E9 211 Aug 3:0

Adaptive Signal Processing

Instructor

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Department: ECE

Course Time: Mon, Wed, 1400-1530

Lecture venue: ECE 1.07

Detailed Course Page:

Announcements

Brief description of the course

The course is for students who are familiar with first principles of detection and estimation theory and who wish to explore the techniques for time-varying environments and to reduce the computational complexity of known estimation techniques.

Prerequisites

Random processes, Matrix Theory, Optimization

Syllabus

Review of estimation theory. Wiener Solution. Kalman filter and its application to estimation, filtering and prediction. Iterative solution; of method of steepest descent and its convergence criteria, least mean square gradient algorithm (LMS), criteria for convergence and LMS versions: normalized LMS, leaky, sign, variable stepsize, transform domain LMS algorithm using DFT and DCT. Block LMS (BLMS) algorithm: frequency domain BLMS (FBLMS). Recursive least square (RLS) method, fast transversal, fast lattice RLS and affine projection algorithms. Applications of adaptive filtering: spectral estimation, system identification, noise cancelling acoustic and line echo cancellation, channel equalization.

Course outcomes

The students would learn how to use iterative techniques to solve parameter estimation problems. Further, the theoretical guarantees of iterative and recursive methods will be learnt to enable them to choose the appropriate method for signal processing systems. A good understanding of techniques like Kalman Filtering and Recursive Least-Squares techniques will be useful to extend them to machine learning paradigms

Grading policy

30% for assignments, 20% for mid-term, 50% for final exam

Assignments

Resources