Phan Trung Huy (joint work with Nguyen Hai Thanh)

Hanoi Unisversity of Science and Technology

In data hiding area, covering codes and correcting codes widely studied and these bring us powerful techniques in embedding schemes. Good covering codes are built by combinatorics and algebraic techniques. In this report we introduce module approach in hiding data which is shown as a generation of covering and correcting code approachs. Module approach provides many flexive and effective ways for designing new embedding schemes. Some of them are presented together with experimental results.

DM17: Coloring perfect graphs with no balanced skew partition

Nicolas Trotignon

CNRS, LIP, ENS Lyon

A graph G is *perfect* if every induced subgraph G' of G satisfies $\chi(G') = \omega(G')$ (here $\chi(G)$ denotes the chromatic number of G and $\omega(G)$ the maximum number of pairwise adjacent vertices in G). In the 1980's, Gröstchel, Lovász, and Schrijver [3] described a polynomial time algorithm that colors any perfect graph. A graph is *Berge* if none of its induced subgraphs, and none of the induced subgraphs of its complement, is an odd chordless cycle on at least five vertices. Berge [1] conjectured in the 1960s that a graph is Berge if and only if it is perfect. This was proved in 2002 by Chudnovsky, Robertson, Seymour and Thomas [2]. Their proof relies on a *decomposition theorem*: every Berge graph is either in some simple

basic class, or has some kind of decomposition. The method used in [3] to color perfect graphs (or equivalently by [2], Berge graphs) is based on the ellipsoid method, and so far no purely combinatorial method is known. In particular, it is not known whether the decomposition theorem from [2] may be used to color Berge graphs in polynomial time.
This question contains several potentially easier questions. Since the decomposition theorem has several outcomes, one may wonder separately for each of them whether it is helpful for coloring. The basic graphs are all easily colorable, so the problem is with the decompositions. One of them, namely the balanced skew-partition, seems to be hopeless. The other ones (namely the 2-join, the complement 2-join and the homogeneous pair) seem to be more useful for coloring. We construct here a polynomial time algorithm that colors Berge graphs with no balanced skew-partition. We show how 2-joins, complement 2-joins and homogeneous pairs can be used simultaneously to solve the related optimization problems.
This is a joint work with Maria Chudnovsky, Théophile Trunck and Kristina Vušković.

References

[1] C. Berge. Färbung von Graphen, deren sämtliche bzw. deren ungerade Kreise starr sind. Technical report, Wissenschaftliche Zeitschrift der Martin-Luther-Universität Halle-Wittenberg, Mathematisch-Naturwissenschaftliche Reihe 10, 1961.

[2] M. Chudnovsky, N. Robertson, P. Seymour, and R. Thomas. The strong perfect graph theorem. *Annals of Mathematics*, 164(1):51–229, 2006.

[3] M. Gröstchel, L. Lovász, and A. Schrijver. *Geometric Algorithms and Combinatorial Optimization*. Springer Verlag, 1988.

DM18: Explictily construction of existentially closed graphs from permutation polynomials over finite fields

Le Anh Vinh

HUS, VNU-Hanoi

Let n, t be positive integers. A t-edge-colored graph G is (n,t)-e.c. or (n,t)-existentially closed if for any t disjoint sets of vertices $A_1, \ldots, A_t$ with $|A_1| + \ldots + |A_t| = n$, there is a vertex x not in $A_1 \cup \ldots \cup A_t$ such that all edges from this vertex to the set A_i are colored by the i-th color. In this paper, we construct explicitly many $(3,t)$-e.c. graphs from permutation polynomials over finite fields.

DMs1: One-relation languages and code generators

Tran Vinh Duc (joint work with Igor Litovsky)

HUST

We investigate the open problem to decide whether the infinite power of a given language is generated by an ω-code. In case the given language is a code (i.e. zero-relation language), the problem was solved. In this work, we solve the problem for the class of one-relation languages.

DMs2: Subgraphs of the odd distance graph

Le Tien Nam (joint work with Moshe Rosenfeld)

K54 Advanced Mathematics Program, HUS, VNU-Hanoi

K_4 is not alone, we prove that the 5-wheel W_5 is not a subgraph of the odd distance graph.
Introduction. The odd distance graph G^{odd} is the infinite graph whose vertices are the points of the Euclidean plane $\mathbb{R}^2$, two vertices connected by an edge if their distance is an odd integer. The "birth" of this graph happened in a conversation with P. Erdös in 1994 at the conference on Graph Theory, Combinatorics and Computation in Boca Raton, Florida. In [3] and [6] it was noted that G^{odd} does not contain K_4 as a subgraph. We asked: "what is the chromatic number of G^{odd}?" Erdös added: "How many distances among n points in the plane can be odd integers?"

Thus started the pursuit of unveiling the mysteries of G^{odd}, whose "close cousin," the unit-distance graph, has been haunting mathematicians since its introduction in 1950. Since every finite subgraph of G^{odd} is K_4-free, it follows from Turán's theorem that the maximum number of odd distances among n points in the plane is $T(n, 4)$, the number of edges in the complete tri-partite graph on n vertices whose three partitions are "as equal as possible". L. Piepemeyer, [5] proved that this maximum is attained by showing that the complete tri-partite graph $K_{m,m,m}$ is a subgarph of G^{odd}. As for the chromatic number, we believe that it is not finite, that is G^{odd} contains finite subgarphs with large chromatic numbers. They are waiting to be discovered. The best known lower bound is 5. A 5-chromatic subgraph of G^{odd} with 21 vertices was constructed in [1]. Interestingly, if we require every mono-chromatic set to be Lebesgue measurable, then it follows from a result of H. Furstenberg, Y. Katzenelson and B. Weiss, [4] that G^{odd} is not finitely measure-colorable. Using spectral techniques, J. Steinhardt [7], also proved that there is no finite measurable coloring of G^{odd}.

In [2], on page 252, it was noted that "*...the existence of a K_4 is the only obstruation. That is, every finite K_4-free graph can be represented by odd distances in the plane.*" In this note we correct this erroneuos claim by showing that W_5, the 5-wheel, see Figure **??**, is not a subgraph of G^{odd}.

References

[1] H. Ardal, J. Manŭch, M. Rosenfeld, S. Shelah, L. Stacho: *The Odd-Distance Plane Graph*, Discrete Comput. Geom. **42** (2009) 132-141.

[2] P. Brass, W. Moser, J. Pach: *Research Problems in Discrete Geometry*, Springer 2005.

[3] R. L. Graham, B. L. Rothschild, E.G. Strauss: *Are there $n + 2$ points in E^n with odd integral distances?* Amer. Math. Monthly **81** (1974) 21-25.

[4] H. Furstenberg, Y. Katznelson, and B. Weiss: *Ergodic theory and configurations in sets of positive density*, Mathematics of Ramsey theory, 184–198, Algorithms Combin., **5**, Springer, Berlin, 1990.

[5] L. Piepemeyer: *The maximum number of odd integral distances between points in the plane*, Discrete Comput. Geom. **16** (1996) 156-159.

[6] M. Rosenfeld: *Odd integral distances among points in the plane*, Geombinatorics **5** (1996) 156-159.

[7] J. Steinhardt: *On Coloring the Odd-Distance Graph*, Electronic J. of Combinatorics **16** (2009) #N12

DMs3: Lattices generated by Chip Firing Game models: characterizations and recognition algorithm

Pham Van Trung (joint work with Phan Thi Ha Duong)

Institute of Mathematics, Hanoi

It is well-known that the class of lattices generated by CFGs is strictly included in the class of upper locally distributive lattices. However a full characterization for this class is still an open question. In this paper, we settle this problem by giving a full condition for this class. This condition allows us to build a polynomial-time algorithm for constructing a CFG which generates a given lattice if such a CFG exists. Going further, we solve the same problem on two other classes of lattices which are generated by CFGs on the classes of undirected graphs and directed acyclic graphs.

DMs4: On the relation between Chip Firing Games and Petri Nets

Le Manh Ha (joint work with Pham Tra An and Phan Thi Ha Duong)

College of Education, Hue University

We represent a new approach to investigate the famous discrete dynamical system Chip Firing Game (CFG) by using Petri Net. First, we discuss about the definition and some main results of Chip Firing Game using different classical approaches. Then, we consider extensions of CFG, especially the class of coloured Chip Firing Games, which corresponds to the class of lower locally distributive lattice. Our main result is to construct injections mapping each Chip Firing Game or each coloured Chip Firing Game to a special Petri Net.

DMs5: Public-key Encryption with Keyword Search using Pseudo-inverse Matrix

Dang Hai Van (joint work with Nguyen Dinh Thuc)

University of Science, VNU-Hochiminh City

We propose a novel construction for Public key Encryption with Keyword Search (PEKS) scheme of Boneh et.al. Our construction is developed based on pseudo-inverse matrices. Our construction is proved to be semantically secure against a chosen keyword attack in the random oracle model. In addition, we will show that our construction's cost is about $O(n^2)$ for storage and comnunication, where n is the system parameter. For computation, its cost mainly relies on multiplication operations of binary matrices. Moreover, for acceptable level of security, size of binary matrices do not need to be large. Therefore, our search operation in PEKS scheme is fast.

DMs6: Effective algorithms based on automata and algebraic techniques to verify codes of infinite and bi-infinite words

Nguyen Dinh Han (joint work with Dang Quyet Thang and Phan Trung Huy)

Hung Yen University of Technology and Education

ω-codes and Z-codes are special codes related with infinite and bi-infinite which have been studied by many authors. Until now, the best algorithm to test whether a regular language X is an ω-code has time complexity $\mathcal{O}(n^3)$, where n is the size of the transition monoid of the minimal automaton recognizing X. For the case of bi-infinite words, a question about existence of an effective testing algorithm in polynomial time for Z-codes arisen naturally. In this paper, with any monoid M saturating X (the transition monoid above is only a special case), we establish two quadratic testing algorithms with time complexity $\mathcal{O}(n^2)$ to verify whether X is an ω-code and a Z-code, where n is Card(M).

DMs7: Queueing network and some types of Customers and Signals

Dao Thi Thu Ha

PriSM, CNRS-UVSQ

Queueing theory plays an important role in communication network. In the very first model, customer queue up in the queue without simplification. In the early 90, Gelenbe introduced the negative customers which can eliminate normal customer in the queue. In this talk, one will present some new types of customers and signals which have been added to enrich the theory.

DMs8: Some Combinatorial Problems in Vector Spaces over Finite Cyclic Rings

Pham Van Thang

HUS, VNU-Hanoi

In this report, we will use to graph method to research some combinatorial problems in vector spaces over finite cyclic rings. To specify, we illustrate some new results for problems of point – line, sum – product estimate, orthogonal system.

DMs9: A Zero-Knowledge protocol based on a product of durations

Bui Vu Anh (joint work with Phan Trung Huy)

HUS, VNU-Hanoi

Zero-Knowledge proof or Zero-Knowledge protocol is used in consulting for privacy and security solutions whenever we need to conduct a privacy assessment. It is often an interactive method for one party to prove to another that a statement is true, without revealing anything other than the veraciousness of the statement. In this paper, we introduce an algebraic structure of durations and its application to design a Zero-Knowledge protocol with high

reliability.

DMs10: Effective algorithms based on automata and algebraic techniques to verify codes of words and bounded words

Ho Ngoc Vinh (joint work with Nguyen Dinh Han and Phan Trung Huy)

Vinh University of Technology and Education

We establish a quadratic algorithm that, given as input a regular language X, decides in time complexity $\mathcal{O}(n^2)$ whether X is a code, where n is the finite index of the syntactic congruence of X. A test of Sardinas-Patterson type for $\diamond$-codes is given when they are $\diamond$-regular languages. As a consequence, we obtain an $\mathcal{O}(n^2)$ time complexity algorithm for $\diamond$-codes.

GS: Geometry and Singularities

GS1: Vanishing Fibers and Singularities

Lê Dũng Tráng

Université de Marseille

In this lecture we are going to define the Vanishing Fibers associated to complex Singularities. We shall prove that in the case of complete intersection Singularities, these vanishing fibers have the homotopy type of bouquet of spheres.

GS2: The Seifert volume of 3-manifolds: computation and application

Vu The Khoi

Institute of Mathematics, Hanoi

In this talk we present some results on computation and application of the Seifert volume of 3-manifolds.

GS3: Arc Spaces and Motivic Milnor fiber

Michel Merle

Université Nice Sophia-Antipolis

Denef and Loeser gave a definition of the Motivic Milnor Fiber using Motivic Integration on arc spaces. We will give related results on spectrum of singularities and Milnor Fibers at Infinity of polynomials.

GS4: Contact structure on mixed singularity links

Mutsuo Oka

Tokyo University of Science

Strongly non-degenerate mixed functions have Milnor open book structures on a sufficiently small sphere. We introduce the notion of *holomorphic-like* mixed function and we will show that a link defined by such a mixed function has a canonical contact structure. Then we will show that this contact structure for a certain holomorphic-like mixed function is carried by the Milnor open book.

GS5: Right simple singularities in positive characteristic

Nguyen Hong Duc

Institute of Mathematics, Hanoi

We classify the right simple isolated hypersurface singularities f in $K[[x_1;\cdots;x_n]]$, where K is an algebraically closed field of characteristic $p>0$. For $K=R$ or C this classification was achieved by Arnol resulting in the famous ADE-series. The classification w.r.t. contact equivalence for $p>0$ was done by Greuel and Krning with a result similar to Arnol. It is surprising that w.r.t. right equivalence and any given $p>0$ we have only finitely many simple singularities, i.e. there are only finitely many k such that A_k and D_k are right simple, all the others have moduli.

GS6: A chapter of singularities for numerical analysis

Ta Le Loi (joint wotk with Phan Phien)

Université de Dalat

In this talk, we give explicit bounds for the data of objects involved in some basic theorems of Singularity theory: the Inverse, Implicit and Rank Theorems for Lipschitz mappings, Splitting Lemma and Morse Theorem, Sard Theorem, the density of Morse functions, ... We hope that the results will be useful for Numerical Analysis and some fields of computing.

GS7: Controlling the multiplicities in a Milnor number constant family of complex hypersurfaces.

David Trotman

Aix-Marseille-Université

As a parametrised version of Zariski's question about the topological invariance of the multiplicity of a complex hypersurface singularity, Teissier conjectured in 1972 that families of isolated complex hypersurface singularities with constant Milnor number are equimultiple. We show that any possible drop in multiplicity in such a family $F(z,t)$, parametrised by t, is controlled by the powers of t in that the coefficient of t^k must have a multiplicity greater than or equal to $m-k+1$ where m is the multiplicity of $f(z)=F(z,0)$. We obtain equimultiplicity of families of the form $f+tg+t^2h$ when the singular set of the tangent cone of $f=0$ is not contained in the tangent cone of $h=0$. Generalising this we obtain further constraints on possible counterexamples to Teissier's conjecture.

GS8: Etude d'un ensemble singulier associé à une application polynomiale

Nguyen Thi Bich Thuy

IML Marseille

Dans leur article (prépublication) "Geometry of polynomial mappings at infinity via inter-

section homology", Anna et Guillaume Valette ont construit une pseudovariété N_F associée à une application polynomiale $F : \mathbb{C}^2 \to \mathbb{C}^2$ de jacobienne partout non nulle. Ils ont montré que si l'homologie d'intersection de NF n'est pas triviale alors F n'est pas un isomorphisme. Cet exposé donne une méthode pour stratifier l'ensemble NF et calculer son homologie d'intersection.

GS9: Lojasiewicz inequality on non-compact domains

Dinh Si Tiep

Institute of Mathematics, Hanoi

Let $f(x)$ be a real analytic function such that $f(0) = 0$. Let $K \subset \mathbb{R}^n$ be a compact set. Then the Classical Łojasiewicz inequality says that there exist some constants $\alpha, c > 0$ such that for every $x \in K$, we have

$$|f(x)| \geqslant cd(x, V)^\alpha,$$

where $V = f^{-1}(0)$ and $d(., V)$ is the usual distance in $\mathbb{R}^n$. In this talk, we present some recent results on Łojasiewicz inequality for some K non-compact and an application in the studies of singularities at infinity.

GSs1: The matrix based representations of the intersection curves

Luu Ba Thang

Hanoi National University of Education

Evaluating the intersection of two rational parameterized algebraic surfaces is an important problem in solid modeling. In this work, we make use of some generalized matrix based representations of parameterized surfaces in order to represent the intersection curve of two such surfaces as the zero set of a matrix determinant. As a consequence, we extend to a dramatically larger class of rational parameterized surfaces, the applicability of a general approach to the surface/surface intersection problem due to J. Canny and D. Manocha [4]. Notice that in [4] only some particular surface parameterizations, namely the parameterizations without base points (i.e. that are well defined over all their parameter space) can be represented by such matrices. This absence of base points is definitely a very strong constraint in the context of applications in solid modeling. It is hence the main limitation of applicability of the Canny-Manocha matrix based approach to the surface/surface intersection problem that is nevertheless an interesting compromise to provide an efficient, robust and accurate solution to this problem. The goal of our work is to overcome this limitation. This abstract is part of the work in [1, 3].

