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Discrete Subgroups of a Locally Compact Group with Jointly Discrete Chabauty Neighborhoods

Let G be a locally compact group. We denote by $\mathcal{SUB}(G)$ the space of closed subgroups of G equipped with the *Chabauty topology*. A discrete subgroup Γ of G is said to admit a *jointly discrete Chabauty neighborhood* if there exists an identity neighborhood U in G and an open neighborhood Ω of Γ in $\mathcal{SUB}(G)$ such that every closed subgroup $L \in \Omega$ satisfies $L \cap U = \{e\}$. Recently, T. Gelander and A. Levit proved that every lattice in a semi-simple analytic group admits a jointly discrete Chabauty neighborhood. In this paper, we prove that G is a Lie group if and only if the trivial subgroup $\{e\}$ admits a jointly discrete Chabauty neighborhood, if and only if every discrete subgroup of G admits a jointly discrete Chabauty neighborhood.

Keywords: Locally compact group, Lie group, pro-Lie group, discrete subgroup, Chabauty topology, jointly discrete Chabauty neighborhood.

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