

CS4725/CS6705 exam review

Fall 2017

General exam information

- Monday, December 18
- 9:00 am – 12:00 pm, Gillin Hall C122
- No books, notes, calculators or other aids
- All calculations will involve small numbers and should be manageable in your head or on paper:
e.g., $0.6 * 0.3$
- If your answer requires taking the log of some number, for example, you can just leave your answer as $\log_2(3/4)$

General exam information

- The marks on the final exam will be *approximately* distributed as follows:
 - 50%: material from before the midterm (Ch. 1-3, Ch.5)
 - 50%: material from after the midterm
- Many questions will be similar to assignment and midterm questions, but will generally be shorter (with fewer calculations).
- Note that there will be some true-or-false, multiple-choice or short answer questions.

Some suggestions

- Use your course notes **and** the textbook to study.
- Review assignments/labs/midterms, including sample solutions.
- A sample exam will be posted on Desire2Learn, but this is just a sample. Don't assume that your exam will include exactly the same types of questions.
- Manage your time well on the exam.
 - Look through the whole exam before starting.
 - Start with the questions you're sure you know how to do.
 - If you're really struggling with a question, don't spend too much time on it. Move on to something else and go back to the problematic one(s) later.

Chapter 1: Introduction

- Useful to re-read, just for some perspective
- However, you will not be tested on anything specific in Chapter 1.

Chapter 2: Intelligent Agents

- Definition of rational agents
- How to specify a task environment (PEAS description)
- Properties of task environments (fully observable vs. partially observable, deterministic vs. stochastic, etc.)

Chapter 3: Solving Problems by Searching

- Search problem formulation: states, initial state, actions, goal test, path cost
- Measuring problem-solving performance: completeness, optimality, time and space complexity
- Uninformed search strategies: BFS, uniform-cost, DFS, depth-limited search, IDS
- Avoiding repeated states (graph search)

Chapter 3 (continued)

- Informed search
 - Greedy best-first search
 - A^*
- Heuristic functions
 - Admissibility
 - Consistency

Chapter 4: Beyond Classical Search

- Local search
- (This topic will not be included on the exam.)

Chapter 5: Adversarial search

- Minimax algorithm
- Alpha-beta pruning
 - If you need to use alpha-beta pruning, you will be provided with the algorithm. However, you should have a good understanding of the purpose of alpha-beta pruning and the general principles behind it. You should be able to look at a small game tree and determine where pruning could take place.
- Expectiminimax
- [Monte Carlo Tree Search will not be on the exam.]

Chapters 7-9: Logical Agents

- (No material from these chapters will be on the exam.)

Chapter 13: Quantifying Uncertainty

- Utility theory, maximum expected utility, decision theory
- Basic probability
 - Prior probabilities
 - Full joint distributions
 - Conditional probabilities
 - Bayes' Rule

Chapter 14: Probabilistic Reasoning

- Bayesian Networks
 - Structure of Bayesian Networks
 - Conditional probability tables
 - Exact inference in BNs (inference by enumeration)
 - (Don't worry about discussion of Monte Carlo methods in Bayesian Networks)

Chapter 16: Making Simple Decisions

- Decision theory, maximum expected utility
- Preferences, lotteries, utility functions
- Attitudes toward risk
- Decision networks
- Value of information
- (Don't worry about axioms of utility)
- (Don't worry about multi-attribute utility)

Chapter 17: Making Complex Decisions

- Markov Decision Processes
- Value iteration
- Partially-observable MDPs and belief states
- (Don't worry about policy iteration)

Chapter 18: Learning from Observations

- Idea behind machine learning
 - Supervised, unsupervised, reinforcement
- Inductive learning
 - Hypotheses, consistent hypotheses
 - Learning decision trees
 - Classification and regression
 - Training set, test set
 - Choosing the best splitting attribute for a decision tree, using information theory
- (Don't worry about overfitting.)

Chapter 18 (continued)

- Neural networks
 - Basic idea, structure of neural networks
 - Activation functions
 - Perceptrons, linear separability
 - Hidden units
 - Be able to construct very simple neural networks
 - Perceptron learning algorithm for learning weights

Relevant textbook sections

- 1.1, 1.2, 1.3, 1.4
- 2.1, 2.2, 2.3, 2.4
- 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
- 5.1, 5.2, 5.3, 5.4, 5.5
- 13.1, 13.2, 13.3, 13.4, 13.5
- 14.1, 14.2, 14.4
- 16.1, 16.2, 16.3
- 17.1, 17.2, 17.3, 17.4
- 18.1, 18.2, 18.3, 18.7