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	17. October	Introduction to IntroPR Lecture Administrative information Key concepts Introduction to A/D conversion
Week 2	24. October	Fourier analysis Nyquist sampling theorem Quantization
Week 3 No lecture 1.11.11	31. October	Vector quantization Histogram equalization (Pre-processing) Intro to Thresholding (Pre-processing)

TOPIC: PRE-PROCESSING

Week 4	07. November	Thresholding Filtering Linear shift-invariant systems Convolution Noise suppression (low-pass filtering)
Week 5	14. November	Edge detection (high-pass filtering) Recursive filtering Homomorphic filters

| Week 6 | 21. November | Morphology
Pattern normalization
Moments |

TOPIC: FEATURE EXTRACTION

| Week 7 | 28. November | Introduction to feature extraction
Orthogonal bases
Fourier series |

| Week 8 | 05. December | Walsh (Hadamard) transform
Haar transform
Linear Predictive Coding
Moments as features |

| Week 9 | 12. December | Wavelets |

| Week 10 | 19. December | Principal Component Analysis (PCA)
Linear Discriminant Analysis (LDA)
Optimal Feature Transform (OFT) |

| Week 11 | 9. January | Gradient Descent
Coordinate Descent
Feature Selection |

TOPIC: CLASSIFICATION

| Week 12 | 16. January | Introduction to classification
Statistical classifiers
Miss-classification cost
Optimal decision rule
Bayesian classifier |

| Week 13 | 23. January | Gaussian classifier
Polynomial classifiers
Non-parametric classifiers |

| Week 14 | 30. January | K-nearest neighbor
Kernel-based density estimation
Artificial Neural Networks (ANNs) |

| Week 15 | 6. February | ANNs with Radial Basis Functions
Multilayer Perceptron
Recap |