UNIVERSITÄT BERN

Philosophisch-naturwissenschaftliche Fakultät

Departement Mathematik und Statistik

Institut für mathematische Statistik und Versicherungslehre

Kolloquiumsvortrag in Statistik

Freitag, 13. Oktober 2023, 15.15 Uhr

Hörsaal -203, Alpeneggstrasse 22, 3012 Bern

Prof. Dr. Almut E. D. Veraart, Imperial College London

Title: Extreme event propagation using counterfactual theory and vine copulas

Understanding multivariate extreme events play a crucial role in managing the risks of complex systems since extremes are governed by their own mechanisms. Conditional on a given variable exceeding a high threshold (e.g. traffic intensity), knowing which high-impact quantities (e.g. air pollutant levels) are the most likely to be extreme in the future is key.

We investigate the contribution of marginal extreme events on future extreme events of related quantities. We propose an Extreme Event Propagation framework to maximise counterfactual causation probabilities between a known cause and future high-impact quantities. Extreme value theory provides a tool for modelling upper tails whilst vine copulas are flexible devices for capturing a large variety of joint extremal behaviours.

We optimise for the probabilities of causation and apply our framework to a London road traffic and air pollutants dataset. We replicate documented atmospheric mechanisms beyond linear relationships. This provides a new tool for quantifying the propagation of extremes in a large variety of applications.
Joint work with Valentin Courgeau.

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