THE COMPUTER SCIENCE PhD PROGRAM AT CARNEGIE MELLON UNIVERSITY

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approved by
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Contents

1 Welcome

The Computer Science Department is known worldwide for our broad view of computer science. We welcome you to our department.

We look forward to the contributions of each of our admitted student's building on our strong foundations in research.

While this handbook is specific to your academic experience in our department, it is just one element of the Graduate Student Handbook Suite. There are several other resources within the suite that you should consult when needed:

- This Program Handbook
- University-Wide Graduate Student Handbook (see the Office of Graduate Postdoctoral & Affairs Resources - `https://www.cmu.edu/graduate/resources/index.html`)
- *The Word* Student Handbook - `https://www.cmu.edu/student-affairs/theword/`

The information contained in this doctoral program handbook focuses on the resources and locations available at the Carnegie Mellon Pittsburgh Campus.

2 Introduction

The Mission and Values of the Computer Science Department are provided on our website: `https://csd.cmu.edu/about`. Additional information to guide you through completion of your degree will also be linked to department, school, or university web pages, when appropriate.

Carnegie Mellon's Computer Science PhD program aims to produce well-educated researchers, teachers, and future leaders in Computer Science. The PhD degree is a certification by the faculty that the student has a broad education in Computer Science and has performed original research in a topic at the forefront of the field.

This document is an informal description of the Computer Science PhD program; herein "we" refers to all the faculty and staff involved in the PhD program.

We are committed to the principle that students may achieve competence through a variety of methods, including courses, seminars, projects, and independent study. Our program is also unique in that we encourage and expect students to engage in research from their first day in the department. To help students fulfill these requirements, we provide these educational opportunities:

- An active research environment
- The *Introductory Course For CS Doctoral Students*, intended to give an overview of the research interests of the faculty and to familiarize new students with the people and facilities of the department
- A large number of *graduate courses*: regularly offered area courses in algorithms and complexity, artificial intelligence, computer systems, programming languages, and software systems; advanced graduate area courses; special topics courses; practicum courses; and reading seminars—together covering a broad range of areas in Computer Science

Students are encouraged to shape an educational program to suit their needs. Financial support and/or permission to continue in the PhD program depends on satisfactory progress each semester. (see Section 9: Evaluation of Student's Progress)

2.1 Degrees Offered

- PhD in Computer Science
- Interdisciplinary Degrees (see Appendices)
  - PhD in Computer Science with Certificate in Neural Basis of Cognition (CNBC)
  - PhD in Algorithms, Combinatorics and Optimization (ACO)
  - PhD in Pure and Applied Logic (PAL)
  - PhD Dual Degree Portugal
  - Self-defined Interdisciplinary PhD Programs

2.2 Doctoral Program Personnel

- Department Head: Srinivasan Seshan
- Director of the Doctoral Program: Karl Crary
- Doctoral Programs Manager: Matthew Stewart
- TA Coordinator: Charlie Garrod
- Student Ombudspersons: Dorian Chan and Aditi Kabra

2.2.1 About Student Ombudspersons

If a student feels that meeting with their advisor or other program personnel is not appropriate for addressing their problem, they can turn to the PhD program's ombudspersons either individually or as a pair.

An ombudsperson's role and responsibilities are:

- To meet with students and listen to their problems
- To give advice, perhaps suggesting someone else to talk to or suggesting the next step to take
- To act as an informal resource – in particular, students may discuss concerns or issues with ombudspersons without committing to any formal university process
- To keep conversations confidential

Ombudspersons are expected to be friendly, approachable, mature, good listeners, in their third year or higher (i.e., should "know the ropes", so to speak), and reasonable (of course!).

An ombudsperson is different from student Doctoral Review Committee (DRC) members since the DRC is an official committee. If a student has a personal problem (e.g., with their advisor), it may not be appropriate to talk to a student DRC representative about it (unless as just a friend).

2.3 Department Personnel

- Key Department Contacts - `https://csd.cmu.edu/key-contacts`
- Department Online Directory - `https://csd.cmu.edu/people/all`

2.4 Department Resources

Department resources, including links to school, university, and student-specific resources are maintained on the Computer Science Department website.

- About the Department - `https://csd.cmu.edu/about`
- General Student Resources - `https://csd.cmu.edu/academics/current-student-resources`
- Doctoral Student Resources - `https://csd.cmu.edu/academics/doctoral-resources`

2.5 School of Computer Science (SCS) Personnel

- SCS Key Contacts - `https://www.cs.cmu.edu/about-scs/key-contacts`
- SCS Online Directory - `https://www.cs.cmu.edu/directory/`

2.6 Residency Requirement

The Computer Science Department doctoral degree requires in-person attendance on the Pittsburgh campus. The department does not offer a remote doctoral degree program.

U.S. government regulations require F-1 and J-1 international students to be enrolled in an in-person degree program, with in-person expectation for coursework. Even though this immigration requirement is specifically for international students, residency requirements in a degree program must be consistent for both international and domestic students.

2.7 Academic Calendar

The Academic Calendar can be found at: `https://www.cmu.edu/hub/calendar/`

Students should be aware of the full academic schedule to understand when they should be available in Pittsburgh during the active semester.

3 Overview of the Program

Carnegie Mellon's PhD in Computer Science is, above all, a research degree. When the faculty award a PhD, they certify that the student has a broad foundation in Computer Science, has advanced the field by performing significant original research, and has reported that work in a scholarly fashion.

Before embarking on original research, we expect students to acquire a body of technical knowledge that includes a familiarity with the breadth of Computer Science as well as a deep understanding of a specialized area.

- The Introductory Course for CS Doctoral Students is the first step in this process, exposing the student to the many ongoing research activities and projects in the Department and School.
- Next, through structured coursework, the student gains a broad understanding of the fundamental research issues in major areas of Computer Science, and has the opportunity to gain a deep understanding in the student's area of specialization.
- Finally, the thesis work itself guarantees that the student understands the area well enough to advance the state of knowledge in the field.

Since the program is flexible, the careers of some students will depart from the following script at one or more points. The progress of a typical student through the program is roughly:

- We do not expect admitted students to already have an advisor when applying to the degree program. In early October after arrival on campus and attending the Introductory Course, each student is matched with a suitable advisor, who helps the student pursue directed research in an area of mutual interest. If the student's research interests change, they are able change advisors, subject to approval.
- During the first two years of the program, the student begins to gain foundational knowledge that will allow them to go on and become an expert researcher in Computer Science, primarily through the following two ways:
  - By mastering a body of graduate material, achieved by passing 72 university units worth of graduate courses. Seventy-two units is equivalent to six full-time (12-unit) courses. Each 12-unit course should require no more than a quarter of the student's time during any one semester.
  - By learning how to organize and begin to carry out original research, achieved by participating in directed research. What constitutes directed research is decided individually between the student and their advisor.

- Twice, usually during the first three or four years, the student serves as a teaching assistant (TA). While teaching or taking courses, we expect students to spend at least half their time doing directed research.
- Our environment provides myriad opportunities for students to hone writing and speaking abilities and to maintain their programming skills. We expect students to satisfy their communications skills requirements within their first three years.
- As the student's thesis research direction becomes clear, the student writes a thesis proposal and assembles a thesis committee with help from the student's advisor. The student then completes and defends the thesis, and graduates.

3.1 Summary of Primary Requirements to Complete the Degree

Curricular requirements are detailed in subsequent sections of this document.

We require that each student:

- Participate in directed research, and complete **at least 24 units** of research at CMU or at an internship **per semester**.
- **Pass 72 university units** of *graduate courses*, with certain distribution requirements outlined in Course Requirements.
- Successfully serve as a teaching assistant (TA) at least twice.
- Successfully complete the oral and written communication skills requirement.
- Write, orally defend, and turn in a final approved thesis document to qualify for certification of a doctoral degree in Computer Science.

The PhD program provides each student with a periodic evaluation of their progress (see Section 9: Evaluation of Student's Progress). Continuation in the PhD program is contingent on making satisfactory progress.

3.2 Expected Timeline

The following table indicates estimates for approximately when students should have finished each requirement. Overall, we expect students to complete the program within 5–6 years, depending on background, research area, and dissertation research. Official Time to Degree is detailed under the university policy for Doctoral Student Status:
`https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html`.

These figures are meant to be suggestive, not prescriptive for the required curricular components of the program. We present them so that all faculty and students can develop a shared image of the expectations of the program.

