

GRADUATE STUDY

NORTHWESTERN

ENGINEERING

Northwestern | McCORMICK SCHOOL OF
ENGINEERING

WE ARE WHOLE-BRAIN THINKERS

SEEING SIMPLICITY IN THE COMPLEX,
THE COMPLEXITY OF THE SIMPLE.

WE ARE WHOLE-BRAIN ENGINEERS,

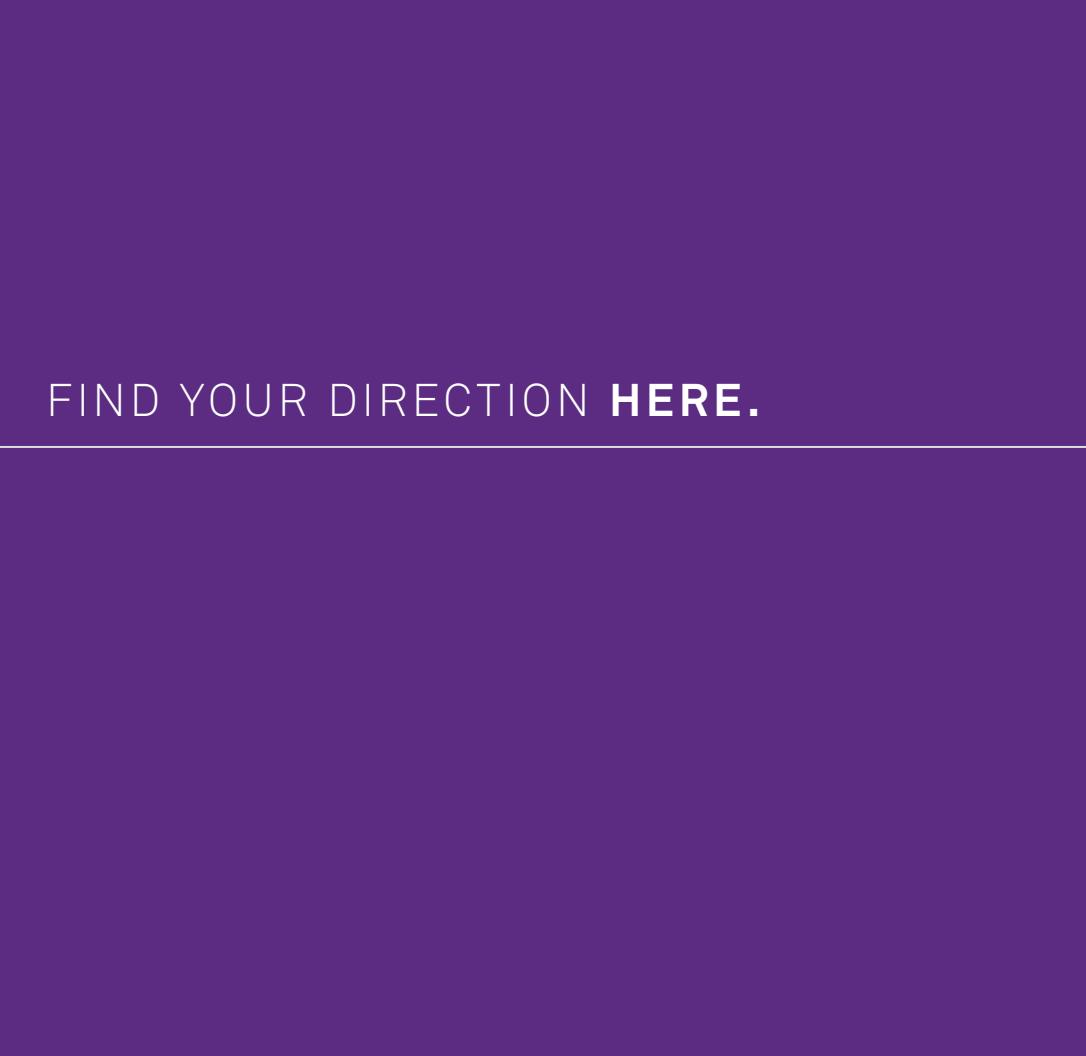
BIG-PICTURE THINKERS, REAL-TIME
COLLABORATORS, ALL-OUT INNOVATORS.



WE ARE TAKING THE WORLD IN A WHOLE NEW DIRECTION.

Driving progress through **innovation** and **leadership**.

Turning research into patented processes and
life-changing inventions. Bringing products to market
with smart **risk-taking and entrepreneurship**.



FIND YOUR DIRECTION **HERE**.



GRADUATE STUDY AT NORTHWESTERN ENGINEERING

WHOLE-BRAIN THINKING.

EMPOWERING OUR STUDENTS WITH ADVANCED ANALYTICAL AND PROBLEM-SOLVING SKILLS

Analysis. Logic. Synthesis. Math. All are elements of “left-brain” thinking, all critical to engineering success. To lead today in a world of change, engineers require more. They need “right-brain” skills. Intuition. Metaphorical thinking. Creative problem solving. At Northwestern Engineering, we celebrate whole-brain thinking and empower our students to become whole-brain engineers.

Master’s and PhD program students at Northwestern Engineering take the concept to new heights. They conduct interdisciplinary research and collaborate with peers and faculty in other highly

ranked departments and beyond. They develop leadership skills inside and outside the classroom and lab. And, they expand their career opportunities through career-focused initiatives and cross-school partnerships that expand their perspectives and strengthen business management skills.

Whatever direction our graduate students take, all develop the highly advanced analytical and problem-solving skills required to change the world for the better in material ways and to lead others to do the same.

WHOLE-BRAIN ENGINEERS.

PURSUING ADVANCED DEGREES ACROSS A WIDE RANGE OF PROGRAMS

At every level in every program of study, Northwestern Engineering students constantly advance in their development as whole-brain engineers. Graduate students choose from an array of master's and doctoral programs aligned with their career goals and personal passions. Master's degree programs—full- and part-time—are designed to meet ever-changing industry and research environments. Doctoral candidates work side-by-side with world-class faculty across disciplines researching advanced topics in engineering.

FULL-TIME MS PROGRAMS

Analytics ✕ Biomedical engineering ✕ Biotechnology ✕ Chemical and biological engineering ✕ Civil and environmental engineering ✕ Electrical engineering and computer science ✕ Engineering design and innovation ✕ Engineering management ✕ Engineering sciences and applied mathematics ✕ Information technology ✕ MMM (dual degree) ✕ Materials science and engineering ✕ Mechanical engineering ✕ Product design and development management ✕ Project management ✕ Robotics ✕ Theoretical and applied mechanics ✕

PART-TIME MS PROGRAMS

Engineering management ✕ Executive management for design and construction ✕ Information technology ✕ Product design and development management ✕ Project management ✕

In addition to the programs listed above, part-time tracks are available for most full-time MS programs.

