COMPUTER SCIENCES, PHD

The Department of Computer Sciences offers the master of science (http://guide.wisc.edu/graduate/computer-sciences/computer-sciences-ms/) and doctor of philosophy degrees in computer sciences. Research specialty areas include artificial intelligence, computational biology, computer architecture, computer graphics, computer networks, computer security, database systems, human–computer interaction, numerical analysis, optimization, performance analysis, programming languages and compilers, systems research, and theoretical computer sciences. The department's Graduate Advising Committee (GAC) advises all computer sciences graduate students except students who are in dissertator status. See the department website (https://www.cs.wisc.edu/) for faculty interests, research activities, courses, facilities, and degree requirements.

ADMISSIONS

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet the minimum requirements (https://grad.wisc.edu/apply/requirements/) of the Graduate School as well as the program(s).** Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply/).

Requirements	Detail
Fall Deadline	December 15
Spring Deadline	The program does not admit in the spring.
Summer Deadline	The program does not admit in the summer.
GRE (Graduate Record Examinations)	Not required but may be considered if available.
English Proficiency Test	Every applicant whose native language is not English, or whose undergraduate instruction was not exclusively in English, must provide an English proficiency test score earned within two years of the anticipated term of enrollment. Refer to the Graduate School: Minimum Requirements for Admission policy: https://policy.wisc.edu/library/UW-1241 (https://policy.wisc.edu/library/UW-1241/).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

Applicants with a strong background in computer sciences or a related field are encouraged to apply for admission. At a minimum, the applicant should have some programming experience, including courses in data structures and machine organization, along with a year of college-level mathematics at the calculus level or above. For more information on admissions, visit the department website (https://www.cs.wisc.edu/graduate-admissions/).

A submitted online application (https://grad.wisc.edu/apply/) is required, consisting of:

- Resume/CV
- Statement of purpose
- Complete supplemental application sections
- Most up-to-date unofficial transcript(s) from all previous higher education institutions, regardless of whether or not a degree was earned (official transcripts are requested of only recommended applicants); international academic records must be in the original language accompanied by an official English translation.
- Test scores and three letters of recommendation as detailed above

Contact admissions@cs.wisc.edu with questions about admissions in the traditional MS or the PhD programs.

FUNDING

FUNDING
GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding/) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

PROGRAM RESOURCES

Funding is offered to about half of the students to whom admission is offered. Funding is usually in the form of fellowships, teaching assistantships, or research assistantships. Because computer science skills are in demand, students who are admitted without funding are often able to find graduate assistantships on campus. The department website (https://www.cs.wisc.edu/academics/graduate-programs/guidebook/financial-aid/) provides information on funding options and offers suggestions for those who are admitted without department funding.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS
MODE OF INSTRUCTION

Face to Face	Evening/Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement	Detail
Minimum Credit Requirement	51 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	26 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: https://policy.wisc.edu/library/UW-1244 (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/).
Other Grade Requirements	All required qualifying breadth courses must have a grade of at least AB.
Assessments and Examinations	Doctoral students must complete a qualifying process, a preliminary examination, and a dissertation requirement. The qualifying process includes both completion of "qualifying breadth courses" (see Required Courses, below) as well as satisfactory completion of a depth examination in a selected focus area. The preliminary examination is an oral examination demonstrating depth of knowledge in the area of specialization in which research for the dissertation will be conducted. The dissertation requirement consists of conducting a substantial piece of original research in computer science, reporting it in a dissertation that meets the highest standards of scholarship, and explaining and defending the contents of the dissertation in a final oral examination and defense.
Language Requirements	No language requirements.
Graduate School Breadth Requirement	All doctoral students are required to complete a doctoral minor or graduate/professional certificate. Refer to the Graduate School: Breadth Requirement in Doctoral Training policy: https://policy.wisc.edu/library/UW-1200 (https://policy.wisc.edu/library/UW-1200/).

REQUIRED COURSES

Additional Qualifying Breadth Courses Requirement

PhD students must take one course from each of the bands 1, 2, 3 and 4 listed below. Two of the four courses used to satisfy this requirement must be numbered 700 or above; the remaining two courses must be numbered 500 above. Grades in all courses used for breadth must be at least AB. COMP SCI 839 may satisfy breadth in the band declared by the course instructor at the time of course offering.

