

An Overview of CS4824/ECE4424: Machine Learning @Spring 2021

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Topic Coverage

- Basic Machine Learning Concepts
 - What's learning, Supervised learning, Semi-supervised learning, Unsupervised learning, Reinforcement learning
- Machine Learning Algorithms
 - Decision trees, Logistic regression, Linear regression, K Nearest Neighbors (KNN), Naïve Bayes, SVM, Perceptron, Clustering (K-means, EM), Principal Component Analysis (PCA), Topic Modeling
- Advanced Machine Learning
 - Deep neural networks: Feedforward Neural Networks, Back Propagation, Auto-encoder, Convolutional Neural Networks, Recurrent Neural Networks, Graph Neural Networks
 - Reinforcement Learning
 - Downstream applications in Natural Language Processing, Computer Vision,
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Class Information

- **Instructor:** Lifu Huang (<https://wilburone.github.io/>)
 - Class Meets: 8:00-9:15am, Tuesday and Thursday
 - Lectures: will be posted a day in advance on the Canvas Page
 - Office Hours: 9:00 - 10:00 AM, Monday and Friday
 - Class & Office Hours Zoom: <https://viriniatech.zoom.us/j/5961845863>
- **Teaching Assistants :**
 - Matt Harrington (GTA), Email: mattaharrington@vt.edu
Office hours: 1:00 - 2:00 PM, Tuesday and Thursday (<https://viriniatech.zoom.us/s/4668844593>)
 - Haider Ali (GTA), Email: haiderali@vt.edu
Office hours: 6:30 - 7:30 PM, Wednesday and Friday
(<https://viriniatech.zoom.us/j/8693837076?pwd=RXQ1VmRaVVdLMUtpcGNhRjFhMDNXdz09>)
 - Yash Mahajan (GTA), Email: yashmahajan@vt.edu
Office hours: 11:00 - 12:00 AM, Monday, 10:00 – 11:00 AM, Wednesday
(<https://viriniatech.zoom.us/j/7404528495>)
 - Yifan Chu (UTA), Email: yifan19@vt.edu
Office hours: 9:30 – 10:30 AM, Tuesday and Thursday (<https://viriniatech.zoom.us/my/yifanc>)



Schedule Overview

- Class and Office Hours

	Monday	Tuesday	Wednesday	Thursday	Friday
Class		8:00 - 9:15 AM		8:00 - 9:15 AM	
OH1	9:00-10:00 AM (Lifu)	9:30-10:30 AM (Yifan)	10:00-11:00AM (Yash)	9:30-10:30 AM (Yifan)	9:00-10:00 AM (Lifu)
OH2	11:00-12:00 AM (Yash)	1:00-2:00 PM (Matt)	6:30-7:30 PM (Haider)	1:00-2:00 PM (Matt)	6:30-7:30 PM (Haider)



Class Information

- **Prerequisites**

- Linear Algebra
- Basic concepts of probability and statistics
- Programming skills, especially Python

- **Course Website**

- CS 4824: <https://canvas.vt.edu/courses/125186/pages/machine-learning-spring-2021>
- ECE 4424: <https://canvas.vt.edu/courses/125557/pages/machine-learning-spring-2021>
- Content of the two websites will be identical

- **Discussion Forum**

- Canvas v.s. Piazza ??



Textbooks & Recommended References

- **Textbook Options**

- *Machine Learning: a Probabilistic perspective*. (Digital copy available for free from http://noiselab.ucsd.edu/ECE228/Murphy_Machine_Learning.pdf)
- *Pattern Recognition and Machine Learning* (Digital copy available for free from <http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop%20-%20Pattern%20Recognition%20And%20Machine%20Learning%20-%20Springer%20%202006.pdf>)
- *Understanding Machine Learning: From Theory to Algorithms* (Digital copy available for free from <https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/>)

- **Other recommended resources**

- *Deep Learning* (<https://www.deeplearningbook.org/>)
- Online Course: *Machine Learning* by Andrew Ng (<https://www.coursera.org/learn/machine-learning>)
- Github: <https://github.com/search?o=desc&q=topic%3Amachine-learning+&s=stars&type=Repositories&utf8=%E2%9C%93>
- Conferences: ICML, NeurIPS, ICLR, ACL, EMNLP, KDD, CVPR



Course Work: Assignments, Exams and Course Project

- **Assignments (60%)**

- Four Assignments, equal weight (4 * 15%)
- Each assignment will include both written and programming portions
- Both written and programming assignments will be submitted electronically
- Programming assignments will be in Python
- Homework assignments will be posted on Canvas

- **Midterm Exam (20%)**

- **Final Project (20%)**

- Include programming, report, and presentation
- Evaluate by class (10%) and TA + Instructor (10%) collectively



Tentative Schedule

Week	Dates	Topics & Lectures	Readings	Homework / Exam
1	Jan. 19, 21	Overview, Basic understanding of ML		
2	Jan. 26, 28	Decision trees, Naive Bayes		HW1-release
3	Feb. 2, 4	Numpy Tutorial (Haider), Linear Regression		
4	Feb. 9, 11	KNN, Logistic Regression		HW1-due, HW2-release
5	Feb. 16, 18	Perceptron, SVM,		
6	Feb. 23	Kernel		HW2-due, HW3-release
7	Mar. 2, 4	Midterm		
8	Mar. 9, 11	Clustering, Kmeans		
9	Mar. 16, 18	EM		
10	Mar. 23, 25	PCA, LDA		HW3-due, HW4-release
11	Mar. 30, Apr. 1	Neural networks, Feedforward NN, Backpropagation		
12	Apr. 8	Pytorch Tutorial (Matt)		HW4-due
13	Apr. 13, 15	Auto-encoder, CNN		
14	Apr. 20, 22	RNN, Reinforcement Learning		
15	Apr. 27, 29	Project Presentation		
16	May 4	Project Presentation		



Other Policies

- **Regrading Requests**

- Requests for regrading due to grading errors must be submitted in writing to the TA within one week of the release of grades.

- **Late Homework Policy**

- Penalization: $(\text{Penalized score}) = (\text{Your raw score}) * (1 - 0.1 * (\# \text{ of days past deadline}))$
- Formula will apply for up to three days. After that, 0 grading!!

- **Final Letter Grade**

A:	93.3%–100%,	A-:	90.0%–93.3%,	B+:	86.6%–90.0%,	B:	83.3%–86.6%,	B-:	80.0%–83.3%,	C+:	76.6%–80.0%,
C:	73.3%–76.6%,	C-:	70.0%–73.3%,	D+:	66.6%–70.0%,	D:	63.3%–66.6%,	D-:	60.0%–63.3%,	F:	00.0%–60.0%.

- **Academic Integrity**

- No cheating, no copy code from others or online



Questions for Short Discussion

- What's the difference between this course and previous/other ML courses?
 - Applied Machine Learning
 - Not much theoretical proof / derivation
 - Cover all the basic machine learning algorithms



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- What to do after finishing this course?
 - pick a task/research project, and apply ML algorithms to solve the problems
 - read papers to learn more advanced algorithms, applications
 - Machine Learning, Deep Learning, Natural Language Processing, Data Mining, Computer Vision, etc. (<https://aideadlin.es/?sub=ML,CV,NLP,DM>)



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- Other questions??

