

Project

- ▶ Topic

- ▶ Use what you have learned in this course to solve a problem of your choice.
- ▶ We will release past year's slides of the remaining topics (see Blackboard → Project)
 - ▶ Probabilistic temporal models
 - ▶ Markov decision processes
 - ▶ Reinforcement learning
 - ▶ Introduction to machine learning



Project

- ▶ Group
 - ▶ No more than 3 people in each group
 - ▶ Talk to me if you wish to form a larger group
 - ▶ You may use the Piazza “search for teammates” function
- ▶ Time table
 - ▶ By April. 3: form groups
 - ▶ April. 17&19: proposal presentation
 - ▶ TBD: final presentation, code, report submission



Project

- ▶ Grading
 - ▶ 15% of the total grade
 - ▶ Criteria
 - ▶ relevance to this course
 - ▶ novelty, soundness, depth
 - ▶ quality of the report, code, presentation
 - ▶ group size (>3)



Midterm Exam

- ▶ Time
 - ▶ in class (8:15-9:55am) on March. 29 (Wed)
- ▶ Location
 - ▶ 教学中心 102
- ▶ Format
 - ▶ Closed-book. You can bring **an A4-size cheat sheet** and nothing else.
 - ▶ 10 multiple-choices (不定项选择题), 4 problems
- ▶ Grade
 - ▶ 25% of the total grade
- ▶ F2020 midterm exam paper is available at:
 - ▶ Blackboard menu → Previous Exams → Fall 2020 Midterm Exam





Midterm Review



Disclaimer

- ▶ Topics covered in this review may not appear in the exam.
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Search

- ▶ Definitions
 - ▶ State space, successor function, start/goal states
 - ▶ Completeness, optimality
- ▶ Tree search
 - ▶ Uninformed Search
 - ▶ DFS, BFS, UCS
 - ▶ Informed Search
 - ▶ Heuristic, admissible heuristic
 - ▶ Greedy, A*
- ▶ Graph Search
 - ▶ A* with consistent heuristic



Constraint Satisfaction Problems

- ▶ CSP
 - ▶ Find an assignment to a set of variables that satisfies a set of constraints
- ▶ Basic solution: backtracking search
- ▶ Speed-ups:
 - ▶ Filtering
 - ▶ Forward Checking, Arc Consistency
 - ▶ Ordering
 - ▶ Minimum Remaining Values, Least Constraining Value
 - ▶ Structure
 - ▶ Tree structured, Cutset conditioning
- ▶ Iterative min-conflicts (local search) is often effective in practice



Adversarial Search

- ▶ Adversarial Search
 - ▶ Game tree, Minimax
- ▶ Resource Limits
 - ▶ Depth-limited search
 - ▶ Limiting branching factor
- ▶ Game Tree Pruning (alpha-beta pruning)
 - ▶ α : MAX's best option on path to root; prune if value of MIN $\leq \alpha$
 - ▶ β : MIN's best option on path to root; prune if value of MAX $\geq \beta$
- ▶ Uncertain Outcomes
 - ▶ Expectimax



Propositional logic

- ▶ Representation
 - ▶ Syntax
 - ▶ Proposition symbols, their compositions using connectives
 - ▶ Semantics
 - ▶ Each model specifies true/false for each proposition symbol
 - ▶ Rules for evaluating truth with connectives
- ▶ Inference
 - ▶ Resolution (for Conjunctive Normal Form)
- ▶ Concepts
 - ▶ Validity, satisfiability, entailment, proof, soundness, completeness, etc.



Propositional logic - Horn logic

- ▶ Representation

- ▶ $P1 \wedge P2 \wedge P3 \dots \wedge Pn \rightarrow Q$

- ▶ Inference

- ▶ Modus Ponens

- ▶ Forward chaining

- ▶ Backward chaining



First-order logic

- ▶ Syntax
 - ▶ Constant, predicate, function, variable, connective, quantifier (universal, existential), equality
- ▶ Semantics
 - ▶ A model contains: objects, relations, interpretation
- ▶ Inference
 - ▶ Propositionalization (universal/existential instantiation)
 - ▶ Unification
 - ▶ Forward/backward chaining
 - ▶ Resolution



Bayesian networks

- ▶ Syntax
 - ▶ DAG + CPTs
- ▶ Semantics
 - ▶ Global semantics
 - ▶ Conditional independence semantics, Markov blanket
 - ▶ D-separation
- ▶ Markov networks
 - ▶ Undirected graph + potentials
 - ▶ Semantics





Good Luck!

