Student Handbook for the Ph.D. Program in Neural Computation

2016-2017

CNBC
CENTER FOR THE NEURAL BASIS OF COGNITION

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1 Preamble

Neuroscientists are applying new technologies to acquire and analyze large data sets, as well as amassing knowledge of neural circuitry in a variety of brain areas. As a consequence the need for quantitative models to understand the great complexities of neurobiological systems has never been greater, and quantitative methods are centrally important in the field of neuroscience. In some respects, neuroscience has historically been ahead of much of biology in adopting and valuing quantitative approaches. There have been important advances through the use of quantitative methods in neurophysiology, and there has been a continuing stream of related work within applied mathematics and physics. More recently, engineers, computer scientists, and statisticians have contributed to the field, expanding further the definition of computational neuroscience. Nevertheless, the number of investigators with the requisite skills and actively engaged in this domain of research is relatively small. There is a widely recognized need for increased training in the application of computational, mathematical, and statistical methods to biology and medicine, and to problems in neuroscience in particular.

The Program in Neural Computation (PNC) trains students with backgrounds in quantitative disciplines in the growing field of computational neuroscience and also provides them the essential background in experimental neuroscience**.** The training environment of the PNC brings the strengths of the unique neuroscience community of both Carnegie Mellon University (CMU) and the University of Pittsburgh (Pitt). The PNC is administered through the Center for the Neural Basis of Cognition (CNBC), an integrative center spanning both CMU and Pitt and PNC students are by extension members of the CNBC. We offer three degrees: a Ph.D. in Neural Computation, a Joint Ph.D. in Neural Computation and Statistics, and a Joint Ph.D. in Neural Computation and Machine Learning. In this document we outline both the course requirements and program milestones that a PNC student in any of the three degree programs must complete during the course of their PhD training.

The PNC program is overseen by the PNC training faculty, the Graduate Program Coordinator, and the Program Co-Directors. Questions about any aspect of the program should be directed either to the Graduate Program Coordinator or the Program Co-Directors:

Graduate Program Coordinator
Melissa Stupka
MI 116C
(412) 268-8362
mstupka@cnbc.cmu.edu

Program Co-Director
Steven M. Chase
Assistant Professor
Center for the Neural Basis of Cognition
Department of Biomedical Engineering
Carnegie Mellon University
MI 115N
(412) 268-5512
schase@cmu.edu

Program Co-Director
Brent Doiron, Ph.D.
Associate Professor
Department of Mathematics
University of Pittsburgh
505 Thackeray
(412) 624-1759
bdoiron@pitt.edu

Program Co-Director
Valérie Ventura, Ph.D.
Associate Professor
Department of Statistics
Carnegie Mellon University
Baker 229E
(412) 268-4249
vventura@stat.cmu.edu

2 Ph.D. in Neural Computation

The program consists of the following core activities:

- Coursework in computational neuroscience, quantitative methodologies and experimental neuroscience
- Exposure to experimental approaches through rotations or thesis research
- Training in teaching, scientific presentations and responsible conduct of research
- Successful defense of a Ph.D. Thesis

Additional satellite activities through the CNBC will also foster students' professional and scientific development.

Course requirements

The course requirements for this program include but extend well beyond the curriculum requirements for the CNBC certificate program. The coursework is designed to ensure that students are well trained in neuroscience and that they also receive in-depth training in a set of quantitative approaches relevant to the field of computational neuroscience. Because of differences in background and educational goals, course requirements for each student in the program will be adapted to their individual needs, drawing on the many computer science, mathematics, and statistics courses offered both at CMU and Pitt.

A PNC student's first year coursework is decided by the student in consultation with the student's faculty mentor and the program co-directors. The week before the start of each fall term the first year PNC students will attend an orientation session held by the program co-directors, where a listing of all PNC relevant courses offered that term would be given. After the orientation meeting, the first semester course choices for each first year student will be determined in consultation, first with the student and the student's faculty mentor, and then with one of the program co-directors. Typically, students will take about 2 courses each term of their first year, including at least one computational neuroscience course and two courses covering experimental neuroscience.

