UAB COLLEGE OF ARTS AND SCIENCES

Department of Computer Science

PhD Program Handbook for the Department of Computer Science

University of Alabama at Birmingham

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1. Ph.D. Program in Computer Science Overview

The Ph.D. program is a research-oriented doctorate program that provides training and research opportunities in computer science for individuals who have a career goal of:

- research and teaching at a university,
- employment in industry or a national research lab, and
- multidisciplinary research, such as biomedical computing.

The Ph.D. in Computer Science prepares students for a life-long career in scientific inquiry, as well as the ability to work in industries where rapidly evolving computer science drives the world economy. Students completing the Ph.D. go on to solve cyber security problems of national importance, found companies, create innovative AI, visualization and graphics solutions, teach the next generation, advance the use of modern IT infrastructure, and pursue inquiries at the frontiers of computer science understanding.

2. Program Basics and Timeline

The Ph.D. program typically requires at least four years of study and research beyond the bachelor's degree, with most students completing the program within five years.

The program consists of three phases (with some overlap between phases). The first is devoted primarily to formal coursework and preparation for the qualifying examination (Level 1). The second consists of coursework and research in preparation for the comprehensive examination, which requires presentation of a dissertation research proposal (Level 2). Successful completion of this phase leads to admission to candidacy. The final phase is the completion of the dissertation research and its defense (Level 3).

There is a residency requirement of at least one consecutive academic year of full-time study. Most students spend their entire Ph.D. program as full-time students. There is no foreign language requirement.

3. Degree Requirements

3.1 Overview

The Ph.D. program consists of three phases or levels as summarized below. Details are provided in Sections 3.2-3.4.

- **Level 1** entails preparing a written survey and critique that encompasses the breadth of a research area, along with an oral presentation of the work. The Level 1 committee, in conjunction with the student’s dissertation advisor, will assess the survey and the

presentation on a pass/fail basis. Additionally, students will begin their research and work on contributions for journals and conference proceedings.

- **Level 2** involves additional coursework, research, and writing to establish the foundation for a dissertation proposal. A graduate study committee, which is also the student's dissertation committee, is formed to guide this research, chaired by the dissertation advisor. This phase culminates in a public oral exam (the Candidacy Examination), focusing on the dissertation proposal.
- **Level 3** consists of research, paper and dissertation writing, and a public final defense. Formal coursework occurs in this third phase only when extraordinary opportunities appear for students to enhance their background in principal areas of interest. The graduate/dissertation committee will assess the dissertation and the final defense on a pass/fail basis.

Minimum Course Credit Requirements (https://catalog.uab.edu/graduate/completionofadegree/#doctoraldegreerequirementstext):

The Graduate School has minimum course credit requirements for students in doctoral programs. If entering with a **baccalaureate degree**, a student is required to earn a minimum of 72 credit hours comprised of the following:

1. Completion of 48 semester hours of coursework prior to candidacy:
   - A minimum of 22 hours of core coursework directly related to the discipline
   - Must include GRD 717 (Principles of Scientific Integrity)
   - No more than 16 hours of non-dissertation research (i.e. 798) can be counted
   - No more than 10 hours of labs, seminars, or GRD and CIRTL courses can be counted

2. Completion of 24 semester hours of research-based work over a minimum of two semesters in candidacy which can be designated as either:
   - A minimum of 24 semester hours in 799 dissertation research OR
   - A minimum of 12 semester hours in 799 dissertation research AND, either during or before candidacy, 12 semester hours in other appropriate research-based coursework which has been approved by the graduate student's program

If entering with a previously earned **master's degree** appropriate to the doctoral degree field, a student is required to earn a minimum of 51 credit hours comprised of the following:

1. Completion of 27 semester hours of coursework prior to candidacy:
   - A minimum of 15 hours of core coursework directly related to the discipline
   - Must include GRD 717 (Principles of Scientific Integrity)
   - No more than 6 hours of non-dissertation research (i.e. 798) can be counted
   - No more than 6 hours of labs, seminars, or GRD and CIRTL courses can be counted

2. Completion of 24 semester hours of research-based work over a minimum of two semesters in candidacy which can be designated as either:
   - A minimum of 24 semester hours in 799 dissertation research OR

- A minimum of 12 semester hours in 799 dissertation research AND, either during or before candidacy, 12 semester hours in other appropriate research-based coursework which has been approved by the graduate student's program

Up to 12 credits of course work that have not been applied toward meeting the requirements for an earned degree taken at UAB or other institutions may be used to satisfy these course credit requirements upon approval of the CS doctoral program director and the Graduate School Dean. Courses which have been previously applied toward meeting the requirements of another degree are not eligible to satisfy minimum course credit requirements.