References

[1] L. Busé and T. Luu Ba. The surface/surface intersection problems by means of matrix based representation. *To appear in Computer Aided Geometric Design* , http://hal.inria.fr/inria-00620947/en/, 2012.

[2] V.N. Kublanovskaya. Methods and algorithm of solving spectral problems for polynomial matrices and rational matrix. *Journal of Mathematical Sciences*, 96(3):3085–3287, 1999.

[3] T. Luu Ba. *Représentation matricielle implicite de courbes et surfaces algébriques et applications*. PhD thesis, University of Nice Sophia Antipolis, July 2011.

[4] D. Manocha and J. Canny. A new approach for surface intersection. In *Proceeding of the first symposium on Solid modeling and CAD/CAM applications*, pages 209–219, Texas, US, 1991.

GSs2: Geometry of smooth quartics and their dual curves

Pho Duc Tai

HUS, VNU-Hanoi

My talk will have two parts: In the first part I will describe the moduli of smooth quartics and geometry of dual of smooth quartics. In the second part I will show how the topology of the complement of dual of smooth quartics can be used to obtain new Zariski pair.

NA: Numerical analysis and Applied mathematics

NA1: Robustness of stability and controllability of dynamical systems

Nguyen Khoa Son

Institute of Mathematics, Hanoi

A linear time-invariant dynamical system is robust stable/controllable if the system itself and all of its nearby systems in a neighborhood of interest are stable/controllable. The problem of computation of the possible quantities indicating the degree of robustness of the system's stability and controllability is of primary importance in mathematical system theory as well as in control practices. In this report we will give an overview on some results of our study in recent years dedicated to this problem for different classes of dynamical systems, including positive linear systems, linear functional differential equations and matrix polynomials. Moreover, an unified approach using multi-valued linear operators has been developed and is dealing successfully with the case of implicit systems where the leading coefficient matrix A_k need not assumed to be non-singular. Some examples are provided to illustrate the obtained results.

NA2: An a Posteriori Error Estimation for the Discrete Duality Finite Volume Discretization of the Stokes Equations

Pascal Omnes (joint work with Anh Ha Le)

LAGA, Université Paris 13

We present an a posteriori error estimation for the discrete duality finite volume (DDFV) discretization of the stationary Stokes equations on very general two-dimensional meshes, when a penalty term is added in the incompressibility equation to stabilize the variational formulation. Two different estimators are provided: one for the error on the velocity and one for the error on the pressure. They both include a contribution related to the error due to the stabilization of the scheme, and a contribution due to the discretization itself. The estimators are globally upper as well as locally lower bounds for the errors of the DDFV discretization. Numerical experiments illustrate the theoretical results and an error reduction strategy, mixing adaptive mesh refinement and decrease of the penalty parameter, is described.

NA3: Mathematical modeling and algorithms for the problem of oil pollution

Dang Quang A (joint work with Matthias Ehrhardt and Duc Le)

Institute of Information Technology, Hanoi

This paper deals with the mathematical modeling and algorithms for the problem of oil pollution caused by accidents in seas. The propagation of oil slick after accidents is described by the advection-diffusion equation. We prove a fundamental equality between the solutions of the main and the adjoint problems for this equation. Based on this equality we propose a novel method for the identification of the pollution source location and the accident time

of oil emission. In realization of the method we use the monotone difference schemes for the main and the adjoint problems. We also study the discrete approximation of the Dirac delta function representing a source of oil emission. The approach to the problem of identification of the location and the history of the source is illustrated on an example for an accident in the offshore of the central part of the Vietnamese coast. Numerical simulations demonstrate the effectiveness of the proposed method.

NA4: Stability and control of neural networks

Vu Ngoc Phat

Institute of Mathematics, Hanoi

In the area of control, signal processing, pattern recognition and image processing, delayed neural networks have many useful applications. Some of these applications require that the equilibrium points of the designed network be stable. In both biological and artificial neural systems, time delays due to integration and communication are ubiquitous and often become a source of instability. The time delays in electronic neural networks are usually time-varying, and sometimes vary violently with respect to time due to the finite switching speed of amplifiers and faults in the electrical circuitry. Therefore, stability and control of delayed neural networks is a very important issue and various stability criteria have been reported in the literature.

This paper addresses some problems of stability and control for neural networks with time-varying delays. Based on the Lyapunov function method, new criteria for stability, stabilization and optimal H_∞ control fro neural networks are derived in terms of linear matrix inequalities, which allow simultaneous computation of two bounds that characterize the exponential stability rate of the solution and can be easily determined by utilizing MATLABs LMI Control Toolbox. Numerical examples are given to illustrate the effectiveness of our results.

NA5: Modeling and simulation for ferromagnetism materials

Stéphane Labbé

Université Joseph Fourier

This presentation will be dedicated to the modeling and simulation of ferromagnetic materials. We will focus on the micromagnetism model and in particular on asymptotic properties of domains. After a glimpse on the theoretical study of the dynamical Landau-Lifchitz system which drives the magnetization evolution, we will present some asymptotic studies (nano-particles, nano-wires and thin plates). In the last part of the presentation, we will describe a strategy of discretization based upon the finite volumes strategy and give some example of simulations.

NA6: Understanding the Hastings Algorithm

Do Le (Paul) Minh

California State University

The Hastings algorithm is a key tool in computational science. While mathematically justified by detailed balance, it can be conceptually difficult to grasp. Here, we present an intuitive way to understand the algorithm. In our framework, it is straightforward to see that the celebrated Metropolis-Hastings algorithm has the highest acceptance probability of all Hastings algorithms.

NA7: Some Theoretical Results and Numerical Methods for Solving the Differential-Algebraic Equations

Ta Duy Phuong

Institute of Mathematics, Hanoi

In the first part of talk, we consider the system

$$A(t)\dot{x} + B(t)x = f(t),\ t \in T_\infty = [0, \infty), \tag{1}$$

$$x(0) = a, \tag{2}$$

where A, B are $(n \times n)$-matrix functions and f is an n-vector function of t.
For the system (1) we assume that

$$\det(A) \equiv 0. \tag{3}$$

Systems of the form (1) satisfying condition (3) are commonly called differential algebraic equations (DAEs). They play an important role in various applications.
First, we develope the concept of vector characteristic exponents (introduced by Hoang Huu Duong for studing the stability of the ordinary differential equations) for DAEs (1).
We also give some asymptotic stability criteria for DAEs (1).
In the second part, the block difference schemes for numerical solution of the boundary-value problem for differential-algebraic equations of the second order are considered. We give conditions under which the algorithms are stable. Numerical examples are given.
This talk is based on joint work with M. V. Bulatov, V. F. Chistyakov, N. T. Khuyen and N. P. Rakhvalov (see [1]-[3]).
Key words. linear differential-algebraic equations, boundary-value problem, matrix polynomial, matrix sweep method.

References

[1] M. V. Bulatov, N. P. Rakhvalov, and T. D. Phuong, Numerical methods of solution of boundary-value problem for differential-algebraic equations of the second order, Journal *News of Irkutsk State University,* Series *Mathematics*, Vol. 4, 2011, No 4. p. 211.

[2] V. F. Chistyakov and T. D. Phuong, *Investigation of Stability of Differential Algebraic Equations Using Their Perturbed Analogue,* p. 1-12, 2012 (submited.)

[3] N. T. Khuyen and T. D. Phuong, The concept of vector characteristic exponents in Differential-Algebraic Equations, In the Proceedings of the Workshop *New Research Aspects in Mathematical Analysis and Applications,* May 24-27, 2012, p. 104-111.

NA8: A well-balanced two stage Roe-type numerical scheme for a model of two phase flows.

Mai Duc Thanh

International University, VNU-Hochiminh City

Numerical approximations for multi-phase flow models have attracted attention of many authors. These models often involve nonconservative terms which give many problems for both theoretical study and numerical approximations. In this talk we consider a model of two-phase flows arisen from the modeling of deflagration-to-detonation transition in granular materials. The model is hyperbolic and this enables us to build up a Roe-type numerical scheme. Investigating the system leads us to the important conclusion that the velocity in the solid phase remains constant across contact discontinuities, and that the volume fractions change only across contact discontinuities. A two-stage process in constructing the Roe-type scheme for the governing equations in both phases is proposed. The volume fractions can be computed separately by using an upwind scheme technique. We will show that the scheme can capture stationary waves and preserves the positivity of the volume fractions. Tests show that the scheme provides us with very good approximations to the exact solution.

NA9: Numerical integration of non-stiff differential-algebraic equations by half-explicit methods

Vu Hoang Linh

HUS, VNU-Hanoi

In this talk, we discuss numerical integration methods for nonlinear differential-algebraic equations (DAEs) in strangeness-free form. In particular, half-explicit methods based on popular explicit methods like one-leg methods, linear multi-step methods, and Runge-Kutta methods are proposed and analysed. Compared with well-known implicit methods for DAEs, these half-explicit methods demonstrate their efficiency, particularly for a special class of semi-linear matrix-valued DAEs which arise in the numerical computation of spectral intervals for DAEs. The theoretical convergence results are confirmed by illustrative numerical experiments. The talk is based on a recent joint work with Volker Mehrmann (TU-Berlin, Germany).

NA10: Convergence to Equilibrium of Some Kinetic Models

Tran Minh Binh

BCAM, Spain

We introduce in this presentation a new approach to the problem of the convergence to equilibrium for kinetic equations. The idea of the approach is to prove a 'weak' coercive

estimate, which implies exponential or polynomial convergence rate. Our method works very well not only for hypocoercive systems in which the coercive part is degenerate but also for the linearized Boltzmann equation.

NA11: Optimized Schwarz Waveform Relaxation for domain decomposition

Laurence Halpern

LAGA. Université Paris 13

In this presentation, I shall give an overview of the Schwarz Wave form relaxation algorithms, which are designed to solve evolution problems in parallel by decomposing the space domain into subdomains. On the continuous level, the algorithm computes a solution on each subdomain in space, over the whole time interval, or over time windows. Transmission conditions are optimized so as to minimize the convergence rate for the interface problem. These algorithms can be used with or without overlap, and thus the discretization can be made independently in the subdomains. This allows for a large versatility: one can deal with large discontinuities in the coefficients, adapt the time step locally, use different numerical methods in different parts of the computational domain, and even different equations and different codes.

NA12: The Interval- valued Differential Equations and Applications

Nguyen Dinh Phu (joint work with Ngo Van Hoa)

University of Science, VNU-Hochiminh City

The set-valued differential equations (IDEs) are important parts of the set-valued analysis theory. In this paper, we have studied interval-valued differential equations and showed many applications of this class IDEs in real-world phenomena.

NA13: Chaotic advection of particles by a 3D vortex soliton

Yoshifumi Kimura

Graduate School of Mathematics, Nagoya University

Motions of fluid particles advected by a 3D vortex soliton are studied. In a reference frame which moves with the vortex soliton, particle motions are confined in a torus near the loop part of the vortex soliton for a wide range of three parameters that characterize the shape and strength of the vortex soliton. The torus is composed of groups of invariant surfaces around periodic trajectories. To extract the essential mechanism of the transport properties, an ODE model is proposed, which is named the chopsticks model. This model successfully explains the qualitative features of the transport.

NA14: Stability for Fractional Differential Equations by Means of Fixed Point Theory

Tran Dinh Ke

Hanoi National University of Education

Our goal is to prove stability results for some classes of fractional differential equations. Instead of Lyapunov approaches, we deploy the technique of fixed point theory in our arguments. Specifically, by using MNC-estimates and fixed point theorems for condensing maps, we will show the stability results for fractional partial differential equations involving nonlocal and impulsive conditions.

NAs1: Large time behavior of solutions of nonlocal evolution problems

Nguyen Thanh Nam

Université Paris 11

We first consider a parabolic equation with a nonlocal term. This problem, which was originally proposed by Rubinstein and Sternberg as a model for phase separation in a binary mixture, is of the form

$$(PDE)\begin{cases} u_t = \Delta u + f(u) - \dfrac{1}{|\Omega|}\displaystyle\int_\Omega f(u) & \text{in } \ \Omega \times (0,+\infty), \\ \partial_\nu u = 0 & \text{on } \ \partial\Omega \times (0,+\infty), \\ u(x,0) = u_0(x) & x \in \Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^N (N \geq 1)$ is a smooth bounded domain, ∂_ν is is the outer normal derivative to $\partial\Omega$ and f is a function of bistable type. We prove, in collaboration with S. Boussaïd et D. Hilhorst, that the unique solution of this problem converges to a stationary solution as t tends to infinity, by means the Lojasiewicz inequality.

We then consider the initial value problem for a nonlocal differential equation

$$(ODE)\begin{cases} v_t = f(v) - \dfrac{1}{2L}\displaystyle\int_{-L}^{L} f(v) & \text{in } \ (-L,L) \times (0,\infty), \\ v(x,0) = v_0(x) & x \in (-L,L), \end{cases}$$

and we characterize the omega-limit set of v_0 for a large class of initial function v_0. Finally, we show that if v_0 is strictly piecewise monotone its omega-limit contains exactly one element φ, which has the form of a step function. More precisely, φ takes at most two values a et b such that $f(a) = f(b)$ and that

$$f'(a) \leq 0 \ \text{ et } \ f'(b) \leq 0.$$

This part is a joint work with D. Hilhorst and H. Matano.

References

[1] C. Bardos, A.Y. le Roux, J.-C Ndlec, *First order quasilinear equations with boundary conditions*, Comm. Partial Differential Equations. **4** (1979), 1017-1034.

[2] D. Brochet, D. Hilhorst and X. Chen, *Finite-dimensional exponential attractor for the phase field model*, Appl. Anal. **49** (1993), 197–212.

[3] R. Chill, *On the Lojasiewicz-Simon gradient inequality*, J. Funct. Anal. **201** (2003), 572-601.

[4] R. Chill, E. Fasangova, J. Pruss, *Convergence to steady states of solutions of the Cahn-Hilliard and Caginalp equations with boundary conditions*, Math. Nachr. **279** (2006), 1448–1462.

[5] O.A. Ladyzenskaya, V.A. Solonnikov and N.N. Uraltseva, *Linear and quasi-linear equations of parabolic type*, Translations of Mathematical Monographs, vol **23**, Providence R I. American Mathematical Society (1968).

[6] M. Marion, *Attractors for reaction-diffusion equations: existence and estimate of their dimension*, Appl. Anal. **25** (1987), 10–147.

[7] H. Matano, *Nonincrease of the lap-number of a solution for a one-dimensional semilinear parabolic equation*, J. Fac. Sci. Univ. Tokyo Sect. IA Math. **29** (1982), 401–441.

NAs2: Atmospheric simulation of a heavy precipitation event over the Southeast of France

Nguyen Thi Hai Yen

CNRM

The Southeast of France is frequently affected by thunderstorms and heavy precipitation events especially during fall. The heat and moisture coming from the Mediterranean sea, combined with the complex orography of this region, create several flash floods each year. Because of the high population density around the Mediterranean coastline these events have a large human and eco- nomic impact. The objective of our work is to reproduce correctly the Cevenol episode of 3-5 November 2011 with the MesoNH atmospheric model at fine resolution (up to 500 m of horizontal grid spacing) and to understand the physical processes leading to the strong convective activity. Different numerical schemes and parameterizations of turbulence are tested and evaluated using observations such as satellite images, radar images, rain gauge data, and surface meteorological parameters, as well as acoustic signals of lightning activities measured at the Haute-Provence Observatory.

This work is a preliminary contribution to the first HyMex campaign that will take place from 5 September to 6 November 2012 over the North-Western Mediterranean. HyMex stands for the Hydrological Cycle in Mediterranean EXperiment, an international and multidisciplinary project from 2010 to 2020.

