Tufts
UNIVERSITY

RATIONAL AGENTS

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VERSION 1.1

TODAY ON AI

- Do you like PEAS?
- Rational agents
- Questions?

Do you like PEAS?

SECTION 01

The difference between a taxi driver and a crossword puzzle solver is all about PEAS:

- **Performance measure**
- **Environment**
- **Actuators**
- **Sensors**

	PERFORMANCE	ENVIRONMENT	ACTUATORS	SENSORS
Taxi driver	Safe, fast, legal, comfortable trip, maximize profit	Roads, other cars, pedestrians, customers	Steering, accelerator, brake, signal, horn, display	Cameras, sonar, speedometer, GPS, accelerometer
Crossword puzzle solver	?	?	?	?

Performance
Complete the puzzle

Environment
The puzzle grid

Actuators
Pencil (?)

Sensors
Camera (?)

	CROSSWORD SOLVER	TAXI DRIVER	POKER	MEDICAL DIAGNOSIS	TEACHING AI TO THIS CLASS
Fully Partially Observable	Fully observable	Partially observable	?	?	?
Deterministic Stochastic	Deterministic	Stochastic	?	?	?
Static Dynamic	Static	Dynamic	?	?	?
Discrete Continuous	Discrete	Continuous	?	?	?
Episodic Sequential	Sequential	Sequential	?	?	?
Single Multi Agent	Single	Multi	?	?	?
Known Unknown	Known	Known	?	?	?

POKER
Partially observable, Stocastic, Static, Discrete, Sequential, Multi agent, Known

MEDICAL DIAGNOSIS
Partially observable, Stocastic, Dynamic, Continous, Sequential, Single agent, Known

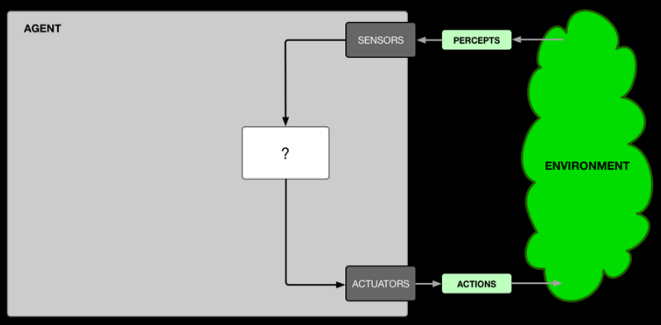
TEACHING AI
Partially observable, Stocastic, Dynamic, Discrete, Sequential, Multi agent, Known