Residency Requirement

There is a residency requirement of at least one consecutive academic year of full-time study.

Deadlines

Continued progress through the Ph.D. program is important. As the UAB Graduate School has an upper bound limit of seven years for the completion of a Ph.D. degree, Ph.D. students in the Department of Computer Science are required to adhere to the deadlines below for the three levels of our program:

- Completion of the Level 1 exam: within 2 years of entrance into the Ph.D. program. If a student fails the first time, he will be given one more chance but must pass Level 1 no later than the end of his third year.
- Completion of the Level 2 exam: within 2.5 years of the Level 1 exam
- Completion of the Level 3 exam: by the end of the seventh academic year since entrance into the Ph.D. program
- Extension of these deadlines requires a petition by the student and the advisor to the graduate review committee.

Important Notes

- Students must register for a minimum of 1 credit hour per semester in order to maintain active status.
- All international students are encouraged to improve scientific communication skills by passing GRD 700, 701, 702 and 703: Scientific Communication I – IV.
- All domestic students are encouraged to take GRD 701: Presentation and Discussion Skills and GRD 712: Research Writing and Style.
- All teaching assistants are encouraged to take GRD 715: Preparing TAs to Be Effective Teachers.
- All Ph.D. students are required to complete the RCR (Responsible Conduct of Research) training (https://www.uab.edu/research/home/uab-rcr-training "For Ph.D. Students") **prior to** admission to candidacy. RCR training must occur at least once every four years.
- If the research involves human or animal subjects, approval from IRB or IACUC must be documented before admission to candidacy can be approved and IRB/IACUC approvals must be kept current until the research is completed. For ways in which students can be

added to a protocol, refer to the Tip Sheet for Students Involved in Research Involving Human or Animal Subjects. The IACUC form must display the appropriate research protocol number.

3.2 Level 1 Exam

The goal of Level 1 is to provide a broad foundation in the field on which the student can later build a research project. During this phase the student will take a series of courses in a breadth of computer science topics, begin research in seminars, and prepare contributions to papers in journals and conference proceedings. The courses the student take will culminate with the Level 1 Qualifying Exam, a research survey presentation.

Coursework
The Ph.D. courses, organized into three areas, are listed below (in no particular order). Students are required to select **at least one course from each** of the three areas before taking the Level 1 exam. Students are also encouraged to complete the courses and training required by RCR during this phase. CS 796 (Directed Readings and Research) is also appropriate during this phase.

Theory
- CS 745: Modern Cryptography
- CS 752: Advanced Algorithms and Applications
- CS 780: Matrix Algorithms for Data Science
- CS 785: Foundations of Data Science

Systems
- CS 710: Database Systems
- CS 729: GPU Programming
- CS 732: Parallel Computing
- CS 733: Cloud Computing
- CS 743: Cloud Security

Applications
- CS 746: Blockchain and Cryptocurrency
- CS 760: Artificial Intelligence
- CS 762: Natural Language Processing
- CS 763: Data Mining
- CS 765: Deep Learning
- CS 767: Machine Learning
- CS 770: Computer Graphics
- CS 773: Computer Vision
- CS 775: Data Visualization

Exam Process
For the Level 1 Qualifying Exam a student will develop a written survey and critique that covers the breadth of a research area and give an oral presentation of his work. The Level 1 Committee consists of at least three tenured or tenure track faculty in computer science, which will perform the examination on behalf of the graduate faculty.

The exam process consists of:

1. Proposing a list of research articles. The student will propose a list of research articles to be surveyed, covering the breadth of a research area. The list of articles, together with an abstract, must be reviewed and approved by the Level 1 committee at least one semester before the presentation of the work.
2. Writing a survey article. The student will prepare an article surveying and critiquing the research articles from the approved list. While the literature search should be motivated by a concrete problem and the original proposal should identify some of the most influential papers in the targeted area, the scope of the survey should be specifically as broad as possible. It should be of sufficient quality to be submitted to a journal appropriate to the research area. The article must be submitted to the Level 1 committee for approval at least two weeks before presentation of the work.
3. Presenting the work. The student will prepare a 25-minute presentation of his findings. The presentation will be open to the public (typically scheduled in a CS seminar slot) and will be followed by questions from the committee.

The Level 1 Examination Committee determines whether a student passes or fails the qualifying exam. It will evaluate the student based on the student's comprehension of the fundamental facts and principles that apply within the research area, and the student's ability to think incisively and critically about the theoretical and practical aspects of the field.