NAs3: On the reachable set bounding for linear discrete-time systems with delays and bounded disturbances

Phan Thanh Nam (joint work with N.D. That and P.Q. Ha)

Quy Nhon University

This paper addresses the problem of reachable set bounding for linear discrete-time systems that are subject to state delay and bounded disturbances. Based on the Lyapunov method, a

sufficient condition is derived, in terms of matrix inequalities, for the existence of an ellipsoid-based bound of reachable sets for system trajectories. Here, a new idea is to minimize projection distances on each axis with different exponential convergence rates, instead of minimization of the ellipsoidal radius with a single exponential rate. An smaller bound can thus be obtained from the intersection of these ellipsoids. Numerical examples are given to illustrate the effectiveness of the proposed approach

NAs4: Guaranteed Cost Control Problem of Linear Systems with Delayed State and Control via Static Output Feedback

Ta Thi Huyen Trang

Institute of Mathematics, Hanoi

In this paper, the problem of output feedback guaranteed cost control for linear systems subjecting to interval time-varying delays is studied. By constructing a set of improved Lyapunov-Krasovskii functionals, which are mainly based on the information of the lower and upper delay bounds, delay-dependent stabilizability conditions, expressed in terms of linear matrix inequalities (LMIs), which guarantee system exponential stabilizability are derived. The stability analysis is carried out by employing an approach that combines both the delay-decomposition and free-weighting matrix approaches as this combination leads to less conservative stability conditions. The design of output feedback controllers can be carried out in a systematic and computationally efficient manner via the use of LMI-based algorithms. A numerical example is included to illustrate the effectiveness of the obtained result.

NAs5: A hybrid finite volume method for complex groundwater flow modeling

Do Vu Huy Cuong

Université Paris 11

We propose a finite volume method on general meshes for the discretization of Richards equation, an elliptic - parabolic equation modeling groundwater flow. The diffusion term, which can be anisotropic and heterogeneous, is discretized in a hybrid mimetic mixed framework. This class of locally conservative methods can be applied to a wide range of unstructured possibly non-matching polyhedral meshes in arbitrary space dimension. As is needed for Richards equation, the time discretization is fully implicit. We obtain a convergence result based upon energy-type estimates and the application of the Frechet-Kolmogorov compactness theorem. We implement the scheme in both two and three space dimensions and present the results of a number of numerical tests. This is joint work with K. Brenner and D. Hilhorst.

NAs6: Effects of dissipation and interaction on optical solitons of the nonlinear Schrödinger equation

Nguyen Minh Quan

VNU-Hochiminh City

We investigate the dynamics of soliton parameters in broadband optical waveguide systems, induced by energy and momentum exchange (crosstalk) in pulse collisions. We obtain the analytic expressions for the amplitude and frequency shifts in a single two-soliton collision and show that amplitude dynamics in an N-channel waveguide system is described by a Lotka-Volterra model for N competing species. By finding the equilibrium states of these models and analyzing their stability, we are able to obtain ways for achieving stable transmission with equal nonzero amplitudes in all channels. The analytic predictions are confirmed by numerical simulations with the couple nonlinear Schrödinger equations. These results uncover an interesting analogy between the dynamics of energy exchange in pulse collisions and population dynamics in Lotka-Volterra models. Joint work with A. Peleg.

NAs7: On the Interval-valued Integro-differential Equations

Le Duc Thang (joint work with Truong Vinh An, Phan Van Tri and Nguyen Dinh Phu)

Ho Chi Minh City Industry and Trade College

In this paper we consider the interval-valued Integro-differential Equations (IIDEs) under Hukuhara derivative. Under condition that the right-hand side of the equation is Lipschitzian we obtain the existence and uniqueness of the solution to such the equations. Finally, we give some examples and method of solving (IIDEs).

NAs8: On the Solutions of Fuzzy Interval-valued Control Differential Equations

Ngo Van Hoa (joint work with Nguyen Dinh Phu and Le Thanh Quang)

University of Science, VNU-Hochiminh City

In this paper, we prove the existence and uniqueness theorem of a solution to the Interval-valued Control Differential Equations (FICDEs) under some kinds of con- trol such as : admissible controls, feedback controls and contraction controls. Beside that, a sufficient condition for bounded solutions are given and proved. Finally, we give some examples for (FICDEs).

NAs9: On Berinde's theorems and related results

Nguyen Van Dung

Dong Thap University

In this paper, we show that [2, Theorem 2.3] could fail to have a fixed point and prove a generalization for main results in [1], [2] by an implicit relation. Also, we obtain an analogue

for self-maps on a 2-metric space.

References

[1] M. Abbas, G. V. R. Babu, and G. N. Alemayehu, *On common fixed points of weakly compatible mappings satisfying 'generalized condition* (B)*'*, Filomat **25** (2011), no. 2, 9 – 19.

[2] V. Berinde, *Some remarks on a fixed point theorem for Ćirić-type almost contractions*, Carpathian J. Math. **24** (2009), no. 2, 157 – 162.

NAs10: Asymptotic integration of linear differential-algebraic equations

Nguyen Ngoc Tuan (joint work with Vu Hoang Linh)

Hung Yen University of Technology and Educations

This talk is concerned with the asymptotic behavior of solutions of linear differential-algebraic equations. Some results of asymptotic integration which are well known for ordinary differential equations (ODEs) are extended to differential-algebraic equation (DAEs). We consider linear differential-algebraic equation of the form

$$[E + F(t)]x'(t) = [A + V(t) + R(t)]x(t), \quad t \geqslant 0, \tag{LDAE}$$

where $E, A \in \mathbb{C}^{n\times n}$, F, V, $R \in C(\mathbb{R}_+; \mathbb{C}^{n\times n})$, and constant matrix E is assumed to be singular, but pencil $\{E, A\}$ is regular. The main question is that if perturbations F, V and R are supposed to be sufficiently small in some sense, how certain solutions of (LDAE) are related to those of the unperturbed DAE as t tends to infinity. In order to characterize the asymptotic behavior of solutions of (LDAE), we first transform the system into an interconnected system consisting of a differential subsystem and an algebraic one. Two approaches are presented. We use either the Kronecker - Weierstrass canonical form or the projector-based approach. Then, conditions for perturbations F, V and R are given so that the asymptotic formulas for solutions of (LDAE) are obtained. Examples are also given for illustration.

NAs11: Convergence Rates for the Tikhonov Regularization of a Coefficient Identification Problem in an Elliptic Boundary Value Problem

Tran Nhan Tam Quyen (joint work with Dinh Nho Hào)

Da Nang University of Education

Let Ω be an open bounded connected domain in $\mathbb{R}^d, d \geq 1$, with the Lipschitz boundary $\partial\Omega$, $f \in L^2(\Omega)$ and $g \in L^2(\partial\Omega)$ be given. We investigate convergence rates for the Tikhonov regularization of the ill-posed nonlinear inverse problem of identifying the diffusion coefficient q in the Neumann problem for the elliptic equation

$$\begin{aligned} -\mathrm{div}(q\nabla u) &= f \text{ in } \Omega, \\ q\frac{\partial u}{\partial n} &= g \text{ on } \partial\Omega, \end{aligned}$$

from imprecise values $z^\delta \in H^1(\Omega)$ of the exact solution u with $\|u - z^\delta\|_{H^1(\Omega)} \leq \delta$. The Tikhonov regularization is applied to the convex energy functional to stabilize this ill-posed nonlinear problem. Under weak source conditions without the smallness requirements on the source functions, we obtain convergence rates of the method (see [1-4]). (This report is a part of my PhD. dissertation.)

References

[1] Dinh Nho Hào and Tran Nhan Tam Quyen (2010), Convergence rates for Tikhonov regularization of coefficient identification problems in Laplace-type equations, *Inverse Problems* **26**, 125014 (23pp).

[2] Dinh Nho Hào and Tran Nhan Tam Quyen (2011), Convergence rates for total variation regularization of coefficient identification problems in elliptic equations I, *Inverse Problems* **27**, 075008 (28pp).

[3] Dinh Nho Hào and Tran Nhan Tam Quyen (2012), Convergence rates for total variation regularization of coefficient identification problems in elliptic equations II, *Journal of Mathematical Analysis and Applications* **388**, pp. 593–616.

[4] Dinh Nho Hào and Tran Nhan Tam Quyen (2012), Convergence rates for Tikhonov regularization of a two-coefficient identification problem in an elliptic boundary value problem, *Numerische Mathematik* **120**, pp. 45–77.

OP: Optimization

OP1: Implicit Multifunctions Theorems: recent developments

Michel Théra

XLIM and University of Limoges

Setting up equations or equations systems, and solving them is an important problem in mathematics. A central question is whether the solutions to an equation involving parameters, that is, the equation generally speaking form $F(x,p)=0$, may be viewed as a function of those parameters. Such a function is called an **implicit function** defined by the equation

$$F(x,p)=0, \tag{2}$$

Finding an implicit function is one of the most important, and one of the oldest paradigm in modern mathematics, and has many applications to algebra, differential geometry, differential topology, functional analysis, partial differential equations, and many other areas of mathematics. The first idea for implicit function theorems goes back to Newton and later to Leibniz, Lagrange, Cauchy, Dini, Nash. The classical implicit function theorem is a device to solve equations and systems of equations.

When the target space is m-dimensional, solving Equation (2) is equivalent to finding the solution of the system of equations

$$F_i(x,p)=0, i=1,...,m. \tag{3}$$

and it is well known that if X is of dimension n and $m=n$, then, if $(\bar{x},\bar{p})$ satisfies (3) and the partial gradients of the $F_i, i=1,...,m$ with respect to x are continuous and linearly independent at $(\bar{x},\bar{p})$, then the classical implicit function theorem tells us that for any p near $\bar{p}$, there is a unique solution $x=s(p)$ of (3); furthermore the function s is continuous at p. However, the classical implicit function theorem **cannot handle** a system of inequalities, of the form

$$F_i(x,p)\leq 0, i=1,...,m. \tag{4}$$

These systems are extremely important in optimization problems with inequalities constraints. So, it is necessary to consider equations in the form (2), where $F: X\times P \rightrightarrows Y$ is a set-valued mapping, which defines (4). The study of the behavior of such parameterized generalized equations is related to implicit multifunction theorems and plays a central role in variational analysis, especially, in investing problems of sensitivity analysis with respect to parameters. A recent book by Dontchev & Rockafellar highlights many variant forms of implicit multifunction theorems as well as their their applications.
The study of implicit multifunction theorems arises in problems related to metric regularity, open covering properties, variational inequalities and many other areas. Similarly to the classical implicit function theorem, we also want to setting up a sufficient condition for the existence of a solutionto a generalized equation and give the formular for calculating of the derivative (coderivative) of the implicit multifunction (if may be).
In this presentation, we use an approach based on the error bound property of the lower semicontinuous envelope of distance functions to the images of set-valued mappings to derive implicit multifunction results. This approach was introduced by Ngai & Théra and allows to avoid the completeness of the image space.

Through these new characterizations, it is possible to investigate implicit multifunction theorems based on coderivatives and on contigent derivatives, as well as the perturbation stability of implicit multifunctions.

OP2: Characterization of metric regularity of subdifferentials

Michel H. Geoffroy (joint work with Francisco J. Aragón and Asen L. Dontchev)

Université des Antilles et de la Guyane

We start by presenting a general proximal point algorithm for solving the inclusion

$$T(x) \ni 0,$$

where T is a set-valued mapping acting from a Banach space X to a Banach space Y. We successively consider the case when the mapping T is metrically regular, strongly metrically regular and strongly metrically subregular and then state several convergence results. This study naturally leads us to examine the case when T is the subdifferential of a single-valued function which reduces to finding critical points of such a function. More precisely, we investigate the metric regularity and subregularity, the strong regularity and subregularity of the subdifferential of proper lower semicontinuous convex functions in a Hilbert space. We characterize each of these properties in terms of a growth condition involving the function.

References

[1] F. J. Aragón, A. L. Dontchev, M. H. Geoffroy, "Convergence of the proximal point method for metrically regular mappings", ESAIM Proc 17, 1-8 (2007).

[2] F. J. Aragón, M. H. Geoffroy, "Uniformity and inexact version of a proximal method for metrically regular mappings", J. Math. Anal. Appl. **335**, 168–183 (2007).

[3] F. J. Aragón, M. H. Geoffroy,"Characterization of metric regularity of subdifferentials", Journal of Convex Analysis, **15**, No. 2, 365–380 (2008).

OP3: To dual-space theory of set-valued optimization

Bao Truong (joint work with Boris Mordukhovich)

Northern Michigan University

The primary goal of this talk is to review and further develop the dual-space approach to multiobjective optimization, focusing mainly on problems with set-valued objectives. This approach is based on employing advanced tools of variational analysis and generalized differentiation defined in duals to Banach spaces. Developing this approach, we present new and updated results on existence of Pareto-type optimal solutions, necessary optimality and suboptimality conditions, and also sufficient conditions for global optimality that have never been considered in the literature in such a generality.

OP4: A free boundary problem arising in optimal design of thin torsion rods

Guy Bouchitté (joint work with Alibert Jean Jacques, Fragalà Ilaria and Lucardesi Ilaria)

IMATH, Université du Sud-Toulon-Var

We study a variational problem, set on a bounded planar domain D, in which the cost functional depends on the gradient of admissible functions through an integrand which is convex but not strictly convex. We are interested in establishing whether solutions exist whose gradient avoids the region of non-strict convexity. Actually, the answer to this question is related to establishing whether homogenization phenomena occur in optimal design of thin torsion rods. From optimality conditions we are led to a new kind of free boundary problem involving a gradient contraint. We provide some existence results for different geometries of D.

References

[1] Bouchitté, Fragalà, Lucardesi, Seppecher. Optimal thin torsion rods and Cheeger sets, to appear on Siam J. Math. Anal. , 2012.

[2] Bouchitté, Fragalà, Seppecher. 'Structural optimization of thin plates: the three dimensional approach, Arch. Rat. Mech. Anal. 202 (3) (2011), 829-874.

[3] Alibert, Bouchitté, Fragalà, Seppecher 'A nonstandard free boundary problem arising in the shape optimization of thin torsion rods, preprint

OP5: Lower semicontinuity of the solution set to a parametric optimal control problem

Bui Trong Kien

Hanoi National University of Civil Engineering

In this report we present some result on the solution stability of parametric optimal control problems. By reducing the problem to a parametric programming problem and a parametric variational inequality, we obtain the lower semicontinuity of the solution map to a parametric optimal control problem with linear state equation, control constraints and convex cost functions.

OP6: About an infinite intersection rule

Alexander Kruger (joint work with Marco López)

University of Ballarat

An important group of calculus results in variational analysis consists of rules which allow to represent normals (of a certain type: convex, Fréchet, limiting or other) to the intersection of a finite collection of sets at a point via normals to particular sets at or around this point. Using the extended version of the *Extremal principle* from [1], it is possible to develop an intersection rule for Fréchet normals to infinite intersections in Asplund spaces.

In this note, $\mathbf{\Omega} := \{\Omega_i\}_{i\in I}$ ($|I| > 1$) denotes a collection of sets in an Asplund space X with $\bar{x} \in \bigcap_{i\in I} \Omega_i$. For any $i \in I$, $N_{\Omega_i}(x)$ is the Fréchet normal cone to Ω_i at $x \in \Omega_i$.

Definition 1. Let $\mathcal{J} := \{J \subset I|\ 1 < |J| < \infty\}$. $\mathbf{\Omega}$ is

(AS) *approximately stationary* at $\bar{x}$ if for any $\varepsilon > 0$ there exist $\rho \in (0, \varepsilon)$; $J \in \mathcal{J}$; $\omega_i \in \Omega_i \cap B_\varepsilon(\bar{x})$ and $a_i \in X$ ($i \in J$) such that $\max_{i\in J} \|a_i\| < \varepsilon\rho$ and

$$\bigcap_{i\in J}(\Omega_i - \omega_i - a_i)\bigcap(\rho\mathbb{B}) = \emptyset;$$

(NAS) *normally approximately stationary* at $\bar{x}$ if for any $\varepsilon > 0$ there exist $J \in \mathcal{J}$; $x_i \in \Omega_i \cap B_\varepsilon(\bar{x})$ and $x_i^* \in N_{\Omega_i}(x_i)$ ($i \in J$) such that

$$\left\|\sum_{i\in J} x_i^*\right\| < \varepsilon \sum_{i\in J} \|x_i^*\|;$$

(NUR) *normally uniformly regular* at $\bar{x}$ if there exists an $\alpha > 0$ and an $\varepsilon > 0$ such that

$$\left\|\sum_{i\in J} x_i^*\right\| \geq \alpha \sum_{i\in J} \|x_i^*\|$$

for any $J \in \mathcal{J}$; $x_i \in \Omega_i \cap B_\varepsilon(\bar{x})$ and $x_i^* \in N_{\Omega_i}(x_i)$ ($i \in J$).

Theorem 2. Suppose the sets Ω_i ($i \in I$) are locally closed near $\bar{x}$. The collection of sets $\mathbf{\Omega}$ is approximately stationary at $\bar{x}$ if and only if it is normally approximately stationary at $\bar{x}$. Moreover, for any $\varepsilon > 0$, conditions (AS) and (NAS) are satisfied with the same set of indices J.

Now let $\mathcal{J} := \{J \subset I|\ 0 < |J| < \infty\}$.