One course taken as a graduate student at another institution may satisfy breadth. A request for this must be made in writing to the faculty member designated to approve equivalence for the respective course on the breadth list. The request should indicate the corresponding UW–Madison course, include a transcript showing a grade equivalent to AB or better, a course syllabus and description.

Code	Title	Credits
Band 1		
COMP SCI/ E C E 506	Software Engineering	3
COMP SCI 536	Introduction to Programming Languages and Compilers	3
COMP SCI 537	Introduction to Operating Systems	4
COMP SCI 538	Introduction to the Theory and Design of Programming Languages	3
COMP SCI 542	Introduction to Software Security	3
COMP SCI/ E C E 552	Introduction to Computer Architecture	3
COMP SCI 640	Introduction to Computer Networks	3
COMP SCI 642	Introduction to Information Security	3
COMP SCI 701	Construction of Compilers	3
COMP SCI 703	Program Verification and Synthesis	3
COMP SCI 704	Principles of Programming Languages	3
COMP SCI 706	Analysis of Software Artifacts	3
COMP SCI/ E C E 707	Mobile and Wireless Networking	3
COMP SCI 736	Advanced Operating Systems	3
COMP SCI 739	Distributed Systems	3
COMP SCI 740	Advanced Computer Networks	3
COMP SCI 744	Big Data Systems	3
COMP SCI/ E C E 752	Advanced Computer Architecture I	3
COMP SCI/ E C E 755	VLSI Systems Design	3
COMP SCI/ E C E 757	Advanced Computer Architecture II	3
COMP SCI 758	Advanced Topics in Computer Architecture	3
COMP SCI 763	Security and Privacy for Data Science	3
COMP SCI/ E C E 782	Advanced Computer Security and Privacy	3
Band 2		
COMP SCI 534	Computational Photography	3
COMP SCI 559	Computer Graphics	3

COMP SCI 564	Database Management Systems: Design and Implementation	4
COMP SCI 565	Introduction to Data Visualization	3
COMP SCI 566	Introduction to Computer Vision	3
COMP SCI 570	Introduction to Human-Computer Interaction	3
COMP SCI 571	Building User Interfaces	3
COMP SCI/ B M I 576	Introduction to Bioinformatics	3
COMP SCI 764	Topics in Database Management Systems	3
COMP SCI 765	Data Visualization	3
COMP SCI/ E C E 766	Computer Vision	3
COMP SCI/ ED PSYCH/ PSYCH 770	Human-Computer Interaction	3
COMP SCI 774	Data Exploration, Cleaning, and Integration for Data Science	3
COMP SCI/ B M I 776	Advanced Bioinformatics	3
COMP SCI 784	Foundations of Data Management	3
Band 3		
COMP SCI/ MATH 513	Numerical Linear Algebra	3
COMP SCI/ MATH 514	Numerical Analysis	3
COMP SCI 520	Introduction to Theory of Computing	3
COMP SCI/E C E/ I SY E 524	Introduction to Optimization	3
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization	3
COMP SCI/ I SY E 526	Advanced Linear Programming	3
COMP SCI 577	Introduction to Algorithms	4
COMP SCI/ I SY E 635	Tools and Environments for Optimization	3
COMP SCI 710	Computational Complexity	3
COMP SCI/ MATH 714	Methods of Computational Mathematics I	3
COMP SCI/ MATH 715	Methods of Computational Mathematics II	3
COMP SCI/ I SY E 719	Stochastic Programming	3
COMP SCI/ I SY E 723	Dynamic Programming and Associated Topics	3
COMP SCI/I SY E/ MATH/STAT 726	Nonlinear Optimization I	3
COMP SCI/ I SY E 727	Convex Analysis	3
COMP SCI/I SY E/ MATH 728	Integer Optimization	3
COMP SCI/I SY E/ MATH 730	Nonlinear Optimization II	3
COMP SCI 787	Advanced Algorithms	3

COMP SCI 880	Topics in Theoretical Computer Science	3
Band 4		
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	3
COMP SCI/E C E/ M E 539	Introduction to Artificial Neural Networks	3
COMP SCI 540	Introduction to Artificial Intelligence	3
COMP SCI/ E C E 561	Probability and Information Theory in Machine Learning	3
COMP SCI/ E C E 760	Machine Learning	3
COMP SCI/ E C E 761	Mathematical Foundations of Machine Learning	3
COMP SCI 762	Advanced Deep Learning	3
COMP SCI 769	Advanced Natural Language Processing	3
COMP SCI/B M I 771	Learning Based Methods for Computer Vision	3
COMP SCI/E C E/ STAT 861	Theoretical Foundations of Machine Learning	3

POLICIES

GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy/) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES
PRIOR COURSEWORK
Graduate Credits Earned at Other Institutions
Subject to faculty approval, one graduate course taken elsewhere may be used for breadth. Other than that, no credits of graduate coursework from other institutions are allowed to satisfy requirements.

