CS344M Autonomous Multiagent Systems

Patrick MacAlpine

Department or Computer Science The University of Texas at Austin

Good Afternoon, Colleagues

Are there any questions?



Department of Computer Sciences The University of Texas at Austin

Patrick MacAlpine





Patrick MacAlpine



• FAI talk Monday in GDC 6.302, 11am





- FAI talk Monday in GDC 6.302, 11am
 - Anca Dragan: "Towards Robotics Algorithms that Reason about People"





- FAI talk Monday in GDC 6.302, 11am
 Anca Dragan: "Towards Robotics Algorithms that
 - Reason about People"

• Final project proposal assigned



Proposal (10/8): 3+ pages

• What you're going to do; graded on writing



Proposal (10/8): 3+ pages

- What you're going to do; graded on writing
- Progress Report (11/5): 5+ pages + binaries + logs
 - What you've been doing; graded on writing



Proposal (10/8): 3+ pages

- What you're going to do; graded on writing
- Progress Report (11/5): 5+ pages + binaries + logs
 - What you've been doing; graded on writing

Peer Review (11/12): review 2 progress reports

• Clear? Suggestions?; graded on writing and feedback quality



Proposal (10/8): 3+ pages

- What you're going to do; graded on writing
- Progress Report (11/5): 5+ pages + binaries + logs
 - What you've been doing; graded on writing
- Peer Review (11/12): review 2 progress reports
 - Clear? Suggestions?; graded on writing and feedback quality

Team (12/1): source + binaries

• The tournament entry; make sure it runs!



Proposal (10/8): 3+ pages

- What you're going to do; graded on writing
- Progress Report (11/5): 5+ pages + binaries + logs
 - What you've been doing; graded on writing
- Peer Review (11/12): review 2 progress reports
 - Clear? Suggestions?; graded on writing and feedback quality

Team (12/1): source + binaries

• The tournament entry; make sure it runs!

Final Report (12/3): 8+ pages

• A term paper; the main component of your grade



Proposal (10/8): 3+ pages

- What you're going to do; graded on writing
- Progress Report (11/5): 5+ pages + binaries + logs
 - What you've been doing; graded on writing
- Peer Review (11/12): review 2 progress reports
 - Clear? Suggestions?; graded on writing and feedback quality

Team (12/1): source + binaries

• The tournament entry; make sure it runs!

Final Report (12/3): 8+ pages

• A term paper; the main component of your grade

Tournament (12/9 7-10PM): nothing due

Oral presentation



• All writing is individual!



- All writing is individual!
- Two hard copies and one electronic copy



- All writing is individual!
- Two hard copies and one electronic copy
- Due at beginning of class



- All writing is individual!
- Two hard copies and one electronic copy
- Due at beginning of class
- One idea: Re-implement an idea from one of the readings



- All writing is individual!
- Two hard copies and one electronic copy
- Due at beginning of class
- One idea: Re-implement an idea from one of the readings
- Be careful with machine learning



- All writing is individual!
- Two hard copies and one electronic copy
- Due at beginning of class
- One idea: Re-implement an idea from one of the readings
- Be careful with machine learning
- Example final report on website



Overview of the Readings

Darwin: genetic programming approach

Stone and McAllester: Architecture for action selection

Riley et al: Coach competition, extracting models

Kuhlmann et al: Learning for coaching

Wihthopf and Reidmiller: Reinforcement learning

MacAlpine, Price, and Stone: Role assignment

MacAlpine, Depinet, and Stone: Overlapping layered learning



• leading passes



- leading passes
- force fields for movement



- leading passes
- force fields for movement
- (other slides, video)



- leading passes
- force fields for movement
- (other slides, video)
- downsides



- leading passes
- force fields for movement
- (other slides, video)
- downsides
- Keepaway



- leading passes
- force fields for movement
- (other slides, video)
- downsides
- Keepaway
- (3D slides on action selection)



• Learn best strategy to play a fixed team



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations
- Learn when successful teams passed/kicked



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations
- Learn when successful teams passed/kicked
- Learn when opponent will pass and try to block



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations
- Learn when successful teams passed/kicked
- Learn when opponent will pass and try to block
- What if players switch roles?



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations
- Learn when successful teams passed/kicked
- Learn when opponent will pass and try to block
- What if players switch roles?
- Why just imitate another team?



- Learn best strategy to play a fixed team
- Give high level advice to players at low frequency
- Focus on learning formations
- Learn when successful teams passed/kicked
- Learn when opponent will pass and try to block
- What if players switch roles?
- Why just imitate another team?
- Other slides



• Find 1 to 1 mapping of agents to roles (target positions)



- Find 1 to 1 mapping of agents to roles (target positions)
- SCRAM: Scaleable Collision-avoiding Role Assignment with Minimal-makespan



- Find 1 to 1 mapping of agents to roles (target positions)
- SCRAM: Scaleable Collision-avoiding Role Assignment with Minimal-makespan
 - Scaleable (computable in polynomial time)



- Find 1 to 1 mapping of agents to roles (target positions)
- SCRAM: Scaleable Collision-avoiding Role Assignment with Minimal-makespan
 - Scaleable (computable in polynomial time)
 - Avoids collisions between agents



- Find 1 to 1 mapping of agents to roles (target positions)
- SCRAM: Scaleable Collision-avoiding Role Assignment with Minimal-makespan
 - Scaleable (computable in polynomial time)
 - Avoids collisions between agents
 - Minimizes the makespan (agents reach all target positions in as little time as possible)



- Find 1 to 1 mapping of agents to roles (target positions)
- SCRAM: Scaleable Collision-avoiding Role Assignment with Minimal-makespan
 - Scaleable (computable in polynomial time)
 - Avoids collisions between agents
 - Minimizes the makespan (agents reach all target positions in as little time as possible)
- (slides)



• Extend to grid soccer



- Extend to grid soccer
- Large state space, joint actions



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options
- Successfully learn the task, use for some of team behavior



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options
- Successfully learn the task, use for some of team behavior
- However, takes 12 million actions to learn



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options
- Successfully learn the task, use for some of team behavior
- However, takes 12 million actions to learn
- Current state of the art: MAXQ-OP



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options
- Successfully learn the task, use for some of team behavior
- However, takes 12 million actions to learn
- Current state of the art: MAXQ-OP
 - "Towards a Principled Solution to Simulated Robot Soccer" - Aijun Bai, Feng Wu, and Xiaoping Chen



- Extend to grid soccer
- Large state space, joint actions
- Address this with state aliasing, options
- Successfully learn the task, use for some of team behavior
- However, takes 12 million actions to learn
- Current state of the art: MAXQ-OP
 - "Towards a Principled Solution to Simulated Robot Soccer" - Aijun Bai, Feng Wu, and Xiaoping Chen
 - Used by 2D champion WrightEagle team