Rational agents

SECTION 02

Rational agents

GENERAL FRAMEWORK



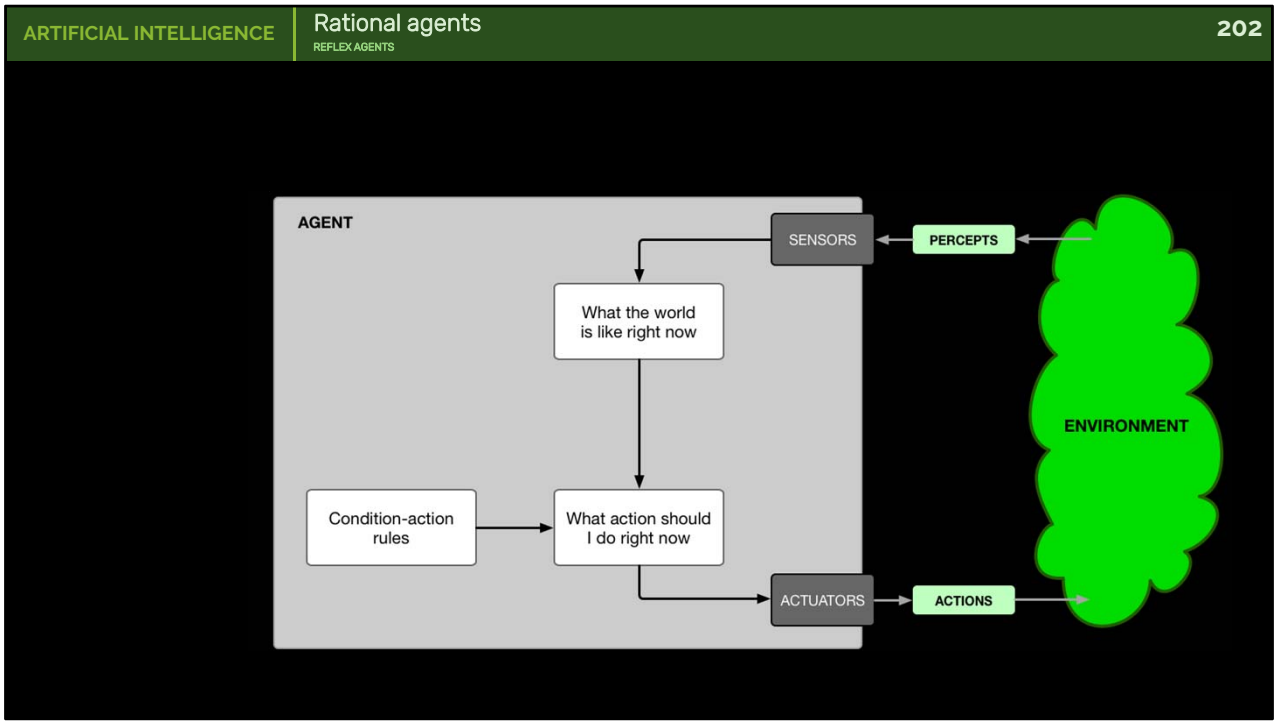
An **agent** is an entity that perceives and acts.

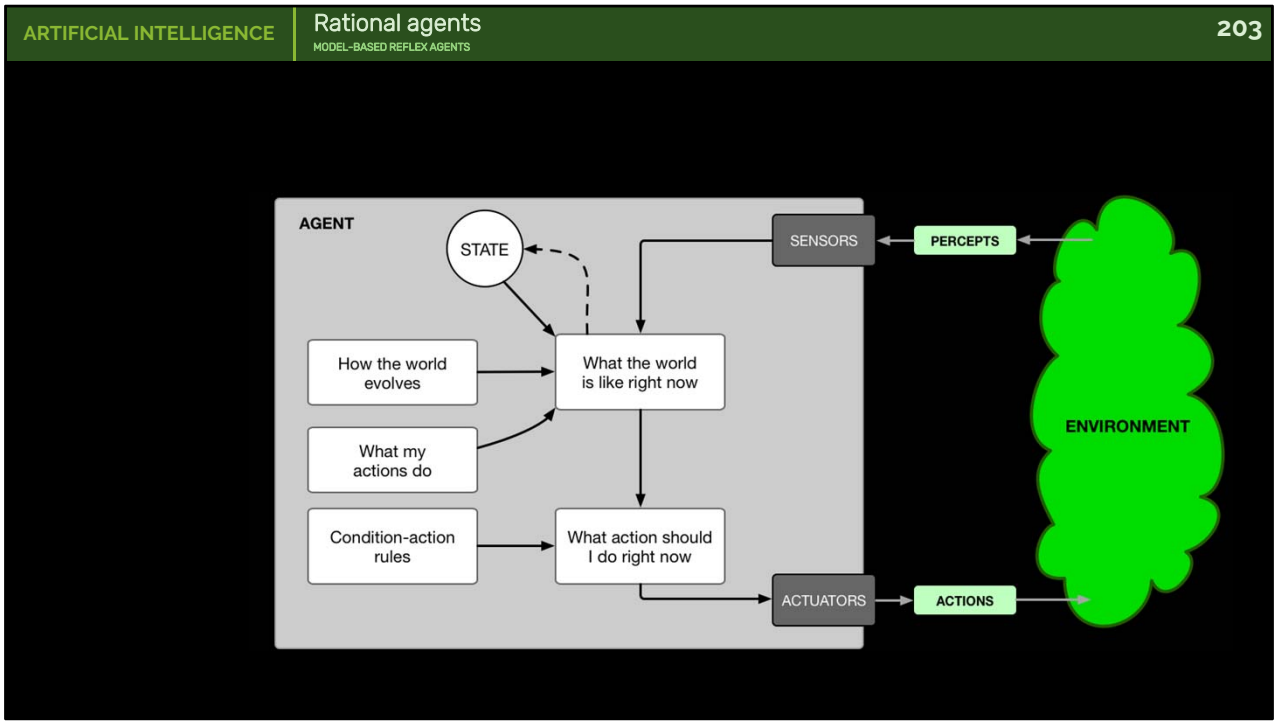
More formally, an agent is a **function** from percept histories to actions:

