Bayesian Machine Learning

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Timetable: 20 hrs (see Class Schedule on https://phd.dei.unipd.it/course-catalogues/)


Examination and grading: Homework assignments and final project.

SSD: Information Engineering

Aim: The course will introduce fundamental topics in Bayesian reasoning and how they apply to machine learning problems. In this course, we will present pros and cons of Bayesian approaches and we will develop a graphical tool to analyse the assumptions of these approaches in classical machine learning problems such as classification and regression.

Course contents:

1. Introduction of classical machine learning problems.
   - Mathematical framework
   - Supervised and unsupervised learning
2. Bayesian decision theory
   - Two-category classification
   - Minimum-error-rate classification
   - Bayes decision theory
   - Decision surfaces
3. Estimation
   - Maximum Likelihood Estimation
   - Expectation Maximization
   - Maximum A Posteriori
   - Bayesian approach
4. Graphical models
   - Bayesian networks
   - Two-dimensional visualization
5. Evaluation
   - Measures of accuracy

References:


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2. Christopher M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), Springer 2007