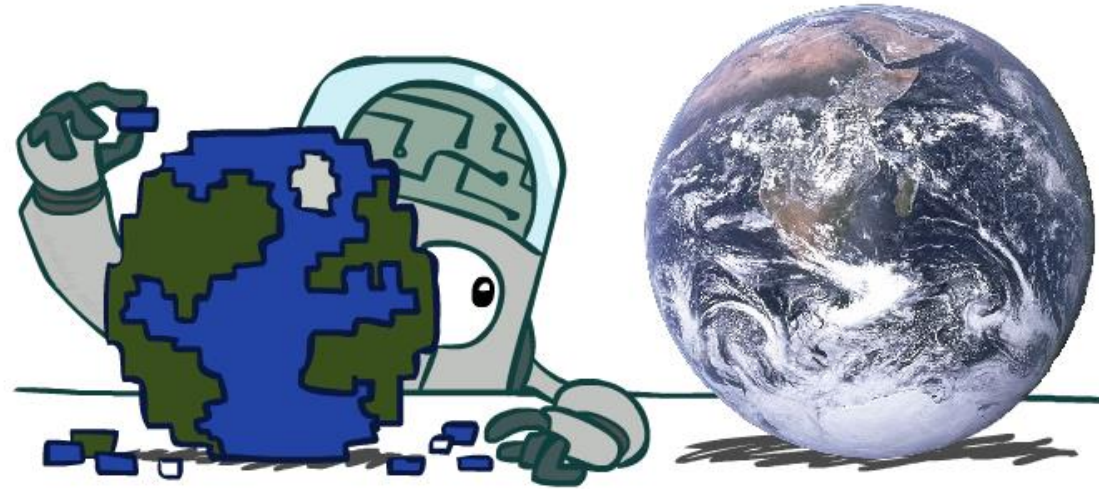


Advanced Topics in AI

Modeling Assumptions



Instructor: Prof. Dr. techn. Wolfgang Nejdl
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[These slides were created by Dan Klein and Pieter Abbeel for CS188 Intro to AI at UC Berkeley. All materials are available at <http://ai.berkeley.edu>.]