PHD PROGRAMS

Applied physics ✕ Biomedical engineering ✕ Chemical and biological engineering ✕ Civil and environmental engineering ✕ Electrical engineering, computer engineering, and computer science ✕ Engineering sciences and applied mathematics ✕ Industrial engineering and management sciences ✕ Materials science and engineering ✕ Mechanical engineering ✕ Technology and social behavior ✕ Theoretical and applied mechanics ✕

WHATEVER DIRECTION OUR GRADUATE STUDENTS TAKE, ALL DEVELOP THE HIGHLY ADVANCED ANALYTICAL AND PROBLEM-SOLVING SKILLS REQUIRED TO CHANGE THE WORLD FOR THE BETTER IN MATERIAL WAYS AND TO LEAD OTHERS TO DO THE SAME.



RESEARCHERS AND COLLABORATORS

BREAKING BARRIERS AND CREATING THE FUTURE

Northwestern Engineering's more than 180 faculty systematically confront some of the world's most pressing and complex challenges in systems, materials, health and wellness, energy, and the environment. Our interdisciplinary collaboration is exemplified by ongoing research initiatives with more than 20 other departments in our extended Northwestern family and dozens of other universities and research centers worldwide.

While the majority of University research funding comes from government sources, corporate-sponsored research represents a growing opportunity for professors.



MAJOR CENTERS INCLUDE:

- Northwestern-Argonne Institute for Science and Engineering
- Center for Quantum Devices
- Institute for Sustainability and Energy
- International Institute for Nanotechnology
- Materials Research Science and Engineering Center
- Northwestern Institute on Complex Systems
- Segal Design Institute
- Transportation Center

CAREER-FOCUSED PROFESSIONALS

PREPARING FOR SUCCESS IN BUSINESS, INDUSTRY, AND ACADEMIA

Northwestern Engineering is committed to preparing students for successful careers as leaders and researchers in business, industry, and academia. The Engineering Career Development office identifies and works with students to secure internship opportunities and provides other career advancement services. For doctoral students, Management for Scientists and Engineers, an eight-week summer course drawn from the Kellogg School of Management core MBA curriculum, equips young researchers with the knowledge they need to become better managers and leaders.



ENTREPRENEURS AND INNOVATORS

CHANGING THE WORLD FOR THE BETTER EVERY DAY.

Northwestern Engineering students and faculty drive progress through innovation and leadership, turning research into patented processes and life-changing inventions and bringing products to market through smart risk-taking and entrepreneurship. They typically account for a lion's share of the University's inventions and faculty startups.

NORTHWESTERN ENGINEERING'S ENTREPRENEURSHIP RESOURCES:

The Farley Center for Entrepreneurship and Innovation provides incubators, mentorships, and seminars and encourages the ongoing development of new, interdisciplinary curricula.

NUvention courses engage interdisciplinary teams from across the University in the entire innovation and entrepreneurial life cycle, including how to transform innovations into viable business.

The Innovation and New Ventures Office (INVO) advises faculty and students on the development of research with commercial potential and provides seminars and educational programs on entrepreneurship and innovation.

The Garage provides an entrepreneurship space for Northwestern students to experiment, collaborate, and get their ideas built.





A COMMUNITY OF LEADERS

GAINING EXPERIENCE INSIDE AND OUTSIDE THE CLASSROOMS AND LAB

The Graduate Leadership Council helps solidify a graduate student community among the eight departments within Northwestern Engineering by organizing social, academic, and professional activities, and facilitates communication with the administration.

Students can also participate in the Graduate Student Association, department-centered student groups, and other student associations that promote interactions among graduate students, provide academic and social programs, and serve as student advocates, including:

Chicago Graduate Student Association (CGSA)

Black Graduate Student Association (BGSA)

Chinese Students and Scholars Association (CSSA)

Graduate Student Association for Latino and Spanish Activities (G-SALSA)

Indian Graduate Student and Scholars Association (IGSSA)

Queer Pride Graduate Student Association (QPGSA)

Turkish Intercultural Club

COLLEAGUES, FRIENDS, AND FAMILIES

LIVING AND LEARNING IN ONE OF THE WORLD'S MOST DYNAMIC METROPOLITAN AREAS

Stretching along the north shore of spectacular Lake Michigan, Northwestern's Evanston campus provides an environment conducive to serious scholarship and rich in rewarding opportunities for every lifestyle. Evanston boasts the amenities of a big city in a manageable suburban setting.

With downtown Chicago only 12 miles away and easily accessible by public transportation or the intercampus shuttle, Northwestern students have easy access to the wealth of professional sports, music, art, and cultural diversity that the nation's third-largest city offers. Northwestern's location also means unsurpassed access to major corporations, research centers, and other organizations eager to engage Northwestern Engineering students in experiential learning, internships, and careers.



GRADUATE APPLICATION INSTRUCTIONS FOR 2018

Northwestern Engineering has prepared this guide to help you navigate the sometimes complex application process for MS or PhD admission. You can also refer to each department's website for more information.

PHD APPLICATIONS

If your ultimate goal is a PhD degree, apply for admission to the PhD program of your choice. Please note that PhD program admission does not require an MS degree; very few of our new PhD students hold an MS degree. Also note that if you are not admitted to a PhD program, you may request admission for self-funded MS study.

MS APPLICATIONS

See below for information on departmental MS programs.

If you are interested in one of the following programs, please refer to the program's website for application instructions and deadlines:

Master of Science in Biotechnology Program (MBP) ▾
Master of Engineering Management (MEM) ▾ Master of Project Management (MPM) ▾ Master of Science in Information Technology (MSIT) ▾ The MMM Program ▾
Master of Science in Analytics (MSIA) ▾ Master of Product Design and Development Management (MPD) ▾
Master of Science in Robotics (MSR) ▾ Master of Science in Engineering Design and Innovation (EDI) ▾ Master of Science in Executive Management and Design Construction ▾



APPLICATION PROCESS AND DEADLINES

The online application websites open in September each year. See The Graduate School website for more details.

You can begin your application in early September. During the process you can save your work and then delay submission of the application and application fee until closer to the deadline.

The application deadline for most PhD programs will be December 15. The deadline for engineering sciences and applied mathematics is January 5.

MS application deadlines vary by program. Please refer to departmental and program websites for specific MS application deadlines.

