PhD Qualifying Exam
Effective Fall 2020

1. Purpose

Each doctoral student must satisfy the PhD qualifying requirement, which consists of (1) a written document describing either original research (Track 1) or a review of core papers in a particular research area (Track 2) and (2) a public oral presentation. The purpose of the qualifying exam is to allow the faculty to assess the PhD student's ability to conduct PhD-level research in Computer Science. The written document and oral presentation allow the faculty to examine how well the PhD student understands key ideas and is able to discuss those ideas in a question and answer session.

2. Qualifying Exam Options

PhD students, in consultation with their advisor, can choose either Track 1 (Section 2.1) or Track 2 (Section 2.2) to complete their qualifying exam.

2.1 Track 1 - Student submits and presents a published peer-reviewed paper

This track is for students who have already been successful in publishing a peer-reviewed research paper, while at UA.

Written Document

The chosen paper has to meet the following conditions:
1. The student's advisor has to approve the paper and confirm that it is published in a high-quality, peer-reviewed venue.
2. The student has to be the lead author and the advisor (or other co-authors) must certify that the student did the large majority of the work in the paper.

The student will submit the published paper for the committee members to read. Because the paper has already been accepted in a high-quality, peer-reviewed venue, the student's committee will not evaluate the paper, rather they will use it to prepare questions for the oral presentation.

Oral Presentation

The student will be required to deliver a 20-minutes conference-style presentation of the research contained in the paper. The committee members will then have 20 minutes to question the student regarding the contents of the paper and presentation to ensure the student is able to adequately communicate the research and answer questions about it. The presentation and subsequent question/answer session will be the primary factor in evaluating the success of the qualifying exam. Appendix B describes the evaluation of the oral presentation.

The committee will then assign the student a score of either *Pass* or *Fail* based on the how well the student's presentation meets the requirements specified in Appendix B.

2.2 Track 2 - Student conducts a traditional literature review

This track is for students who have not yet been successful in publishing a paper in a peer-reviewed venue. In this case, the student will prepare a publication-quality literature review on a topic relevant to the student's anticipated PhD research. The student begins by selecting a set of five (5) core papers that are significant within the chosen research topic. Upon approval from the student's advisor and committee, the student then proceeds to develop the written document described below. [Note: If a student wishes to conduct a formal Systematic Literature Review, please contact the Graduate Director to discuss this option.]

Written Document

The written document should follow the outline provided in Appendix A. If a student chooses to deviate from this outline, the content described in Appendix A should still be present.

When assessing the written document, the committee will use the following **evaluation rubric**:
1. The document should provide the necessary background so that a non-expert in the area (e.g., a faculty member who works in a different area of research) can understand the written document and the presentation.
2. The document should provide a clear explanation of basic definitions and motivate the importance of the topic.
3. The document should identify standard techniques, measures and metrics.
4. The document must demonstrate a clear analysis of each chosen core paper that is more than a simple summary of the paper.
5. The document should not be an annotated bibliography of the literature, but should draw some conclusions or make observations that could not be made from the individual papers.
6. The document should identify the contributions of a paper and how these contributions helped to advance the field (e.g., countered or disproved previously held thoughts in the area).
7. The document should contain a synthesis of the ideas in the core papers that provides insight that goes beyond what is contained in any one of the papers.
8. The document must demonstrate the student's ability to search the literature for additional relevant papers, summarize important findings, understand a related set of research papers, and describe the current state-of-the-art in the topic.
9. In the document solved problems should be distinguished from unsolved problems, as well as limitations associated with any existing practices within the field.
10. The discussion of the core papers and the state-of-the-art should lead to insights into potential topics that could be the subject for future research.
11. The document should make an intellectual contribution by identifying gaps in knowledge and potential areas for new inquiry, based on a critical analysis of the core papers and related literature.
12. The document must be well-written, using clear and correct English.

