

Project

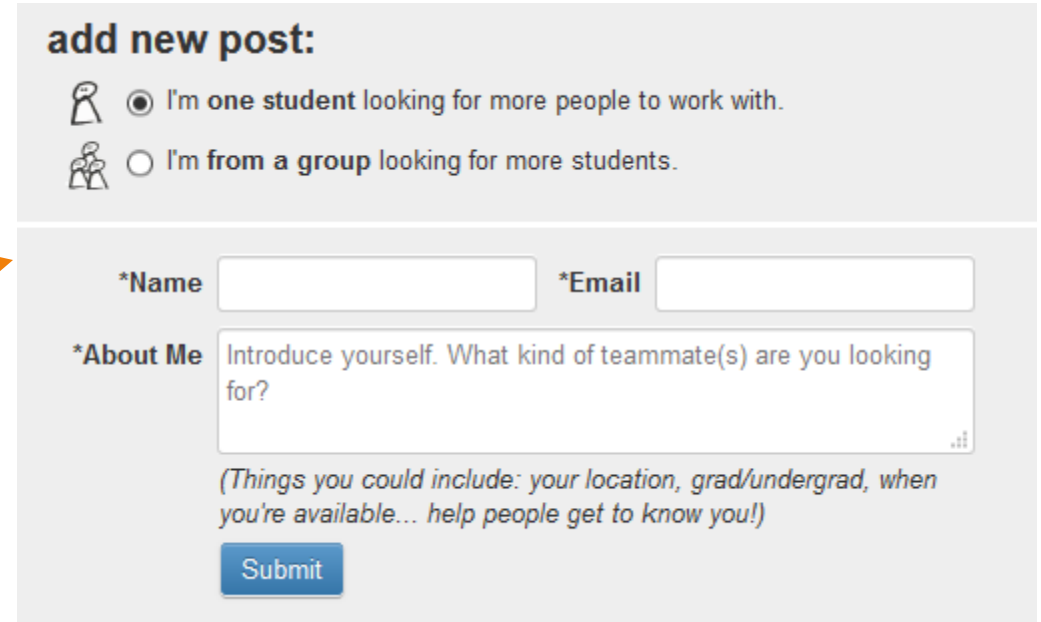
- ▶ Topic

- ▶ Use what you have learned in this course to solve a problem of your choice.
- ▶ We will release S18 slides of the remaining topics (see Blackboard → Project)
 - ▶ Probabilistic temporal models
 - ▶ Markov decision processes
 - ▶ Reinforcement learning
 - ▶ Introduction to machine learning
 - ▶ Introduction to natural language processing





Project

- ▶ Group
 - ▶ 1-5 people in each group
 - ▶ Good to have more ppl
 - ▶ You may use the Piazza “search for teammates” function
- ▶ Schedule
 - ▶ By early Dec.: form groups
 - ▶ Mid-Dec.: proposal presentation
 - ▶ Jan. 13&14 (Week 18): final presentation, report submission



add new post:

 ☒ I'm **one student** looking for more people to work with.

 ☐ I'm **from a group** looking for more students.

*Name *Email

*About Me

(Things you could include: your location, grad/undergrad, when you're available... help people get to know you!)

An orange arrow points from the text "search for teammates" in the list to the "I'm from a group" radio button.



Project

- ▶ Grading
 - ▶ 15% of the total grade
 - ▶ Criteria
 - ▶ relevance to this course
 - ▶ novelty, soundness, depth
 - ▶ quality of the report and presentation



Midterm Exam

- ▶ Time
 - ▶ in class (10:15-11:55am) on Nov. 12 (Fri)
- ▶ Location
 - ▶ 教学中心 301, 303 ← Check 教务系统 for your seat arrangement
- ▶ Format
 - ▶ Closed-book. You can bring **an A4-size cheat sheet** and nothing else.
 - ▶ 10 multiple-choices, 4 problems
- ▶ Grade
 - ▶ 25% of the total grade
- ▶ F2018 midterm exam paper is available at:
 - ▶ Blackboard menu → Previous Exams → Fall 2018 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
- ▶ Atomic sentence, term

- ▶ 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



Bayesian networks: Inference

- ▶ Exact inference
 - ▶ Inference by enumeration
 - ▶ Variable elimination
 - ▶ Interleave join (pointwise product) and elimination (summing out)
 - ▶ Efficient inference on polytrees
- ▶ Approximation inference
 - ▶ Prior Sampling
 - ▶ Rejection Sampling
 - ▶ Likelihood Weighting
 - ▶ Gibbs Sampling





Good Luck!

