School of Behavioral and Brain Sciences Program

Master of Science Program in Applied Cognition and Neuroscience Program

Faculty


Associate Professors: Francesca Filbey, Daniel Krawczyk, Mandy J. Maguire, Christa K. McIntyre, Bart Rypma, Lucien (Tres) Thompson

Assistant Professors: Chandramallika Basak, Cindy M. De Frias, Kristen Kennedy, Sven Kröener, Jonathan E. Ploski, Karen Rodrigue, Noah J. Sasson, Gagan Wig

Distinguished Scholar in Residence: James F. Jerger

Objectives

The Master of Science in Applied Cognition and Neuroscience (ACN) program is an applied multidisciplinary program that incorporates and integrates methodologies from such diverse fields as psychology, neuroscience, computer science, and philosophy. The Neuroscience specialization area enables students to focus on the brain from a variety of perspectives including systems, cellular, and molecular-level approaches with the objective of understanding the interactions of these systems and how they underlie the emergence and diversity of behavior. The Cognition specialization area provides students with training in the area of experimental cognitive psychology, which exploits experimental psychology methods to develop and test information processing theories of human behavior, including perception, learning, memory, thinking, and language. The Cognition and Neuroscience specialization area provides a flexible multidisciplinary curriculum for studying the mind and brain that strategically incorporates features of both the Cognition specialization area and the Neuroscience specialization area. Students enrolling in the Cognition and Neuroscience specialization area learn to use behavioral research methods in conjunction with neuroscience research methods to investigate the neural foundations of cognitive processes. The Computational Modeling/Intelligent Systems specialization area provides advanced training applicable to mathematical and computer simulation models of the brain and behavior as well as the design, development, and evaluation of artificially intelligent systems. The Human-Computer Interaction specialization area provides preparation for work in areas involving human-computer interactions. These areas include usability engineering and user-experience design issues associated with the design, development, and evaluation of user-friendly human-computer interactions.
interfaces. The *Neurological Diagnosis and Monitoring specialization area* provides advanced training for using functional brain imaging methodologies such as: EEG, SPECT, PET, and fMRI for both clinical and experimental investigations. It also provides training for career paths in the field of Intraoperative Neurophysiological Monitoring. Furthermore, all six specialization areas provide excellent preparation for doctoral work in the Cognition and Neuroscience area as well as medical school.

### Career Opportunities

The Masters of Science in Applied Cognition and Neuroscience (ACN) provides advanced training opportunities in the areas of Neuroscience, Experimental Psychology, Artificial Intelligence, and Human-Computer Interactions. In addition, the ACN program is a multidisciplinary program that should be of interest to business professionals working full-time in a professional-level job who are interested in either a career change or continuing education. Many courses in the ACN program are offered periodically as evening courses that meet either once or twice a week. A few representative career opportunities in the Applied Cognition and Neuroscience Area are listed as follows.

- **Software development and engineering professionals** interested in pursuing careers in the areas of usability engineering and user-experience (UX) design and development will greatly benefit from the *Human-Computer Interactions specialization area*. Usability engineering and user-experience design involve the evaluation and design of human-computer interfaces such as: website and software graphical user interfaces (GUIs), smartphone interfaces, and voice-user interfaces (VUIs).

- **Psychological counselors and education professionals** (e.g., high school science teachers, adult literacy educators) will greatly benefit from the basic neuroscience and psychological science courses offered in the *Cognition and Neuroscience specialization area*.

- **Medical health professionals** (e.g., Electroneurodiagnostic Technologists, MRI Technicians, Radiologists) who are working in the area of brain imaging technology will find the *Neurological Diagnosis and Monitoring specialization area* relevant for improving their knowledge and understanding of functional brain imaging technologies such as: EEG, SPECT, PET, and fMRI.

- **Software development and engineering professionals** interested in artificially intelligent systems should consider the *Intelligent Systems specialization area*. Mathematical algorithms are now widely embedded in a variety of systems for the purposes of providing "intelligent assistance" to the end-user. Examples of such systems include: web search engines, speech recognition systems, robotics, computer-vision systems, computer games, natural language understanding systems, bionic and prosthetic technology, data mining systems, and machine learning systems.

### Facilities

In addition to numerous individual faculty research labs, the Applied Cognition and Neuroscience Program utilizes several facilities which are shared among faculty and graduate students in the
School of Behavioral and Brain Sciences. The Computational Systems Laboratory consists of a network of workstations which are used for computationally intensive models of perceptual, cognitive, and neural processes as well as high-volume data analyses. The Computational Systems Laboratory can be accessed remotely by graduate students and faculty members. The Neuroscience Laboratory facilities are located in Green Hall and the Administration Building at the Richardson campus as well. The Callier Center for Communication Disorders, located adjacent to the University of Texas Southwestern Medical Center, provides access to brain imaging laboratories and speech, hearing, and language laboratories.