COMPONENT	INTENSITY	COMPLETION TIME
Fall Introductory Course (IC)	first fall	2 weeks (+Login Ball)
Spring Introductory Course (IC)	first spring	6 weeks (3 hrs/wk)
Breadth Courses	each 1/4 time	by end of year 2
Elective Courses	each 1/4 time	by end of year 2
Writing Skills	variable	before Proposal, by end of year 3
Speaking Skills	variable	before Proposal, by end of year 4
Teaching	1/2 time	by end of year 4
Thesis Proposal	1/2 time	by end of year 4
Thesis (Research & Writing)	full time	by end of year 5 (or 6)

Students are expected to be working on research every semester with intensity at least 1/2 time throughout their time at CMU. In addition, it is expected that students volunteer within the department and school throughout their time at CMU.

3.3 New Policies & "Grandfather" Policy

New policies may be added at any time that were either required by the university or because they were deemed necessary or appropriate for the overall effectiveness and governance of the doctoral degree program.

The major goal of arranging for "grandfathering" of requirements is that students who have already dispensed with some of the requirements in place when they entered the program should be in at least as good shape after the implementation of new policy.

Students are expected to meet the curricular requirements in force when they entered the program and should refer to the corresponding handbook. Handbooks can cover multiple incoming cohort years if no adjustments were made to the handbook in a given year.

3.4 The Doctoral Review Committee

The Doctoral Review Committee (DRC) is the official advisory committee to the Director of the PhD program and the Department Head. While the structure and contents of the PhD program are still discussed by the faculty and students as a whole, the DRC makes sure that the program's design is implemented and rules abided by properly. In this sense the DRC is also an oversight committee.

The DRC monitors all courses. It regularly asks students to evaluate courses and their instructors. It keeps statistics and data about all past and present CS PhD students, discusses issues and problems that are specific to CS PhD students, and makes minor policy decisions that do not require the attention of all the faculty and students.

The DRC is also something like a senate since the student representatives speak for all the students and the faculty representatives speak for all the faculty.

`https://www.cs.cmu.edu/afs/cs/academic/committee/drc/drc.html`

Authentication is required to access the DRC web page.

3.5 Introductory Course for CS Doctoral Students

The Introductory Course for CS Doctoral Students is intended to provide a common starting point for the entering PhD students.

It is organized as a short, intensive two-week session that starts the week before the beginning of the fall semester and a six week course at the beginning of the spring semester with added lectures that may occur throughout the fall or spring semester.

3.5.1 Fall Introductory Course (IC 15-996 Section A)

- To orient students new to the Department, through introductions to people (faculty, staff, other students) and through social activities.
- To introduce students to various research and educational topics of current interest to the faculty.
- To provide the opportunity to find a suitable research advisor.
- To familiarize students with the computing facilities and environment at Carnegie Mellon.

These goals are fulfilled through a program of lectures, poster sessions, demonstrations, and tours of laboratories. Enough open hours are scheduled to allow students to meet with faculty individually to learn more about their research.

3.5.2 Spring Introductory Course (IC 15-996 Section B)

This is a required course for first-year CSD PhD students, occurring during the first six weeks of the spring semester.

The goal of this course is to prepare students to engage in the CS community and better understand community standards and expectations. This is a primarily discussion-based course, it is PhD-student-taught, and it requires approximately 3 hours/week, or 18 hours total, of student's time.

3.6 Community Spirit

Our sense of community is well-known as a distinguishing aspect of doing computer science at Carnegie Mellon. It is one of the reasons many students choose to come here. The Computer Science Department is proud of our strong community spirit, which we foster through close working relationships between students and advisors, among faculty, and students. Many working relationships turn into friendships for life.

People volunteer their time, energy, intellect, talent, and other skills to do many of the things that keep our environment running smoothly. These efforts include organizing seminars, maintaining software packages, serving on departmental committees, grading for a graduate course, planning and running social activities, giving tours, and hosting visitors.

4 Advising

The Doctoral Programs Manager acts as the student's general academic and university-life advisor.

Except during their first month in the program, each student has a faculty advisor charged with guiding their education and monitoring their progress through the program. This personal student-advisor relationship ensures that every student receives the necessary faculty mentoring.

4.1 Role of the Doctoral Programs Manager

The Doctoral Programs Manager is the student's primary contact during the duration of the student's pursuit of their degree. They are responsible for the overall management of doctoral program processes. The manager maintains the student records in DSR and enforces program policies.

4.2 Role of the Research Advisor

Throughout the program, the faculty advisor is responsible for guiding the student's research and education.

Early in the program, the advisor guides the student along some research initiative and helps with strategic planning for courses, internships, and other educational activities. Later, the advisor helps to focus the student's research interests towards a thesis topic.

Toward the end of the program, the advisor chairs the student's thesis committee and helps to select the other members of the committee. The advisor also provides the student with career advice.

4.3 How are Research Advisor–Advisee Matches Made?

After approximately a month at CMU, entering students are matched with faculty advisors by the "handshake" process. Students list faculty preferences and faculty list student preferences; a committee then matches each student with a faculty member, taking into consideration each of their preferences and other factors.

Students base their faculty preferences on research interests. They can learn about an individual faculty member's research interests by attending the faculty research presentations during the Introductory Course (IC), by referring to the Department's Faculty Research Guide `https://csd.cmu.edu/research/faculty-research-guide`, and by meeting individually with different faculty members during their first month here.

There is flexibility in the kind of relationship a student has with their advisor. Some students work more closely with their advisors than any other faculty member, and some students work more closely with another faculty member on a particular research project. A few students have two co-advisors.

There are many faculty both within SCS and outside SCS who have advising privileges and can either function as sole advisors or co-advisors. Please see https://csd.cmu.edu/academic/doctoral-resources/thesis-proposal-process for a current list of faculty with advising privileges. Suggested additions to this list should be made by contacting the Department Head. A CSD faculty sponsor is required for anyone wishing to be added to the list.

4.3.1 Changing Advisors

While it must be approved by the Director of the Doctoral Program, a request to switch advisors is routine and almost always granted to a student in good standing, especially during the early part of the degree program. It often results from an evolution of the student's research interests.

5 Directed Research

Students and advisors may have different ideas of what directed research means and how progress can be demonstrated. It is the responsibility of both the student and their advisor to formulate for each semester a set of reasonable goals, plans, and criteria for success in conducting directed research.

Note that neither research nor practicum units count towards the 72 unit coursework requirement.

Advisors are individually responsible for adequately supervising this portion of the PhD program.

5.1 Individual Development Plan (IDP)

The Individual Development Plans (IDPs) are meant to promote professional and personal growth by formally documenting goals and facilitating dialogue, collaboration, and accountability between advisors and advisees. Carnegie Mellon has developed a set of templates that can be used by doctoral students and their advisors to create an Individual Development Plan. You can find the templates on the graduate education website at: https://www.cmu.edu/graduate/resources/index.html

Refer to the Doctoral Student Review (DSR) for the PhD program in Computer Science documentation goals and life balance for doctoral students.

5.2 Directed Research Expectations All Students Should Meet

- During a student's first two years, they should be doing directed research at least half-time (24 credits, per semester); once all coursework is completed, and before doing thesis research, directed research should be full-time (except when teaching).

- We typically expect students to also use the summer semester to make progress on their PhD research. Students can either work on their research at CMU, as part of an internship at a company, or at another research center to make this progress.
- There are official course numbers associated with both directed research at CMU and internships. Active students (excludes, LOA and ABS status; Dual Degree Portugal students; and students on vacation semester) must enroll in these courses each semester and will receive a pass/fail grade.
- Active students are **required to complete 24-48 units** of Graduate Reading and Research (GRR) each Fall, Spring, and Summer semester.
- During any semester, with the program's approval, students may substitute up to 36 units of Practicum in Computer Science for these research units.
- Students typically substitute practicum units for research units 3-4 times during their PhD degree program.
- Substituting practicum units more than 4 times requires approval from the Doctoral Programs Director.
- International students *must consult with the Office of International Education* (OIE) for eligibility before seeking an internship/practicum or signing an offer contract.
- All research must be conducted in compliance with policies and regulations set forth by Carnegie Mellon University. Information is available on the Office of Research Integrity & Compliance web page - `http://www.cmu.edu/research-compliance/index.html`

6 Course Requirements

Every student must complete **72 university units** (typically 6 classes) worth of graduate courses. We have defined *five breadth subject areas* (listed below) in computer science. To ensure that students acquire sufficient exposure to basic knowledge concepts, we require that students take at least one class from four of these five subject areas. Students can use the remaining two courses (24 elective units) to gain more depth in the student's particular area of research.