The Dangers of Optimism and Pessimism

Dangerous Optimism

Assuming chance when the world is adversarial

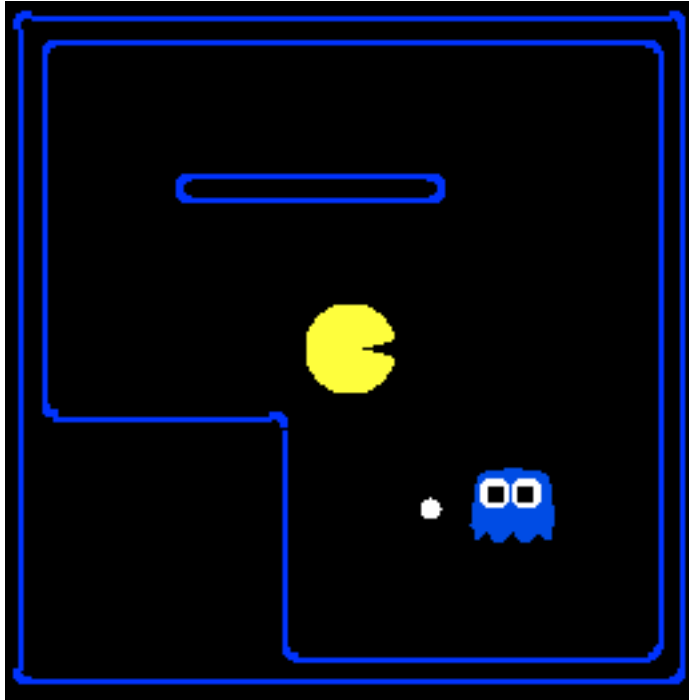


Dangerous Pessimism

Assuming the worst case when it's not likely



Assumptions vs. Reality

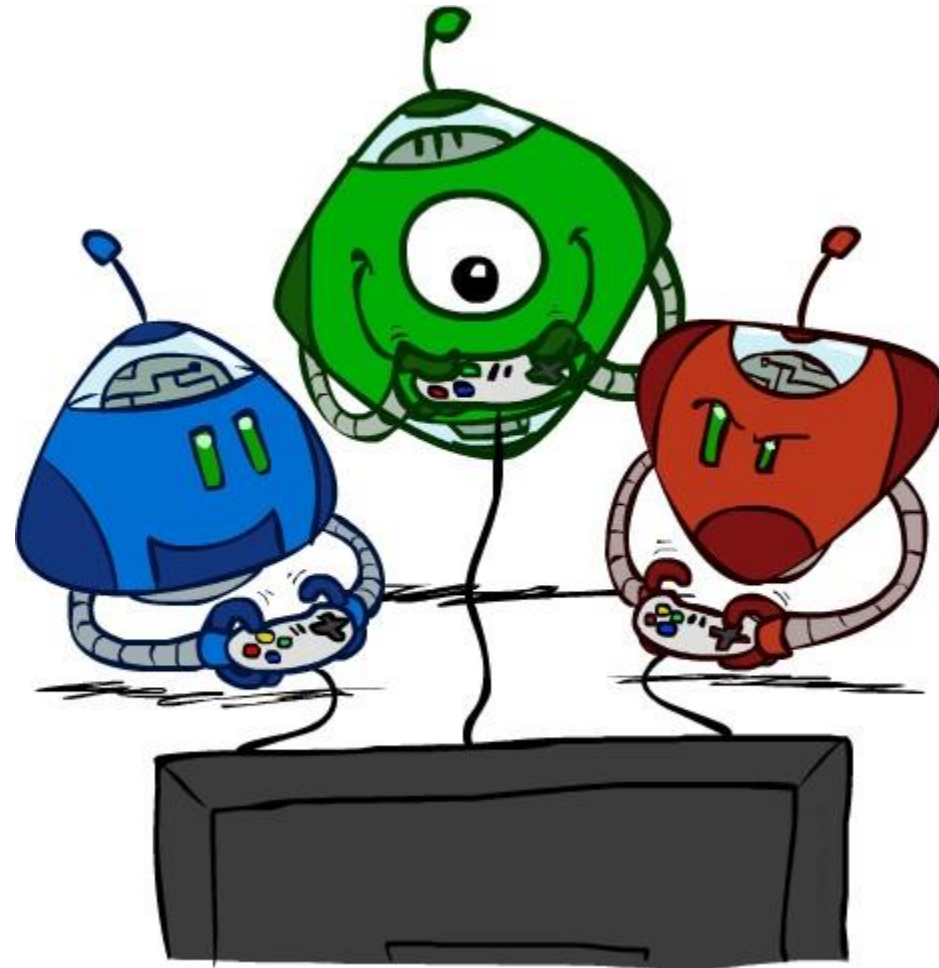


	Adversarial Ghost	Random Ghost
Minimax Pacman	Won 5/5 Avg. Score: 483	Won 5/5 Avg. Score: 493
Expectimax Pacman	Won 1/5 Avg. Score: -303	Won 5/5 Avg. Score: 503

Results from playing 5 games

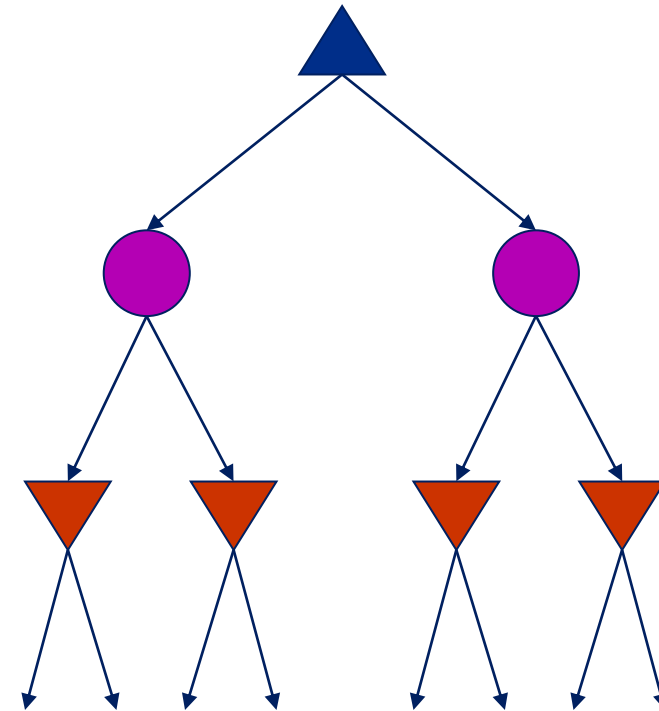
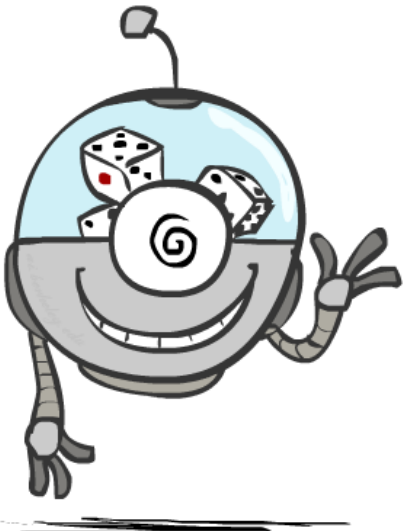
Pacman used depth 4 search with an eval function that avoids trouble
Ghost used depth 2 search with an eval function that seeks Pacman

