School of Computer Science

Tom Mitchell, Interim Dean
Guy Bielloch, Associate Dean for Undergraduate Education
Thomas Cortina, Assistant Dean for Undergraduate Education

Location: GHC 4115
www.cs.cmu.edu/undergraduate-programs (http://www.cs.cmu.edu/undergraduate-programs/)

Carnegie Mellon founded one of the first Computer Science departments in the world in 1965. As research and teaching in computing grew at a tremendous pace at Carnegie Mellon, the university formed the School of Computer Science at the end of 1988. Carnegie Mellon was one of the first universities to elevate Computer Science into its own academic college at the same level as the Mellon College of Science and the College of Engineering. Today, the School of Computer Science consists of seven departments and institutes, including the Computer Science Department that started it all, along with the Human-Computer Interaction Institute, the Institute for Software Research, the Computational Biology Department, the Language Technologies Institute, the Machine Learning Department, and the Robotics Institute. Together, these units make the School of Computer Science a world leader in research and education. Recently, the School of Computer Science launched two new undergraduate majors: Computational Biology and Artificial Intelligence. These new majors, along with the highly-researched Computer Science major, give students the School of Computer Science distinct paths in the field of computing with ample opportunities in industry and advanced research.

The School of Computer Science offers the following majors and minors:

- B.S. in Artificial Intelligence
- B.S. in Computational Biology
- B.S. in Computer Science
- Bachelor's in Computer Science and Art (joint with the College of Fine Arts)
- Additional major in Computational Biology
- Additional major in Computer Science
- Additional major in Human-Computer Interaction
- Additional major in Robotics
- Minor in Computer Science
- Minor in Computational Biology
- Minor in Human-Computer Interaction
- Minor in Language Technologies
- Minor in Machine Learning
- Minor in Neural Computation
- Minor in Robotics
- Minor in Software Engineering

Information for these majors and minors can be found through the navigation menu or through the links below:

- Artificial Intelligence (http://coursescatalog.web.cmu.edu/schools-colleges/schoolscomputerintelligence/artificialintelligence/) (B.S. degree)
- Computational Biology (http://coursescatalog.web.cmu.edu/schools-colleges/schoolscomputerintelligence/undergraduatecomputationalbiology/) (B.S. degree, additional major, minor)
- Computer Science (http://coursescatalog.web.cmu.edu/schools-colleges/schoolscomputerintelligence/undergraduatecomputerinformatics/) (B.S. degree, additional major, minor)
- SCS additional majors and minors (http://coursescatalog.web.cmu.edu/schools-colleges/schoolscomputerintelligence/addmajorsandminors/)

Students who apply to, and are directly admitted into, the School of Computer Science can choose between three primary majors: Artificial Intelligence, Computational Biology or Computer Science. Students admitted into the School of Computer Science and the College of Fine Arts are also given the option to pursue a Joint major in Computer Science and Art. Suitably prepared students from other Carnegie Mellon colleges are eligible to apply for internal transfer to the School of Computer Science (for Computational Biology or Computer Science) and will be considered for transfer if grades in specific requirements are sufficiently high and space is available. Computation-oriented programs are also available within the Mellon College of Science, the Dietrich College of Humanities and Social Sciences, the College of Engineering and the College of Fine Arts.

### Policies & Procedures

#### Academic Standards and Actions

**Grading Practices**

Grades given to record academic performance in SCS are detailed under Grading Practices at Undergraduate Academic Regulations (http://coursescatalog.web.cmu.edu/servicesandoptions/undergraduateacademicregulations/).

**Dean's List WITH HIGH HONORS**

SCS recognizes each semester those undergraduates who have earned outstanding academic records by naming them to the Dean's List with High Honors. The criterion for such recognition is a quality point average of at least 3.75 while completing a minimum of 36 factorable units and earning no incomplete grades.

**Academic Actions**

In the first year, quality point averages below 1.75 in either semester invoke an academic action. For all subsequent semesters an academic action will be taken if the semester quality point average or the cumulative quality point average (excluding the first year) is below 2.00.

**Probation:** The action of probation will be taken in the following cases based on QPA:

1. One semester of the first year is below 1.75 QPA;
2. The semester QPA of a student in good standing beyond the first year falls below 2.00.

The term of probation is one semester as a full-time student. First year students are no longer on probation at the end of the second semester if the second semester's QPA is 1.75 or above. Students in the third or subsequent semester of study are no longer on probation at the end of one semester if the semester QPA and cumulative QPA (excluding the first year) are 2.00 or above.

**Probation Continued:** A student who has had one semester on probation and is not yet meeting minimum requirements but whose record indicates that the standards are likely to be met at the end of the next semester of study is occasionally continued on probation. This action is normally taken only when a student's semester QPA is above 2.0 but their cumulative QPA is not yet above 2.0.

**Suspension:** A student who does not meet minimum standards based on QPA at the end of one semester of probation will be suspended:

1. A first year student will be suspended if the QPA from each semester is below 1.75.
2. A student on probation in the third or subsequent semester of study will be suspended if the semester QPA is below 2.00.

The minimum period of suspension is one academic year (two non-summer semesters). At the end of that period a student may return to campus (on probation) by:

1. completing a Return from Leave form from the HUB, and
2. submitting an additional written statement to the SCS Assistant Dean for Undergraduate Education, minimum one page, that outlines what the student did while on leave to address the issues that led to the suspension and that would indicate future success on return, and
3. (optional) submitting up to two letters of support from individuals supporting the student's return, and
4. written approval from the student's academic advisor and the Assistant Dean for Undergraduate Education, in consultation with the Office of Student Affairs and the Office of International Education as appropriate.

Students who have been suspended or have withdrawn are required to absent themselves from the campus (including residence halls and Greek houses) within a maximum of two days after the action and to remain off the campus for the duration of the time specified. This action includes debarment from part-time or summer courses at the university for the duration of the period of the action. Although suspended students may not hold student jobs, students on academic suspension may, under certain circumstances, have a non-student job with the university. Students on disciplinary or administrative suspension may not.
Drop: This is a permanent severance. Students who have been suspended and who fail to meet minimum standards in the semester that they return to school will be dropped.

Students who have been dropped are required to absent themselves from the campus (including residence halls and Greek houses) within a maximum of two days after the action.

Other Actions: In addition to academic actions based on QPA, the Associate Dean for Undergraduate Education may place students on probation, or subsequent suspension, if they do not demonstrate reasonable progress through the core curriculum of their major (e.g., not completing a core class after 3 attempts, not completing the required 100-level core courses by the end of the sophomore year, etc.). Students are encouraged to consult with their academic advisor about any concerns with regard to lack of progress in their chosen SCS major.

The relation indicated above between probation, suspension and drop is nominal. In unusual circumstances, SCS College Council may suspend or drop a student without prior probation.

Return from Leave of Absence

SCS undergraduate students may elect to take a leave of absence for a variety of reasons, after consultation with their academic advisor. Students returning from a leave of absence are required to submit a Return from Leave of Absence form to their academic advisor for approval by the student's academic advisor and the SCS Assistant Dean for Undergraduate Education. In addition, the student must also supply a letter that explains the reason for the leave, the actions that were performed during the leave to prepare the student for a successful return, and a description of the on-campus resources, if required, that would be used by the student in order to increase the likelihood of success. Students returning from a leave are also encouraged to provide up to two letters of support from people close to the student (e.g. family, friends, clergy, teachers, coaches, others as appropriate). Requests to return are reviewed by the student's academic advisor, the Assistant Dean and the Student Affairs liaison to determine eligibility and any resources that need to be put into place to assist the student upon return. Contact the CS Undergraduate Office for more information.

Internal Transfer

First year students admitted to SCS are considered undeclared during their first year. These students declare their SCS major in the second semester of their freshman year. SCS students who wish to transfer from one SCS major to another SCS major may do so by applying for transfer by mid-semester break during the semester the transfer is desired. These students should consult with their academic advisor and the program director of the intended major for more information about specific course requirements and academic plans. Internal SCS transfers do not have any grade requirements. Transfers are approved based on demonstrated interest, ability, and available space in the intended major.