6.1 Core Curriculum - Five Breadth Subject Areas

Each student must pass one *approved* course from four of these areas:

- Algorithms and Complexity
- Artificial Intelligence
- Computer Systems
- Programming Languages
- Software Systems

Only certain classes in each area fulfill this requirement. However, each area provides multiple approved courses. The approved breadth courses are 12 university units each. The list of currently approved classes in each area is available on the Doctoral Breadth Course webpage `https://csd.cmu.edu/academics/doctoral-resources/doctoral-breadth-courses`. Note that there may be classes not on this list that can satisfy the breadth requirement for an area. You should contact the listed Area Advocate to determine if there are alternative classes for an area in a particular semester.

We attempt to schedule these courses so that students can satisfy their breadth requirement in a one-year period; however, since we expect students to be engaged in directed research at least half-time, a typical student should plan to satisfy their breadth requirement over a two-year period.

6.1.1 Area Advocates

Issues regarding course requirements and substituting classes should be directed to the appropriate Breadth Area Advocate. Current Area Advocates are listed on the Doctoral Breadth Courses web page.

6.1.2 Breadth Course Substitution

Substitution is when a student takes a non-breadth PhD-level course instead of a breadth course. For example, if a student has taken courses in compilers and computer architecture already, instead of taking one of our Computer Systems breadth courses, they might wish to use a different computer systems area course, with approval from the area advocate, to satisfy the Computer Systems area requirement. In essence, substitution gives the student another free elective, where the choice is somewhat limited to courses within the area.

6.2 Elective Units

Students must also take 24 university units worth of elective courses, at least 12 of which are from graduate courses offered by the School of Computer Science (not necessarily the Computer Science Department); the other 12 may be from graduate courses offered by the rest of the University. **These graduate courses must be PhD-level, which normally means *level 700 or above*.**

Students may use electives to gain additional depth of knowledge in the student's research area, e.g., to complement their directed research or to prepare them for choosing a thesis topic. Students may also use electives to gain additional breadth of knowledge in an area outside of the student's research area.

We strongly advise students to choose electives in consultation with their advisor. The student and their advisor are both responsible for making sure that through these 24 elective units, the student gains new knowledge, perhaps to fill gaps or to prepare for thesis research. They are also responsible for balancing how a student fulfills these units (through courses, projects, or teaching), taking into consideration the student's career goals, strengths and weaknesses in research, teaching, communication skills, and programming ability. Students are free to take more than the required number of elective units.

Many students take courses from Electrical and Computer Engineering, in the College of Engineering, which maintains its own Breadth Courses list - `https://www.ece.cmu.edu/academics/phd-ece/breadth-areas.html`. Only ECE (18-xxx) courses identified as PhD level from their list qualify to fulfill the CSD elective requirement.

6.3 Course Registration

Course registration affects your financial support and your eligibility for student health insurance. CSD Doctoral Students are expected to be registered full-time each semester while actively pursuing their degree. Please refer to the Registrar provided course registration guidance `https://www.cmu.edu/hub/registrar/registration/index.html`.

The CSD PhD program is a Pass/No Pass program. Please refer to the Grade Options webpage `https://www.cmu.edu/hub/registrar/grade-options/index.html` for details.

6.3.1 First & Second Semester in the Program

Incoming doctoral students are required to register for:

- 6 units of Introductory Course (IC, 15-996 A) in fall;
- 6 units of Introductory Course (IC, 15-996 B) in the spring of their first year.

This is in addition to Breadth or elective courses (ideally at least one 12-unit course) and Graduate Reading & Research (GRR, 15-997, minimum of 24 units) the first two semesters on campus. First-year doctoral students will typically carry a course load of 54 units each semester their first year.

6.3.2 Fall & Spring Registration

- Continuing students should be registered for a minimum of 48 units.
- Students are required to **register themselves** and should be aware of semester registration periods (Spring for Fall, Fall for Spring) and refer to the CSD the Doctoral Breadth Courses web page for course information: `https://csd.cmu.edu/academics/doctoral-resources/doctoral-breadth-courses`

6.3.3 Summer Registration

- Students should either be registered for 36 units of 15-997 (research) or 15-998 (internship) for the summer term.
- The Doctoral Programs Manager will register students for summer term **once a student fills out the "Summer Plans" form sent out early in the spring semester to determine if a student will be on campus or undertaking a summer internship** (Practicum in Computer Science) so they can be registered for the appropriate course.

6.3.4 Graduate Reading & Research

All students should be registered for:

- A minimum of 24 units of GRR, indicating a student will be spending at least half of their time on research each semester, if taking courses.
- 48 units of GRR, if not taking any courses in fall or spring.
- 36 units of GRR in summer if not undertaking an internship off-campus.

Students are permitted to overload, *minimally* beyond 48 units, however GRR *must be a minimum of 24 units.*

6.3.5 Practicum in Computer Science

Internships can be an integral part of your degree process and, while not required, are highly recommended to provide additional resources for your research and to expand your network.

As noted previously in the Directed Research information:

- During any semester, with the program's approval, students may substitute up to 36 units of Practicum in Computer Science (15-998) for GRR units, at the recommendation of and under the guidance of their research advisor.
- Students typically substitute practicum units for research units 3-4 times during their PhD degree program, usually for the summer semester.
- Substituting practicum units more than 4 times requires approval from the Doctoral Programs Director.
- A Practicum in Computer Science is generally taken for a full semester, usually summer, and is not the same as outside consulting, which is limited to 8 hours a week while you are an enrolled student working on curricular progress toward your degree. Please refer to Consulting and Outside Employment under Student Financial Support.
- International students are *required to consult with the Office of International Education* for eligibility for work authorization before starting or seeking an internship/co-op or consulting opportunity. International students will benefit from proactively reviewing OIE guidance regarding off-campus work authorization. Off-campus work authorization processing times can take several weeks or months, and international students will benefit from starting the off-campus work authorization process as early as possible.

6.4 Auditing a Course

If a student plans to audit a course they should use the appropriate form, available for download from the Hub Grading Policy & Options webpage `https://www.cmu.edu/hub/registrar/grade-options/index.html`. The form should be filled in by the student, signed by the student and the instructor of the course and sent to the Doctoral Programs Manager for additional signatures before the semester audit deadline. (see Academic Calendar)

6.5 Taking Courses outside CSD

CSD PhD students may formally register for graduate or undergraduate courses in other departments. However, they must register for these courses with Pass/No Pass grading. A form to request Pass/No Pass grading is available for download from the Hub Grading Policy & Options webpage `https://www.cmu.edu/hub/registrar/grade-options/index.html`.

6.5.1 PCHE Cross Registration

Carnegie Mellon University offers students the opportunity to take courses for credit through a cross-registration program with the Pittsburgh Council on Higher Education (PCHE) `https://www.cmu.edu/hub/registrar/registration/cross/index.html`, which might be allowed as an elective selection with confirmation that the course is a PhD level course and approval from Doctoral Program Director.

The Carnegie Mellon University transcript will include information on such courses as follows: Carnegie Mellon courses and courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA for programs that use QPA. All other courses will be recorded on this transcript indicating where the course was taken, but without grades. Such courses will not be taken into account for academic actions, honors or QPA calculations. (Note: suspended students may take courses elsewhere; however, they may receive transfer credit only if their college's and department's policies allow this.)

6.6 Double-counting CMU Course Credits

No courses can be double counted toward the Computer Science PhD requirements. A maximum of two PhD-level courses taken by Carnegie Mellon students that were not counted for the certification of the bachelor's, Master of Science in Computer Science, or 5th Year Master's Degree can be applied to the 72 unit course requirement. No courses taken in another degree program will apply to the Breadth Requirement without approval from the Director of the Doctoral Program.

6.7 Transfer Credit

The PhD program in Computer Science only accepts limited internal transfer credit. The program does not accept transfer credit from other institutions.

6.8 Course Drop, Add, Withdraw Procedures

Students taking undergraduate- or master's-level courses must follow the University's procedures and deadlines for adding, dropping, or withdrawing from courses as identified on the academic calendar.

