Research Paper Specification

CS 3610

Goals

Some of you are rapidly approaching the end of your degrees. Unfortunately, too many of you have not yet had the opportunity to

a) **read** good, scholarly literature, and

b) **write** good, scholarly literature.

Both of these skills are extremely beneficial as a computer scientist. Many of you may still believe that you will get jobs where all you do is write code. The fact is, even programmers spend a vast amount of time involved with writing and communicating ideas. Programmers write problems descriptions, program designs, program and end user documentation, grant proposals, reports, papers, articles etc. The ability to talk and write about your knowledge is probably just as important as actually having the knowledge itself. I was fortunate, that my advisers in graduate school required that I hone my reading and writing skills before I was "allowed" to do "real research." I now know that these skills have absolutely opened doors for some incredible opportunities.

Therefore, in addition to any writing you may do on homework assignments, you will write one large research paper this semester. This paper will be written as though you were submitting it for publication at the annual conference of one of the top AI organizations - the American Association for Artificial Intelligence (www.aaai.org). Although the topic of your paper will be different from what is normally submitted for presentation/publication at AAAI, the process you follow and the requirements you work within, will be very similar to those of an AI researcher preparing for publication at AAAI.

Furthermore, you will be writing this paper with at least one co-author. You will read research together and discuss what information is worth writing about and which information needs to be explored more deeply. You will discuss multiple directions for a specific theme and decide, as a group, which approach to take. You will write certain sections of your paper as a group and divide other sections up and write them individually. You will proof-read and evaluate each other's work so that you develop a single, cohesive paper. We will talk more about the details of this as the semester goes on.

The goals for assigning a big paper include:

- There are areas of AI that we will barely touch on in class, and others that we won't cover at all. If one of those topics is of interest to you, the paper gives you an opportunity to study it with some expert guidance.
- You will have an opportunity to explore a topic in greater detail than we ever could in class. Depth of knowledge is just as important as breadth.
- Analytical skills are hard to exercise when all you ever see are relatively small problems (as on homework) that are time-constrained (as on exams). The paper will give you a chance to step into a larger arena to think.
- You will have an opportunity to go through the process of preparing a bonafide research document. Few CS courses require or emphasize this skill, however, the material in AI lends itself well to descriptive explanation, so this is an ideal place to do some writing.
- At the end of the course you will have spent a significant time doing research into a topic that most of your classmates haven't had the opportunity to study. We will take these papers that each team writes and merge them into a single "proceedings" of which each of you will get a copy.

I hope that you will view this paper not as a burden but as an opportunity to explore a topic that interests you and to practice your professional writing skills.
Types of Paper

As I alluded to above, the papers that are normally submitted to, and published at, the annual AAAI conference are formal research papers (you will likely have the opportunity to read several of these papers during the overall process this semester). These are papers which discuss the results of a specific research project conducted by the authors and will normally involve the construction of a system, the testing of the system, and a statistical analysis of the results of this system compared to some set of benchmarks.

Clearly, you are not going to know enough AI to conduct this type of research. Instead, you are going to perform literature based research. You will analyze approximately a dozen different books, magazine articles, and websites to write a paper on an AI topic that interests you. The actual format for the paper you write will likely fit into one of three types of paper:

- You could write a survey of a topic.
  
  A survey defines a topic, identifies the interesting questions in the area, and then describes the different kind of work that has been done to seek answers to these questions. For example, you might select the topic of AI and the law and write a survey of legal reasoning systems that use AI.

  The emphasis of a survey paper is on the description of what has been done. Your contribution as survey author lies in how you organize the questions and how you describe the work.

- You could write a problem analysis on a potential application of AI.
  
  A problem analysis aims to describe a specific problem and to describe how it might be solved (in this course, with AI techniques). Such a paper defines the problem in the vocabulary of the problem domain, considers one or more AI approaches that could be applied to the problem, and then selects one approach and explains why it is the best or most promising. For example, you might select the topic of AI in music and do an analysis of how a computer program might compose a symphony.

  The emphasis of a problem analysis paper is on the problem being studied. You discuss and analyze AI techniques and tools in the context of just that problem. Your contribution as analyst lies in your presentation of the domain, your careful presentation of options and trade-offs among them, and the suitability of your recommended technique.

- You could write a tutorial on a topic.
  
  A tutorial aims to teach the topic to readers with sufficient general background who lacks specific background in the topic. Such a paper presents the important concepts in the area, relates them to one another, and identifies open questions for further study. For example, you might select the topic of case-based reasoning and write a paper that would help your classmates learn the topic without having to read the whole literature.