By two weeks before start of fall term of a student's second year, the student must submit a proposed schedule of coursework to the graduate program coordinators, along with a statement from his or her advisor recommending approval. This plan will then be considered by the PNC training faculty which may approve the course plan, or ask for modifications. Approval will be based on meeting program expectations in the following three areas. It is expected that by the end of the third year of the program all coursework will be completed.

CNBC requirement

Students must complete the four-course requirement of the CNBC certificate program, i.e., they must:

They must also gain graduate level training through coursework in the following three areas: (i) cell and molecular neuroscience/neurophysiology, (ii) systems neuroscience, and (iii) cognitive neuroscience. Recommended courses fulfilling this requirement include

- (i) 03-762 Advanced Cellular Neuroscience (CMU) or NROSCI 2100/2101 Cellular and Molecular Neurobiology (Pitt)
- (ii) 03-763 Systems Neuroscience (CMU) or NROSCI 2102 Systems Neuroscience (Pitt), and
- (iii) 85-765 Cognitive Neuroscience.

To complete the computational requirement, students must take the combined Pitt/CMU course:

- 36-759 Statistical Models of the Brain (CMU) / Math 3375 Computational Neuroscience (Pitt).

Note that this is not exactly the same as the standard CNBC computational requirement.

Computational Neuroscience

Students are required to take at least two additional computational neuroscience courses, including mathematical, statistical and computational approaches.

Recommended courses fulfilling this requirement include:

MATH 3370 Mathematical Neuroscience (PITT)
15-686 Neural Computation (CMU)
15-883 Computational Models of Neural Systems (CMU)
18-698/42-632 Neural Signals Processing (CMU)

85-719 Introduction to Parallel Distributed Processing (CMU)
86-631 Neural Data Analysis (CMU)
86-675 Computational Perception (CMU)

Quantitative Methods
Students must take at least two graduate level courses in one quantitative subject (e.g. math, computer science or statistics) to ensure depth of knowledge in this area. Courses listed above under the Computational Neuroscience requirement are not eligible to fulfill this requirement. Under the quantitative methods requirement, we have identified two examples of focus areas:

Dynamical Systems focus
MATH 2940 Applied Stochastic Methods (PITT)
MATH 2950 Applied Math Methods (PITT)

Statistics and Machine Learning focus
10-701 or 10-715 Machine Learning (CMU)
36-705 Intermediate Statistics (CMU)
36-707 Regression Analysis (CMU)

Other foci, including "brain imaging and signal processing" have been discussed and may be added as recommended course sets, subject to approval by the program co-directors. Note that to be eligible to take certain of these course, students might first need to complete course pre-requisites. These pre-requisites would not count towards the two course depth requirement.

Program Milestones
Progress in the program is tracked based in part on students' successful completion of program milestones. A committee selected by the student and approved by the program co-directors evaluates the performance on milestones. Failure to pass a milestone will result in a student being placed on probation. Specific conditions for removal of probation will be specified by the program co-directors along with a set of deadlines for meeting these conditions. Failure to meet these conditions constitutes grounds for dismissal from the program.

First year research requirement: By the end of the first calendar year in the program, all students are required to complete a computational project. This project will be evaluated by a committee consisting of at least three faculty, of whom at least two are PNC training faculty. The project requires the student to identify a biological problem, understand the data collection process, articulate the goals of building a model or performing a particular kind of analysis and implement this computational approach. In some cases this project may be a precursor to the student's eventual thesis project. This project cannot substantially overlap with a project completed for a class, although it may be on the same topic as a class project, provided that it represents a substantial extension of that work.

Students should begin formally discussing this research project no later than the end of the spring term. Initial steps should include forming this committee and organizing a meeting to discuss/outline the project with your committee. The makeup of this committee should be approved by the program co-directors. At this first meeting the committee should approve the project proposal or indicate steps necessary to identify a new project. Then, before the start of the fall term, students must schedule a committee meeting where they present/defend their results. This meeting should occur before Oct 15. The initial part of this meeting involves a 30 minute presentation by the student, which is open to the public. This will be followed by a meeting with the committee and the student, during which the committee will ask detailed questions about the work. Based on this meeting, the committee will evaluate the student's work and will decide whether a student passes, fails or needs to revise the project, subject to re-evaluation. Questions about the content of the presentation should be raised by the student with committee members well before the evaluation meeting.

