



Elec 535: Data Analysis and Pattern Recognition

Term – Spring 2016 (201601)

Instructor

Dr. Stephen W. Neville

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Office Hours

Days: Wed.

Time: 2:30pm to 3:20 pm (or by appointment)

Location: EOW 441 or ELW A228

Note: All course emails **MUST** have “Elec535:” in the subject line and **MUST** be sent from UVic email accounts. Emails without proper subject lines or sent from off-campus email accounts will likely be dropped by UVic’s email spam filters or be automatically redirected to junk email folders.

Course Objectives

The objectives of this course are to introduce students to modern approaches to statistical pattern recognition, including the application and assessment of common machine learning techniques. The course focuses on providing the students with an appreciation of the underlying probability and statistical as they apply to these domains and how these can be used to assess the quality and performance of pattern recognition solutions.

The course project will provide the students with a hands-on learning opportunity to perform apply statistical pattern recognition principals to an actual real-world data set(s) they have identified, where a core goal will be to developed the skills required to be able to properly quantify what is and is not knowable from a given statistical data set.

Learning Outcomes

Students successfully completing this course will gain an understanding of:

- Probability, statistics, and random processes as applied to statistical pattern recognition.
- The nature an importance of statistical stationarity and ergodicity assumptions with respects to pattern recognition problems.
- The differences and distinctions between parametric and non-parametric pattern classification techniques.
- Why the underlying statistics and probability issues are important to the proper assessment of the accuracy and correctness of pattern classification approaches.
- The basic characteristics and distinction between several commonly applied machine learning-based pattern recognition approaches.

If time permits, a understanding as to how problem domains such as cyber-security and privacy introduce changes to the underlying assumptions.

Syllabus

The exact pacing of the syllabus materials will vary in accordance with each class, as such the syllabus solely denotes a provisional pacing which may or may not change during the course delivery.

- Course introduction
- Review of Mathematical Foundations
- Brief review of the basics of Matlab.
- Basic examples of Pattern Recognition & Classification Problems
- Bayesian Decision Theory
- Maximum-likelihood & Bayesian Parameter Estimation
- Non-parametric Techniques
- General Machine Learning Issues
- Unsupervised Learning and Clustering
- Application Area: (if time permits)
 - Applying pattern recognition to Cyber-Security and Privacy problems

Lectures:

A-Section(s): A01, A02 / CRN 21173, 21174

Days: Tues., Wed., Fri.

Time: 12:30 pm - 1:20 pm

Location: Cornett Building A120

Required Text

Title: Pattern Classification (2nd Edition)

Author: Richard O. Duda, et al

Publisher: Wiley

Year: 2001

Note: All assignments will come from the North American edition of this text and expressly not from the international addition. The end-of-chapter questions are different between the two editions and it is solely the students' responsibility to ensure that they are doing the correct questions from the North American edition.

Course Web Site: <http://www.ece.uvic.ca/~sneville/Teaching/Elec535>

Assessment:

Project:	25%	Due Date: The full project report will be due in on Monday April 18 th .
Mid-term	25%	Date: Friday, Feb. 19th
Final Exam	55%	

Note: Graduate students must complete and pass the course project to pass the course. Students failing to successfully complete the project will receive an N grade. Late project reports will not be marked and will receive a zero project grade.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Graduate Calendar.

<http://web.uvic.ca/calendar/GRAD/FARe/Grad.html>

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

Accommodation of Religious Observance

<http://web.uvic.ca/calendar/GI/GUPo.html>

Policy on Inclusivity and Diversity

<http://web.uvic.ca/calendar/GI/GUPo.html>

Standards of Professional Behaviour

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

<https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

Cheating, plagiarism and other forms of academic fraud are taken very seriously by the University, the Faculty, and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity.

<http://web.uvic.ca/calendar/FACS/UnIn/UARe/PoAcl.html>

Course Lecture Notes

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may constitute a breach of academic integrity as defined in the UVic Calendar as well as the Standards of Professional Behaviour required of all Faculty of Engineering students.