From Cascading Extremes to Generative Models for Extremes

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Abstract

In this talk, I will first introduce cascades of extremes, as recently proposed by de Carvalho, Ferrer and Vallejos (2026, Extremes). Examples include an earthquake followed by a tsunami and a sequence of extreme stock-market losses. A neural model will illustrate the main concepts and ideas.

I will then explain how this sequential perspective motivates generative models for extremes. I will introduce a framework based on extreme value theory in which causal attention is used to generate cascades. A causal transformer encodes the history of extreme events in a latent state governing the direction, magnitude and timing of subsequent events. Simulations and applications to real data will illustrate the proposed approaches.