CMPS 460 – Machine Learning

Syllabus and Course Admin

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Outline

- Course introduction
- Grading
- Policies

About the Instructor

- **Dr. Abdelkarim Erradi**
  - **Office:** H07 - C309, College of Engineering
  - **Phone:** 4403 4254

Office hours:

- **Tuesday 1pm to 2pm at H07-C309**
- You can talk to me **after** class if you have quick issues/questions
- Best way to contact me is via **MS Teams chat**

Course Learning Outcomes

1. Understand the basic theoretical concepts and fundamental principles of machine learning
2. Compare and contrast various approaches to machine learning.
3. Gain **hands-on experience** with solving a real-world problem with appropriate machine learning techniques.
4. **Design**, **implement**, and **analyze** machine learning solutions

Prerequisites

- **Proficiency in Python**. All class assignments will be in Python. See that your level of knowledge is sufficient by going over the following tutorials
  - https://docs.python.org/3/tutorial/
  - https://docs.scipy.org/doc/numpy/user/quickstart.html
- **College Level Calculus, Linear Algebra**. You should be comfortable taking derivatives and understanding matrix/vector operations and notation
  - See https://people.engr.tamu.edu/guni/csce689/files/linalg.pdf
- **Basic Probability and Statistics**. You should be familiar with basics of probabilities, Gaussian distributions, mean, standard deviation, etc.
  - See https://people.engr.tamu.edu/guni/csce689/files/prob.pdf

Schedule

Topics	Weeks	Chapters
Introduction to Machine Learning	1	
Working with Data	2	
Clustering	2	
Classification	2	
Regression and Logistic Regression	3	
Neural Networks	4	
Project Presentations & Exams	1	

Your Grade is Based on

Theory:

Assignments:	15% - 3 assignments
Quizzes:	15% - 4 take 3
	(no makeup for missed quizzes)
Project & Presentation:	15%
Midterm Exam:	20% - Week 8
Final Exam:	35%

ML Learning Approach

- **Conceptual Foundations:** Explains the "why" behind algorithms to build intuition and enable students to select the correct model for specific real-world problems
  - Example-driven teaching to provide context and make concepts intuitively clear
- **Mathematical Foundations:** Breaks down the linear algebra, calculus, and probability underlying models, supporting effective debugging and result interpretation
- Learning by doing:
  - **Implementation from Scratch:** Builds algorithms using only Python and NumPy before using libraries, eliminating “black-box” thinking through hands-on understanding
  - **Real-World Application using Scikit-Learn & PyTorch:** Bridges theory and industry practice preparing students for production-level ML

Quizzes & Assignments

- **Quizzes:**
  - Short (~10 minutes) quizzes on BB
  - Quizzes will mostly include multiple-choice questions covering main concepts that were discussed in class
  - These quizzes will give you a good idea of your level of understanding
- **Assignments:**
  - You will implement common ML algorithms in Python
  - You will be graded separately on each algorithm