Second year research requirement: In the second year, students are expected to work on research about 1/3 of their time during the academic year and full time during the summer**.** By the end of the second full year in the program all students are required to complete a deeper computational project. The student's work on the project should demonstrate that the student has 1) the ability to analyze and interpret experimental data in a particular area 2) the ability to develop and implement a computational approach incorporating the relevant level of biological detail and 3) the ability to organize, interpret and present the results of the computational work. This project should be a

body of work suitable for publication*. It is expected that this work will be written up as a manuscript suitable for submission to a journal in the relevant field; a draft of this manuscript must be submitted to the committee at least a week in advance of the meeting.* In most cases this project will be on an area related to the student's eventual thesis project.

The evaluation of this milestone is similar to that of the first year milestone described above. Initial steps include forming this committee and organizing a meeting to discuss/outline the project with your committee. At this first meeting the committee should approve the project proposal or indicate steps necessary to identify a new project. Then, before the start of the fall term, students must schedule a committee meeting at which they will present/defend their results. The initial part of this meeting involves a 30 minute presentation by the student, which is open to the public. This will be followed by a meeting with the committee and the student, during which the committee will ask detailed questions about the work. Based on this meeting, and the submitted manuscript draft, the committee will evaluate the student's work and will decide whether a student passes, fails or needs to revise the project, subject to re-evaluation.

Ph.D. Thesis proposal: Required coursework should be completed by the end of the third year. During the fourth year a Ph.D. candidate should present a thesis proposal to his or her thesis committee and the community. The proposal should include:

- a clear statement of the proposed research problem
- the significance of the proposed research
- a review of relevant literature relating to the problem
- a review of the candidate's work leading up to the thesis
- a tentative schedule for completing the work

Advising on scheduling the proposal, and guiding in the formation of the dissertation committee, is the thesis advisor's responsibility. The thesis committee should be composed of at least four members, one being an external member and of at least two being PNC training faculty. The external member is typically from outside the two participating Universities. All thesis committees are subject to approval by the PNC training faculty.

Ph.D. Thesis Defense: Normally, the dissertation is completed during the student's fifth year. The student should set up a pre-defense meeting with their committee members six months prior to their defense. The final defense is a public presentation, in accord with the College and University requirements for the Ph.D. It is the candidate's responsibility to ensure that the College and University's guidelines are followed for publicity of the defense and the availability of the thesis document at least two weeks prior to the defense. Note that the defense must be held at least 21 days before the date the degree is awarded.

3 Joint Ph.D. in Neural Computation and Statistics

The program consists of the following core activities:

- the requirements for the Ph.D. in Statistics
- the four core course requirements for the CNBC certificate
- exposure to experimental techniques
- a roughly semester-long project to satisfy the PNC first-year research requirement
- a year-long project that would satisfy both the PNC second-year research requirement and the Statistics Advanced Data Analysis preliminary exam requirements
- participation in CNBC activities as a CNBC student
- a Ph.D. thesis on a neuroscientific topic, with joint advisors, one from within Statistics and one from outside—both being CNBC-affiliated faculty members

Additional satellite activities through the CNBC will also foster students' professional and scientific development.

Course requirements

Students must complete the four-course requirement of the CNBC certificate program, i.e., they must:

They must also gain graduate level training through coursework in the following three areas: (i) cell and molecular neuroscience/neurophysiology, (ii) systems neuroscience, and (iii) cognitive neuroscience. Recommended courses fulfilling this requirement include

- (i) 03-762 Advanced Cellular Neuroscience (CMU) or NROSCI 2100/2101 Cellular and Molecular Neurobiology (Pitt)
- (ii) 03-763 Systems Neuroscience (CMU) or NROSCI 2102 Systems Neuroscience (Pitt), and
- (iii) 85-765 Cognitive Neuroscience.

To complete the computational requirement, students must take the combined Pitt/CMU course:

- 36-759 Statistical Models of the Brain (CMU) / Math 3375 Computational Neuroscience (Pitt).