Transfer into SCS / Dual-Degree

Undergraduate students admitted to colleges at CMU other than SCS and wishing to transfer to Computer Science or pursue a dual degree in Computer Science should consult with the SCS Assistant Dean for Undergraduate Education during their first year. Students wishing to transfer to Computational Biology or pursue a dual degree in Computational Biology should consult with the Assistant Department Head for Education in the Computational Biology Department during their first year. See the individual program pages for Computer Science (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputerscience/) and Computational Biology (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputationalbiology/) for locations.

- For the Computer Science major, students must complete 21-127 (or equivalent), 15-122, 15-150, 15-210, 15-213, 15-251 with an overall QPA of at least 3.6 or higher and an overall QPA of at least 3.0 in order to apply for transfer or dual degree.
- For the Computational Biology major, students must complete 21-127 (or equivalent), 15-122, 15-251, 15-351 (or 15-210), 03-121 and 02-250 with an overall QPA over these six courses of 3.6 or higher and an overall QPA of at least 3.0 in order to apply for transfer or dual degree. (*Students who take 15-210 will need to also take 15-150; this course is not required for the B.S. in Computational Biology but can count as an elective.)

- At this time, no transfers will be allowed into the Artificial Intelligence program for non-SCS students. Consult with the program director of the Artificial Intelligence major for any changes to this policy at the start of each academic year.

Students may apply for transfer by the mid-semester break in the semester when the last of the six required courses will be completed. In the case of courses in progress, the mid-semester grades will be used in the QPA calculation. The decision to allow transfer or dual degree will be made by committee based on the student's academic performance (in the specified courses and in their courses overall if necessary), additional involvement in SCS and other computing-related activities, and availability of space in the student's class level. Students should consult the office of the Assistant Dean for Undergraduate Education for complete information concerning minimum requirements, instructions and deadlines.

External Transfer

A student currently enrolled at another university or college who wishes to transfer to SCS should first apply through the Office of Admission. If the Office of Admission believes the applicant meets admission guidelines, the student's record is sent to SCS for evaluation. Admission is based on academic actions based on QPA, the Associate Dean for Undergraduate Education may place students on probation, or subsequent suspension, if they do not demonstrate reasonable progress through the core curriculum of their major (e.g., not completing a core class after 3 attempts, not completing the required 100-level core courses by the end of the sophomore year, etc.). Students are encouraged to consult with their academic advisor about any concerns with regard to lack of progress in their chosen SCS major.

The relation indicated above between probation, suspension and drop is nominal. In unusual circumstances, SCS College Council may suspend or drop a student without prior probation.

Graduation Requirements

1. A requirement for graduation is the completion of the program specified for a degree with a cumulative quality point average of 2.00 or higher for all courses taken after the first year.
2. Students must be recommended for a degree by the faculty of SCS.
3. A candidate for the bachelor’s degree must complete at the University a minimum of four semesters of full-time study, or the equivalent of part-time study, comprising at least 360 units of course work.
4. Students will be required to have met all financial obligations to the university before being awarded a degree.

A student who does not meet the QPA requirement above must petition SCS College Council for a waiver of the first requirement.

General Education Requirements

All undergraduate degrees in the School of Computer Science include depth in their particular field of study but also breadth through the general education requirements. General education requirements are part of SCS degrees to give students an opportunity to learn more about the world from scientific and humanistic points of view. These additional skills are useful for graduates since computing is often embedded in domains that are not entirely within the bounds of computing. SCS students will need to use their computing skills to solve problems alongside scientists and engineers, artists, social and cognitive scientists, historians, linguists, economists and business experts, and SCS students will need to communicate effectively and understand the ethical implications of their work. The general education requirements help SCS students gain this broad perspective so they can work well in a wide variety of domains.

Science and Engineering

All candidates for a B.S. degree in the School of Computer Science must complete a minimum of 36 units offered by the Mellon College of Science and/or the College of Engineering (CIT).

Computational Biology majors

For Computational Biology majors, consult the Computational Biology (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputationalbiology/) program page for specific science and engineering requirements. The required science and engineering courses for the Computational Biology major also satisfy the General Education requirement for SCS.

Artificial Intelligence and Computer Science majors


For Artificial Intelligence and Computer Science majors, four courses in science and engineering are required, 9 units or more for each course, at least one course must have a laboratory component and at least two courses must be from the same department.

Non-lab courses that can be taken by AI and CS majors to satisfy this requirement are given in the list below. (Consult your academic advisor for additional choices available each semester.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>02-223</td>
<td>Personalized Medicine: Understanding Your Own Genome</td>
</tr>
<tr>
<td>03-121</td>
<td>Modern Biology</td>
</tr>
<tr>
<td>03-125</td>
<td>Evolution</td>
</tr>
<tr>
<td>03-132</td>
<td>Basic Science to Modern Medicine</td>
</tr>
<tr>
<td>03-133</td>
<td>Neurobiology of Disease</td>
</tr>
<tr>
<td>06-100</td>
<td>Introduction to Chemical Engineering</td>
</tr>
<tr>
<td>06-221</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>09-105</td>
<td>Introduction to Modern Chemistry I</td>
</tr>
<tr>
<td>09-106</td>
<td>Modern Chemistry II</td>
</tr>
<tr>
<td>09-217</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>09-218</td>
<td>Organic Chemistry II</td>
</tr>
<tr>
<td>09-225</td>
<td>Climate Change: Chemistry, Physics and Planetary Science</td>
</tr>
<tr>
<td>12-100</td>
<td>Exploring CEE: Infrastructure and Environment in a Changing World</td>
</tr>
<tr>
<td>12-201</td>
<td>Geology</td>
</tr>
<tr>
<td>18-100</td>
<td>Introduction to Electrical and Computer Engineering</td>
</tr>
<tr>
<td>18-220</td>
<td>Electronic Devices and Analog Circuits</td>
</tr>
<tr>
<td>18-240</td>
<td>Structure and Design of Digital Systems</td>
</tr>
<tr>
<td>24-101</td>
<td>Fundamentals of Mechanical Engineering</td>
</tr>
<tr>
<td>24-231</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>24-261</td>
<td>Statics</td>
</tr>
<tr>
<td>24-351</td>
<td>Dynamics</td>
</tr>
<tr>
<td>33-114</td>
<td>Physics of Musical Sound</td>
</tr>
<tr>
<td>33-120</td>
<td>Science and Science Fiction</td>
</tr>
<tr>
<td>33-121</td>
<td>Physics I for Science Students</td>
</tr>
<tr>
<td>33-142</td>
<td>Physics II for Engineering and Physics Students</td>
</tr>
<tr>
<td>33-224</td>
<td>Stars, Galaxies and the Universe</td>
</tr>
<tr>
<td>42-101</td>
<td>Introduction to Biomedical Engineering</td>
</tr>
<tr>
<td>42-202</td>
<td>Physiology</td>
</tr>
<tr>
<td>42-341</td>
<td>Introduction to Biomechanics</td>
</tr>
<tr>
<td>85-219</td>
<td>Biological Foundations of Behavior</td>
</tr>
<tr>
<td>80-241</td>
<td>Introduction to Computer Application in Civil &amp; Environmental Engineering</td>
</tr>
<tr>
<td>18-090</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
</tr>
<tr>
<td>18-200</td>
<td>ECE Sophomore Seminar</td>
</tr>
<tr>
<td>18-202</td>
<td>Mathematical Foundations of Electrical Engineering</td>
</tr>
<tr>
<td>18-213</td>
<td>Introduction to Computer Systems</td>
</tr>
<tr>
<td>18-345</td>
<td>Introduction to Telecommunication Networks</td>
</tr>
<tr>
<td>18-411</td>
<td>Computational Techniques in Engineering</td>
</tr>
<tr>
<td>18-482</td>
<td>Telecommunications Technology and Policy for the Internet Age</td>
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<tr>
<td>18-487</td>
<td>Introduction to Computer Security</td>
</tr>
<tr>
<td>18-540</td>
<td>Rapid Prototyping of Computer Systems</td>
</tr>
<tr>
<td>19-101</td>
<td>Introduction to Engineering and Public Policy</td>
</tr>
<tr>
<td>19-211</td>
<td>Ethics and Policy Issues in Computing</td>
</tr>
<tr>
<td>19-325</td>
<td>Technology and Policy Writing for Lay Audiences</td>
</tr>
<tr>
<td>19-402</td>
<td>Telecommunications Technology and Policy for the Internet Age</td>
</tr>
<tr>
<td>19-411</td>
<td>Science and Civilization Leadership for the 21st Century: Firms, Nations, and Tech</td>
</tr>
<tr>
<td>19-432</td>
<td>Special Topics: Bitcoin and Cryptocurrencies</td>
</tr>
<tr>
<td>27-410</td>
<td>Computational Techniques in Engineering</td>
</tr>
<tr>
<td>33-100</td>
<td>Basic Experimental Physics</td>
</tr>
<tr>
<td>33-115</td>
<td>Physics for Future Presidents</td>
</tr>
<tr>
<td>33-124</td>
<td>Introduction to Astronomy</td>
</tr>
<tr>
<td>33-232</td>
<td>Mathematical Methods of Physics</td>
</tr>
<tr>
<td>42-201</td>
<td>Professional Issues in Biomedical Engineering</td>
</tr>
</tbody>
</table>