Timeline
A student is expected to pass this qualifying exam in two years. If a student fails the first time, he will be given one more chance but must pass it no later than the end of his third year.

3.3 Level 2 Exam

The goal of Level 2 is the development of a dissertation proposal acceptable to a doctoral dissertation committee. During this phase a student will work under the close direction of a research advisor and participate in research seminars. In addition to making presentations at departmental research seminars, students are expected to make a presentation of preliminary research results at regional or national research conferences on and off campus.

During this phase of the program, students are required to:

- demonstrate the ability to critically evaluate published research,
- confirm the student's understanding of the important issues in the chosen area, and
- propose an original contribution that will advance the state of knowledge in that area.

Multi-disciplinary research is encouraged so that the research contributions will not only impact the field of computer science but other disciplines and research groups on campus as well.

Coursework
Advanced courses and seminars in the student's area of research are assigned by the student's advisor. Directed research hours (CS 796) are usually appropriate. Students must complete all required RCR courses and training during this phase, prior to admission to candidacy.

Exam Process
The culmination of Level 2 is the development and a (public) presentation of a dissertation proposal, which is evaluated by the student's doctoral dissertation committee (graduate study committee) in the Level 2 Exam. The proposal must be sent to the committee for review at least two weeks before presentation of the work. The student will prepare a 40-minute presentation of his proposed dissertation research. The presentation will be open to the public (typically scheduled in a CS seminar slot) and will be followed by questions from the committee. The committee will evaluate the student based on the novelty and feasibility of the proposed research methods, data availability to support the research, and soundness of the evaluation and analysis plan. The committee votes on the proposal, which may result in the proposal being approved as submitted, approved with revisions, or failed. If the committee approves the proposal, the student will finalize it based on their feedback and submit a copy of the final proposal in PDF format to both the committee and the Doctoral Program Director before admission to candidacy. If the student fails, he may be given a second chance by the committee to make modifications to the proposal and to defend it again.

All Institutional Review Board (IRB) approvals must be obtained in advance of the Level 2 exam and of the work that is being done. Please visit the UAB IRB website (https://www.uab.edu/research/home/irap-training/irb) for details.

Timeline
The Level 2 Exam must be successfully passed within 2.5 years of the completion of the Level 1 Qualifying Exam. Candidacy deadlines can be found at: https://www.uab.edu/graduate/students/current-students/theses-dissertations/candidacy-deadlines

Doctoral Dissertation Committee (Graduate Study Committee)
During Level 2, a Ph.D. student will work with his dissertation advisor to form a doctoral dissertation committee (graduate study committee) consisting of at least five full-time faculty members holding doctoral degrees, each of whom should be able to contribute some relevant insight and expertise to guide the student and must have credential equal to or exceeding that of the degree the student is pursuing. In addition, at least one committee member (preferably two) should be from outside the student's specialization/research-area, and at least one committee member should be from outside the Department of Computer Science. In all cases, at least three of the committee must be comprised of UAB CS Graduate Faculty members. At UAB, Graduate Faculty status is required for faculty members who serve on graduate students' thesis or dissertation committees. A candidate member who is not already on the UAB Graduate Faculty, especially if from outside UAB, should request for appointment to the Graduate Faculty prior to being included in the dissertation committee (https://www.uab.edu/graduate/faculty-staff/graduate-faculty/graduate-faculty-listing).

3.4 Level 3 Exam

During the Level 3 phase a student will carry out the research proposed in the dissertation proposal that was approved at the end of the Level 2 phase. The student's research will be directed by his research advisor and the same doctoral dissertation committee formed during Level 2. During this phase the student is also expected to publish research results as they are developed in the proceedings of major conferences and journals.

Coursework
During this phase, the student will typically only register for seminars and CS 799: Dissertation Research.

Exam Process
The dissertation must be sent to the committee for review at least two weeks before presentation of the work. This final phase culminates in the Level 3 Exam — a public final defense of the student's dissertation research (40-45 minutes), followed by questions from the committee. The committee will evaluate the student based on the dissertation's originality and contribution to the field, the thoroughness in evaluating the research methods, and the quality of the dissertation's writing. The committee votes on the dissertation, which may result in the dissertation being approved as submitted, approved with revisions, or failed. If the committee approves the dissertation, the student will finalize it based on their feedback and submit a copy of the final dissertation in PDF format to both the university and the Doctoral Program Director before completing the Ph.D. program. If the student fails, he may be given a second chance by the committee to make modifications to the dissertation and to defend it again.

