

Probabilistic Operator Algebra Seminar

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November 27 **Octavio Arizmendi**, CIMAT Guanajuato

Title: *A variational approach to free convolutions*

For μ and ν , compactly supported probability measures on the real line with densities with respect to the Lebesgue measure. We show that for real z if $\mu \boxplus \nu$ is their additive free convolution, we have $\int \log(z - x) \mu \boxplus \nu(dx) = \sup(\mathbb{E}[\log(z - (X + Y))] - \text{Ent}[\Pi] + \text{Ent}[\mu] + \text{Ent}[\nu])$, where the supremum is taken over all probability laws Π on \mathbb{R}^2 with respective marginal laws μ and ν , and given a probability law Π with density function f on \mathbb{R}^k , $\text{Ent}[\Pi] = \int f \log f$ is its classical entropy. Our approach is based on applying a large deviation principle on the symmetric group to the celebrated quadrature formulas of Marcus, Spielman and Srivastava. We end with some consequences of the variational principle and the solution coming from it. This talk is based on joint work with Samuel G. G. Johnston arXiv:2309.12196.