Doctoral students in the Computer Science Department should not have withdrawals (W) on their record and should consult with the Doctoral Programs Manger to be sure their course changes are done as drops, not withdrawals.

- General policies are provided at: `https://www.cmu.edu/hub/registrar/course-changes/index.html`

  Students may add or drop doctoral-level level courses themselves by the add/drop deadline. To drop a course after the add/drop deadline students should contact the Doctoral Programs Manager for assistance.

- There is a separate calendar for doctoral-level courses, which is available at: `https://www.cmu.edu/hub/calendar/index.html`

6.9 Review/Redress of Academic Conflicts

Students and advisors enjoy a close working relationship in our program. If students have problems, whether related to their academic work, research or other issues, they should feel free to speak to their advisors. If doing so is awkward or if students simply want a second opinion, they should feel free to discuss any issues with the:

- Director of the Doctoral Program
- Doctoral Programs Manager
- Student Ombudspersons

For issues a student feels rise to, or are determined to require, formal university processes, graduate students can find detailed information in the Summary of Graduate Student Appeal and Grievance Procedures on the Graduate Education Resource web page:

`https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html`

7 Teaching Requirement

The ability to teach is an important skill for all scientists, not only for those who plan to teach after completing their degrees. Teaching skills include the ability to communicate technical material ranging from elementary to advanced, and to communicate technical material to audiences ranging from general to specialized. Thus, we expect students to develop and exercise teaching skills as part of their graduate education.

Students have ample opportunities to present advanced material while working on research projects, by participating in research seminars, and by giving practice conference talks. The School of Computer Science offers a TA workshop which we encourage students to take advantage of. To gain experience in presenting more elementary material, we require that all graduate students help teach two courses.

Students generally teach:

- one introductory-level undergraduate course
- one advanced-level undergraduate course

Current policy (which is subject to change from semester to semester) is that graduate breadth courses in the Computer Science Department with an enrollment of 20 or more are also eligible for TA credit.

Please note:

- Courses in other units in the School of Computer Science, or advanced graduate courses, are **not** eligible for satisfying the teaching requirement.
- All teaching that is to count towards the TA requirement *must be assigned and approved* **in advance** by the TA Coordinator. Students' preferences will be taken into account, but cannot always be honored.

We encourage students to teach more than twice. At the Doctoral Student Review (DSR) meeting the faculty give special recognition to those who do an outstanding job as a TA and to those who teach beyond the required load.

General information about TA-ing can be found at: `https://www.ugrad.cs.cmu.edu/ta/general.html`

7.1 Evaluation and Certification of English Fluency for Instructors

Graduate students are required to have a certain level of fluency in English before they can instruct in Pennsylvania, as required by the English Fluency in Higher Education Act of 1990. Through this Act, all institutions of higher education in the state are required to evaluate and certify the English fluency of all instructional personnel, including teaching assistants and interns.

The full university policy can be reviewed at: `https://www.cmu.edu/policies/faculty/evaluation-certification-english-fluency-instructors.html`

The fluency of all student instructional personnel will be rated by Language Support in the Student Academic Success Center to determine at what level of responsibility the student can TA.

In addition to administering the International Teaching Assistant (ITA) Test (a mandatory screening test for any non-native speaker of English), Language Support in the Student Academic Success Center helps teaching assistants who are non-native English speakers develop fluency and cultural understanding to teach successfully at Carnegie Mellon.

Visit the Student Academic Success Center website for additional information: `https://www.cmu.edu/student-success/`

8 Written and Oral Communication Skills

To be a well-rounded computer scientist each student should have not just basic knowledge, but also the abilities

- To communicate technical ideas clearly in writing, and
- To communicate technical ideas clearly orally

8.1 Writing Skills Requirement

8.1.1 The Writing Skills Document

To satisfy the written communication skill requirement the student must write a solo-authored technical blog post on current research and have it approved by a 3-person committee. Once approval is logged it will be posted to the `http://www.cs.cmu.edu/~csd-phd-blog/`.

It is strongly suggested that the writing skills be completed by the end of the 3rd year in the doctoral program. In any case, **the writing skills requirement must be completed before the thesis proposal**. The writing skills cannot be the thesis proposal, though it might inform a future thesis proposal.

The following describes the intended audience, content, and writing format required of a blog post submission:

- **Target audience**: The post should be written at a level so that any interested advanced computer science student finding the blog can get something useful out of it. A good yardstick might be your fellow CSD doctoral students who are not necessarily in your own research area.
- **Suggested length**: Around 2500 words (it can be shorter; the length should be whatever is necessary to get the main ideas across in a concise, clear, and understandable way). The post should not be longer than 5000 words.
- **Content**: The blog post must present a self-contained, cogent, and engaging narrative on some recent research, including a blend of scientific (high-level) and technical exposition.
  - The post can describe the student's own published or accepted research (this will probably be the most common option), or it can summarize an interesting recent line of work in the student's research area (however, the post shouldn't be an opinion piece beyond the choice of what to summarize or emphasize).
  - Figures/images/tables that add to the exposition and enhance understanding are strongly encouraged.
  - Bibliography optional but inline references to attributions made in the text should be given.

- **Format**: The post should build off a provided template file, available from the public git repository `https://github.com/cmu-csd-phd/csd-blog`, along with detailed instructions (in the README file) on the workflow for downloading the necessary files, building the blog post, and submitting it for review and final posting. It should contain metadata including category and keywords (the categories are to be chosen from a fixed set provided in the template, but keywords are free-flowing).

8.1.2 Benefits of the blog post format of writing skills requirement

Main Benefits: (Graduating students need to be able to write well.)

- Technical content and high-level explanations are both required elements.
- Quality is ensured through the committee and public eyes.
- The student gets visibility for the post as its single author, and their work gets noted outside usual publication circles
- Writing for a broad target audience cultivates the ability to communicate outside of a bubble.
- The blog post format gives experience in an increasingly prevalent form of modern communication.

Ancillary Benefits: (Publicity)

- It is easy to search for and convenient to read.
- The Department and School can point to the blog to show off student research.
- Students can point to the blog to advertise their work.
- It can help point people in other areas who might be interested in topics relating to the post's related work, which could potentially lead to collaborations.

8.1.3 Composition of writing skills committee

Students must obtain written final approval of the blog post content from:

- One CSD tenure-track/research faculty member.
- One SCS or CSD tenure-track/research faculty member.
- One doctoral student who has already passed their writing skills.

The PhD advisor(s) of the student should not serve as a reviewer. A co-author on the work(s) upon which the blog post is based also should not act as a reviewer (though, if required, they can provide informal feedback on initial drafts of the post to the student).

8.1.4 Process to satisfy the writing requirement

It is anticipated that the whole process should comfortably fit within a semester, and in fact typically over a shorter duration:

- Choose topic of the blog post.
- Gather committee agreeing to review your topic in a timely fashion, subject to the above requirements on committee composition. Make sure the committee is aware of the bounded timeframe of the process and their schedule permits providing feedback in a timely fashion.
- Read over the README file on the git repository dedicated to the writing skills `https://github.com/cmu-csd-phd/csd-blog` and make sure you understand the steps and workflow of the process.
- Prepare initial draft of post and send it to committee
- Committee approves unanimously or suggests revisions:
  - In case of approval:
    * Get the writing skills blog approval form signed by the committee and email the form and a PDF document of the approved blog content to the Doctoral Programs Manager, who files the documents in the Doctoral Student Review (DSR) database for the student and indicates in their records that the requirement has been successfully fulfilled.
    * Follow the instructions in the README and submit a pull request to get the blog post, with public committee approval, posted on the CSD PhD blog site.
  - Non-approval means "not yet pass" and should come with feedback for iteration.
    * Unless there are major issues such as the topic itself no longer being considered viable, or a big pivot in the focus with respect to original intent, this should be a fast and efficient iteration: feedback and revisions should be able to happen within about 2 weeks (maybe longer for the initial draft), perhaps even same day if quick/minor edits).
    * Iterate based on feedback as necessary, until post is approved.
    * The date of the blog post should be identical to the date of the final approval signature from reviewers. This final date will be recorded as the completion date in DSR.