Definition 3. An element $x^* \in X^*$ is *finitely normal* to the intersection $\bigcap_{i\in I} \Omega_i$ at $\bar{x}$ if for any $\varepsilon > 0$ there exists a $\rho > 0$ and a subset $J \in \mathcal{J}$ such that

$$\langle x^*, x - \bar{x}\rangle < \varepsilon\|x - \bar{x}\| \quad \forall x \in \bigcap_{i\in J} \Omega_i \bigcap B_\rho(\bar{x}) \setminus \{\bar{x}\}.$$

Theorem 4. Suppose the sets Ω_i ($i \in I$) are locally closed near $\bar{x}$. If $x^* \in X^*$ is finitely normal to the intersection $\bigcap_{i\in I} \Omega_i$ at $\bar{x}$, then for any $\varepsilon > 0$ there exist $J \in \mathcal{J}$; $x_i \in \Omega_i \cap B_\varepsilon(\bar{x})$, $x_i^* \in N_{\Omega_i}(x_i)$ ($i \in J$); and a $\lambda \geq 0$ such that

$$\sum_{i\in J} \|x_i^*\| + \lambda = 1 \quad \text{and} \quad \|\lambda x^* - \sum_{i\in J} x_i^*\| < \varepsilon. \tag{5}$$

Corollary 5. Suppose the sets Ω_i ($i \in I$) are locally closed near $\bar{x}$ and the collection $\mathbf{\Omega}$ is normally uniformly regular at $\bar{x}$. If $x^* \in X^*$ is finitely normal to the intersection $\bigcap_{i\in I} \Omega_i$ at $\bar{x}$, then for any $\varepsilon > 0$ there exist $J \in \mathcal{J}$; $x_i \in \Omega_i \cap B_\varepsilon(\bar{x})$ and $x_i^* \in N_{\Omega_i}(x_i)$ ($i \in J$) such that

$$\|x^* - \sum_{i\in J} x_i^*\| < \varepsilon. \tag{6}$$

The above two results are applied in [2] for establishing stationarity conditions in infinitely constrained optimization.

References

[1] A. Y. Kruger and M. A. López. Stationarity and regularity of infinite collections of sets, J. Optim. Theory Appl. 154 (2012), no. 2.

[2] A. Y. Kruger and M. A. López. Stationarity and regularity of infinite collections of sets. Applications to infinitely constrained optimization, to appear.

OP7: Some extensions of Farkas lemma and Hahn-Banach theorem

Nguyen Dinh

International University, VNU-Hochiminh City

It is well-known that the classic Hahn-Banach theorem fails in the case where the sublinear functional appeared in this theorem admits infinite values. In this report, we introduce a new version of Farkas lemma and show that they are equivalent to a new version of Hahn-Banach theorem which extends the celebrated theorem to the case where the mentioned sublinear functional has $+\infty$ as one of its values under some mild condition.

OP8: On Hölder continuity of approximate solution sets of parametric equilibrium problems

Lam Quoc Anh (joint work with P. Q. Khanh, T. N. Tam and D. T. M. Van)

Can Tho University

We establish verifiable sufficient conditions for Hölder continuity of approximate solutions to parametric equilibrium problems, when solutions may be not unique. Many examples are provided to illustrate the need of considering approximate solutions instead of exact solutions and the essentialness of the imposed assumptions. As applications, we derive this Hölder continuity for constrained minimization, variational inequalities and fixed point problems.

OP9: Quantitative stability of a generalized equation. Application to non-regular electrical circuits

Samir Adly

XLIM, Université de Limoges

OP10: Optimality conditions for vector optimization problems with variable ordering structures

Truong Xuan Duc Ha

Institute of Mathematics, Hanoi

Our main concern in this paper are concepts of nondominatedness w.r.t. a variable ordering structure introduced by P.L.Yu in 1974. Restricting ourselves to the case when the values of a cone-valued map defining the ordering structure are Bishop-Phelps cones, we obtain for the first time scalarizing functionals for nondominated elements, Fermat rule, Lagrange multiplier rule and duality results for a single- or set-valued vector optimization problem with a variable ordering structure. The talk is based on the paper writen by G.Eichfelder and the author to be published in Optimization.

OP11: Large Calculations for Coderivatives of the Normal Cone Mapping to Polyhedral Convex Sets with Linear Perturbations

Nguyen Quang Huy

Hanoi Pedagogical University II, Xuan Hoa

In this talk, we present generalizations for computing the Fréchet coderivative and the Mordukhovich coderivative of the normal cone mapping to polyhedral convex sets with perturbations by a linear mapping. Results obtained continuously develop and complement to the existing results on the topic. An example is given to illustrate the formulae for calculating and analyzing the previous related results.

OP12: On second-order conditions for nonsmooth problems with constraints

Phan Nhat Tinh (joint work with Anulekha Dhara and Dinh The Luc)

College of Sciences, Hue University

To study the sufficiency of an optimization problem, one either imposes some convexity assumptions or consider second order optimality conditions. In this paper we establish second order optimality conditions for nonsmooth optimization problems by considering second order approximations of the functions involved and introducing the concept of second order tangentiability.

OP13: On higher-order sensitivity analysis in nonsmooth vector optimization

Le Thanh Tung (joint work with Phan Quoc Khanh)

College of Science, Cantho University

We propose the notion of higher-order contingent-radial derivative, develop some calculus rules and apply directly them to obtain optimality conditions for several particular optimization problems. Then, we employ this derivative together with contingent-type deriva-

tives to analyze sensitivity for nonsmooth vector optimization. Properties of higher-order contingent-type derivatives of the perturbation and weak perturbation maps of a parameterized optimization problem are obtained.

OPs1: On Approximate Convexity and Vector Variational Inequalities

Vivek Laha

Banaras Hindu University

OPs2: On optimality and duality in nondifferentiable multiobjective optimization involving pseudo d-invexity

Vinay Singh (joint work with S. K. Mishra and J. S. Rautela)

Banaras Hindu University

Consider the following multiobjective programming problem:

$$\text{(CMP) Minimize } (f_1(x), ..., f_p(x))$$

$$\text{subject to: } g_j(x) \leqq 0,$$

$$x \in S \subseteq R^n,$$

where $f_i : S \subseteq R^n \to R,\ i = 1, 2, ..., p,\ g_j : S \subseteq R^n \to R,\ j = 1, 2, ..., m$ are nondifferentiable functions on the open set $S \subseteq R^n$.
The aim of this paper is to establish characterization for efficient solutions to nondifferentiable multiobjective programming problems. Necessary and sufficient conditions for Kuhn-Tucker points to be efficient solutions for nondifferentiable multiobjective problem functions are introduced and proved. Similarly, characterizations for efficient solutions by Fritz-John optimality conditions, is obtained. Furthermore Mond-Weir type dual problem is studied and weak, strong and converse duality results are established.
Keywords: Nondifferentiable multiobjective programming, Efficiency, Optimality conditions, Duality, d-invexity.

References

[1] T. Antczak, Multiobjective programming under d-invexity, European Journal of Operational Research 137 (2002) 28-36.

[2] M. Arana-Jimenez, A. Rufian-Lizana, R. Osuna-Gomez and G. Ruiz-Garzon, Pseudoinvexity, Optimality conditions and efficiency in multiobjective problems; duality, Nonlinear Analysis 68 (2008) 24-34.

OPs3: Well-posedness, Robustness and Stability Analysis of a Set-Valued Controller for Lagrangian Systems

Le Ba Khiet (joint work with Samir Adly and Bernard Brogliato)

XLIM, Université de Limoges

The aim of this paper is to study a class of nonlinear Euler-Lagrange dynamical systems with a multivalued controller of the form:

$$M(q(t))\ddot{q}(t) + C(q(t), \dot{q}(t))\dot{q}(t) + \nabla\mathcal{V}(q(t)) + F(t, q(t), \dot{q}(t)) \in -\partial\Phi(\dot{q}(t)) \quad (1)$$

for a.e. $t \geq t_0$ where $t_0 \in \mathbb{R}$ is fixed, $\Phi : \mathrm{dom}(\Phi) = \mathbb{R}^n \to \mathbb{R}$ is a convex function, $\mathcal{V} \in C^1(\mathbb{R}^n; \mathbb{R})$, $F : \mathbb{R} \times \mathbb{R}^n \times \mathbb{R}^n \to \mathbb{R}^n$ is continuous in t, uniformly locally Lipschitz in x_1, x_2, the matrices $M(q), C(q, \dot{q}) \in \mathbb{R}^{n\times n}$, and $\partial\Phi$ stands for the convex subdifferential of Φ. The model in (1) appears widely in many scientific fields such as physics, economics, biology, electrical engineering, and especially in unilateral mechanics. Motion of many systems with frictional contact can be represented in the form (1). In this case, the vector q represents the generalized coordinates, n is the number degrees of freedom, $M(q)$ is the inertia matrix, $C(q, \dot{q})$ is the centripetal - Coriolis matrix. The function $F(t, q(t), \dot{q}(t))$ represents a perturbation force which is usually bounded by a constant. Historically, numerous articles deal with the case when M and C are constant matrices, but the study of (1) is very limited.
In this article, we recall some important properties of (1) and give sufficient conditions on $M(q), C(q, \dot{q}), \mathcal{V}, F$ and Φ to ensure the existence and uniqueness of a solution of (1) for given initial conditions. We also study the stability and asymptotic stability (in the sense of Lyapunov) of the equilibrium set. Finally, we show that with the presence of dry friction, finite-time stability holds and an estimation of the settling-time is obtained. This work can be seen as an extension of some known results for the linear case of the Lagrangian dynamical systems.

References

[1] S. Adly, H. Attouch and A. Cabot."Finite time stabilization of nonlinear oscillators subject to dry friction", Progresses in Nonsmooth Mechanics and Analysis (edited by P. Alart, O. Maisonneuve and R.T. Rockafellar), Advances in Mathematics and Mechanics, Kluwer, pp. 289-304, (2006)

[2] S.Adly, D. Goeleven. "A stability theory for second-order nonsmooth dynamical systems with application to friction problems", J. Math. Pures et Appliquées, vol.83, no 1, pp.17-51, 2004.

OPs4: Optimality conditions for a class of relaxed quasiconvex minimax problems

Huynh Thi Hong Diem

College of Cantho

A class of minimax problems is considered. The main assumption is that the involved functions are relaxed quasiconvex in the sense that the level sets need to be convex only at the considered point. We prove both necessary and sufficient conditions for solutions and

unique solutions in terms of generalized subdifferentials, which have been used to establish optimality conditions for minimization problems (under more restrictive assumptions) in the literature, but not yet for minimax problems, as far as we know.

OPs5: TBA

Nguyen Huu Tron

XLIM, Universite de Limoges

OPs6: General existence theorems in GFC-spaces and applications

Vo Si Trong Long

Cao Thang Technology College

We prove general theorems on alternative for set-valued mappings on GFC-spaces and show their equivalence. As applications, they are employed to derive sufficient conditions for the solution existence for general models of quasiequilibrium, analytic alternative and minimax problems.The results obtained improve or include as special cases several recent ones in the literature.

OPs7: Minimizing the memory of a system

Dao Ngoc Minh (joint work with D. Noll)

Institut de Mathématiques, Université de Toulouse

We consider a stable linear time-invariant system $G(\theta)$ with tunable parameters $\theta \in \mathbb{R}^n$, which maps inputs $w \in L^2(\mathbb{R}^p)$ to outputs $z \in L^2(\mathbb{R}^m)$, i.e., $z(s) = G(\theta, s)w(s)$. The goal is to find a choice of θ^* which minimizes the memory effects of $G(\theta)$, making it thereby the least predictable. More precisely, we design the system $G(\theta)$ such that the influence of past inputs on future outputs is minimized. This is described by the Hankel norm

$$\|G(\theta)\|_H = \max_{0 \neq w \in L^2} \left(\frac{\int_0^\infty \|z(t)\|_2^2 dt}{\int_{-\infty}^0 \|w(t)\|_2^2 dt} \right)^{1/2}. \tag{1}$$

We give an equivalent representation of the Hankel norm as the maximum eigenvalue of the product of the controllability and observability Gramians of $G(\theta)$, which makes it accessible to optimization [3]. Then we solve

$$\min_{\theta \in \mathbb{R}^n} \|G(\theta)\|_H \tag{2}$$

using nonsmooth eigenvalue optimization techniques expanding on [2]. For comparison a relaxation method by Nesterov [1] for convex eigenvalue optimization problems is also applied despite the nonconvexity of (2).
Applications of (2) are in system reduction, in feedback control, and in time-series analysis, where the discrete variant of (1) is used.

References

[1] Y. Nesterov. "Smoothing technique and its applications in semidefinite optimization," Math. Programming, Ser. A **110**, 245–259 (2007).

[2] D. Noll, O. Prot, A. Rondepierre. "A proximity control algorithm to minimize nonsmooth and nonconvex functions," Pacific J. Optim. **4**, No. 3, 569–602 (2008).

[3] M. Overton. "Large-scale optimization of eigenvalues," SIAM J. Optim. **2**, 88–120 (1992).

OPs8: About Hölder-type regularity properties of collections of sets

Nguyen Hieu Thao (joint work with Alexander Y. Kruger)

University of Ballarat

Regularity properties of collections of sets play an important role in variational analysis and optimization [2, 3], e.g., convergence analysis of numerical algorithms. The Hölder-type extensions of these properties can also be of interest.
In what follows, $\mathbf{\Omega} := \{\Omega_1, \Omega_2, ..., \Omega_m\}$ is a collection of sets in a normed linear space X, $\bar{x} \in \Omega := \bigcap_{i=1}^m \Omega_i$ and $q > 0$.
DEFINITION. (i) $\mathbf{\Omega}$ is $[q]$-*locally linearly regular* at $\bar{x}$ if there exist $\delta, \gamma > 0$ such that

$$d(x, \Omega) \leqslant \gamma \max_{1 \leqslant i \leqslant m} d^q(x, \Omega_i) \text{ whenever } x \in B_\delta(\bar{x}).$$

(ii) $\mathbf{\Omega}$ is $[q]$-*uniformly regular* at $\bar{x}$ if there exist $\delta, \alpha > 0$ such that

$$\bigcap_{i=1}^m (\Omega_i - \omega_i - a_i) \bigcap \rho\mathbb{B} \neq \emptyset$$

for any $\rho \in (0; \delta], \omega_i \in \Omega_i \cap B_\delta(\bar{x})$ and $a_i \in \alpha\rho^{1/q}\mathbb{B}$, i=1,2,...,m.
The first property is also known as $[q]$-*metric inequality*. It is weaker than the second one.
THEOREM. $\mathbf{\Omega}$ *is* $[q]$-*uniformly regular at* $\bar{x}$ *if and only if it satisfies at this point the* $[q]$-*uniform metric inequality: there exist* $\delta, \gamma > 0$ *such that*

$$d\Big(x, \bigcap_{i=1}^m (\Omega_i - x_i)\Big) \leqslant \gamma \max_{1 \leqslant i \leqslant m} d^q(x + x_i, \Omega_i)$$

for any $x \in B_\delta(\bar{x}), x_i \in \delta\mathbb{B}, i = 1, 2, ..., m$.
The above regularity properties of collections of sets are closely related to the corresponding Hölder-type regularity properties of multifunctions (see [1, 4]).
DEFINITION. Let $F : X \rightrightarrows Y$ be a multifunction between metric spaces and $(\bar{x}, \bar{y}) \in \text{gph}F$.
(i) F is $[q]$-*metrically subregular* at $\bar{x}$ for $\bar{y}$ if there exist $\delta, \gamma > 0$ such that

$$d(x, F^{-1}(\bar{y})) \leqslant \gamma d^q(\bar{y}, F(x)) \text{ whenever } x \in B_\delta(\bar{x}).$$

(ii) F is $[q]$-*metrically regular* at $\bar{x}$ for $\bar{y}$ if there exist $\delta, \gamma > 0$ such that

$$d(x, F^{-1}(y)) \leqslant \gamma d^q(y, F(x)) \text{ whenever } x \in B_\delta(\bar{x}) \text{ and } y \in B_\delta(\bar{y}).$$

Given a collection of sets $\mathbf{\Omega}$, we consider the product space X^m (with the maximum norm) and define the multifunction $F : X \rightrightarrows X^m$ by

$$F(x) := (\Omega_1 - x) \times (\Omega_2 - x) \times ... \times (\Omega_m - x) \text{ for any } x \in X.$$

THEOREM. (i) $\mathbf{\Omega}$ *is* $[q]$*-locally linearly regular at* $\bar{x}$ *if and only if* F *is* $[q]$*-metrically subregular at* $\bar{x}$ *for* 0.
(ii) $\mathbf{\Omega}$ *is* $[q]$*-uniformly regular at* $\bar{x}$ *if and only if* F *is* $[q]$*-metrically regular at* $\bar{x}$ *for* 0.