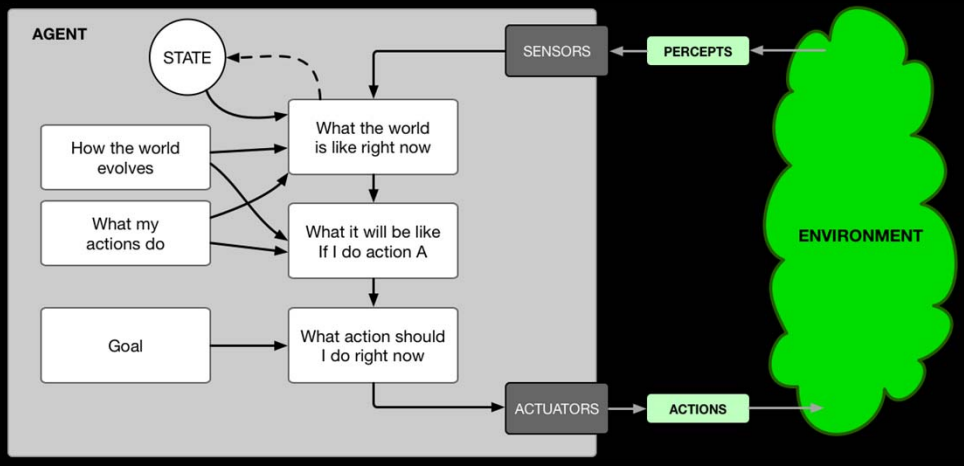
$$f : P^* \rightarrow A$$

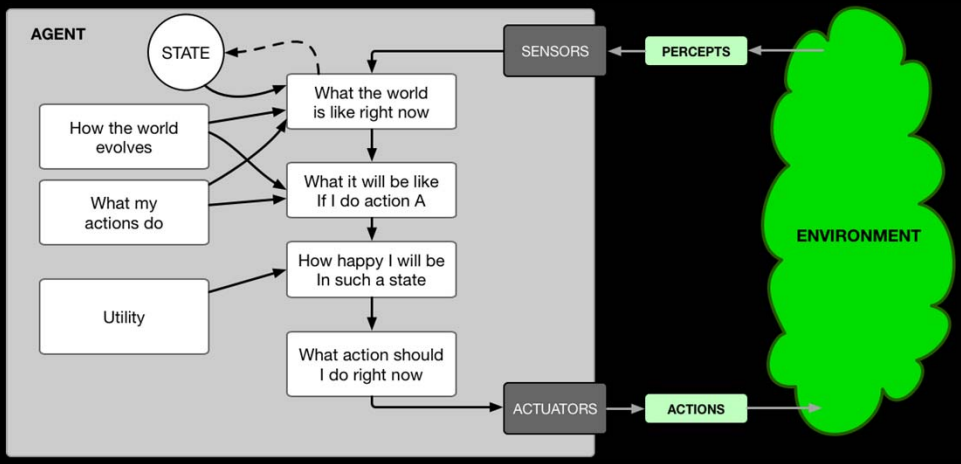
For any given class of environments and tasks, we seek the agent with the **best performance**.

