CS 175: Project in Artificial Intelligence
Fall 2021
Lecture 1: Introduction

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Today's lecture

Overview

Logistics

Resources

Learning goals

Practice AI/ML

Software Engineering

Presentation Skills

- Be creative about what problem to solve

- Get a feel for what's practical to solve and how

- Implement and debug a machine learning pipeline

- Design and implement a complex software system

- Use modern software practices

- Experience collaborative software development

- "Sell" your ideas in writing / figures / talk

- Present your project in a convincing manner

- Document and maintain a project website

Lectures and assignments

- First couple of weeks: 4 lectures (no discussion section)

  ‣ Introducing general principles of reinforcement learning (RL)

  ‣ Overview of project platforms

  ‣ In a nutshell: deep RL and advanced topics

- 2 assignments

  ‣ Install one of the project platforms (Malmo)

  ‣ Implement and experiment with basic RL algorithm

- Reading and thinking

Project meetings and presentations

- Project timeline:

  ‣ Week 3: team formation (3 per team) + proposals

  ‣ Continually: reading > thinking > implementation > experimentation > evaluation

  ‣ Week 7: progress reports

  ‣ Week 10+11: presentations + reports

- Meetings:

  ‣ Teams should meet regularly

  ‣ Meet with course staff as often as you want; at least on weeks 3–4, 5–6 and 8–9

Today's lecture

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Logistics

Expectations

Course logistics

- When: Tuesdays and Thursdays, 2–3:20pm

  ‣ Only in the first couple of weeks

- Where: in-person: SH 174; virtual: https://uci.zoom.us/j/93006900208

- Website: https://royf.org/crs/F21/CS175/ ← Schedule! Resources!

- Forum: https://edstem.org/us/courses/14172/discussion/

  ‣ For announcements and questions (preferred over email)

- 2 assignments: https://www.gradescope.com/courses/312826

- Office hours: https://calendly.com/royfox/office-hours

  ‣ Welcome to schedule 15-min slots and invite friends; give 4 hour notice

Course staff

- Instructor: Prof. Roy Fox

- Teaching assistant: Kolby Nottingham
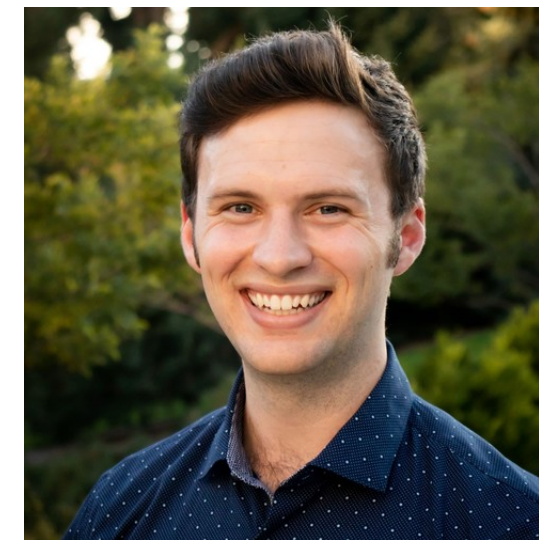
- Contact us on Ed Discussion (publicly or privately)

