

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

April 20 **Tobias Mai**, University of Saarbruecken

Title: *Free and cyclic differential calculus and characterizations of gradients*

Free and cyclic derivatives play an important role in the analytic theory of free probability. This demands for a better understanding of the basics of this highly noncommutative counterpart of classical differential calculus. A very fundamental question is whether gradients can be characterized similar to the classical Poincare Lemma. In 2000, Dan-Virgil Voiculescu proved such a characterization for cyclic gradients of noncommutative polynomials. In my talk, which is based on joint work with Roland Speicher, I will present extensions of this remarkable result in two different directions : first, we obtain an analogous characterization of free gradients; second, we lift both of these results to Voiculescu's framework of multivariable generalized difference quotient rings.