

「数理モデリングと数学解析研究部門」ワークショップ
『ビッグデータ解析及び逆問題解析の数学的アプローチ』
のお知らせ

東京理科大学総合研究院「数理モデリングと数学解析研究部門」では
University of Reading (英国) の Roland Potthast 教授、Southeast
University (中国) の Jijun Liu 教授及び北海道大学の中村玄名誉教授をお招
きし、ビッグデータ解析及び逆問題解析の数学的アプローチについてご講演頂
きます。皆様のご参加をお待ちしております。

・日時(Date): 平成 29 年 2 月 24 日(金) February 24, 2017 (Fri.) 14:00—17:00

・場所(Place): 東京理科大学神楽坂校舎 7 号館 4 階 7 4 2 教室

Room 742 (4th floor), Building No. 7, Kagurazaka campus,
Tokyo University of Science

Program

14:00–15:00 Roland Potthast (DWD, Germany/University of Reading, UK)
The Mathematics of Data in Dynamical Models
- from Weather Prediction to Neuroscience

15:20–16:00 Jijun Liu (Southeast University, P.R.China)
Identification of non-smooth boundary heat dissipation
by partial boundary data

16:20--17:00 Gen Nakamura (Hokkaido University)
Identification of elasticity tensor by boundary measurements



東京理科大学
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総合研究院「数理モデリングと数学解析研究部門」

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➤ Prof. Roland Potthast (DWD, Germany/University of Reading, UK)
The Mathematics of Data in Dynamical Models - from Weather Prediction to Neuroscience

Abstract :

The use of real data in dynamical models to analyse the state of the model or some of the underlying parameter distributions and forecast the development of the system state is of tremendous importance in for the human society. Application fields range from weather prediction and climate change to medical diagnostics and treatment.

The agenda of operational centers for weather forecasting includes the development and operation of ensemble forecasting system (EPS) on all scales, which have the ability to model and describe the distribution of possible events and as such the variability of extreme weather, its variables and phenomena.

We describe the setup of the ensemble data assimilation (EDA) and forecasting systems which have been developed and are under development at the German weather service DWD, including the ICON global model with its hybrid ensemble variational data assimilation (EnVAR) and ensemble prediction system ICON EPS as well as the high-resolution ensemble data assimilation system COSMO-KENDA (Kilometer Scale Ensemble Data Assimilation), which is in the process of becoming the operation system at DWD and further members of the COSMO consortium (Germany, Italy, Russia, Switzerland, Poland, Greece, Romania and Israel) to drive the high-resolution ensemble forecasting system COSMO-DE-EPS. We demonstrate the high quality of the system.

We will then develop a setup of a joint kernel estimation and data assimilation forecasting system for neural field theory. Here, the task is two-fold: first there is the need to estimate the neural activity from EEG and other measurements. Second, the neural connectivity kernel is usually unknown and needs to be reconstructed. Forecasting relies on both the connectivity and state estimation. An iterative method is introduced and we show the feasibility of the approach.

➤ Prof. Dr. Jijun Liu

(Department of Mathematics, Southeast University, P.R.China)

Identification of non-smooth boundary heat dissipation by partial boundary data

Abstract :

When electronic devices are in operation, the sharp change of the temperature on devices surface can be considered as an indicator of devices faults. Based on this engineering background, we consider an inverse problem for 1-dimensional heat conduction model, with the aim of detecting the nonsmooth heat dissipation coefficient from measurable temperature on the device surface. We establish the uniqueness for the nonsmooth dissipation coefficient and prove the convergence property of the minimizer of the regularizing cost functional for the inverse problem theoretically. Then a double-iteration scheme minimizing the data-match term and the regularization term alternatively is proposed to implement the reconstructions. Numerical experiments are presented to show the validity of the proposed scheme. This work is supported by NSFC (No.11531005).

➤ Prof. Gen Nakamura (Hokkaido University)

Identification of elasticity tensor by boundary measurements

Abstract :

The uniqueness of Calderon problem for three dimensional elasticity has not been solved even for isotropic elasticity. So far there is a partial result by Nakamura-Uhlmann and Eskin-Ralston for isotropic elasticity. In this talk I will consider the case that the elasticity tensor is piecewise constant or piecewise analytic. The anisotropy of elasticity tensor can be allowed in some cases. This study stemmed out from the joint work with C. Carsteas (National Taiwan University).