Lecture 1 - CS486 Introduction

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Readings: Poole & Mackworth 1.1
People, books, web

People:
  ▶ Jesse Hoey (Instructor)
  ▶ TAs:
    ▶ Kai Ma
    ▶ Zheng Ma
    ▶ Kelechi Ogueji
    ▶ Kyle Tilbury
    ▶ Mojtaba Valipour
    ▶ Blake Vanberlo
    ▶ Ji Xin
    ▶ Dake Zhang

Lectures:
  ▶ Section 002: T/Th 1:00pm-2:20pm in RCH-302
  ▶ Section 001: T/Th 2:30pm-3:50pm in RCH-302

Office hours: TBA (online)
Office hours (TA): near assignment due dates
Assignments, etc

- **CS486 (undergrad students)**
  - 4 Assignments (40%: 10% each) (approx deadlines: May 29th, Jun 15, Jun 29, Jul 20)
  - 1 midterm exam (15%) (June 8th, 7:00pm-8:50pm in M3-1006)
  - 1 final exam (45%) (must pass to pass course)
  - optional project (5% bonus, proposal due at midterm)

- **CS686 (grad students)**
  - 4 Assignments (25%: 6.25% each) (approx deadlines: May 29th, Jun 15, Jun 29, Jul 20)
  - 1 midterm exam (10%) (June 8th, 7pm-8:50pm in M3-1006)
  - 1 final exam (35%)
  - 1 project report (30%, proposal due at midterm)

- Students wishing to write a project (and all CS686 students) **must** submit a project proposal.

- the Final is cumulative (covers all course material) with a focus on the post-midterm material.
Projects

- Optional for CS486 students (5% bonus)
- Mandatory for CS686 students (30% of grade)
- you must submit a correctly constructed and formatted proposal by the midterm - will be pass/fail with no mark
- Final project due before the final exam
- Individual project (CS686)
- Group project (up to 3 members, CS486):
  - must be substantially more involved than individual projects,
  - each team members contributions must be clearly and specifically described
  - there must be more papers referenced and discussed for team projects (3 more per team member)

https://cs.uwaterloo.ca/~jhoey/teaching/cs486/projects.html
Textbooks, websites

- **Textbook:** David Poole and Alan Mackworth
  *Artificial Intelligence: Foundations of Computational Agents.*
  available online at artint.info

- **Secondary textbooks:**
  - Russell and Norvig
    *Artificial Intelligence* aima.cs.berkeley.edu/
  - Ian Goodfellow and Yoshua Bengio and Aaron Courville
    *Deep Learning* - deeplearningbook.org/

- **Website:**
  https://cs.uwaterloo.ca/~jhoey/teaching/cs486/index.html

- **Discussion forum and email:** Piazza
  piazza.com/uwaterloo.ca/spring2022/cs486686/home

- assignments handed in and returned, grades, on LEARN
To accommodate a classmate who is registered with AccessAbility Services, the AccessAbility Services staff and I are looking for a volunteer notetaker for CS486. We appreciate your contribution to the university on behalf of fellow students who are unable to take notes due to a disability. If you are interested in being a volunteer notetaker, please complete the application form on the AccessAbility Services website by signing-in with your WATIAM credentials (https://york.accessiblelearning.com/UWaterloo/).
Overview of the Course

Lectures:

- Introduction
- Agents and AI
- Representation and Reasoning
  - States and Searching
  - Features and Constraints (CSPs)
  - Logical inference
  - Uncertainty (Bayesian probability)
- Learning
  - Supervised learning (Regression)
  - Neural Networks and Deep Learning (Stochastic gradient descent)
  - Bayesian learning (learning Bayes Nets)
  - Unsupervised learning (Expectation-Maximization)
- Planning
  - deterministic (under certainty)
  - with uncertainty (Markov decision processes)
  - reinforcement learning
- Topics (time permitting)
Integrity, Intellectual Property

- See official course outline at https://cs.uwaterloo.ca/~jhoey/teaching/cs486/S22CS486Outline.html

- Property of UW:
  - Lecture content, spoken and written (and any audio/video recording thereof);
  - Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
  - Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
  - Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

- Sharing intellectual property without the intellectual property owner’s permission is a violation of intellectual property rights.
Current Research In A.I.

- **Organizations:**
  - Waterloo AI institute [waterloo.ai](waterloo.ai)
  - Assoc. for the Advancement of A.I. (AAAI) [aaai.org](aaai.org)
  - European Association for A.I. (EurAI) [eurai.org](eurai.org)
  - Canadian A.I. Association [caiac.ca](caiac.ca)
  - Intl. Machine Learning Society [machinelearning.org](machinelearning.org)
  - Association for Affective Computing (AAAC) [https://aaac.world/](https://aaac.world/)

- **Journals**
  - Artificial Intelligence [journals.elsevier.com/artificial-intelligence/](journals.elsevier.com/artificial-intelligence/)
  - Journal of AI Research [jair.org](jair.org)
  - Journal of Machine Learning Research [jmlr.org](jmlr.org)

- **Conferences**
  - International Joint Conferences on A.I. [ijcai-22.org](ijcai-22.org)
  - AAAI 2018 [aaai.org/Conferences/AAAI-22](aaai.org/Conferences/AAAI-22)
  - Neural Information Processing Systems [neurips.cc](neurips.cc)
  - International Conf. on Machine Learning [icml.cc](icml.cc)
What is Artificial Intelligence (AI)?
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The synthesis and analysis of computational agents that act intelligently.

An agent acts \textit{intelligently} when

- what it does is appropriate for its circumstances and its goals, taking into account the short-term and long-term consequences of its actions
- it is flexible to changing environments and changing goals
- it learns from experience
- it makes appropriate choices given its perceptual and computational limitations
What is AI? (Poole & Mackworth chapter 1.2-1.10, 2.1-2.3)
Search (Poole & Mackworth chapter 3)