Introduction to Artificial Intelligence

DA 221

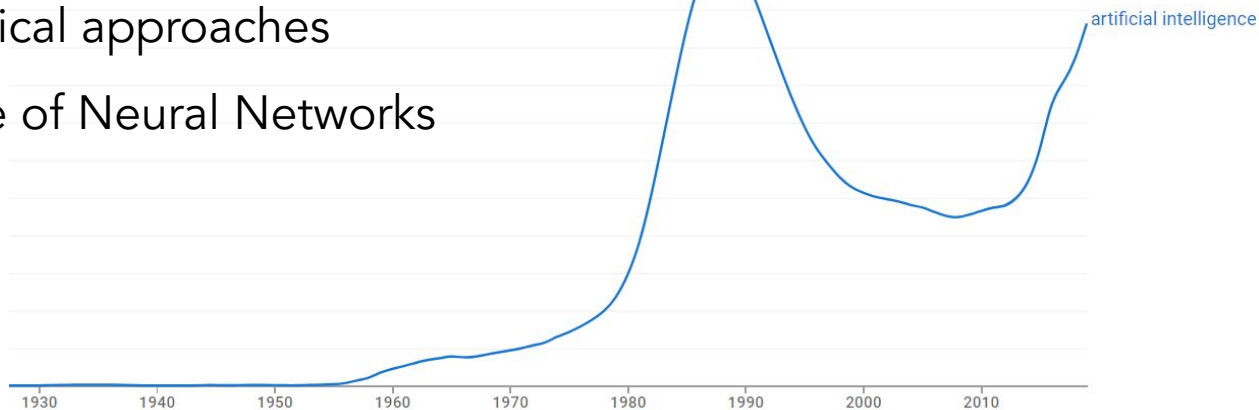**Jan - May 2023** | **IIT Guwahati**

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Lecture 2

Tentative

AI History

- 1940 - 1950: Early days

- 1950 - 1970: Excitement and expectations

- 1970 - 1990: Knowledge-based approaches

- 1990 - 2005: Statistical approaches

- 2005 - Present: Rise of Neural Networks

artificial intelligence

1930   1940   1950   1960   1970   1980   1990   2000   2010