SUPPORTING MATERIALS FOR APPLICATIONS

TEST SCORES

Applicants can use the ETS system to send GRE and TOEFL scores (if TOEFL is required for you) to Northwestern University (ETS code 1565).

Northwestern will accept scanned copies of score reports with the online application and verify those scores with ETS.

The minimum Internet-based TOEFL scores are 90 for PhD applicants and 80 for MS applicants in most programs. Higher TOEFL scores may be required for some MS programs. Please see departmental websites for that information. A score of 7.0 may also be used from the IELTS.

RESUME/CV AND STATEMENT OF PURPOSE

Please include your resume/CV and statement of purpose with the online application.

TRANSCRIPTS

Applicants upload unofficial transcripts with the online application.

Official transcripts will be required only for new students who enroll at Northwestern. Those will be collected in the summer months.

RECOMMENDATIONS

All recommendations should be submitted through the online process. Two or three recommendations are required depending on the program.

Please do not have your references send hard copies by mail.

ONCE YOU HAVE APPLIED

During the application process, you will work with the departmental graduate program assistant to complete your application file. You will also be able to track your status online in the application system.





ONCE YOU HAVE BEEN ADMITTED

PhD programs: Admitted PhD students have until April 15 to accept or decline the offer of admission. Those residing in the United States are invited to campus in late winter. Northwestern Engineering will help defray expenses for your travel to Evanston.

MS programs: Admitted MS students will receive specific acceptance deadline information from their department or program.

FUNDING

PhD programs: Northwestern Engineering fully funds PhD students with paid tuition, paid health insurance, and a monthly stipend. After admission, PhD applicants will receive a formal PhD funding offer letter.

MS programs: Northwestern Engineering generally does not fund MS students. To help make sure that all of our master's degree students can fund their educations regardless of personal financial circumstances, Northwestern Engineering provides opportunities for access to a variety of federal and private loan and funding options. (See end of the brochure for more financial aid information.)

NEED ASSISTANCE? HAVE A QUESTION?

Please feel free to contact the graduate program assistant for your chosen program or Bruce A. Lindvall, assistant dean for graduate studies:

Bruce A. Lindvall
2145 Sheridan Road, Suite L-261
Evanston, IL 60208-3103
Phone 847-491-4547
b-lindvall@northwestern.edu

APPLICATION CHECKLIST

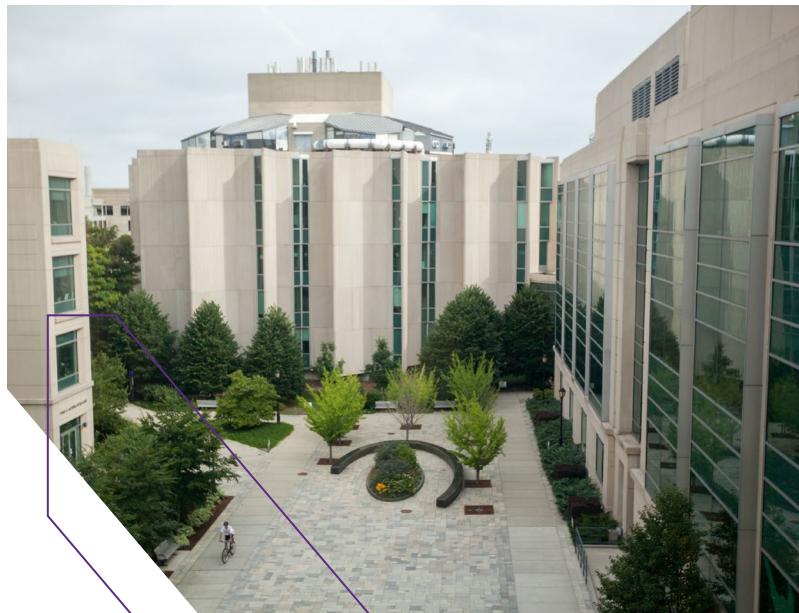
Please check with your specific program for specific instructions.

- Complete online application

INCLUDE WITH ONLINE APPLICATION

- Recommenders' contact information
- Resume/CV
- Statement of purpose
- Unofficial transcripts
- GRE scores
- TOEFL scores (if required; if English was the language of instruction at the institution where you received your bachelor's or master's degree, then the TOEFL requirement is waived.)
- IELTS scores (as an alternative to TOEFL scores)

Do not send hard copies of materials that have been submitted electronically. It slows the processing of your application.





PHD PROGRAM IN ELECTRICAL ENGINEERING & COMPUTER SCIENCE

THE DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE (EECS) offers graduate degree programs in electrical engineering, computer engineering, and computer science. The department's internationally renowned and award-winning faculty members are highly committed to students and frequently receive research grants from the National Science Foundation, the US Departments of Defense and Energy, and various industry collaborators. The department has state-of-the-art research equipment and the considerable resources of a prestigious university.



PHD PROGRAM

The EECS PhD program emphasizes excellence in education and research and provides a solid foundation for careers in industry, academia, and research labs. The program trains students in the methods of research: formulating research problems and proceeding in a logical and systematic way to find their solutions. Graduates are well-prepared for academic and professional success and become leaders in their fields.

PhD programs are offered in:

- Computer science
- Computer engineering
- Electrical engineering

ADMISSION TO CANDIDACY

PhD students must be admitted to candidacy within three academic years of starting the program, or two academic years following completion of the MS degree. Admission to candidacy requires meeting the academic requirements of one of the EECS programs of study and passing a qualifying exam for that program.

PHD PROSPECTUS

Students must have a prospectus (dissertation proposal) approved by their faculty committees no later than the beginning of the fifth year of study to remain in good academic standing.

DISSERTATION

Every candidate is required to present a dissertation indicating evidence of original and significant research. A copy of Instructions for the Preparation of Dissertations may be obtained from The Graduate School (TGS).

TEACHING TRAINEE REQUIREMENT

All full-time doctoral students in EECS must serve as either:
A teaching assistant (TA) for at least three quarters or a TA for two quarters and a teaching trainee (TT) for one quarter or a TT for two quarters

An instructor for an EECS course or approved Northwestern Engineering course for one quarter

One quarter of service as a Northwestern Engineering graduate tech tutor may be substituted for one quarter of TT. This requirement must be fulfilled before graduation.

COURSE REQUIREMENTS

Eight quarters of study are required for a PhD from The Graduate School (TGS) of Northwestern University. A student with an MS degree from Northwestern or a student with an MS degree from another university in an area relevant to the PhD degree can be granted up to six units of credit if approved by the adviser and the department. Such credits only count toward departmental requirements, not those of TGS.