All Electrical and Computer Engineering graduate courses [18-6xx, 18-7xx, 18-8xx, 18-9xx] cannot be used for this requirement. In general, any MCS or CIT courses that are cross-listed with SCS courses or have significant mathematical or computational content cannot be used for this requirement. Consult with a CS undergraduate advisor about any course to be used for the Science and Engineering requirement before registration.

### Humanities and Arts

All candidates for a B.S. degree in the School of Computer Science must complete a minimum of 63 units offered by the College of Humanities & Social Sciences and/or the College of Fine Arts as prescribed below. Students pursuing a Bachelor’s in Computer Science and Art (http://coursecatalog.web.cmu.edu/servicesandoptions/intercollege/#bcsscurriculumtext) should consult the general education requirements for that program.

#### A. Freshman Writing Requirement (9 units)

Complete one of the following writing options for 9 units:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-101</td>
<td>Interpretation and Argument</td>
</tr>
<tr>
<td>76-102</td>
<td>Advanced First Year Writing: Special Topics (by invitation only)</td>
</tr>
</tbody>
</table>

or two of these three writing minis for 9 units total:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-106</td>
<td>Writing about Literature, Art and Culture</td>
</tr>
<tr>
<td>76-107</td>
<td>Writing about Data</td>
</tr>
<tr>
<td>76-108</td>
<td>Writing about Public Problems</td>
</tr>
</tbody>
</table>

#### B. Breadth Requirement (minimum 27 units: 9 units each)

Complete three courses, one each from Category 1, Category 2, and Category 3. Students may use two minis totaling 9 units or more to satisfy one of the categories, with permission of the Assistant Dean for Undergraduate Education, if the minis meet the goals of the desired category. NOTE: Artificial intelligence majors replace Category 1 with Category 1A: Cognitive Studies which is a subset of Category 1.

Category 1 (for Computational Biology and Computer Science majors): Cognition, Choice and Behavior - this requirement explores the process of thinking, decision making, and behavior in the context of the individual.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-311</td>
<td>Organizational Behavior</td>
</tr>
<tr>
<td>80-130</td>
<td>Introduction to Ethics</td>
</tr>
<tr>
<td>80-150</td>
<td>Nature of Reason</td>
</tr>
<tr>
<td>80-180</td>
<td>Nature of Language</td>
</tr>
<tr>
<td>80-221</td>
<td>Philosophy of Social Science</td>
</tr>
<tr>
<td>80-241</td>
<td>Ethical Judgments in Professional Life</td>
</tr>
</tbody>
</table>

Category 2:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-111</td>
<td>Computational Molecular Biology and Genomics</td>
</tr>
<tr>
<td>03-112</td>
<td>Computational Methods for Biological Modeling and Simulation</td>
</tr>
<tr>
<td>06-262</td>
<td>Mathematical Methods of Chemical Engineering</td>
</tr>
<tr>
<td>09-103</td>
<td>Atoms, Molecules and Chemical Change</td>
</tr>
<tr>
<td>09-231</td>
<td>Mathematical Methods for Chemists</td>
</tr>
</tbody>
</table>
Conflict and Dispute Resolution 9
Problems of Mind and Body: Meaning and Doing 9
Philosophy and Psychology 9
Metaphysics 9
Language and Thought 9
Introduction to Psychology 9
Cognitive Psychology 9
Human Information Processing and Artificial Intelligence 9
Principles of Child Development 9
Social Psychology 9
Personality 9
Psychopathology 9
Perception 9
Human Memory 9
Visual Cognition 9
Language and Thought 9
Reason, Passion and Cognition 9

Category 1A (for Artificial intelligence majors): Cognitive Studies - this requirement explores how the brain and the mind work.

85-211 Cognitive Psychology 9

Category 2 (all SCS majors): Economic, Political and Social Institutions - this requirement explores the processes by which institutions organize individual preferences and actions into collective outcomes.

19-101 Introduction to Engineering and Public Policy 12
36-303 Sampling, Survey and Society 9
73-332 Business, Society and Ethics 9
73-102 Principles of Microeconomics 9
73-103 Principles of Macroeconomics 9
79-245 Capitalism and Individualism in American Culture 9
79-299 From Newton to the Nuclear Bomb: History of Science, 1750-1950 9
79-300 History of American Public Policy 9
79-320 Women, Politics, and Protest 9
79-331 Body Politics: Women and Health in America 9
79-341 The Cold War in Documents and Film 9
79-383 The History of Capitalism 9
80-135 Introduction to Political Philosophy 9
80-136 Social Structure, Public Policy & Ethics 9
80-243 Ethics of Leadership 9
80-244 Environmental Ethics 9
80-245 Medical Ethics 9
80-324 Philosophy of Economics 9
80-335 Social and Political Philosophy 9
80-341 Computers, Society and Ethics 9
84-104 Decision Processes in American Political Institutions 9
84-275 Comparative Politics 9
84-310 International Political Economy 9
84-320 Global Perspectives on International Affairs 9
84-322 Nonviolent Conflict and Revolution 9
84-324 The Future of Democracy 9
84-326 Theories of International Relations 9
84-362 Diplomacy and Statecraft 9
84-380 Grand Strategy in the United States 9
84-386 The Privatization of Force 9
84-389 Terrorism and Insurgency 9
84-393 Legislative Decision Making: US Congress 6
84-402 Judicial Politics and Behavior 6
84-414 International and Subnational Security 9
88-257 Experimental Economics 9

Category 3 (all SCS majors): Cultural Analysis - this requirement seeks to recognize cultures that have shaped and continue to shape the human experience; courses in this category are usually either broad in place, time, or cultural diversity.

57-173 Survey of Western Music History 9
60-205 Critical Theory in Art III 9
62-306 Music-Cinema-Culture 9
62-371 Photography: The First 100 Years, 1839-1939 9
70-342 Managing Across Cultures 9
76-223 Books You Should Have Read By Now 9
76-227 Comedy 9
76-232 Introduction to Black Literature 9
76-239 Introduction to Film Studies 9
76-241 Introduction to Gender Studies 9
79-104 Global Histories 9
79-201 Introduction to Anthropology 9
79-202 Flesh and Spirit: Early Modern Europe, 1400-1750 9
79-223 Mexico: From the Aztec Empire to the Drug War 9
79-226 African History: Earliest Times to 1780 9
79-229 The Origins of the Palestinian-Israeli Conflict, 1880-1948 9
79-230 Arab-Israeli Conflict Since 1948 9
79-240 Development of American Culture 9
79-241 African American History: Africa to the Civil War 9
79-242 African American History: Reconstruction to the Present 9
79-261 The Last Emperors: Chinese History and Society, 1600-1900 9
79-262 Modern China: From the Birth of Mao ... to Now 9
79-265 Russian History: Tsar, Power, and Rebellion 9
79-281 Introduction to Religion 9
79-282 Europe and the World Since 1800 9
79-311 PaleoKitchen: Food and Cooking in the Ancient World 6
79-316 Photography, the First 100 Years, 1839-1939 9
79-333 Sex, Gender & Anthropology 9
79-345 Roots of Rock & Roll 9
79-350 Early Christianity 9
79-368 Un-natural Disasters: Societies and Environmental Hazards in Global Perspective 6
79-395 The Arts in Pittsburgh 9
79-396 Music and Society in 19th and 20th Century Europe and the U.S. 9
80-100 Introduction to Philosophy 9
80-250 Ancient Philosophy 9
80-251 Modern Philosophy 9
80-253 Continental Philosophy 9
80-254 Analytic Philosophy 9
80-255 Pragmatism 9
80-261 Experience, Reason, and Truth 9
80-276 Philosophy of Religion 9
82-267 Topics in Italian Language & Culture 9
82-273 Introduction to Japanese Language and Culture 9
82-293 Russian Cinema: From the Bolshevik Revolution to Putin's Russia 9
82-294 19th Century Russian Masterpieces 9
82-303 French & Francophone Cultures 9
82-304 French & Francophone Sociolinguistics 9
82-314 Literature of the Arabic-speaking World 9
82-327 The Emergence of the German Speaking World 9
82-333 Introduction to Chinese Language and Culture 9
82-342 Spain: Language and Culture 9
82-343 Latin America: Language and Culture 9
82-344 U.S. Latinos: Language and Culture 9
82-345 Introduction to Hispanic Literary and Cultural Studies 9

