

15D017

3 ECTS

## Computational Machine Learning

### Overview and Objectives

The main idea behind the Computational Machine Learning course is for the students to get a good overview of modern Machine Learning methods along with practical hands on experience. The course will focus around supervised and unsupervised learning methods that are often used in industry settings. The course will have a strong emphasis on hands-on usage of the algorithms introduced, we will make use of python and the many Machine Learning libraries available in python on some real world datasets. Students are expected to have a working installation of python on their laptops.

### Course Outline

#### Stochastic Gradient Descent and variants

- Classification, Regression with SGD

#### Generalized Linear Models

- Logistics Regression
- Lasso
- Elastic Net

#### Kernel Methods

- SVM's
- Kernel PCA
- Spectral clustering

#### Naive Bayes

#### Gaussian Processes

- Gaussian Process Regression and Classification

#### Decision Trees

- Classification Regression with Decision Trees

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### Ensemble methods

- Gradient Boosted methods, xgboost
- AdaBoost
- Random Forest

### Feature Selection

### Dimensionality reduction

- PCA

### Nearest Neighbor Methods

- k-means

### Hierarchical Clustering

### Collaborative Filtering and Recommenders

- Memory-based methods
- Matrix Factorization, Tensor Factorization, Factorization Machines

## Evaluation

Project

## Materials

Friedman, J., Hastie, T., & Tibshirani, R. 2nd ed. (2009). The elements of statistical learning. Springer.  
Free version <http://statweb.stanford.edu/~tibs/ElemStatLearn/>

Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.