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Pinned patterns and density theorems in $\mathbb{R}^d$

We consider the abundance property of pinned k -point patterns occurring in $E \subseteq \mathbb{R}^d$ with positive upper density $\delta(E)$. We show that for any fixed k -point pattern V , there is a set E with positive upper density such that E avoids all sufficiently large affine copies of V , with one vertex fixed at any point in E . However, we obtain a positive quantitative result, which states that for any fixed E with positive upper density, there exists a k -point pattern V , such that for any $x \in E$, a carefully chosen *pinned scaling factor set* has upper density $\geq \tilde{\varepsilon} > 0$, where constant $\tilde{\varepsilon}$ depends on k, d and $\delta(E)$.