University of Victoria

Faculty of Engineering | Electrical and Computer Engineering
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COURSE OUTLINE

ECE 535: Data Analysis and Pattern Recognition

Term – SPRING 2020 (20946, 20947)

Instructor

Dr. Stephen W. Neville

E-mail: sneville@ece.uvic.ca

Office Hours

Days: Wed.
Time: 2:30 pm to 3:20 pm (or by appointment)
Location: EOW 441(or ELW A228)

Note: All course emails **MUST** have "ECE 535:" 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 data analysis and 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 issues as they apply to these domains and how these can be used to assess the quality and performance of data analysis and pattern recognition solutions.

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.
- There is an overall lack of generally superiority of any given data analysis, pattern recognition, and/or machine learning method as well as a lack of any privileged (or best) set of measurement features. Instead, the selection of analysis methods and feature is driven by the problem domains and the questions being asked of the available data.

If time permits, an 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 and data analysis methods to Cyber-Security and Privacy problems

A-Section(s): A01, A02 / CRN 20946, 20947
Days: Tues., Wed., Fri.
Time: 12:30 pm – 1:20 pm
Location: ECS 124

Required Textbook

Title: Pattern Classification (2nd Edition)
Author: Richard O. Duda, et al
Publisher: Wiley
Year: 2001

Course Web Site: http://www.ece.uvic.ca/~sneville/ select the "Teaching" tab, then select the "ECE 535" tab. All lecture notes and past exams area available from the course website. Note: Solutions to prior final exams will not be provided or posted.

Assessment:

Project:	20%	Due Data: The full project report will be due on the Final Exam date.
Mid-term	30%	Date: **Wed., Feb. 26th**
Final Exam	50%	

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. Additionally, failure to pass the final exam will result in a failing grade for the course

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.

https://web.uvic.ca/calendar2020-01/grad/academic-regulations/grading.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.

Course Withdrawal Deadlines:
- January 19: Withdrawal with 100% reduction of tuition fees
- February 9: Withdrawal with 50% reduction of tuition fees
- February 29: Last day for withdrawal (no fees returned)

Accommodation of Religious Observance:

https://web.uvic.ca/calendar2020-01/grad/registration/Registration.1.17.html#

Policy on Inclusivity and Diversity:
https://web.uvic.ca/calendar2020-01/general/policies.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.
http://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

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

https://web.uvic.ca/calendar2020-01/grad/academic-regulations/academic-integrity.html

Equality:
This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building. https://www.uvic.ca/services/cal/. The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

Course Lecture Notes:
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 copywrited and 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 in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

Sexualized Violence Prevention and Response at Uvic:
UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support, please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:
>   **Where:** Sexualized violence resource office in EQHR; Sedgewick C119
>   **Phone:** 250.721.8021
>   **Email:** svpcoordinator@uvic.ca
>   **Web:** www.uvic.ca/svp

Office of the Ombudsperson:
The Office of the Ombudsperson is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations. Phone: 250-721-8357; Email: ombuddy@uvic.ca; Web: https://uvicombudsperson.ca/