Students typically take three courses per quarter, or 24 units total. Of those units, a minimum of 15 are required to be coursework. Students must take at least six units of coursework at the 400 or 500 levels. A student granted six units of credit for an MS degree must take at least nine additional units of coursework, at least three of which are at the 400 or 500 level.

EECS 590 research units make up the remainder of the units beyond courses taken by the student and credit given for prior coursework. A PhD student's division, research group, or research adviser may require more than the minimum number of courses.



PROGRAM OF STUDY

Upon receiving a PhD, a candidate should have a solid background in his or her field as preparation for a career in research or teaching. To ensure that each student receives this background, students are required to choose and complete the program of study (POS). Students entering without the prerequisite knowledge to enroll in the POS courses are required to take additional preparatory coursework.

COGNITIVE SCIENCE SPECIALIZATION

Computer science graduate students may earn a specialization in cognitive science by taking five cognitive science courses. Students have the opportunity to broaden their area of study and improve their resume by attending cognitive science events and lectures, conferences, and cross-disciplinary exchanges.

For more information on the cognitive science specialization, please visit <http://www.cogsci.northwestern.edu/graduate.php>.

AREAS OF RESEARCH EXCELLENCE

COGNITIVE SYSTEMS (COGSYS)

The cognitive systems division conducts computational research on how minds work and creates systems for education, performance support, and entertainment that exploit principles of cognitive science and artificial intelligence. Research areas include:

Agent-based modeling ▾ Analogical reasoning and learning ▾
Auditory user interfaces ▾ Autonomous agents for
interactive entertainment ▾ Case-based reasoning and instruction ▾
Cognitive simulation ▾ Design thinking ▾
Embodied conversational agents ▾
Human-computer interaction ▾ Intelligent information systems ▾
Intelligent user interfaces ▾ Qualitative reasoning ▾
Learning by reading ▾ Music cognition ▾
Natural language processing ▾ Sketch understanding ▾
Spatial reasoning and learning ▾ Web-scale knowledge harvesting ▾

FACULTY

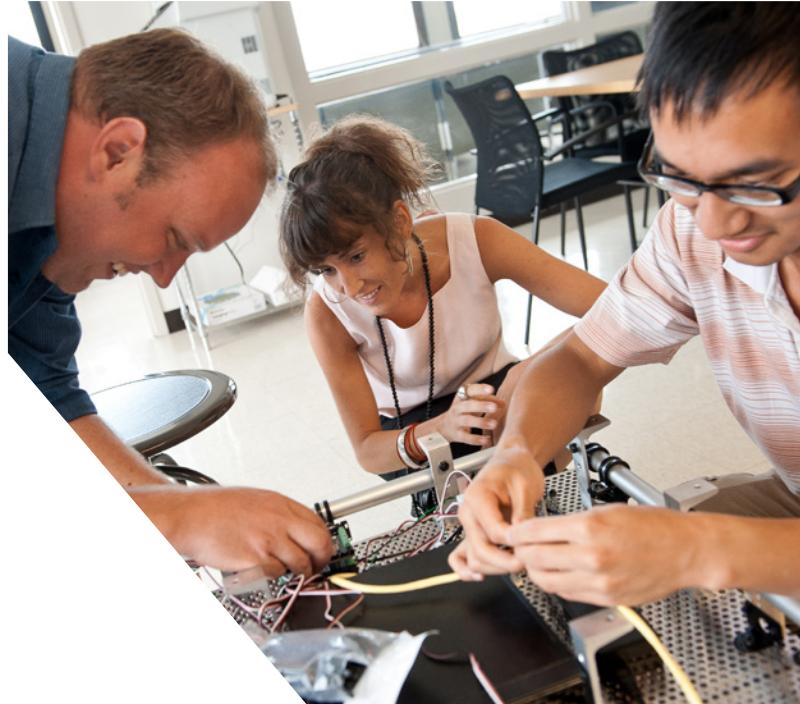
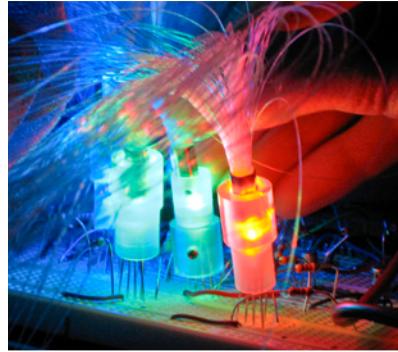
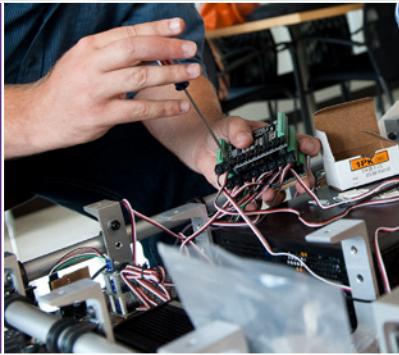
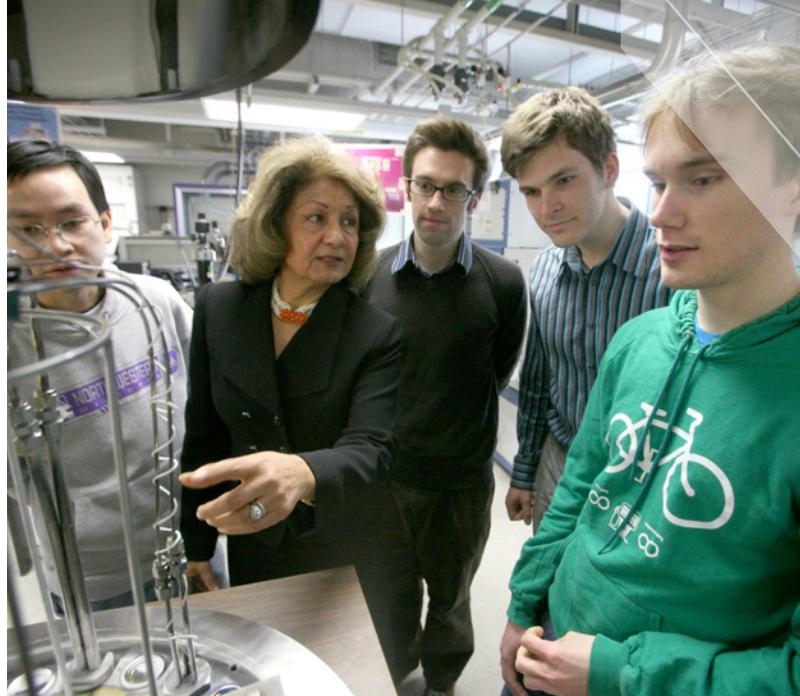
Ken Forbus (division head) ▾ Brenna Argall ▾ Larry Birnbaum ▾
Douglas Downey ▾ Kristian Hammond ▾ Lawrence Henschel ▾
Michael Horn ▾ Ian Horwill ▾ Bryan Pardo ▾ Christopher Riesbeck ▾
Uri Wilensky ▾ Haoqi Zhang ▾

