

CMSC 100: Research Project Guidelines

Fall 2008

This document explains the requirements for the research project, which will count for 15% of your overall grade in CMSC 100.

Please note that I have changed many of the due dates from those that appeared in the schedule that was handed out on the first day of class. The online schedule has been updated. Almost all of the due dates are *later* than the original dates, but this does not mean that you should put off the research until the last minute before the due date! I mainly moved the dates back so that each assignment is more likely to be thorough and well edited, and I will accordingly expect high-quality submissions for each deadline.

You must choose an application domain that reflects one of your academic or personal interests. (A list of possible topics is given at the end of this document, but you should not feel limited in any way by those suggestions!) You will research the applications of computers in your chosen domain, and will write a research paper summarizing your findings. You will also be required to read and provide comments on two other students' research papers.

Students will have two opportunities to briefly present their topics and findings in class. These presentations will count towards your class participation grade, *not* towards your project grade.

There are six "deliverables" (assignments) that must be turned in: (1) a topic proposal, (2) an initial bibliography, (3) an outline, (4) a draft paper, (5) the reviews of other students' draft papers, and (6) the final report. The requirements for these assignments, and the two class presentations, are summarized below.

Topic Proposal

(Due Thursday 9/18; 5% of project grade)

The topic proposal should consist of a short explanation of your chosen application domain, why you chose it, and what you think the relevant applications of computers might be. The proposal should be at least two paragraphs (one about the domain, one about applications), and not longer than two pages, single-spaced (which is very roughly 1000 words).

Initial Bibliography

(Due Thursday 10/9; 5% of project grade)

The initial bibliography may be formatted according to any standard style. (I suggest the APA guidelines, which you can find at <http://owl.english.purdue.edu/workshops/hypertext/apa/parts/references.html>, among other places. However, another style is acceptable, as long as your references are consistently and neatly formatted, with complete bibliographic information.)

Your initial bibliography should include **at least five** sources of information about your application domain and uses of computers in the domain (or relevant computing technology that could be applied to the domain). Of these sources, **at least three** must be "establishment" (peer-reviewed or formally published) media, such as journals, newspapers, books, or magazines. Furthermore, of these three sources, at least one must be *aprint* media source (although you may access it online, e.g., in the case of an ebook that is also available in print form, or an online *New York Times* article).

The other two sources can be less formal sources, such as Wikipedia or a web page that was posted by a knowledgeable institution, group, company, or individual. None of the sources should be completely

unreviewed, open forums (e.g., Yahoo Answers is not acceptable as a source -- if you learn of something interesting such an unreviewed source, you need to find a more reliable source that can verify that information, and use that in your bibliography). You should label each source as "E" (establishment), "I" (informal), and/or "P" (print).

If you have any doubt about whether a particular source would count as "establishment," "less formal," or "unreviewed," just ask.

Outline

(Due Tuesday 11/11; 5% of project grade)

The outline should be in outline form (i.e., organized hierarchically, with top-level entries numbered "I," "II," etc., and subtopics up to three levels deep below those main topics). It should summarize the main topics you plan to discuss in your paper, and mention the main ideas you will cover within each section.

One possible organization is: Introduction (overview of paper), Application Domain (what your domain is and why you think it's important), one section for each major application of computing within the domain, a section on social/ethical issues, and a Conclusions section. (See *Final Report*, below, for an explanation of what your final paper should include. This should also help you to organize your outline.)

The outline should be around 1-2 pages in double-spaced form.

Your outline must also include a more thorough bibliography, with at least 10 sources. Of these sources, at least five should be from "establishment" sources; at least two of these "establishment" sources should be from print media.

Draft Paper

(Due Tuesday 12/2; 10% of project grade)

The draft should be at least 5 pages, double-spaced. The basic structure should follow that of the outline you submitted, although you are welcome to change it if you think you now have a better organization for the paper.

It's fine to submit a complete paper (i.e., 10-15 pages with all of the material) as your draft. If you do this, you are likely to end up with a better grade on the final report, because I'll be able to give you more thorough feedback on the draft. At a minimum, though, your draft should include all of the basic ideas to be covered in your full paper, if not all of the details about these ideas. (For example, if you chose football, you might have a short section that describes the automatically generated line of scrimmage that is shown in televised football games, and mention a few sources that you've found that talk about how the line is generated. You might, however, leave out the technical details (of how it actually works) in the draft -- although they should appear in the final paper.)

The draft should be grammatically complete and readable, just as a final paper would be -- that is, it can leave out details, but it shouldn't be sloppy or unpolished.

You must bring *three* hardcopies of your paper to class on the day that the draft is due: one for the course staff, and one for each of the other students who will be reviewing your paper.

Reviews

(Due Tuesday 12/9; 5% of project grade)

An online review form will be distributed via Blackboard, and you will be given two other students' papers to review. The form will be self-explanatory: you'll be asked to rate the draft paper on a numeric scale with respect to a number of questions (e.g., organization of the paper, grammar and style, clarity of the descriptions of the applications of computing). You'll also be asked to comment on each of these ratings with a few sentences.

