

Integrative Graduate Education and Research Traineeship Program (IGERT)

*Biological and Computational Foundations of Language Diversity
University of Maryland at College Park*

2012 Guidelines for Applicants

Deadline for receipt of applications: Monday, March 28th, 2012

Benefits of Participation

For students

- engage in innovative interdisciplinary training
- develop research skills not normally available in a single department
- participate in collaborative research
- learn to communicate with diverse groups, contribute to scientific outreach
- develop leadership skills through student-led initiatives
- success enhanced by strong peer support network
- funding for research and travel

For faculty/departments

- cutting-edge training enhances students' career prospects
- professional development activities help students' presentation and communication skills
- students can bring new expertise to the home department
- student projects can foster lasting cross-department collaborations
- access to additional funding for research and travel
- enhances department visibility and supports recruiting outstanding students
- improves department's ability to compete for new grants, gifts, etc.
- be an integral part of the largest language science community in N America, a U of MD priority area

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General Information

The program

The University of Maryland's language science community offers an interdisciplinary program in Biological and Computational Foundations of Language Diversity, which is supported by the National Science Foundation's prestigious Integrative Graduate Education and Research Training (IGERT) program. The IGERT program is designed for highly motivated students who seek broad interdisciplinary training that is not normally available within an individual program.

The program's main goal is to strengthen the language science community at the University of Maryland by offering students and faculty venues and resources for interdisciplinary training and collaborative research. The program offers a number of generous 2-year fellowships for students, and a variety of additional forms of support for US and international students alike. Importantly, funding is only one component of this ambitious program, which provides a broad array of resources for interdisciplinary academic and professional development.

Eligibility

Application is open to ALL currently enrolled U of Maryland PhD students who are able to pursue the program, regardless of citizenship, current funding status, advisor, or home PhD program. Although NSF training funds can only be used to support US citizens and permanent residents (i.e., green card holders), all students may participate in the program. Some non-NSF funds have been secured to help to support students who are not able to receive NSF funds.

Key Dates:

March 12	notify program via email of intent to apply
March 28	all application materials due – electronic submission only
From mid-April	admission decisions & funding commitments note that applications sometimes require revision before a decision is made

Email contacts: Csilla Kajtar (ckajtar@umd.edu), Colin Phillips (colin@umd.edu)

Note: a version of the full IGERT grant proposal that was submitted to NSF can be accessed from the document depository at languagescience.umd.edu, under Resources > IGERT. Prospective students and their advisors are encouraged to use this and other available information to familiarize themselves with the goals of the program, its potential benefits, and the different components of the program.

Application Options

Program Affiliate

- a. **Participants:** students who are interested in participating in some program activities, but without committing to complete the full program. This status is most relevant to beginning students who wish to explore their interest in the program, and to students whose other commitments or advanced status make it impractical to complete the program.
- b. **Benefits:** affiliated students will be kept informed about program activities and invited to participate in events, courses, etc.
- c. **Requirements:** evaluation and documentation of program outcomes is an important part of the program. All participating students will be expected to provide information on their training, research, or outreach activities.
- d. **Application:** send an email to Csilla Kajtar (ckajtar@umd.edu) indicating interest in the program, and including PDF copies of a current CV and unofficial transcript (a copy downloaded from Testudo is sufficient). The student's advisor should also send an email message to confirm that s/he endorses the student's participation.
- e. **Dates:** applications may be submitted at any time.

Apprentice

- a. **Participants:** students who plan to submit a training plan to become a full IGERT program participant in the Spring semester of the current year are eligible to become an IGERT Apprentice.
- b. **Benefits:** IGERT Apprentices will benefit from additional mentoring from faculty and more experienced graduate students, which should aid the process of developing a plan that is both innovative and feasible; resources may be allocated for support for apprentice research activities.
- c. **Requirements:** apprentices are expected to become fully involved in program activities such as Winter Storm and the outreach program, in just the same way as full participants, and while working on developing a training plan over the course of the year.
- d. **Application:** send an email to Csilla Kajtar (ckajtar@umd.edu) indicating interest to become an IGERT Apprentice and including PDF copies of a current CV and unofficial transcript (a copy downloaded from Testudo is sufficient). The student's advisor should also send an electronic letter to confirm that s/he understands this, and supports the students' plan to (a) become fully involved in program activities, and (b) to develop a full program proposal in time for the annual March due date.
- e. **Dates:** applications may be submitted during the Fall semester of the academic year.

