

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

March 15 **Felix Parraud**, University of Lyon and Kyoto University

Title: *Interpolation between random matrices and their free limit with the help of free stochastic calculus*

It has been known for a long time that as their size grow to infinity, many models of random matrices behave as free operators. This link was first explicitated by Voiculescu in 1991 in a paper in which he proved that the trace of polynomials in independent GUE matrices converges towards the trace of the same polynomial evaluated in free semicircular variables. In 2005, Haagerup and Thorbjornsen proved the convergence of the norm instead of the trace. The main difficulty of their proof was to prove a sharp enough upper bound of the difference between the trace of random matrices and their free limit. They managed to do so with the help of the so-called linearization which allows to relate the spectrum of a polynomial of any degree with scalar coefficients with a polynomial of degree 1 with matrix coefficients. A drawback of this method is that it does not give easily good quantitative estimates. In arXiv:1912.04588, we introduced a new strategy to approach those questions which does not rely on the linearization trick and instead is based on free stochastic calculus. In this talk I will first introduce necessary notion in Random Matrix Theory and Free Probability. Then I will explain the method that we used and finally I will give the results that we obtained in this paper as well as in other related paper such as arXiv:2005.13834 and arXiv:2011.04146.