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A probabilistic approach to the almost-periodicity of convolutions

For two sets A and B in a finite abelian group, it is a classical result of Bogolyubov that the convolution $1_A * 1_B$ is L^2 -almost-periodic, i.e., that there are many translates $1_A * 1_B(\cdot + t)$ that approximate $1_A * 1_B(\cdot)$ in L^2 . This was extended to L^p -almost-periodicity for $p > 2$ by Bourgain, who applied the result to show that the sumset $A + B$ of two dense sets $A, B \subset \mathbb{Z}/N\mathbb{Z}$ contains long arithmetic progressions. We shall describe some versions of these almost-periodicity results that are valid also for non-abelian groups and give some applications. Joint work with E. Croot.