Exams and Project

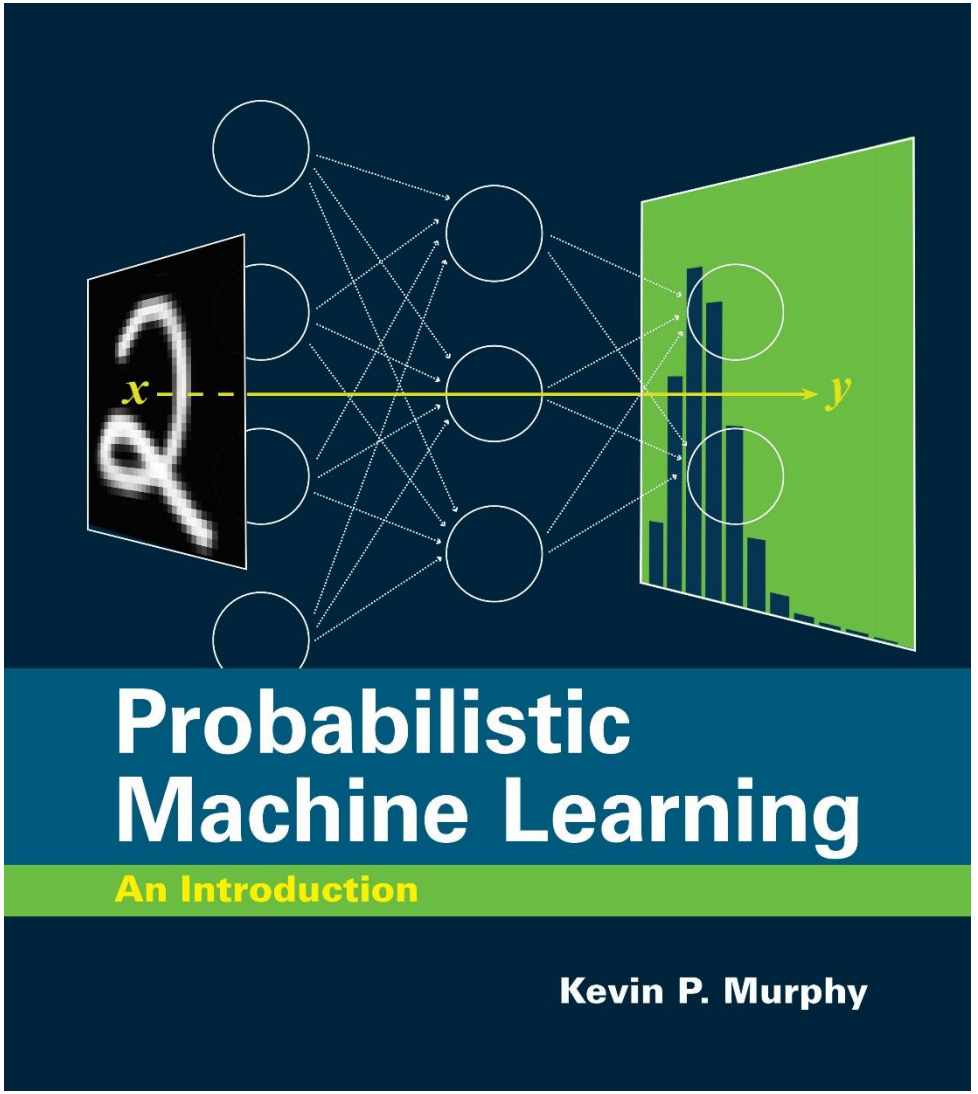
- Exams assess understanding and basic application of concepts
- Project apply ML to real problem (you select the desired problem, design, implement, test and present).

Recommended Textbook

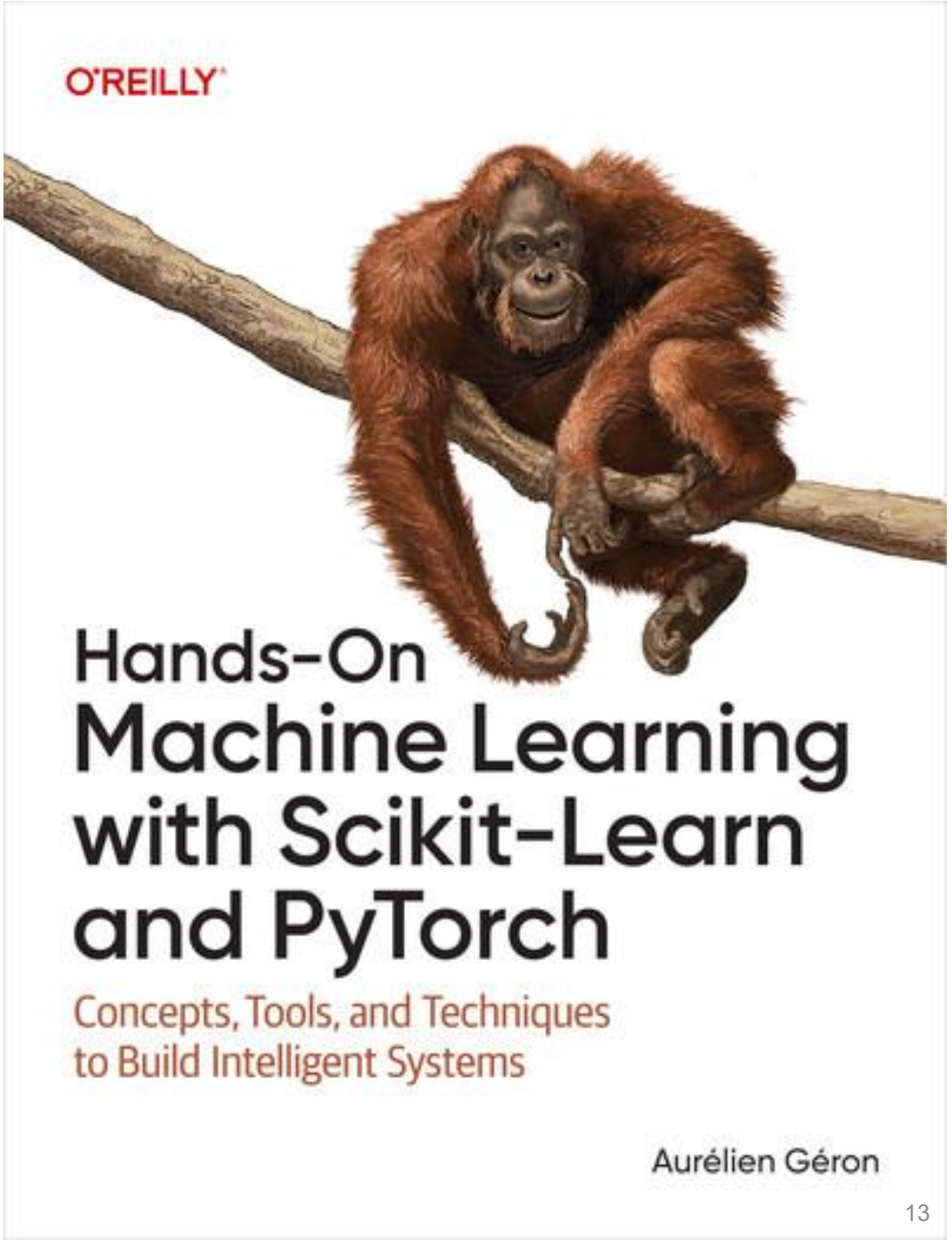
Kevin P. Murphy, **Probabilistic Machine Learning: An Introduction**, MIT Press, 2022. ISBN: 978-0262046824

