Course Project Proposal

17-355/17-665/17-819: Program Analysis
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Due dates listed below; 400 points total

An overarching goal of this course is to provide students the expertise necessary to (A) understand, appreciate, criticize, and reuse key ideas in program analysis, and (B) put those ideas into practice in state-of-the-art analysis tools. For Ph.D. students, a component of research is expected both on the understanding and contributions side. The goal of the project is to become deeply familiar with a particular subarea of program analysis, and to demonstrate that familiarity through a research or engineering-focused course project. The expected scope of the project is about 30–40 hours per person, spread out over the last month of the course (note that we have no final exam).

This project has two variants: the Research variant and the Practice variant. The Research variant is required for students enrolled in the Ph.D. version of the course, 17-819, and optional for others. Undergraduate and master's students taking 17-355 or 17-665 may elect the research variant; please note in the project proposal if you want to do this. The differences are:

- The Research variant is expected to touch on recent research in the field of program analysis, and students are expected to choose a project with the potential to make a modest contribution to the state of the art.

- The Research variant requires students to read at least 3 major conference or journal papers related to their project. In their final project report, students must compare and constrast those papers to one another and to the work done in the project.

- Students doing the Research variant are excused from Homework 9, allowing them more time for the project.

The project consists of several deliverables, each with their own due dates. All deliverables should be submitted via Canvas under the corresponding assignment. Please continue to follow our conventional naming scheme and submit your work in PDF form.

- **Proposal:** *(40 points)* Tuesday, April 9 (research option) or April 16 (practice option), 2019, 11:59 pm
- **Milestone:** *(10 points)* Thursday, April 25, 2019, 11:59 pm
- **Presentation:** *(150 points)* Monday, May 13, 2019, 5:30 pm (in the "final exam" slot for the class). No late days are allowed.
- **Final deliverables:** *(200 points)* Monday, May 13, 2019, 11:59pm.

Groups. Students may work in groups of their own selection. Group projects will be given a single grade, with exceptions only in extraordinary circumstances. Expectations for the project will be scaled (within reason) to the size of the group.

Project scope/proposal *(Tuesday, April 9 (research option) or 16 (practice option); 40 points)*. The first deliverable is a proposal that describes what you are going to do in your project. **Note that students choosing the research option must turn in a proposal on April 9, in lieu of doing HW 9. Other students may turn in their proposal on April 16.**

The proposal should consist of 1–2 pages of text (soft limit) and is worth 50 points. List the project title and the members of your group (or indicate that you are working alone). Outline what you are going to do, why it is interesting, and how you are going to evaluate it, as well as what you are going to do for the first milestone. Undergraduate and master's students who choose the Research option should indicate that here. All students doing the Research option should list the 3 (or more) papers they plan to read and give a justification for why they were chosen.

You have many options for the project:
- Design and implement an interesting analysis. In this case, your proposal should describe the goals of the analysis, the techniques you plan to use in designing and implementing it, and how you will evaluate its success.
- Carry out an empirical evaluation of one or more existing analysis method(s) and/or tool(s). In this case, describe the analysis methodology and/or tool(s) you will be using. Also describe the code which you will be analyzing, and how you will evaluate the analysis.
- Conduct an extension of your existing research, so long as it is new and includes a non-trivial analysis component. Many students in the course already study, use, or extend various analyses in their current research.[1] It is therefore acceptable to integrate/make use of your current research for the project, but you must plan, make and document novel progress. That is, you may not simply write up and analysis/results you already have. In the proposal, provide sufficient background on your current project that we can understand the high level goal, identify the components that relate to program analysis, and describe the scientific questions you will investigate; how you will investigate them (empirically, theoretically, etc); and how you will evaluate. Sketch the initial ideas that underlie your solution or hypothesis. Check with us if you are not sure whether your research qualifies.
- Other ideas are welcome, contact us.

Milestone *(Thursday, April 25; 10 points)*. Submit a short status update that describes you have done, whether you are on schedule with respect to your original plan, and any issues or concerns with the project. If all is going well, a short paragraph will suffice. Include evidence (code, data, design document) of your work so far. There are no requirements on the form of the evidence, i.e. it doesn't have to compile or run.

Presentation *(Monday, May 13; 150 points)*. Prepare an 8–10-minute presentation (We will be firm on this time limit, due to the number of students in the class). Note that by default, we cannot allow late days for the presentation. Describe the problem you are solving and why it is important; give high-level background not already provided in the class; explain how you solved the problem, and show an indicative result or short demo, depending on the contribution of your project. Include a short set of potential criticisms of possible extensions. Yes, the amount of time allotted is short. You will also turn in your slides and fill out feedback forms for one another, which will be included in the overall grading for the presentation day.

Final deliverables *(Monday, May 13; 200 points)*. No more than two late days by default unless you have extenuating circumstances, since we need to be able to complete/submit grades on time. Turn in a document that describes what you did, why, your results, and reproduction steps as

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[1] Recall that analysis includes static and dynamic techniques, and not simply the material we covered in the course so far.

necessary. This should look like a standard 2-column conference publication and should include a brief related work section. We are flexible on length so long as you do all that is necessary to convey the information requested: fewer than around 4 pages is probably too short; more than 8 is almost certainly too long for Practice option projects but perhaps about right for Research option projects. Include information necessary to understand and reproduce what you did and your results. All scientific results, as well as input data, should be included or referenced. Students who chose the Research option should include a detailed related work section that describes, compares, and contrasts the related work in the research literature to the work done in the project; thus Research option papers will be on the longer side of the length figures given above. If your project involved implementation, submit a link to the source code and provide instructions for building and running it.