CS343 Artificial Intelligence

Prof: Peter Stone

Department of Computer Science The University of Texas at Austin

Good Afternoon, Colleagues



Good Afternoon, Colleagues

Are there any questions?





• Classification assignment: Avg: 22.8 (out of 25), stddev: 2.79





- Classification assignment: Avg: 22.8 (out of 25), stddev: 2.79
 - Mini-contest: 1. Jonny (86.2%) 2. George (85.6%) 3.
 Craig (76.4%)





- Classification assignment: Avg: 22.8 (out of 25), stddev: 2.79
 - Mini-contest: 1. Jonny (86.2%) 2. George (85.6%) 3.
 Craig (76.4%)
- Late readings accepted until the night before the exam (5/9)
- Final: Thursday May 10th, 9am-noon



Tournament Qualifiers

 ShotCallaKoalas, NikolaAndTheNomNoms, SHARON, ManicM Mayonnaise, AgentStanley, AgentSea, MediocreAgentsV2, GreyhoundAgents, Magnesium, Grepped, CaesarAgents, helloAgent, PsychoAgents, TenPoolWithSpeedAgents, O___O, NotMelsPacman, GentlemenAgents, RoleReversal



Tournament Qualifiers

 ShotCallaKoalas, NikolaAndTheNomNoms, SHARON, ManicM Mayonnaise, AgentStanley, AgentSea, MediocreAgentsV2, GreyhoundAgents, Magnesium, Grepped, CaesarAgents, helloAgent, PsychoAgents, TenPoolWithSpeedAgents, O___O, NotMelsPacman, GentlemenAgents, RoleReversal

Congratulations to all!



Pending questions

- How could we verify strong AI?
- What's the role of emotions?
- What's the role of the Turing test?
- Can Al achieve "thinking"?
- When will there be an ultraintelligent agent?
- Does it matter to you if our "descendents" aren't human?



First weeks: search (BFS, A*, minimax, alpha-beta)
 Find an optimal plan (or solution)



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs —



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning
 - Still know transition and reward function



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning
 - Still know transition and reward function
 - Looking for a **policy** optimal action from every state



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning
 - Still know transition and reward function
 - Looking for a **policy** optimal action from every state
- Before Midterm: Reinforcement learning



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning
 - Still know transition and reward function
 - Looking for a **policy** optimal action from every state
- Before Midterm: Reinforcement learning
 - Policy without knowing transition or reward functions



- First weeks: search (BFS, A*, minimax, alpha-beta)
 - Find an optimal plan (or solution)
 - Best thing to do from the current state
 - Know transition and cost (reward) functions
 - Either execute complete solution (deterministic) or search again at every step
 - Know current state
- Next: MDPs towards reinforcement learning
 - Still know transition and reward function
 - Looking for a **policy** optimal action from every state
- Before Midterm: Reinforcement learning
 - Policy without knowing transition or reward functions
 - Still know state



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)
 - Week 10: Exact state estimation over time



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)
 - Week 10: Exact state estimation over time
 - Week 11: Approximate state estimation over time



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)
 - Week 10: Exact state estimation over time
 - Week 11: Approximate state estimation over time
- Week 12: What if they're not known?



- Probabilistic Reasoning: Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)
 - Week 10: Exact state estimation over time
 - Week 11: Approximate state estimation over time
- Week 12: What if they're not known?
 - Also Bayesian networks for **classification**



- **Probabilistic Reasoning:** Now state is unknown
- Bayesian networks state estimation/inference
- Prior, net structure, and CPT's known
 - Week 5: Probability and utilities
 - Week 9: Conditional independence and inference (exact and approximate)
 - Week 10: Exact state estimation over time
 - Week 11: Approximate state estimation over time
- Week 12: What if they're not known?
 - Also Bayesian networks for **classification**
 - A type of machine learning



• Week 13: Machine Learning

- Just a taste - focus on concept learning = classification



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations
 - So far we had dealt only with propositions



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations
 - So far we had dealt only with propositions
 - Back to known transitions, known state, etc.



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations
 - So far we had dealt only with propositions
 - Back to known transitions, known state, etc.
- Week 15: Philosophical foundations and ethics



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations
 - So far we had dealt only with propositions
 - Back to known transitions, known state, etc.
- Week 15: Philosophical foundations and ethics

It's all about building agents

Sense, decide, act



- Week 13: Machine Learning
 - Just a taste focus on concept learning = classification
 - Perceptrons, SVMs, MIRA
 - Didn't cover unsupervised learning
- Week 14: Classical planning
 - Reasoning with first order representations
 - So far we had dealt only with propositions
 - Back to known transitions, known state, etc.
- Week 15: Philosophical foundations and ethics

It's all about building agents

Sense, decide, act

Maximize expected utility



Topics not covered

Constraint satisfaction

(Chapter 6)

- Knowledge representation and reasoning
 - (Chapters 7-9, 11, 12)

(Sections 17.5, 17.6)

- Game theory and auctions
- Aspects of learning
- Natural language
- Vision

Robotics



- (Chapters 22, 23)
 - (Chapter 24)
 - (Chapter 25)



• Thursday May 10th, 9am-noon



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning
 - Office hours on Tuesday may change
 - Available by appointment if you want to meet



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning
 - Office hours on Tuesday may change
 - Available by appointment if you want to meet
- Covers the whole semester
 - Slightly heavier emphasis on material since midterm
 - Certainly a question on planning



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning
 - Office hours on Tuesday may change
 - Available by appointment if you want to meet
- Covers the whole semester
 - Slightly heavier emphasis on material since midterm
 - Certainly a question on planning
- Striving for similar difficulty to midterm



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning
 - Office hours on Tuesday may change
 - Available by appointment if you want to meet
- Covers the whole semester
 - Slightly heavier emphasis on material since midterm
 - Certainly a question on planning
- Striving for similar difficulty to midterm
- 3 hours rather than 1 hour and 15 minutes



- Thursday May 10th, 9am-noon
- I may be late Daniel will proctor beginning
 - Office hours on Tuesday may change
 - Available by appointment if you want to meet
- Covers the whole semester
 - Slightly heavier emphasis on material since midterm
 - Certainly a question on planning
- Striving for similar difficulty to midterm
- 3 hours rather than 1 hour and 15 minutes
- Sample Dan Klein's Spring 2009 exam with solutions

• I've enjoyed teaching this class!



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material
- I've been impressed by the levels of questions and understanding



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material
- I've been impressed by the levels of questions and understanding
 - You kept me on my toes
 - I learned tons!



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material
- I've been impressed by the levels of questions and understanding
 - You kept me on my toes
 - I learned tons!
- Thanks to Daniel for handling all the programming assignments!



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material
- I've been impressed by the levels of questions and understanding
 - You kept me on my toes
 - I learned tons!
- Thanks to Daniel for handling all the programming assignments!
- I'm proud of all of you for sticking with it through what I think was a demanding course



- I've enjoyed teaching this class!
- Wasn't sure at first if I could cover all this material
- I've been impressed by the levels of questions and understanding
 - You kept me on my toes
 - I learned tons!
- Thanks to Daniel for handling all the programming assignments!
- I'm proud of all of you for sticking with it through what I think was a demanding course

THANKS!!!



Surveys

- Daniel's and my surveys
- Positive **and** negative feedback useful
- Invitation to send more feedback by email
 - If/when I teach the course again, how should it change?
- Most important: course rating, instructor rating, written comments