  The emphasis of a tutorial paper is on teaching the concepts of the topic, almost like a textbook chapter. Your contribution as tutorial author lies in what concepts you select, how you organize them, and how you present them to the reader.

You may propose to do a different type of paper, but you will need to justify both the topic and your paper format.
Potential Topics

Any topic within AI is fair game, as is an application of AI to any problem domain. Select a topic from your own experience and interests, and you will find the project more engaging. The result will be a more interesting -- and, usually, better -- paper.

If you decide to look for a topic in the text or lectures, identify a problem or issue that goes beyond what we read about or discuss. For example, if you find that you really like the area of planning systems, you might select an open question in planning, such as how best to re-plan in the face of a changing environment, and write a survey of techniques for solving the problem. Or, if you find that you really like the topic of learning, you might select a learning technique that we don't discuss in great detail and write a tutorial.

Here are some topics that interest me. If one of them interests you, consider writing your paper on it.

- a survey of AI applications in almost any area, but especially the creative disciplines such as art and music
- a survey of work on task-specific architectures
- a survey of approaches to natural language understanding, vision, or robotics (all topics that we will barely touch on in class)
- a tutorial on state-space planning
- a tutorial on the frame problem
- a tutorial on fuzzy logic, especially one that explains what it contributes to solving the AI problem
- a problem analysis in almost any area, but especially the creative disciplines such as art and music
- a problem analysis of a problem that you would like to solve, which you could use to jump start a project in CS 3620.
Reading Research Literature (RP#1 phase a and b)

**Due**: Friday, September 4<sup>th</sup> (phase a) and Friday, September 11<sup>th</sup> (phase b).

**Background**: While you won't conduct bleeding edge research in this paper, you will consider a more weighty problem than you are likely used to tackling. There will be two main challenges in producing your “research” paper.

1. You aren’t used to reading formal research. To compound this problem, some of what you read will cover topics well over your head.
2. You aren’t used to writing formal writing. Again, to compound the problem you will need to learn how to write a short and concise paper when you may have a lot to say.

The two phases of this assignment aim to help you begin to consider these challenges by forcing you to read and analyze your first AI articles. In doing so, I hope that you will begin to consider some of the challenges earlier rather than later.

**Deliverable Specifics**: For this assignment you will read two research papers. The first (phase a) will be one paper that all students will read. I will post a link to this paper on Friday, August 28<sup>th</sup> in class.

The second (phase b) will be a research paper about AI from one of the following sources:

- The proceedings of a conference (co)-sponsored by SIGART (The ACM Special Interest Group on ARTificial intelligence).
- A journal or a conference sponsored by AAAI (American Association of Artificial Intelligence)
- A paper listed off of a university website and published in a conference or journal dealing with AI

If you have any doubts about the acceptability of a paper you find, please discuss it with me.

While it is not required that this paper have anything to do with the topic you are beginning to consider for your research paper, it would certainly make sense, since this paper could be one of your first sources for this paper.

For both phase a and phase b, read the paper, and then write a response to this paper (2-4 pages, 600-1200 words). Your response should explicitly address the following issues.

- Summarize - What is this paper about?
- Analyze - What do the authors do well?
- Analyze - What do the authors do poorly?
- Analyze - What question did the author's leave unanswered?
- Reflect - What did you learn about the topic they were discussing?
- Reflect - What did you learn about writing a short/concise paper?

You should submit a hard copy of your response at the start of class on the due date. You should also submit an electronic copy to me via the homework submission system.
**Topic and Teammate proposal (RP#2)**

**Due**: Friday, September 18th.

**Deliverable Specifics**: For this assignment you should

- Submit a prioritized list of at least three topics which you would be interested in exploring with a team of classmates. This may be an ordered list (1st choice, 2nd choice, 3rd choice, etc.) or a list of "ratings" (5 start topics, 4 star topics, etc). Notice that by this point in the semester, we will have only barely started the actual content of this course. In order to select a topic, you may want to skim ahead in the text to learn a bit more about what topics are available. Feel free to discuss any ideas you may have ahead of time with me. I'll try to point you in a good direction.
- If you like, submit the names of one or two students with whom you think you would work well.
- If you like, submit the names of one or two students with who you would rather not be partnered.
- Submit any significant time constraints that you have (can't meet on Mondays, can't meet on weekends, can't meet after 4:00 PM etc).

You should submit a hard copy of your response at the start of class on the due date.

I will use this information to assign teams of co-authors.

