Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

June 5 **Pavel Gumenyuk**, Politecnico di Milano

Title: *Methods of holomorphic dynamics in the study of branching processes*

We discuss complex-analytic tools provided by Loewner Theory, and their applications to stochastic branching processes with continuous time. It is well- known that one-parameter semigroups of holomorphic self-maps (of the unit disk or a half-plane) appear in a natural way in the study of time homogeneous branching processes. Recently there has been growing interest to understand deeper the inhomogeneous case, in which one-parameter semigroups have to be replaced by (reverse) evolution families. The intrinsicversion of Loewner Theory suggested by Bracci, Contreras and Diaz-Madrigal [https://doi.org/10.1515/CRELLE.2011.167, https://doi.org/10.1007/s00208-009-0340-x] provides a suitable framework for studying evolution families contained in a given compositional semigroup of holomorphic self-maps. The talk is mainly based on two joint preprints with Takahiro Hasebe (Hokkaido University) and José-Luis Pérez (CIMAT Guanajuato) arXiv:2206.04753 and arXiv:2211.12442. We study evolution families of Bernstein functions, which describe (via the Laplace transform) the transition probabilities of continuous-state branching processes. In particular, we establish a one-to-onecorrespondence between (families of transition kernels of) a wide class of continuous-state branching processes, on the one side, and reverse evolution families satisfying a suitable version of the Loewner-Kufarev ODE on the other side, and try to explore probabilistic interpretations of their dynamics properties. We also consider discrete-state branching processes and solve the "spatial embeddability" problem (i.e. the problem of embedding into a continuous-state process).