

36125321 Pattern Recognition

Graduate course

Instructor: Prof. Mayer Aladjem, <http://www.ee.bgu.ac.il/~aladjem>

THIS COURSE IS INTENDED TO BE LARGELY SELF-CONTAINED

PREREQUISITES: basic undergraduate mathematical courses.

This course is suitable for all fields of specialization of Electrical & Computer Engineering.

It will cover the theory, computational aspects, and practice of a variety of pattern recognition techniques. The presentation focuses on methods with the specific goal of predicting future outcomes in particular classification methods. Pattern recognition is a practical technology, with successful applications in many fields.

The lecture notes and handouts will be available in <http://hl2.bgu.ac.il>.

Final Grade:

70 % homework - The homework will include analysis of datasets, theoretical problems, and programming assignments.

30% interview on the homework and the course topics - around 30 min. with each student.

Syllabus: Approaches to automatic pattern recognition. Statistical pattern recognition. Bayes decision theory: rules for minimum risk and minimum error rate, case with multivariate normal distributions, discrete case, minimax test, other tests, sequential classification. Error probability and error bounds. Alternatives to the Bayesian approach. Methods for estimation classification errors. Nearest neighbor decision rule: homogeneous and non-homogeneous relationships, editing technique, condensing technique, finite –sample considerations. Probability density function estimation: parametric and nonparametric estimations, Parzen estimator, K-nearest neighbor method, mixture density estimation. Linear and generalized linear discriminant functions: least mean-squared-error procedure, multiclass extensions, approximations of various types. Interclass and between-class distance measures. Feature selection and feature extraction.

Text books:

1. P. A. Devijver and J. Kittler, "Pattern recognition : a statistical approach" , Prentice-Hall, 1982.
2. K. Fukunaga, "Introduction to statistical pattern recognition", Academic Press, 1990
3. R. O. Duda, P. E. Hart, D. G. Stork, "Pattern classification", Wiley, 2001
4. A. Webb, "Statistical pattern recognition", Newnes, 2001.