**Abstract Proposal (RP#3)**

**Due**: Friday, October 2nd, at the start of class

**Background**: Often times, before you submit a paper for publication the journal editors or conference organizers will issue a CFP or "Call for proposals." While the exact format of these proposals will vary, they typically involve having you write a relatively brief but concise description of what it is that you would like to write about in your full paper. By having this short proposal approved by the editors in advance, you know that you won't spend weeks working on a paper that is deemed completely irrelevant for the conference. While acceptance of the abstract does not guarantee acceptance of the final paper, rejection of the abstract tells you that your paper is targeted towards the wrong conference or journal.

Similarly, for this class, you will write a short proposal so that you don't waste several weeks researching a topic that is deemed inappropriate for this course.

**Deliverable Specifics**: By the start of class on the due date, submit a hard copy of your proposal. You should also submit an electronic copy to me via the homework submission system.

This should be a 400-500-word description of the topic your team would like to explore and the type of paper you'd like to write. I will try to help you make sure that you have a topic of the right scope and that there is sufficient material available for your research.
Status Update (RP#4a)

**Due**: Friday, October 16th, at the start of class

**Background**: Demonstrate to me that you are starting off as a team player

**Deliverable Specifics**: At this point your team has decided on a research topic. For this deliverable you need to pull your weight as part of the team and help find resource materials that would be helpful in writing your group's research paper.

1. You need to locate a minimum of five research papers, articles, textbook chapters etc. that you think would be helpful as part of your team's research paper. For each item you should submit a bibliographic entry for the item and a 4-5 sentence summary containing what the paper is about.
2. You should pick the two articles that you feel will be the most beneficial to your team. For each of these articles you should write a two to three paragraph summary of the article (more detailed than what you did in part #1) and an additional one paragraph about how this would help in your team's research paper.
3. You should print five copies of this deliverable. One copy will come to me on the due date listed above. The other copies should be distributed to your teammates for use in group meetings as you start to decide how to structure your groups research paper.

Please note, while most of the remaining deliverables are team deliverables, this one is something that you are to complete on your own.

Status Update (RP#4b)

**Due**: Monday, October 26th, at the start of class

**Background**: Demonstrate to me that your team is making progress.

**Deliverable Specifics**: By the start of class on the due date, submit a hard copy of your status report. This can take a variety of forms but should likely include a bibliography of research that you have read so far, a discussion of topics you will include in your final paper and who will be responsible for what, if appropriate, a discussion of topics you have chosen to exclude from your paper, and a rough outline of what you expect your paper to look like.

This document is likely a minimum of 600 words.

Peer Review Version (RP#5)

**Due**: Friday, November 13th, at the start of class

**Background**: The next step in submitting a paper for a conference or a journal is the submission of the first complete version of your paper. This paper should be one that your team has written and rewritten several times. You should feel that it shows the quality of work that you are capable of producing. At a conference like AAAI, the organizers will typically receive 2-5 times as many papers as they actually have the ability to accept for publication/presentation. At this stage, authors submit what they consider to be their best work - not some kind of rough draft - and a peer evaluation is conducted. Each paper would be read by 2-4 peers - other researchers who understand the type of work being conducted - who evaluate the paper on the quality of research being conducted, the impact of the results being discussed, and the readability of the overall paper. In the end, these peers will advise the editors/organizers as to whether or not the paper should be accepted for publication and only the top vote getters will be accepted. Thus, it is crucial that the paper that authors submit is complete and well written.
While each and every one of you will have your papers "accepted" we still want to have you put some serious effort into this first full version of your paper. Notice that I do not use the language "rough" draft or "working" draft. I have used the language "review" version. In other words, this paper should largely be a complete paper that you would consider submitting for a final grade in a class. Your peers will be editing this paper and trying to help you improve it before you submit the final version, but they will also be evaluating your paper, and you don't want them telling you (and me) that what you have so far isn't very good.

**Deliverable Specifics**: You will submit 2n+1 separately stapled copies of your paper where n is the number of authors of your paper (2 authors = 5 copies. 3 authors= 7 copies). One of these will go to me. The others will be randomly distributed to your classmates who will perform a peer review.

You should also submit an electronic copy to me via the homework submission system.