Full Participant - (NSF-funded or non-funded)

- a. **Participants:** students who are interested in pursuing the full training program (see below for details). All U of Maryland PhD students are eligible, regardless of citizenship, funding source, or home department.
- b. **Benefits:** full participants gain most intellectual benefits from participation. Please note that while all full applicants may request funding, 'full-participant' status can be gained without seeking or securing NSF funding.
 - US citizens and permanent residents are eligible to receive IGERT fellowships (*note:* IGERT-funded students should preferably not hold other appointments; any exceptions must be approved by the Program Director). The NSF-IGERT funds provide generous two-year support packages for around 5 new students per year (an estimate of 23 students over a 5-year period). These students will receive a \$30,000/year stipend (payable over 12 months each year) and \$10,500/year towards tuition/health, plus limited research support.

- International students are eligible for support, and are eligible to take advantage of all program activities, courses, and other resources. However, the support is drawn from different sources than the IGERT grant itself, and is subject to different restrictions, as it comes from specific colleges at the University of Maryland. Some travel and research support is also available. International students should contact Colin Phillips if they have specific questions about the options available to them.
 - US citizens or permanent residents who apply for 'full participant' status but wish to keep their own funding may take advantage of all program activities, courses, and resources, and have access to some forms of travel and research funding.
- c. **Requirements:** all full participants in the program, regardless of funding, are expected to take part in a rigorous interdisciplinary program of training, research, and outreach activities. It is also expected that students' advisors will contribute to the overall success of the program.
- d. **Application:** details below.
- e. **Dates:** indication of intention to apply - we prefer that prospective applicants send an email message indicating their intention to apply to Csilla Kajtar (ckajtar@umd.edu) by Thursday, March 12th. All materials should be submitted (to the same email address) by Monday, March 28th, 2012.

Fellowship Application for Students already in the Program

Some students are already full participants in the IGERT program, but are financially supported by standard TA/RA/fellowship sources. These students are welcome to submit a new application for consideration for an NSF fellowship. This should be a full application, but can be a revision (minor or major) of the application submitted last year. The new application should reflect the progress that the student has already made in participating in the program and completing program objectives. Students in this category are strongly encouraged to consult with their advisors about the revision process.

This is most relevant to students who are currently in the 2nd year of their PhD program.

Full Application Requirements

The process of applying to join the program serves two roles. It provides the IGERT Executive Committee with information that is needed to make fair funding decisions. It also contributes to the program's training objectives, since proposal preparation is an important aspect of a scientific career. A full application has 3 sections, consisting of (1) student records, (2) a research and training plan (including a rotation and 'broader impact' plan) and (3) letters of support. Documents should use single-spaced text, in a size that is readable by normal people.

All documents except for the confidential letters of recommendation (3b) should be submitted electronically by the student to Csilla Kajtar (ckajtar@umd.edu), as a single PDF file. The confidential letters of recommendation should be emailed separately to ckajtar@umd.edu - PDF, MSWord, or email text are all fine, though PDF is strongly preferred.

1. Student records

- a. CV
- b. Academic records (transcripts and test scores). Official copies are not needed; an unofficial transcript downloaded from Testudo is perfectly acceptable.
- c. Description of student's existing funding plan for the PhD, listing the source and anticipated amount of funding. If there is a plan to apply for other fellowships (e.g., NSF-GRF, NIH-NRSA, CEBH) please mention this. *Important: this information is needed for organizational reasons, and will not be a factor in funding decisions, so there is no benefit in concealing funding sources.*

2. Research and training plan

- a. Training plan [2pp max] - this plan should explain which courses will be taken to meet the IGERT program course requirements, and when. It should also explain how the IGERT courses align with the course requirements of the student's home PhD program. Courses may be counted towards both programs, but students are expected to take at least some courses that go beyond their home program requirements. If the student plans to complete the NACS Certificate program in conjunction with the IGERT coursework, then this should be explained. Past experience suggests that it is particularly helpful to include in the training plan a table that shows how courses will be counted towards the student's home department PhD and to the IGERT program requirements.
- b. Research plan [4pp max] - this plan should describe a program of research that could be carried out in the context of the training program, and should include an explanation of the importance of the research and how it contributes to the integrative goals of the program. It is important to explain the context for the research, in a fashion that is understandable by an interdisciplinary readership. The IGERT grant proposal submitted to NSF discusses some possible integrative research activities - these should be taken as suggestive examples rather than as a fixed set of options to choose from. Applicants can obtain useful ideas for integrative research projects by talking with current students and participating faculty.
- c. Rotation: It is preferred to include a plan for a lab rotation (i.e. plan for one semester working primarily with a different mentor).
- d. Broader impact plan [1p max] - this plan explains how the student's IGERT training would benefit their home department and how the student could contribute to the outreach goals of the project, e.g., high school/undergraduate mentoring, international activities, organizational support or committee service, offering training in specific skills as a component of Winter Storm.