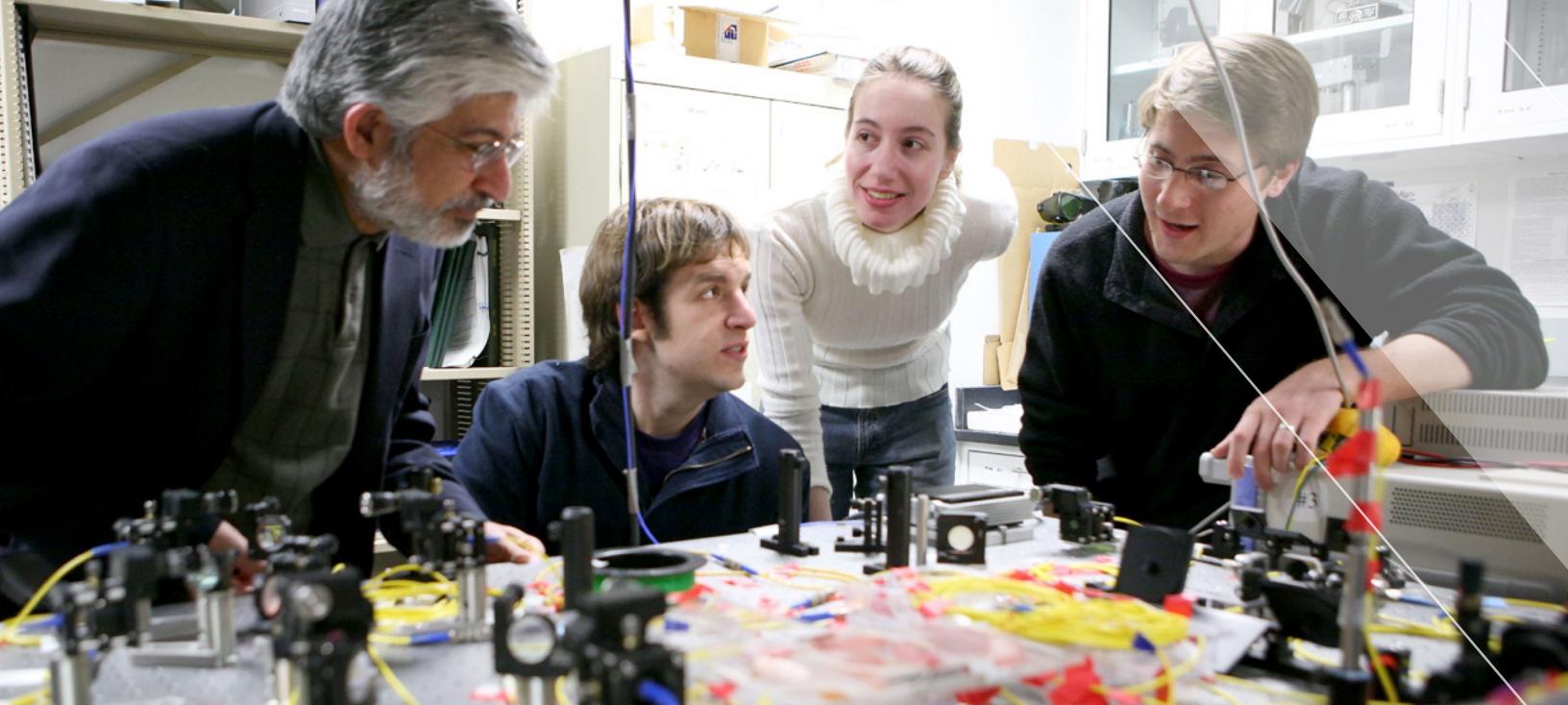
COMPUTER ENGINEERING

Areas of study in computer engineering and systems fall into five main categories:

Analysis and design of integrated circuits ▾ Computer Aided Design, design verification, integrated circuit synthesis, physical design of integrated circuits, analog and mixed signal circuits

Computer architecture ▾ Application-specific programmable processors, power-aware microarchitectures, reconfigurable architectures, and reliable high-performance processor design





High-performance and parallel computing \ Compilers and applications, high-performance storage and parallel I/O, and ultra-scale architectures and software

Embedded systems \ Embedded system synthesis; mobile, wireless, and ubiquitous computing; operating systems; and power optimization

Data management and analysis \ Data mining and knowledge discovery

FACULTY

Gokhan Memik (division head) \ Alok Choudary \ Nikos Hardavellas \ Russ Joseph \ Seda Ogrenci Memik \ Morteza Rahimi \ Alan Sahakian \ Goce Trajcevski \ Chi-Haur Wu \ Hai Zhou \

COMPUTING, ALGORITHMS & APPLICATIONS (CAA)

The CAA division focuses on algorithms, theory, applications, and software and hardware implementation. Algorithmic research focuses on continuous and discrete optimization, game theory, database algorithms, networking, and VLSI CAD. Theoretical analysis centers on complexity, well-posedness, and convergence rates. Applications fall into three main categories:

Computational economics, social networks, and computational finance

Bioinformatics, self-assembly, weather and climate modeling, electrical power networks, and medical imaging

Computer science/engineering applications such as security, networking, integrated circuits, and database systems

The division produces both public domain and commercial software for optimization, and validates algorithms for networking, security, and VLSI using hardware implementations. A unifying theme in

the division is the use of advanced mathematical analysis and algorithmic thinking to explore novel applications in science, economics, and engineering.