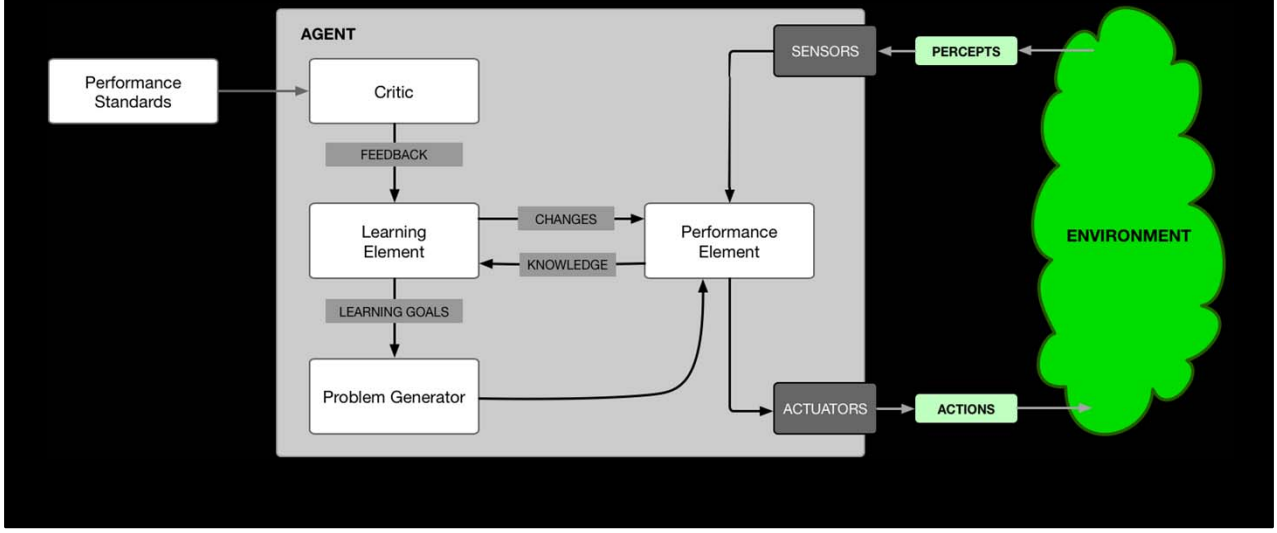
Computational limitations make perfect rationality unachievable. Therefore AI is about design the best program for given machine resources. Beware of omniscience.


AGENT
SENSORS
PERCEPTS
What the world is like right now
ENVIRONMENT
Condition-action rules
What action should I do right now
ACTUATORS
ACTIONS


AGENT
STATE
SENSORS
PERCEPTS
How the world evolves
What the world is like right now
What my actions do
ENVIRONMENT
Condition-action rules
What action should I do right now
ACTUATORS
ACTIONS


AGENT
STATE
SENSORS
PERCEPTS
What the world is like right now
How the world evolves
What my actions do
What it will be like If I do action A
Goal
What action should I do right now
ACTUATORS
ACTIONS
ENVIRONMENT


AGENT
STATE
How the world evolves
What my actions do
Utility
What the world is like right now
What it will be like If I do action A
How happy I will be In such a state
What action should I do right now
SENSORS
ACTUATORS
PERCEPTS
ACTIONS
ENVIRONMENT


AGENT
Performance Standards
Critic
FEEDBACK
Learning Element
CHANGES
KNOWLEDGE
Performance Element
LEARNING GOALS
Problem Generator
SENSORS
PERCEPTS
ENVIRONMENT
ACTUATORS
ACTIONS

STATE
B
C
STATE
B
C
STATE
B
C
ATOMIC
FACTORED
STRUCTURED

QUESTIONS ?