

Introduction to Pattern Recognition

RECOMMENDED TEXTBOOKS

H. Niemann. *Klassifikation von Mustern*. Springer, 1983. 2nd 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	18. October	Introduction to IntroPR Lecture Administrative information
Week 2	25. October	Introduction to A/D conversion Sampling Fourier analysis Nyquist sampling theorem 2D sampling schemes
Week 3	01. November	Quantization Bits and SNR
Week 4	08. November No lecture 08.11.10	Vector quantization

TOPIC: PRE-PROCESSING

Week 4	08. November No lecture 08.11.10	Histogram equalization Thresholding
Week 5	15. November	Filtering Linear shift-invariant systems Convolution Noise suppression (low-pass filtering) Edge detection (high-pass filtering)

Week 6	22. November	Recursive filtering Homomorphic filters Morphology
Week 7	29. November	Pattern normalization Moments

TOPIC: FEATURE EXTRACTION

Week 7 (continued)	29. November	Introduction to feature extraction Orthogonal bases Fourier series
Week 8	06. December	Walsh (Hadamard) transform Haar transform Linear Predictive Coding Moments as features
Week 9	13. December	Wavelets
Week 10	20. December	Principal Component Analysis (PCA) Linear Discriminant Analysis (LDA) Optimal Feature Transform (OFT)
Week 11	10. January	Gradient Descent Coordinate Descent Feature Selection

TOPIC: CLASSIFICATION

Week 12	17. January	Introduction to classification Statistical classifiers Miss-classification cost Optimal decision rule Bayesian classifier
Week 13	24. January	Gaussian classifier Polynomial classifiers Non-parametric classifiers
Week 14	31. January	K-nearest neighbor Kernel-based density estimation Artificial Neural Networks (ANNs)
Week 15	7. February	ANNs with Radial Basis Functions Multilayer Perceptron