

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

October 24 **Jacob Campbell**, University of Waterloo

Title: *Commutators in finite free probability.*

In the finite free probability theory introduced by Marcus, Spielman, and Srivastava in 2015, there is now a good amount known about their "d-free" additive and multiplicative convolution operations. The basis for most results in this area is a pair of simple formulas for the expected characteristic polynomials of $A + UBU^*$ and $AUBU^*$, where U is a $d \times d$ random unitary matrix and A and B are fixed $d \times d$ matrices.

The next natural question in this vein is whether one can similarly describe the expected characteristic polynomial of the commutator $AUBU^* - UBU^*A$. After reviewing some of the basic ideas of finite free probability, I will explain how this question can be answered (arXiv:2209.00523) using Weingarten calculus and a 1992 result of Goulden and Jackson to compute immanants of certain low-rank matrices. I will also say a bit about the prospects for a d -finite version of the Nica-Speicher formula for the free cumulants of commutators of free variables.