References

[1] J. M. BORWEIN, D. M. ZHUANG, *Verifiable necessary and sufficient conditions for openness and regularity of set-valued and single-valued maps*. J. Math. Anal. Appl. 134 (1988), no. 2, 441–459.

[2] A. Y. KRUGER, *Stationarity and regularity of set systems*. Pac. J. Optim. 1 (2005), no. 1, 101–126.

[3] A. Y. KRUGER, *About regularity of collections of sets*. Set-Valued Anal. 14 (2006), no. 2, 187–206.

[4] B. KUMMER, *Inclusions in general spaces: Hoelder stability, solution schemes and Ekeland's principle*. J. Math. Anal. Appl. 358 (2009), no. 2, 327–344.

OPs9: On the stability of weak Pareto-Nash equilibrium points for parametric multi-objective generalized games

Tran Trinh Minh Son (joint work with Phan Quoc Khanh and Le Minh Luu)

Thang Long Gifted High School, Dalat

We consider parametric multi-objective generalized games with enlarged strategy sets. We give sufficient conditions for semicontinuity of sets of approximate weak Pareto-Nash equilibrium points. Sufficient conditions for the well-posedness and metric characterization of well-posedness of parametric multi-objective generalized games are presented.

OPs10: Semicontinuity of solution sets to parametric vector equilibrium problems with equilibrium constraints

Nguyen Van Hung

Dong Thap University

In this paper we establish sufficient conditions for the solution sets of parametric vector equilibrium problems with vector equilibrium constraints to be semicontinuous. All kinds of semicontinuity are considered: upper semicontinuity, lower semicontinuity, Hausdorff lower semicontinuity and closedness.

References

[1] Anh, L. Q., Khanh, P. Q. "Semicontinuity of the solution sets of parametric multivalued vector quasiequilibrium problems, J. Math. Anal. Appl. **294**, 699-711 (2004).

[2] Anh, L. Q., Khanh, P. Q., Van, D. T. M. "Well-Posedness Under Relaxed Semicontinuity for Bilevel Equilibrium and Optimization Problems with Equilibrium Constraints," J. Optim. Theory Appl. DOI 10.1007/s10957-011-9963-7, online first.

[3] Anh, L. Q., Hung, N, V. "Semicontinuity of the solutions set of parametric vector quasiequilibrium problems", The 8th international spring school on optimization and its applications, NhaTrang, (2010)

[4] Lalitha, C. S., Bhatia, Guneet. "Stability of parametric quasivariational inequality of the Minty type, J Optim Theory Appl. DOI 10.1007/s10957-010-9755-5.

[5] Luc, D. T. "Theory of Vector Optimization,": Lecture Notes in Economics and Mathematical Systems, Springer-Verlag Berlin Heidelberg, (1989).

OPs11: On stability for parametric lexicographic equilibrium problems

Tran Quoc Duy

Cantho Technical and Economic College

We consider parametric lexicographic and sequential equilibrium problems in Hausdorff topological vector space. Establishing sufficient conditions for the upper semicontinuity and closedness of solution mappings. Applications to lexicographic variational inequality and lexicographic optimization problems are also provided.

OPs12: Variational convergence of finite valued bifunctions

Phan Quoc Khanh

International University, VNU-Hochiminh City

We try to attack the two major problems about bivariate functions: (1) not all bifunctions in applications are convex-concave (called also saddle functions); (2) variational limits are not unique and conditions for uniqueness need to be developed. We approach by lop- and epi/hypo convergence of finite valued bifunctions and reveal that, in many important applications of non-convex-concave bifunctions, these limits are fortunately unique. Then we develop general conditions for uniqueness in terms of four explicit formulas of limit bifunctions which enjoy beautiful geometry. Several kinds of tight lop- and epi/hypo convergence are also discussed to obtain the convergence of maxinf, minsup and saddle points.

PDE: Partial differential equations

PDE1: Collapsing ring solutions to the mass super critical NLS

Pierre Raphaël

Université Paul Sabatier

I will show the existence of a universal upper bound on blow rate for the radially symmetric mass supercritical focusing Non Linear Schrodinger equation. I will show that this bound is sharp and attained on solutions which concentrate on a collapsing ring as first predicted by Gavish, Fibich and Wang. This is joint work with F. Merle and J. Szeftel.

PDE2: Dispersive effects for waves on domains

Danela Oana Ivanovici

Universite de Nice Sophia-Antipolis

We will review recent results quantifying dispersion inside strictly convex domains. The presence of gliding rays induces losses with respect to free space, relating to the presence of caustics.

PDE3: Characteristic systems for general Monge-Ampere equations

Ha Tien Ngoan

Institute of Mathematics, Hanoi

It is well-known that there is characteristic theory for Cauchy problems of general first-order partial differeltial equations. We present the way of driving characteristic systems for Cauchy problem of general Monge-Ampere equations.

PDE4: Global existence for fast rotating fluids with small viscosity

Ngo Van Sang

Laboratoire de Mathématiques Raphael Salem, Université de Rouen

In this talk, we consider the equations of a fast rotating anisotropic fluid with small viscosity in $\mathbb{R}^3$, that is the Navier-Stokes system with a large Coriolis force term and a vanishing anisotropic viscosity. This is a simplified, but relevant model used to describe the behaviors of oceanic currents with good accuracy. Using Strichartz-type estimates, we prove the existence of a unique, global strong solution for large initial data, provided that the rotation is fast enough. We also study an application of our method in a more complex case, where the fluid rotates between two parallel plates.

PDE5: On the asymptotic behavior of of the evolution equations

Dang Dinh Chau (joint work with Le Thi Thanh Tuyet)

HUS, VNU-Hanoi

In this paper we will present some results concerning the study of extension of a strongly continuous semigroup to uniformly bounded group and use it to investigate the asymptotic behavior of the evolution equations.

PDE6: Lack of compactness in nonlinear many body quantum systems

Mathieu Lewin

CNRS and University of Cergy-Pontoise

In the 70s and the 80s, the so-called "geometric techniques" have played an important role for the study of the spectrum of many-body Schrödinger operators. In this talk I will present a formalism which also allows to deal with nonlinear problems. I will in particular concentrate on the description of the lack of compactness of many-body wave functions. As an application, I prove the existence of minimizers for the Pekar multi-polaron functional.

PDE7: Long time behavor of solutions to semilinear parabolic equations involving strongly degenerate elliptic differential operators

Nguyen Minh Tri

Institute of Mathematics, Ha noi

A large number of authors have studied the global existence and the long-time behavior of solutions to the semilinear parabolic equations. In recent years, many works have been devoted to the study of long-time behavior of solutions to degenerate semilinear parabolic equations. In this talk we consider initial boundary value problem for semilinear strongly degenerate parabolic equations. Depending on the concrete types of nonlinearity we establish the existence of global attractors of semigroups generated by the problem under consideration. The solutions (mild or weak) of the problem are described with the help of a continuous semigroup $S(t)$ which acts on $S_0^1(\Omega)$ or on $L^2(\Omega)$. We will consider separately the cases when $S(t)$ is a gradient system and when it is not a gradient system.

PDEs1: Existence and non-existence of solutions to Schrödinger equation for atoms

Phan Thanh Nam

University of Cergy-Pontoise

We consider an atom in $\mathbb{R}^3$, with a nucleus of charge $Z > 0$ and N electrons of charge -1, interacting via Coulomb force. It is well-known that the system has infinitely many bound states if $N < Z+1$, and it is conjectured that the system has no bound state if $N > Z+2$. In this talk, we shall show that the system has no bound state when either $N > 1.22Z + 3Z^{1/3}$ for all Z, or $N > Z + CZ^{2/3}$ for Z large.

PT: Probability theory

PT1: Limit theorems of historical processes in population dynamics

Tran Viet Chi

Université de Lille

We consider the evolving genealogy of a birth and death process with trait structure and ecological interactions. Traits are hereditarily transmitted from a parent to its offspring unless a mutation occurs. The dynamics may depend on the trait of the ancestors and on its past and allows interactions between individuals through their lineages.
We define an interacting historical particle process describing the genealogies of the living individuals. Each individual can be represented by its trait and by the traits of its ancestors, which define the "lineage" of the individual. The lineage is the realization of a pure jump process and belongs to the Skorokhod space D of càdlàg functions. The population is represented by measure-valued process on D where each individual is described by a Dirac mass weighting its lineage. For large populations with small individuals with allometric demographis, this individual-based process can be approximated by a nonlinear historical superprocess, as those considered by Perkins (1995).
Our convergence theorem is illustrated by examples of current interest in Biology.
This is a joint work with Sylvain Billiard, Régis Ferrière and Sylvie Méléard.

PT2: Kolmogorov systems under the telegraph noise

Nguyen Hai Dang (joint work with Nguyen Huu Du)

HUS, VNU-Hanoi

This talk deals with the dynamics of Kolmogorov systems of competition and prey-predator types under telegraph noise. The telegraph noise switches at random two Kolmogorov deterministic models. The omega-limit set of the solutions to the systems is described. Moreover, some sufficient conditions for the existence and attractive of a stationary distribution are given.

PT3: Trees under attack

Le Vi

Université d'Aix-Marseille

We obtain a representation of Feller's branching diffusion with logistic growth in terms of the local times of a reflected Brownian motion H with a drift that is affine linear in the local time accumulated by H at its current level. As in the classical Ray-Knight representation, the excursions of H are the exploration paths of the trees of descendants of the ancestors at time $t = 0$, and the local time of H at height t measures the population size at time t. We cope with the dependence in the reproduction by introducing a pecking order of individuals: an individual explored at time s and living at time $t = H_s$ is prone to be killed by any of its contemporaneans that have been explored so far. The proof of our main

result relies on approximating H with a sequence of Harris paths H^N which figure in a Ray-Knight representation of the total mass of a branching particle system. We obtain a suitable joint convergence of H^N together with its local times and with the Girsanov densities that introduce the dependence in the reproduction.
Joint work with E. Pardoux and A. Wakolbinger.

PT4: Applications of weak dependence to non-linear time series analysis

Paul Doukhan

Université de Cergy-Pontoise and IUF

Weak dependence(s) conditions are an important tool for time series analysis. In order to make it suitable for the purpose of time series analysis, one needs flexible enough notions, which makes mixing a bit delicate to use, see Doukhan (1994) and Rio (2000). There might be traps, see Andews (1984).
We will first describe some of those notions together with their characteristic features with a special emphasis on the one we introduced in Dedecker et al (2007) . Our conditions rely on bounds such as:

$$|\mathrm{Cov}\left(f(X_{i_1},\ldots,X_{i_u})g(X_{j_1},\ldots,X_{j_v})\right| \leq (u\ \mathrm{Lip}f\|g\|_\infty + v\ \mathrm{Lip}g\|g\|_\infty)\eta(r)$$

for sequences such that $\eta(r)\downarrow 0$ as $r\uparrow\infty$ if $i_1\leq\cdots\leq i_u < i_u + r \leq j_1 \leq\cdots\leq j_v$ and for Lipschitz functions f, g.
A complete limit theory is available in such settings with reasonable and even sometimes sharp results. Optimality is not the first feature researched here but the results should better be of a simple use for practitioners.
A huge variety of models useful for applications includes Gaussian or associated models may be considered. Also infinite moving averages and more general Bernoulli shifts $X_t = H\left((\xi_{t-s})_{s\neq 0}\right)$ excited by iid sequences are cconsidered. As examples of such excessively complicated models we may cite $p-$Markov models as well as infinite memory models may be proved to exhibit such conditions. In the Markov case, no irreducibility is needed but some contraction is used and GARCH-type models with integral values may thus be considered.
We will detail some applications to parameter estimation, prediction, subsampling of variance series as in Doukhan et al (2009), extremes, see Doukhan et al (2011), as well as wild resampling.
Those important tools are essential for studying effective questions, such that DNA sequencing, global warming, extreme value theory and heavy tailed phenomena for financial aims or for natural or pharmaceutical risks.

PT5: Stochastic dynamic equations on disconnected sets

Nguyen Huu Du (joint work with Nguyen Thanh Dieu)

HUS, VNU-Hanoi

This talk deals with stochastic dynamic equations on disconnected sets of $\mathbb{R}$. We introduce the concept of Ito's integral on time scales, show the Ito's formula and consider the existence, uniqueness finiteness of moments of solutions for a random dynamic equation. Later, we give the necessary and sufficient condition for exponential $p-$stability of $\nabla-$stochastic dynamic

equations. This work can be considered as a unification and generalization of works dealing with the stability of random difference and stochastic differential equations.

PT6: A practical approach to fractional stochastic calculus and applications

Tran Hung Thao (joint work with Nguyen Tien Dung)

Institute of Mathematics, Hanoi

We introduced an approximation approach to develop fractional cases for lots of models as those of Black-Scholes, Merton, risk theoryThe main advantage of this approach is that one can profit the traditional Ito Calculus for calculation in a new context and therefore one can solve many practical problems in Finance, for instance.
We would like to present a fundamental result of approximation and its applications to many crucial models that can be solved from a practical point of view.

References

[1] Tran Hung Thao, C. Thomas-Agnan (2003). *Evolution des cours gouverne par un processus de type ARIMA fractionnaire (in French)*, Studia Babes-Bolyai, Mathematica 48(2) (2003) 107-115.

[2] Tran Hung Thao (2006). *An Approximate Approach to Fractional Analysis for Finance*, Nonlinear Analysis: Real World Applications 7(2006) 124-132. (Elsevier, ISI Classified).

[3] Tran Hung Thao , T. Plienpanich and P. Sattayatham (2009), *Fractional integrated GARCH diffusion limit models*. Journal of Korean Statistical Society, 38 (2009), N0 3, 231 - 238 (Elsevier).

[4] Tran Hung Thao and Nguyen Tien Dung (2010), *On a Fractional Stochastic Landau-Ginzburg Equation*, Applied Mathematical Sciences 4 (2010), N0 7, 317 - 325.

[5] Nguyen Tien Dung (2011),*Semimartingale approximation of Fractional Brownian motion and its applications*. Computers & Mathematics with Applications, Vol. 61, Issue 7, April 2011, 1844-1854 (Elsevier)

PT7: Probabilistic Linear Operators on Probabilistic Hilbert spaces

Dang Hung Thang (joint work with Nguyen Thinh)

HUS, VNU-Hanoi

In this report ,we introduce the notion of probabilistic Hilbert spaces and obtain the theorem on the orthogonal decomposition and the random Riesz theorem on the probabilistic Hilbert space . Next, probabilistic linear operators defined on a probabilistic dense linear subspace of the probabilistic Hibert spaces are defined and discussed.

PT8: A new proof of the monotonicity of the speed of an excited random walk in high dimensions using cut times

Pham Cong Zan

Université d'Aix-Marseille

In this talk, we deal with the monotonicity of the speed of excited random walks. Using cut times, we prove that the speed of the excited random walk is differentiable in parameter in every dimension $d \geq 8$ and monotone in high dimension. We also prove that for $d \geq 8$ the speed is increasing in a neighbor of 0 and the Einstein relation holds for ERW.

Firstly, we present the definition of excited random walk with bias parameter $\beta \in [0; 1]$ and the speed is a function of β. Next, by the existence of cut times of simple random walk for the dimensions ≥ 5, we have an expression of the speed using cut times.

Based on Girsanov's transform we prove the speed is a differentiable for $d \geq 8$ and calculate directly the derivative. Then relying on the construction of ERW from three sequences of independent random variables, we estimate the derivative of the speed and show that it's nonnegative.
Work under the supervision of F. Castell and P. Mathieu.

PT9: Length of branches of some Λ Coalescent

Jean-Stéphane Dhersin

Université Paris XIII

In modern genetics, it is possible to sequence whole genomes of individuals. In order to put this information to maximal use, it is important to have well-fitting models for the gene genealogy of a sample of individuals. The standard model for a gene genealogy of a sample of n individuals is Kingman's n-coalescent (Kingman (82)). Kingman's n-coalescent is a continuous-time Markov process with state space $\mathcal{P}^{(n)}$, the set of partitions of $\{1, \ldots, n\}$. The process starts in the trivial partition $(\{1\}, \ldots, \{n\})$ and transitions are only possible as mergers of exactly two blocks of the current state. Each such binary merger occurs with rate 1. These mergers are also called collisions.
For many populations, Kingman's n-coalescent describes the genealogy quite well. Kingman showed that the ancestral trees of a sample of size n in populations with size N evolving by a Wright-Fisher model will converge weakly to Kingman's n-coalescent for $N \to \infty$ (after a suitable time-change). This result is relatively robust if population evolution deviates from the Wright-Fisher model. However, there is evidence that there are populations where the gene genealogy of a sample is not described well by Kingman's n-coalescent. Examples of such populations can be found in maritime species, where one individual can have a huge number of offspring with non-negligible probability.
A whole class of potential models for the gene genealogy of a sample was introduced independently by Pitman (1999) and Sagitov (1999): The class of n-coalescents with multiple collisions, also called Λ-coalescents.
In this talk, we give a description of these coalescents, and describe the asymptotics of the lengths of total branches and external branches and their applications to the estimation of mutation rates.