8.1.5 Committee criteria for evaluation of post

Here are some (possibly overlapping) criteria for the committee to consider when evaluating the post:

- Scientific exposition (w.r.t target audience)
  - Why is this interesting?
  - What is the main challenge? Eg: intellectual difficulty, aesthetics, usefulness?
  - What is this connected to, and how does it fit within the big picture of work in the field?
  - What are the main high-level ideas?
- Technical exposition (w.r.t target audience)
  - What are the specific contributions?
  - What are the main details?
  - What obstacles are overcome and how?
  - What might it enable going forward?
  - Mathematical writing/experimental design?
- Overall structure + flow
  - English: paragraphs, sentences
  - Clarity of proofs, arguments, deductions, etc.
- Placing into broader context
  - Related work
  - Connection to motivation
- Additional criteria the committee feels is appropriate, to be included in feedback to the author to incorporate

If the post is not yet accepted, feedback should include actionable criticism. If the topic remains viable, then that criticism should reference some subset of the criteria listed above.

Doctoral students who entered the program prior to fall 2021 may opt to use the previous writing skills process to satisfy the requirement. Please refer to the graduate program web page `https://csd.cmu.edu/academics/doctoral-resources/writing-skills-requirement` and the handbook for the year in which you entered the CSD PhD program to utilize that option.

8.2 Speaking Skills

The Department and School provide many opportunities for students to practice their speaking skills. Here are just a few:

- Research area seminar series (AI, CS, Logic, PoP, PS, Theory)
- Research unit seminar series (MLD, HCII, LTI, Robotics)
- Regular lunchtime talks (e.g., SDI lunch, Student Seminar Series)
- Research area group meetings (e.g., Machine Learning, Theory)
- Recitations, tutorials, and guest lectures (as a teaching assistant)

To complete the oral communication skill requirement each student must give a public talk at Carnegie Mellon. The talk is scheduled so that members of a standing committee, the *Speaker's Club*, can attend, evaluate the student's talk, and provide oral and written feedback to the student.

8.2.1 Speaker's Club

The Speakers Club maintains high standards and expects that a successful Skills talk will be on par with a good job talk. In particular, the speaker should strive for clarity of presentation without substantially compromising the technical material presented.

The Speaker's Club Calendar is maintained by the department and accessed by the Doctoral Programs Manager to gather the necessary information to schedule and announce Speaking Skills talks. The Speakers Club Calendar system helps students schedule their talks, provides reminders so a quorum of Speakers Club members is met, and reminds Speakers Club members of their responsibility and commitment to attend talks.

Detailed scheduling and process information is available on the Speaking Skills Requirements webpage: `https://csd.cmu.edu/academics/doctoral-resources/speaking-skills`.

8.2.2 Satisfying the Speaking Skills Requirement

Students should be able to use existing forums (e.g., those listed above) to give their talk, and thereby avoid having to schedule a special talk. Of course, it is acceptable if the student wants to schedule a special time and date, but the student should take care to ensure that an audience beyond the three required members of the Speakers Club (two faculty and one student) is present at the talk.

- This talk must be accessible to a general computer science audience.
- It should be advertised as "In Partial Fulfillment of the Speaking Requirement" so the audience knows what kind of feedback the student is seeking and so all interested and available Speaker's Club members can mark their calendars accordingly.

All Speakers Club members are welcome to attend the advertised talk. Immediately after the talk, those members in attendance confer among themselves (with the student absent) about the talk. They also each fill out a Speaking Review Form, available from the Doctoral Programs Manager.

- If at least two faculty members and one graduate student member of the Speakers Club grade the student's talk to be "Good" or better, then the student passes.
- If not, the student will be required to give another talk. After a decision has been made, one of the attending faculty members volunteers to discuss the feedback and outcome privately with the student.
- After the talk, when the student passes, they provide all signed forms to the Doctoral Programs Manager who keeps copies in the student's file and marks in the student's records for the completion of this requirement.

Much of this part of the process is similar to what happens after a thesis proposal presentation or thesis defense; the focus here, however, is on oral communication skills.

As with writing, speaking well takes practice. Satisfying this requirement might take a few tries on the student's part. For students who are naturally good speakers or are already experienced speakers, one try may suffice. No stigma is attached to those who have to try more than once.

9 Evaluation of Student's Progress

Evaluation and feedback on a student's progress are important both to the student and to the faculty. Students need information on their overall progress to make long-range plans. The faculty need to make evaluations to advise students, to make support decisions, and to write recommendations to potential employers.

9.1 Doctoral Student Review

The faculty hold a *Doctoral Student Review* (DSR) meeting twice a year at the end of the semester to make a formal evaluation of each student in the PhD program.

The primary purpose of having the advising faculty meet together to discuss all the students is to ensure uniformity and consistency in evaluating students across all the different areas, by all the different advisors, and throughout the years of the PhD program in CSD as it inevitably changes.

The meeting consists of two parts, one in which subsets of the faculty meet according to research area, and the other in which all advising faculty meet together.

The faculty measure each student's progress against the goal of completing the PhD program in a reasonable period of time. The evaluation considers all components of the program using indicators and information sources described below.

A *Doctoral Student Review letter* from the faculty informs students of the results of this evaluation, which may include specific recommendations for future work or requirements that must be met for continued participation in the program.

9.2 Components and Indicators

In their evaluation, the faculty consider the following components, though naturally only some of these components will be applicable in any given semester and they are not equally important at every stage of a student's career:

- *Courses taken*: Evaluated by the course instructor—brief prose evaluation/summary grade.
- *Directed research*: Evaluated by research supervisor and other collaborating faculty.
- *Teaching*: Evaluated by the course instructor and two different teaching evaluation forms (one filled out by the course instructor and the other filled out by students, where appropriate).
- *Skills*: Writing and speaking, evaluated by relevant faculty and forms.

- *Thesis*: Status summarized by the thesis advisor and commented on by members of the thesis committee.
- *Departmental/community service*: Reported by the student and evaluated by relevant faculty.
- *Other*: Lectures given, papers written, etc. Evaluated by cognizant faculty.

The faculty's primary source of information about the student is the student's advisor and the student statement. The advisor is responsible for assembling the above information and presenting it at the faculty meeting. The student should make sure the advisor is informed about participation in activities and research progress made during the semester. Each student is asked to submit a summary of this information to the faculty at the end of each semester—the *Student Statement for Doctoral Student Review* at `https://dsr.csd.cmu.edu`. This statement is used as student input to the evaluation process and as factual information on activities and becomes part of the internal student record. It is strongly recommended that the student and advisor meet prior to the faculty meeting to review the information provided in this statement.

9.3 Determination of Satisfactory Progress

Based on the above information, the faculty decide whether or not a student is making satisfactory progress in the PhD program.

- If progress is satisfactory: The faculty review student-identified goals or suggest goals in consultation with the student's advisor for the student to achieve over the next semester.
- If progress is not satisfactory: The faculty make more specific and measurable demands of the student.

  These may be:

  - long-term – e.g., finish your thesis research over the next 3 semesters
  - short-term – e.g., select and complete one or more specific courses next semester; prepare a thesis proposal by the next Doctoral Student Review.

Ultimately, permission to continue in the PhD program is contingent on whether or not the student continues to make satisfactory progress toward the degree. If a student is not making satisfactory progress, the faculty may choose to drop the student from the program.

The faculty also decide whether financial support should be continued for each student. Termination of financial support does not always mean termination from the program, details regarding continuation in the program are provided in the student's evaluation letter.

Students should refer to the Summary of Graduate Student Appeal and Grievance Procedures if they feel they need redress for decisions made regarding their standing in the program. https://www.cmu.edu/graduate/resources/appeal-grievance-procedures.html

9.4 Grades

Since the PhD program is not a course-based degree program, it is difficult to associate grades with a student's accomplishments. Also, for students who complete the program, grades are largely irrelevant. As such, the CS PhD program is a Pass/No Pass program (see University Policy for Grading Options). Doctoral students are judged primarily on their research progress, professional achievements, and the experience they have gained during the program based on recommendations from members of the faculty.

For curricular purposes:

- A passing grade for graduate courses is B- or better.
- If a student in the program will not pass a course it should be dropped from their schedule before the end of the semester.

The PhD program keeps an internal record of various information about a student's performance, such as final grades given for graduate courses taken to fulfill curricular requirements. This information is used at the *Doctoral Student Review* meeting. Letter grades do not appear on the student's university transcript.