3. Support letters

- a. Advisor's letter of commitment - this letter confirms that the advisor has discussed the student's plan and that the student's participation in the program has the support of the advisor and the home department. The letter should also describe how the advisor and/or the home department is willing to contribute to the goals of the IGERT project. Examples include: (i) teaching IGERT-related courses; (ii) participation in outreach activities; (iii) committee membership; (iv) help with mentoring IGERT students from other departments; (v) non-NSF funding.
- b. Two confidential letters of recommendation, of which one should be from the student's primary advisor.

Admission and funding decisions will be made by the IGERT Executive Committee, which is a representative committee of 7 faculty members from participating departments. Current committee membership is marked in the table of Participating Faculty in this document. Evaluation criteria will include the quality and potential contributions of the application. Students may apply for funding more than once.

Program Requirements

This section contains a summary of the program requirements. Students are encouraged to consult the proposal submitted to NSF for more information on the program and its goals.

1. Application: Research and Training plan
2. Coursework
 - a. Winter Storm, each year
 - b. Regular attendance at the IGERT weekly lunch seminar
 - c. 6 foundational courses (may overlap with student's regular PhD program requirements, but must also go beyond regular PhD requirements)
 - d. At least one integrative seminar (to be offered annually by the program - rotating topics)
 - e. Research Ethics - NACS 600, or an alternative approved by the Program Director

3. Advanced Rotation - one semester, or equivalent, working primarily with a different mentor
4. Outreach Activities
5. Participation in program evaluation and assessment activities
6. Regular meetings with the advisor to discuss progress

The table shows a list of suggested courses arranged into separate 'areas'. Students may suggest alternative courses as a part of their individualized training plan (*please see the list at the end of this document for examples*). Substitutions should preserve the commitment of the program to diverse training that includes significant work in language diversity.

<i>Students must complete coursework from at least two of the three areas and all students should take at least two courses from the language diversity track; students may propose substitute courses that better serve their interdisciplinary preparation</i>		
Language Diversity Track	Cognition & Neurosci. Track	Comp./Neural Modeling Track
Syntax I/II (LING 610-611) Phonology I/II (LING 620-621) Semantics I/II (LING 660-661) Pragmatics (LING 663)	Psycholing. I/II (LING 640-641) Fund. Neurosci (NACS 641) Cog. Neurosci (NACS 642) Cog. Science (NACS 645) Cog Proc. (SLAA741)	Intro Comp Mod. of Lang (LING689A) <i>For neuroscientists:</i> Fund. Neurosci (NACS 641) Comp. Neurosci (NACS 643) Quant Proc of Biol Data (NACS728b) <i>For natural language processing:</i> Machine Learning (CMSC726) Comp Ling I (CMSC723) Comp Ling II (CMSC773) Machine Learning (CMSC726)
<i>All students should also plan to take one integrative seminar and research ethics.</i>		

NACS Certificate: Note that certain course combinations may also be counted towards the *Certificate in Neuroscience and Cognitive Science* offered by the NACS Program. Requirements for the Certificate are 16 credits, consisting of two courses from NACS 641-644 [8 credits], two other approved courses [6 credits], and two semesters of attendance at the NACS 608 seminar [2 credits]. Students must submit a separate application to the NACS Certificate program. Details on this program and a downloadable application form may be found at nacs.umd.edu.

Project Summary (taken from NSF proposal)

1. Title IGERT: Biological and Computational Foundations of Language Diversity
Lead Institution University of Maryland
Participating Inst Central Institute for Indian Languages, Mysore, India; Hiroshima and Tohoku Universities, Japan; Universidade Federal do Rio de Janeiro, Brazil; Center for Advanced Study of Language (UMd.); VL2 Science of Learning Center, Gallaudet University; National Institute on Deafness and other Communication Disorders.

