Course Information

- Webpage: www.eecs.wsu.edu/~holder/courses/AI
- Email (holder@wsu.edu)
- Blackboard Learn (learn.wsu.edu)
Introduction

Readings: Chapter 1
What Is AI?

- John McCarthy, Dartmouth (1956)
  - “The science and engineering of making intelligent machines.”
- Intelligent?
- What makes humans intelligent?
Intelligence

- Ability to learn or understand or to deal with new or trying situations
- Ability to apply knowledge to manipulate one's environment
- Ability to think abstractly as measured by objective criteria (e.g., tests)
Four Approaches to AI

- Acting humanly
- Thinking humanly
- Thinking rationally
- Acting rationally
AI = Acting Humanly

- **Turing Test**
  - Can the machine convince a human that it is human via written English

- **Machine abilities**
  - Natural language
  - Knowledge representation
  - Reasoning
  - Learning

- **Loebner Prize**
  - [www.aisb.org.uk/events/loebner-prize](http://www.aisb.org.uk/events/loebner-prize)
AI = Thinking Humanly

- Building machines that mimic human cognition
- “Cognitive Science”
- How to capture human thought
  - Introspection
  - Psychological experiments
  - Brain imaging
AI = Thinking Rationally

- Laws of thought
- Logic
- Difficulties
  - Expressing knowledge as logical formulae
    - A chair is something designed to support a person in a sitting position, usually having four legs for support and a rest for the back and often having rests for the arms.
  - Logical reasoning is NP–Hard
    - If A is true, and A → B, then is B true?
AI = Acting Rationally

- Rational agent
  - Acts to achieve the best outcome
  - Encompasses other approaches
- Focus of textbook (“a modern approach”)
IBM’s Watson competes against humans in Jeopardy! Game

Is Watson
- Thinking humanly?
- Acting humanly?
- Thinking rationally?
- Acting rationally?
Computer Learns to Play Breakout

- Is DQN Breakout
  - Thinking humanly?
  - Acting humanly?
  - Thinking rationally?
  - Acting rationally?
Foundations of AI

- Philosophy
  - Logic, knowledge and rationality
- Mathematics
  - Algorithms, computability, probability
- Economics
  - Utility and decision theory, games
- Linguistics
- Neuroscience
  - Neuron, connectome
- Psychology
  - Human cognition
- Control Theory
- Computer Engineering
- Computer Science
History of AI

- Gestation of AI (1943–1955)
  - Turing’s “Computing Machinery and Intelligence”
  - Artificial neuron

- Birth of AI (1956)
  - John McCarthy and the Dartmouth Summer Workshop
  - Newell and Simon’s “Logic Theorist”

- Early enthusiasm, great expectations (1952–1969)
  - Newell and Simon’s “General Problem Solver”
  - Symbolic programming languages (LISP)
  - Perceptron
History of AI (cont.)

- Dose of reality (1966–1973)
  - Systems lacked knowledge; made simple mistakes
  - Systems provably unable to generate intelligent behavior
  - Most AI problems found to be intractable
  - Knowledge and uncertainty representation
  - Expert systems
- AI industry (1980–present)
- Return of neural networks (1986–present)
  - Multi–layer perceptrons, back–propagation, deep learning
History of AI (cont.)

- **AI adopts scientific method (1987–present)**
  - Empirical validation and theory
- **Emergence of intelligent agents (1995–present)**
  - Human–level AI
  - Artificial general intelligence
- **Availability of “big data” (2001–present)**
  - Amazon Web Services Public Datasets (xTB) ([http://aws.amazon.com/datasets](http://aws.amazon.com/datasets))
  - Semantic Web ([http://linkeddata.org](http://linkeddata.org))
- **Deep learning (2010–present)**
Achievements

- Robotics
- Speech recognition
- Planning and scheduling
- Game playing
- Spam filtering
- Machine translation
- Big data
- Deep learning
Caution

- “AI is a fundamental risk to the existence of human civilisation.”
  - Elon Musk, July 2017

- “… whose culmination is a world relying on machines ungoverned by ethical or philosophical norms.”
  - Henry Kissinger, June 2018
Summary

- AI is the science and engineering of building intelligent machines
  - I.e., machines that act rationally
- Impressive achievements
- Promising, challenging future