Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

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Title: *Central limit theorems for star-generators of the infinite symmetric group.*

Distributional invariance principles like exchangeability or spreadability imply algebraic central limit theorems in the context of noncommutative probability spaces. An interesting class of such examples is available for the infinite symmetric group S_∞. Here the transpositions $(1, n+1)$, known as star-generators, provide an exchangeable sequence of noncommutative random variables with respect to any fixed character character of S_∞, as observed in [2]. If the (extremal) character is the one associated to the left regular representation of S_∞, the resulting central limit law is Wigner's semicircle law, as shown by Biane in 1995. A more general class of extremal characters are provided by block characters of S_∞, which are parametrized by a natural number $d \geq 2$. Given this parameter d, the resulting central limit law for a block character of S_∞ is identified in [3] to be the law of a random Hermitian $d \times d$-matrix, known as a "traceless GUE matrix" in the literature. Considering an even larger class of extremal characters in the Thoma classification scheme, the central limit law is that of a "traceless CCR-GUE matrix", as we coined it in [1]. Here the role of classical Gaussian random variables in a GUE matrix is now played by CCR-complex-Gaussian random variables. My talk will overview these recent developments, with emphasis on the results jointly obtained with Jacob Campbell and Alexandru Nica in [1].

[1] Campbell, Jacob; Köstler, Claus; Nica, Alexandru. A central limit theorem for star-generators of S_∞, which relates to traceless CCR-GUE matrices Internat. J. Math. 33 (2022), no.9, Paper No. 2250065, 46 pp.

[2] Gohm, Rolf ; Köstler, Claus. Noncommutative Independence from characters of the infinite symmetric group S_∞. e-Preprint (2010), arXiv:1005.5726, 47pp.

[3] Köstler, Claus; Nica, Alexandru. A central limit theorem for star-generators of S_∞, which relates to the law of a GUE matrix. J. Theoret. Probat. 34 (2021), no. 3, 1248-1278.