C. Humanities and Arts Electives (minimum 27 units)
Complete 3 non-technical courses of at least 9 units each from any of the departments in the College of Humanities & Social Sciences or the College of Fine Arts. Some of the courses taught in these units are considered
technical courses and may not be used to satisfy this requirement (see Deletions below). Additionally, a select set of courses from Business Administration and from Environmental and Public Policy can also count for this requirement (see Additions below). Students may combine humanities/arts courses with lower units together to form a single course of 9 units or more. Students are encouraged, but not required, to take courses from different departments to gain additional breadth and to create new opportunities for engagement with the university community.

The most up-to-date list of additions and deletions can be found at http://www.csd.cs.cmu.edu/content/bscs-humanities-and-arts-requirements (http://www.csd.cs.cmu.edu/content/bscs-humanities-and-arts-requirements/) and supersedes the lists given below. Consult with a CS undergraduate advisor for additional information.

Deletions

The following courses may not count toward the unconstrained electives in Humanities and Arts in SCS due to the technical (computing and/or mathematical) nature of the courses:

36-200 Reasoning with Data 9
36-202 Methods for Statistics & Data Science 9
36-207 Probability and Statistics for Business Applications 9
36-208 Regression Analysis 9
36-217 Probability Theory and Random Processes 9
36-220 Engineering Statistics and Quality Control 9
36-225 Introduction to Probability Theory 9
36-226 Introduction to Statistical Inference 9
36-247 Statistics for Lab Sciences 9
36-303 Sampling, Survey and Society 9
36-304 Biostatistics 9
36-309 Experimental Design for Behavioral & Social Sciences 9
36-314 Biostatistics 9
36-315 Statistical Graphics and Visualization 9
36-326 Mathematical Statistics (Honors) 9
36-350 Statistical Computing 9
36-401 Modern Regression 9
36-402 Advanced Methods for Data Analysis 9
36-410 Introduction to Probability Modeling 9
36-428 Time Series 6
36-459 Statistical Models of the Brain 12
36-461 Special Topics: Statistical Methods in Epidemiology 9
36-462 Special Topics: Data Mining 9
36-463 Special Topics: Multilevel and Hierarchical Models 9
36-464 Special Topics: Applied Multivariate Methods 9
36-468 Special Topics: Text Analysis 9
36-490 Undergraduate Research 9
36-492 Topic Detection and Document Clustering 6
36-494 Astrostatistics 6
51-224 CD: Web Design 9
51-257 Introduction to Computing for Creative Practices 10
51-327 Design Center: Introduction to Web Design 9
51-328 Design Center: UX for Digital Systems 9
67-211 Business Oriented Sys:History, Des & Dev-Lens of CoBOL Programming Language 6
67-240 Mobile Web Design & Development 9
67-250 The Information Systems Milieux 9
67-262 Database Design and Development 9
67-272 Application Design and Development 9
67-279 Introduction to Geographical Information Systems 6
67-306 Special Topics: Management of Computer and Information Systems 6
67-308 Innovation Studio: Health Care Information Systems 9
67-309 Special Topics: Information Assurance and Security 6
67-317 Mobile Web Development and Usability Testing 9
67-319 Global Technology Consulting Groundwork 3
67-324 Accelerating Innovation and Entrepreneurship 9
67-327 Web Application Security 6
67-328 Mobile to Cloud: Building Distributed Applications 9
67-329 Contemporary Themes in Global Systems 9
67-330 Technology Consulting in the Community 9
67-331 Technology Consulting in the Global Community 9
67-344 Organizational Intelligence in the Information Age 9
67-353 IT & Environmental Sustainability 6
67-364 Practical Data Science 9
67-373 Information Systems Consulting Project 12
67-390 Independent Study in Information Systems Var.
67-391 Independent Study in Information Systems Var.
67-440 Ideate Mobile Application Design & Development 9
67-475 Innovation in Information Systems 12
67-490 Practicum in Information Systems Var.
73-230 Intermediate Microeconomics 9
73-240 Intermediate Macroeconomics 9
73-274 Econometrics I 9
73-347 Game Theory Applications for Economics and Business 9
73-374 Econometrics II 9
76-481 Introduction to Multimedia Design 12
76-487 Web Design 12
80-110 Nature of Mathematical Reasoning 9
80-210 Logic and Proofs 9
80-211 Logic and Mathematical Inquiry 9
80-222 Measurement and Methodology 9
80-223 Causality and Probability 9
80-310 Formal Logic 9
80-311 Undecidability and Incompleteness 9
80-314 Causal Discovery, Statistics, and Machine Learning 9
80-315 Modal Logic 9
80-405 Game Theory 9
80-411 Proof Theory 9
80-413 Category Theory 9
80-521 Seminar on Formal Epistemology: Network Theory 9
85-213 Human Information Processing and Artificial Intelligence 9
85-219 Biological Foundations of Behavior 9
85-370 Perception 9
85-414 Cognitive Neuropsychology 9
88-251 Logic and Mathematical Inquiry 9
88-252 Seminar on Formal Epistemology: Network Theory 9
88-253 Seminar on Formal Epistemology: Network Theory 9
88-311 Undecidability and Incompleteness 9
88-314 Causal Discovery, Statistics, and Machine Learning 9
88-315 Modal Logic 9
88-411 Proof Theory 9
88-413 Category Theory 9
88-521 Seminar on Formal Epistemology: Network Theory 9
Additions

The following courses outside of Dietrich College and the College of Fine Arts may count toward the Humanities and Arts requirement in SCS:

17-333 Privacy Policy, Law, and Technology (formerly 08-533) 9
17-562 Law of Computer Technology 9
19-101 Introduction to Engineering and Public Policy 12
19-402 Telecommunications Technology and Policy for the Internet Age 12
19-403 Policies of Wireless Systems 12
19-411 Science and Innovation Leadership for the 21st Century: Firms, Nations, and Tech 9
32-102 Seapower and Maritime Affairs 6
32-201 Leadership & Management 9
32-402 Leadership and Ethics 9
70-160 Graphic Media Management 9
70-311 Organizational Behavior 9
70-321 Negotiation and Conflict Resolution 9
70-332 Business, Society and Ethics 9
70-340 Business Communications 9
70-341 Team Dynamics and Leadership 9
70-342 Managing Across Cultures 9
Honors Research Thesis

Students considering going on to graduate school in Computer Science or related disciplines should take a wide variety of Computer Science and Mathematics courses, as well as consider getting involved in independent research as early as possible. This would be no later than the junior year and can begin even earlier. Students interested in graduate school in computer science or its related areas are strongly encouraged to participate in the SCS Honors Undergraduate Research Thesis program. Additionally, graduate CS courses can be taken with permission of the instructor and in consultation with an academic advisor.

The goal of the SCS Honors Undergraduate Research Thesis Program is to introduce students to the breadth of tasks involved in independent research, including library work, problem formulation, experimentation, analysis, technical writing and public speaking. In particular, students write a survey paper summarizing prior results in their desired area of research, present a public poster session in December of their senior year describing their current progress, present their final results in an oral summary in the year-end university-wide Undergraduate Research Symposium (Meeting of the Minds) and submit a written thesis at the end of their senior year. Students work closely with faculty research advisors to plan and carry out their research. The SCS Honors Undergraduate Research Thesis (07-599) typically starts in the fall semester of the senior year, and spans the entire senior year. Students receive a total of 36 units of academic credit for the thesis work, 18 units per semester. Students should prepare their research prospectus (i.e. proposal of work) during the spring semester of their junior year, and students in this program are advised to plan their schedules carefully to ensure there is ample time to perform the required research for the thesis during the senior year.