  ‣ Email only for personal matters unrelated to the course

- Office hours: https://calendly.com/royfox/office-hours

  ‣ Welcome to schedule 15-min slots, optionally with classmates; give 4 hour notice
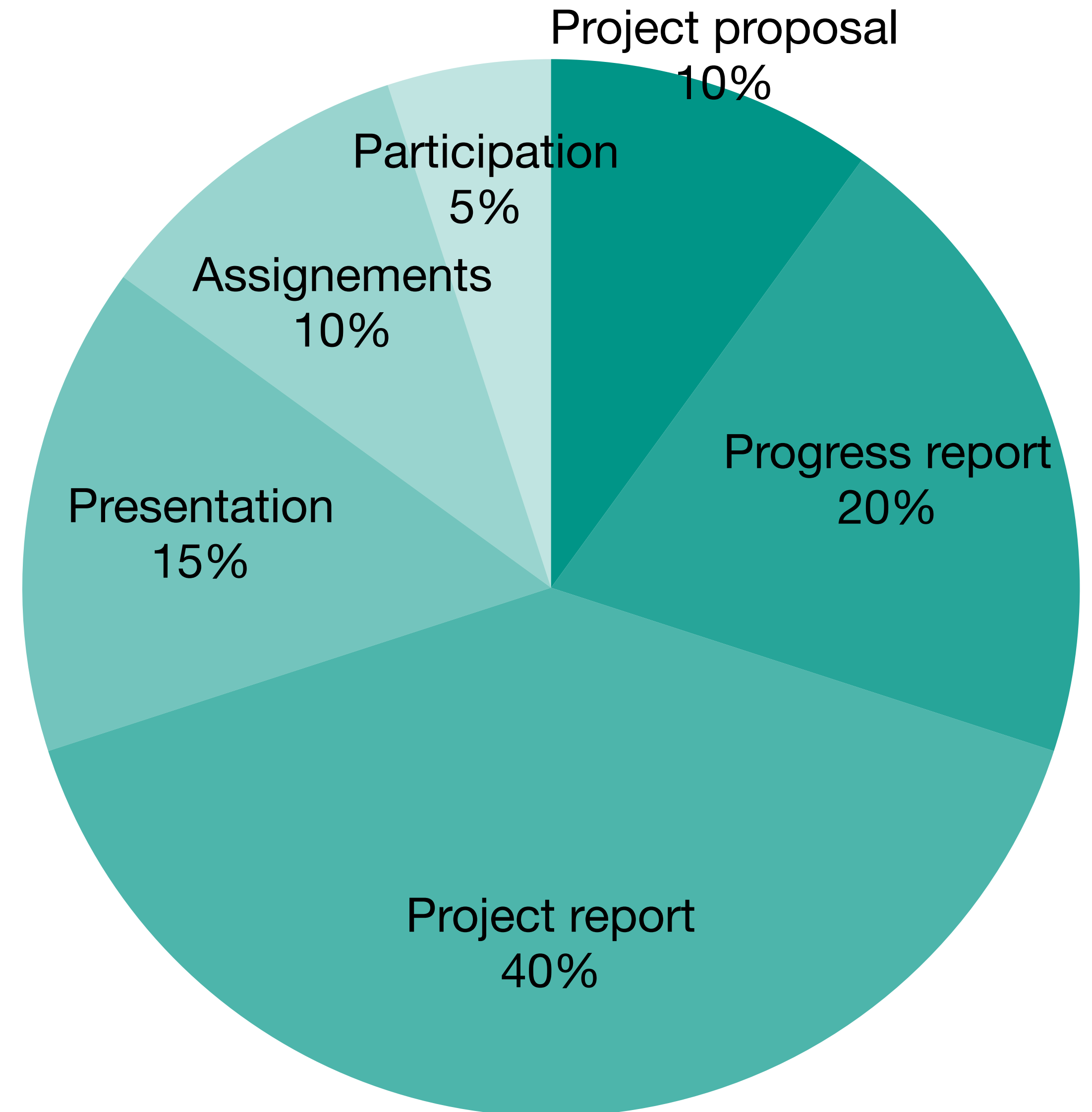
Grading policy

- 2 assignments (weeks 2+3)

- Project proposal (week 3)

- Progress report (week 8)

- Project report (finals week)

- Grace days:

  ‣ Assignments: 3 days total per person

  ‣ Project: 4 days total per team

- No exams

Project proposal
10%

Participation
5%

Assignements
10%

Presentation
15%

Progress report
20%

Project report
40%
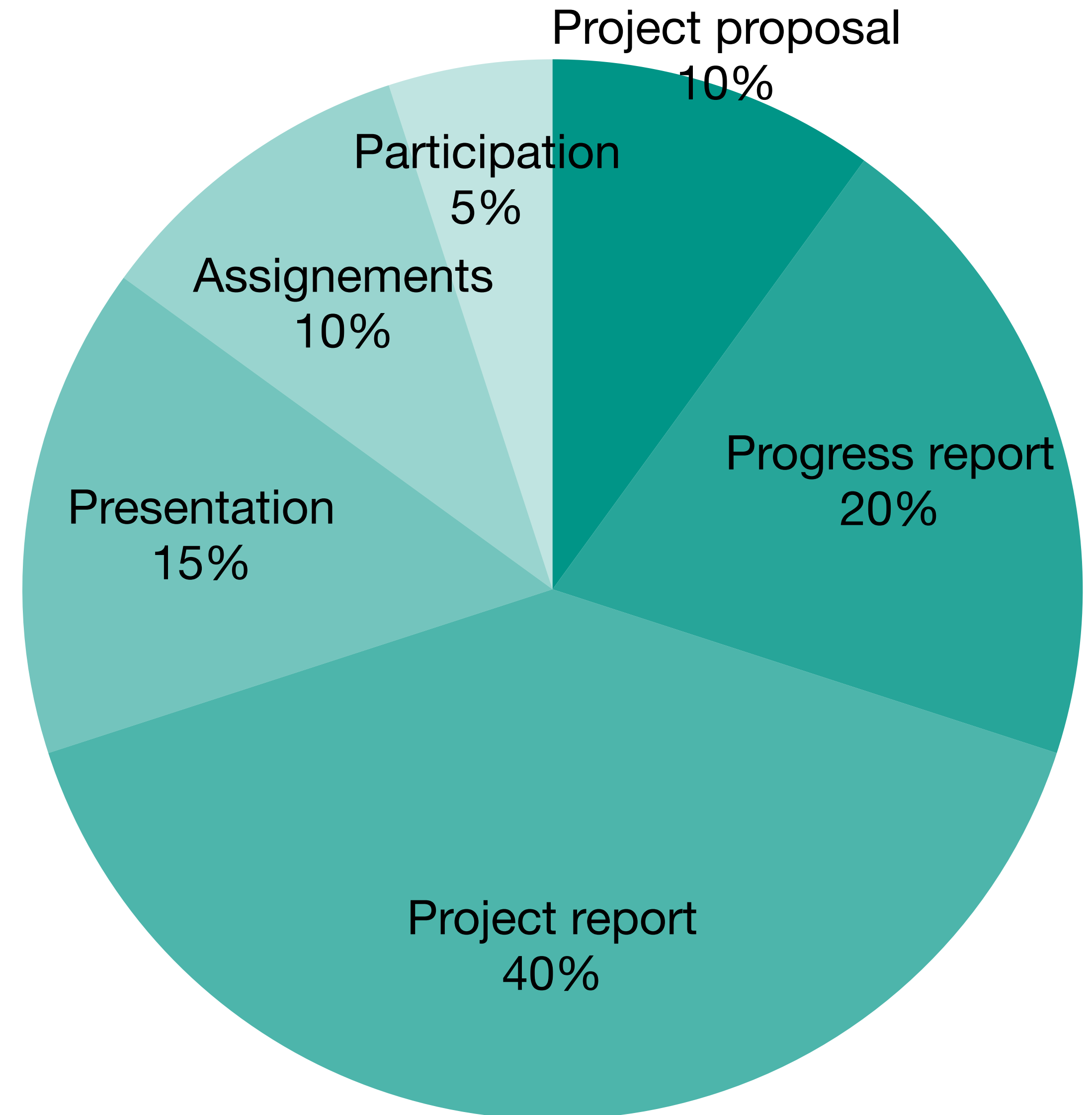
Grading: participation

