Lecture 1 - CS486 Introduction

Jesse Hoey
School of Computer Science
University of Waterloo

January 7, 2020

Readings:Poole & Mackworth 1.1

People, books, web

- People:
  - Jesse Hoey (Instructor)
  - TAs:
    - Ashutosh Adhikari
    - 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

Assignments, etc

- 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)

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/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)