Let's start with getting aware of some AI developments

- Time
- Researchers
- Problems
- Places and Companies
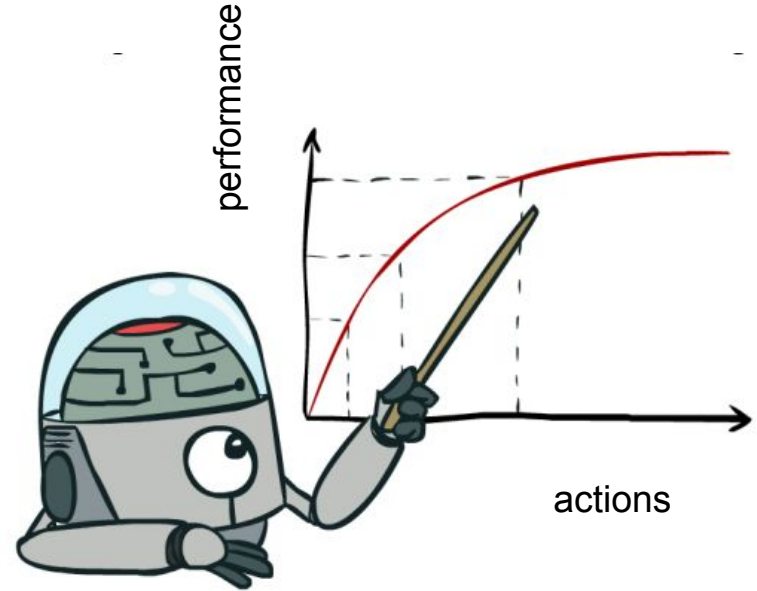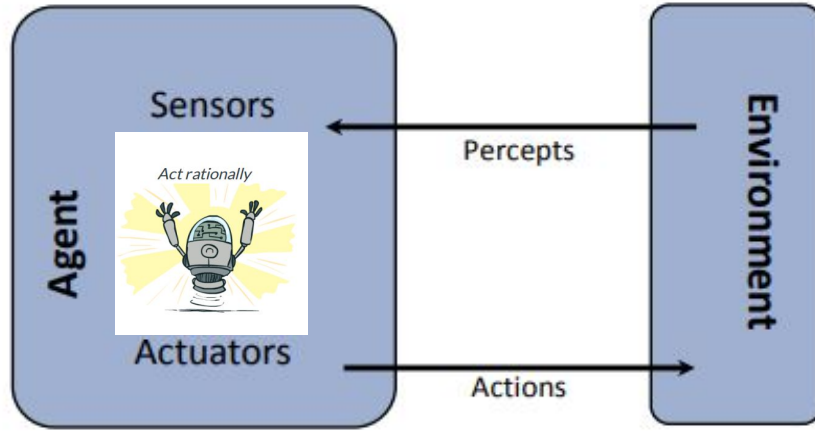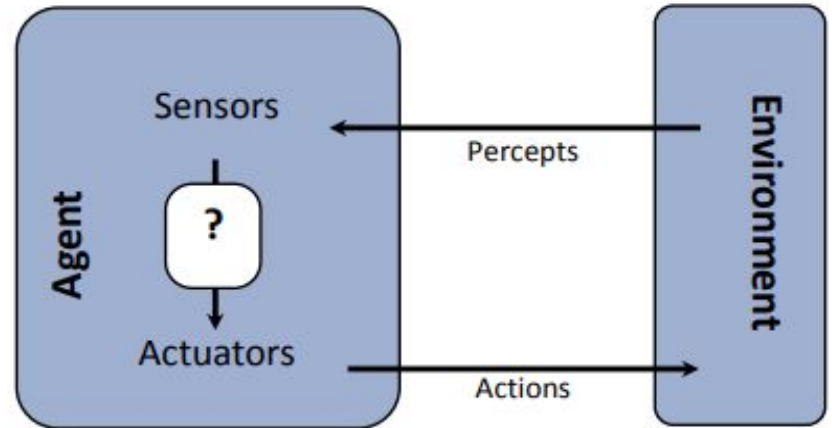
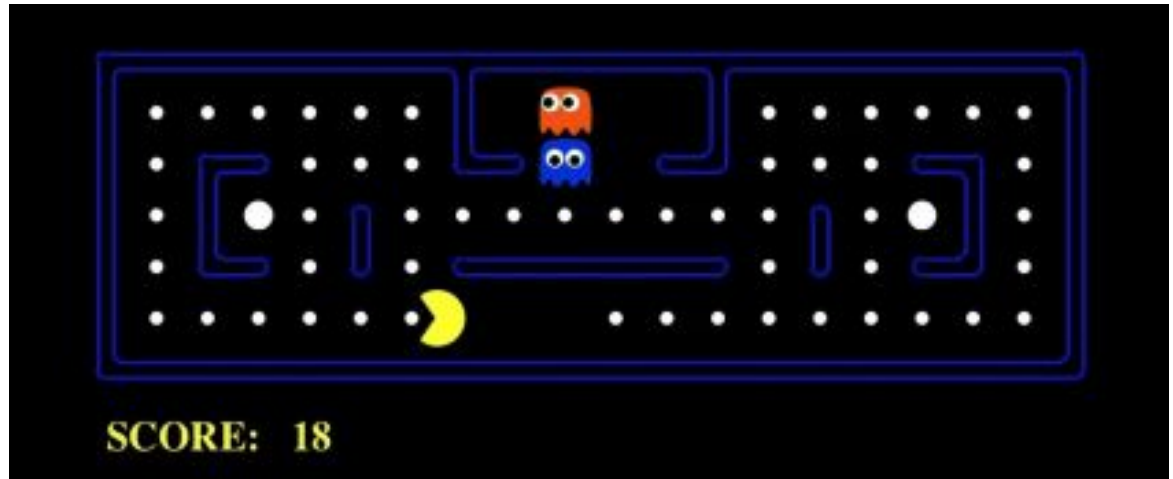# Artificial Intelligence

Image credits: CS188, UC Berkeley

Agents

An agent is an entity that perceives its environment through sensors and take actions through actuators.

