EE-613

Machine Learning for Engineers

Calinon Sylvain, Fleuret François, Odobez Jean-Marc

Cursus	Sem.	Type
Electrical Engineering		Opt.
Robotics, Control and Intelligent Systems		Opt.

Language of teaching	English
Credits	4
Session	
Exam	Multiple
Workload	120h
Hours	**56**
Lecture	28
Practical work	28
Number of positions	**40**

Frequency

Every 2 years

Remark

Next time: Fall 2021

Summary

The objective of this course is to give an overview of machine learning techniques used for real-world applications, and to teach how to implement and use them in practice.

Content

Fundamentals

- Notion of learning, cross validation and performance evaluation
- Recalls in probability and information theory
- Optimization (gradient, newton, stochastic gradient, etc.)

Generative models

- Directed / non-directed models, conditional independence, naive Bayesian
- k-Mean, GMM, E-M
- PCA and probabilistic PCA
- Bayesian networks, belief propagation
- HMM and extensions
- Sub-space clustering

Regression

- Least-square + weighted least-square
- 2) GMR + GPR

Discriminative models

- SVMs and Kernelization (perceptron, PCA, etc.)
- Perceptron, MLP, convolution networks
- Decision trees

Meta-algorithms

- Bagging and boosting
- Feature selection, regularization and sparsity

Keywords

Machine learning, pattern recognition, regression.

Learning Prerequisites

Required courses

At least one prior course in probabilities, linear algebra and programming (C, Java or equivalent).

Learning Outcomes

By the end of the course, the student must be able to:

- Select appropriately in practice standard learning-based inference techniques for regression, classification and density modeling.

Assessment methods

Multiple.