CSE 7344
Research Project Logistics

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I. Document Summary

This document describes the basic logistics required to successfully complete the term research project and research paper for CSE7344.

One of the major goals of the CSE7344 course is to introduce the students to research. To this end, the term research is a major component of the course and of the course grade. In performing the term research, you will draw upon your knowledge and experience from the course lectures and readings and elsewhere to actually perform the research. This document is intended to guide you in the logistics process required for the term research paper.

The basic topics covered in this document are: the research paper logistics timeline, the requirement for teamwork, the research proposal, background knowledge for the research, and the high standards of work expected of us. This course is meant to be fun and informative, so make sure to choose a topic that you are interested in and teammates that share your interest. Interesting topics are the ones that will be fun and the most rewarding to you personally.

II. Research Logistics Timeline

The term research is a major work product upon which your grade is based. Be studious and reach these logistics milestones on time, and you will do well in the course. There are three written reports due in conjunction with the research plus one oral presentation. The written reports are the research proposal, the interim report, and the final report. The oral presentation is a final research presentation given in class during the last week of classes.

The timeline for the research deliverables is given below.

> 5 February 2015: Research proposal due. (10% of research project grade)
>
> 5 March 2015: Interim draft due. (20% of research project grade)
>
> 28 April - 30 April 2015: Final presentation in class. (10% of research project grade)
>
> 4 May 2015: Final paper due. (60% of research project grade)

III. Teams

Teams of three or four are required for the term research project (teams of one or two are not acceptable), so start looking for teammates as soon as possible!

The networking field is broad and it draws upon multiple diverse knowledge domains. The shear diversity of knowledge and expertise required to research and develop technologies, create applications, and deploy a potentially large scale networking system fosters collaborative work in networking research and development.

We all learned how to play nice with others in kindergarten, but we weren't forced to learn how to work with others until we got to college and took great courses like this one. Research teams are often significantly more productive, and the resulting work of higher quality, than if you were working in isolation. Working with others is a learned skill often best learned through actually working with others, and it is mandatory in most jobs in the real world outside of the university. The more you work with others, the better your interpersonal and team skills will become (or you will realize you belong in a job with no living human contact whatsoever, like a morgue technician working on the graveyard shift). Besides, working with others is a lot more fun than working alone. Just think about how much more fun it is to play Doom or Halo or World of Warcraft with a couple of your buddies. Blasting the bad guys isn't nearly as much fun when you're doing it by yourself!

IV. Research Proposal

Resarch proposals of up to two pages are due as specified above. You will use LaTeX to format your proposal. More on this requirement below. Print out one hardcopy of the pdf of your proposal and hand it in at the beginning of the class period in which the proposal is due. I will read the proposals carefully over the following few days and get back to you by email with any questions or feedback. I will be looking mainly at three aspects of your proposal: 1) Is it topical? This is to say, does it relate in some way to networking, which it had better, or else. 2) Is it sufficiently focused? Research looking at broad open ended questions typically lasts several years, costs millions of dollars, and has no guarantees of results or outputs. You have two months, no budget, and must guarantee four outputs, your research proposal, your interim report, your class presentation and your final report. And, 3) Is it too ambitious (or not ambitious enough)? You have two months. You won't win the Touring Award based upon your class research project, but you can take the first step with it. Besides, your final report (probably after a last round of editing) is expected to be submitted to CCR (Computer Communications Review) with at least a 50-50 chance of being accepted. This means, learn how to write well. And, do so very quickly!

Where do you get a research project idea? That's easy. Choose one of the research topics that I've given for the class

or come up with a topic of your own. This is the perfect opportunity to perform thesis research related to computer networking. Be sure that your team is the only team working on that research topic. If two teams choose to do a project based on the same topic, both teams will receive a zero for their research project grade. So, don't choose your research topic in isolation!

Note that I provide a list of topics that either outline a problem domain or specify a specific problem to be solved. It is your responsibility to take your chosen topic and ensure that a research problem is what is being addressed by you and your team.

Your research will be targeted towards an open problem with the goal that your results will be novel and publishable in a peer-reviewed academic journal or conference.

