Machine Learning I
DATS 6202 - 10, Spring 2020

1 Meeting Time and Location

- Meeting time: Tuesday, 12:45 PM - 3:15 PM
- Location: Duques-Bus Sch 250

2 Instructor

- Name: Yuxiao Huang
- Email: yuxiaohuang@gwu.edu
- Office address: Samson Hall, Room 314
- Office hours:
  Monday, 3:30 PM - 5:00 PM;
  Tuesday, 3:30 PM - 5:00 PM;
- Note: If you cannot make my scheduled office hours and need to talk outside of class, please send email to set up an appointment. I will try to respond within 24 hours. Please be aware that I may be unable to answer emails about homework and final project before the deadline, if they are received less than 24 hours before they are due.

3 Teaching Assistant

- Name: Mihir Gadgil
- Email: mihirgadgil@gwmail.gwu.edu
- Office address: Samson Hall, Room 311
- Office hours:
  Monday, 10:00 AM - 12:30 PM;
  Tuesday, 10:00 AM - 12:30 PM;
  Thursday, 4:00 PM - 7:00 PM

4 Course Description

- This course offers an introduction to Machine Learning for students in Data Science program
- While we will dive deep into the math underpinning some of the shallow models, the real focus of this course is to teach students to use Machine Learning tools to solve large-scale real-word problems
- This course will use Jupyter notebook for coding

5 Learning Outcomes

As a result of completing this course, students will be able to:

- understand the key math in Machine Learning (e.g., Gradient Descent and Back Propagation)
- use the key tools in Machine Learning (e.g., scikit-learn 0.22 and TensorFlow 2.0)

6 Textbook

The following books are highly recommended but not required:

HML Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (2nd Edition)
NND Neural Network Design (2nd Edition)

7 Average Minimum Amount of Out-Of-Class or Independent Learning Expected Per Week

- Going over the math and coding covered in class is integral for success in this course
- You should spend at least 5 hours of out-of-class or independent learning per week

8 Homework

- There will be 12 homework, which will only include coding questions
- Homework must be completed individually

9 Exam

- There will be 2 exams (a Take-Home Midterm and In-Class Final), which will only include coding questions

10 Final Project

- The final project is a great opportunity for you to apply what you have learned in class to solve large-scale real-world machine learning problems.
- While each team can choose a problem of their interest, you are strongly encouraged to work on Kaggle Competitions. The bottom line is, you must use real-world data. Please talk to the instructor if you are not sure about the nature of the data.
- The final project should be completed by teams with no more than three students.

10.1 Deliverables

- Report (a ipynb file should be submitted to blackboard)
- Presentation (the slides are not required to be submitted)

10.2 Report

The report should be in ipynb form. It should include:

- Title
- Introduction (including the problem and motivation)
- Experiment (including the code and the discussion of empirical results)
- Conclusions

10.3 Presentation

- Each team will present their final project
- A presentation should be no longer than 10 minutes (and no shorter than 8 minutes), and will be followed by a Q & A session (no longer than 2 minutes)
- All team members should present

11 Submission

- Homework and final project report will be due for submission through blackboard by Tuesday at 11:59 PM (Eastern time)
- Submission will no longer be accepted after the deadline, and will receive a grade of 0.

12 Grading Scheme

- 48% Homework (12)
- 22% Final project (1)
  - 12% Report
  - 10% Presentation
- 30% Exams
  - 10% Midterm
  - 20% Final

13 Grade Appeals

- A grade becomes permanent one week after you receive the grade
- Grade appeals and questions must be raised in writing (email) within one week after the day on which the grade was received

14 Letter Grade Distribution

$[93, 100]$	A
$[90, 93)$	A-
$(87, 90)$	B+
$[83, 87]$	B
$[80, 83)$	B-
$(77, 80)$	C+
$[73, 77]$	C
$[70, 73)$	C-
<70	F

15 University Policies

15.1 University Policy on Observance of Religious Holidays

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: `https://students.gwu.edu/accommodations-religious-holidays`.

15.2 Academic Integrity Code

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For details and complete code, see: `https://studentconduct.gwu.edu/code-academic-integrity`.

15.3 Safety and Security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

16 Support for Students Outside the Classroom

16.1 Disability Support Services (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: `https://disabilitysupport.gwu.edu/`.

16.2 Mental Health Services 202-994-5300

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: `https://counselingcenter.gwu.edu/`.

17 Tentative Schedule

Class Date	Topics	Textbook Chapter	Release Date	Due Date
01/14	Introduction to Machine Learning Data Preprocessing	HML: Ch 1, 2		
01/21	Linear Regression	HML: Ch 4	Homework 1	
01/28	Learning Theory Regularization	HML: Ch 4	Homework 2	Homework 1
02/04	Hyperparameter Tuning The Pipeline	HML: Ch 2	Homework 3	Homework 2
02/11	Logistic Regression	HML: Ch 4	Homework 4	Homework 3
02/18	Decision Tree	HML: Ch 6	Homework 5	Homework 4
02/25	Bagging, Boosting and Stacking	HML: Ch 7	Homework 6	Homework 5
03/03	Shallow Neural Network	HML: Ch 10 NND: Ch 4, 11	Homework 7 Midterm	Homework 6
03/10	Deep Learning in Computer Vision	HML: Ch 11-14	Homework 8	Homework 7 Midterm
03/17	Spring Break (no class)			
03/24	Deep Learning in Computer Vision (continued)	HML: Ch 11-14	Homework 9	Homework 8
03/31	Deep Learning in Natural Language Processing	HML: Ch 11-13, 15, 16	Homework 10	Homework 9
04/07	Deep Learning in Natural Language Processing (continued)	HML: Ch 11-13, 15, 16	Homework 11	Homework 10
04/14	Reinforcement Learning	HML: Ch 18	Homework 12	Homework 11
04/21	Final project presentation			Homework 12
04/28	No class			Final project report
05/05	Final exam			