CAP5636 Artificial Intelligence

Introduction
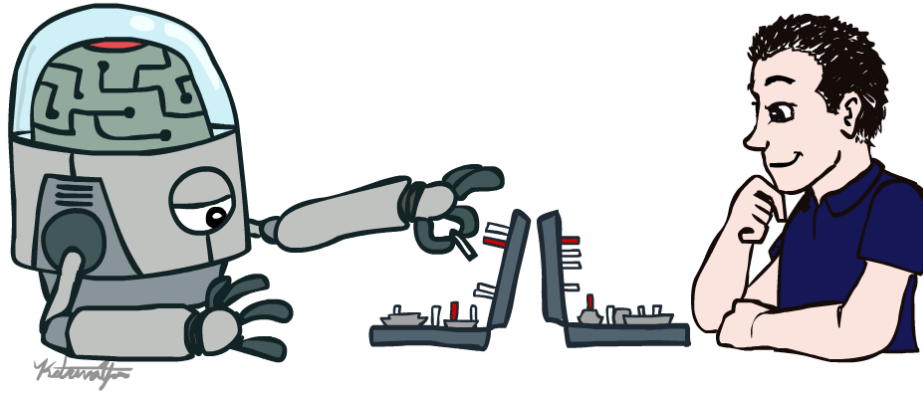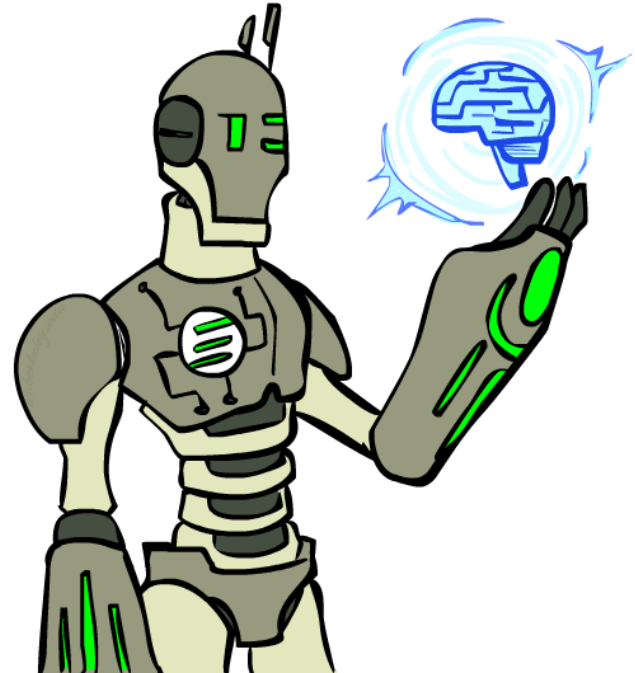
Textbook

- Not required, but for students who want to read more we recommend

  - Russell & Norvig, AI: A Modern Approach, 3rd Ed.

  - Warning: Not a course textbook, so our presentation does not necessarily follow the presentation in the book.
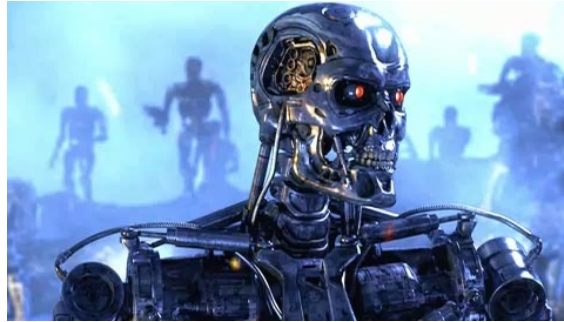
Today

- What is artificial intelligence?

- What can AI do?

- What is this course?

Sci-Fi AI?

What is AI?

The science of making machines that:
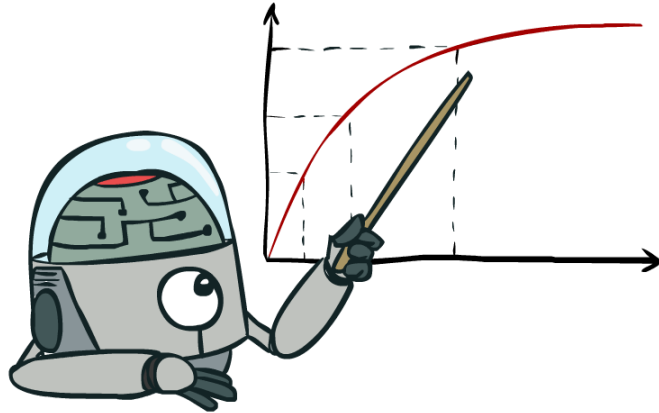
Rational Decisions

We'll use the term **rational** in a very specific, technical way:

- Rational: maximally achieving pre-defined goals
- Rationality only concerns what decisions are made

  (not the thought process behind them)
- Goals are expressed in terms of the **utility** of outcomes
- Being rational means **maximizing your expected utility**

A better title for this course would be:

Computational Rationality

Maximize Your Expected Utility
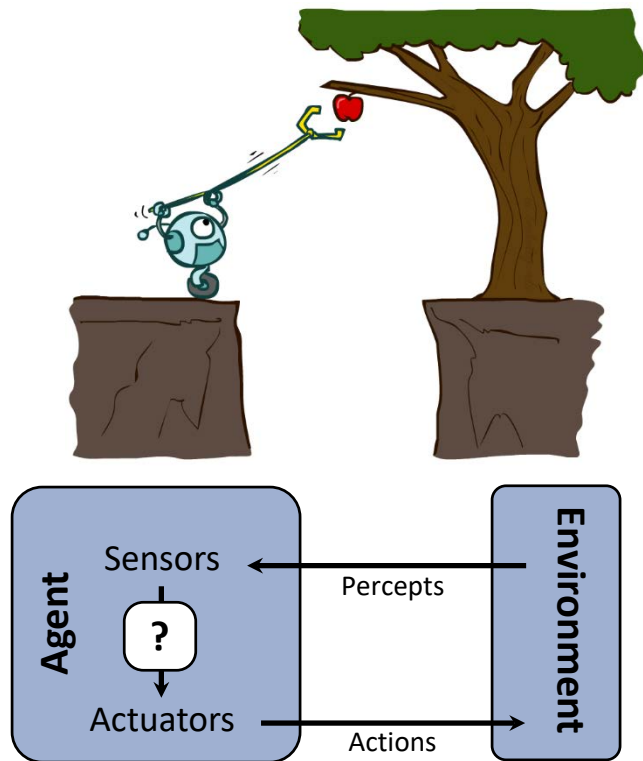
What About the Brain?

- Brains (human minds) are very good at making rational decisions, but not perfect
- Brains aren't as modular as software, so hard to reverse engineer!
- "Brains are to intelligence as wings are to flight"
- Lessons learned from the brain: memory and simulation are key to decision making
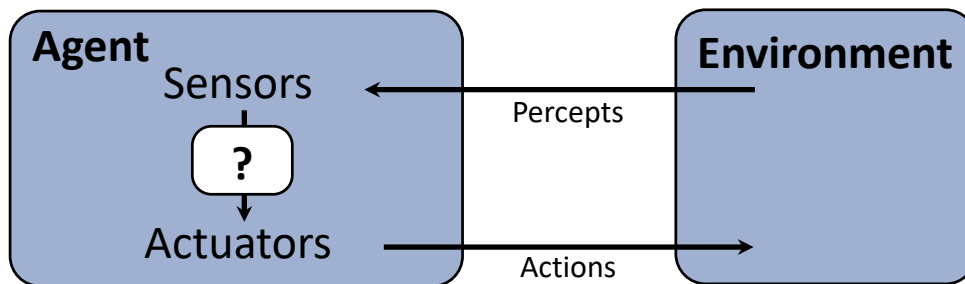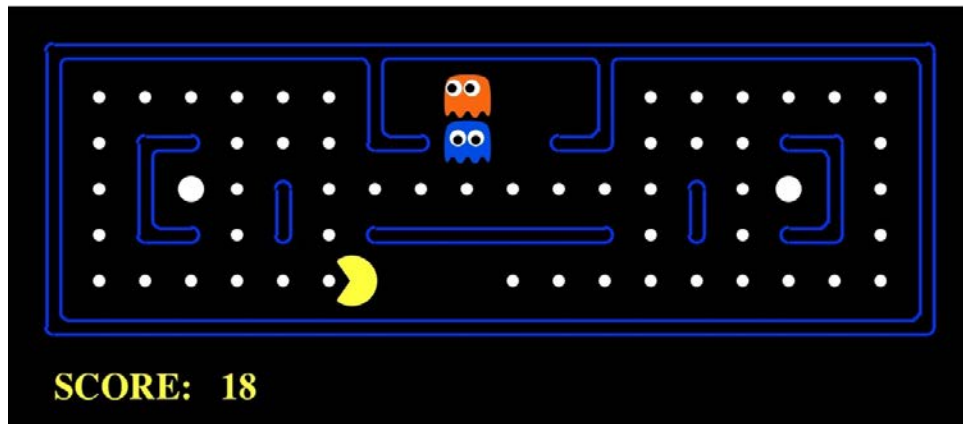
Designing Rational Agents

- An **agent** is an entity that *perceives* and *acts*.

- A **rational agent** selects actions that maximize its (expected) **utility**.

- Characteristics of the **percepts, environment,** and **action space** dictate techniques for selecting rational actions

- **This course** is about:
  - General AI techniques for a variety of problem types
  - Learning to recognize when and how a new problem can be solved with an existing technique

Pac-Man as an Agent

SCORE: 18

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Agent                          Environment
  Sensors  ◄─────── Percepts ──────
     │
    [?]
     ▼
 Actuators ─────── Actions ──────►
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Pac-Man is a registered trademark of Namco-Bandai Games, used here for educational purposes

Demo1: pacman-l1.mp4 or L1D2

Course Topics

- **Part I: Making Decisions**
  - Fast search / planning
  - Adversarial and uncertain search

- **Part II: Reasoning under Uncertainty**
  - Bayes' nets
  - Decision theory
  - Machine learning