FACULTY

Ming Kao (division head) \ Yan Chen \ Jason Hartline \ Peter Scheuermann \ Allen Taflove \ Hai Zhou \

GRAPHICS & INTERACTIVE MEDIA (GIM)

GIM is an interdisciplinary group involved in the human-centered design of computational media systems. GIM brings faculty from computer science, communication science, design, learning sciences, psychology, and radio, television, and film to study not only the machine itself but also human users and their closed-loop interactions with the machine. Students combine computer science with theoretical and experimental techniques from the behavioral sciences and the arts to build systems with more effective closed-loop behavior. Areas of study include:

Audio processing \ Musical and linguistic prosody, sound source separation, audio search engines

Computer graphics \ Computational photography, procedural animation and motion synthesis, human and machine perception, digital archiving

Design and human-computer interaction (HCI) \ computer-supported cooperative work (CSCW), computer-mediated communication (CMC), computer-supported learning environments

Interactive art and entertainment systems \ Game design, interactive narrative, character modeling

Virtual humanoids and embodied conversational agents (ECAs) \ Gesture and non-verbal communication, behavioral modeling, social modeling, simulation, and understanding of emotion

FACULTY

Ian Horswill (division head) \ Larry Birnbaum \ Oliver Cossairt \ Kristian Hammond \ Aggelos Katsaggelos \ Bryan Pardo \ Jack Tumblin \ Uri Wilensky

SIGNALS & SYSTEMS (SIGSYS)

Networks, communication, and control focus on communications, telecommunications and communication networks, and control theory. Specific areas of study include mobile wireless multi-user communication, estimation and detection, wireless networks, resource allocation in communication networks, data network protocol design, network performance modeling and analysis, nonlinear and robust control, and stochastic hybrid systems.

Signal processing focuses on the digital representation and algorithmic manipulation of speech, audio, tactile, image, and video signals. Specific topics within this general area include image and video processing; recovery and compression; multimedia signal processing; computer vision; perceptual models for visual, acoustic, and tactile signal analysis; filter design and rank-order operators; image and video transmission; medical and biomedical signal processing; medical imaging; and algorithms for medical instrumentation.

FACULTY

Alan Sahakian (division head) \ Brenna Argall \ Randy Berry \ Arthur Butz \ Randy Freeman \ Dongning Guo \ Abraham Haddad \ Michael Honig \ Aggelos Katsaggelos \ CC Lee \ Wei-Chung Lin \ Thrasos Pappas \ Jack Tumblin \ Chi-Haur Wu \ Ying Wu \ Horace Yuen \

SOLID STATE AND PHOTONICS (SSP)

Solid-state engineering focuses primarily on the science and technology of semiconductors for quantum structures and devices operating from the ultraviolet up to far infrared. Quantum devices are fabricated using the most advanced semiconductor synthesis technologies (MOCVD, MBE, gas source MBE, etc.), as well as micro-fabrication techniques (high-precision photolithography, e-beam evaporation, RTA, reactive-ion etching, etc.). They are fully tested at each step in the fabrication process using advanced characterization techniques (diffraction, SEM, TEM, photoluminescence, Hall, etc.). Most SSP research is performed within the Center for Quantum Devices in a “clean room” environment similar to those found in industry.

Quantum devices are in high demand for modern applications. Ultraviolet lasers and photodetectors are used in astronomy, space communications, and the monitoring of engines and heat sources. Red, green, and blue (RGB) solid-state lasers are needed for high brightness full-color displays and optical data storage (CD, DVD). High power 0.808 μm, 0.98 μm, 1.3 μm, and 1.5 μm lasers and VCSELs are required for medical applications and fiber optical communications. Infrared lasers (e.g., Quantum Cascade lasers), photodetectors (e.g., QWIP), and focal-plane-arrays (FPA) are needed for chemical analysis and night vision.

Optical systems and technology focus on microcavity lasers, nanostructures, quantum and nonlinear optics, integrated optics, fiber optic and infrared waveguide devices, fiber optic communications, computational electromagnetics, and imaging through turbulence. Special emphases include applications of novel quantum amplifiers in optical communications, imaging, and cryptography; devices for terabit per second WDM and TDM optical networks; and applications of computational techniques in integrated and nonlinear optics.

FACULTY

Selim Shahriar (division head) \ Koray Aydin \ Matthew Grayson \ Seng-Tiong Ho \ Prem Kumar \ Chang Liu \ Hooman Mohseni \ Manijeh Razeghi \ Horace Yuen \

SYSTEMS

Areas of study in computer engineering and systems fall into four main categories:

Programming language design and implementation

Data management and analysis \ Data mining and knowledge discovery, moving objects databases, parallel and distributed database systems, and physical database design

Security \ Network security, secure architectures, and secure software

Distributed systems and networks \ Autonomic computing; network measurement and performance analysis; network protocols and security; peer-to-peer and overlay networks; resource virtualization; and wireless, ad-hoc, and sensor networks

FACULTY

Fabian Bustamante \ Yan Chen \ Peter Dinda \ Jennie Dugga \ Robby Findler \ Aleksandar Kuzmanovic \ Peter Scheuerman \ Goce Trajcevski \





PHD PROGRAM IN TECHNOLOGY & SOCIAL BEHAVIOR

THE TECHNOLOGY AND SOCIAL BEHAVIOR (TSB) PhD is a joint degree program in computer science and communication studies offered by Northwestern Engineering and the Northwestern University School of Communication. It prepares graduate students to integrate several disciplines of technology and social behavior to ensure their success in research careers in business and academia.



PHD PROGRAM

The TSB doctoral program rigorously educates students from a variety of backgrounds in the humanities, social sciences, human-computer interaction, and computer science methodologies. Students gain an understanding and participate in technological developments in their broadest possible contexts. They study human behavior and computer technology; design and implement new technologies; incorporate the results of empirical research into these technologies; and prepare for a wide range of academic and industrial careers in fields such as computer science, information systems (or informatics), information technology, library and information sciences, new media, communications, learning sciences, and cognitive science.

STRONG SUPPORT FOR INTERDISCIPLINARY RESEARCH

TSB faculty think about problems from multiple points of view and offer multi-method training that helps students produce better research and understand the work of future colleagues who will likely come from a range of disciplinary traditions.

OPPORTUNITIES FOR COLLABORATIVE RESEARCH

Northwestern University's strong support for cross-disciplinary graduate education complements the TSB approach. Faculty members regularly carry out research and co-author publications with graduate students. Northwestern University also prides itself on its ability to foster and support collaborations across departments, and many students work with faculty and enroll in courses outside their departments.

SUPPORT FOR STUDENT INITIATIVES

TSB provides financial support for student initiatives such as speaker series, conferences, and online resources. It also offers generous financial assistance to help students attend conferences to further their academic growth.

OPPORTUNITIES TO EXPAND RESEARCH

Students in the TSB doctoral program have the opportunity to spend summers conducting research on the Evanston campus or completing internships in industry research labs at companies like IBM, Google, Adobe, FXPal, and Microsoft Research. Students also have numerous opportunities to explore their research interests beyond the Northwestern campus in seminars, workshops, and archival collections at area institutions including the Newberry Library, the Art Institute of Chicago, the University of Chicago, and Argonne National Laboratory. In addition, a number of industrial research labs are located nearby.



