CS 181 Final Project

UNO Agent

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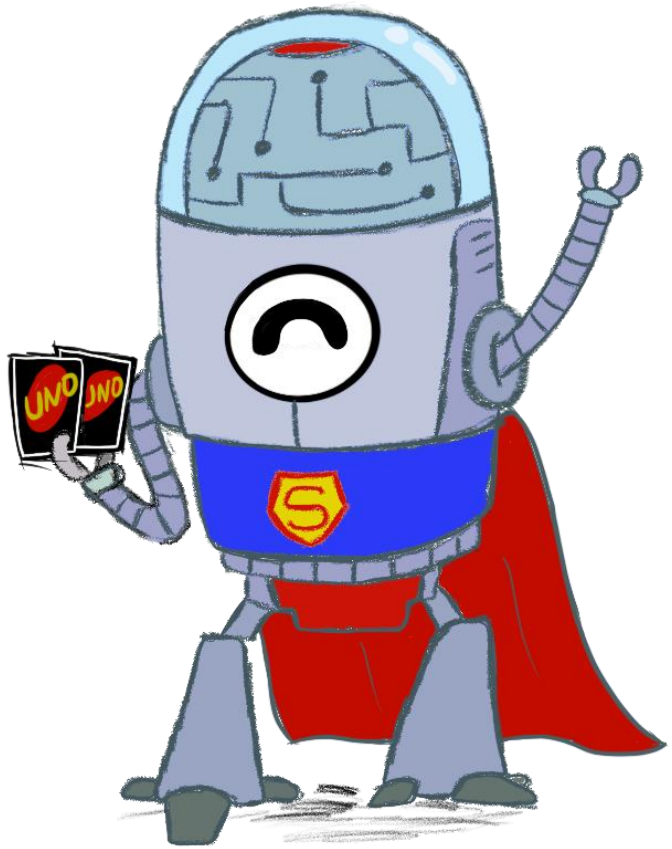
[Slide template from Dan Klein and Pieter Abbeel for CS188 Intro to AI at UC Berkeley (ai.berkeley.edu).]

Problem Definition

- Build an UNO agent with hopefully human-level performance via knowledge learnt in CS181.
- Performance
  - Random
  - Human
  - Super-human

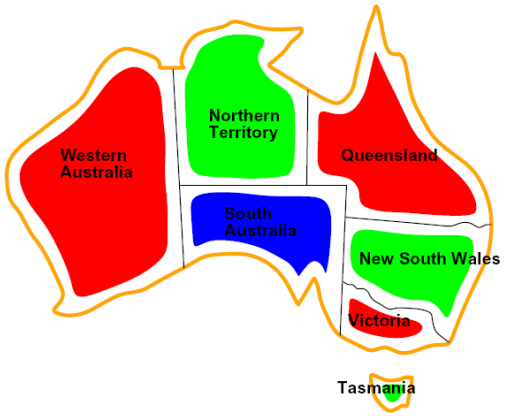


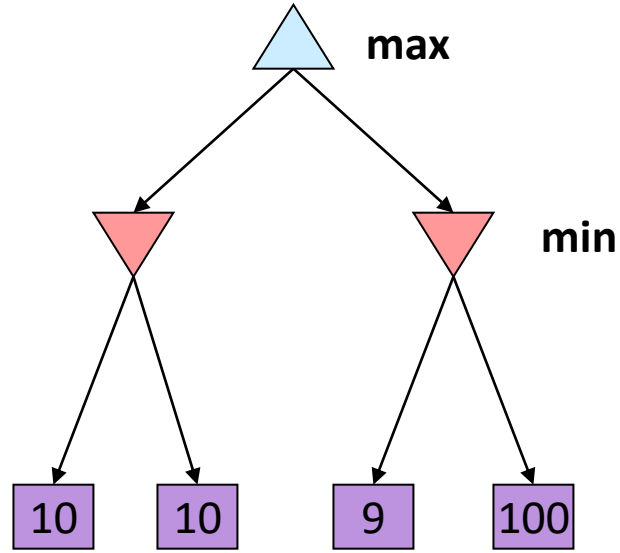
Motivation

- We all like games!
- Creating an intelligent UNO agent is a challenging task!
- Can be tackled in various ways taught in class. Apply theory to practice!
- (more on 2 & 3 in the following slides)

Proposed Methods

- ~~CSP~~
  - Same color / digit
  - Special case handling for functional card
  - Logic programming trauma (PA2) / Need to learn logic PL
  - High asymptotic complexity
  - No notion of optimality
- **Game tree search**
  - Minimax (Expectimax) with heuristic
- Reinforcement learning
  - Approximate Q learning
- Stretch goals
  - Monte Carlo Tree search
  - Value and policy network coupled with MCTS





Challenges

- High uncertainty
  - Many partially observable states
  - Opponents' draws & draw deck vs. your own draws
  - As is the case for many card games compared to board games
- Deep game tree & Huge game state
  - Discard pile is shuffled into the draw deck
  - Infinitely many rounds in the worst case!
  - Averages 70 – 80 rounds when played by random agent
  - Branching factor is large when you have handful of cards
- Sparse reward