2. INTELLECTUAL MERIT. Human language is both universal within the species and highly variable across populations. This IGERT will train young scientists to understand language diversity by combining tools of behavioral, computational and biological research. The goal of the project is to create a model for sustainable change in the science of language. We argue that this requires change in the role of academic departments that focus on language, creating units that form the hub of a collaborative network, rather than attempting to simply remove traditional departmental boundaries. We also contend that sustainable change, i.e., change that will persist across time and across institutions, depends strongly on the pursuit of diversity, encompassing both language diversity and diversity of participation. The starting point for the project is a language research community at the University of Maryland that is perhaps uniquely well positioned to combine expertise from linguistic, computational, cognitive and neuroscientific approaches to language with clinical and pedagogical concerns, drawing upon an extensive network of existing connections that span nine departments in five colleges. The first goal of the IGERT is to build upon our existing interdisciplinary success to break down further barriers to collaboration and cross-training. The second goal of the project is more outward-looking. The aim is to promote sustainable change through local and international collaborations and outreach efforts that will build infrastructure for interdisciplinary work on diverse languages, build awareness of the science of language among younger and underrepresented groups of students through high school and undergraduate partnerships, while also training IGERT students to be effective agents of change in their own future careers.

The training program will create a framework that allows students to translate broad foundational training into innovative interdisciplinary research. The training plan provides coursework, research training, and environment that are all geared towards the goal of preparing students for interdisciplinary research projects and equipping them to build similar collaborative networks at other institutions in their future careers. Preparation for interdisciplinary research projects will be provided by broad coursework in language and cognitive (neuro-)science, integrative pro-seminars and a post-candidacy lab rotation that pairs trainees with students from other disciplines. A central component of the IGERT is the *Winter Storm*, an intensive two-week workshop that provides foundational skills training, building student partnerships through research projects, review and updating of research goals, and professional development. In addition, the IGERT builds upon international connections that will advance interdisciplinary training in language in India, Japan, and Brazil, while providing IGERT trainees with access to broader multilingual perspectives. The IGERT will partner with an NSF-supported Science of Learning Center based at Gallaudet University, expanding local training opportunities for deaf students.

3. BROADER IMPACTS. This interdisciplinary training model developed in this IGERT will have a national and international impact. The project will create resources and train graduates that can promote the integration of psychological, neural, and computational tools with multi-lingual expertise at other institutions. The project will strengthen a series of international collaborations through which students can contribute to infrastructure for interdisciplinary research in countries where linguists have less ready access to experimental and computational expertise. The project will enhance the use of computational and neuroscientific techniques in studies of atypical language and second language learning. A program of outreach activities at the undergraduate and high school level, plus the partnership with Gallaudet University, will enhance participation of underrepresented groups in science.

This is a list of faculty who signed on to participate in the program at the time of proposal submission, or who have expressed interest since that time. *The list is not exhaustive, and the program is not restricted to students who are supervised by these faculty.*