Note that this is not exactly the same as the standard CNBC computational requirement.

To meet the course requirements for the PhD in Statistics, students must take:

- 36-705 Intermediate Statistics
- 36-707 Regression Analysis
- four graduate courses (48 units) chosen from a variety of options, but including at least one collaborative research project course, a statistical methodology course, and a course in probability or statistical theory. The one-semester pair of half-semester courses 36-729,730, Time Series and Point Processes is highly recommended.
- 36-752, Advanced Probability Overview,
- 36-755, Advanced Statistical Theory.

Any substitutions or exemptions from coursework must be recommended by the student's advisor and approved by the PNC co-directors and the director of graduate studies in Statistics.

Program Milestones

The milestones listed below are stated as requirements, but some flexibility is likely to be necessary. In individual cases exceptions may be granted by the PNC training faculty and the Statistics faculty. In such cases clear alternative deadlines must be established and communicated in writing to the student.

First year research requirement: By the end of the first calendar year in the program, all students will be required to complete a data-analytic project. The purpose of the project is to have the student identify a biological problem, understand the data collection process, articulate the goals of building a model or performing a particular kind of analysis and implement this computational approach. In some cases the project may be a precursor to the student's eventual thesis project. Both written and oral summaries of the project must be presented. The project will be evaluated by a committee consisting of at least three faculty, of whom at least two are PNC training faculty. Students

who wish to enter the joint program from Statistics after their first year may be able to waive this requirement with the permission of the PNC training faculty.

Second year research requirement: All students will be required to complete a deeper computational project. The student's work on the project should demonstrate that the student has 1) the ability to analyze and interpret experimental data in a particular area 2) the ability to develop and implement a computational approach incorporating the relevant level of biological detail and 3) the ability to organize, interpret and present the results of the computational work. This project should be a body of work suitable for publication. This research should be written up as a paper to be submitted to a journal in the relevant field. In the second year, students are expected to work on research about 1/3 of their time during the academic year and full time during the summer. In most cases this project will be on an area related to the student's eventual thesis project, and it should be completed by the end of the student's second calendar year in the program. In addition, the results of the project will be presented publicly in the form of a seminar. This project will be evaluated by a committee consisting of at least three faculty of whom at least two are PNC training faculty.

Note that the second year research requirement also counts to satisfy the Advanced Data Analysis project required by Statistics.

Statistics Preliminary Exams: By the end of the third full year the student should complete and pass the preliminary examinations for the Ph.D. in the Department of Statistics.

Ph.D. Thesis proposal: Required coursework should be completed by the end of the third year. During the fourth year a Ph.D. candidate should present a thesis proposal first to his or her thesis committee and then to the CNBC and Statistics community. The student will have two joint advisors, one from Statistics and the other a CNBC faculty member from outside of Statistics. A thesis committee will be formed and should be composed of at least four members, one of whom is an external member (typically from outside CMU and Pitt); two must be PNC training faculty; two must be Statistics faculty; and at least one CMU or Pitt member must be from a discipline outside of statistics. The thesis committee is subject to approval by the PNC training faculty and the Department of Statistics faculty.

The thesis proposal should include: a succinct summary of the proposed research problem; the significance of the proposed research; a review of relevant literature relating to the problem; a review of the candidate's work leading up to the thesis, including preliminary results; a clear statement of remaining research; and a tentative schedule for completing the work. It should also conform to the stylistic requirements for thesis proposals in the Department of Statistics. As in the Department of Statistics, the thesis committee must offer its preliminary approval of the proposal following a meeting that is open to other faculty. The student then arranges to present the proposal publicly, so that CNBC and Statistics faculty and other community members can attend. Formal approval is conferred by the Statistics faculty and the PNC training faculty.

Ph.D. Thesis Defense: Normally, the dissertation is completed during the student's fifth year. The student should set up a pre-defense meeting with their committee members six months prior to their defense. The final defense is a public presentation, in accord with the College and University requirements for the Ph.D. It is the candidate's responsibility to ensure that the College and University's guidelines are followed for publicity of the defense and the availability of the thesis document at least two weeks prior to the defense. Note that the defense must be held at least 21 days before the date the degree is awarded.

