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Academy of Mathematics and Systems Science, CAS Colloquia & Seminars

Speaker: 卢祖帝教授, University of Southampton

Inviter:

Title: Dynamic Learning and Modelling of Nonlinear Spatio-Temporal Network Data: theory with an application to the EU energy markets

Language: Chinese

2022.12.08 16:00-17:30 腾讯会议: 601647136

Time & Venue:

Abstract:

Nonlinear modelling of dynamic spatio-temporal network data is often a challenge with various issues, in particular due to irregularly observed locations and location-wide non-stationarity. In this paper we propose a semiparametric family of Dynamic Functional-coefficient Autoregressive Spatio-Temporal (DyFAST) models to address the difficulties. We specify the autoregressive smoothing coefficients depending dynamically on both a concerned regime and location so that the models can characterise not only the dynamic regime-switching nature but also the location-wide non-stationarity in real spatio-temporal data. Different semiparametric smoothing schemes are then proposed to model the dynamic neighbouring-time interaction effects with irregular locations incorporated by (spatial) weight matrices. The first scheme popular in econometrics supposes that the weight matrix is pre-specified. We show that the greedy idea of seeking locally optimal modelling, popular in machine learning, should be cautiously applied. Moreover, in practice, many weight matrices can be generated differently by data location features. Model selection for an optimal one is popular, but may suffer from loss of features of different candidates. Our second scheme is thus to suggest a weight matrix fusion to let data combine or select the candidates with estimation done simultaneously. Both theoretical properties and Monte Carlo simulations are investigated. The empirical application to an EU energy market dataset further demonstrates the usefulness of our DyFAST models with a significant improvement over other methods in forecasting.

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