Participating Faculty and Key Partners		
Jordan Boyd-Graber	Asst Prof, Information Sciences	comp ling, stat mod of lang learning
DJ Bolger	Asst Prof, Hum Development	cogn neurosci of reading
Hal Daume III**	Asst Prof, Computer Science	comp ling, machine translation, machine learning
Allen Braun, MD	Chief, Lang & Speech Unit, NIDCD	cogn neurosci, aphasia, ASL
Robert deKeyser **	Professor, Second Lang Acq	second language acquisition
Bonnie Dorr	Professor, CompSci & UMIACS	multilingual NLP, machine translation
Michael Dougherty	Assoc Prof, Psychology	attention, memory, decision theory
Carol Espy-Wilson	Professor, Elec Eng & ISR	digital speech processing
Yasmeen Farooqi-Shah	Asst Prof, Hearing & Speech Sci	aphasia, cognitive neuroscience
Naomi Feldman	Asst Prof, Linguistics	comp psycholing, phonetics/ phonology, language acquisition
Kira Gor	Assoc Prof, SLA	second language phonology and morphology
Valentine Hacquard	Asst Prof, Linguistics	semantics, psycholinguistics
Norbert Hornstein	Professor & Chair, Linguistics	syntax, semantics, philos of lang
Bill Idsardi **	Assoc Prof, Linguistics	phonology, phonetics, comp models
Nan Jiang	Assoc Prof, SLA	psycholinguistics of SLA
Howard Lasnik	Disting Univ Prof, Linguistics	syntax
Ellen Lau	Asst Prof, Linguistics	cognitive neuroscience, psycholinguistics
Jeffrey Lidz **	Professor, Linguistics	lang acq, psycholing, lang diversity
Michael Long	Professor & Chair, Sch of Langs	second language acquisition
Carlos Montalvan, MA	AP Psych teacher, Northwood HS	psychology education
Rochelle Newman **	Assoc Prof, Hearing & Speech	infant and adult psycholinguistics
Jared Novick	Asst Research Scientist	cog neuroscience and psycholinguistics
Colin Phillips **	Professor, Linguistics	psycho/neurolinguistics, lang acq
Paul Pietroski	Professor, Linguistics & Philosophy	semantics, logic, lang acq
Nan Bernstein Ratner	Professor, Hearing & Speech	lang acq, lang disorders, stuttering
Elizabeth Redcay	Asst Prof, Psychology	developmental cognitive neuroscience
James Reggia, MD	Professor, CompSci & UMIACS	comp modeling, neurology
Philip Resnik	Professor, Linguistics & UMIACS	comp ling, machine translation
Meredith Rowe	Asst Prof, Hum Development	(a)typical language devt, gesture
Shihab Shamma	Professor, Elec Eng & ISR	auditory neurosci, neuromorphic eng.
Jonathan Simon	Asst Prof, Elec Eng & Biology	biological signal processing
Bob Slevc	Asst Prof, Psychology & CASL	psycholinguistics, aphasia, language production
Juan Uriagereka	Professor, Linguistics	syntax, lang diversity, evol of lang
Min Wang **	Assoc Prof, Hum Development	lang and literacy, bilingualism
Amy Weinberg	Professor, CASL	comp linguistics, psycholinguistics
Alexander Williams	Asst Prof, Linguistics	semantics
Andrea Zukowski	Asst Res Scientist, Linguistics	atypical language development

** IGERT Executive Committee Members CASL - Center for Adv Study of Lang; ISR - Inst for Systems Res; UMIACS - U of Maryland Inst for Adv Comp Studies

Course List

The University of Maryland offers a huge variety of courses in different areas of language science. This is a *non-exhaustive* list of courses, compiled in early 2011, that may be relevant to language science students who are participating in the IGERT program. Students should consult with their advisors and other faculty, including the IGERT program director, for feedback on individual course plans.

Special IGERT courses

These are examples of courses offered as seminars aimed at an interdisciplinary audience. IGERT students should aim to take one seminar of this nature. Topics frequently change.

LING889B Seminar in Categorization; (3 credits) W. Idsardi
LING848 Seminar in Comp Psycholinguistics; (3 credits) P. Resnik
LING849 Seminar in Developmental Language Disorders; (3 credits) A. Zukowski
HESP818L Seminar in Infant Language Acquisition; (3 credits) R. Newman
LING859 Seminar in Language Acquisition; (3 credits) J. Lidz & A. Woodward

NACS600 (*PermReq*) Ethics in Scientific Research; (2 credits) A. Popper and C. Moss and P. DeShong and R. Dooling. *This is the research ethics course that IGERT fellows are expected to take, if they have not satisfied the research ethics requirement in another course.*

Linguistics and Language Diversity

Due to the focus of the program on language diversity, all IGERT students should include coursework from this area as part of their training.

Courses offered annually (fall-spring sequences):

LING610 Syntactic Theory; (3 credits) H. Lasnik [*fast moving introductory course; presupposes minimal background, focus on syntactic argumentation and evidence.*]
LING611 Issues in Syntax; (3 credits) N. Hornstein
LING620 Phonological Theory; (3 credits) W. Idsardi [*This sequence focuses on the cognitive science of phonology.*]
LING621 Issues in Phonology; (3 credits) W. Idsardi
LING660 Introduction to Semantics; (3 credits) P. Pietroski/V. Hacquard
LING661 Issues in Semantics; (3 credits) V. Hacquard/A. Williams

These are a selection of the advanced seminars that are offered regularly:

LING698A Language & Mind (3 credits) N. Hornstein and P. Pietroski
LING819 Seminar in Syntactic Theory; [Varying topics] (3 credits) N. Hornstein / H Lasnik
LING879 Seminar in Semantics: [Varying topics] (3 credits) P. Pietroski, V. Hacquard, A. Williams
LING663 Pragmatics; (3 credits) A. Williams and V. Hacquard

Cognition and neuroscience

IGERT Program Guidelines (there are very many courses in this area, so alternatives are welcome).

