COURSE DETAIL

STATISTICAL PATTERN RECOGNITION

Country
Korea, South

Host Institution
Yonsei University

Program(s)
Yonsei University

UCEAP Course Level
Graduate

UCEAP Subject Area(s)
Electrical Engineering Computer Science

UCEAP Course Number
210

UCEAP Course Suffix

UCEAP Official Title
STATISTICAL PATTERN RECOGNITION

UCEAP Transcript Title
STATSTCL PATTERN RC

UCEAP Quarter Units
4.50

UCEAP Semester Units
3.00

Course Description

This course examines major topics in pattern recognition, particularly aspects of classification and decision. Students will gain effective pattern recognition tools with which to analyze the often vast amounts of diverse data in research applications.

Topics include introduction to pattern recognition - machine perception - PR systems and design cycle, Bayesian decision theory for continuous features - Bayes Decision Rule - minimum-error-rate classification - classifiers, normal density, discriminant functions and discrete Bayesian decision theory - discriminant functions for the normal density - error probabilities and integrals - Bayes Decision Theory for discrete features, maximum-likelihood and Bayesian parameter estimation - Bayesian parameter estimation: Gaussian case - Bayesian parameter estimation: general theory - HMM, nonparametric techniques - density estimation - Parzen windows - nearest neighbor estimation (NN, k-NN) - fuzzy classification, linear discriminant functions i - linear discriminant functions and decision surfaces - generalized linear discriminant functions - minimizing the perceptron criterion function, relaxation procedures, linear discriminant functions ii - minimum square-error procedures - relation to Fishers linear discriminant - the Widrow-Hoff and Ho-Kashyap procedures - multicategory generalizations - ridge regression and its dual form [2] - classification error based method [2], model assessment and performance evaluation - bias, variance and model complexity [2] - model assessment and selection 2] - confusion matrix, error rates, and ROC [2] - statistical inference [2] - statistical errors [2], dimension reduction and feature extraction - principal component analysis - Fisher linear discriminant - nonlinear projections, support vector machines - introduction - SVM for pattern recognition [2] - linear support vector machines [2] - nonlinear support vector machines [2], multilayer neural networks - introduction - feedforward operation and classification - backpropagation algorithm - some issues in training neural networks - key ideas in classification, introduction to deep learning networks - convolutional neural networks (CNN) - autoencoders - deep belief networks - deep reinforcement learning - generative adversarial networks (GAN), algorithm-independent machine learning - introduction - bias and variance -

resampling for classifier design - estimating and comparing classifiers - combining classifiers, unsupervised learning and clustering - mixture densities and identifiability - maximum-likelihood estimates - application to normal mixtures.

Prerequisites: Linear Algebra, Probability, MATLAB, Python, or C-Programming Skills

Language(s) of Instruction
English

Host Institution Course Number
EEE6502

Host Institution Course Title
STATISTICAL PATTERN RECOGNITION

Host Institution Campus

Host Institution Faculty

Host Institution Degree

Host Institution Department

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