



DS 391 Jan 3:0

Data Assimilation to Dynamical Systems

Instructor

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Department: Computational and Data Sciences

Course Time:

Lecture venue: CDS 309

Detailed Course Page: <http://cds.iisc.ac.in/courses/descriptions/>

Announcements

Brief description of the course

This course introduces an advanced topic, namely systematic data assimilation to dynamical systems. This is a "topics" style advanced course meant for research students.

Prerequisites

Elements of statistical analysis and probability theory; some dynamical systems.

Syllabus

Quick introduction to nonlinear dynamics: bifurcations, unstable manifolds and attractors, Lyapunov exponents, sensitivity to initial conditions and concept of predictability. Markov chains, evolution of probabilities (Fokker-Planck equation), state estimation problems. An introduction to the problem of data assimilation (with examples) Bayesian viewpoint, discrete and continuous time cases Kalman filter (linear estimation theory) Least squares formulation (possibly PDE examples) Nonlinear Filtering: Particle filtering and MCMC sampling methods. Introduction to Advanced topics (as and when time permits): Parameter estimation, Relations to control theory, Relations to synchronization.

Course outcomes

Familiarity with basics of modern data assimilation techniques

Grading policy

midterms/projects - 50%, final exam or project - 50%

Assignments

Resources