4. Joint Ph.D. in Neural Computation and Machine Learning

The program consists of the following core activities

- the requirements for the Ph.D. in Machine Learning;
- the four core course requirements for the CNBC certificate;
- exposure to experimental techniques in the form of a lab rotation;
- a roughly semester-long project to satisfy the PNC first-year research requirement and the first of the MLD speaking skills requirements;
- a year-long project that would satisfy both the PNC second-year research requirement and the MLD Data Analysis Project requirements;
- participation in CNBC activities as a CNBC student; and
- a Ph.D. thesis on a neuroscientific topic; if there is a single advisor, that person should be both a CNBC faculty member and affiliated with MLD; otherwise, the student may two co-advisors who, between them, have CNBC and MLD affiliations.

Additional satellite activities through the CNBC will also foster students' professional and scientific development.

Course requirements

Students must complete the four-course requirement of the CNBC certificate program, i.e., they must:

They must also gain graduate level training through coursework in the following three areas: (i) cell and molecular neuroscience/neurophysiology, (ii) systems neuroscience, and (iii) cognitive neuroscience. Recommended courses fulfilling this requirement include

- (i) 03-762 Advanced Cellular Neuroscience (CMU) or NROSCI 2100/2101 Cellular and Molecular Neurobiology (Pitt)
- (ii) 03-763 Systems Neuroscience (CMU) or NROSCI 2102 Systems Neuroscience (Pitt), and
- (iii) 85-765 Cognitive Neuroscience.

To complete the computational requirement, students must take the combined Pitt/CMU course:

- 36-759 Statistical Models of the Brain (CMU) / Math 3375 Computational Neuroscience (Pitt).

Note that this is not exactly the same as the standard CNBC computational requirement.

To meet the course requirements in MLD they must take

- 10-715 Advanced Introduction to Machine Learning,
- 10-702 Statistical Machine Learning,
- 10-705 Intermediate Statistics,

They must also take any two of the following:

- 10-708 Probabilistic Graphical Models,
- 10-725 Convex Optimization,
- 15-826 Multimedia Databases and Data Mining,
- 15-750 Algorithms, or 15-853 Algorithms in the Real World.

Any substitutions or exemptions from coursework must be recommended by the student's advisor and approved by the program co-directors and the co-directors of graduate studies in MLD.

Program Milestones

First year research requirement: By the end of the first calendar year in the program, all students will be required to complete a data-analytic project. The purpose of the project is to have the student identify a biological problem, understand the data collection process, articulate the goals of building a model or performing a particular kind of analysis and implement this computational approach. In some cases the project may be a precursor to the student's eventual thesis project. Both written and oral summaries of the project must be presented. The project will be evaluated by a committee consisting of at least three faculty, of whom at least two are PNC training faculty. Students who wish to enter the joint program from MLD after their first year may be able to waive this requirement with the permission of the PNC training faculty.

Second year research requirement: All students will be required to complete a deeper computational project. The student's work on the project should demonstrate that the student has 1) the ability to analyze and interpret experimental data in a particular area 2) the ability to develop and implement a computational approach incorporating the relevant level of biological detail and 3) the ability to organize, interpret and present the results of the computational work. This project should be a body of work suitable for publication. It is expected that the research will be written up as a paper to be submitted to a journal in the relevant field. In the second year, students are expected to work on research about 1/3 of their time during the academic year and full time during the summer. In most cases this project will be on an area related to the student's eventual thesis project, and in most cases it should be completed by the end of the student's second calendar year in the program. In addition, the results of the project will be presented publicly in the form of a seminar. This project, which counts as the Data Analysis Project in MLD, will be evaluated by a committee consisting of at least three faculty, two of whom are PNC training faculty and one of whom is ML faculty appropriate to the topic.

Note the MLD speaking skills requirements will be met via the first-year research project and second-year research project presentations, specified above. In addition, students in this joint program must participate in the MLD journal club, but participation in a CNBC-related journal club may be used as a substitute if approved by the MLD graduate co-advisors.

Ph.D. Thesis proposal: Required coursework should be completed by the end of the third year. During the fourth year a Ph.D. candidate should present a thesis proposal first to his or her thesis committee and then to the CNBC and MLD community.

