

## IMT4611 Data Analysis and Statistics - 2008-2009

**Emnekode:**

IMT4611

**Emnenavn:**

Data Analysis and Statistics

**Faglig nivå:**

Master (syklus 2)

**Studiepoeng:**

5

**Varighet:**

Høst

**Varighet (fritekst):**

Første halvdel av semesteret

**Språk:**

Engelsk

**Forutsetter bestått:**

BSc level basics in statistics and mathematics, Image analysis and processing course (1st semester)

**Anbefalt forkunnskap:**

Expected prior-knowledge: Understanding of basic statistics like probability density function, variance, etc. Basic analysis and matrix algebra. Digital image Processing with Matlab (a student should be able to do some basic manipulations of images)

**Forventet læringsutbytte:**

This course develops understanding of use of statistical analysis for multidimensional data. It also give fundamentals to understand data analysis from raw measurement values to higher level decision making in color and image context. The course develops basic understanding for difference between analysis with or without a priori data as well as ways to evaluate results. The methods will be learned in practical sessions, where they will be programmed and tested with real data. The course is practice oriented, where students learn basics of data analysis useful in color, color image and spectral image analysis and processing. In lectures basics of methods are lectures and in practical session, their usage is practices. The aim is not to get deep theoretical understanding and derivation of methods.

On completion of this course the students will be able to:

- Understand principles how multidimensional statistical methods differ from one dimensional methods.
- Program some basic clustering and classification methods and test their validity.
- Program some basic Neural networks methods and test their validity.
- Extract features from raw, measured values of data to be analysed.
- Understand the distribution of information in statistical analysis and meaning in data representation.
- To apply basic statistical and data analysis methods to color and image data.

**Emnets temaer:**

Basics of multidimensional statistical analysis.

- Principal component analysis, non-negative matrix factorization.
- Data classification: Bayesian classifier, k-NN classifier, basics of neural networks.
- Data clustering: k-means clustering, Self-Organizing map.
- Spectrum estimation and reconstruction: PCA, polynomial, classification/clustering based method.
- Classification and clustering validity testing: leave-one-out, ground truth.

Practical Laboratory Sessions:

- Write spectral color and image data reading and writing routines by Matlab
- Produce PCA component images and reconstruct spectral images from PCA eigenimages
- Realize some classification methods by Matlab
- Realize some clustering methods by Matlab
- Realize some Neural networks and fuzzy-means methods by Matlab
- make simple tests of spectral image segmentation, spectral image categorization etc. using learned methods

**Pedagogiske metoder:**

Forelesninger

Lab.øvelser

Oppgaveløsning

**Vurderingsformer:**

Skriftlig eksamen, 3 timer

Øvinger

**Vurderingsformer:**

Exam (75%), exercises (25%)

**Karakterskala:**

Bokstavkarakterer, A (best) - F (ikke bestått)

**Sensorordning:**

One internal and one external examiner

**Utsatt eksamen (tidl. kontinuasjon):**

None

**Tillatte hjelpemidler:****Tillatte hjelpemidler (gjelder kun skriftlig eksamen):**

None

**Ansvarlig avdeling:**

Avdeling for informatikk og medieteknikk

**Emneansvarlig:**

Associate Professor Katrin Franke

**Læremidler:**

Literature and study materials: Handouts of the material covered in the lectures will be distributed.

- Sergios Theodoridis, Konstantinos Koutroumbas. "Pattern Recognition", third edition. Academic Press.
- Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Addison Wesley, 2003.
- R.O.Duda, P.E. Hart, and D.G. Storck: Pattern Classification. 2nd ed., Wiley, 2001.

**Klar for publisering:**

Ja