Undergraduate Credits Earned at Other Institutions or UW–Madison
No credits from a UW–Madison undergraduate degree are allowed to satisfy requirements.

Credits Earned as a Professional Student at UW–Madison (Law, Medicine, Pharmacy, and Veterinary careers)
Refer to the Graduate School: Transfer Credits for Prior Coursework (https://policy.wisc.edu/library/UW-1216/) policy.

Credits Earned as a University Special student at UW–Madison
Refer to the Graduate School: Transfer Credits for Prior Coursework (https://policy.wisc.edu/library/UW-1216/) policy.

PROBATION

At the end of any regular (non-summer) semester, a student is considered to be making satisfactory academic progress (SAP) if the following conditions are all satisfied:

- Before achieving dissertator status: the student has completed at least 6 (if full load) or 3 (if part load) credits of approved courses during the semester.
- After achieving dissertator status: the student has satisfactorily completed at least three credits of courses approved by the student's major professor.
- The student has removed all Incomplete grades from any previous regular semester or summer session.
- The student has passed any required exams and procedures within designated time limits.

Any graduate student who fails to make satisfactory academic progress (SAP) during two consecutive regular semesters (fall and spring, or spring and fall) will be dismissed from the department at the end of the subsequent summer session. Any graduate student who fails to make satisfactory academic progress (SAP) due to missed deadlines will be dismissed from the department at the end of the subsequent summer session.

ADVISOR / COMMITTEE

A member of the graduate advising committee must formally approve all graduate schedules each semester until a student is in dissertator status.

CREDITS PER TERM ALLOWED

15 credits

TIME LIMITS

Students must pass the qualifying process by the end of the sixth semester.

The preliminary exam must be taken within two regular (non-summer) semesters after the deadline for the qualifying exam.

Refer to the Graduate School: Time Limits (https://policy.wisc.edu/library/UW-1221/) policy.

GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (https://doso.students.wisc.edu/bias-or-hate-reporting/)
- Graduate Assistantship Policies and Procedures (https://hr.wisc.edu/policies/gapp/#grievance-procedure)
- Hostile and Intimidating Behavior Policies and Procedures (https://hr.wisc.edu/hib/)
    - Office of the Provost for Faculty and Staff Affairs (https://facstaff.provost.wisc.edu/)
- Employee Assistance (http://www.eao.wisc.edu/) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (https://employeedisabilities.wisc.edu/) (for qualified employees or applicants with disabilities to have equal employment opportunities)

- Graduate School (https://grad.wisc.edu/) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (https://compliance.wisc.edu/) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office Student Assistance and Support (OSAS) (https://osas.wisc.edu/) (for all students to seek grievance assistance and support)
- Office of Student Conduct and Community Standards (https://conduct.students.wisc.edu/) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (http://www.ombuds.wisc.edu/) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (https://compliance.wisc.edu/titleix/) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

OTHER

n/a

PROFESSIONAL DEVELOPMENT

PROFESSIONAL DEVELOPMENT
GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (https://grad.wisc.edu/pd/) to build skills, thrive academically, and launch your career.

PROGRAM RESOURCES

The Department of Computer Sciences hosts many professional development opportunities, including job fairs, workshops, seminars, talks, employer information sessions, mentoring, and student socials. The Department of Computer Sciences' student organizations, Student-ACM (SACM) and Women's ACM (WACM), are active partners in providing professional development opportunities for computer sciences graduate students.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. Articulates research problems, potentials, and limits with respect to theory, knowledge, or practice within the field of study.
2. Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of study.
3. Creates research, scholarship, or performance that makes a substantive contribution.
4. Demonstrates breadth within their learning experiences.
5. Advances contributions of the field of study to society.
6. Communicates complex ideas in a clear and understandable manner.
7. Fosters ethical and professional conduct.

PEOPLE

PEOPLE

Visit the CS website to view our department faculty (https://www.cs.wisc.edu/people/faculty/) and staff (https://www.cs.wisc.edu/people/staff/).