CMSC 678 Statistical Learning and Fuzzy Logic Algorithms

Syllabus
Fall 2018

Instructor:	Dr. Vojislav Kecman, http://www.people.vcu.edu/~vkecman/Index.html
Office Hours:	*Tuesday, 11am - 1 pm, in E4250*
Email:	**vkecman@vcu.edu**
Semester course:	3 lecture hours. 3 credits.
Schedule:	**TR 3:30 pm - 4:45 pm, Eng. Build. West, Room 105**
Prerequisites:	MATH 310 or MATH 309. **Proficiency in MATLAB is assumed**. Otherwise, LEARN it BEFORE CLASSES START. Find one out of MANY TUTORIALS or use MATLAB help files. LEARN MATLAB IN ADVANCE INDEED or you'll not going to make it :-(

The lecture notes will be used as the teaching materials and they will be based on the book:
Learning and Soft Computing, Support Vector Machines, Neural Networks, and Fuzzy Logic Models, by Vojislav Kecman, The MIT Press, Cambridge, MA, 2001 (available in a VCU Library)
See also the book site www.support-vector.ws there are various links to useful sites. There is an electronic version of the book somewhere on the internet too.

Objectives: This course considers two central problems in modern science and engineering :

the **problem of statistical learning** from examples (empirical data) - basics of classic statistical algorithms and neural networks (NNs), support vector machines (SVMs) and,

the **problem of embedding existing human knowledge** into workable mathematics – fuzzy logic algorithms (FLAs)

Contents:
- Different applications as examples of multivariate functional mapping,
- Basics of classic classification and regression, NNs, SVMs & FLAs
- Curve and surface fittings, multivariate function approximation, nonlinear optimization, bias-variance dilemma
- Cross-validation for machine learning model and model parameters selection
- Support vector machines as a new learning paradigm. Quadratic programming as the SVMs design algorithm
- Fuzzy Logic Systems: Crisp and Fuzzy Sets, Linguistic Variables, Fuzzy Set Theory
- If-Then Rules, Fuzzy Inference, Fuzzification and Defuzzification, Neuro-Fuzzy Paradigms

Grades for this course will be determined from the following factors:

Coursework - Three, ***or more***, projects	=	75 %
Exam (by the end of semester)	=	25 %

Grading Scale

90 – 100	% A
75 – 89	% B
60 – 74	% C
50 – 59	% D
50 & < 50	% F

On projects: The projects will cover software implementations of the algorithms presented in lectures on real data sets and they include the class presentations (if time allows) too. You are also expected to submit the results of your project in the form of a written, PDF, project report. A template (which will be an IEEE paper format) for the report will be given to you.

Class Participation: To be successful in both projects and final exam a regular class **attendance is more than necessary**.

No make-up projects or examinations will be given unless special permission has been given prior to the date of the project submission. Special permission will only be granted in very, very exceptional circumstances.

In the case you want to Email me the following rules apply:

Subject line must be **CMSC 678, YOUR FAMILY NAME**
(I am receiving huge number of Emails daily, and the only way how your Email can be safe with me is to keep an easy record by having the **Subject line** having both **the COURSE NAME** and **your FAMILY name**).

You are reminded that you are expected to adhere to the VCU Honor Code. Information on the Honor Code can be found at https://conduct.students.vcu.edu/student-code-of-conduct/

Religious Observances:

It is the policy of VCU to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a religious holiday of special importance must provide advance written notification to each instructor by the end of the second week of classes. Instructors are encouraged to avoid scheduling on these dates one-time-only activities that cannot be replicated. Faculty members are expected to make reasonable accommodations to students who are absent because of religious observance through such strategies as providing alternative assignments or examinations or granting permission for audio or video recordings and the like.

Americans with Disabilities Act:

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 require Virginia Commonwealth University to provide an 'academic adjustment' and/or a 'reasonable accommodation' to any individual who advises us of a physical or mental disability. If you have a physical or mental limitation that requires an academic adjustment or an accommodation, please arrange a meeting with me at your earliest convenience but not later than the end of second week of classes. Additionally, if your course work requires you to work in a lab environment, you should advise the instructor or department chairperson of any concerns you may have regarding safety issues related to your limitation(s).

VCU Emergencies:

What to Know and Do To Be Prepared for Emergencies at VCU

1. Sign up to receive VCU text messaging alerts (https://alert.vcu.edu/).
   Keep your information up-to-date.
2. Know the safe evacuation route from each of your classrooms.
   Emergency evacuation routes are posted in on-campus classrooms.
3. Listen for and follow instructions from VCU or other designated authorities.
4. Know where to go for additional emergency information (https://alert.vcu.edu/).
5. Know the emergency phone number for the VCU Police (828-1234).
   Report suspicious activities and objects.