

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

November 8 **Jorge Garza-Vargas**, UC Berkeley

Title: *Finite Free Cumulants: Multiplicative Convolutions, Genus Expansion, and Infinitesimal Distributions*

Finite free probability studies certain classical polynomial convolutions in the context of free probability. In this talk I will focus on the finite free multiplicative convolution, denoted by \boxtimes_d . To motivate the study of this convolution I will present a new short and conceptual proof of a recent result [Steinerberger (2020), Hoskins and Kabluchko (2020)] that connects root distributions of polynomial derivatives with free fractional convolution powers.

Then, for two polynomials $p(x)$ and $q(x)$ of degree d , I will present a formula that rewrites the finite free cumulants of $p \boxtimes_d q$ in terms of the finite free cumulants of p and q , and explain that this formula admits a topological expansion in d . The leading term of this topological expansion coincides with a formula due to Nica and Speicher for the free cumulants of multiplicative free convolutions of measures, while the term of order $1/d$ is written in terms annular non-crossing partitions and allows us to study infinitesimal distributions of sequences of real-rooted polynomials. This is joint work with Octavio Arizmendi and Daniel Perales: arXiv:2108.08489