1 Overview

This document provides a detailed overview of the qualification exam and proposal defense for students in the School of Computing at the University of Utah. It is targeted towards students in the data track, but may be expanded to all students in the School of Computing.

The requirements described herein will encompass what has previously been presented as the Qualifying Examination and the Proposal Defense. The university treats these as individual events, and this document suggests how to do them in quick succession.

To complete the two requirements, the student should demonstrate three key areas of competency:

- Breadth in their sub-discipline
- Ability to perform research
- Ability to propose research directions and lines of attack to accomplish them.

The first two areas will be partially accomplished by performing well in classes and by publishing research papers, so a disproportional amount of emphasis will be on the third bullet.

The defense will consist of three components: preparing a proposal document, answering questions from the committee, and an oral defense of their proposal. The steps and the rough timelines are as follows:

1. Form a committee consisting of 5 members, at least three from the School of Computing and at least 1 from outside the School of Computing (per University of Utah requirements).

2. Prepare a document that will be roughly in the style of an NSF proposal which outlines new research directions and plans of attack proposed to complete the student’s Ph.D., as well as background in the area and of their research. (See section 2.)

3. Set a date for the oral proposal defense (at least 2 weeks after submitting the proposal document to the committee).

4. The committee members will ask questions about background, related work or past work of the candidate. This will happen via email, as described in section 3. The question and answer period will last for two weeks, where the student may be expected to answer follow-up questions. Based on this, the committee decides on a pass/fail grade for the qualifying examination.

5. On the date of the oral proposal defense, the student gives a presentation, which is followed by a Q&A session (see section 4 for details).

For a more detailed discussion on the timeline, see Section 5.
2 Proposal Document

The proposal document will have 10 pages of content, and will then allow unlimited space for references. As a strong guideline, the first page should be an overview of the entire document, the second and third pages should contain the necessary background, the fourth and fifth pages should detail the previous contributions of the student, and the final five pages should propose a series of research directions that will possibly be executed as completion of the research for the student’s Ph.D. thesis. Typically, the more a student can align with this outline, the easier the next component will be, and the more beneficial the process will be for the student.

2.1 Overview Page

The first summary page should outline the remainder of the document focusing on what new ideas are being proposed in the Plan section and how they build on existing work. Distilling your entire proposal as a single sentence (a thesis statement) is recommended, and is often useful to help focus the topic and presentation.

2.2 Background

The two pages on background should represent a small survey of the related work specific to the specialized subarea of the student and the proposed work. This section (in addition to classes completed) should demonstrate the student’s knowledge base and represents the breadth aspect of the exam. The most relevant existing work in the area should be explained and related to the proposed work. Related but not core research should at least be cited with context.

2.3 Prior Work

The two pages on prior work should summarize the student’s research leading to this proposal. If the student has performed research on numerous topics, then they should focus here only on work relevant to the topics described in the Plan section. Most important elements of this section are those that will be built upon and extended in the Plan.

This section also serves to summarize the prior work of the student in enough depth, along with a publication record, for the committee to judge if the student has performed enough research to demonstrate their ability to do so successfully towards a Ph.D.

2.4 Plan

This is the major new component that the student is required to produce. This section, of about 5 pages, should describe several new ideas for research. Ideally these directions will build on the existing work and knowledge base of the student. A good guide for the student is to propose around 3 major topics, each of which if executed would constitute a distinct paper, and would altogether round out their Ph.D. thesis research.

For each direction in the plan the student should

- provide strong motivation, possibly tying into a central theme of the document,
- build on prior work the student has demonstrated knowledge in, and
- provide a roadmap of how they expect to complete this direction.

Successful directions are built around a single central new idea each. This idea can, for instance, be a new insight into a problem, a line of attack, or a connection to a different area or body of literature. Then this
part of the document should be structured to expand on this idea and show how it relates to motivation and expertise, and how it may lead to new results.

A timeline may be useful as a guide in executing and presenting this plan, but is not required. Some students may present more directions than they plan to complete (say some more speculative); in this case, they should state how many (say 2 out of 5) they propose to complete in order to be ready to defend their Ph.D.

3 Committee Questions

In the next phase, the student’s committee will ask questions for the student. Each committee member, except the internal one, is required to ask at least one question.

3.1 Questions and Response

When the proposal document is completed, it should be provided (typically by email) to the student’s committee. This begins the question phase of the proposal which will last for at most two weeks.

The student’s committee should read the proposal and can directly reply to the student with questions; they should reply-all and CC the rest of the committee. The committee has one week to ask questions, to which the student can immediately reply with answers. There are no upper limit to the number of questions the committee can ask, and they may reply to the student’s responses with more questions, as long as they are within the first week.

The student must answer each and all questions within a week from the last question asked – so the entire process can last at most two weeks. However, it is expected that students will reply to questions more quickly and sequentially, often as soon as they are posed.

Generally, the stronger, the more thorough, and the more coherent the proposal document is, the fewer and less hard the committees questions should be, and the less specific the answers need to be. For good proposal documents, the committee questions can often be simple questions asked over email – they do not need to be presented in a pdf document, or expect an elaborate response.

3.2 Evaluation

Each committee member who poses a question should inform the advisor of a score for the student: as Fail, Pass, or High Pass. The student passes if a majority of the votes are not Fail.

Each committee member should make their vote efficiently. As soon as the student answers their questions they can make their decision, and send in their vote. (They can change their decision based on answers to other questions which come afterwards.)

