

Pattern Recognition

Introduction

Prerequisites: Math

What does it mean?

Examples – one should be able at least to guess, what does it mean:

$$\ln \prod_i f(x_i) = \sum_i \ln f(x_i)$$

$$\min_x f(x) = -\max_x (-f(x))$$

$$\arg \min_x f(x) = \arg \min_x \ln f(x)$$

$$\min_x \sum_y f(x, y) \geq \sum_y \min_x f(x, y)$$

$$\sum_{i=1}^n a_i \ln x_i \rightarrow \max_x$$

$$\text{s.t. } x_i \geq 0, \sum_i x_i = 1$$

$$x_i \sim a_i$$

In particular: linear algebra (vectors, matrices, SVD, scalar products),
a bit geometry, functions (derivative, gradients, integrals, series),
optimization, probability theory ...

Topics.

1. Neurons and neuronal networks:

simple linear classifiers, complex classifiers by combination, basic algorithms, learning, clustering ...

2. Probability theory:

inference and learning (probabilistic and discriminative) ...

3. Support Vector Machines:

linear classifiers again, complex classifiers by generalization, kernels, a bit of statistical learning theory, optimization techniques ...

Seminars

- 2 Groups, Friday 1+5 DS. Please, partition you by yourself.
- Practical assignments (no computers, on the board) – lectures supplement.
- Assignments pair of days before on the page.
- Homework !!!
- Credits: active participation is assessed – points during the semester, optional – written test.

Exam: oral (graded), with seminars – 4SWS, without – 2SWS.

- Scripts, slides (quite chaotic at the moment), info etc.

http://www1.inf.tu-dresden.de/~ds24/lehre/bvme_ss_2013/bvme_ss_2013.html

- Literature:

- Christopher M. Bishop: „Pattern Recognition and Machine Learning“ (practically all the stuff)
- Michail I. Schlesinger, Václav Hlavác: „Ten Lectures on Statistical and Structural Pattern Recognition“ (especially statistical PR)
- During the semester – Papers (see [www1.inf...](http://www1.inf.tu-dresden.de/~ds24/lehre/bvme_ss_2013/bvme_ss_2013.html)) for SVM-s, Neuronal Networks etc.

- Comments, requests, questions, criticism are welcome (anonym via mail-form as well).