The paper should be written in the style of a AAAI conference paper using the following [rtf file for AAAI publications](#) as a starting point.
FORMAT:

- **General:** Use 10-point type in a two-column format with margins of 3/4 inch on all four sides. The material in the columns should be single-spaced and both left- and right-justified. The gap between the columns should be approximately 1/4-inch.
- **Title and author(s):** The paper's title and author(s) will run across both columns, in larger type. Your title should end with an indication of which type of paper you have written. For example "Training a neural network to play checkers : A Tutorial" or "Why Speech to Text translators will never get it right : A Problem Analysis". For the author, give your name, affiliation, and e-mail address.
- **Page numbering:** Do not number pages.
- **Sections:** The abstract is not numbered. Break the body of the paper into appropriate sections and number them from 1 in Arabic numerals. Section headings should be 12-point, bold, and left-justified: "1. Introduction". Do not number the reference section.
- **Paragraphs:** Indent the beginning of each new paragraph approximately 1/4 inch. Do not skip a line between paragraphs.
- **Abstract:** Begin the paper with an abstract of 100 to 200 words that summarizes the paper and its important results. The abstract falls in the left column; unlike the title and author(s), it does not lie across both columns.
- **Tables and figures:** Number tables and figures consecutively from 1, using Arabic numerals. Each table or figure should be accompanied by a caption in 10-point type:

  "Figure 1. The module structure of the fish-finding expert system."

  - Table captions lie above tables; figure captions lie below figures. The text should refer to each table or figure by its number: "Figure 1 illustrates the system's structure." Table and figures may be two columns wide, if necessary; single-column tables and figures must fit within their columns.
  - **Citations:** Use the "name-date" scheme to cite references: "A neural network can be trained to play expert checkers (Chellapilla and Fogel, 1999)." and "Chellapilla and Fogel (1999) demonstrated that a neural network can be trained to play expert checkers."
  - **Reference list:** List references alphabetically by the first author's last name. Follow any pattern you like---e.g., APA format---but be consistent. Be sure to list all the references the paper cites, including those found on the web. Print sources are more credible and reliable than material found on the web. (If a paper is available both in print and on line, list its print reference.) You should probably have a minimum of 8 references. A dozen is probably better.
  - **Length:** The paper may be **no longer than eight pages**, including the title, abstract, figures, and references.

Unless we discuss otherwise in advance, your draft must follow from the topic we agree on after you submit your proposal.
Peer Evaluations (RP#6)

Due: At the start of class on Friday, November 20th.

Background: An important part of being a member of a research community is the participation in peer reviews. In this activity you are given one or more papers authored by other people, and are asked to read and evaluate the papers, often following a very specific format for evaluation. Additionally, you are typically asked to provide very specific comments on not only simple things like grammatical errors ("you have the word it's when you meant the word its") but more advanced things such as issues of confusion ("I don't understand what you mean by the term 'nearest neighbor' in the paragraph about alternate methods") or suggestions for improving the paper ("The paper might flow a little better if you moved the section on motivation before the section on prior work. Of course, doing so will require rewriting so that you don't refer to concepts introduced in the prior work section"). Being a thorough and helpful peer reviewer is an important skill as well.

Deliverable Specifics: For each of the papers that you were asked to review you will complete a formal peer review form (posted on the class website). Please provide specific and helpful comments for each paper. Note that I will be assigning a grade to your evaluations based on the amount of effort that it appears that you put into providing helpful comments for your classmates.

Final Paper (RP#7)

Due: At the start of class on Friday, December 11th

Background: After peer reviews are performed, the editors/organizers will decide which papers to accept and which ones to reject. Authors are notified which category they fall in, and the peer reviews completed on each paper are returned to the original authors. If a paper is rejected, peer reviews should help the author understand why. If a paper was accepted, they give the author ideas on ways to continue to improve the quality of the paper before final submission. In fact, for journal articles there often is a requirement that the authors must provide the editor with a document indicating how they specifically addressed each of the reviewers’ concerns. Most of the time this involves making the change the reviewers suggested, but it can also include defending why the authors chose to do it in the first place ("While we understand the reviewer's comment on including a section about "big challenges" we feel doing so changes the tone of this paper.").

Deliverable Specifics: You should read through the comments provided by each of your reviewers. In most cases, you will be making the changes suggested in your reviews. In certain cases you may choose to ignore comments, but you should not do so without making it a conscious decision. Put the time into making sure that your final paper reflects a semester's worth of research and writing.

At the start of class you should submit a paper copy of your research paper. You should also have used the homework submission system to submit, a PDF version of your entire paper, and a txt or rtf version of just your title and abstract.

Grades will be determined on the basis of content and form.

- Content refers to the intellectual material of your paper: the depth and breadth of your understanding of the topic, the quality of your arguments, and the topical organization. Content will account for about 80% of your grade on the paper.
- Form refers to the mechanical style of your paper: your grammar and spelling, the readability of your prose, and the suitability of your format to the style of paper (survey, tutorial, analysis). Form will account for about 20% of your grade on the paper.

I really do care about the quality of your writing. Please use this as an opportunity to practice and to learn.