The student will have two joint advisors, one from MLD and the other a CNBC faculty member from outside of MLD. A thesis committee will be formed and should be composed of at least four members, one of whom is an external member (typically from outside CMU and Pitt); two must be PNC training faculty; two must be MLD faculty; and at least one CMU or Pitt member must be from a discipline outside of statistics and computer science. The thesis committee is subject to approval by the PNC training faculty and the MLD faculty.

The thesis proposal should include: a succinct summary of the proposed research problem; the significance of the proposed research; a review of relevant literature relating to the problem; a review of the candidate's work leading up to the thesis, including preliminary results; a clear statement of remaining research; and a tentative schedule for completing the work. It should also conform to the stylistic requirements for thesis proposals in MLD. The thesis committee must offer its preliminary approval of the proposal. The student then arranges to present the proposal publicly, so that CNBC and MLD faculty and other community members can attend. Formal approval is conferred by the MLD faculty and the PNC training faculty.

Ph.D. Thesis Defense: Normally, the dissertation is completed during the student's fifth year. The final defense is a public presentation, in accord with the College and University requirements for the Ph.D. It is the candidate's responsibility to ensure that the Departmental, College and University guidelines are followed for publicity of the defense and availability of the thesis document at least two weeks prior to the defense. Note that the defense must be held at least 21 days before the date the degree is awarded.

5 Additional Program Information and Requirements

Training in Responsible Conduct of Research (RCR)
All students must obtain RCR training through two distinct training programs available at CMU.

University-wide RCR seminar series
Before the end of their second year in the program, all students are expected to complete the university-wide course *Responsible Conduct of Research Seminar Series*. The course is a combination of face-to-face lectures and group discussions, covering the following topic areas:

1. Introduction to RCR / Overview / Roadmap
2. Authorship and Publication
3. Collaboration
4. Conflict of Interest
5. Data: collection accuracy, security, access
6. Export Control Compliance
7. Intellectual Property
8. Mentor / Trainee Responsibilities
9. Peer Review
10. Research involving Human Subjects
11. Research Misconduct
12. The Scientist & Society
13. Who owns it? (copyrights, plagiarism, attribution)

CNBC-specific RCR training
The CNBC provides training in scientific ethics and responsible conduct in research through a series of informal "brain bag" presentations. PNC students are expected to attend these brain bag presentations in their third year and they will serve as refresher training for the core ethics training given in years one and two of the program.

Collaboration with experimentalists
One critical aspect of a successful training program for computational neuroscience is to give students a detailed understanding of how the experimental data they are analyzing or modeling are collected. This allows students to appreciate the limitations of the experimental data (such as sources of variability), appreciate what kinds of experiments can and cannot be done and aid in their ability to interact with experimentalists. This also increases the relevance of the student's computational-based research and increases the overall caliber of the student's PhD dissertation.

All students in the PNC are encouraged to do experimental work and/or to collaborate closely with experimentalists. Students working in different areas will have different needs in terms of the extent of their involvement collecting experimental data. Some students will be in laboratories in which both experimental and computational work is being performed and will gain experience in both approaches throughout their training. Students working in a strictly computational lab are required to do a 10 week rotation in an experimental lab with the intent to begin (or continue) a collaboration with that lab. The goal of this rotation is that students should be sufficiently well trained that they can design and carry out their own experiments. The student is responsible for meeting this requirement, and it should be discussed with the student's advisor not later than by the end of the first year. A proposal detailing this cross-training experience must be submitted for approval by the PNC training faculty prior to approval of the thesis proposal, and preferably earlier.

Note that the experimental rotation may serve as a major component of either the first-year or second-year research requirement but that this is not necessarily the case.

Teaching Assistant Requirement
In order to build skills in teaching, mentoring, communication and management skills, each student will be required to serve as a teaching assistant for two courses during their career as a graduate student in the program. The ideal scenario would include one introductory level course and one advanced level course. The time commitment for TA-ship should be roughly 12 hours per week. The student will receive a formal evaluation from the course instructor each semester they serve as a Teaching Assistant. Students must receive a satisfactory evaluation to receive credit for the semester. Note that students in the joint PNC/ML degree program will split their TA responsibilities between

CNBC and ML, i.e., students will TA one CNBC course and one ML course. The ML course will be subject to the standard ML PhD teaching assistant requirements.

