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Francesco Fournier-Facio — Ultrametric analogues of Ulam stability of groups 551-653
Olivier Debarre — On a conjecture of Kazhdan and Polishchuk 655-667
Alexandre Baraviera & Renaud Leplaideur — The Jacaranda tree is strongly aperiodic and has zero entropy 669-687
Ismael Bailleul & Hugo Eulry — Nonlocal quasi-linear singular SPDEs 689-711
Omid Amini & Matthieu Piquerez — Hodge theory for tropical fans 713-809

SOCIÉTÉ MATHÉMATIQUE DE FRANCE

Pages 551-809

Bull. Soc. Math. France
154 (3), 2026, p. 551-809

Sommaire

Francesco Fournier-Facio — Analogues ultramétriques de la stabilité des groupes au sense d'Ulam 551-653
Olivier Debarre — Sur une conjecture de Kazhdan et Polishchuk .. 655-667
Alexandre Baraviera & Renaud Leplaideur — Le Jacaranda est fortement apériodique et d'entropie nulle 669-687
Ismael Bailleul & Hugo Eulry — Équations quasi-linéaires singulières non locales 689-711
Omid Amini & Matthieu Piquerez — Théorie de Hodge des éventails tropicaux 713-809

Bull. Soc. Math. France
154 (3), 2026, p. 551-809

Contents

Francesco Fournier-Facio — Ultrametric analogues of Ulam stability of groups 551-653
Olivier Debarre — On a conjecture of Kazhdan and Polishchuk ... 655-667
Alexandre Baraviera & Renaud Leplaideur — The Jacaranda tree is strongly aperiodic and has zero entropy 669-687
Ismael Bailleul & Hugo Eulry — Nonlocal quasilinear singular SPDEs 689-711
Omid Amini & Matthieu Piquerez — Hodge theory for tropical fans 713-809

Bull. Soc. Math. France
154 (3), 2026, p. 551-653

ULTRAMETRIC ANALOGUES OF ULAM STABILITY OF GROUPS

by Francesco Fournier-Facio

Abstract. — We study stability of metric approximations of countable groups with respect to groups endowed with ultrametrics, the main case study being a p-adic analogue of Ulam stability, where we take $\mathrm{GL}_n(\mathbb{Z}_p)$ as approximating groups instead of $\mathrm{U}(n)$. For finitely presented groups, the ultrametric nature implies equivalence of the pointwise and uniform stability problems, and the profinite one implies that the corresponding approximation property is equivalent to residual finiteness. Moreover, a group is uniformly stable if and only if its largest residually finite quotient is. We provide several examples of uniformly stable groups, including finite groups, virtually free groups, some groups acting on rooted trees, and certain lamplighter and (Generalised) Baumslag–Solitar groups. We construct a finitely generated group that is not uniformly stable. Finally, we prove and apply a (bounded) cohomological criterion for stability of a finitely presented group.

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