Other Game Types



Mixed Layer Types

- E.g. Backgammon
- Expectiminimax
 - Environment is an extra “random agent” player that moves after each min/max agent
 - Each node computes the appropriate combination of its children



Example: Backgammon

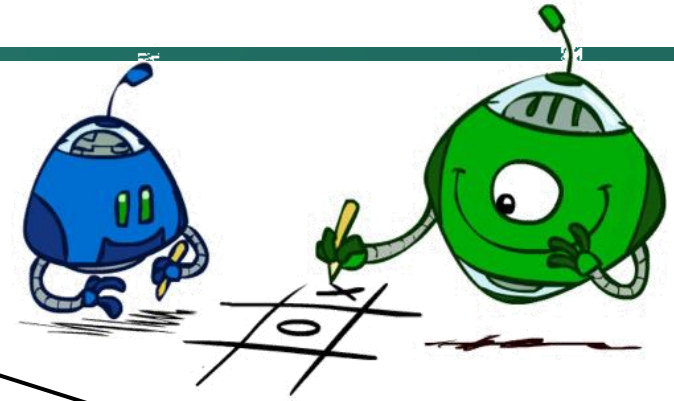
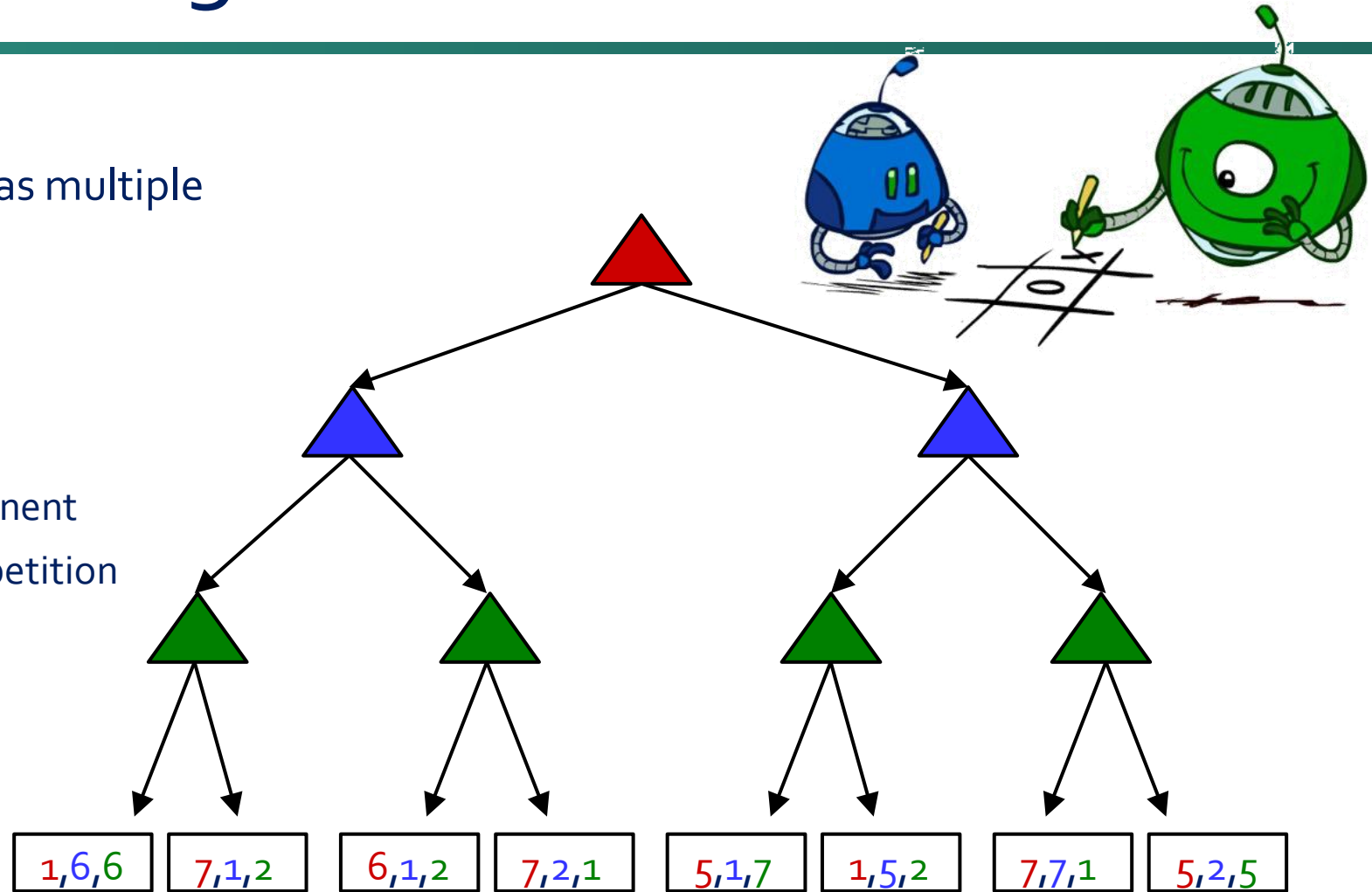
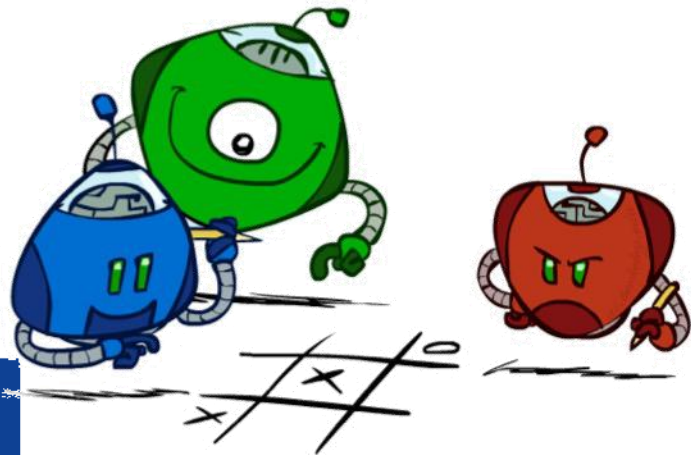
- Dice rolls increase b : 21 possible rolls with 2 dice
 - Backgammon \approx 20 legal moves
 - Depth 2 = $20 \times (21 \times 20)^3 = 1.2 \times 10^9$
- As depth increases, probability of reaching a given search node shrinks
 - So usefulness of search is diminished
 - So limiting depth is less damaging
 - But pruning is trickier...
- Historic AI: TDGammon uses depth-2 search + very good evaluation function + reinforcement learning: world-champion level play
 - **1st AI world champion in any game!**



