Introduction to Machine Learning

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ECTS: 1
Time: Wednesdays 12:30 – 16:15
Tentative dates: April 16, April 23, April 30, May 7 and May 14
Place: TBD
Deadline: April 7

Description

We often need to process data, collected from the real world or generated from experiments. How can we extract information from these data automatically? What can we find out or conclude from these data?

We often want to design an intelligent system that for example is able to recognize objects, identify persons or filter spam. How can we build such a system?

These tasks often involve selecting methods and models, setting thresholds and evaluating performance. How can we handle them in a systematic and scientific way instead of solely relying on our intuition?

Answer to these questions is found in machine learning, a field concerned with learning from examples. Machine learning is of interdisciplinary nature, with roots in computer science, statistics and pattern recognition. With growing importance and awareness, machine learning has been successfully applied in computer vision, control (robotics), computer gaming, data mining, web search, spam filtering, time-series prediction, bioinformatics, data compression and many more.

This course gives an introduction to machine learning and its applications both by presenting technologies proven valuable and by addressing specific applications. The goals are

— to provide you with insights and skills in machine learning. This will be achieved by illustrative presentations and by hands-on experiments using algorithms implemented by others (to avoid being overwhelmed with implementation details).
— to benefit you with accomplishing your general semester projects and reports in a more scientific way than an ad hoc way.
— to build the principles of machine learning into your study profile in the early stage, which hopefully then can serve you in many ways now and in the future.

Content

• Supervised learning (of classification and regression functions)
  K-nearest neighbors, decision trees, linear regression, linear discriminant analysis
• Unsupervised learning (for clustering, density estimation and dimensionality reduction)
  Histogram, K-means, principal component analysis
• Algorithm-independent machine learning
  Bias and variance, ensemble learning (bagging and boosting), performance measure and cross-validation

Prerequisites

Basic knowledge of probability theory is assumed.
References:
There is no required textbook for this course; slides and other materials will be put on the course homepage prior to the lectures. Here are some references:

- Introduction to Machine Learning, Ethem Alpaydin, The MIT Press, October 2004,
- Pattern Recognition and Machine Learning, Chris Bishop, Springer, 2006
- Data Mining: Practical Machine Learning Tools and Techniques, Witten and Frank, Morgan Kaufmann, June 2005

Course homepage
http://kom.aau.dk/~zt/courses/Intro_machine_learning/

Type
Free study activity

Credits
1 ECTS

Exam
Running evaluation with passed/not passed. This means that to pass the course, the student is required to be present at least 4 out of 5 lectures, be active during class and show a certain understanding of the course content. Certificate will be given to those who have passed the exam.

Other info
The course is free of charge.
Students who are interested in the course should send an email to the organizer at zt@es.aau.dk by April 7, 2008.