Applications of harmonic analysis to packing and covering problems

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I'll begin with an overview of the Poisson summation formula, and in particular why this tool from harmonic analysis is so potent in geometric problems -- even ones not specifically about lattices. I'll then discuss two recent applications:

1) the "Universal Optimality Theorems" joint with Cohn, Kumar, Radchenko, and Viazovska, which in certain dimensions give provable energy-minimizing configurations of points of a fixed density;

and

2) l_p "transference theorems" in the geometry of numbers, joint with Noah Stephens-Davidowitz, which relate the shortest nonzero vector in a lattice to the covering radius of the dual lattice.