At a minimum, your review should give useful and thoughtful feedback about the quality of the paper, and should show clearly that you actually read and thought about the paper. You are welcome to write more extensive comments, which may be useful for the author, but are not required to do so.

Final Report

(Due Tuesday 12/16; 70% of project grade)

The final paper should be 10-15 pages, double spaced, with 1" margins. This roughly corresponds to 2500-3500 words. If you feel strongly that you can cover all of the necessary information in less than 10 pages, or that you need more than 15 pages, then you can submit a shorter or longer paper -- but if I judge that you have skimmed on details (or conversely, that the paper is repetitive and filled with "fluff"), your grade will reflect that.

The paper should introduce and discuss your topic area, and talk about some of the key challenges. (These can be both computational -- e.g., encrypting online medical records -- and non-computational -- e.g., ensuring physician compliance with medical recordkeeping standards.)

Next, you should present at least three applications of computing in your chosen field (you can talk about more than three if you want). At least one of these applications should refer to technology that is currently in use in the field. Also, at least one of them should be emergent technology (new technology that hasn't yet been widely adopted) or a possible future application (this can be as "out there" as you want, as long as it's not impossible). For each of these applications, you should explain what it does, why it's useful, and how the underlying computational technology works. This should be written so that a non-computer scientist can understand it, but should have enough detail that a computer scientist (i.e., me) will find it convincing and interesting. You should also talk about the limitations of existing technology (what can't it do yet, what doesn't it do well, or when is it not applicable). For emerging/future technology, you should discuss what technological advances would be needed to make it possible.

Finally, you should discuss the social and ethical impact of these current and future applications. These can include privacy, moral and legal implications, potential social benefits or detriments, or anything else that you think is relevant for the broader impact of the technology on society.

Your paper should include a "Conclusions" section that summarizes the main points, and a bibliography that lists your sources.

All quoted material must be properly cited. Also, you should support your discussion by appropriate bibliographic citations within the text. (That is, it isn't enough to just include a bibliography -- you also need to indicate which sources you used to get the information within each section.) In general, these citations don't need to be sentence-by-sentence or even paragraph-by-paragraph. For example, in the football example mentioned above, when you first mention the line of scrimmage application, you can say something like "The line of scrimmage technology is used to automatically generate an overlay for television viewers [Scienceline.org 2008]." After that, you only need to give that citation (or another citation) if you quote the article or want to support a specific point that might seem questionable to the reader.

All bibliographic entries should be cited somewhere in the paper. (If they aren't, then why would you include them?)

Class Presentations

"Your Turn" Topic Descriptions

(Slide due Thursday 10/9; presentations Tuesday 10/14.)

At this point, you'll know what your topic is, and will have just turned in your bibliography, but may not have fully researched your applications. That's OK, since we just want to hear about your topic and a bit about why you think it will be interesting.

These presentations will most likely be given from your seats -- since we have about 45 students in the class and only 75 minutes for the presentations, students will be limited to one minute each (possibly 90 seconds), and you'll have to submit a single PowerPoint slide (plus title slide) in advance of the presentation day, so that we don't have to rotate laptops through the projector. You should practice what you're going to say in that 60 to 90 seconds several times! We will talk more in class about how to design a good slide and "spiel" before this assignment is due.

Project Presentations

(Draft slides due Tuesday 11/25; final slides due Monday 12/1; presentations Tuesday 12/2 and Thursday 12/4)

By now, you'll have submitted your draft, gotten feedback from the course staff, and received two reviews from other students. So you should have a good understanding of your chosen domain and the relevant computing applications.

We will spread these presentations over two days; still, you will likely only have 3 or 4 minutes. So again, you will have to submit your slides in advance (about 3 slides will be plenty), and you need to think carefully about what you want to say, and practice your presentation in advance. This time, you'll have a chance to submit a draft version of your slides; I'll send you comments on these, which you can incorporate into the final slides, due the day before the presentations start.

Presentation slots will be assigned by lottery, possibly grouped into general areas. Be prepared to give your presentation on either day. I will distribute the schedule in advance so you can plan accordingly -- but both Tuesday and Thursday presenters will need to submit their slides on Monday out of fairness.

Topic Ideas

These are just some ideas that might inspire you. Notice that some of the topics (like bioinformatics) are inherently computational, whereas others (like football) are not. Either of these types of topics is fine, as long as there is some interdisciplinary flavor to it (e.g., "software engineering" or "algorithmic complexity" aren't good topics). Please be aware that any of these topics could grow to be quite broad, so when you start doing your research, you may very well need to narrow the description of your application domain to make your research manageable.

- Geology / earthquake prediction
- Medical records management
- Autonomous vehicles
- Cognitive orthotics for Alzheimer's patients
- Stock market prediction
- Techno music / audio processing
- Bioinformatics / gene sequence alignment
- Digital art
- Weather forecasting
- Video gaming / artificially intelligent "virtual player" models, or real-time rendering for 3D game environments
- Football (or any sport... swimming, gymnastics, badminton...)
- Chess (or any game... Go, bridge, ...)