PT10: Poisson boundary and certain extensions of free groups

François Gautero

Université de Nice

The Poisson boundary of a group G endowed with a probability measure μ, first introduced by Furstenberg, is a measured space which allows one to describe the behavior at infinity of the random walk with transition probabilities $p(g,h) = \mu(g^{-1}h)$.
A classical problem is to give a geometric or topological description of such a boundary. For instance, with certain technical conditions on the random walk, the Poisson boundary of (the fundamental group of) a hyperbolic surface is the circle S^1, compactification of the Poincaré disc. The Poisson boundary of a free group is the Cantor set of the ends of its Cayley graph, a tree, which compactifies this tree.
We are here interested in the Poisson boundary of certain extension of free groups, which we prove to often reduce to the Poisson boundary of the normal free subgroup itself. This work relies on Kaimanovich's approach of Poisson boundary and on the theory of real trees.

PT11: Laws of large numbers for arrays of random variables in metric space

Nguyen Tran Thuan (joint work with Nguyen Van Quang)

Vinh University

The concept of convex combination space was introduced by Terén and Molchanov [J. Theor. Probab., 19 (2006), 875-898], that is, a metric space endowed with a convex combination operation. In this report, we will present some our results concerning with the laws of large numbers for arrays of random variables in convex combination space. Some related results in the literature are extended. In order to derive laws of large numbers, the used conditions are similar to the known ones and the laws of large numbers are established without adding any other conditions.

PT12: Adaptation via L_p-norm in the regression model

Nguyen Ngoc Bien

Université d'Aix-Marseille

Let the statistical experiment be generated by the observation $Z^(n) = (X_i, Y_i), i = \overline{1,n}$ where each (X_i, Y_i) satisfies the equation

$$Y_i = f(X_i) + \zeta_i, i = \overline{1,n}$$

Here $f : [0,1]^d \to \mathbb{R}$ is an unknown function to be estimated from the observation $Z^{(n)}$. We suppose that f is uniformly bounded by a known constant and (X_i, ζ_i)'s are i.i.d, X_i is uniformly distributed on $[0,1]^d$. Our results are established under two types of noise ζ_i: ζ_i is Gaussian tail and ζ_i has the bounded p-moment property. With L_p-loss and a family of kernel estimators, we develop a selection procedure and derive two inequalities of type oracle. And we will show that the proposed selection rule leads to the minimax estimator that is adaptive over the scale of anisotropic Holder classes.

The main technical tools used in our derivations are uniform bounds on the L_p-norms of empirical processes recently developed in Goldensluger and Lepski (2011)

PT13: Parametric estimation for ergodic diffusion processes with jumps

Tran Ngoc Khue

Université paris 13

In this talk, we consider a stochastic differential equation with jumps whose drift coefficient depends on an unknown parameter. We derive the validity of the local asymptotic normality (LAN) property via the Malliavin calculus when the solution process is continuously observed or discretely observed at high frequency.
Work under the supervision of Eulalia Nualart.

PT14: Some laws of large numbers for arrays in probability theory

Nguyen Van Quang

Vinh University

This talk presents our research results on some laws of large numbers for arrays in probability theory. Namely, we will present the following problems;
Laws of large numbers for array of measurable operators
Laws of large numbers for arrays of random variables in Banach spaces
Laws of large numbers for array of for array of random set
Laws of large numbers for array of random variables in Metric spaces
Some well-known results are extended.

PTs1: Strictly stationary type processes generated by hyper groups

Cao Van Nuoi

Danang University of Education

PTs2: Lyapunov spectrum of nonautonomous linear stochastic differential algebraic equations of index 1

Nguyen Thi The (joint work with Nguyen Dinh Cong)

TU Dresden and Vinh University

We introduce a concept of Lyapunov exponents and Lyapunov spectrum of a stochastic differential algebraic equation (SDAE) of index-1. The Lyapunov exponents are defined samplewise via the induced two-parameter stochastic flow generated by inherent regular stochastic differential equations. We prove that Lyapunov exponents are nonrandom.

PTs3: Coincidence of Lyapunov exponents and central exponents of linear Ito stochastic differential equations with nondegenerate stochastic term

Nguyen Thi Thuy Quynh (joint work with Nguyen Dinh Cong)

Academy of Finance and Institute of Mathematics, Hanoi

In this report we show that under a nondegeneracy condition Lyapunov exponents and central exponents of linear Ito stochastic differential equation coincide. Furthermore, as the stochastic term is small and tends to zero the highest Lyapunov exponent tends to the highest central exponent of the ordinary differential equation which is the deterministic part of the system.

PTs4: On complete convergence for arrays of rowwise independent of random variables in convex combination spaces

Pham Tri Nguyen (joint work with Nguyen Van Quang and Nguyen Tran Thuan)

Electric Power University, Ha Noi

For random variables with values in a metric space, by constructing the various concepts of expectation and conditional expectation, many limit theorems were established. In 2006, Terán and Molchanov introduced the concept of convex combination space, that is, a metric space endowed with a convex combination operation. The class of these spaces is not only larger than the class of Banach spaces but also larger than the class of hyperspace of compact subsets of Banach space. In this paper, we establish the complete convergence for arrays of rowwise independent of (single-valued, multivalued) random variables and fuzzy random variables in convex combination space.

PTs5: On the Rate of Approximation in the Weierstrass Approximation Theorem by Bernstein's Polynomials of random degree

Tran Loc Hung (joint work with Tran Manh Tuong)

University of Finance & Marketing, Hochiminh City

The main purpose of this paper is to establish the rates of approximation in well-known Weierstrass Approximation Theorem by Bernstein-type polynomials of random degree which based on random sums of independent Bernoulli distributed random variables. Some simulating computations are studied, too.

PTs6: Bounds for the Approximation of Poisson-binomial distribution by Poisson distribution

Vu Thi Thao (joint work with Tran Loc Hung)

University of Finance & Marketing, Hochiminh City

The sum $S_n = X_1 + \cdots + X_n$ of n independent, non-identically distributed Bernoulli random

variables with $P(X_i = 1) = 1 - P(X_i = 0) = p_i, p_i \in [0; 1], i = 1, 2, \cdots$, has probability distribution with complicated structure and it can be approximated by Poisson distribution. The well-known Le Cam's inequality is established for providing information on the quality of the Poisson approximation. The main aim of this paper is to establish the Le Cam-type inequality via a linear operator. The operator method in this paper is quite elementary and it also could be applied for random sum $S_{N_n} = X_1 + \cdots + X_{N_n}$, where $N_n, n \geq 1$ are positive integer-valued random variables, independent of all $X_i, i = 1, 2, \cdots$

PTs7: Stationary Processes Generated by Orthogonal Polynomials

Tran Van San

Ho Chi Minh City Industry and Trade College

PTs8: Domains of operator semi-attraction of probability measures on Banach spaces

Ho Dang Phuc

Institute of Mathematics, Hanoi

The paper deals with operator (semi-) stability and domains of operator (semi-) attraction of probability measures on infinite dimensional Banach spaces. Characterizations of operator (semi-) stability, and of domains of (normal) operator (semi-) attraction are given. It is shown that the set of operator stable probability measures is a close subset under weak topology; the domains of operator semi-attraction of a given stable probability measure coincide with the domain of operator attraction of that measure; a probability measure is (semi-) stable iff its finite-dimensional projections are (semi-) stable.

PTs9: On the stochastic dynamic equations on time scale

Nguyen Thanh Dieu (joint work with Nguyen Huu Du)

Vinh University

The aim of this talk is to consider the condition of the existence and uniqueness of solutions, the finiteness of moments and to give the necessary and sufficient condition for exponential $p-$stability of $\nabla-$stochastic dynamic equations on arbitrary closed subset of $\mathbb{R}$ via Lyapunov functions. This work can be considered as a unification and generalization of works dealing with the random difference and stochastic differential equations.

References

[1] Dieu, N. T. (2009), Doob- Meyer decomposition for martingales on time scale, *Vinh university journal of science*, **38**(3A), 15 - 25.

[2] Dieu, N. T. and The, N. T. (2011), Exponential martingale on time scales, *Vinh university journal of science*, **40**(3A), 21-29.

[3] Du, N. H., Dieu, N. T. (2011), The first attempt on the stochastic calculus on time scale. *Journal of Stochastic Analysis and Application,* **29**(6) 1057 - 1080.

[4] Du, N. H., Dieu, N. T. (2012), Stochastic dynamic equation on time scales, *to appear in Acta Mathematica Vietnamica.*

[5] Du, N. H., Dieu, N. T. (2012), On the P- exponential stability of stochastic dynamic equation on disconnected sets, *submitted in Journal of Stochastic Analysis and Application.*

RT: Representation theory

RT1: Theta Divisors for Vector Bundles on Curves

Vikram B. Mehta (joint work with Kirti Joshi)
University of Mumbai

Let V be a semistable bundle of degree 0 on X , such that X degenerates to a Castelnuovo curve $X(0)$. Assume that V also degenerates to $V(0)$, a semistable bundle on $X(0)$. Then V has a theta divisor.

RT2: On some arithmetic aspect of representation theory of algebraic groups

Nguyen Quoc Thang
Institute of Mathematics, Hanoi

Let G be a smooth affine algebraic group acting linearly on a finite dimensional vector space V, via a representation $\rho : G \to GL(V)$, all are defined over a field k. Many results of (geometric) invariant theory related to the orbits of the action of G are obtained in the geometric case, i.e., when k is an algebraically closed field. In particular, there was a good account of description of isotropy subgroups under a representation ρ and some other related topics. However, since the very beginning of modern geometric invariant theory there is a need to consider the relative case of the theory. Also some questions or conjectures due to Borel, Tits... ask for extensions of results obtained to the case of non-algebraically closed fields. We just cite the results by Borel and Harish-Chandra, Birkes, Kempf . which gave solutions to some of the above mentioned questions or conjectures.

Also, in number-theoretic applications, the local and global fields k are in the center of such investigation. For any affine k-variety X defined over a local field k we can endow $X(k)$ with the (Hausdorff) v-adic topology induced from that of k. Let $x \in X(k)$ be a k-point. We are interested in the set $G(k).x$, which is called *relative orbit of* x (to distinguish with *geometric orbit* $G.x$). In particular, we are interested in a connection between the Hausdorff closedness of $G(k).v$ and the Zariski-closedness of the orbit $G.x$ of x in X. The first result of this type was obtained by Borel and Harish-Chandra. It was shown that if G is a reductive $\mathbf{R}$-group, $G.x$ is Zariski closed if and only if $G(\mathbf{R}).x$ is closed in the real topology, and this was extended to $\mathfrak{p}$-adic fields by Bremigan. One of the main steps in the proof of the analog of Margulis' super-rigidity theorem in the global function field case (say, in the proof by Venkataramana) was to prove the (locally) closedness of some relative orbits $G(k).x, x \in V(k)$, for some action of an almost simple simply connected group G on a k-variety V. Notice that some of the proofs previously obtained earlier do not extend to the case of positive characteristic.

The aim of this talk, based on joint works with D. P. Bac, is to discuss to what extent the above results still hold for more general class of algebraic groups over more general fields, and in particular complete fields.

RT4: On a fixed point formula for shtukas

Ngo Dac Tuan

CNRS - University of Paris 13

We present a fixed point formula for shtukas, which generalizes previous works of Drinfeld and Lafforgue in the case of Drinfeld's shtukas.

RT5: Center of Hecke algebras and nearby cycles

Benoit Stroh

CNRS - University Paris 13

RT6: On the Kontsevich-Soibelman integral identity conjecture

Lê Quy Thuong

HUS, VNU-Hanoi and Université Paris 6

It is well known that the integral identity conjecture is one of the key foundations in Kontsevich-Soibelman's theory of motivic Donaldson-Thomas invariants for 3-dimensional Calabi-Yau varieties. In this talk, we shall mention some approaches to the conjecture in the algebro-geometric and arithmetic-geometric points of view.

We work over $K = \kappa((t))$ and $R = \kappa[[t]]$, with κ a field of characteristic zero.

Let f be in $\kappa[[x, y, z]]$, where (x, y, z) is a system of coordinates of $\kappa^{d_1} \times \kappa^{d_2} \times \kappa^{d_3}$, such that $f(0, 0, 0) = 0$ and $f(\tau x, \tau^{-1} y, z) = f(x, y, z)$ for any $\tau \in \mathbb{G}_{m,\kappa}$. By the previous conditions, the series $f(x, y, z)$ belongs to $\kappa\{x\}[[y, z]]$. Put

$$\mathfrak{V} = \mathrm{Spf}\big(R\{x\}[[y, z]]/(f(x, y, z) - t)\big)$$

and

$$\mathfrak{W} = \mathrm{Spf}(R[[z]]/(f(0, 0, z) - t)).$$

Let $\mathfrak{X}$ be the formal completion of $\mathfrak{V}$ along $\mathbb{A}^{d_1}_\kappa \subset \mathfrak{V}_0$, let $\mathfrak{Z}$ be the formal completion of $\mathfrak{W}$ along 0. Consider the formal functions $\hat{f} : \mathfrak{X} \to \mathrm{Spf}(R)$ and $\hat{f}_\mathfrak{Z} : \mathfrak{Z} \to \mathrm{Spf}(R)$ induced by $f(x, y, z)$ and $f(0, 0, z)$, respectively. We denote by i the embedding $\mathbb{A}^{d_1}_\kappa \hookrightarrow \mathfrak{X}_0$, and by $\int_{\mathbb{A}^{d_1}_\kappa}$ the forgetful morphism $\mathcal{M}^{\hat{\mu}}_{\mathbb{A}^{d_1}_\kappa} \to \mathcal{M}^{\hat{\mu}}_\kappa$.

Conjecture (Kontsevich-Soibelman [KoSo])**.** *The identity* $\int_{\mathbb{A}^{d_1}_\kappa} i^* \mathcal{S}_{\hat{f}} = [\mathbb{A}^1_\kappa]^{d_1} \mathcal{S}_{\hat{f}_\mathfrak{Z}, 0}$ *holds in the Grothendieck ring* $\mathcal{M}^{\hat{\mu}}_\kappa$.

Here are some principal results obtained by the author.

Theorem 1 ([Th1], for regular version)**.** *Let f be a regular function on $\mathbb{A}^d_\kappa$ such that $f(0, 0, 0) = 0$ and $f(\tau x, \tau^{-1} y, z) = f(x, y, z)$ for any $\tau \in \mathbb{G}_{m,\kappa}$. Assume that f has one of the following forms:*
(a) $f(x, y, z) = P(g_1(x, y), g_2(z))$, where $P(\alpha, \beta)$ is a polynomial in two variables with

$P(0,\beta)$ non-zero of positive degree, $g_1(x,y)$ and $g_2(z)$ are regular functions, g_1 is non-degenerate w.r.t. its Newton polyhedron Γ_{g_1} and no vertex of Γ_{g_1} lies in a coordinate plane. (b) $f(x,y,z) = g(x,y,z) + h(z)^\lambda$, where $g(x,z,y)$ and $h(z)$ are regular functions, g is non-degenerate w.r.t. its Newton polyhedron Γ and no vertex of Γ lies in a coordinate plane, λ is large enough.
Then the identity $\int_{\mathbb{A}_\kappa^{d_1}} i^*\mathcal{S}_f = [\mathbb{A}_\kappa^1]^{d_1}\mathcal{S}_{f|_{\mathbb{A}_\kappa^{d_3}},0}$ holds in $\mathcal{M}_\kappa^{\hat{\mu}}$.

The principal references are [GLM1, GLM2].

Theorem 2 ([Th3], for regular version) **.** *Let f be a regular function on $\mathbb{A}_\kappa^d$ such that $f(0,0,0) = 0$ and $f(\tau x, \tau^{-1}y, z) = f(x,y,z)$ for any $\tau \in \mathbb{G}_{m,\kappa}$. If κ is algebraically closed, then the identity $\int_{\mathbb{A}_\kappa^{d_1}} i^*\mathcal{S}_f = [\mathbb{A}_\kappa^1]^{d_1}\mathcal{S}_{f|_{\mathbb{A}_\kappa^{d_3}},0}$ holds in $\mathcal{M}_\kappa^{\hat{\mu}}$.*

Using the model theory, Hrushovski and Loeser construct in [HrLo] a ring homomorphism of Grothendieck rings $\mathbb{HL} : K(\mathrm{VF}^{\mathrm{bdd}}[*]) \to \mathcal{M}_\kappa^{\hat{\mu}}$. We consider a definable set in VF^d, decompose it into definable subsets whose classes in $K(\mathrm{VF}^{\mathrm{bdd}}[*])$ have images in $\mathcal{M}_\kappa^{\hat{\mu}}$ through $\mathbb{HL}$ being motivic nearby cycles expected.

