University of Victoria

Faculty of Engineering | Electrical and Computer Engineering
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COURSE OUTLINE

ECE 503 Optimization for Machine Learning
Term – Summer 2021 (202105)

Instructor

Dr. Wu-Sheng Lu
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Office Hours

Days: Week days
Time: Online consultation
Location: Remote

Course Objectives

To understand fundamental principles and basic algorithms for optimization problems encountered
in machine learning.

Learning Outcomes

Ability to analyze and formulate typical machine learning problems as optimization problems; and
apply appropriate algorithms to obtain and evaluate optimal solutions to the problems at hand.

Syllabus

Machine learning problems and solutions via optimization………………………..…………………………… 13
   Machine learning problems. Basics of unconstrained optimization. Linear regression. Logistic
   regressions for classification. Multi-class classification.
Improved optimization algorithms ……………………………………………………………………………..11
   Mini-batch optimization. Gradient descent with momentum. Stochastic GD. BFGS.
Selected topics in machine learning ………………………………………………………… ……………………………………13
   Feature engineering. Softmax regression. Cross validation. Regularization. K-means clustering.
   Autoencoder and PCA.

A-Section(s): A01,A02/CRN 31891,31892   B01 T, 14:00-16:50, May 25, Jun 08, Jun 22, Jul 13
Days: Asynchronous video lectures   B04 F, 14:00-16:50, Jun 04, Jun 18, Jul 09, Jul 23
Time: Two 80-min asynchronous video lectures per week, to be posted each Tuesday and Friday.
Location/Platform/link: https://www.ece.uvic.ca/~wslu/403/index.html

Required Textbook

Course notes.

Online Course Delivery:

Fully online and blended (a mix of "real time" and asynchronous sessions). Recorded lectures with synchronous midterm
and final exams. The students will require access to a computer which has MATLAB installed.

Assessment:

Assignments:	10 %	Due days: to be posted online.
Labs & a Project	15 %	
Mid-term	20 %	Date: Wednesday, June 16, at 12:30 pm.
Final Exam	55 %	

Important: All deadlines and schedules for this course will reference Pacific Daylight Time.

Note: Failure to complete all laboratory requirements will result in a grade of N being awarded for the course. 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.

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.

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.

Academic Integrity:

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.

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:
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 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/