Some examples

Pacman

Pacman

Percept sequence	Action
(left cell, no food)	go right
(left cell, food)	eat
(right cell, no food)	go left
(left cell, food)	eat
(left cell, no food), (left cell, no food)	go right
(left cell, no food), (left cell, food)	eat
(...)	(...)

SCORE: 18

Pacman

SCORE: 18
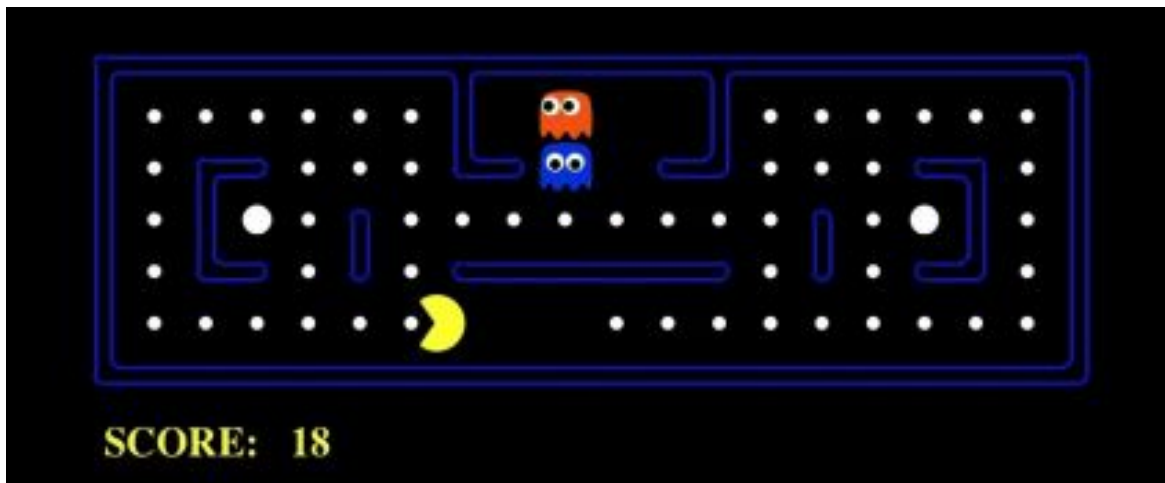
- The optimal Pacman?
- What is the right agent function?
- How to formulate the goal of Pacman?
  - 1 point per food dot collected up to time ?
  - 1 point per food dot collected up to time , minus one per move?
  - Penalize when too many food dots are left not collected?
- Can it be implemented in a small and efficient agent program?
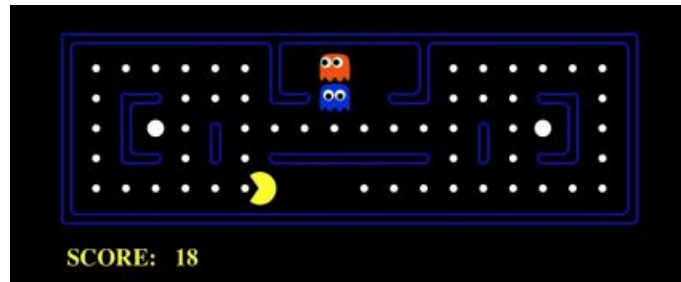
Rational Agent

- Informally, a rational agent is an agent that does the "right thing".

- A performance measure evaluates a sequence of environment states caused by the agent's behavior.

- A rational agent is an agent that chooses whichever action that maximizes the expected value of the performance measure, given the percept sequence to date.

