



ECE 5524 Statistical Learning and Pattern Recognition Fall 2009

This course will cover supervised learning, pattern classification, neural networks, support vector machine, unsupervised learning, cluster analysis, feature discovery, cross-validation, and independent component analysis, with an emphasis on the strategic frontier between machine learning and scientific discoveries. The course is theoretical, practical, and challenging in nature. Major effort will be made to present applications in the areas of computer-aided decision making, genomic bioinformatics, computational biology, and biomedical imaging.

Instructor: Dr. Yue Wang (Joseph)
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Lectures: Tuesdays, 4:00pm – 6:45pm (Blacksburg: check with official schedule)

Office Hours: Tuesdays, 6:45pm- 7:30pm (e-mails are greatly welcome)

Textbook: *Pattern Classification* (2nd ed) by R. O. Duda, P. E. Hart and D. G. Stork, John Wiley & Sons, 2000.

References: Simon Haykin, *Neural Networks: A Comprehensive Foundation*, Prentice-Hall, Inc., 1999.

Hyvarinen, A., Karhunen, J. & Oja, E. *Independent Component Analysis*, John Wiley, New York, 2001.

T Hastie, R. Tibshirani, and J. Friedman, *The Elements of Statistical Learning*, Springer, 2001.

Pre-requisite: A graduate course covering probability theory, random variables, and random processes. Knowledge about signal detection and estimation is desirable (e.g., ECE 5605/5606).

Grading:	Reading report and homework	40%
	Term paper proposal	10%
	Final term paper	50%

Course Outline: Introduction to statistical and machine learning theory, statistical decision principles, linear discriminant analysis, Fisher criterion, single and multilayer perceptrons, support vector machine, feature selection, cross-validation, bootstrap and permutation re-sampling, principal component analysis, self-organizing maps, mixture model and data clustering, independent component analysis.

Honor Code: Adherence to Virginia Tech's honor code is fully expected. Please discuss any questions you may have about what is or is not permitted with the instructor.