FEO3310 Gles Signalbehandling 8,0 hp

Sparse Signal Processing

Fastställande

Kursplan för FEO3310 gäller från och med HT11

Betygsskala

G

Utbildningsnivå

Forskarnivå

Särskild behörighet

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

After the course, the students should be able to :
(1) Understand the key concept of sparsity in nature that relates to the fact that most of the signals
and systems have low degrees of freedom and then identify relevant research problems.
(2) Formulate and use a linear model setup for describing a sparse signal and system setup.
(3) Apply algorithmic tools to solve for a sparse solution such that overall system efficiency

increased.
(4) Design and compare several algorithms applied to a particular signal and system setup, using
appropriate simulation platform and analytical tools.
(5) Contribute to the frontier research in the area.

Kursinnehåll

The course is focused on solving a sparse solution of a linear under-determined system with the trade-off
between complexity and performance. A brief outline of the course contents is as follows.
(1) The key problem of solving a linear under-determined system and sparsity
(2) Pursuit algorithms – Design and their theoretical performance guarantees
(3) From exact to approximate solutions
(4) Iterative-shrinkage algorithms
(5) Towards average performance analysis
(6) The Dantzig-Selector algorithm
(7) MAP versus MMSE estimation

Kursupplägg

Lectures, group and individual discussion of research papers, project assignment and a final examination of five
hours.

Kurslitteratur

Michael Elad, “Sparse and Redundant Representations: From Theory to Applications in Signal and Image
Precessing” 2010, Springer

Examination

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Övriga krav för slutbetyg

The evaluation criteria are the presentation of research papers and project assignments. Each paper presentation
will be graded according to (approximate thresholds):

-1 : less that 20% of the paper is understood correctly
0 : between 20 % to 40% of the paper is understood correctly
1 : between 40% to 70% of the paper is understood correctly
2 : more than 70% of the paper is understood correctly
There are three paper presentations (two in a group as a technical note preparation and one individually as a
paper presentation) and the threshold for receiving a pass-grade is four points.
In addition, the student has to successfully complete two project assignments. The project assignments will
mainly focus on implementing algorithms and their use in practice. Each project assignment will be graded
according to (approximate thresholds):
-1 : less that 20% of the project executed
0 : between 20 % to 40% of the project executed
1 : between 40% to 70% of the project executed
2 : more than 70% of the project executed
The threshold for receiving a pass-grade is three points.
Overall, for achieving a pass-grade, the threshold is seven points out of ten points. If required, a final
examination of five hours may be arranged.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.