PROGRAM REQUIREMENTS

The curriculum for the TSB joint degree program is rigorous, combining requirements from the electrical engineering and computer science PhD program at Northwestern Engineering and from the Media, Technology, and Society (MTS) PhD program in the School of Communication.

COURSE REQUIREMENTS

Key goals of the TSB doctoral program are critical evaluation of disciplinary perspectives and integration of disciplinary methodologies. Required courses provide practice in research methods along with theoretical, historical, psychological, and sociological perspectives on technology. Since degree requirements are flexible, students can expect to engage in hands-on research starting in their first year.

Students are encouraged to create a course sequence that best supports their research, dissertation, and teaching plans. Each student is assigned to a temporary adviser who helps create a course of study that approaches a single theme within technology and social behavior from multiple disciplines. The adviser also helps design a research plan that incorporates course requirements from both Northwestern Engineering and the School of Communication.

EXAMINATIONS

Students in the joint PhD program must complete a portion of the qualifying exam in both computer science and communication studies. Exams must be completed before the beginning of the student's fourth year in the program.

DISSERTATION

Theses in computer science require implementation and theoretical analysis of a computer system in a technical research context; theses in communication require either empirical or archival evidence for a well-developed argument. PhD theses in TSB comprise two parts that are not often found together—an implementation and a hypothesis about how the implemented system affects social behavior, with an empirical evaluation of that hypothesis.

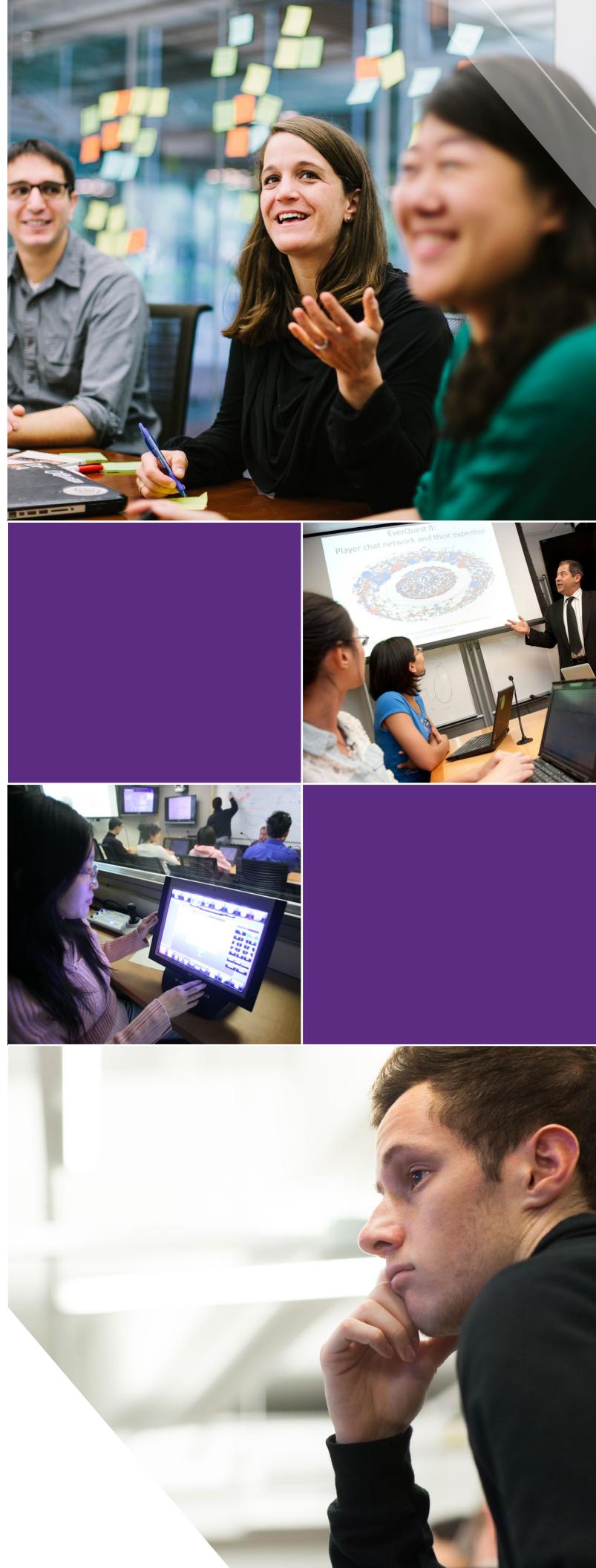
In order to ensure that the PhD thesis represents joint competence in computer science and communication, the thesis committee must be composed of four faculty members, of whom two are in communication and two are in computer science. Three of the committee members must be faculty at Northwestern University. All four committee members must judge the thesis acceptable.

TSB RESEARCH EXAMPLES

PhD students can join faculty from across the Northwestern campus in the study of topics as timely and innovative as:

The digital divide from sociological, policy, and engineering perspectives

Designing interactive technologies for children and understanding their effects on children's development



History of information and communication technologies

Designing cars that communicate with their drivers more naturally

Trust development in computer-mediated environments such as chat rooms

Technologies to support distance collaboration

Cell phones that can “name that tune”

Psychology of virtual humans

Non-player characters in massively multiplayer online role-playing games (MMORPGs) that gossip

Self-generating music videos

Technology use in global perspective

Language and behavior in online communities

Genre and interactivity in video games

Mind and society in the information age

Crowdfunding approaches to support creativity and innovation

Mining cultural diversity and developing culturally aware technologies

Developing natural user interfaces for collaboration and learning

FACULTY

Larry Birnbaum ✎ Jeremy Birnholtz ✎ Pablo Boczkowski ✎
Fabian Bustamante ✎ Noshir Contractor ✎ Leslie DeChurch ✎
Nick Diakopoulos ✎ Peter Dinda ✎ Doug Downey ✎
Matthew Easterday ✎ Ken Forbus ✎ Steve Franconeri ✎
Elizabeth Gerber ✎ Darren Gergle ✎ Kris Hammond ✎
Jason Hartline ✎ Brent Hecht ✎ Michael S. Horn ✎ Ian Horswill ✎
Sid Horton ✎ Ágnes Horvát ✎ Aggelos Katsaggelos ✎
Barbara O’Keefe ✎ Eleanor O’Rouke ✎ Bryan Pardo ✎
Anne Marie Piper ✎ Madhu Reddy ✎ Chris Riesbeck ✎
Michael Roloff ✎ James Schwoch ✎ Aaron Shaw ✎
Jack Tumblin ✎ Ellen Wartella ✎ Uri Wilensky ✎ Haoqi Zhang ✎





FINANCIAL AID FOR PHD PROGRAM STUDENTS

The Graduate School of Northwestern University and the McCormick School of Engineering provide incoming PhD students with full funding, including paid tuition, paid health insurance, and a monthly stipend for living expenses. Monthly stipends start at approximately \$2,500.

