Course Introduction

Forrest Davis

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Fall 2025 COSC410A: Applied Machine Learning
Colgate University

About me

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Prof. Forrest Davis

- **Pronouns** he/him
- **Office** 322 Bernstein
- **Background** Computer Science, Mathematics, and Linguistics
- **Research** using AI to find differences between our experience with language(s) and our knowledge of language(s) (including, English, Spanish, Italian, Chinese)
- **Loves** coffee, the outdoors, cats

About me

Fig

- **Pronouns** he/him
- **Background** anthropology and ornithology
- **Research** training humans to feed cats all the time
- **Loves** windows, birds, and food

What the course is and isn't

A disclaimer of the course scope

- We aren't after
  - Artificial General Intelligence (for one, it's either impossible or an incoherent goal driven by marketing)
  - Field specific algorithms (at a deep level), including NLP (despite my love of this area), robotics, genetics, games, vision, etc.

A disclaimer on the course scope

- I hope you leave the course able to
  - Map from problems to appropriate ML techniques
  - Critically evaluate existing systems and models
  - Understand some of the underlying math and foundational concepts behind ML
  - Engage in public scholarship
  - Prototype an ML system to solve something you care about
- Also,
  - Have fun growing your interest and skills in an exciting area of computer science

The learning objectives

Broad Goals

- Practical ML for interdisciplinary problems
  - Hands on practice applying and testing a wide-range of machine learning algorithms
    - Both "traditional" and neural network based
    - Drawing on standard python libraries (scikit-learn, PyTorch)
  - Understand the components of a machine learning pipeline
    - Data
    - Model
    - Objectives and Performance metrics
    - Optimization algorithms
  - Design, conduct, and present a ML project using public or self-collected datasets

Broad Goals

- Fundamental Knowledge
  - Small scale hands on walk troughs of the math behind ML techniques
  - Dig deeper into the class of problems solved by particular ML techniques

The course structure

Topic Overview

- Background
  - What is ML?; ML pipelines; data quality; preprocessing
- Supervised Learning
  - Regression; classification; nearest neighbors; decision tress; ...
- Deep Learning
  - Multilayer perceptrons; convolutional networks; recurrent networks; transformers
- Unsupervised Learning
  - Clustering: dimensionality reduction; ...
- Additional ML Topics
  - Reinforcement Learning

Course structure - Class

- Topic Introduction
  - Lecture, example-walk through together, etc.
- Hands-on practice
  - Work in small groups by hand

Course structure - Readings

- Required readings will be given on the course website and should be completed prior to class
  - Most readings are from the online textbook
  - Non-textbook readings will be posted as PDFs or links
- A brief **reading quiz** posted on Moodle will accompany many of the readings and is *due prior to the relevant class*

Course structure - Codelets/Labs/Midterms

- Codelets
  - Small programming tasks motivated by core skills and concepts
  - Reinforces the conceptual topics in class with implementation
- Labs
  - Apply concepts from class
  - Work individually or in groups
- Two written midterms
  - Oct 2 (in class) - covers non-neural techniques
  - Nov 13 (in class) - covers non-neural techniques

Course structure - Society Reflection

- Connect machine learning/AI with real life implications
- Attend at least one of the following events (more details in the syllabus)
  - Robots as characters?
  - Films by Lawrence Lek
  - Maria Antoniak Lecture
- Write a 2 page, single-spaced response that addressing the points in on the syllabus

Course structure - Capstone Project

- Opportunity to apply machine learning to a topic of your choice
- Work in teams of up to 3
- Several deadlines to encourage consistent progress
  - See syllabus
  - More details to follow on the course website (when we get there)

Ways to Get Help

- Each other
- Discord
  - Asynchronous questions (linked on the course website)
- Office hours
  - 3-6PM Tuesday in 331 Bernstein (upstairs conference room)
- Email (though discord is preferred for questions everyone can benefit from)

Fostering Independent Problem Solving Skills

- In this class you should **productively struggle**
  - Things are difficult on purpose, but you shouldn't spend 2 hours on a codelet with no progress. Reach out to me or others if you find yourself stuck for a long while!
  - You should learn to balance asking for help and spending time really digging into your problem
    - You'll learn more struggling through a problem on your own then simply giving up quickly and asking for help
    - You'll learn how to deal with problems (e.g., what resources you find helpful, how to better debug) which will help you later!
    - Help me help you help yourself

Key parts of syllabus

Grading - Course

Grade	Codelets (S/U)	Exams (2)	Capstone
A	8/8	>90% avg	>90% avg and 4/4 S
B	6/8	80–89% avg	80–89% avg and 3/4 S
C	4/8	70–79% avg	70–79% avg and 2/4 S
D	2/8	60–69% avg	60–69% avg and 1/4 S
F	Failure to meet expectations for D results in an F		

Table 1: Grading breakdown for the course. Final grade is the **mean** of the three categories.

Grading - Lab

Grade	Labs (S/U)	Attendance
A	6/6	0 unexcused absences
B	4/6	1 unexcused absences
C	3/6	2 unexcused absences
D	2/6	2 unexcused absences
F	Failure to meet expectations for D results in an F	

Table 2: Grading breakdown for the lab. Final grade is the **mean** of the two categories

Attendance

- Please attend class
  - It's part of your grade
  - It helps you learn
- Contact me prior to any absence
  - Check-in email within 48 hours of the relevant class
  - Include a brief (2-4 sentences) of what was covered in the class and any thoughts/questions you have
- While in class, make space for everyone to contribute

Late Policy

- **No late submission for capstone related deadlines**
  - You will receive a 0
- I'm reasonably flexible about other deadlines if you get in touch with me in advance
  - Submitting work late with no prior approval (or relevant administrative dean approval) will receive a 0

Academic Honesty

- Ultimately, **you are responsible for your own work and the thought behind it**
- Do not share assignment code (or pseudo code) with your peers
- Do not use generative AI systems for easy answers
- **READ THE SYLLABUS**

Before next class

- Read Ch. 1
- Complete survey: `https://forms.gle/yHhPQxwhFSLrCeWU7`
- Read syllabus
- Complete pre-class quiz (on Moodle and linked on website)