MDPs: overview

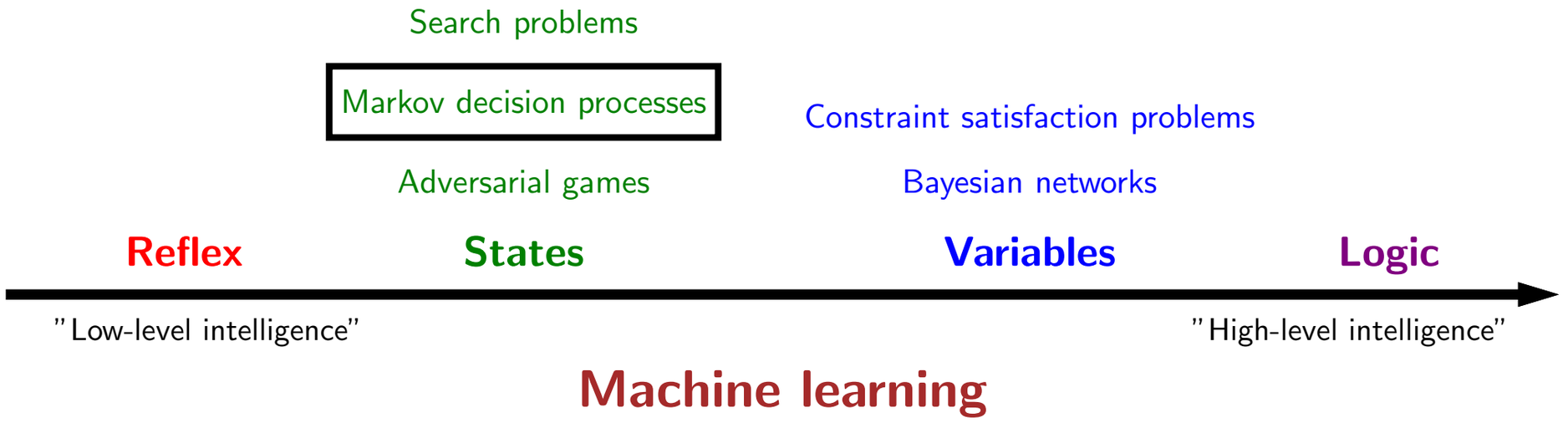
answer in chat

Question

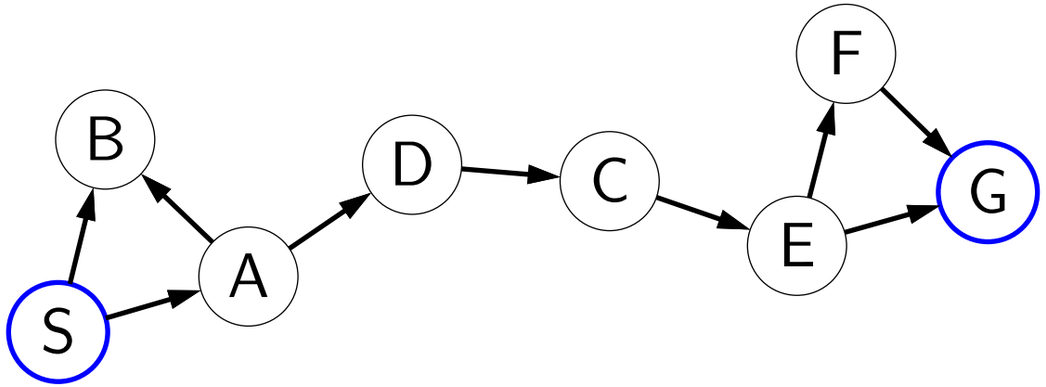
How would you get groceries on a Saturday afternoon in the least amount of time?

- order grocery delivery
- bike to the store
- drive to the store
- Uber/Lyft to the store
- fly to the store

Course plan

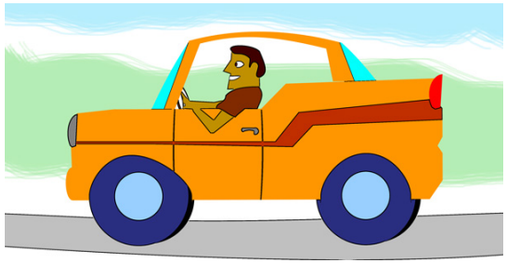

Search problems
Markov decision processes
Adversarial games
Constraint satisfaction problems
Bayesian networks
Reflex
States
Variables
Logic
"Low-level intelligence"
"High-level intelligence"
Machine learning

So far: search problems

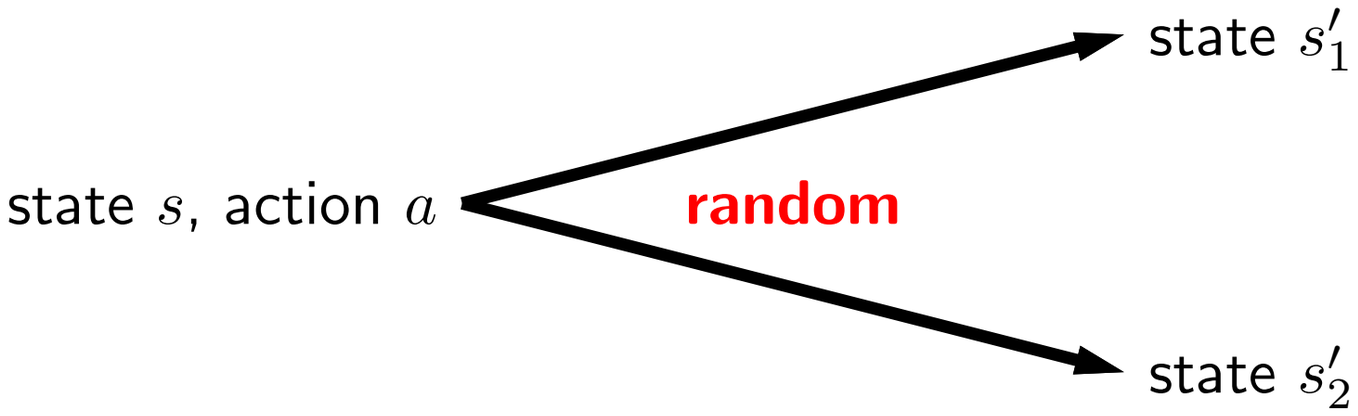


deterministic

state s, action a ⟶ state Succ(s, a)



Uncertainty in the real world



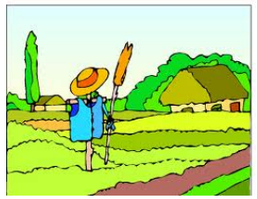
History

- MDPs: Mathematical Model for decision making under uncertainty.
- MDPs were first introduces in 1950s-60s.
- Ronald Howard's book on Dynamic Programming and Markov Processes
- The term 'Markov' refers to Andrey Makov as MDPs are extensions of Markov Chains, and they allow making decisions (taking actions or having choice).

Applications

Robotics: decide where to move, but actuators can fail, hit unseen obstacles, etc.

Resource allocation: decide what to produce, don't know the customer demand for various products



Agriculture: decide what to plant, but don't know weather and thus crop yield

Volcano crossing

Run (or press ctrl-enter)

		-50	20
		-50	
2			

Roadmap

Modeling

Modeling MDP Problems

Algorithms

Policy Evaluation

Value Iteration

Learning

Intro to Reinforcement Learning

Model-Based Monte Carlo

Model-Free Monte Carlo

SARSA

Q-learning

Epsilon Greedy

Function Approximation