Probabilistic Operator Algebra Seminar

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Title: *Weighted Sums in free Probability Theory*

In classical probability the following phenomenon was proven by Klartag and Sodin in 2010: Let $(X_i)_{i\in\mathbb{N}}$ be a sequence of independent identically distributed random variables with finite fourth moments. Consider weighted sums of the form $\theta_1 X_1 + \cdots + \theta_n X_n$ for some vector $\theta = (\theta_1, \ldots, \theta_n)$ taken from the unit sphere. Then for most choices of the vector θ, the distribution of such a weighted sum converges faster to the standard Gaussian distribution than the classical Berry-Esseen theorem suggests. In more detail, Klartag and Sodin obtained a rate of convergence of order n^{-1} whereas the standard rate is given by $n^{-1/2}$. We prove an analogue statement in the setting of free probability theory. Moreover, we show that weighted sums also exhibit a better behavior in the context of superconvergence. This talk is based on arXiv:2303.06489.