Students interested in research are urged to consult with their undergraduate advisor and the SCS Assistant Dean no later than the end of their sophomore year in order to plan their workload effectively. Although there is no specific GPA requirement to participate, students are expected to have at least a 3.5 QPA in the core SCS topics relevant to their proposed research to be successful in their work. For those students with no background in research, they may consider using Research and Innovation in Computer Science (15-300, 9 units) as an introduction to the research process in their junior year since this course will introduce students to various research projects going on in the School of Computer Science and important skills that are needed to be an effective researcher. This course leads to a subsequent Research Practicum in Computer Science (15-400, 12 units) that allows students to complete a small-scale research study or experiment and present a research poster. Students who use 15-400 to start their senior thesis can use these units toward the required 36 units. Students should consult with their academic advisor concerning how the units earned toward the senior thesis can be used toward elective requirements for their major.

Interested juniors should submit a project prospectus of no more than three pages by the end of their junior year, although submissions over the summer prior to the senior year will also be considered for review. A prospectus must include:

• The name of the research advisor (an SCS faculty member)
• A short abstract (two paragraphs, max)
• A description of the problem to be worked on and its significance
• A tactical description of the proposed research plan, including:
  • a description of the background reading to be carried out;
  • a description of the research contribution,
  • a description of the expected results of the research, and
  • a reasonably detailed timeline for the thesis work
• A bibliography of related work (all references belong here)
• The signature of the research advisor, signifying endorsement of the project and willingness to supervise and evaluate it

Students who need help finding potential advisors should get in touch with the Associate Dean or Assistant Dean for Undergraduate Education. Applications to the program are due by the end of the semester prior to the start of the thesis, typically the end of the Junior Spring semester.

Students successfully completing this thesis will earn SCS College Honors and can compete for various SCS research awards given out during commencement.

Faculty

UMUT ACAR, Associate Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2012–

ANIL ADA, Associate Teaching Professor, Carnegie Mellon University – Ph.D., McGill University; Carnegie Mellon, 2014–

HENNY ADMONI, Assistant Professor, Robotics Institute – Ph.D., Yale University; Carnegie Mellon, 2017–

YUVRAJ AGARWAL, Associate Professor, Institute for Software Research – Ph.D., University of California, San Diego; Carnegie Mellon, 2013–

JONATHAN ALDRICH, Professor, Institute for Software Research – Ph.D., University Of Washington; Carnegie Mellon, 2003–

VINCENT ALEVY, Professor, Human-Computer Interaction Institute – Ph.D., University Of Pittsburgh; Carnegie Mellon, 2000–

DAVID ANDERSEN, Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2005–

JOHN ANDERSON, R.K. Mellon University Professor – Ph.D., Stanford University; Carnegie Mellon, 1978–

DIMITRIS APOSTOLOPOULOS, Senior Systems Scientist, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1989–

CHRISTOPHER ATKESON, Professor, Robotics Institute – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2000–

JAMES BAGNELL, Associate Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2004–

MARIA FLORINA BALCAN, Associate Professor, Machine Learning Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2014–

STEPHANIE BALZER, Systems Scientist, Carnegie Mellon University – Ph.D., ETH Zurich; Carnegie Mellon, 2016–

ZIV BAR-JOSEPH, Professor, Computational Biology Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2003–

MATTHEW BASS, Assistant Teaching Professor, Institute for Software Research – M.S., Carnegie Mellon University; Carnegie Mellon, 2012–

LUJO BAUER, Professor, Institute for Software Research – Ph.D., Princeton University; Carnegie Mellon, 2015–

NATHAN BECKMANN, Assistant Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2017–

TAYLOR BERG-KIRKPATRICK, Assistant Professor, Language Technologies Institute – Ph.D., University of California at Berkeley; Carnegie Mellon, 2016–

KAREN BERNTSEN, Associate Teaching Professor, Human Computer Interaction Institute – M.S., Duquesne University; Carnegie Mellon, 2005–

JEFFREY BIGHAM, Associate Professor, Human-Computer Interaction Institute – Ph.D., University of Washington; Carnegie Mellon, 2013–

ALAN BLACK, Professor, Language Technologies Institute – Ph.D., University Of Edinburgh; Carnegie Mellon, 1999–

GUY BLELLOCH, Associate Dean for Undergraduate Education and Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1988–

LENORE BLUM, Distinguished Career Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1999–

MANUEL BLUM, University Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1999–

CHRISTOPHER BOGART, Systems Scientist, Institute for Software research – Ph.D., Oregon State University; Carnegie Mellon, 1999–

DAVID BOURNE, Principal Systems Scientist, Robotics Institute – M.S., University Of Pennsylvania; Carnegie Mellon, 1980–

DANIEL BOYARSKI, Professor – M.F.A., Indiana University; Carnegie Mellon, 1982–

TRAVIS BREAUX, Associate Professor, Institute for Software Research – Ph.D., North Carolina State University; Carnegie Mellon, 2010–

STEPHEN BROOKES, Professor, Computer Science Department – Ph.D., Oxford University; Carnegie Mellon, 1981–

Randal Bryant, University Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1984–

James Callan, Professor, Language Technologies Institute – Ph.D., University Of Massachusetts; Carnegie Mellon, 1999–

Qana Cara, Assistant Professor, Computational Biology – Ph.D., Stanford University; Carnegie Mellon, 2019–

Patrick Carrington, Assistant Professor, Human Computer Interaction Institute – Ph.D., University Of Maryland; Carnegie Mellon, 2019–

Justine Cassell, Professor, Language Technologies Institute – Ph.D., University of Chicago; Carnegie Mellon, 2010–

Maijin Heile, Associate Professor, Computer Science Department – Ph.D., Delft University of Technology (Netherlands); Carnegie Mellon, 2019–

Laszlo Jeni, Systems Scientist, Robotics Institute – Ph.D., University of Tokyo; Carnegie Mellon, 2018–

Yuanzhi Li, Assistant Professor, Machine Learning Department – Ph.D., Princeton University; Carnegie Mellon, 2019–

Changliu Liu, Assistant Professor, Robotics Institute – Ph.D., University of California, Berkeley; Carnegie Mellon, 2019–

Javier Camara Moreno, Systems Scientist, Institute for Software Research – Ph.D., University of Malaga; Carnegie Mellon, 2015–

Jaime Carbonell, University Professor and Director, Language Technologies Institute – Ph.D., Yale University; Carnegie Mellon, 1979–

Kathleen Carley, Professor, Institute for Software Research – Ph.D., Harvard University; Carnegie Mellon, 1984–

Justine Cassell, Professor, Language Technologies Institute – Ph.D., University of Chicago; Carnegie Mellon, 2010–

Iliao Cervesato, Teaching Professor, Computer Science Department – Ph.D., University Of Torino; Carnegie Mellon, 2016–

Howard Choset, Professor, Robotics Institute – Ph.D., California Institute Of Technology; Carnegie Mellon, 1996–

Nicolas Christin, Associate Professor – Ph.D., University Of Virginia; Carnegie Mellon, 2017–

William Cohen, Professor, Machine Learning Department – Ph.D., Rutgers University; Carnegie Mellon, 2003–

Phillip Compeau, Assistant Teaching Professor, Computational Biology Department – Ph.D., University of California, San Diego; Carnegie Mellon, 2015–

Albert Corbett, Associate Research Professor Emeritus, Human-Computer Interaction Institute – Ph.D., University Of Oregon; Carnegie Mellon, 1983–

Thomas Cortina, Assistant Dean for Undergraduate Education and Teaching Professor, Computer Science Department – Ph.D., Polytechnic University (NYU); Carnegie Mellon, 2004–

Keenan Crane, Assistant Professor, Robotics Institute – Ph.D., California Institute of Technology; Carnegie Mellon, 2015–

Lorrin Cranor, Professor, Institute for Software Research – Ph.D., Washington University; Carnegie Mellon, 2003–

Karl Crary, Associate Professor, Computer Science Department – Ph.D., Cornell University; Carnegie Mellon, 1998–

