

Inn'formal Probability Seminar

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“On the planar Ulam’s floating body problem for perimeter density $1/6$.”

Abstract:

In this talk, we will discuss the Ulam’s floating body problem, a classic question in geometric analysis originally appearing as Problem 19 in the famous Scottish Book. The problem asks whether a convex body of uniform density must be a Euclidean ball if it floats in equilibrium in every orientation. It turns out that the answer depends on both the dimension and the relative density of the body. For density $D = 1/2$, planar counterexamples were constructed as early as 1938 by H. Auerbach. In higher dimensions, the first counterexamples for density $D = 1/2$ were only recently discovered by D. Ryabogin (Annals of Mathematics, 2022). For densities $D \neq 1/2$ in the two-dimensional case, the problem can be reformulated in terms of the perimetral density σ (the fraction of the perimeter cut off by the waterline). In 2004, J. Bracho, L. Montejano, and D. Oliveros showed that for $\sigma = 1/3, 1/4, 1/5$, and $2/5$, the answer is affirmative (the disk is the unique solution), while in 2022–2008 F. Wegner constructed counterexamples for certain other densities. In this talk, I will present a recent joint result with O. Asipchuk and M. Kosmakov, providing an affirmative answer for the case of perimetral density $\sigma = 1/6$.

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