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Metric Discrepancy Theory

Abstract

This is a survey on progress in metric discrepancy theory and probabilistic aspects in harmonic analysis. We start with classical limit theorems of Salem and Zygmund as well as with the work of Erdős and Gaál and of Walter Philipp. A focus lies on laws of the iterated logarithm for discrepancy functions of lacunary sequences. We show the connection to certain diophantine properties of the underlying lacunary sequences obtaining precise asymptotic formulas. Different phenomena for subexponentially growing, for exponentially growing and for superexponentially growing sequences are established. Furthermore, relations to arithmetic dynamical systems and to Donald Knuth's concept of pseudorandomness are discussed. Recent results are contained in joint work with Christoph Aistleitner and István Berkes and it is planned to publish parts of it in a Jean Morlet Springer lecture Notes volume.