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	15. October	Introduction to IntroPR Lecture Administrative information Key concepts Introduction to A/D conversion
Week 2	22. October	Fourier analysis Nyquist sampling theorem Quantization

TOPIC: PRE-PROCESSING

Week 3 No lecture 31.10.12	29. October	Histogram equalization Intro to Thresholding
Week 4	05. November	Thresholding Filtering Linear shift-invariant systems Convolution Noise suppression (low-pass filtering)
Week 5	12. November	Edge detection (high-pass filtering) Recursive filtering Homomorphic filters

Week 6	19. November	Morphology
		Pattern normalization
		Moments

TOPIC: FEATURE EXTRACTION

Week 7	26. November	Introduction to feature extraction
		Orthogonal bases
		Fourier series

Week 8	03. December	Walsh (Hadamard) transform
		Haar transform
		Linear Predictive Coding
		Moments as features

| Week 9 | 10. December | Wavelets |

Week 10	17. December	Principal Component Analysis (PCA)
		Linear Discriminant Analysis (LDA)
		Optimal Feature Transform (OFT)

Week 11	7. January	Gradient Descent
		Coordinate Descent
		Feature Selection

TOPIC: CLASSIFICATION

Week 12	14. January	Introduction to classification
		Statistical classifiers
		Miss-classification cost
		Optimal decision rule
		Bayesian classifier

Week 13	21. January	Gaussian classifier
		Polynomial classifiers
		Non-parametric classifiers

Week 14	28. January	K-nearest neighbor
		Kernel-based density estimation
		Artificial Neural Networks (ANNs)

Week 15	4. February	ANNs with Radial Basis Functions
		Multilayer Perceptron
		Recap