CSD PhD students may formally register for graduate or undergraduate courses in other departments. However, they must register for these courses with Pass/No Pass grading. A form to request Pass/No Pass grading is available for download from the Hub: https://www.cmu.edu/hub/docs/pass-fail.pdf

9.4.1 Retaking a Course

Courses should be dropped (not withdrawn) if the student will not meet the required B- to count toward curriculum requirements. Courses can be retaken to meet the grade requirement. See Course Drop, Add, Withdraw Procedures.

9.4.2 Incomplete Grades

CSD follows university policy for grading. The student needs to work directly with the course instructor to determine what must be done to receive a grade for completion. Please refer to: https://www.cmu.edu/policies/student-and-student-life/grading.html

The process for appealing final grades is covered by University Policy - https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html

10 Requirements for Candidacy, Thesis Preparation & Defense

The Computer Science Department does not administer a qualifying exam.

10.1 Thesis

The thesis must describe a significant piece of original research in a specialized area of Computer Science and must describe it well. It is evidence of proficiency, high attainment, and ability to do research in a specialized area of computer science, which the Department relies upon to certify the qualifications of the new PhD.

Furthermore, it is the most important basis on which the scientific community judges the initial achievement and potential of that individual.

10.2 Thesis Committee

The student's advisor chairs the thesis committee. All other committee members, including the external member, should be agreed upon before the thesis proposal presentation. Members of the student's committee must accept the responsibility of meeting with the student regularly to ensure that the research is progressing in the right direction.

The Thesis Committee must consist of at least one Computer Science Department faculty, two members of SCS faculty and/or other approved faculty, and an external committee member. Please see the department webpage `https://csd.cmu.edu/academic/doctoral-resources/thesis-proposal-process`, for the current list of people with advising privileges. Thesis committees and any changes to committees are subject to departmental approval.

Thesis committee members (including the Chair) must be physically present for the thesis proposal (at least two) and defense (at least three). Additional thesis proposal process information is maintained on the website listed above.

10.3 Thesis Proposal

The student submits a written proposal to the faculty. The student also orally presents the thesis proposal to interested faculty and students in a public colloquium.

A thesis proposal should:

- Explain the basic idea of the thesis topic (e.g., the problem to be solved and the approach to solving it).
- Argue why that topic is interesting (e.g., what contributions to the field would be made in carrying out the proposed work).

- State what kind of results have already been obtained and what further results are expected.
- Argue that these results are obtainable within a reasonable amount of time.
- Demonstrate the student's personal qualifications for doing the proposed work.

The main purpose of the thesis proposal is to convince the faculty that the chosen thesis topic is significant and that the student's approach has a reasonable chance of success. A thesis proposal gives the faculty the opportunity to pass such judgment at the start of the work and not at the end. We want to minimize the chance that a thesis will be turned down when almost completed. We expect students to present their thesis proposals as early as possible, not halfway through writing the thesis. A thesis proposal should be short, about 15–20 pages.

A thesis proposal should *not* **be**:

- A dry run for the thesis
- A summary or abstract of the thesis
- The first chapter or part of the thesis
- A technical report
- A survey of the field
- An annotated bibliography

Any included list of references or bibliography should serve the purpose of supporting the assessment of the state of the art and the student's personal qualifications.

To provide ample notice to the public, at least two weeks in advance of the oral presentation, students should provide the Doctoral Programs Manager with one hardcopy of the thesis proposal, an on-line copy of the proposal's abstract, and a list of the thesis committee members, including the external member. The Doctoral Programs Manager posts the public announcement of the thesis proposal presentation.

Please remember that at least **two thesis committee members (including the Chair) must be physically present** for the thesis proposal.

A more extensive checklist is available online with specific information on the thesis proposal `https://csd.cmu.edu/academic/doctoral-resources/thesis-proposal-process`

10.4 Criteria for Advancement to Doctoral Candidacy

Until the curricular requirements are completed (core and elective courses, teaching, Speaking & Writing Skills), the thesis proposal is approved, and all requirements are recorded as completed in DSR the status assigned is "student".

Upon completion of the curricular requirements and approval of the thesis proposal the student transitions to "doctoral candidate".

The All But Dissertation Agreement (`https://www.cmu.edu/hub/docs/abd-status-agree.pdf`) must be completed by the doctoral candidate, signed by the primary thesis (research) advisor and provided to the Doctoral Programs Manager to obtain the department head's signature to officially move the student to candidate status.

10.4.1 ABD and ABS Status

An ABD doctoral candidate may choose to continue as a regular student *In Residence*, or to be *In Absentia* (ABS).

Please see the University policy, which sets forth a definition of All But Dissertation (ABD) status, time limits on doctoral candidacy status, a definition for In Residence and In Absentia for candidates and the tuition and fees charged for candidates in each status. A useful references is the University Registrar's All But Dissertation FAQ: `https://www.cmu.edu/es/docs/abd-doc-faq.pdf`.

Doctoral candidates should refer to university policy regarding ABD or ABS status requirements: `https://www.cmu.edu/hub/registrar/doctoral-students/index.html` and `https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html` for Doctoral Student Status overall.

10.5 Thesis Defense

The student's thesis committee decides whether to accept the thesis based on its content and the outcome of the *thesis defense*, which is a public presentation describing the contributions of the thesis.

The Doctoral Programs Manager ensures that the talk announcement for the thesis oral defense is posted to the School of Computer Science and Computer Science Department online event calendars and sends the appropriate announcement email to students, advisors and other appropriate distribution lists.

Before the thesis defense, the entire committee is expected to have read the entire thesis, to have given comments to the candidate, and to have given approval for scheduling the public defense. This means that a copy of the complete thesis document should be provided to the whole thesis committee a minimum of six weeks in advance of any proposed date for the defense. Significant deviations from this rule must be approved by the Director of the Doctoral Program. Committee members should meet briefly before the thesis presentation to discuss any issues.

The presentation by the candidate is normally about 45 minutes, followed by a question-and-answer period which may be as long as needed. Please remember

that at least three thesis committee members (including the Chair) must be physically present for the thesis defense. The thesis committee chair (advisor) determines who may ask questions and in what order and brings the discussion to a close at the appropriate time. The question-and-answer period is followed by a closed-door session attended by only the members of the thesis committee.

The options of the thesis committee are:

- To approve without corrections
- To approve subject to minor changes, to be approved later by the thesis chair only
- To require a resubmission after major changes and re-approval of the entire committee
- Not to approve the thesis

The thesis committee chair(s), the Department Head, and the Dean sign a final signature title sheet when the student submits the final version of the thesis.

A more extensive checklist is available online with specific information on the thesis document format, defense process, and post-defense processes at `https://csd.cmu.edu/academics/doctoral-resources/thesis-oral-defense-process`.

Every student must read and adhere to these more detailed process rules.

11 Degree Attainment

11.1 Obtaining a Master's Degree on the Way

We are happy to grant any student a *Master of Science in Computer Science Research* degree once they have:

- passed all 72 course units,
- passed at least one of the two communication skills requirements,
- and taught at least once.

No Master's degree will be granted if you have received a Master's degree in another area of SCS.

You must make your request in writing or via email to the Doctoral Programs Manager.

11.2 Graduation Certification

The Doctoral Programs Manager maintains a checklist of procedures for scheduling the thesis oral presentation and completing the other requirements for graduation. The Doctoral Programs Manager certifies fulfillment of requirements for graduation only when the final version of the thesis has been approved by the thesis committee, the Department Head, and the Dean. Students are not allowed to participate in commencement exercises unless final certification has been made.

If the final copy of the thesis is not submitted within one year of the thesis defense, the faculty may require a second defense before making a final certification.

11.2.1 QPA and GPA

Due to the Pass/No Pass nature of the program, QPA and GPA are not factors for certification of a doctoral degree in Computer Science.

12 Student Financial Support

12.1 Academic Year Support

The Department aims to allow students as much freedom as possible in choosing research directions, subject to the interests and expertise of the faculty who are available to oversee the work. Thus, the PhD program generally decides which funding source to use to support a student *after* the student has chosen an advisor or research area.

12.1.1 Stipend, Tuition & University Fees

As outlined in the student's offer letter when admitted to the program, the School of Computer Science (SCS) sets the base stipend and tuition which are covered by the department. Stipend is primarily covered by faculty advisor funding.

Carnegie Mellon University sets the student activities, transportation, and technology fees, which are also covered by the PhD program.