Admission Requirements

The University's general admission requirements are discussed on the [Graduate Admission page](catalog.utdallas.edu/2013/graduate/admission).

Admission to the Applied Cognition and Neuroscience Program is based on a review of the applicant's GPA, letters of recommendation, and narrative description of interests and career goals. Both GRE math and verbal scores are required to be considered for admission.

Students with strong academic records, who are in the process of completing their undergraduate degree at UT Dallas, may be admitted as Fast-track students. Fast-track students may accelerate completion of the degree requirements of the Master of Science Program in Applied Cognition and Neuroscience at UT Dallas by completing up to 15 credits of specified fast-track graduate coursework at UT Dallas as an undergraduate. Fast-track credit hours may be used to fulfill requirements for the student's undergraduate UT Dallas degree as well as satisfy course requirements for the masters' degree in Applied Cognition and Neuroscience. Applications to the Graduate Program in Applied Cognition and Neuroscience can be submitted as soon as the student is an undergraduate at UT Dallas with no more than 45 credit hours remaining.

Degree Requirements

The University's general degree requirements are discussed on the [Graduate Policies and Procedures page](catalog.utdallas.edu/2013/graduate/policies/policy).

All students in the program are required to regularly review their degree plans with their program advisor. In all areas of specialization, students complete 6 hours of approved core courses, 6 hours of approved methods courses, 6 hours of approved advanced elective courses, 12 hours of coursework in an approved specialization area, and 6 hours of internship courses. A grade of "B" is the required passing grade for coursework used to fulfill the core course and methods course requirements of the degree. Internship coursework must be taken pass/fail.

**Master of Science in Applied Cognition and Neuroscience**

*36 hours minimum*
Required Major Core Courses: 6 hours

Select two of the following core courses based upon choice of specialization area:

- **ACN 6330** Cognitive Science
- **ACN 6395** Cognitive Psychology
- **ACN 6340** Cellular Neuroscience
- **ACN 6338** Functional Neuroanatomy
- **ACN 6346** Systems Neuroscience
- **ACN 6348** Neural Net Mathematics

Required Methods Courses: 6 hours

Select two methods courses based upon choice of specialization area:

- **ACN 6312** Research Methods in Behavioral and Brain Sciences - Part I
- **ACN 6313** Research Methods in Behavioral and Brain Sciences - Part II
- **ACN 6316** Research Methods in Behavioral and Brain Sciences - Part III
- **ACN 5314** Computational Modeling Methods in Behavioral and Brain Sciences
- **ACN 6388** MATLAB for Brain Sciences
- **ACN 6322** Computational Modeling Methods for Language Understanding
- **ACN 6351** Quantitative Methods in Neuroscience
- **ACN 6347** Intelligent Systems Analysis
- **ACN 6349** Intelligent Systems Design
- **ACN 6373** Intraoperative Neurophysiological Monitoring I
- **ACN 6374** Intraoperative Neurophysiological Monitoring II

Area of Specialization (18 hours)

The following six specialization areas have been approved for the Applied Cognition and Neuroscience program. Alternative curriculum proposals may be submitted for consideration to the Applied Cognition and Neuroscience program head.

**Neuroscience Specialization Area**

All students selecting this specialization area should take at least two of the following three courses: **ACN 6346** Systems Neuroscience, **ACN 6338** Functional Neuroanatomy, and **ACN 6340**
Cellular Neuroscience in order to fulfill their core course requirements.

Students selecting this specialization area are approved to select any four courses from the ACN program (i.e., courses with the prefix ACN) or the Cognition and Neuroscience Area of the Doctoral Programs in Psychological Sciences (i.e., courses with the prefix HCS).

**Cognition Specialization Area**

The core course requirement for this specialization area is satisfied by choosing: **ACN 6330** Cognitive Science and **ACN 6395** Cognitive Psychology. Research Methods I (**ACN 6312**) and Research Methods II (**ACN 6313**) are also strongly recommended for this specialization area.

Students selecting this specialization area are approved to select any four courses from the ACN program (i.e., courses with the prefix ACN) or the Cognition and Neuroscience Area of the Doctoral Programs in Psychological Sciences (i.e., courses with the prefix HCS).

