

Beyond the Kalman Filter: Bayesian Recursive Filtering in Engineering and Finance

Overview

The problem of estimating the unobserved states of a system from observed data often arises in many branches of science, ranging from tracking the location of an object from radar-based observations to estimating the volatility from observed prices of financial securities. Filtering refers to any method for obtaining such state estimates, recursively in time, by combining model predictions with noisy observations. If the future state depends linearly on the present state, a state estimator which is optimal in certain sense is known after its inventor as the Kalman filter (KF), is popular in engineering, finance and econometrics since 1970s. While the use of KF is well-understood for linear models, nonlinear models are often needed to describe the observed dynamics adequately.

Exact nonlinear filtering is often impossible and various Bayesian approximations exist to solve the filtering problem. Over the last two decades, significant advances have been made in theory and applications of nonlinear filtering. These developments have mostly occurred independently in different branches of science such as mathematical finance and engineering, with limited opportunities for knowledge transfer from one research community to another.

The proposed intensive course will guide the participants through the theory and practice of linear and nonlinear filtering. Theory, including the state of the art developments in filtering as applied in engineering as well as in mathematical finance, will be taught through class-room based lectures. The participants will have an opportunity to implement the filtering algorithms they learn in the class on prototype simulations in a high level programming language such as Matlab, in supervised tutorial sessions.

Objectives

The primary objectives of the course are as follows:

1. Exposing the participants to the state of art knowledge on nonlinear estimation.
2. Providing exposure to practical estimation problems in finance and engineering.
3. Building confidence in designing filters for real-life problems through hands-on simulation sessions.
4. Enhancing capabilities of the participants in identifying estimation problem and implementing suitable estimators to achieve the chosen objectives.

Modules	1st Jan 2018 to 5th Jan 2018 Number of participants for the course will be limited to fifty.
You Should Attend If...	<ul style="list-style-type: none"> ▪ Executives, engineers, researchers and scientists from R&D laboratories, engaged in designing estimators for various applied fields. ▪ Student, faculty, researchers from academic institution interested in learning nonlinear estimation for Engineering and finance applications.
Fees	Participants from abroad: USD 200 Industry/ Research Organizations: INR 5000 Academic Institutions: INR 3000 Students & Research Scholars: INR 1000 The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility. The participants may be provided with accommodation on payment basis based on availability in guest house and student hostels.

The Faculty



Dr Paresh Date is a faculty in the Department of Mathematics at Brunel University. He did his doctoral studies in engineering at University of Cambridge, UK under Cambridge Nehru Fellowship. His research interests include nonlinear filtering and its applications in non-traditional domains such as quantitative finance and biomedical engineering, and optimization problems in power markets.



Dr Shovan Bhaumik is an Associate Professor of Electrical Engineering Department, Indian Institute of Technology Patna. His research interests include nonlinear estimation, statistical signal processing, control systems and their applications in military target tracking.



Dr Nutan Kumar Tomar is an Associate Professor of Indian Institute of Technology Patna. His research interest is mathematical control theory.

For Registration

Register at GIAN site: <http://www.gian.iitkgp.ac.in/GREGN> and sent application with fees to course coordinator

Deadline for submitting application: 12th Dec, 2017

Notification of acceptance: 15th Dec, 2017

Boarding & Lodging

Limited accommodation is available in the Institute Guest house/ Hostels for a very limited number of participants on payment as per actual and with advance request.

Course Co-ordinator

Dr. Shovan Bhaumik

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