The department also pays a dependency allowance that is 10% of the CSD monthly base stipend per eligible dependent provided that your spouse or qualifying domestic partner earns less than 15% of the stipend amount.

University and SCS graduate tuition and fees detail is available at: `https://www.cmu.edu/sfs/tuition/graduate/scs.html`

12.1.2 External Funding

On occasion, the PhD program is able to obtain an individual fellowship for a student through external sources. We also encourage students to seek their own external funding since often the award is prestigious (e.g., NSF or Hertz) or the source provides an opportunity to make professional connections (e.g., an industrial fellowship).

If a student receives an external fellowship/scholarship, they must notify the Doctoral Programs Manager. The Department supplements the stipends of students with an outside fellowship to meet (and usually exceed) the stipends of students with internal funding.

12.1.3 Health Insurance Coverage Benefit

Carnegie Mellon University requires that students carry health insurance when they are enrolled in a program of study at the university. 100% coverage is provided for the enrolled student. Additional information about university-provided health insurance and financial aspects of this requirement are available at: `https://www.cmu.edu/health-services/student-insurance/index.html`

12.1.4 Doctoral Student Paid Time Off

Research is a year-round activity, and students should expect to continue working on their research even when classes are out of session. Nevertheless, it is important for students' health and quality of life to take time off occasionally throughout the year. Doctoral students are entitled to the same time off for official university holidays as staff and faculty.

For additional paid time off (PTO), students should meet with their advisor to discuss their advisor's expectations regarding vacation time. At a minimum, students should expect their advisor to approve two weeks off during the summer, and another two weeks off during the winter.

The seasonal patterns of every research group are different, so it is impossible to state general rules regarding the timing of vacation. Except for an unexpected emergency, students should coordinate time off with sufficient advance notice to minimize impact to individual or research group progress. In the unusual circumstance of a conflict regarding vacation between a student and advisor, the department can mediate.

12.2 Summer Support

There is summer support available for many students, particularly for those working on their dissertation. However, we believe it is also good for students to gain experience in industry for one or two summers during their career here at Carnegie Mellon. Faculty and staff will provide help in finding suitable summer employment. Refer to the Practicum in Computer Science section for additional summer internship information.

12.3 Conference and Travel Support

The department encourages students to travel to conferences and workshops to enhance their professional and career development.

If a student wants to attend a conference or workshop, the student's advisor or research sponsor should support the trip through either a research contract or a discretionary account.

If no such funding is available to the student, then limited departmental funds may be available upon request. Since departmental funds are limited, some requests may not be approved, and some may not receive full funding; however, the department will try to support a student's travel as much as possible. Funding is usually available to a student for no more than one departmentally-sponsored trip per year.

To obtain travel support, the student and their faculty advisor/research sponsor must first agree that the student should take the trip. Then *in advance of the trip* the student should get a Student Travel Authorization Form (`https://www.cs.cmu.edu/~csd-grad/Student_Travel_Auth.pdf`) and then the advisor/research sponsor's signature (on the Faculty Research Sponsor line). The faculty member must either (i) indicate the amount of support the student

may receive and its source (be sure the charge number is filled in!), or (ii) state that no funds are available from any research or discretionary account.

If no faculty support is available, the student should submit the signed form to the Associate Department Head – Finance and Administration for approval of departmental sponsorship. The maximum to be reimbursed will be $200 plus the registration fee, if only attending the conference or workshop; $600 plus registration fee, if presenting a paper.

University Funding: Conference Funding is a funding application process provided by the GSA and the Provost's Office for students, student work groups or groups to attend a conference, whether as a participant or as a presenter. The process is managed by the Office of Graduate and Postdoc Affairs. Students can find more information about the application process and deadlines at: `https://www.cmu.edu/graduate/professional-development/index.html`

12.4 Employment Eligibility Verification

If a student receiving a stipend is a TA, or is planning to have a paid position with CMU, then Employment Eligibility Verification is required.

Form I-9 must be completed within 3 business days of beginning work for any type of compensation (stipend or employment).

To ensure compliance with federal law, Carnegie Mellon University maintains the *Employment Eligibility Verification (I-9) Policy* covering the university's I-9 and E-Verify requirements: `https://www.cmu.edu/hr/assets/hr/restrict/employment-eligibility-verification-policy.pdf`

- Every individual receiving a stipend from CMU or employed by CMU must comply with the I-9 Policy by completing the Form I-9 within three business days following the first day of stipend start date/employment.
- Individuals who expect to work on a federally funded project are further responsible for an E-Verify Processing Request Form to the Office of Human Resources if required.

For more information and to schedule an appointment:

- See CMU's Guidance for Completing the Form I-9 Requirements: : `https://www.cmu.edu/hr/assets/recruiting/restrict/i-9-guidance.pdf`
- Visit the Human Resources Service website to learn more about Form I-9 and E-Verify: `https://www.cmu.edu/hr/service-center/new-faculty-staff/i-9-e-verify/index.html`
- To schedule an appointment to complete the Form I-9: `https://go.oncehub.com/I9Appointment`

12.5 Consulting and Outside Employment

Consulting is limited to a maximum of 8 hours per week.

Consulting is a privilege, not a right. We grant this privilege for one of two reasons:

- The consulting task is relevant to the student's thesis work or a Carnegie Mellon research project.
- The student has exceptional financial obligations.

Limited part-time consulting is not the same as doing an internship, which generally is done full-time during a single semester. Please see Practicum in Computer Science.

A student who wishes to consult should obtain permission from their advisor and the Director of the Doctoral Program, and fill out an approval form, available from the Doctoral Programs Manager.

We may require that students limit outside employment to comply with university and government rules. International students are *required to consult with the Office of International Education* for eligibility for work authorization before starting or seeking an internship/co-op or consulting opportunity. International students will benefit from proactively reviewing OIE guidance regarding off-campus work authorization. Off-campus work authorization processing times can take several weeks or months, and international students will benefit from starting the off-campus work authorization process as early as possible.

12.6 University Funding Sources

- Graduate students who find themselves in need of immediate funds for emergency situations should contact the Office of the Dean of Student Affairs, to inquire about the types of emergency funding available to enrolled students.
- **Conference, Professional Engagement & Scholarly Project Funding** may be available through the Office of Graduate and Postdoctoral Affairs. Refer to their webpage `https://www.cmu.edu/graduate/funding/index.html` for details.

13 Leave of Absence and Withdrawal

13.1 Leave of Absence

Students who wish to leave the program temporarily may request a leave of absence (LoA) by submitting a request to the Director of the Doctoral Program. Leaves are initially granted for a period of no more than one year, but an extension of up to one additional year may be granted under exceptional circumstances. When an extension is granted, the conditions for return must be negotiated with the advisor and the Director of the Doctoral Program prior to returning to the program.

Students on leave of absence should contact the Doctoral Programs Manager two months prior to the end of the leave to indicate their plans. While a leave can in principle start at any time, university regulations allow students to return only at the beginning of a semester (usually in late August or in January). Ideally, students should try to gain approval to return in time to participate in the registration period for the semester in which they plan to take classes (refer to the academic calendar).

International students must consult with the Office of International Education regarding visa implications for a leave and for returning to the program.

University Policy for Leave of Absence: `https://www.cmu.edu/policies/student-and-student-life/student-leave.html`

University process for Leave of Absence: `https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/`

13.2 Withdrawal

Students considering withdrawing from the program should contact the Director of the Doctoral Program and submit the withdrawal to the Doctoral Programs Manager.

University policy for withdrawal: `https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/`

14 University Policies & Expectations

NOTE: For any policies not explicitly covered in this document the Computer Science Department adheres to School of Computer Science or Carnegie Mellon University policies.

These policies include, but are not limited to, the status of All But Dissertation (ABD) and In Absentia students, academic disciplinary actions, and grievance procedures.

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental doctoral student handbook the following resources are available to assist you in understanding community expectations (not an exhaustive list):

- University Policies Website: `https://www.cmu.edu/policies/`
- University Vision, Mission, and Values: `https://www.cmu.edu/about/mission.html`
- University Policy on Grades: `https://www.cmu.edu/policies/student-and-student-life/grading.html`
- Graduate Education Website: `https://www.cmu.edu/graduate/policies/index.html`

The Carnegie Mellon Code can be found on-line at: `https://www.cmu.edu/student-affairs/theword/code/index.html`.