Image credits: CS188, UC Berkeley
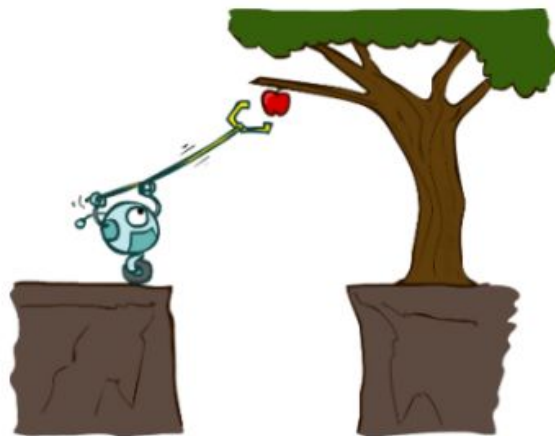
Rational Agent

- Rationality is not equal to omniscience
  - percepts may not supply all relevant information

- Rationality is not equal to clairvoyance action
  - outcomes may not be as expected

- Rational is not equal to successful

Rationality leads to exploration, learning and autonomy.

Some tasks

Example 1: a self-driving car

- performance measure: safety, destination, legality, comfort, ...

- environment: streets, highways, traffic, pedestrians, weather, ...

- actuators: steering, accelerator, brake, horn, speaker, display, ...

- sensors: video, accelerometers, gauges, engine sensors, GPS, ...

Some tasks

Example 2: an Internet shopping agent

- performance measure: price, quality, appropriateness, efficiency

- environment: current and future WWW sites, vendors, shippers

- actuators: display to user, follow URL, fill in form, ...

- sensors: web pages (text, graphics, scripts)

Let's define a problem

Let's define a problem

A cab driver driving through traffic

A problem

- Define a problem space
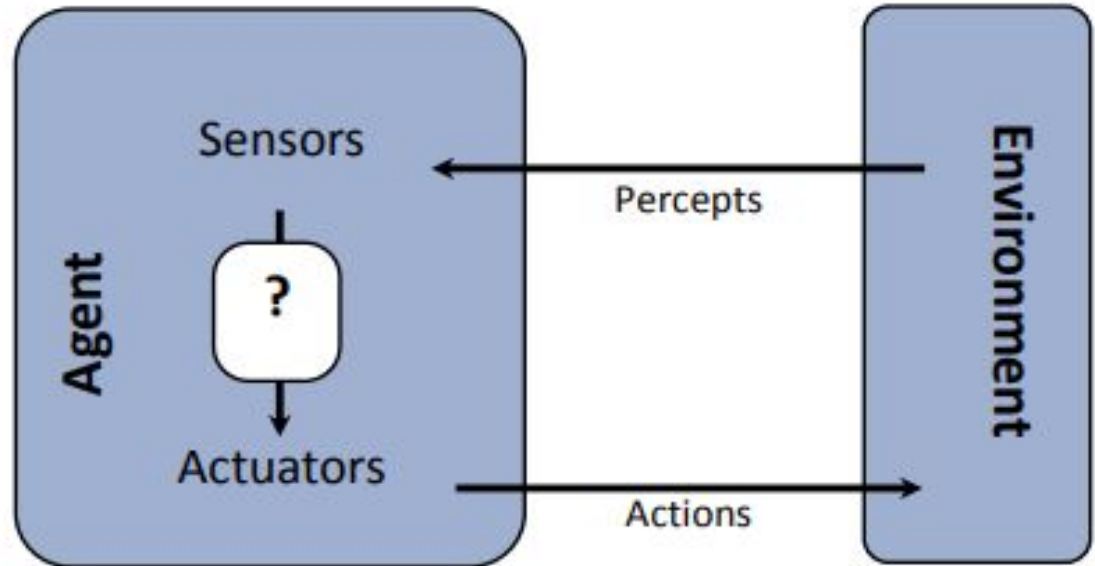 - Are there sub-problems?
- Task

A problem

- Goal
- Constraints
- Task

A problem

- Goal
- Constraints
- Task

PEAS: Performance, Environment, Actuators, and Sensors

Lets' focus on types of Environment

- Fully observable vs. partially observable
- Single agent vs. multi-agent
- Deterministic vs. stochastic
- Episodic vs. sequential
- Static vs. dynamic
- Discrete vs. continuous
- Known vs unknown

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- Crossword puzzle
- Chess, with a clock
- Poker
- Backgammon
- Taxi driving
- Medical diagnosis
- Image analysis
- Part-picking robot
- Refinery controller
- The real world

Thank you