EQ2401 Adaptive Signal Processing 7.5 credits

Adaptiv signalbehandling

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

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

Establishment

Course syllabus for EQ2401 valid from Spring 2019

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

For single course students: 180 ECTS credits and documented proficiency in English B or equivalent.

Language of instruction

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

Intended learning outcomes

After completing the course, the student should be able to:

- Design and apply optimal minimum mean square estimators and in particular linear estimators. To understand and compute their expected performance and verify it.
- Design, implement and apply Wiener filters (FIR, non-causal, causal) and evaluate their performance.
- Design, implement and apply the different adaptive filters to given applications.
- Analyze the accuracy and determine advantages and disadvantages of each method.
- Use the theoretical understanding to do troubleshooting, e.g., in cases the observed performance is not as expected.
- Report the solution and results from the application of the filtering techniques to given problems.

Course contents

This course teaches adaptive signal processing algorithms for extracting information from noisy signals. The emphasis is on recursive, model based estimation methods for signals and systems whose properties change in time. Applications in, for example, communications, control and medicine are covered.

The course presents the fundamentals of adaptive signal processing; mean-square estimation, Wiener filters. Introduction to adaptive filter structures and the least squares method. State space models and optimal (Kalman) filtering. Stochastic gradient, LMS (least mean squares), and RLS (recursive least squares) methods. Analysis of adaptive algorithms: Learning curves, convergence, stability, excess mean square error, mis-adjustment. Extensions of LMS and RLS.

Course literature

Will be announced on the course homepage before course start.

Examination

- PRO1 - Project 1, 1.5 credits, grading scale: P, F
- PRO2 - Project 2, 1.5 credits, grading scale: P, F
- TEN1 - Exam, 4.5 credits, grading scale: A, B, C, D, E, FX, F

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.

Other requirements for final grade

2 Project assignments (PRO1, 1,5 ECTS credits, grading P/F; PRO2, 1,5 ECTS credits, grading P/F) completed and reported in pairs of at most 2 students before given deadlines.

Written exam (TENA, 4,5 ECTS credits, grading A-F)

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.