

Title: Combinatorial conversion and disassociator dynamics for stochastic rewriting systems

ABSTRACT: The so-called rule algebraic framework for stochastic graph rewriting systems introduced in [1,2] provides an excellent starting point to investigate the combinatorial properties of such discrete rewriting systems. Compared to more traditional combinatorial concepts such as urn models and normal-ordering procedures, graph rewriting provides a powerful (Turing-complete!) extension capable of describing relationships between combinatorial entities rather than purely discrete objects. A traditional example of vast interdisciplinary interest would be the study of network models. The purpose of this extended talk is two-fold: in the first part, I plan to present the formalism in a format accessible to non-experts, highlighting in addition the precise connection between the traditional, category-theoretic approach to graph rewriting and the new rule algebraic approach. In the second part of the talk I will present a new result, the so-called combinatorial conversion theorem, which clarifies the precise relationship between combinatorial analysis in the form of normal-ordering procedures and generating function techniques on the one hand and the combinatorially accessible data of stochastic graph rewriting models on the other hand. As a rather intriguing corollary, time permitting I will also present the equally novel concept of disassociator dynamics, namely a variant of moments of observables specifically useful for studying complicated dynamical systems that are not amenable to other analysis techniques in practice. The talk will be concluded with the case study of a number of analytically solvable examples of graph rewriting systems.

[1] N. Behr, V. Danos and I. Garnier, *Stochastic mechanics of graph rewriting*, In Proceedings of the 31st Annual ACM/IEEE Symposium on Logic in Computer Science, pp. 46-55. ACM, 2016.

[2] N. Behr, V. Danos, I. Garnier and T. Heindel, *The algebras of graph rewriting*, arXiv preprint arXiv:1612.06240 (2016).