COURSE ANNOUNCEMENT

EE 8591 **Predictive Learning From Data (3 credits)** **Fall 2021**

PREREQUISITES: Graduate standing in EE or IT, or consent of instructor. Familiarity with computer programming, using software of your choice, for homework assignments. *Technical prerequisites:* working knowledge of probability/ statistics and linear algebra, one of beginning courses on machine learning/data mining, e.g. EE4389, CSci 5521, CSci 5523 or consent of instructor.

INSTRUCTOR: Prof. Vladimir Cherkassky, KHK 6-111, phone (612) 625-9597, email: cherk001@umn.edu

OFFICE Hours Tue, Thur 1:30 – 2:30pm, Keller Hall 6-111

TIME/PLACE: Tue, Thur 11:15am – 12:30 pm, Ackerman Hall 319. This course is offered via UNITE for off-campus students

GRADING:

4 homework assignments	40%	
Midterm exam (open book/ open notes)	25%	on November 23
course project	midterm progress report (10%) due Nov 18 final project report (25%) due Dec 16	

Other Credits: extra credit for class participation (5 %)

NOTE: there is **no final exam** (instead, the project report is due during the week of finals).

COURSE MATERIAL:
(1) V. Cherkassky and F. Mulier, `Learning from Data. Concepts, Theory and Methods`, Second edition, Wiley-Interscience 2007
Digital version (PDF file) is available at the University of Minnesota library – see
https://onlinelibrary-wiley-com.ezp3.lib.umn.edu/doi/pdf/10.1002/9780470140529

(2) V. Cherkassky, `Predictive Learning`, 2013 http://vctextbook.com/
Available at the University bookstore.
Note: most homework assignments will be problems from this textbook.
WEB PAGE: all course material (including lecture notes) will be available at
http://people.ece.umn.edu/users/cherkass/ee8591/

EE 8591 Predictive Learning From Data (3 credits) Fall 2021

COURSE DESCRIPTION:
Methods for estimating dependencies from data have been traditionally explored in such diverse fields as: Statistics (multivariate regression and classification), Engineering (pattern recognition, system identification), Computer Science (artificial intelligence, machine learning, data mining) and Health Informatics. Recent interest in learning methods is triggered by the widespread use of digital technology and availability of data. Unfortunately, developments in each field are seldom related to other fields. Most real-life applications attempt to estimate *predictive data-analytic models* that are used for prediction or decision making. This course will first provide a general conceptual framework for all learning methods, and then discuss specific methods developed in statistics, pattern recognition and machine learning. Course descriptions will emphasize *methodological aspects* of machine learning, rather than development of 'new' algorithms. We also discuss advantages and limitations of recent magic bullet approaches, such as Deep Learning.

COURSE PROJECTS: Each student will complete a course project. A list of project topics will be provided during second week. Students will receive close supervision from the instructor.

Course Outline (tentative)

CONCEPTS and THEORY	
Introduction/motivation (Chapter 1)	0.5 week
Formulation of the learning problem & classical methods (Ch. 2)	1 week
Adaptive learning: concepts & inductive principles (Ch. 2)	1 week
Regularization and complexity control (Ch. 3)	0.5 week
Statistical Learning Theory (Ch. 4)	1 week
Nonlinear optimization (Ch. 5)	0.5 week
LEARNING METHODS	
Clustering/ VQ/ Self-organizing networks (Ch. 6)	1 week
Methods for regression (Ch. 7)	1 week
Classification (Ch. 8)	1 week
Support Vector Machines (Ch. 9)	1.5 weeks
Deep Learning: advantages and limitations	1 week
ADVANCED LEARNING SETTINGS (Ch. 10)	1 week

(All chapters refer to textbook by Cherkassky & Mulier, *Learning from Data*).