When Additive Combinatorics meets Ergodic Theory and Fourier Analysis

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A celebrated theorem of Szemeredi asserts that every subset of integers with nonvanishing upper Banach density contains arbitrarily long arithmetic progressions. I will discuss the role of ergodic theory and Fourier analysis in this problem. I will also explain how this problem led to the conjecture of Furstenberg-Bergelson-Leibman, which is a major open problem in pointwise ergodic theory.