Non-native speaking teaching assistants (TAs) must take the International Teaching Assistant Test administered by the Intercultural Communication Center. Only those students who receive a Pass or Restricted I can be certified to teach. Graduate students who do not pass the International Teaching Assistant Test will be provided with help at the Intercultural Communication Center until they are able to pass. Students who are non-native English speakers may also benefit from completing 99-452: Language and Culture for Teaching (3 units) offered through the Intercultural Communication Center at CMU.

Advising and Student Evaluation

Twice each year, the PNC training faculty reviews the progress of each student in all aspects of the program. The results of this evaluation will be communicated to the student by the co-directors of the graduate program. As part of this process, each student is expected to submit a self-evaluation, stating whether they meet their previous semester's goals, and also giving their plans for next steps in the program.

Selection and change of thesis advisor: At all times during their graduate training, students will be engaged in research under the supervision of a faculty advisor. This advisor is responsible for the academic and financial support of the student. Students initially will be assigned an advisor upon admission to the PNC, who will guide the student in selecting courses and help form his or her initial research project. By the end of the summer following the first year students must identify a thesis advisor, which in many cases will be the first year academic advisor. Occasionally, a student's faculty advisor may be changed (see below); most often this change occurs because of a change in the student's research interests. If the advisor must change for any reason, it is the responsibility of the student to identify a new advisor who is willing and able to provide academic and financial support. This advisor must then be approved by the program co-directors and the CMU co-director of the CNBC.

A student may voluntarily change advisors with the mutual consent of the new advisor, the program co-directors and the CMU co-director of the CNBC. An advisor may terminate his or her supervision of and responsibility for a student after written notification of the problems, which may include lack of effort, lack of research progress, lack of research aptitude, failure to obey policy or procedures, failure to comply with University regulations, or behavior detrimental to the laboratory or program. Consideration of this action must be brought to the attention of the student, the PNC program co-directors and the CMU CNBC co-director. A student who no longer has an advisor will be given two weeks to find a new advisor. Students without advisors after this time may be terminated from the program.

Termination of a Student from the Graduate Program: Students may be terminated from the Graduate Program for failure to achieve a "B" or better in two required core courses or one of these courses on successive occasions, failure to pass any program milestone, failure to make adequate progress in research, failure to find/maintain an acceptable research advisor, breaches in ethical conduct such as plagiarism or for conduct detrimental to the program. Except for instances involving breaches in legal or ethical behavior, students will not be terminated from the Program without first being notified in writing that they have been placed on probation. This written communication will include a description of the reason(s) for placing the student on probation, and the goals that the student must accomplish in order to regain good standing in the Program.

When a student who is not on probation fails a program milestone, the student will be placed on probation and given a second opportunity to pass that milestone. The student will receive a written communication from the committee that evaluated performance on the exam detailing the deficiencies in performance and what must be accomplished to satisfy these concerns. A second failure of the same milestone constitutes grounds for termination from the Program. When a student who is already on probation fails one of the major examinations, the student may or may not be given a second opportunity to pass that examination, at the discretion of the PNC training faculty.

In all cases, the termination of a student requires a decision by the PNC training faculty and acceptance of a recommendation for dismissal by the co-Directors of the CNBC. Terminations are final.

Grievance procedures in the PNC

From time to time students may have complaints about some aspect of their training in the PNC. Graduate students are encouraged to discuss such concerns with any faculty member, especially their advisors or the program co-

directors. The PNC tries to solve problems informally, but there may come a time when a problem arises that cannot be resolved through informal procedures. To provide for this situation, there is a formal grievance procedure.

The process will commence when a student files a grievance in writing with the CMU CNBC co-director. The grievance will be discussed by a three-person board including the CMU CNBC co-director and two PNC faculty members selected by the CMU co-director of the CNBC. The board will render a written recommendation, with copies sent to the student, the office of the Dean of H&SS, and those against whom the grievance was brought (if specific individuals are involved). No person against whom the grievance is brought will have a role in investigating it. If the co-director is among those against whom the grievance is brought, then the Dean will be asked to designate another senior faculty member from the CNBC to substitute for the co-director on the three-person board.