Your research proposal must contain the following items:

- *Project title.* A detailed project title is better than a vague title. A properly formed title will help to focus your energies on the actual problem being addressed in your project.
- *Names and email addresses of all investigators for the project.* There must be at least three investigators.
- *Clear statement of the research problem.* A one to two sentence statement of the problem followed by a one paragraph clarification of the problem. The paragraph should identify clearly the research question you are addressing, and proper motivation for the importance of the problem must be provided.
- *Clear statement of your research methodology.* A multiple paragraph explanation of how you will approach and develop a solution to the research problem under study. Note that you need to identify multiple intermediate milestones. Research is not an all or nothing proposition. If you make it all or nothing, you are likely to lose everything. When you strip the problem to its essence, the first step becomes clear. And, that first step is usually a baby step. Identify that baby step, and then the next one and the next one and so on. It is possible to get an 'A' on the research project without completing every step you identify, but it is certainly easier to get a good grade when all the steps you've identified are baby steps.
- *A statement of previous work related to the problem.* This is a preliminary inquiry into what research has or has not been performed to solve your chosen problem. Your final report will contain an extensive discussion of previous and related research. You should have at least five citations of previous or related work on your topic area. Note that you must use BibTeX for your citations.
- *A statement of your research plan and schedule.* The timeline and major milestones that you will achieve in completing your project must be explicitly spelled out. You need to timeline your project to convince yourself (and me) that you can complete the project before the end of the semester and that your project isn't trivial.
- *A list of resources needed to accomplish your work, with special emphasis on important pieces you don't yet have access to.* Be as clear and precise as you can in your requirements, and we will work towards getting what you need as quickly as possible. We have a very limited budget, so requests for electron scanning microscopes and new signal generators may not be honored unless they can be borrowed from somewhere else on campus. If your request cannot be accommodated for any reason, we will notify you as soon as we find out.
- *Any other questions or clarifications you need from us.*

Your research proposal (and all of your documents) must be written using LaTeX. Your proposal, interim and final research papers will be written according to the Computer Communications Review submission requirements, so you must utilize the CCR LaTeX template for all of your documents. (You will lose 10% of your possible points for each paper that does not use the CCR LaTeX template.) More information on LaTeX may be found at www.ctan.org.

I am available to answer your questions as you prepare your research proposal. While this is a short document, coming up with a research problem is not always done quickly. A quick look at related and previous work on your chosen topic will give you an idea of how novel your project work needs to be and how hard it will be to achieve something new.

V. Interim Draft

Your interim draft is an early draft of your final paper, and it should be written with the end in mind. Your interim draft should be at least 3 pages in length, have the basic structure of your final paper including most, if not all, of your references, and it should have all the non-experiment dependent sections written to a draft level of understandability.

A typical research paper has six sections plus an abstract. Generically, the six sections are: Introduction, Related Work, Research Approach, Experiment and Results, Analysis, and Conclusions (note that Conclusions is plural). The abstract plus the first three and one-half sections should be written in your interim draft. Note that poorly written is fine at this point. This is simply an early draft. There may also be holes in this draft. For example, the Introduction section should give a 30,000 foot view of your approach to solving the problem plus the primary results and conclusions. You may not have all of this information after only one month of working on your research. This is OK.

VI. Final Paper

Your final paper is expected to be a paper suitable for submission to CCR with a 50% chance of being accepted. This is a high level of expectation both for the research that you will do and the writing that you perform.

CCR accepts submissions that are for either original research or editorial on existing publications. Please look at papers of each type on CCR to get an idea of the style of each type of paper. Note that an editorial paper does not mean a simple essay. An editorial entails a detailed analysis, including appropriate theory and experimental work, to refute, confirm, or expand upon an already published work.

CCR submission policy requires a 6-page submission in their style. You will use LaTeX to format your paper, so be sure to download the CCR LaTeX template. For those of you

that wish to write more than 6 pages for your final report (or, perish the thought, you have a desire to write less than 6 pages) be aware that 15 percentage points per page (or any portion thereof) for any deviation from 6 total pages will be deducted from your final term research project grade. This is to say, write 6 pages. No more. No less.

Please don't wait for me to get back to you before starting your research. Get started as soon as possible! That means today! You have roughly two months to start and complete the research and all the documentation. This is ample time if your proposal is focused and you start early, but not otherwise. Plan on spending at least one week writing the final paper. Your interim report must be a draft of your final paper and must be at least 3 pages in length.

VII. Knowledge Background

In a one semester course, one can cover only a fraction of the networking topics, current or otherwise. There are sure to be research projects where the background material needed for the research is not covered in the course or is not covered in sufficient detail or a timely manner. And, even for topics that we do cover in detail, there will certainly be other relevant related work that you will need to be familiar with to finish your research.

A large part of doing research is figuring out what has already been done and where the knowledge holes exist. So, you should research your problem's related literature and any other available information as extensively as you can. Keep an eye out for useful software, such as ns2 or ns3, or research methodology or tools that you can leverage. This will save you tremendous amounts of time in performing your research and doing the final paper.

VIII. Work Product Standards

Aim high in a focused way, and do the best that you can! The best research papers are sure to be publishable in top ACM or IEEE conferences or appear as articles in journals. In fact, the goal every research project in this class is to produce a body of work that gets published in Computer Communications Review. If research does not get published and, therefore, publicized, it is of no use to the community at large.

I have great confidence that you will far surpass my already high expectations with wonderful work that will further the state-of-the-art in networking.

Above all, have fun with the project!
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