14.1 Academic Integrity

- University Academic Integrity Website - Please review the University expectations at: `https://www.cmu.edu/policies/student-and-student-life/index.html`
- Academic Integrity Policy - please review the entire policy at: `https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html`

14.2 Degree and Enrollment Verification and Transcripts

Enrollment Services is the only University office that can provide an official letter of enrollment, official transcript, and enrollment verification.

Degree or Enrollment Verification: `https://www.cmu.edu/hub/registrar/student-records/verifications/index.html`

Transcripts: `https://www.cmu.edu/hub/registrar/student-records/transcripts/index.html`.

14.3 Withdrawal of Degree

The university reserves the right to withdraw a degree even though it has been granted should there be discovery that the work upon which it was based or the academic records in support of it had been falsified. In such a case, the degree will be withdrawn promptly upon discovery of the falsification.

The complete reference to this university policy is available at: `https://www.cmu.edu/policies/student-and-student-life/withdrawal-of-a-degree.html`

Please see Appendices E through H for additional information about The Word `https://www.cmu.edu/student-affairs/theword/` and University resources.

The Statement of Assurance can be found online at: `https://www.cmu.edu/policies/administrative-and-governance/statement-of-assurance.html`.

14.4 Change of Address

`https://www.cmu.edu/hub/registrar/student-records/personal-information.html`

Students are responsible for notifying the department and HUB of all address changes in a timely manner. Students will be held responsible for any failure to receive official college notices due to not having a correct address on file; F-1 students may jeopardize their status if address information is not kept current.

Students can change their address using SIO, which is available via the HUB website.

Appendices

A Other PhD Degree Specializations

Students admitted to the PhD Program in Computer Science may also qualify to enroll in one of three alternate degree or specialization programs jointly administered by the Computer Science Department with other colleges or departments at Carnegie Mellon:

- Algorithms, Combinatorics, and Optimization (ACO) degree
- Pure and Applied Logic (PAL) degree
- The Center for Neural Basis of Cognition (CNBC) certificate training program.

Note that students must be admitted to those programs and that their degree requirements differ from the Computer Science PhD program.

A.1 Algorithms, Combinatorics, and Optimization

The PhD Program in Algorithms, Combinatorics and Optimization is an interdisciplinary program administered jointly by the department of Computer Science, the department of Mathematical Sciences, and the Operations Research group in Tepper School of Business (TSB). The purpose of the program is to bring together the strengths of the participating departments in topics such as algorithm design, graph theory, combinatorial optimization, integer programming, polyhedral theory, analysis of heuristics, and number theory.

Course of Study: For details regarding the program requirements, see the ACO web page at `https://www.cmu.edu/math/aco/index.html` Completion of all degree requirements earns the student a PhD in Algorithms, Combinatorics, and Optimization.

A.2 Pure and Applied Logic

The Pure and Applied Logic Program is joint with the Carnegie Mellon Mathematics and Philosophy Departments. Carnegie Mellon has a large and active group of faculty whose research and teaching interests span all aspects of logic, with a particularly strong concentration in foundational aspects of computing. This Logic Community has an established record of collaborations in pursuing theoretical research, conducting major implementation projects, and running colloquia and workshops.

Course of Study: CS/PAL students are admitted through their home department (Computer Science). They may choose to specialize in Pure and Applied Logic any time after their first year, though the expectation is that a mutual decision is reached by the end of their first year. CS/PAL students fulfill all the normal CS PhD program requirements; however, rather than take 24 units of elective courses, they must take 48 elective units. CS/PAL students should choose their elective courses from a list of regularly offered courses in Pure

and Applied Logic. Since some of these courses are taught in the Mathematics or Philosophy Departments, CS students must still ensure that they meet the requirement that at least 12 units of electives are taken from the School of Computer Science. CS/PAL students are also expected to participate in the activities of the Carnegie Mellon Logic Community, such as relevant seminars and colloquia.

Completion of all degree requirements earns the student a PhD in Computer Science: Pure and Applied Logic. More information about the PAL program is available at `http://logic.cmu.edu`.

B Center for Neural Basis of Cognition Certificate Training Program

The CNBC Training Program is an interdisciplinary PhD and postdoctoral certificate training program operated jointly with several academic departments at Carnegie Mellon and the University of Pittsburgh. Other affiliated departments at CMU are Biological Sciences, Machine Learning, Psychology, Robotics, and Statistics. Affiliated departments at the University of Pittsburgh are Mathematics, Neurobiology, Neuroscience, and Psychology.

The CNBC option for Computer Science PhD students allows them to combine intensive training in CS with a broad exposure to cognitive science, neural computation, and other disciplines that touch on problems of higher brain function.

Course of Study: CS/CNBC students are admitted through their home department (Computer Science) and fulfill the normal CS PhD program requirements. In addition, they are required to take a sequence of CNBC core courses in neurophysiology, systems neuroscience, computational neuroscience, and cognitive neuroscience. The CNBC core courses take the place of the three elective course unit requirement in CS. CS/CNBC students also participate in a research seminar series.

Completion of all degree requirements earns the student a PhD in Computer Science plus an additional certificate in the "Neural Basis of Cognition." More information about the CNBC option is available at `http://www.cnbc.cmu.edu/`.

C Dual Degree Program with Portugal

Since Fall 2007 the department also offers a dual degree program in cooperation with several Portuguese universities. The regulations are essentially the same as given in this document, except that some requirements can be fulfilled in an affiliated program in Portugal. For more information, see `https://cmuportugal.org/dual-degree-phd/`.

D Self-Defined Interdisciplinary PhD Programs

We encourage students to follow their interests and to pursue interdisciplinary contacts as appropriate for their program of research and study. The doctoral program is broad and flexible, so usually we can find ways to accommodate these interests. However, there are times when a student's research goes so far afield that an interdisciplinary PhD would be more appropriate. The department accommodates these students by allowing a self-defined interdisciplinary PhD program.

A student interested in a self-defined PhD sets it up between Computer Science and another academic department. The student must draw up a description of the area in which they wish to work and a proposed academic plan, which typically includes coursework, a description of the qualifier (if any), and how the thesis will be approved. The student then must put together a program committee consisting of faculty from both departments who will agree to oversee the student's progress through the program; this committee acts as the student's department. Finally, the program must be approved by the DRC and by the equivalent committee of the other department.

The process of setting up an interdisciplinary PhD is not easy and can easily take a year or two. The process by which an interdisciplinary PhD is created is unfamiliar to most other departments and is not well-defined by the university itself, so it may take significant effort to define an interdisciplinary degree and have it recognized in all participating departments. It is therefore in most students' interests to stay within the Computer Science program; once coursework is done, there are few limitations on a Computer Science PhD student's course of study, thereby giving the student nearly the same flexibility achievable through a self-defined program.

E Resources for Graduate Student Support

- Office of Graduate and Postdoc Affairs - https://www.cmu.edu/graduate/
  E-Mail: grad-ed@cmu.edu
- Office of the Dean of Students - http://www.cmu.edu/student-affairs/dean
- Eberly Center for Teaching Excellence & Educational Innovation - http://www.cmu.edu/teaching
  - Eberly Graduate Student Specific - http://www.cmu.edu/teaching/graduatestudentsupport/index.html
- Graduate Student Assembly (GSA) - http://www.cmu.edu/stugov/gsa/index.html
- Office of International Education (OIE) - http://www.cmu.edu/oie/
- Additional Community Resources - https://www.cmu.edu/inclusive-excellence/resources/index.html

F Key Offices for Health, Wellness & Safety

- Assistance for Individuals with Disabilities - http://www.cmu.edu/education-office/disability-resources/
- Counseling & Psychological Services - https://www.cmu.edu/counseling/
- Health Services - http://www.cmu.edu/HealthServices/
- Campus Wellness - https://www.cmu.edu/wellness/
- Religious & Spiritual Life Initiatives (RSLI) - www.cmu.edu/student-affairs/spirituality
- University Police - https://www.cmu.edu/police/
- Shuttle & Escort Service - https://www.cmu.edu/parking/shuttle/index.html

G Key Offices for Academic & Research Support

- Computing and Information Resources - http://www.cmu.edu/computing
- Student Academic Success Center - https://www.cmu.edu/student-success/
- University Libraries - https://www.library.cmu.edu
- Veterans and Military Community - http://www.cmu.edu/veterans/