Laura Dabbish, Associate Professor, Human Computer Interaction Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2007–

Roger Dannenberg, Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1982–

Fernando de la Torre Fraade, Associate Research Professor, Robotics Institute – Ph.D., La Salle School of Engineering; Carnegie Mellon, 2002–


Artur Dubrawski, Research Professor, Robotics Institute – Ph.D., Institute of Fundamental Technological Research; Carnegie Mellon, 2003–

David Eckhardt, Teaching Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2003–

William Eddy, Professor – Ph.D., Yale University; Carnegie Mellon, 1976–

Jeffrey Eppinger, Professor Of The Practice, Institute for Software Research – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2001–

Michael Erdmann, Professor, Robotics Institute – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1989–

MAXINE ESKENAZI, Principal Systems Scientist, Language Technologies Institute – Ph.D., University Of Paris; Carnegie Mellon, 1994–

Scott Fahlman, Professor Emeritus, Language Technologies Institute – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1978–

Christos Faloutsos, Professor, Computer Science Department – Ph.D., University Of Toronto; Carnegie Mellon, 1997–

Fei Fang, Assistant Professor, Institute for Software Research – Ph.D., University Of Southern California; Carnegie Mellon, 2017–

Jodi Forlizzi, Professor, Department Head: Human-Computer Interaction Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2000–

Kate Fragkidakis, Assistant Professor, Machine Learning Department – Ph.D., University Of Pennsylvania ; Carnegie Mellon, 2016–


Matthew Frikson, Assistant Professor, Computer Science Department – Ph.D., University of Wisconsin; Carnegie Mellon, 2015–

Carol Frieze, Director, Women@SCS and SCS4ALL, School of Computer Science – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2000–


David Garlan, Professor, Institute for Software Research – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1990–

Charles Garrod, Associate Teaching Professor, Institute for Software Research – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2012–

Anatole Gershman, Distinguished Service Professor, Language Technologies Institute – Ph.D., Yale University; Carnegie Mellon, 2007–

Hartmut Geyer, Associate Professor, Robotics Institute – Ph.D., Friedrich-Schiller University; Carnegie Mellon, 2010–

Phil Gibbons, Professor, Computer Science Department – Ph.D., University Of California at Berkeley; Carnegie Mellon, 2015–

Garth Gibson, Professor, Computer Science Department – Ph.D., University Of California; Carnegie Mellon, 1991–

Ioannis Gkioulkas, Assistant Professor, Robotics Institute – Ph.D., Harvard; Carnegie Mellon, 2017–

Clark Glymour, University Professor – Ph.D., Indiana University; Carnegie Mellon, 1985–

Mayank Goel, Assistant Professor, Institute for Software Research – Ph.D., University of Washington; Carnegie Mellon, 2016–

Seth Goldstein, Associate Professor, Computer Science Department – Ph.D., University Of California; Carnegie Mellon, 1997–

Jeffrey Gordon, Professor, Machine Learning Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2001–

Matthew Gormley, Assistant Teaching Professor, Machine Learning Department – Ph.D., John Hopkins University; Carnegie Mellon, 2015–

Vipul Goyal, Associate Professor, Computer Science Department – Ph.D., University Of California at Los Angeles; Carnegie Mellon, 2017–

Matthias Grabmaier, Systems Scientist, Language Technologies Institute – Ph.D., University Of Pittsburgh; Carnegie Mellon, 2015–

Abhinav Gupta, Associate Professor, Robotics Institute – Ph.D., University Of Maryland; Carnegie Mellon, 2011–

Anupam Gupta, FIPA, Professor, Computer Science Department – Ph.D., University Of California at Berkeley; Carnegie Mellon, 2003–

Venkatesan Guruswami, Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2009–

Bernard Haeupler, Associate Professor, Computer Science Department – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2014–

Jessica Hammond, Associate Professor, Human-Computer Interaction Institute – Ph.D., Columbia University; Carnegie Mellon, 2014–

Mor Harchol-Balter, Professor, Computer Science Department – Ph.D., University Of California at Berkeley; Carnegie Mellon, 1999–

Robert Harper, Professor, Computer Science Department – Ph.D., Cornell University; Carnegie Mellon, 1988–

Christopher Harrison, Assistant Professor, Human-Computer Interaction Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2014–
ALEXANDER HAUTPMANN, Research Professor, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1994–

MARTIAL HEBERT, Professor and Director, Robotics Institute – Ph.D., Paris-XI; Carnegie Mellon, 1984–

DAVID HELD, Assistant Professor, Robotics Institute – Ph.D., Stanford University; Carnegie Mellon, 2017–

JAMES HERBSLEB, Professor, Institute for Software Research – Ph.D., University Of Nebraska; Carnegie Mellon, 2002–

LEE HILLMAN, Executive Director of MCHI, Human-Computer Interaction Institute – M.S., Carnegie Mellon University; Carnegie Mellon, 2017–

MICHAEL HILTON, Assistant Teaching Professor, Institute for Software Research – Ph.D., Oregon State University; Carnegie Mellon, 2017–

JESSICA HODGINS, Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2001–

JAN HOFFMANN, Assistant Professor, Computer Science Department – Ph.D., Ludwig-Maximilians-Universität and TU Munich; Carnegie Mellon, 2015–

JASON HONG, Associate Professor, Human-Computer Interaction Institute – Ph.D., University Of California at Berkeley; Carnegie Mellon, 2004–

EDUARD HOVY, Research Professor, Language Technologies Institute – Ph.D., Yale University; Carnegie Mellon, 2012–

DANIEL HUBER, Senior Systems Scientist, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2002–

SCOTT HUDSON, Professor, Human-Computer Interaction Institute – Ph.D., University Of Colorado; Carnegie Mellon, 1997–

FARNAM JAHANIAN, President, Carnegie Mellon University, and Professor, Computer Science Department – Ph.D., University of Texas at Austin; Carnegie Mellon, 2014–

MICHAEL KAESS, Associate Research Professor – Ph.D., Georgia Institute of Technology; Carnegie Mellon, 2013–

TAKEO KANADE, University Professor, Robotics Institute – Ph.D., Kyoto University; Carnegie Mellon, 1980–

EUNSUK KANG, Assistant Professor, Institute for Software Research – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2017–

JOSHUA KANGAS, Assistant Teaching Professor, Computational Biology Department – PhD, Carnegie Mellon University; Carnegie Mellon, 2018–

GEORGE KANTOR, Senior Systems Scientist, Robotics Institute – Ph.D., University of Maryland; Carnegie Mellon, 2002–

CHRISTIAN KASTNER, Associate Professor, Institute for Software Research – Ph.D., University of Magdeburg; Carnegie Mellon, 2012–

GEOFF KAUFMAN, Assistant Professor, Human Computer Interaction Institute – Ph.D., Ohio State University; Carnegie Mellon, 2015–

DILSUN KAYNUR, Assistant Teaching Professor, Computer Science Department – Ph.D., University of Edinburgh; Carnegie Mellon, 2012–

ALONZO KELLY, Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1998–

SARA KIESLER, Professor Emeritus, Human Computer Interaction Institute – Ph.D., Ohio State University; Carnegie Mellon, 1979–

SEUNGJIN KIM, Systems Scientist, Human-Computer Interaction Institute – Ph.D., Gwangju Institute of Science and Technology; Carnegie Mellon, 2011–

SEYOUNG KIM, Associate Professor, Computational Biology Department – Ph.D., University of California at Irvine; Carnegie Mellon, 2010–

CARL KINGSFORD, Professor, Computational Biology Department – Ph.D., Princeton University; Carnegie Mellon, 2012–

KRIS KITANI, Associate Research Professor, Robotics Institute – Ph.D., University of Tokyo; Carnegie Mellon, 2016–

ANIKET KITTUR, Professor, Human-Computer Interaction Institute – Ph.D., University of California At Los Angeles; Carnegie Mellon, 2009–

KENNETH KOEDINGER, Professor, Human-Computer Interaction Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1991–

J. ZICO KOLTER, Associate Professor, Computer Science Department – Ph.D., Stanford University; Carnegie Mellon, 2012–

DAVID KOSBIE, Associate Teaching Professor, Computer Science Department – M.S., Carnegie Mellon University; Carnegie Mellon, 2009–

