

## **Syllabus for the Lecture course**

# **Introduction to machine learning and pattern recognition**

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4 lectures of 1 hour

### **1. Various things**

- course objectives etc.
- supervised vs. unsupervised learning
- linear regression and least squares
- introduction to R
- nearest neighbours
- curse of dimensionality
- regularization and generalization, bias-variance tradeoff

### **2. Low-D classification and regression**

- maximum likelihood method
- density estimation (leads into next lecture on LDA and QDA)
- Bayes theorem
- Linear Discriminant Analysis (LDA) – just mention, don't do, QDA
- nonlinear regression: 1D, k-nn and kernel regression
- basis functions
- splines (brief and only as illustrative of regularization)

### **3. Regularization, basis function and neural networks**

- smoothing splines: regularization and degrees of freedom
- neural networks (for regression)

### **4. Support vector machines and clustering**

- support vector machines (for classification)
- k-means clustering
- vector quantization
- SOM

### **5. PCA and mixture models (Extra lecture, not done)**

- PCA
- mixture models for clustering and classification
- EM algorithm
- model selection via BIC