Theorem 3([Th2], for adic version)**.** *Let $f(x,y,z)$ be a polynomial such that $f(0,0,0) = 0$, $f(\tau x, \tau^{-1}y, z) = f(x,y,z)$ for $\tau \in \mathbb{G}_{m,\kappa}$. There is a canonical quasi-isomorphism of complexes $R\Gamma_c(\mathbb{A}_\kappa^{d_1}, R\psi_{\hat{f}}\mathbb{Q}_\ell|_{\mathbb{A}_\kappa^{d_1}}) \cong R\Gamma_c(\mathbb{A}_\kappa^{d_1}, \mathbb{Q}_\ell) \otimes (R\psi_{\hat{f}_3}\mathbb{Q}_\ell)_0$.*

Our proof is based on the comparison theorem for nearby cycles functors in [Berk2] and on the fundamental results on the étale cohomology of Berkovich spaces in [Berk1].

Theorem 4([Th3], for formal version)**.** *The integral identity conjecture is true.*

We use motivic integration for special formal schemes and the description of volume Poincaré series via resolution of singularity developped in [Ni] by Nicaise.

References

[Berk1] V. I. Berkovich, *Étale cohomology for non-Archimedean analytic spaces*, Publ. Math. Inst. Hautes Étud. Sci. **78** (1993), 5-171.

[Berk2] V. I. Berkovich, *Vanishing cycles for formal schemes II*, Invent. Math. **125**(2) (1996), 367-390.

[GLM1] G. Guibert, F. Loeser, M. Merle, *Iterated vanishing cycles, convolution, and a motivic analogue of the conjecture of Steenbrink*, Duke Math. J. **132** (2006), no. 3, 409-457.

[GLM2] G. Guibert, F. Loeser, M. Merle, *Nearby cycles and composition with a non-degenerate polynomial*, International Mathematics Research Notices **31** (2005), 1873-1888.

[HrLo] E. Hrushovski, F. Loeser, *Monodromy and the Lefschetz fixed point formula*, preprint (26 pages).

[KoSo] M. Kontsevich, Y. Soibelman, *Stability structures, motivic Donalson-Thomas invariants and cluster tranformations*, arXiv: 0811.2435vl[math.AG] 16 Nov 2008.

[Ni] J. Nicaise, *A trace formula for rigid varieties, and motivic Weil generating series for formal schemes*, Math. Ann. **343** (2009), 285349.

[Th1] L. Q. Thuong, *On a conjecture of Kontsevich and Soibelman*, to appear in Algebra and Number Theory.

[Th2] L. Q. Thuong, *A proof of the ℓ-adic version of the integral identity conjecture for polynomials*, preprint (17 pages).

[Th3] L. Q. Thuong, *Proofs of the integral identity conjecture*, preprint (28 pages).

RT7: Tannaka duality over discrete valuation rings

Phung Ho Hai

Institute of Mathematics, Hanoi

We obtain a version of Tannaka duality for affine group schemes over discrete valuation rings. In view of this duality we study the category of stratified sheaves with respect to a smooth map $f : X \to S$ where S is the formal spec of a complete discrete valuation ring.

RT8: Regular singular stratified bundles and tame ramification

Lars Kindler

Universität Duisburg-Essen

On smooth varieties over a field of positive characteristic, Grothendieck's sheaf of differential operators is more complicated than in characteristic 0. A stratified bundle is a vector bundle which is a module over this ring of differential operators. Among the flat vector bundles in characteristic 0 there is the important class of regular singular bundles. We present an analogous notion of regular singularity for stratified bundles in positive characteristic and show how it relates to tame ramification of coverings.

RT9: The metaplectic fundamental lemma of Jacquet and Mao in equal characteristic

Do Viet Cuong

Université de Lorraine

We prove in the case of equal characteristic a fundamental lemma conjectured by Jacquet and Mao for the metaplectic group. We use the arguments of Bao Châu Ngô for Jacquet-Ye's fundamental lemma and a geometric study of the metaplectic extension

RT10: Stokes matrices for the quantum differential equations of some Fano varieties

Marius van der Put

University of Groningen

This is joint work with John Alexander Cruz Morales. Associated to a Fano variety is a Dubrovin–Givental connection which leads to a quantum differential equation. Dubrovin conjectured the values of the Stokes matrices of these equations. In this lecture we will explain an explicit method for computing those Stokes matrices. For the case of the projective spaces $\mathbb{P}^n$, Dubrovin's conjecture has been verified by Guzzetti. Our method provides an elementary proof of this and applies to more Fano varieties.

RT3: Harish-Chandra operators and quantization of fields

Do Ngoc Diep

Institute of Mathematics, Hanoi

We prove that in the case of real reductive Lie groups, the procedure of quantization of fields gives exactly the same Harish-Chandra operators in the functional equation.

RTs1: Singular quadratic Lie superalgebras

Duong Minh Thanh (joint work with R. Ushirobira)

Ho Chi Minh City University of Pedagogy

Let us begin with a $\mathbb{Z}_2$-graded complex vector space $\mathfrak{g} = \mathfrak{g}_{\bar{0}} \oplus \mathfrak{g}_{\bar{1}}$. We say $\mathfrak{g}$ a *quadratic* $\mathbb{Z}_2$-graded vector space if it is endowed with a non-degenerate even supersymmetric bilinear form B. In addition, if there is a Lie superalgebra structure on $\mathfrak{g}$ such that B is invariant, i.e. $B([X,Y],Z) = B(X,[Y,Z])$ for all $X,Y,Z \in \mathfrak{g}$, then $\mathfrak{g}$ is called a *quadratic* Lie superalgebra. A structural theory of quadratic Lie algebras based on the notion of double extension was introduced in [Kac85] in the solvable case and in [MR85] in the general case. Another construction, namely the T^*-extension was given in [Bor97] for solvable quadratic Lie algebras. These two notions have been generalized for quadratic Lie superalgebras in [BB99] and [BBB].
The third interpretation based on the concept of super Poisson bracket, was introduced in [PU07] and then there appear several interesting properties of quadratic Lie algebras as follows. Let $(\mathfrak{g}, B)$ be a non-Abelian quadratic Lie algebra and define a 3-form I on $\mathfrak{g}$ by:

$$I(X,Y,Z) = B([X,Y],Z),\ \forall\ X,Y,Z \in \mathfrak{g}.$$

Then I is non-zero and $\{I,I\} = 0$, where $\{\ ,\ \}$ is the super Poisson bracket defined on the Grassmann algebra $\mathcal{A}(\mathfrak{g})$ of $\mathfrak{g}$ by

$$\{\Omega,\Omega'\} = (-1)^{k+1}\sum_{j=1}^{n} \iota_{X_j}(\Omega) \wedge \iota_{X_j}(\Omega'),\ \forall\ \Omega \in \mathcal{A}^k(\mathfrak{g}),\ \Omega' \in \mathcal{A}(\mathfrak{g})$$

with $\{X_j\}_{j=1}^n$ a fixed orthonormal basis of $\mathfrak{g}$.
Conversely, given a quadratic vector space $(\mathfrak{g}, B)$ and a non-zero 3-form $I \in \mathcal{A}^3(\mathfrak{g})$ satisfying $\{I,I\} = 0$ then there is a non-Abelian Lie algebra structure on $\mathfrak{g}$ such that B is invariant.
The element I carries some useful informations about corresponding quadratic Lie algebras. For example, when I is decomposable and non-zero, corresponding quadratic Lie algebras are called *elementary* quadratic Lie algebras and they are exhaustively classified in [PU07]. In this case, $\dim([\mathfrak{g},\mathfrak{g}]) = 3$ and coadjoint orbits have the dimension at most 2. In [DPU], the authors further consider a notion that is called the dup-*number* of a non-Abelian quadratic Lie algebra $\mathfrak{g}$. It is defined by $\mathrm{dup}(\mathfrak{g}) = \dim\{\alpha \in \mathfrak{g}^* \mid\ \alpha \wedge I = 0\}$ where $\mathfrak{g}^*$ is the dual space of $\mathfrak{g}$. Then the dup-number receives values 0, 1 or 3 and it measures the decomposability of I. For instance, I is decomposable if and only if $\mathrm{dup}(\mathfrak{g}) = 3$. Moreover, it is also an invariant of quadratic Lie algebras under Lie algebra isomorphisms, that means if $\mathfrak{g}$ and $\mathfrak{g}'$ are isomorphic quadratic Lie algebras then $\mathrm{dup}(\mathfrak{g}) = \mathrm{dup}(\mathfrak{g}')$. Its proof is rather non-trivial. It is obtained through a description of the space generated by invariant symmetric

bilinear forms on a quadratic Lie algebra having the dup-number non vanish. Such quadratic Lie algebra is called a *singular* quadratic Lie algebra. Another remarkable result is that all singular quadratic Lie algebras were completely classified up to isometrical isomorphism by $O(n)$-adjoint orbits of the Lie algebra $\mathfrak{o}(n)$.
The purpose of this talk is to give a generalization of the third interpretation for quadratic Lie superalgebras. We shall introduce the notion of dup-*number* of a non-Abelian quadratic Lie superalgebra $\mathfrak{g}$ and suggest considering the set of *singular* quadratic Lie superalgebras where the dup-number is not vanish. We proof that the dup-number is an invariant of quadratic Lie superalgebras. Moreover, we give a complete classification of singular quadratic Lie superalgebras and a formula of the quadratic dimension of reduced singular quadratic Lie superalgebras.

References

[BBB] I. Bajo, S. Benayadi, and M. Bordemann, *Generalized double extension and descriptions of quadratic Lie superalgebras*, arXiv:0712.0228v1.

[BB99] H. Benamor and S. Benayadi, *Double extension of quadratic Lie superalgebras*, Comm. in Algebra 27 (1999), no. 1, 67-88.

[BP89] H. Benamor and G. Pinczon, *The graded Lie algebra structure of Lie superalgebra deformation theory*, Lett. Math. Phys. 18 (1989), no. 4, 307-313.

[Ben03] S. Benayadi, *Socle and some invariants of quadratic Lie superalgebras*, J. of Algebra 261 (2003), no. 2, 245-291.

[Bor97] M. Bordemann, *Nondegenerate invariant bilinear forms on nonassociative algebras*, Acta Math. Univ. Comenianac LXVI (1997), no. 2, 151-201.

[Bou59] N. Bourbaki, *Éléments de Mathématiques. Algèbre, Formes sesquilinéaires et formes quadratiques*, Vol. Fasc. XXIV, Livre II, Hermann, Paris, 1959.

[CM93] D. H. Collingwood and W. M. McGovern, *Nilpotent Orbits in Semisimple Lie Algebras*, Van Nostrand Reihnhold Mathematics Series, New York, 1993.

[DPU] M. T. Duong, G. Pinczon, and R. Ushirobira, *A new invariant of quadratic Lie algebras*, Alg. Rep. Theory, DOI: 10.1007/s10468-011-9284-4, 41 pages.

[FS87] G. Favre and L. J. Santharoubane, *Symmetric, invariant, non-degenerate bilinear form on a Lie algebra*, J. Algebra 105 (1987), 451-464.

[Kac85] V. Kac, *Infinite-dimensional Lie algebras*, Cambrigde University Press, New York, 1985.

[Kos50] J-L. Koszul, *Homologie et cohomologie des algèbres de Lie*, Bulletin de la S. M. F 78 (1950), 65-127.

[MR85] A. Medina and P. Revoy, *Algèbres de Lie et produit scalaire invariant*, Ann. Sci. École Norm. Sup. 4 (1985), 553-561.

[MPU09] I. A. Musson, G. Pinczon, and R. Ushorobira, *Hochschild Cohomology and Deformations of Clifford-Weyl Algebras*, SIGMA 5 (2009), 27 pp.

[NR66] A. Nijenhuis and R. W. Richardson, *Cohomology and deformations in graded Lie algebras*, Bull. Amer. Math. Soc. 72 (1966), 1-29.

[PU07] G. Pinczon and R. Ushirobira, *New Applications of Graded Lie Algebras to Lie Algebras, Generalized Lie Algebras, and Cohomology*, J. Lie Theory 17 (2007), no. 3, 633 668.

[Sam80] H. Samelson, *Notes on Lie algebras*, Universitext, Springer-Verlag, 1980.

[Sch79] M. Scheunert, *The Theory of Lie Superalgebras*, Lecture Notes in Mathematics, vol. 716, Springer-Verlag, Berlin, 1979.

RTs2: On a Special Class of Real Solvable Lie Groups and Corresponding Co-adjoint Representation

Le Anh Vu (joint work with K.P. Shum, Ha Van Hieu and Tran Thi Hieu Nghia)

University of Economics and Law, VNU-Hochiminh City

The talk introduces one special class of Lie groups. Namely, the talk gives a complete classification of all real solvable Lie groups of dimension 5 such that all orbits in their co-adjoint representation are orbits of dimension zero or maximal dimension.

RTs3: Co-adjoint Representation of a class of Real Solvable Lie groups and Foliations assocated to them

Duong Quang Hoa (joint work with Le Anh Vu and Nguyen Anh Tuan)

University of Economics and Law, VNU-Hochiminh City

The talk introduces one special class of real solvable Lie goups of dimension 5 and gives a description of orbits in co-adjoint (K-orbits). In addition, the talk consider foliations formed by K-orbits of maximal dimension of each considered Lie goups and gives analytical description or characterization Connes' C*-algebras of these foliations by KK-functors.

RTs4: Maximal Subgroups in skew linear groups

Bui Xuan Hai

University of Science, VNU-Hochiminh City

Recently, the structure of maximal subgroups in the general skew linear group $\mathrm{GL}_n(D)$ has been investigated by several authors. In this talk we present some new results we obtained about the influence of such subgroups to the structure of D. Moreover, in the particular case with $n = 1$, we investigate properties of maximal subgroups in an arbitrary subnormal subgroup G of $\mathrm{GL}_1(D)$. Some new obtained results for this case completely generalizes the previous results for maximal subgroups of $\mathrm{GL}_1(D)$.

RTs5: Tannaka characterization of surjective and injective homomorphisms of affine group schemes over DVR

Nguyen Dai Duong (joint work with Phung Ho Hai)

Institute of Mathematics, Hanoi

Let R be a commutative ring and $f : G \longrightarrow G'$ be a homomorphism of flat affine group schemes over R. Then f induces a $\otimes-$functor $\omega^f : \mathrm{Repf}(G') \longrightarrow \mathrm{Repf}(G)$, where Repf

denotes the category of representations which are finitely generated as $R-$modules. How are the properties of f are reflected in ω^f and vice versa? If R is a field then this was answered by Deligne-Milne. In this report, we will extend their theorem to the case when R is a DVR.

SF: Stochastic analysis and statistics in finance

SF1: On existence of shadow prices

Luciano Campi

Université Paris 13

For utility maximization problems under proportional transaction costs, it has been observed that the original market with transaction costs can sometimes be replaced by a frictionless "shadow market" that yields the same optimal strategy and utility. However, the question of whether or not this indeed holds in generality has remained elusive so far. In this paper we present a counterexample which shows that shadow prices may fail to exist. On the other hand, we prove that short selling constraints are a sufficient condition to warrant their existence, even in very general multi-currency market models with possibly discontinuous bid-ask-spreads. This is a joint work with G. Benedetti, J. Kallsen and J. Muhle-Karbe.

SF2: Limit theorem for Leland's strategy with stochastic volatility

Nguyen Huu Thai

University of Economics, Hochiminh City

This paper deals with the Leland strategy for the European option hedging problem with stochastic volatility and transaction costs. We establish a limit theorem and determine a convergence rate for the hedging error. A new form of the adjusted volatility is applied for the Leland algorithm to release the underhedging property pointed out in [19] . This also gives a posibility to improve the convergence rate and make the option hedging and pricing problems more practical in the presence of transaction costs.

References

[1] H. Ahn, M. Dayal, E. Grannan and G. Swindle (1998). Option replication with transaction costs: General diffusion limits. Annals of Applied Probability, vol 8, No 3: 767-707.

[2] F.Black, M. Scholes (1973). *The pricing of options and corporate liabilities*. J. Political Economy 81: 637-659.

[3] M. Baran (2003). Quantile hedging on markets with proportional transaction costs. Appl. Math. (Warsaw) 30, 193-208.

