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Regularly varying Markov trees

Abstract: Extreme values of regularly varying Markov chains can be described in terms of the limiting conditional distribution of the normalized chain given that it is large at a particular time instant [1]. The limit distributions are called forward and backward tail chains, according to the time direction considered [2]. Viewing a chain as a tree consisting of a single, long branch, we seek for generalizations to general Markov trees, i.e., random vectors whose dependence structure is governed by a tree representing a set of conditional independence relations together with a collection of bivariate distributions along the tree edges [3]. As for Markov chains, we find that extremal dependence of such Markov trees can be described in terms of a collection of tail trees, each tree describing the limit distribution of the rescaled Markov tree given that its value at a particular node is large. Moreover, the time-change formula for tail chains generalizes to a relation between these tail trees. Tail trees can be used to compute quantities such as the number of nodes in the graph affected by a shock at a particular node or the probability that a particular part of the graph will be affected by a shock in another part of the graph. Moreover, specifying the graph structure and the bivariate distributions along the edges provides a construction method for max-stable models.

This talk is based on joint work with Gildas Mazo.

References:

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