

Lecture 1 - CS486 Introduction

Jesse Hoey
School of Computer Science
University of Waterloo

January 14, 2020

Readings: Poole & Mackworth 1.1

- People:
 - ▶ Jesse Hoey (Instructor)
 - ▶ TAs:
 - ▶ Shushant Agarwal
 - ▶ Ehsan Ganjidoost
 - ▶ Joshua Jung
 - ▶ Charupriya Sharma
 - ▶ Kyle Tilbury
 - ▶ Ethan Ward
 - ▶ Allen Wang
- Lectures:
 - ▶ Section 001: T/Th 4:00pm-5:20pm in MC-2038
 - ▶ Section 002: T/Th 11:30am-12:50am in RCH-307
- Office hours: Mondays 1pm-2pm in DC2584 (CHIL)
- Office hours (TA): near assignment due dates

- CS486 (undergrad students)
 - ▶ 4 Assignments (40%: 10% each)
 - ▶ 1 midterm exam (15%) (Feb 7th, 630pm in M3-1006)
 - ▶ 1 final exam (45%) (must pass to pass course)
 - ▶ optional project (5% bonus, proposal at midterm)
- CS686 (grad students)
 - ▶ 4 Assignments (25%: 6.25% each)
 - ▶ 1 midterm exam (10%) (Feb 7th, 630pm 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.

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)

- 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/winter2020/cs486686/home
- assignments handed in and returned, grades, on LEARN

Current Research In A.I.

- Organizations:
 - ▶ Waterloo AI institute waterloo.ai
 - ▶ Assoc. for the Advancement of A.I. (AAAI) aaai.org
 - ▶ European Association for A.I. (EurAI) eurai.org
 - ▶ Canadian A.I. Association caiac.ca
 - ▶ Intl. Machine Learning Society machinelearning.org
 - ▶ Association for Affective Computing (AAAC) emotion-research.net
- Journals
 - ▶ Artificial Intelligence journals.elsevier.com/artificial-intelligence/
 - ▶ Journal of AI Research jair.org
 - ▶ Journal of Machine Learning Research jmlr.org
 - ▶ arXiv AI <https://arxiv.org/list/cs.AI/recent>
 - ▶ arXiv Learning <https://arxiv.org/list/cs.LG/recent>
- Conferences
 - ▶ International Joint Conferences on A.I. ijcai-18.org
 - ▶ AAAI 2018 aaai.org/Conferences/AAAI-18
 - ▶ Neural Information Processing Systems neurips.cc
 - ▶ International Conf. on Machine Learning icml.cc

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/W20CS486Outline.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.

What is Artificial Intelligence (AI)?

What is Artificial Intelligence (AI)?

The synthesis and analysis of computational agents that act intelligently.

An agent acts *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

Next:

- What is AI? (Poole & Mackworth chapter 1.2-1.10,2.1-2.3)
- Search (Poole & Mackworth chapter 3)