Image: Wikipedia

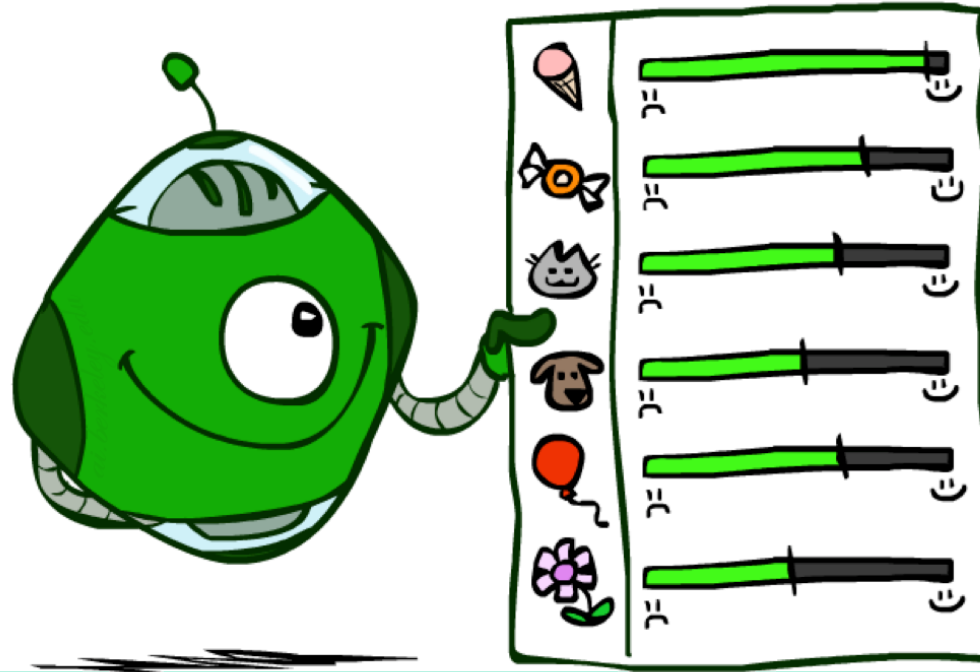
Multi-Agent Utilities

- What if the game is not zero-sum, or has multiple players?
- Generalization of minimax:
 - Terminals have utility tuples
 - Node values are also utility tuples
 - Each player maximizes its own component
 - Can give rise to cooperation and competition dynamically...



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Next: Utilities



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