Classical AI
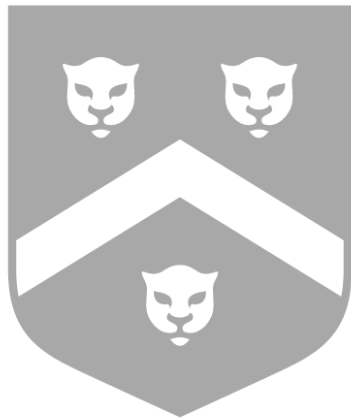
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What Is AI?

What Is Intelligence?

What behaviors require intelligence?
What makes an agent intelligent?

Goals in AI

Cognitive Modeling: human-like behavior
Engineering: human-like performance
Rational: perfect/optimal behavior
Bounded-rational: behaving as close to perfect as possible

Subfields: knowledge representation and reasoning, computer problem-solving, planning, machine learning, natural language processing, (autonomous) robotics, intelligent agents, multi-agent systems, distributed AI, intelligent user interfaces, machine vision

Relations

- CS: algorithms
- Engineering: applications
- Cognitive psych: modeling
- Math: logic, statistics
- Linguistics: language processing
- Operations research: optimization
- Economics: agents, incentives

AI Today

What Is AI?
Intelligence
Goals in AI
Relations
AI Today
AI in Robotics

This Course

Agents and
Environments

- Games: chess, backgammon, Jeopardy!, crosswords, go, StarCraft II, Gran Turismo
- Design: VLSI, jet engines
- Diagnosis: loans, customer service, medical testing and classification
- Planning: airports, flight routes, logistics
- Learning: Amazon, Netflix, Walmart, Facebook
- Robotics: ping-pong, driving, flying, swimming
- Language: voice recognition, translation, subtitles
- Vision: scene descriptions, face recognition
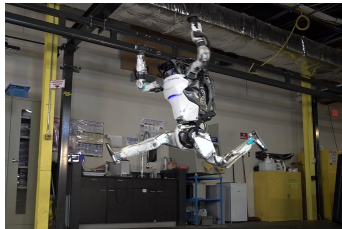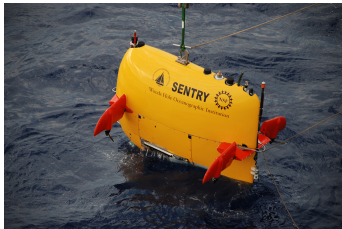- Creativity: writing, art

AI in Robotics

This Course

Schedule

1. Problem solving: sampling robot planner
2. Logic: theorem prover
3. Planning: general planner
4. Learning: reinforcement learner, handwriting classifier
5. Probabilistic reasoning

Formalisms

What Is AI?

This Course

Schedule

Formalisms

Agents and
Environments

1. combinatorial search
2. propositional logic
3. first-order logic
4. Markov decision processes
5. hidden Markov models
6. Bayesian networks

Missing: NLP, vision, robotics, cognition, neural nets

What Is AI?

This Course

Agents and Environments

Agent Designs

Examples

Environments

Search Space

Agents and Environments

Agent Designs

What Is AI?
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Agents and
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Reflex: sensors $\rightarrow$ actuators
Reflex with state: sensors + state $\rightarrow$ actuators + new state
Goal-based: reason to achieve goals
Utility-based: quantitative measure of achievement

Examples of Agents

1. Thermostat
2. DART logistics planner
3. Mail delivery bot
4. Medical diagnosis system
5. Eliza

Observability: complete, partial, hidden
Predictability: deterministic, strategic, stochastic
Interaction: one-off, sequential
Time: static, dynamic
State: discrete, continuous
Agents: single, multiagent (competitive, cooperative)

Example Search Space

What Is AI?

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Agents and Environments

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Examples

Environments

Search Space