**Cognition and Neuroscience Specialization Area**

All students selecting this specialization area should take either: **ACN 6346** Systems Neuroscience or **ACN 6338** Functional Neuroanatomy in order to fulfill one of their core course requirements. The remaining core course requirement will be satisfied by choosing either: **ACN 6330** Cognitive Science or **ACN 6395** Cognitive Psychology. Research Methods I (**ACN 6312**) and Research Methods II (**ACN 6313**) are also strongly recommended for this specialization area.

Students selecting this specialization area are approved to select any four courses from the ACN program (i.e., courses with the prefix ACN) or the Cognition and Neuroscience Area of the Doctoral Programs in Psychological Sciences (i.e., courses with the prefix HCS).

**Human-Computer Interactions Specialization Area**

The core course requirement for this specialization area is satisfied by choosing: **ACN 6330** Cognitive Science and **ACN 6395** Cognitive Psychology. All students selecting this specialization area should take at least one of the following three courses: **ACN 6341** Human Computer Interactions I, **ACN 6342** Human Computer Interactions II, and **ACN 6343** Human Computer Interactions Lab. Research Methods II (**ACN 6313**) is highly recommended as well.

Students pursuing the usability-engineering track within the HCl specialization area should take two additional courses from the Cognition and Neuroscience Specialization Area course selections.

Students pursuing the user experience design track within the HCl specialization area should take the coursework in the usability engineering track as well as: **CS 5343** Algorithm Analysis & Data Structures and **CS 6354** Advanced Software Engineering. Note that the prerequisites for **CS 5343** are: **CS 5303** Computer Science I (or equivalent) and **CS 5333** Discrete Structures.

Students specializing in the Human-Computer Interactions area should also regularly review the Arts and Technology (ATEC) courses offered in the School of Arts and Humanities and discuss relevant course offerings with the ACN Program Head.
Computational Modeling/Intelligent Systems Specialization Area

Students pursuing the computer simulation modeling track should take four courses from the Cognition and Neuroscience specialization area which include at least one of the following courses: ACN 6388 MATLAB for Brain Sciences, ACN 7367 Speech Perception Laboratory, ACN 6322 Computational Modeling Methods for Language Understanding, and ACN 5314 Computational Modeling Methods in the Behavioral and Brain Sciences.

Students pursuing the mathematical modeling track will satisfy the advanced elective requirement in this specialization area by taking the sequence: ACN 6348 Neural Net Mathematics, ACN 6347 Intelligent Systems Analysis, and ACN 6349 Intelligent Systems Design and one additional course from the Cognition and Neuroscience specialization area course selection. Note that STAT 5351 Probability and Statistics, linear algebra, multivariable calculus, and ACN 5314 Computational Modeling Methods in the Behavioral and Brain Sciences are recommended prerequisites for: ACN 6347, ACN 6348, and ACN 6349.

The following Computer Science and Electrical Engineering courses are pre-approved electives for students specializing in the Intelligent Systems area who have the appropriate prerequisite background in computer science and/or electrical engineering: CS 6320 Natural Language Processing, CS 6321 Discourse Processing, CS 6364 Artificial Intelligence, CS 6373 Intelligent Systems, CS 6375 Machine Learning, CS 6384 Computer Vision, EESC 6362 Introduction to Speech Processing, EESC 6363 Digital Image Processing, EESC 6364 Pattern Recognition, and EESC 6365 Adaptive Signal Processing.

Neurological Diagnosis and Monitoring Specialization Area

Students should choose ACN 6338 Functional Neuroanatomy and ACN 6346 Systems Neuroscience to fulfill the core course requirements. ACN 6373 Intraoperative Neurophysiological Monitoring I and ACN 6374 Intraoperative Neurophysiological Monitoring II should be taken to fulfill the methods requirement.

Students should also choose at least 2 of the following courses as specialization area electives: ACN 6310 Fundamentals of Functional Brain Imaging, HCS 7315 Statistical Analysis of Brain Imaging Data, HCS 7329 Functional Brain Imaging Practica, ACN 6372 The Neuroscience of Pain, and ACN 7330 Advanced Functional Brain Imaging.

Internships (6 hours)

The internship requirement is satisfied by enrolling in 6 credit hours of ACN 7V71 Industry Internship, ACN 7V72 Research Internship, and/or HCS 8V80 Research in Behavioral and Brain Sciences.

Students whose immediate post-graduate goals are graduate school and medical school should fulfill the Internship Requirement by taking six credit hours of HCS 8V80 in order to obtain research experience.

Students not intending to pursue graduate or medical school training immediately after receiving
their ACN masters degree should discuss internship opportunities with the Program Head during their second semester of enrollment in the ACN program.