PRAVEESH KOTHARI, Assistant Professor, Computer Science Department – Ph.D., University of Texas at Austin; Carnegie Mellon, 2018–

IOANNIS KOUTIS, Adjunct Assistant Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2008–

ROBERT KRAUT, Professor Emeritus, Human-Computer Interaction Institute – Ph.D., Yale University; Carnegie Mellon, 1993–

OLIVER KROEMER, Assistant Professor, Robotics Institute – Ph.D., Technische Universität Darmstadt; Carnegie Mellon, 2017–

CHINMAY KULKARNI, Assistant Professor, Human Computer Interaction Institute – Ph.D., Stanford University; Carnegie Mellon, 2015–

CHRISTOPHER LANGMEAD, Associate Professor, Computational Biology Department – Ph.D., Dartmouth University; Carnegie Mellon, 2004–

CLAIRE LE GOUÉS, Associate Professor, Institute for Software Research – Ph.D., University of Virginia; Carnegie Mellon, 2013–

CHRISTIAN LEBIERE, Research Psychologist, Psychology – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1999–

EUN SUN LEE, Assistant Teaching Professor, Institute for Software Research – M.S., Carnegie Mellon University; Carnegie Mellon, 2014–

TAI-SING LEE, Professor, Computer Science Department – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 1996–

LORRAINE LEVIN, Research Professor, Language Technologies Institute – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1989–

MAXIM LIKACHEV, Associate Research Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2010–

SIMON LUCEY, Associate Research Professor, Robotics Institute – Ph.D., University of Southern Queensland; Carnegie Mellon, 2002–

JIAN MA, Associate Professor, Computational Biology Department – Ph.D., Pennsylvania State University ; Carnegie Mellon, 2016–

JOHN MACKEY, Teaching Professor, Computer Science Department and Mathematics Department – Ph.D., University of Hawaii; Carnegie Mellon, 2003–

MATTHEW MASON, Professor, Robotics Institute – Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1992–

ROY MAXION, Research Professor, Computer Science Department – Ph.D., University Of Colorado; Carnegie Mellon, 1984–

JAMES MCCANN, Assistant Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2017–

BRUCE MCLAREN, Associate Research Professor, Human-Computer Interaction Institute – Ph.D., University Of Pittsburgh; Carnegie Mellon, 2003–

FLORIAN METZE, Associate Research Professor, Language Technologies Institute – Ph.D., Universität Karlsruhe; Carnegie Mellon, 2009–

NATHAN MICHAEL, Assistant Research Professor, Robotics Institute – Ph.D., University of Pennsylvania; Carnegie Mellon, 2012–

GARY MILLER, Professor, Computer Science Department – Ph.D., University Of California; Carnegie Mellon, 1988–

HEATHER MILLER, Assistant Professor, Institute for Software Research – Ph.D., Ecole Polytechnique Fédérale de Lausanne; Carnegie Mellon, 2018–

EDUARDO MIRANDA, Associate Teaching Professor, Institute for Software Research - M.S./M.Eng., University of Linköping/University of Ottawa; Carnegie Mellon, 2008–

TERUKO MITAMURA, Research Professor, Language Technologies Institute – Ph.D., University Of Pittsburgh; Carnegie Mellon, 1990–

TOM MITCHELL, University Professor, Machine Learning Department – Ph.D., Stanford University; Carnegie Mellon, 1986–

STEFAN Mitsch, Systems Scientist, Computer Science Department – Ph.D., Johannes Kepler University; Carnegie Mellon, 2016–

HOSEIN MOHIMANI, Assistant Professor, Computational Biology Department – Ph.D., University of California, San Diego; Carnegie Mellon, 2017–

ALAN MONTGOMERY, Associate Professor of Marketing – Ph.D., University Of Illinois; Carnegie Mellon, 1994–

ADDISON MOORE, Dean and Professor, School of Computer Science – Ph.D., University Of Cambridge; Carnegie Mellon, 1993–

GORDON MORDATCH, Assistant Professor, Robotics Institute – Ph.D., University of Washington; Carnegie Mellon, 2017–

LOUIS-PHILIPPE MORENCY, Associate Professor, Language Technologies Institute – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2015–
JAMES MORRIS, Professor, Emeritus, Human-Computer Interaction Institute - Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 1982–

DAVID MORTENSEN, Research Scientist, Language Technologies Institute - Ph.D., University of California, Berkeley; Carnegie Mellon, 2015–

JACK MOSTOW, Research Professor Emeritus, Robotics Institute - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1992–

TODD MOWRY, Professor, Computer Science Department – Ph.D., Stanford University; Carnegie Mellon, 1997–

KATHARINA MUELLING, Systems Scientist, Robotics Institute - Ph.D., Max Planck Institute for Intelligent Systems; Carnegie Mellon, 2013–

ROBERT MURPHY, Professor and Department Head, Computational Biology Department - Ph.D., California Institute Of Technology; Carnegie Mellon, 1983–

BRAD MYERS, Professor, Human-Computer Interaction Institute - Ph.D., University Of Toronto; Carnegie Mellon, 1987–

PRIYA NARASIMHAN, Professor - Ph.D., University Of California; Carnegie Mellon, 2001–

SRINIVASA NARASIMHAN, Professor, Robotics Institute - Ph.D., Columbia University; Carnegie Mellon, 2004–

GRAHAM NEUBIG, Assistant Professor, Language Technologies Institute - Ph.D., Kyoto University; Carnegie Mellon, 2016–

CHRISTINE NEUWIRTH, Professor - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2004–

ILLAH NOURBAKHSH, Professor, Robotics Institute - Ph.D., Stanford University; Carnegie Mellon, 1997–

ERIC NYBERG, Professor, Language Technologies Institute - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1989–

RYAN O’DONNELL, Professor, Computer Science Department - Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2006–

KEMAL OFLAZER, Associate Dean of Research, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2008–

AMY OGAN, Assistant Professor, Human-Computer Interaction Institute - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2014–

DAVID O’HALLARON, Professor, Computer Science Department – Ph.D., University of Virginia; Carnegie Mellon, 1989–

IRVинг OPPENHEIM, Professor - Ph.D., University of Cambridge; Carnegie Mellon, 1973–

MATTHEW O’TOOLE, Assistant Professor, Robotics Institute and Computer Science Department - Ph.D., University of Toronto; Carnegie Mellon, 2018–

BRYAN PARNO, Associate Professor - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2017–

ANDREW PAVLO, Associate Professor, Computer Science Department - Ph.D., Brown University; Carnegie Mellon, 2013–

ADAM PERER, Assistant Research Professor, Human Computer Interaction Institute – Ph.D., University of Maryland; Carnegie Mellon, 2018–

JUERGEN PFEFER, Assistant Research Professor, Institute for Software Research - Ph.D., Vienna University of Technology; Carnegie Mellon, 2012–

ANDREAS PFENNIGN, Assistant Professor, Computational Biology Department - Ph.D., Duke University; Carnegie Mellon, 2015–

FRANK PFENNIGN, Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1986–

ANDRE PLATZER, Associate Professor, Computer Science Department - Ph.D., University of Oldenburg; Carnegie Mellon, 2008–

BARNABAS POZCOS, Associate Professor, Machine Learning Department - Ph.D., Eötvös Loránd University; Carnegie Mellon, 2012–

NANCY POLLARD, Professor, Robotics Institute - Ph.D., Massachusetts Institute Of Technology; Carnegie Mellon, 2002–

ARIEL PROCACCIA, Associate Professor, Computer Science Department – Ph.D., The Hebrew University of Jerusalem; Carnegie Mellon, 2011–

BRIAN RAILING, Assistant Teaching Professor, Computer Science Department - Ph.D., Georgia Institute of Technology; Carnegie Mellon, 2016–

BHIKSHA RAJ RAMAKRISHNAN, Professor, Language Technologies Institute - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2008–

DEVA RAMANAN, Associate Professor, Robotics Institute – Ph.D., University of California at Berkeley; Carnegie Mellon, 2015–

PRADEEP RAVIKUMAR, Associate Professor, Machine Learning Department - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2016–

RAJ REDDY, University Professor, Institute for Software Research – Ph.D., Stanford University; Carnegie Mellon, 1969–

MARGARET REID-MILLER, Assistant Teaching Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2002–