- In-class participation

- Forum participation

  ‣ Ask questions if you have any

  ‣ Answer questions if you can

  ‣ Post relevant useful links

  ‣ Upvote useful posts

  ‣ Give private feedback to staff

- Quizzes, surveys, and evaluations

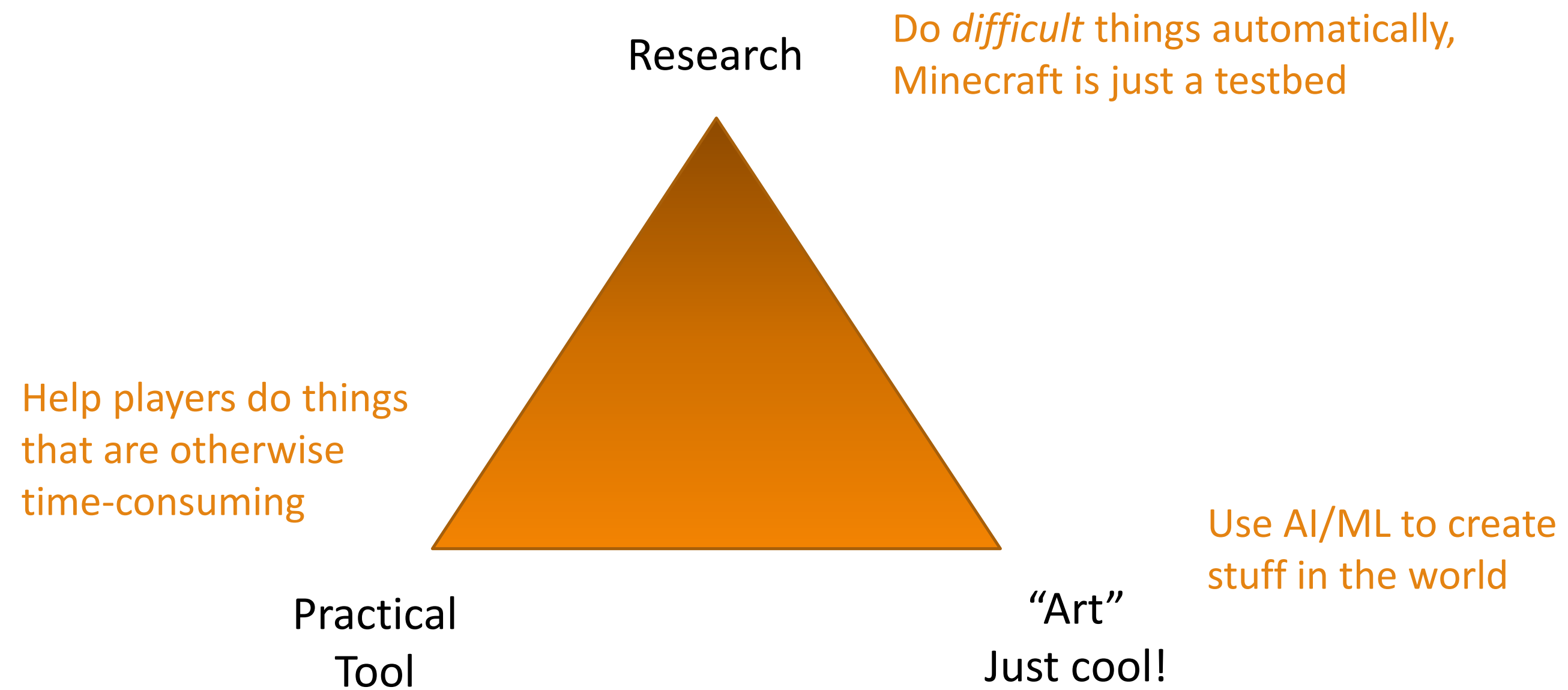 ‣ Answer polls published on the forum

  ‣ Submit course evaluations

Today's lecture

Overview

Logistics

Expectations

What can a project be?

Research

Do *difficult* things automatically, Minecraft is just a testbed

Help players do things that are otherwise time-consuming

Use AI/ML to create stuff in the world

Practical
Tool

"Art"
Just cool!

https://canvas.eee.uci.edu/courses/34142/modules

Technical Solution

Use Artificial Intelligence or Machine Learning algorithms

Artificial Intelligence

Machine Learning

Heuristic/Adversarial/Local Search

Supervised Learning

Logic   Planning

Unsupervised Learning

Bayesian Networks

Reinforcement Learning

Natural Language Processing

Computer Vision   Recommendation Systems   Computer Vision

Constraint Satisfaction   Time Series Modeling   Deep Learning

https://canvas.eee.uci.edu/courses/34142/modules

Evaluation

How would YOU define that your project was a success?