Regular core courses include:

EDHD721 Cognitive Development and Learning: An Introduction; (3 credits) D. Bolger
EDHD779Q Special Topics in Human Development: Bilingual/Biliteracy Acquisition; (3 credits) M. Wang
EDHD840 Language and Literacy Development; (3 credits) M. Rowe
HESP602 (*PermReq*) Neurological Bases of Human Communication; (3 credits) Yasmeen Shah
HESP610 Aphasia; (3 credits) Y. Shah
HESP626 Language and Learning Disabilities; (3 credits) F. Roth
HESP724 Research Design; (3 credits) R. Newman
HESP818 (*PermReq*) Seminar in Language Processing; (3 credits) N. Ratner
LING640 Psycholinguistics; (3 credits) C. Phillips
LING641 Issues in Psycholinguistics; (3 credits) C. Phillips

Courses eligible for the NACS certificate:

NACS608 Neuroscience and Cognitive Science Seminar; (1 credit) R. Araneda. *This is the weekly NACS speaker series. Students who plan to take the NACS Certificate must enroll in this course in at least 2 semesters.*

NACS641 Fundamentals of Neuroscience; (4 credits) R. Araneda & D. Soares. *Limited enrollment, priority to NACS PhD and NACS Certificate students. Plan ahead if you intend to take this course.*

NACS642 Cognitive Neuroscience; (4 credits) D. Bolger

NACS 643 Computational Neuroscience; (4 credits) Dan Butts

NACS644 Cellular and Molecular Neuroscience; (4 credits) E. Quinlan

NACS645 Cognitive Science; (4 credits) W. Idsardi

Other courses:

NACS728A ABC of Prefrontal Cortex

PHIL879N Seminar in Philosophy: Representing Numbers; (3 credits) P. Pietroski

PSYC607 Advanced Topics in Human-Learning and Cognitive Psychology; (3 credits) M. Dougherty

PSYC611 Advanced Developmental Psychology; (3 credits) Tracy Riggins, Jude Cassidy,

PSYC6XX Development of the Social Brain; (3 credits) Elizabeth Redcay

PSYC6XX Language Production; (3 credits) Bob Slevc

PSYC798M Seminar: The Seven Sins of Memory; (3 credits) M. Dougherty

SLAA649T Theories and Change in Second Language Acquisition; (3 credits) M. Long

SLAA741 Cognitive Processes in Second Language Learning; (3 credits) R. De Keyser

SLAA749Y Bilingual Language Processing/ L1 Transfer; (3 credits) N. Jiang

SLAA760 Fundamentals of Second Language Assessment; (3 credits) S. Ross

Computational/Neural Modeling

Individual student needs are likely to be particularly varied in this area, and it is recommended that students consult closely with their advisors and other faculty about the most appropriate choice of courses in this area. Please consult the Computational Linguistics Wiki for guidance on ways to navigate the computational community at UMD: <http://languagescience.umd.edu/wiki/Computational%20Linguistics>

Courses offered on a regular basis:

LING689A Introduction to Computational Modeling of Language; (1-3 credits)

N. Feldman [Relevant to all. *Normally a spring course. Presupposes minimal background. A good starting point.*]

CMSC723 Computational Linguistics I; (3 credits) H. Daume [The main gateway course in natural language processing. *Some programming background or practice recommended – consult!*]

CMSC773 Computational Linguistics II; (3 credits) P. Resnik

CMSC726 Machine Learning; (3 credits) L. Getoor

ENEE632 Speech and Audio Processing; (3 credits) C. Espy-Wilson

NACS643 Computational Neuroscience; (4 credits) D. Butt [NACS core course.]

NACS 728b Quantitative processing of biological data; J. Simon. [This course is generally offered in alternate years. *Signal processing bootcamp, particularly popular with students who do electrophysiological research.*]

Examples of advanced seminar courses offered less frequently:

CMSC828X Nature Inspired Artificial Intelligence; (1-3 credits) J. Reggia

INFM718G Web Scale Information Processing Applications; (3 credits) J. Boyd-Graber

LING848 Seminar in Computational Linguistics; (3 credits) P. Resnik

Other courses students found quite useful:

PSYC601 Quantitative methods I; (4 credits) M. Dougherty

PSYC602 Quantitative methods II; (4 credits) M. Wang