

# Introduction to Pattern Recognition

## RECOMMENDED TEXTBOOKS

H. Niemann. *Klassifikation von Mustern*. Springer, 1983. 2<sup>nd</sup> edition (2003) available via the Internet: <http://www5.informatik.uni-erlangen.de/en/our-team/niemann-heinrich>

S. Theodoridis and K. Koutroumbas, *Pattern Recognition*, 4th ed., by, Academic Press 2008, ISBN 1597492728 or (ISBN 978-1-59749-272-0)

R. O. Duda, P. E. Hart and D. G. Stork, *Pattern Classification*, 2nd ed., by, Wiley-Interscience 2000, ISBN 0471056693.

## Lecture Plan

### TOPIC: SIGNAL ACQUISITION

Week 1	14. October	Introduction to IntroPR Lecture Administrative information Key concepts Introduction to A/D conversion
Week 2	21. October	Sampling Fourier analysis Nyquist sampling theorem Quantization

### TOPIC: PRE-PROCESSING

Week 3	28. October	Histogram equalization Thresholding
Week 4	04. November	Filtering Linear shift-invariant systems Convolution Noise suppression (low-pass filtering) Edge detection (high-pass filtering)
Week 5	11. November	Recursive filtering Homomorphic filters Morphology on binary images Morphology on gray-scale images Pattern normalization Moments

### **TOPIC: FEATURE EXTRACTION**

Week 6	18. November	Introduction to feature extraction Orthogonal bases Fourier series Walsh (Hadamard) transform
Week 7	25. November	Haar transform Linear Predictive Coding Moments as features Wavelets
Week 8	02. December	Wavelets (continued) Principal Component Analysis (PCA)
Week 9	09. December	Principal Component Analysis (PCA) (continued) Linear Discriminant Analysis (LDA) Optimal Feature Transform (OFT)
Week 10	16. December	Gradient Descent Coordinate Descent Feature Selection

### **TOPIC: CLASSIFICATION**

Week 11	6. January	Introduction to classification Miss-classification cost Optimal decision rule Bayesian classifier Gaussian classifier
Week 12	13. January	Polynomial classifiers Non-parametric classifiers
Week 13	20. January	K-nearest neighbor Kernel-based density estimation Artificial Neural Networks (ANNs)
Week 14	27. January	ANNs with Radial Basis Functions Multilayer Perceptron
Week 15	3. February	Multilayer Perceptron (continued) Recap