Quantitative Evaluation

Numerical Metrics:
- Accuracy, F1, AUC, …
- Time to "run", time to "train"

Baselines:
- What would be currently used?
- What are reasonable "simpler" methods?

By how much amount?

We hope to improve the METRIC by AMOUNT over BASELINE!

(I won't hold you to it, just want you to think about it)

https://canvas.eee.uci.edu/courses/34142/modules

Evaluation

How would YOU define that your project was a success?

Qualitative Evaluation

Simple Example Cases:
- What are examples that your idea will "definitely" work on?
- What is the expected output on these?

Error Analysis and Introspection:
- Are there plots/figures to verify the behavior?
- If it doesn't work, how will you improve it?

The Super-Impressive Example
- What is the best example? "awesome if it works"
- E.g. something that perfectly captures your idea!

https://canvas.eee.uci.edu/courses/34142/modules

You will have doubts!

Is it too simple?

Is it too ambitious?

Is there data to train my classifier?

Is there a different algorithm I should use?

Is my evaluation inappropriate?

Can I only use off-the-shelf code?

Use Campuswire!

Every team has to meet me in Weeks 3-4.

Staff is available for more appointments every week

https://canvas.eee.uci.edu/courses/34142/modules

Previous Projects

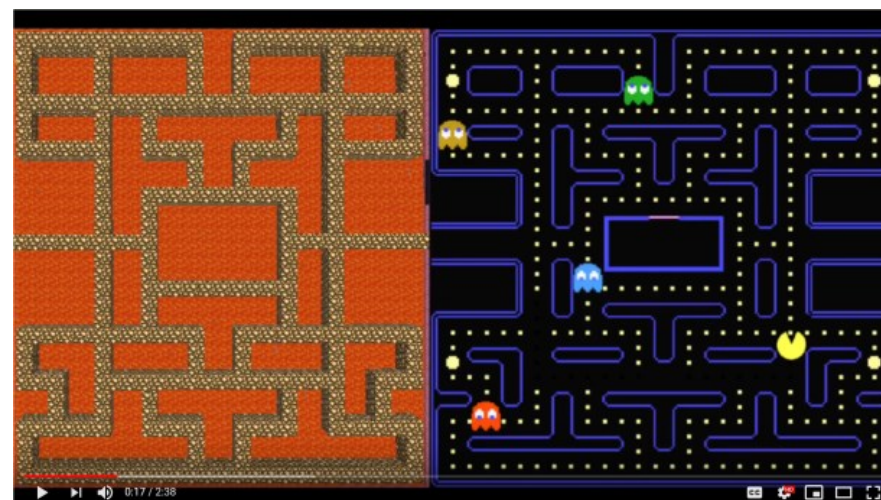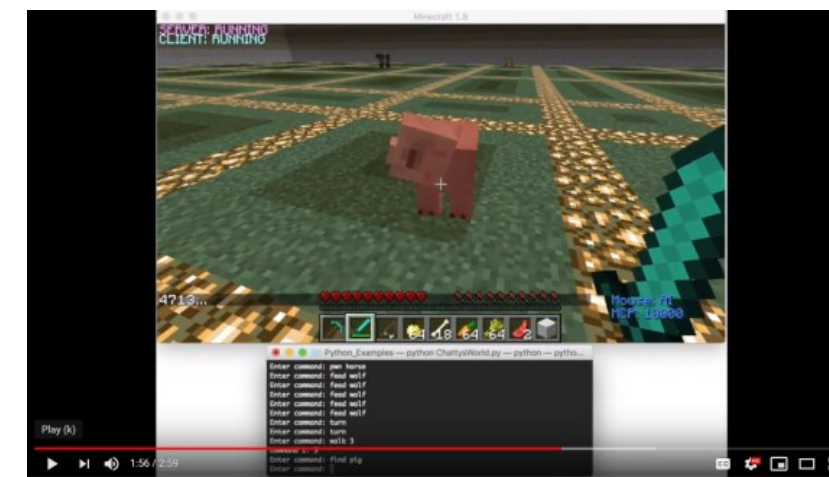- Full list will be posted on Canvas soon. Meanwhile,

