Probabilistic and geometric aspects of classical and non-commutative ℓ_p-type spaces in high dimensions

Doktorandenkolloquium
von Michael L. Juhos
am Mittwoch, 29.5.2024 um 15:40 Uhr
im HS 13, IM, Innstr. 33 der Universität Passau
oder auch per Zoom (der Zoomlink wird intern gemailt)

(Betreuer: Prof. Dr. Joscha Prochno)

Within the last few decades there has evolved at the crossroads of analysis, geometry and probability the field of asymptotic geometric analysis, going back at least to the application of probabilistic methods in the local theory of Banach spaces by Maurey and Pisier in the 1970s; among the highlights are V. Milman's proof of Dvoretzky's theorem, the central limit theorem for convex bodies by Klartag and recently the introduction of an asymptotic thin-shell condition by Kim, Liao, and Ramanan.

Because of their amenability to direct computation, the classical ℓ_p-sequence spaces, both finite- and infinite-dimensional, have attracted much attention and their geometry is very well understood now. The employment of probabilistic methods for the investigation of these spaces is made possible by a simple, yet powerful probabilistic representation of the uniform distribution on the unit ball. An equally classic object from functional analysis are the noncommutative analogues of ℓ_p-spaces, namely the Schatten-p classes S_p of compact operators or matrices; here computations are more involved because of the definition via singular values, and the use of probabilistic tools is more recent. Another class of ℓ_p-type spaces whose functional-analytic properties are well-studied are those with a mixed norm, though their geometry has not received much attention yet.

In this talk we will present a new probabilistic representation of the uniform distribution on the unit ball of mixed norm spaces and deduce therefrom weak limit theorems for the mixed norm of a random vector sampled from the unit ball and for its components. We also mention a few results on Schatten classes of nonsquare matrices, like the exact volume of the S_∞-unit ball.