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Random Latices as Sphere Packings

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In 1945, Siegel showed that the expected value of the lattice-sums of a function over all the lattices of unit co-volume in an n-dimensional real vector space is equal to the integral of the function. In 2012, Venkatesh restricted the lattice-sum function to a collection of lattices that had a cyclic group of symmetries and proved a similar mean value theorem. Using this approach, new lower bounds on the most optimal sphere packing density in n dimensions were established for infinitely many n.
In the talk, we will outline some analogs of Siegel's mean value theorem over lattices. This approach has modestly improved some of the best-known lattice packing bounds in many dimensions. We will also show how such results can be made effective and talk about some variations.
Joint work with Vlad Serban.

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