



KATHOLISCHE UNIVERSITÄT
EICHSTÄTT-INGOLSTADT

Mathematisches Kolloquium

Detecting causality from time series in a machine learning framework

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Donnerstag, 14. Juli 2022, KG I/Bau A 304, 11.00 Uhr

Eine digitale Teilnahme am Kolloquium via Zoom ist ebenfalls möglich.

Bitte melden Sie sich bei Frau C. Seibert per Email (caroline.seibert@ku.de) an, dann werden Sie den Zugangslink erhalten.



Abstract:

Detecting causality from observational data is a challenging problem. Here, we propose a machine learning based causality approach, Reservoir Computing Causality (RCC), in order to systematically identify causal relationships between variables. We demonstrate that RCC is able to identify the causal direction, coupling delay, and causal chain relations from time series. Compared to a well-known phase space reconstruction based causality method, Extended Convergent Cross Mapping, RCC does not require the estimation of the embedding dimension and delay time. Moreover, RCC has three additional advantages:

- (i) robustness to noisy time series;
- (ii) computational efficiency; and
- (iii) seamless causal inference from high-dimensional data.

We also illustrate the power of RCC in identifying remote causal interactions of high-dimensional systems and demonstrate its usability on a real-world example using atmospheric circulation data. Our results suggest that RCC can accurately detect causal relationships in complex systems.