The Graduate School administers fellowships, scholarships, and graduate assistantships.

Academic programs determine the fellowship and scholarship awardees and recommend the awarding of graduate assistantships.

Principal investigators and/or academic programs award research assistantships to students later in graduate study.

ELIGIBILITY FOR FINANCIAL AID

To be eligible for all forms of financial aid, graduate students must remain in good academic standing and demonstrate satisfactory progress toward their respective degrees. In general, to be in good academic standing in The Graduate School, students must meet the standards set by the academic program and The Graduate School and make satisfactory progress toward fulfilling all stated requirements for the degree.

A student whose overall grade average is below B, who has more than one incomplete grade, or who otherwise fails to make progress toward the degree in accordance with the requirements adopted by the graduate faculty is not considered in good standing. For complete information regarding satisfactory academic progress, please see the student services pages of The Graduate School website.

RESEARCH FUNDING

Northwestern Engineering strongly encourages graduate students to seek external funding for their research. External grants fill two vital functions:

They supplement or extend doctoral students' funding to finance research that often forms the basis of the dissertation, sometimes for much of a scholar's ensuing career.

Awards, particularly highly competitive, prestigious grants, demonstrate to prospective employers that a student is a serious scholar and a potentially valuable member of the academic and/or research community.

For more information, see the external funding website.

FELLOWSHIPS

RYAN FELLOWSHIPS

Ryan Fellowships support outstanding students of nanoscale science in the United States, providing them with education and experience to assume leadership roles in nanotechnology.

WALTER P. MURPHY AND CABELL FELLOWSHIPS

These fellowships are designated for PhD students in the McCormick School of Engineering and are awarded to first-year PhD students.

DATA SCIENCE FELLOWSHIPS

Data Science Fellowships are intended to provide students with education and experience to assume leadership roles in the realm of data science.

OTHER FUNDING OPPORTUNITIES

CONFERENCE TRAVEL GRANTS

Conference Travel Grants are available on an annual basis to PhD students beyond their first year of graduate study at Northwestern. The grants provide funds to assist PhD students traveling to conferences and/or seminars to make presentations on behalf of the University. The award is not designed to support attending classes at other institutions, general education, or research travel.

EXTERNAL FELLOWSHIPS

Students are encouraged to contact the Office of Fellowships, which has staff on hand to assist students in their endeavor to secure outside funds.

The Office of Fellowships maintains a graduate fellowships website to serve graduate fellowship seekers and applicants. This site identifies external fellowships that students in each Northwestern graduate department have won in the past. There are also listings for diversity-based fellowships, awards available to international students, and links to selected national fellowships databases. The graduate fellowships calendar provides month-by-month deadlines for external award competitions.

The Office of Fellowships also publishes an e-newsletter for seekers of external fellowships (twice per quarter and once in the summer). The newsletter provides profiles of Northwestern students who succeeded in previous award competitions, tips for writing outstanding grant applications, and descriptions of select fellowship opportunities. Archived editions of the newsletter are also available on the website.

If you have questions about external fellowships or the above resources, please contact the Office of Fellowships.



STUDENT LOANS

Student loans are available to help finance the cost of education. The amount borrowed must be for educational expenses and cannot exceed (including all other sources of aid) the cost of attendance for the loan period. The loan period is the term for which the funds are being borrowed. The student must be enrolled at least half time during the loan period to be considered for federal student loans. For more information, see our [student loans website](#).

GRADUATE ASSISTANTSHIPS

Many PhD students at Northwestern University will serve as graduate assistants during their academic careers. A graduate assistantship provides a monthly stipend and is accompanied by a tuition scholarship. Graduate assistants may serve either as teaching assistants or as research assistants.

Teaching assistants may serve as graders for a course, lead discussion sections as part of a larger lecture course, or instruct their class sections.

Research assistants or trainees will work in a lab or conduct other types of investigative research for their primary investigator.

The academic programs recommend all assistantship appointments to The Graduate School.

Every graduate assistant in The Graduate School must meet the eligibility requirements set for all students receiving financial assistance. In addition, students receiving an assistantship must:

Inform The Graduate School of other sources of support such as traineeships, teaching assistantships, research assistantships, School of Professional Studies teaching, or other fellowships.

In cases where alternative funding is available, make arrangements to integrate this funding with The Graduate School award.

Refrain from remunerative work (other than teaching or research directly related to their assistantships) unless a written request for a waiver is approved by The Graduate School after a thorough review of the circumstances.

CROWN FAMILY INTERNSHIP

This elective program permits doctoral candidates to gain practical experience in industry or at national laboratories in areas closely related to their research. These internships can provide impetus for the intern's thesis and may provide future employment.

The experience is best suited for the middle-to-latter stages (e.g., third year) of PhD study. The three- or six-month, full-time internship is generally a paid position. Proper placement is determined by the student's PhD adviser and the senior associate dean for graduate studies and research.





The performance of interns will be evaluated by their sponsors and forwarded to the senior associate dean. Eight quarters of residency tuition will still be required even though the sequence will be interrupted. However, it is expected that this experience will not require additional time to complete degree requirements. Interns should have progressed to the level of candidacy, but candidacy is not required.

ELIGIBILITY

The program is open to all Northwestern Engineering doctoral students. International students may participate by using part or all of their curricular practical traineeship visa during the internship. However, the total term of work experience (pre-graduation internship plus post-graduation work) may not exceed one year. Participants in this program register for a non-credit, non-tuition-bearing course. This registration allows health benefits to be maintained (if the student desires them and pays the appropriate fees), permits loans to be deferred, and provides evidence of the internship on transcripts. Up to three registrations of the course are allowed, but no more than two registrations may be consecutive.

APPLICATION PROCESS

Interested current students should complete the application form, obtain their adviser's approval and signature, and submit it with a resumé to the Office of the Senior Associate Dean in room L254 of the Technological Institute. The Office of Career Development can help applicants prepare a resumé and develop interview skills. Please be aware that the dean will require a brief evaluation (three to five sentences) from the intern's supervisor during the internship before assigning a grade.