If the student submits their document almost exactly two weeks before the oral proposal date, and does not finish answering questions until the day before the proposal date, then this may leave little time for the committee to evaluate the written responses (this timing is obviously not recommended). If this occurs, and there is insufficient time to evaluate, any committee member can decide the oral defense should be postponed and rescheduled. Alternatively, the committee may decide to meet immediately before the oral defense and review the responses as a group and decide if the student passes, and the next component can continue.

Only if the student passes this phase can the next oral defense phase be continued.

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4 Proposal Presentation Defense

The Proposal Defense will culminate in a proposal presentation and its oral defense.

4.1 Presentation

The presentation will last 45-50 minutes and will usually be open to the public; the committee will also be present. A student can request it is closed to public, but the default is that it is open to the public. The structure of the document is a good guide for the structure of the presentation. That is, most of the presentation should be spent on the plan and new directions, but sufficient background in general and in the student’s own work will likely first be presented to give context.

The background should be sufficient to demonstrate students breadth of knowledge in the area. A concise but complete and often newly devised taxonomy of existing work can often demonstrate a student’s grasp of the breadth of the field much better than a simple list of existing work with short summaries.

Similarly, when the student is relating their own existing research, they should not simply list all of their accomplishments, but attempt to build a foundation of approaches and results on which the forthcoming plan will be supported. This approach may prioritize the student’s accomplishments differently than pure impact, but rather by usefulness in the forthcoming plan.

Finally, the Plan section of the presentation should outline roughly what the student hopes to accomplish in their final years completing the Ph.D. Each proposed direction should be presented to the committee in a way that it is evident how it built upon the student’s accumulated knowledge, why and how the student believes they can execute this direction, and how it fits into or would help resolve a well-motivated problem. Like the proposal document, it is recommended that the presentation spend roughly half the time on this component.

Although not required, building these directions around a single well-motivated theme is recommended. This may allow the student to reuse motivation, and have each direction build on a previous part of the overall plan.

4.2 Examination

As the presentation is (usually) open to the public, those outside the committee will be allowed to ask questions of the student, time permitting. Following their questions a closed door section will begin with just the student and committee members. At this point, the committee will be able to ask more specific questions of the student’s previous work, the proposed work, and relation of the work to related work in the subarea. Anything that was or should have been included in the document or covered in the presentation is fair game.

The student is expected to be able to answer most questions regarding to related work, completely defend their prior work that is used in or extended in the Plan, and to foresee clear challenges that will be encountered in executing their Plan.

Again, at the conclusion of the committee’s oral questions, the student is excused from the room, and the committee votes. The possible votes are Fail, Pass, or High Pass. The student passes is a majority of the votes are not Fail.
5 Timing and Logistics

5.1 Timing

We anticipate this defense will occur typically around the first semester of the fourth year, although it may vary among students. Ideally the student should have completed about 1-2 papers and hope to complete 2-3 more to fill out their Ph.D.

Before beginning the process, the student should schedule the events with their committee. This includes the oral defense date and time. It should also include a planned date to send out the proposal document at least two weeks before the oral defense. Each committee should have some availability in the week after the proposal document is delivered to execute their portion of the question-answer phase.

Proposal document. It is anticipated that the students should start brain-storming for the proposal for at least a month before they begin the proposal document. The core writing of the proposal document should take a week to a month – depending on how concurrently they work on other tasks. They can plan their presentation in parallel with the document.

The feedback from the advisor should be limited, but available to keep the student in the correct direction. Advice like “this direction is too broad” or “this proposed work is too incremental” may be appropriate comments. The advisor is not expected to provide the details of specific research directions, however, it is natural for these directions to arise from early discussions with an advisor about future directions in research. Nor should the advisor provide specifics on which related work is most important, or how to summarize their own work. If a student has completed one or more papers on the topic of the proposal, then this can serve as the basis for the elements of the proposal document.

Committee questions. As noted, the committee should plan time in the one week after the proposal document is delivered. They must pose all of their questions within that first week. And the student will have to answer all questions within one week of the final question posed. However, they can (and are recommended to) answer the questions sequentially as they come in. Quickly posed questions, and quick responses from the students can allow for follow-up questions to clarify or ask for more detail in the response.

5.2 Scoring

At the conclusion of stages 2 (written) and 3 (oral), the committee will designate one of three scores:

Fail. The student performed inadequately, and did not demonstrate the ability perform Ph.D. level research. In accordance with the graduate handbook, they will be given one more opportunity to take each phase of this process, that must be no later than six months from the date of the failed exam. If the student fails a second time, they will be asked to leave the program.

Pass. The student demonstrated the ability and experience to perform Ph.D. level research. All aspects of the exam were completed satisfactory.

High Pass. The student demonstrated the ability and experience to perform Ph.D. level research at a high level. All aspects of the exam were completed at a very high level. This impressive honor should apply to at most the top 5% of students taking this exam.
5.3 Feedback to Student

An important aspect of this process is for the committee to provide guidance to the student as they work towards completing their Ph.D. The committee should make suggestions on which proposed directions seem most promising, seem most likely to be successful, and are most likely to have an impact.

It will probably be common (especially, if this is completed in the third or early fourth year) that student will propose more topics than they will actually complete, or plan to complete. If the proposal defense is successful, the committee should recommend to the student how many of the proposed topics (or which ones) would be acceptable to complete, for them to be ready to defend their Ph.D.

While not so in a formal sense, the student (and committee) should think of this feedback as a soft “contract.” If the student completes the agreed upon subset of tasks, that should roughly be sufficient for them to defense their thesis.