Guidelines for Research-Oriented Ph.D. Qualifying Exam

Overview

The main aim of the Ph.D. Qualifying Examination (QE) in CS is to evaluate the student's ability to do Ph.D. level research, including the ability to identify, understand and synthesize relevant papers, conduct independent research and communicate the findings in a scholarly manner.

The qualifying examination consists of a written portion and an oral portion. The oral portion must be at least 30 minutes long. The student can make at most two attempts for the qualifying exam. The first attempt must be made within one year after completing all the core courses or two years in the Ph.D. program, whichever comes earlier. The second attempt should be made in the next long semester. The Ph.D. committee will consider necessary exceptions on the timeline if the research supervisor and examination committee request a petition.

Course requirement

Each student is required to successfully complete three core courses with a GPA of at least 3.5 in the chosen track before taking the qualifying exam.

Written Portion of the Qualifying Exam

The student should expect to spend the equivalent of three credits of work preparing the qualifying examination paper**.** The CS department offers the qualifying exam in two formats: 1) systematic review or 2) research questions.

Format 1: Systematic Review

The student will choose the topic in consultation with the research supervisor and the examination committee. The student will submit a survey/synthesis paper on the topic. In general, the student should aim at surveying their research area and submitting a comprehensive survey article that would be suitable for publication. The examination committee will publish an initial reading list of at least 10 research papers one month before a survey submission date. The examination committee may consult with the research supervisor regarding the choice of papers.

The student is expected to choose papers on top of the initial reading list and produce a fairly analytical paper and not a superficial survey as we are looking for more depth than breadth in the topic. The paper should use the ACM computing surveys format and have at least 15 to 30 pages. The use of suitable examples and mathematics to justify the arguments is highly recommended. The write-up should include clear identification of the main research problems

in the field and the main suggested solutions (with their advantages and disadvantages). In the process, the student needs to also compare/contrast their survey with existing surveys in the field (if such surveys exist in a similar format) and avoid plagiarism. The paper should be understandable to all members of the committee, so it should introduce the necessary terminology.

The student has 30 to 60 days to write and submit the survey paper after the reading list of papers is available. After the paper is submitted, the oral exam needs to be held within 30 university business days. Please refer to the **Qualifying Exam Flowchart for Format 1**.

Format 2: Research Questions

The committee provides a list of research questions related to the student's chosen area of study, for which the student must provide written responses. These questions will be based upon texts from the chosen area of study, including but not limited to books, research articles, surveys, etc. The committee will publish the reading list at least one month before the exam. The list of research questions can take different forms. For example, open-ended research questions, or more concrete test-style questions. At the discretion of the committee, these questions may be given in a take-home manner, or in a timed in-person exam fashion. In either case, the committee has the discretion to decide whether the exam is open or closed book/notes. The committee will also specify the format of the expected written responses to the questions. Based on the evaluation of the written responses (particularly when questions are given as a test), the committee may choose to waive the oral exam requirement.

The timeline depends on the questions and should be decided by the examination committee. Please refer to the **Qualifying Exam Flowchart for Format 2**.

Oral Portion of the Exam

The aim of this session is to evaluate the student's research ability and depth of understanding in their research area. The committee will decide the format. Suggestions include a presentation to the general audience and a closed room session in which faculty will ask the student general questions related to the list of papers the student has read and presented in the written portion.

Outcome of the Exam

Following the examination, the committee will make one of the following recommendations: pass, conditional pass, and fail. In the case of conditional pass, the committee might require the student to rewrite a portion of the paper, clarify details regarding the paper and presentation or take a class. If the student fails the examination, they have one more attempt in the next long semester to retake the examination. In the case of a second attempt, no

conditional pass will be allowed. If the student fails the exam the second time, they will leave the program.

Faculty Involvement

The selection of an appropriate research area or problem is crucial to the success of the qualifying exam process. The student should find a research supervisor before taking the qualifying exam. The supervisor will choose the examination committee that must be approved by the Ph.D. committee. The committee should have at least three faculty members (the supervisor and two more faculty members from the computer science department). Faculty serving on the examination committee are expected to discuss potential research areas and to provide advice on relevant readings. The supervisor should obtain an agreement in advance from all committee members on the general research area to be studied and should arrange regular review sessions with the student to assess progress.

Student Involvement

The student is responsible for all work carried out in the qualifying examination process. Decisions on the area to research, the content of the review, style of presentation, etc., rest ultimately with the student but should be made with input from the examination committee. In preparation for researching and writing the qualifying exam, the student should consider the faculty expertise and support necessary to complete the exam and make adjustments to the makeup of the examination committee, if necessary.

Successful Completion and Signatures

When the qualifying exam has been passed, the appropriate form needs to be signed by each of the committee members. It is the student's responsibility to bring this form to the oral examination so that the present faculty can sign it, and deliver it to the CS advising staff.