ANDREJ RISTESKI, Assistant Professor, Machine Learning Department – Ph.D., Princeton University; Carnegie Mellon, 2019–

KELLY RIVERS, Assistant Teaching Professor, Computer Science Department - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2017–

CAMERON RIVIERE, Research Professor, Robotics Institute – Ph.D., Johns Hopkins University; Carnegie Mellon, 1995–

DAVID ROOT, Associate Teaching Professor, Institute for Software Research – M.P.M., Carnegie Mellon University; Carnegie Mellon, 2002–

CAROLYN ROSE, Professor, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2003–

RONALD ROSENFELD, Professor and Department Head, Machine Learning Department - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1995–

STEPHANIE ROSENTHAL, Assistant Teaching Professor, Computer Science Department - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2019–

STEVEN RUDICH, Professor, Computer Science Department – Ph.D., University of California; Carnegie Mellon, 1989–

ALEXANDER RUDNICKY, Professor Emeritus, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1980–

NORMAN SADEH-KONIECPOL, Professor, Institute for Software Research - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1991–

MAJID SAKR, Teaching Professor, Computer Science Department – Ph.D., University of Pittsburgh; Carnegie Mellon, 2006–

RUSLAN SALAKHUTDINOV, Associate Professor, Machine Learning Department - Ph.D., University of Toronto; Carnegie Mellon, 2016–

TUOMAS SANDHOLM, Professor, Computer Science Department – Ph.D., University of Massachusetts; Carnegie Mellon, 2001–

MAHADEV SATYANARAYANAN, Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1983–

RICHARD SCHEINES, Dean, Dietrich College and Professor, Philosophy – Ph.D., University of Pittsburgh; Carnegie Mellon, 1988–

SEBASTIAN SCHERER, Associate Research Professor, Robotics Institute – Ph.D, Carnegie Mellon University; Carnegie Mellon, 2010–

WILLIAM SCHERLIS, Professor and Director, Institute for Software Research - Ph.D., Stanford University; Carnegie Mellon, 1989–

BRADLEY SCHMERL, Principal Systems Scientist, Computer Science Department – Ph.D., Fllinders University of South Australia; Carnegie Mellon, 2000–

JEFF SCHNEIDER, Research Professor, Robotics Institute – Ph.D., University of Rochester; Carnegie Mellon, 1995–

DANA SCOTT, Professor Emeritus, Computer Science Department – Ph.D., Princeton University; Carnegie Mellon, 1981–

TEDDY SEIDENFELD, Herbert A. Simon Professor - Ph.D., Columbia University; Carnegie Mellon, 1985–

SRINIVASAN SESHAN, Professor and Department Head, Computer Science Department - Ph.D., University of California; Carnegie Mellon, 2000–

NIHAR SHAH, Assistant Professor, Machine Learning Department – Ph.D., University of California at Berkeley; Carnegie Mellon, 2017–

MICHAEL SHAMOS, Teaching Professor, Language Technologies Institute and Institute for Software Research – Ph.D., Yale University; Carnegie Mellon, 1975–

MARY SHAW, University Professor, Institute for Software Research - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2016–

YASER SHEIKH, Associate Professor, Robotics Institute - Ph.D., University of Central Florida; Carnegie Mellon, 2008–

JUSTINE SHERRY, Assistant Professor, Computer Science Department – Ph.D., University of California at Berkeley; Carnegie Mellon, 2017–

HIROKAZU SHIRADO, Assistant Professor, Human Computer Interaction Institute – Ph.D., Yale University; Carnegie Mellon, 2019–

DOUGLAS SICKER, Professor, Institute for Software Research – Ph.D., University of Pittsburgh; Carnegie Mellon, 2014–

MEL SIEGEL, Associate Research Professor Emeritus, Robotics Institute – Ph.D., University of Colorado; Carnegie Mellon, 1982–

DANIEL SIEWIOREK, University Professor, Human-Computer Interaction Institute – Ph.D., Stanford University; Carnegie Mellon, 1972–

REID SIMMONS, Research Professor, Robotics Institute – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 1988–

AARTI SINGH, Associate Professor, Machine Learning Department – Ph.D., University of Wisconsin At Madison; Carnegie Mellon, 2009–

RITA SINGH, Associate Research Professor, Language Technologies Institute – Ph.D., National Geophysical Research Institute; Carnegie Mellon, 2010–

SANJIV SINGH, Research Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1994–

DANIEL SLEATOR, Professor, Computer Science Department – Ph.D., Stanford University; Carnegie Mellon, 1985–

STEPHEN SMITH, Research Professor, Robotics Institute – Ph.D., University of Pittsburgh; Carnegie Mellon, 1982–

PETER SPIRTES, Professor, Philosophy – Ph.D., University of Pittsburgh; Carnegie Mellon, 1983–

JOHN STAMPER, Assistant Professor, Human-Computer Interaction Institute – Ph.D., University of North Carolina At Charlotte; Carnegie Mellon, 2009–

RAVI STARZL, Assistant Teaching Professor, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2015–

PETER STEENKISTE, Professor, Computer Science Department – Ph.D., Stanford University; Carnegie Mellon, 1987–

MARK STEHLIK, Teaching Professor, Computer Science Department – B.S., Pace University; Carnegie Mellon, 1981–

AARON STEINFELD, Associate Research Professor, Robotics Institute – Ph.D., University of Michigan; Carnegie Mellon, 2001–

ANTHONY STENTZ, Research Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1989–

GEORGE STETTEN, Adjunct Research Professor, Robotics Institute – Ph.D., University of North Carolina; Carnegie Mellon, 1999–


KLAUS SUTNER, Teaching Professor, Computer Science – Ph.D., University of Munich; Carnegie Mellon, 1995–

KATIA SYCARA, Research Professor, Robotics Institute – Ph.D., Georgia Institute of Technology; Carnegie Mellon, 1987–

AMEET TALWALKAR, Assistant Professor, Machine Learning Department – Ph.D., New York University; Courant Institute; Carnegie Mellon, 2017–

ZEYNEP TEMEL, Assistant Professor, Robotics Institute – Ph.D., Sabanci University (Istanbul, Turkey); Carnegie Mellon, 2019–

DAVID TOURETZKY, Research Professor, Computer Science Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1984–

MATTHEW TRAVERS, Systems Scientist; Robotics Institute – Ph.D., Northwestern University; Carnegie Mellon, 2013–

YULIA TSVETKOV, Assistant Professor, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2017–

BOGDAN VASILESCU, Assistant Professor, Institute for Software Research – Ph.D., Eindhoven University of Technology; Carnegie Mellon, 2016–

MANUELA VELOSO, University Professor, Computer Science – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1992–

RASHMI VINAYAK, Assistant Professor, Computer Science Department – Ph.D., University of California at Berkeley; Carnegie Mellon, 2017–

PAT VIRTUE, Assistant Teaching Professor, Computer Science Department and Machine Learning Department – Ph.D., University of California at Berkeley; Carnegie Mellon, 2018–


HOWARD WACHTLER, Research Professor, Computer Science Department – M.S., University of Maryland; Carnegie Mellon, 1967–

ALEXANDER WAIBEL, Professor, Language Technologies Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1988–

WEINA WANG, Assistant Professor, Computer Science Department – Ph.D., Arizona State University; Carnegie Mellon, 2018–

LEILA WEHBE, Assistant Professor, Machine Learning Department – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2018–

DAVID WETTERGREEN, Research Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2000–

WILLIAM RED WHITTAKER, University Research Professor, Robotics Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1973–

WEI WU, Associate Research Professor, Computational Biology Department – Ph.D., Rutgers University; Carnegie Mellon, 2011–

POE ERIC XING, Professor, Machine Learning Department – Ph.D., University Of California At Berkeley; Carnegie Mellon, 2004–

MIN XU, Assistant Research Professor, Computational Biology Department – Ph.D., University of Southern California; Carnegie Mellon, 2016–

JEAN YANG, Assistant Professor, Computer Science Department – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2016–

Yiming Yang, Professor, Language Technologies Institute – Ph.D., Kyoto University; Carnegie Mellon, 1996–

LINING YAO, Assistant Professor, Human Computer Interaction Institute – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2017–

WENZHEN YUAN, Assistant Professor, Robotics institute – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2019–

HAIYI ZHU, Assistant Professor, Human Computer Interaction Institute – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2019–