FEM3210 Estimation Theory 10.0 credits

Estimeringsteori

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Sufficiency in probability theory, calculus and linear algebra (matrix analysis useful but not required).

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course the student should be able to:

·   Describe the difference between the classical and Bayesian approach to estimation; describe the notions of estimator bias, variance, and efficiency; and describe the notion of sufficient statistics and its meaning in minimum variance unbiased (MVU) estimation.

·   Formulate system models and parameter estimation problems and derive corresponding Cramer-Rao lower bounds and sufficient statistics. Prove optimality of estimators.

·   Apply appropriate estimators – including linear, least squares, maximum likelihood, and method of moments estimators – after considering estimation accuracy and complexity requirements

·   Work with both real and complex valued data models.

Course contents

·   Introduction

·   Minimum Variance Unbiased Estimation, Cramer-Rao Lower Bound

·   Linear Estimators

·   Maximum Likelihood

·   Least Squares

·   The Method of Moments

·   Bayesian Methods

·   Extension to Complex Data

Disposition

6 Lectures, 6 extensive homework peer graded homework sets, 2 project assignments, 48h take home exam.

Course literature

Steven M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory", Prentice Hall, ISBN 0-13-345711-7

Equipment

Access to a computer with Matlab for projects.

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

A score of 90 on 58 homework problems (78%) grades according to;0: didn't try or completely incorrect, 1: almost correct (or solved parts of the problem), 2: correct. Completion of 2 project assignments. 50% on 48h take home exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.