Available online

Plenty of online resources will be provided



- Available online
- Login using your QU email and password



How to succeed in this course….

- Do your weekly assigned readings
- **Read the slides before you come to the class**
- **Exercise a lot – study as many examples as possible**

  - Understand and enhance the examples I provide as well as the ones in the textbook and the ones in the provided resources
- **Attend and participate in class**
  - **Many of the exam questions are from the class explanation**
- Do all the assignments and project **yourself.** Actively contribute to your project.
- Seek help when needed and ask questions (and do it EARLY): During Lectures & Come to office hours

We learn swimming by swimming and we learn ML by practicing it!

Software we will use

- Python and ML libraries including NumPy, Pandas, Scikit-Learn, PyTorch
- VS Code
- Jupyter Notebook
- GitHub Desktop
- Other tools will be communicated to you as we progress

GitHub will be used to deliver Slides, Examples, Assignments, and Project

https://github.com/cmps460s26/cmps460-content

Check it regularly!

Communication

- Post your technical questions to

https://github.com/cmps460s26/cmps460-content

Do NOT send me by email

- To contact me do not send emails but use **Microsoft Teams** chat

- For **guidance** on technical issues come to office hours NOT by email

Important Notes

- Attendance… QU attendance policies will be enforced
  - Do not miss classes/labs
- **Start your assignments and project early!!!**
- This is a senior-level course and students are expected to learn independently as much as needed in order to complete the course requirements
  - Do not expect me to find/fix your code bugs
  - Do not expect me to find and fix your technical issues

  => I can only give you high level suggestions and guidance

No ‘Free Riding’ allowed

- ‘free riders’ (who do not contribute much) => not acceptable and not fair for hardworking students
  - You must actively contribute to your project and do your ultimate best to deliver the best possible results
  - Otherwise you will be asked to do the project alone
  - **Report free-riders early**

Plagiarism / Cheating

- “Getting an unfair academic advantage"
  - Using other people's work as your own
  - Not doing your assignments yourself
- All the code you submit must be your own
    - Only exception: Code I have provided or explicitly authorized
    - **NO** code you have found on the web. **NO** sharing with others.
- **Do your homework and project yourself**
  - Do NOT copy from each other or from the Internet - **I will know it!**
  - You can be picked-up randomly to explain your implementation
  - Cheating will be treated very seriously
- Penalties START with a zero on the assignment, failing the course! and other disciplinary actions as per QU policy

To do before next class

- Install the required software: VS Code & GitHub desktop (see announcement on Teams)
- Decide your team members and enter them in the spreadsheet on Teams
- Create your GitHub account **(firstname-quUsername)**
- Prepare any questions you might have

I wish you a fruitful and enjoyable journey!