

CS 4320/5314 Final Project

DUE: Wed, Dec 6, 11:59 PM

Groups: You may optionally work in a group of up to two for the project. The expectations for the amount/quality of work will be scaled accordingly if you choose to work in a group. The standards for graduate students will also be higher, and any group with at least one graduate student will be evaluated based on that standard.

If you work in a group, turn in only one copy per group clearly listing all of the team members. It is expected that each team member will contribute significantly towards the design, coding, testing, and documentation aspects of the project. You should include a brief description in your report addressing the contributions of the team members.

Goal: Artificial intelligence is a very broad topic, and we have only been able to overview some of the general themes, fundamental problems, and most common algorithms and techniques used in the field. There are many major areas of study that we have not been able to cover, including many chapters in the textbook. This project is designed to allow you to explore at least one additional topic beyond the standard scope of the course that you have a personal interest in. While some specific criteria and suggestions are given below, keep in mind that the main objective here is to show that you have engaged independently and put significant effort into learning a new topic in AI. If you have ideas about how to do this that vary somewhat from what is described below please let me know and we can discuss further.

Description: The first step is to select a topic area that we have not covered in detail in the course. For this, you should review the textbook and find a chapter on a topic that you would be interested in learning more about. Read it, and find a specific topic within that chapter to focus on; this will likely mean focusing in on one or two subsections, but you should probably read the rest of the chapter for additional context. There are many candidates, including everything in the section on knowledge, reasoning and planning (Ch 7-12), advanced probabilistic

reasoning (Ch 14-15), machine learning other than reinforcement learning (Ch 18-20), and many application areas (Ch 22 and above).

Find a technique/algorithm that you can implement and experiment with in a simple domain, or for a simple instance of the problem. You can look at the algorithms and pseudocode describe in the chapters, as well as looking at the exercises at the end of the chapters for inspiration. The goal is to implement at least one new method/technique, and show how it works so that you really understand it. Be sure to appropriately cite and reference any other resources you use in doing this, and make sure you have done a substantial core of the work on your own.

Next, you should find a research paper (TWO for graduate students) from a major AI conference in the last 2 years that advances work in this area and read it. Good candidates for AI conferences include AAAI, IJCAI, ICML, NIPS, ICAPS, AAMAS, UAI, ACM EC, CVPR, and other highly regarded venues. Your main goal here is to understand what is going on in current research in this area, and how this paper contributes to the state of the art in solving novel challenges in this area. **NOTE: if you are working in a group, each team member should read and report on different papers.**

Finally, you need to write a report that documents your study (a rough guideline is 3-5 pages for undergraduates, 4-7 for graduate in a standard format). First, you should address the problem you chose to focus on and why it is interesting, and what sections of the book you read to learn about the topic. Then you should describe in your own words the basic problem and common approaches/techniques from the book. Next, describe what you have chosen to implement, and how you have tested it (on what domain or example problem, what your criteria are for evaluating the approach, etc.). You should also include your commentary on the approach; what challenges you faced in implementing it, what you learned, and if you see any open problems or ways to improve the approach. In general, I expect graduate students to attempt implementing/testing more sophisticated methods than undergraduates.

Finally, you should include a writeup on the research paper(s) you read related to this topic, including a clear description of what problem the paper addresses, why it is novel, what the primary contributions were, and what opportunities you see for future work in this area. **NOTE: for groups you should include individual writeups on the research papers, noting who provided each report.**

A typical project report will be 1-2 pages. Graduate students must review two papers, and the reports should generally be of greater depth in the discussion and analysis.