The written document will be evaluated as follows:
1. The Graduate Director will run a plagiarism check on the submitted document.
2. The Qualifying Exam Screening Committee will screen each submitted paper to ensure it is complete and passes a minimum standard (relative to the evaluation rubric described above). Any paper that is incomplete or does not meet the standard will result in a failed qualifying exam.
3. Once the paper passes the screening, it will then be sent to the student's committee for review.
4. The student's committee will have two (2) weeks to review the document.
5. Each of the student's committee members will rate the document as either:

- *Fail* - The document is not up to our standards. The student fails the exam without a presentation.
- *Needs Modification* – The document needs minor modifications. The student will have one (1) week to update the document based on the committee's comments. The committee will review the modified document and assign it a Pass or Fail.
- *Pass* – The document meets the requirements and does not need modification.

<u>Oral Presentation</u>

Once a student's document receives a score of *Pass,* the student can proceed to the oral presentation phase. The student will present a 20-minute discussion of the work contained in the paper. The student's committee and other faculty will then have 20-minutes to ask the student detailed questions about the papers included in the review along with the student's synthesis of those papers. Appendix B provides the rubric the faculty will use to evaluate the student's presentation

The student's committee will then assign the student a score of either *Pass* or *Fail* based on the how well the student's presentation meets the requirements specified in Appendix B.

3. Process

To ensure quality and consistency across all qualifying exams, we will use the following process:
1. Papers are due to the Graduate Director on the 1st day of class
2. The Graduate Director will schedule all qualifying exams to occur together in the same session (or multiple sessions if there are a large number of exams)
3. Each student will be allocated 40 minutes (20 for the presentation and 20 for questions)
4. All faculty in attendance will remain after the last presentation to deliberate and make decisions on all exams
5. To pass, the student must receive a positive vote from 2/3 of the faculty who vote

Appendix A
Guidelines for the Written Document (Track 2) of the Computer Science PhD Qualifying Exam

The paper itself should be composed of the following five sections (**note that a student may choose to organize the paper differently, but this content should still be present):**

Introduction

This section should give an overview of the problem area, explain why the problem is important, describe the problem area in the context of the fundamental areas of Computer Science, and discuss the potential impact of various solutions.

Analysis of each Core Paper

In this section, each core paper should be discussed in turn with an emphasis on the findings of and the questions raised by the paper.

Synthesis of the Core Papers

This section should present a summary of the overall findings of the papers, how these findings relate to each other, what about these findings make the core papers so important to the problem area, and which aspects of the problem area have been settled by the core papers.

Overview of the Current State of the Art (additional references)

In this section, a discussion of the current state of the art in the problem area should be given and should include references to additional relevant papers. The section should also discuss the influence the core papers had on developments in the problem area.

Future directions

This section details some of the future directions for research in the problem area, including open problems and possible approaches to solving these problems. The section should be at least one page long and focus on areas of interest to the candidate.

Format

IEEE conference format 10-14 pages or 20-25 pages (11pt font, single spaced, 1 inch margins), with additional pages available for the bibliography.

Appendix B
Oral Presentation Rubric

During the oral presentation of the Qualifying Exam Document (Track 1 or 2), the student should demonstrate the ability to do the following. The faculty will use these items as a rubric to determine whether the student earns a *Pass* or a *Fail* on the oral portion of the Qualifying Exam.

1. The student should clearly communicate the key concepts from the research (Track 1) or core papers (Track 2).
2. For Track 2 papers, the student should clearly communicate a synthesis of the reviewed literature and explain the new insights gained through the synthesis.
3. For Track 2 papers, the student should clearly explain the state-of-the-art and suggest potential research directions that result from the review.
4. The student should demonstrate the ability to answer questions about the research (Track 1) or the core papers (Track 2).
5. The visual communication (i.e. the slides) should be clear.
6. The oral communication (i.e. the talk) should be clear.
7. The student should stay within the allotted presentation time.

Note that the question portion of the oral exam should focus primarily upon the content of the written document. While faculty may ask general questions about future directions, we do not expect the student to be able to answer specific questions that would be more appropriate for a dissertation proposal defense.