CSE353: Machine Learning

Fall 2020, Time: Tuesdays, Thursdays, 3.00–4.20pm, Zoom Online
Instructor: Minh Hoai Nguyen, New CS 243.
Office hours: Thursdays & Fridays 5.30–6.15pm, and by appointments
TA: TBA.

`Click here for Zoom link` You will need to sign in with your NetID Google Account to view.

This page provides some information to students who are considering to enroll in the course. Below are tentative grading scheme and syllabus, which are subject to change. Once you have enrolled in the course, you should go to Blackboard for updated information and futher annoucements. The content of this page will not be updated two weeks after the course has begun.

Description

This course covers fundamental machine learning concepts for intelligent systems that autonomously learn to perform a task and improve with experience, including problem formulations (e.g., selecting input features and outputs) and learning frameworks (e.g., supervised vs. unsupervised), standard models, methods, computational tools, algorithms and modern techniques, as well as methodologies to evaluate learning ability and to automatically select optimal models. Applications to areas such as computer vision (e.g., image classification, object detection) and medical data analysis (e.g., Covid-19 prediction) will motivate the coursework and material.

This course is intended for ungraduate students who already have good programming skills and adequate background knowledge in mathematics, including probability, statistics, and linear algebra. The prerequisites are: CSE 216 or CSE 219 or CSE 260; CSE major Pre- or Co-requisite: AMS 310 or AMS 311 or AMS 312.

Tenative grading scheme

There will be 5-6 homework assignments, two exams, and several popup quizzes.

- Exams and quizzes: 50%
  - Midterm 1: 20%
  - Midterm 2: 20%
  - Quizzes: 10%
- Homework assignments: 50%

Weights are approximate and subject to change. You are expected to do homework assignments by yourselves. Even if you discuss them with your classmates, you should turn in your own code and write-up. You can have one sheet of paper with notes in the exams.

Tentative Syllabus

Week	Date	Topic	Assignments
1	25-Aug-2020	Introduction	
	27-Aug	Point estimation, MLE, probability review	
2	1-Sep	Point estimation, MLE, probability review	
	3-Sep	Linear Regression	HW1 out
3	8-Sep	Logistic Regression	
	10-Sep	Logistic Regression	
4	15-Sep	Model complexity and error measurement	
	17-Sep	Model complexity and error measurement	HW1 due. HW2 out
5	22-Sep	Regularization, Ridge and LASSO regression	
	24-Sep	Regularization, Ridge and LASSO regression	
6	29-Sep	Bayes Classifier and Nearest Neighbor	
	1-Oct	SVM	HW2 due. HW3 out
7	6-Oct	SVM - Duality	
	`8-Oct`	No lecture - Midterm 1	Midterm 1
8	13-Oct	SVM - Kernel	
	15-Oct	Decision Tree	HW3 due. HW4 out
9	20-Oct	Decision Tree	

	22-Oct	Ensemble learning	
10	27-Oct	Boosting	
	29-Oct	Unsupervised learning, K-means clustering, GMM	HW4 due. HW5 out
11	3-Nov	Artificial Neural Networks	
	5-Nov	Training Deep Networks	
12	10-Nov	Convolutional Neural Networks	
	12-Nov	Convolutional Neural Networks	HW5 due. HW6 out
13	17-Nov	Recurrent Neural Networks	
	19-Nov	No lecture - Midterm 2	Midterm 2
Break	24-Nov	No lecture - Thanksgiving	
	26-Nov	No lecture - Thanksgiving	
14	1-Dec	Overview of Advanced Machine Learning Topics	
	3-Dec	Final lecture - Course review	HW6 due

Textbooks

Textbooks are optional. But if you prefer to follow a textbook, I recommend:

- Tom Mitchell, Machine Learning, McGraw Hill, 1997.
  - Excellent book. Concise and well-explained. But it is quite old and does not cover recently developed concepts.
  - Some New Chapters are available
- Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Ed
  - I haven't read it yet, but it seems to have good reviews on Amazon.
  - Scikit-Learn is useful tool to use

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or via e-mail at: sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http:www.stonybrook.edu*commcms*academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.