[4] M. Barski (2011). Quantile hedging for multiple assets derivatives. Preprint available at *http://arxiv.org/PS_cache/arxiv/pdf/1010/1010.5810v2.pdf.*

[5] M. Bratyk, Y. Mishura (2008). The generalization of the quantile hedging problem for price process model involving finite number of Brownian and fractional Brownian motions. *Theory of Stochastic Processes*, Vol. 14, 3-4:27-38.

[6] J. Cvitanić, I. Karatzas (1996). Hedging and portfolio optimization under transaction costs: a martingale approach. Mathematical finance 6, 133-165.

[7] E. Denis (2008). Marché avec côuts de transaction: approximation de Leland et arbitrage. Thèse doctorale, Université de Franche-Comté Besançon.

[8] E. Denis (2009). Leland's Approximations for Concave Pay-off Functions. Recent Advances in Financial Engineering. World Scientific.

[9] E. Denis, Y. Kabanov (2010). Mean square error for the Leland-Lott hedging strategy: convex payoffs. Finance and Stochastics vol **14**, no **4**, p. 625-667.

[10] E. Denis (2010). Modified Leland's strategy for constant transaction costs rate,Preprint, Besançon.

[11] N. El Karoui, M. Quenez (1995). Dynamic programming and pricing of contingent claims in an incomplete market, SIAM J. Control and Optimization **33**, 29-66

[12] H. Föllmer, P. Leukert (1999). Quantile hedging. *Finance Stochastic*, 3, 251-273.

[13] J.P. Fouque , G. Papanicolaou, K.R. Sircar (2000). *Derivatives in Financial Markets with Stochastic Volatility*. Cambridge University Press.

[14] A. Friedman (1975). *Stochastic Differential Equations and Applications*, Academic Press.

[15] M. Gamys, Y. Kabanov. (2009). Mean square error for the Leland–Lott hedging strategy. Recent Advances in Financial Engineering: Proceedings of the 2008 Daiwa International Workshop on Financial Engineering. World Scientific.

[16] P. Granditz, W. Schachinger (2001). Leland's approach to option pricing: The evolution of discontinuity. Mathematical Finance, **11**, 347–355.

[17] P. Hall (1980). *Martingale Limit Theory and Its Applications*, Academic Press.

[18] Yu.M. Kabanov, S. M. Pergamenshchikov (2003). Two-scale stochastic systems. Springer-Verlag Berlin.

[19] Yu.M. Kabanov, M. Safarian (1997). On Leland's strategy of option pricing with transaction costs. Finance and Stochastics **1** , 239-250.

[20] Yu M. Kabanov, M. Safarian (2009). *Markets with Transaction Costs*. Mathematical Theory, Springer - Verlag Berlin.

[21] I. Karatzas, S. Shreve (1998). *Methods of Mathematical Finance*. Springer - Verlag Berlin.

[22] Yu.A. Kutoyants (2004). *Statistical inference for ergodic diffusion processes*. Springer - Verglag London.

[23] H. Leland (1985). Option pricing and replication with transactions costs. Journal of Finance, **40**, 1283-1301.

[24] R.S Liptser, A.N. Shiryaev (2001). *Statistics of Random Processes I, General Theory*. Applications of Mathematics, Springer - Verlag Berlin.

[25] Lott K. (1993). Ein verfahren zur eplikation von optionen unter transaktionkosten in stetiger Zeit, Dissertation, Universität der Bundeswehr München, Institut für Mathematik und Datendverarbeitung.

[26] A.A. Novikov (1997). Hedging of options with a given probability. Theory Probability Applications, vol. 43, 1.

[27] S. M. Pergamenshchikov (2003). Limit theorem for Leland's strategy. Annals of Applied Probability, **13**, 1099-1118.

SF3: Discrete hedging in Heston model with liquidity costs

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In this paper we study a discrete time hedging and pricing problem using Heston model in a market with liquidity costs. We derive a partial differential equation for the option price in the presence of liquidity costs. Then, a modified option hedging strategy are given.

SF4: Dynamized copulas and application to counterparty risk modeling

Stéphane Crépey

Université d'Evry

Counterparty risk on a portfolio of credit instruments between two parties poses some specific modeling challenges. On one hand, the model must be able to account for the wrong-way risk which is due to the potentially strong dependence between the credit risk ofthe two parties and that of the reference portfolio. On the other hand, the optional and therefore inherently dynamic nature of counterparty risk obliges one to cope with dynamic credit portfolio models, with the related combinatorial and computational issues. In particular a standard reduced-form approach for modeling the defaults of the two parties is not relevant in this case. To tackle these issues we resort to appropriately dynamized copula models. Specifically we consider first a dynamized Gaussian Copula model in which, in particular, the CDS spread deltas of a CDO tranche at time 0 coincide with the market Gaussian copula deltas; and second, a dynamized Gaussian Marshall-Olkin model in which dependence between credit names stems from the possibility of simultaneous defaults.

SF5: Second-order dynamical models for securities prices

Nguyen Thanh Thien

Université Toulouse III et Hanoi National University of Education

This talk is based on a work in progress with Nguyen Tien Zung, where based on ideas from physics, we build some second order stochastic dynamical models of the movement of financial securities prices, which are arguably better than the usual first-order models. Applications in investing and risk management will be discussed.

SF6: Optimal discretization of hedging strategies with jumps

Mathieu Rosenbaum

Université Paris 6

In this work, we consider the hedging error due to discrete trading in models with jumps. We propose a framework enabling to (asymptotically) optimize the discretization times. More precisely, a strategy is said to be optimal if for a given cost function, no strategy has

(asymptotically) a lower mean square error for a smaller cost. We focus on strategies based on hitting times and give explicit expressions for the optimal strategies. This is joint work with Peter Tankov.

SF7: Estimating Fractional Stochastic Volatility

Hoang Thi Phuong Thao

HUS, VNU-Hanoi

The aim of this paper is to find the best state estimation for fractional stochastic volatility from point process observations by a method of semimartingale approximation.

SF8: Statistical properties and dynamic of cross-correlation in the Vietnamese stock market

Nguyen Quang

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Cross-correlation matrix in a stock market, usually composes of several hundreds of stocks, plays an important role in constructing an efficient portfolio and managing investment risk. The study of such high-dimensional and complex system is not easy and recently, some method developed in statistical physics have been employed [1-2], in particular the random matrix theory (RMT) [3-4]. The most important finding of previous studies is that the distribution of the eigenvalue and the components of the eigenvectors largely follow that of random matrices. In contrast, some deviation from the random matrix spectrum carry important information. In this work, we investigate the statistical and spectral properties of the cross-correlation matrix in the Vietnamese stock market using RMT. "Empirical" results show accordance with studies in most developed market (US, European) [3-11]: cross-correlation distribution and dynamic, eigenvalue strectrum and eigenvector participant component; and also share other different properties as in other emerging market [12-15]: largest eigenvalue behavior, proportion of deviated spectrum. We also highlight the relation between the average cross-correlation coefficient, the quantification of largest eigenvalue with the common economic notion of market risk. Extension of this work is presented which could be useful for risk and portfolio manager in the local financial market.

References

[1] R.N. Mantegna, H.E. Stanley, "An Introduction to Econophysics: Correlation and Complexity in Finance" (Cambridge University Press, Cambridge, UK, 1999)

[2] J.-P. Bouchaud, M. Potters, "Theory of Financial Risk and Derivative Pricing: From Statistical Physics to Risk Management" (Cambridge University Press, Cambridge, USA, 2004)

[3] V. Plerou, P. Gopikrishnan, B. Rosenow, L.A.N. Amaral, H.E. Stanley, Phys. Rev. Lett. 83 (1999) 1471.

[4] L. Laloux, P. Cizeau, J.-P. Bouchad, M. Potters, Phys. Rev. Lett. 83 (1999) 1467.

[5] L. Giada, M. Marsili, Phys. Rev. E 63 (2001) 061101.

[6] V. Plerou, P. Gopikrishnan, B. Rosenow, L.A.N. Amaral, T. Guhr, H.E. Stanley, Phys. Rev. E 65 (2002) 066126.

[7] S. Sharifi, M. Crane, A. Shamaie, H. Ruskin, Physica A 335 (2004) 629.

[8] Z. Burda, J. Jurkiewicz, M.A. Nowak, Acta Phys. Pol. B 34 (2003) 87.

[9] S. Drozdz, F. Grummer, A.Z. Gorski, F. Ruf, J. Speth, Physica A 287 (2000) 440.

[10] S. Drozdz, J. Kwapien, F. Grummer, F. Ruf, J. Speth, Physica A 299 (2001) 144.

[11] A. Utsugi, K. Ino, M. Oshikawa, Phys. Rev. E 70 (2004) 026110.

[12] D. Wilcox, T. Gebbie, Physica A 344 (2004) 294.

[13] D. Wilcox, T. Gebbie, e-print (2004) arXiv:cond-mat/0402389.

[14] W.-S. Jung, S. Chae, J.-S. Yang, H-T. Moon, e-print (2005) arXiv:physics/0504009.

[15] V. Kulkarni, N. Deo, e-print (2005) arXiv:physics/0512169

SF9: Series representation of the norm of Brownian motions and norm-normal approximations

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In this paper, we obtain an analogue of Ito-Nisio theorem for Bessel processes which are the norm of multi-dimensional Brownian motions and apply the Chen-Stein method for norm-normal approximation on the positive haft-line.

References

[1] Bingham, N.H., Random walks on spheres, Z. Wahrscheinlichkeitstheorie Verw. Geb., **22**, (1973), 169-172.

[2] Chung, L. K., Lectures from Markov processes to Brownian motion, Springer-Verlag, New York Heidelberg Berlin, 1982).

[3] Ciesielski, Z.,Holder conditions for realizationsof Gaussian processes. Amer. Math. Soc. **99** (1961) 403-413.

[4] Going-Jaeschke, A., Yor, M., Survey and some Generalizations of Bessel Processes, Bernoulli **23**, (2003), 313-349.

[5] Hunt G. A., Random Fourier transforms, Trans. Amer. Amer. Math. Soc. **71** (1951), 38-69.

[6] Ikeda, N, Taniguchi, S., Quadratic Wiener functionals, Kalman-Bucy filters, and the KdV equation, in: H. Kunita, S. Watanabe, Takahashi Y. (Eds), Stochastic analysis and related topics in Kyoto. In honor of $KyoshiIt^o$, in: Adv. Studies Pure Math., vol. **. 41**, Math. Soc. Japan, Tokyo, 2004, pp. 167- 187.

[7] Ito, K., Mckean H.P., Jr., Diffusion processes and their sample paths. Berlin-Heidelberg-New York. Springer (1996).

[8] Ito, K, Nisio M., On the convergence of sums of independent Banach space valued random variables, Osaka J. math. **5**, (1968), 35-48.

[9] Kalenberg O., Random measures, 4rd ed. New York: Academic Press, (1986).

[10] Kuelbs, J., Lepage, R., The law of the iterated logarithm for Brownian motion in a Banach space, Trans. Amer. Math. Soc.**185** (1973), 253265.

[11] Kingman, J.F.C., Random walks with spherical symmetry, Acta Math., **109**, (1963), 11-53.

[12] Mikosch,T., The order of approximation to a Wiener process by its series representation, Technical report, TU Dresden, 1987.

[13] Mikosch,T.,Almost sure behavior of tail series in functional spaces, Analysis Mathematica, **16**(1990), 123-133.

[14] Nguyen, V. T., Banach space valued Brownian motions, Acta Math. Vietnam,**3** (1978), no. 2, 3546.

[15] Nguyen V.T, Generalized independent increments processes, Nagoya Math. J.**133**, (1994), 155-175.

[16] Nguyen V. T., A Kingman convolution approach to Bessel processes, Probab. Math. Stat,**29**, fasc. 1(2009) 119-134.

[17] Nguyen T.V., OGAWA S., Yamazato M. A convolution Approach to Mutivariate Bessel Processes, Proceedings of the 6th Ritsumeikan International Symposium on "*Stochastic Processes and Applications to Mathematical Finance*", edt. J. Akahori, S. OGAWA and S. Watanabe, World Scientific, (2006) 233-244.

[18] Raiput B.S., Rosinski J., Spectral representation of infinitely divisible processes, Probab. Th. Rel. Fields **82** (1989),451-487.

[19] Revuz, D. and Yor, M., Continuous martingals and Brownian motion. Springer-verlag Berlin Heidelberg, (1991).

[20] Paley R. E. A., Wiener, N., Fourier Transforms in the complex domain. Amer Math. Soc. Colloq. Publ. **19**. Providence, R. I., AMS, 1934.

[21] Sato K, Lévy processes and infinitely divisible distributions, Cambridge University of Press, (1999).

[22] Shiga T., Watanabe S., Bessel diffusions as a one-parameter family of diffusion processes, Z. Warscheinlichkeitstheorie Verw. geb. 27,(1973), 34-46.

[23] Urbanik K., Generalized convolutions, Studia math., **23** (1964), 217-245.

[24] Analysis of Wiener functionals (Malliavin calculus) and its applications to heat kernels. The Annals of Probability 15 ()1987 1-39.

[25] Watson G.N., A Treatise on the Theory of Bessel Functions. Cambridge, 1944.

[26] Paley, R. and Wiener, N., Fourier transforms in the complex domain, Amer. Math. Soc. Coll. Publ. XIX, 1934.

SF10: Measuring the Foreign Exchange Risk by using EVT method

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SFs1: Ruin Probability for risk models with dependent random variables

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SFs2: On the Interval- valued Stochastic Differential Equations and Applications

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The interval-valued differential equations (IDEs) are important parts of the set-valued analysis theory. In this paper, we have studied interval-valued stochastic diferential equations (ISDEs) and showed many applications of this class ISDEs.

SFs3: Applying GARCH-EVT-Copula models for Value-at-Risk of portfolio on Vietnam stock market

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Copula functions represent a methodology that describes the dependence structure of a multi-dimension random variable. It is a flexible tool to handle risk factors in finance, such as Value-at Risk (VaR), which is probably the most widely used risk measure in financial institutions. Combining copula and the forecast function of the GARCH model, called conditional copula-GARCH, to compute the VaR of portfolios. Moreover,VaR typically deals with the low-probability events in the tails of asset return distribution. Extreme value theory (EVT) focuses directly on the tails and therefore could potentially give us better estimates and forecasts of risk. This work paper introduces GARCH-EVT-Copula model and applies it to compute the VaR of portfolio on Viet nam stock market.

SFs4: Strong uniform consistency of nonparametric estimation of aconditional quantile for censored and dependent data

Walid Horrigue (joint work with Elias Ould Saïd)

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Let (T, C, X) be a vector of random variables (rvs) where T, C and X are the interest variable, a right censoring rv and a covariate respectively. In this paper, we study the kernel conditional quantile estimation under dependant case and when the covariable takes values in an infinite dimension space. An estimator of the conditional quantile is given and, under some regularity conditions, among which the small ball probability for the covariate, its uniform strong convergence with rates is established.
The goal is to propose a smooth estimator of the conditional quantile and prove its strong uniform convergence (with rate) over a compact subset.In the censored case, we adapt the

idea of Carbonez et al. , Kohler et al. and Ould Saïd for the infinite dimension case by using a smooth distribution function $H(.)$ inserted to a step function, then we get

$$\widehat{F}_n(t|x) = \frac{\sum_{i=1}^{n} \frac{\delta_i}{\overline{G}_n(Y_i)} K\left(\frac{d(x,X_i)}{h_K}\right) H\left(\frac{t-Y_i}{h_H}\right)}{\sum_{i=1}^{n} K\left(\frac{d(x,X_i)}{h_K}\right)}$$

Then a natural estimator of $\xi_p(.)$ is given by

$$\widehat{\xi}_p(x) = \inf\left\{y : \widehat{F}_n(y|x) \geq p\right\}$$

Our main results are the following

Theorem 1 Under assumptions **A1**-**A5** then for $n \to \infty$ we have

$$\sup_{0\geq t\geq \tau} \sup_{x\in\Omega} \left|\widehat{F}_n(t|x) - F(t|x)\right| = O(h_K^{\beta}) + O(h_H) + O\left(\left(\frac{\log n}{n\phi(h_K)}\right)^{1/2}\right) a.s.$$

Theorem 2 Under the same assumptions as those of Theorem 1 and if $f(t|x) > 0$ for all $t \in \mathcal{V}(\xi_p)$, we have

$$\sup_{x\in\Omega} \left|\widehat{\xi}_p(x) - \xi_p(x)\right| = O(h_K^{\beta}) + O(h_H) + O\left(\left(\frac{\log n}{n\phi(h_K)}\right)^{1/2}\right) a.s.$$

LIST OF PARTICIPANTS

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