https://www.youtube.com/watch?v=JkVa7xYHzVA

https://www.youtube.com/watch?v=QOfay_gvvJ0

https://www.youtube.com/watch?v=KL9a2zpZo2c

https://www.youtube.com/watch?v=sS253RfbM3s

https://www.youtube.com/watch?v=ulUQLIo7MJY

https://www.youtube.com/watch?v=Zn3SfC7HQ1A

https://canvas.eee.uci.edu/courses/34142/modules
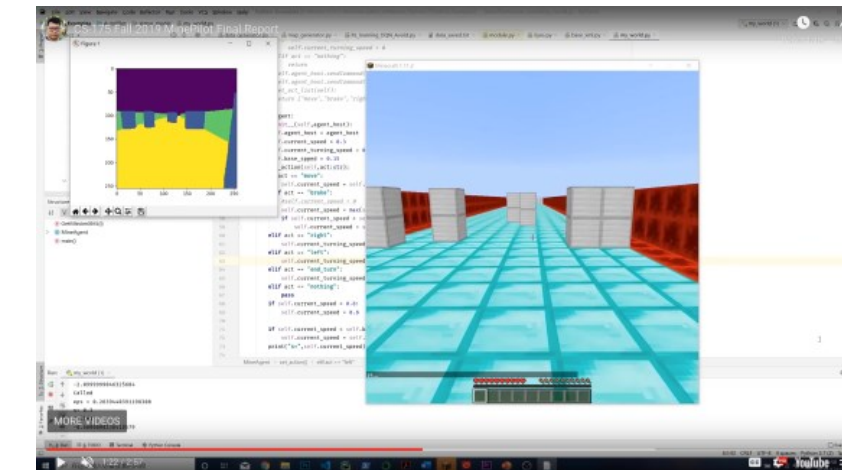
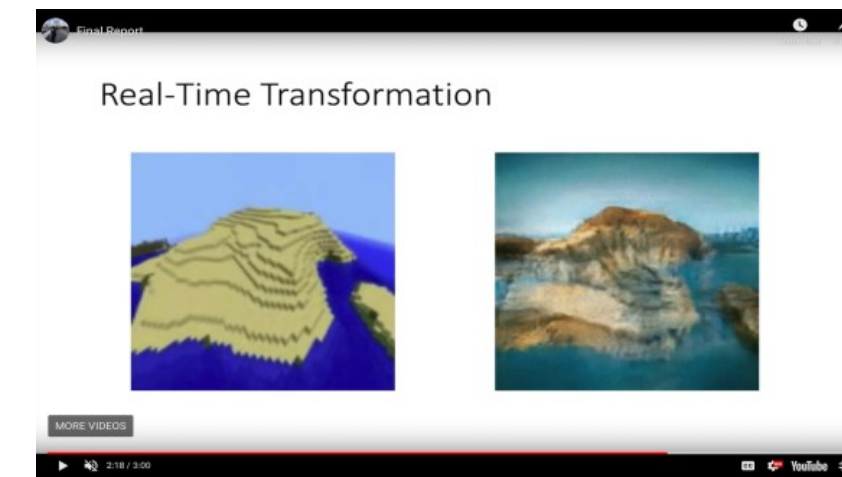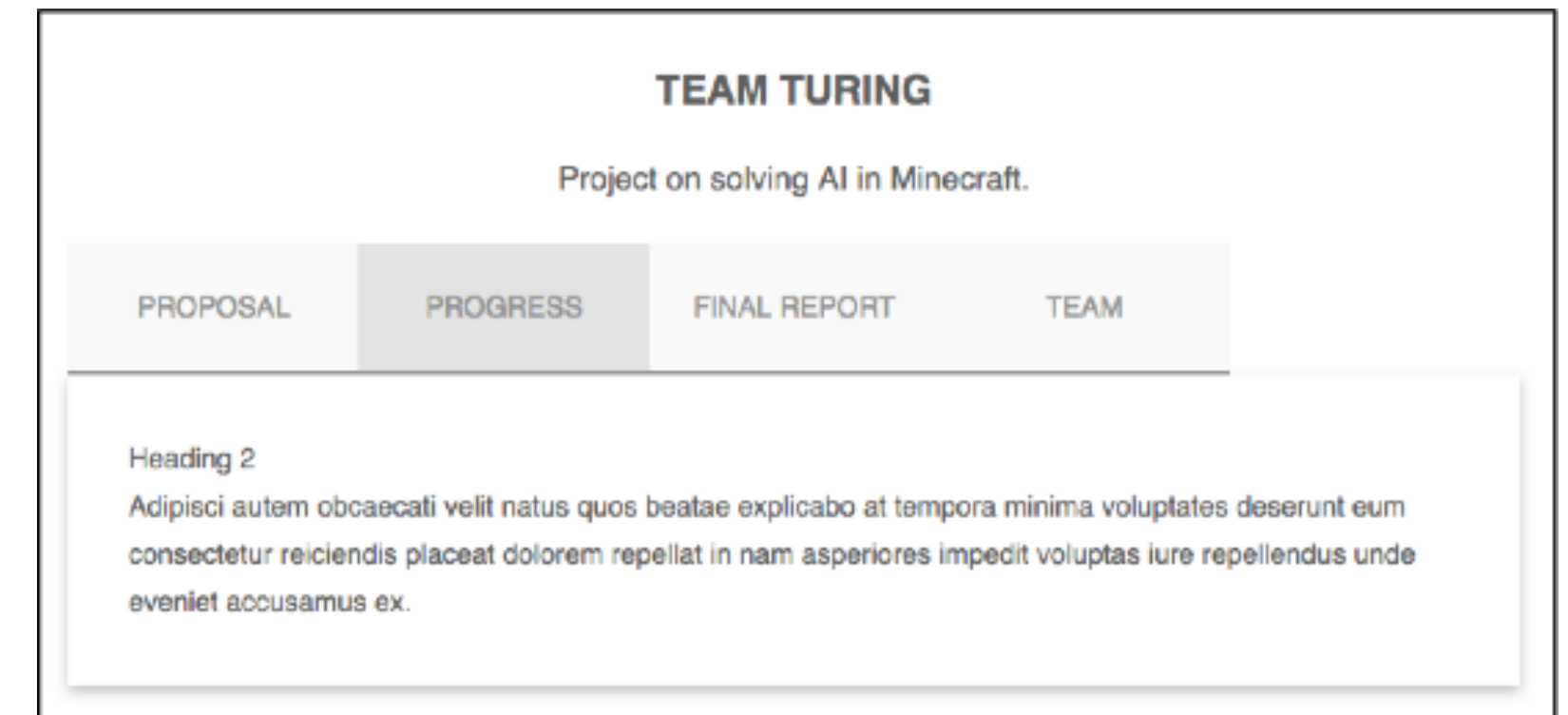# Software tools

- GitHub — sync your work with teammates and course staff

- GitHub Pages — maintain project website

- Program in Python

  ‣ Use libraries (numpy, scikit-learn, pytorch, rllib, ...)

- Suggested platforms (others allowed, welcome to discuss):

  ‣ Malmo: https://www.microsoft.com/en-us/research/project/project-malmo/

  ‣ DuckieTown: https://challenges.duckietown.org/

  ‣ ColosseumRL: https://rl-competition.igb.uci.edu/

Compute resources

- Assignments should fit on your personal computer

- For projects, if more compute resources are required:

  - ICS Jupyterhub: https://swiki.ics.uci.edu/doku.php/virtual_environments:jupyterhub

  - Campus-wide cluster: https://rcic.uci.edu/hpc3/

  - Google Colab: https://colab.research.google.com/

Upcoming...

logistics

- Check out Ed Discussion for announcements and forum

- See website for planned schedule

assignments

- Assignment 1 to be published soon