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Symbolic counter-examples for quantitative multiple recurrence problems

Furstenberg multiple convergence theorem states that for every set A with positive measure in a measure preserving system, there are infinitely many n such that the set $A \cap T^{-n}A \cap \cdots \cap T^{-dn}A$ is of positive measure. In stead of asking the positivity of the measure of the set $A \cap T^{-n}A \cap \cdots \cap T^{-dn}A$, quantitative multiple recurrence problems studies how far (and how often) is this measure away from 0. In this talk, I will introduce recent advances of this topic as well as its connection to the symbolic dynamics and combinatorics. This is joint work with Sebastian Donoso.