Thickness and a Gap Lemma in $\mathbb{R}^d$

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A general problem that comes up repeatedly in geometric measure theory, dynamics and analysis is understanding when two or more "small" compact sets intersect. In the real line, the classical Gap Lemma of S. Newhouse, based on the notion of thickness, gives an easily checkable robust condition for two Cantor sets to intersect, but it is strongly based on the order structure of the reals. I will discuss some recent extensions of the notion of thickness, and the Gap Lemma, to higher dimensions. Applications to patterns in fractals will be discussed.