Timeline
The Level 3 exam must be completed before the end of the student's seventh year in the Ph.D. program. This is a Graduate School requirement. The degree application and the dissertation defense deadlines can be found at https://www.uab.edu/graduate/students/current-students/completing-your-degree/earning-your-degree#deadlines

Publication Requirement
Students are expected to first-author an accepted high-quality journal or conference paper before graduation. Proof of acceptance must be provided to the Doctoral Program Director before completion of the degree, either in the form of a copy of the letter of acceptance from the editor or a preprint/reprint of the article.

4. Satisfactory Academic Progress, Academic Integrity Code, and Permissible Use of AI

4.1 Satisfactory Academic Progress

Maintenance of Good Academic Standing
(https://catalog.uab.edu/graduate/completionofadegree/#doctoraldegreerequirementstext)

The Graduate School requires that students be in good academic standing in order to graduate. All Ph.D. students must have at least a 3.0 graduate-level GPA, as well as a 3.0 in the CS program in order to graduate. Good academic standing is also required for Graduate Teaching and Graduate Research assistantships (GTA and GRA) in the CS Department.

Annual Evaluation
Students are expected to maintain satisfactory academic progress throughout their degree program. The Doctoral Program Director evaluates this progress based on coursework, research publications, and successful completion of exams, in consultation with the student's dissertation advisor. The Doctoral Program Director assigns a grade as: S = Satisfactory, D = Developing, and US = Unsatisfactory.

If a student receives an Unsatisfactory grade twice consecutively, they may be placed on Academic Probation. This status aims to help the student return to satisfactory progress in meeting degree requirements. Students on probation will receive a written statement outlining the timeline for meeting these requirements to regain good standing, as well as the consequences of failing to do so, which may include administrative withdrawal.

4.2 Academic Integrity Code (AIC)

The following policies are enforced in alignment with the UAB Academic Integrity Code: https://www.uab.edu/one-stop/policies/academic-integrity-code . UAB requires that both faculty and students uphold high standards of academic honesty and integrity. Everyone who witnesses academic misconduct has a duty to report it. Violations of the Academic Integrity Code transfer across courses. Records of past violations are maintained by the university's student conduct system and by the Dean's office. Any Ph.D. student found to have committed an AIC violation will no longer be eligible for any assistantships sponsored by the CS department, including GTA and GRA positions.

1. Course work

The Department enforces a three-strike policy for violations of the UAB Academic Integrity Code by graduate students in their course work:

> 1) First violation: If it is the first violation by the student in any UAB course, the minimum penalty the student receives is a 0 grade for the particular assignment, homework, exam, or project.
> 2) Second violation: If it is the second violation by the student in any UAB course, the minimum penalty the student receives is an F grade for the course in which the second violation occurred.
> 3) Third violation: If it is the third violation by the student in any UAB course, the department will recommend academic probation, suspension or expulsion of the student from the major and from UAB, in addition to an F grade for the course.

2. Research

The Department enforces a one-strike policy for violations of the UAB Academic Integrity Code by students on scholarly research which includes preparing manuscripts, performing research, taking comprehensive examinations, and any other activity related to research and completion of degree requirements.

1) First violation on research: expulsion of the student from the graduate program and from UAB

3. Retake allowed for required courses only

The Department may allow a student who earns an F for the violation of AIC to retake the course only if the course is required by the student's program of studies, subject to the maximum number of allowed attempts. Per UAB Grade Forgiveness Policy, any course grade of F for academic misconduct supersedes any other grade or notation for that class and therefore is not eligible for replacement under the Forgiveness Policy.

4.3 Permissible Use of AI

Any AI use must be disclosed by the PhD student. Dissertation committees should guide students on the risks and benefits of using AI, including potential impacts on future publishing and career success. Students are responsible for understanding and adhering to UAB and program-specific guidelines on permissible AI use.

Permissible Use of AI in Writing

AI tools should not be used to originate content of the proposal or dissertation. Instead, AI tools should be limited to the help the UAB writing center would offer, such as editing existing text for grammar and spelling. For example, a valid prompt would be 'correct the grammar and spelling of this document'.

AI use in any proposal/report or dissertation must be disclosed by the graduate student, and approved beforehand by the dissertation committee and PhD program director. The disclosure will include the various ways AI tools have been used in conducting the research and/or writing the dissertation or proposal/report (e.g., Level 1 survey).

Permissible Use of AI in Coding

AI use in developing code that is used in the dissertation or proposal must be disclosed by the PhD student, and approved beforehand by the dissertation committee and PhD program director. An example of valid use of AI in coding is for debugging. For example, a valid prompt would be 'debug this code'. If AI is used in coding, all code that has components generated by AI must be robustly tested, and evidence of this testing must be provided to the dissertation committee.