

FROM ADDITIVE COMBINATORICS TO GEOMETRIC MEASURE THEORY

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Additive combinatorics is a loosely defined area of mathematics that aims to understand the additive structure of subsets of some ambient group, such as the presence of arithmetic progressions, and the behaviour under sumsets and convolutions. Many tools developed in additive combinatorics are very powerful and have found applications in harmonic analysis, geometric measure theory, and ergodic theory, among other areas.

The aim of the course is to introduce some of the main concepts and results from additive combinatorics, focusing on those that have been applied to a wide variety of areas outside of combinatorics itself, and then survey a selection of applications to geometric measure theory, including Bourgain's discretized sum-product theory (and further applications), and the resolution of Furstenberg's conjecture on the intersections of Cantor sets arising from expansions in incommensurable bases.