University policies and agreements governing student, staff, and faculty rights supersede this procedure. If a satisfactory settlement is not reached through the activity of the three-person board described above, the student may bring the grievance to the Dean and, subsequently, to the Provost. In this case the grievance board's written recommendation will be part of the preliminary background information reviewed by the Dean or Provost or other University official before any action is taken.

The student may withdraw the grievance at any point throughout the Departmental investigation.

Grievances within the College of Humanities and Social Sciences

Any graduate student who has exhausted normal grievance procedures within the Department may present a grievance to the office of the Dean of the College. The Dean may request statements or testimony from other parties involved, and will consider the grievance in an ad hoc committee composed of the Dean, a faculty member from a department not involved in the grievance and a graduate student from a second uninvolved department. The committee will present its decision in writing to all parties involved.

Other Program Activities

PNC students will participate with CNBC certificate students in the following co-curricular activities.

The CNBC colloquium series is a student-run speaker series that brings eminent scientists to Pittsburgh. Students have played a major role in the selection and hosting of speakers throughout the years; faculty provide input on speaker selection, but the students do all the voting and interact extensively with the speakers during their visits.

The Brain Bag research seminars meet approximately bi-weekly throughout the academic year on Monday evenings. At each Brain Bag, a student gives a brief talk describing research in progress. Students are required to attend 2 Brain Bags per semester. Each student must present a Brain Bag by the end of their third year in the program.

The CNBC Retreat is held in the Fall semester every year. The goal of our retreat is to foster scientific and social interactions among faculty, post-docs, and students affiliated with the CNBC. The program includes a full agenda of scientific presentations and discussions, as well as other informational, social, and recreational events. Retreat attendance is a required part of the CNBC program, and the CNBC Education Committee has adopted a policy that students must participate in the retreat each year to remain in good standing. However, we realize that sometimes a scheduling conflict makes attendance difficult, and therefore, each student will receive one "opt-out". That is, a CNBC student may pick one year when they do not attend the retreat. We encourage you to save this for when you really need it, as additional opt-outs will not be available.

CNBC Friday Seminars are an occasional seminar series at which in-house and outside speakers present in an informal and interactive setting.

6 Training faculty

Any potential PhD thesis advisor must be a member of the PNC approved training faculty. Training faculty will be drawn from Pitt and CMU, and will include both faculty working in computational neuroscience and experimental faculty who have interest and experience in collaborating on computational work. Training faculty from the two campuses will be treated equally in every respect, including availability and cost of students. An up to date list of training faculty can be found at http://www.cnbc.cmu.edu/pnctrainingfaculty.

7 University Policies & Expectations

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student handbook the following resources are available to assist you in understanding community expectations:

- The Word/Student Handbook: www.cmu.edu/student-affairs/theword//index.html
- Academic Integrity Website: www.cmu.edu/academic-integrity
- University Policies Website: www.cmu.edu/policies/
- Graduate Education Website: http://www.cmu.edu/graduate/policies/index.html

Please see Appendix A for additional information about The Word and University resources.

Carnegie Mellon University Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

The Statement of Assurance can also be found on-line at: http://www.cmu.edu/policies/documents/SoA.html.

The Carnegie Mellon Code

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met, commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The Carnegie Mellon Code can also be found on-line at: http://www.cmu.edu/student-affairs/theword/code.html.

Appendix A

Highlighted University Resources for Graduate Students and The Word, Student Handbook
Key Offices for Graduate Student Support
Office of the Assistant Vice Provost for Graduate Education
www.cmu.edu/graduate; grad-ed@cmu.edu

The Office of the Assistant Vice Provost for Graduate Education, AVPGE, directed by Suzie Laurich-McIntyre, Assistant Vice Provost for Graduate Education, provides central support for graduate students in a number of roles. These include: being an ombudsperson and resource person for graduate students as an informal advisor; resolving formal and informal graduate student appeals; informing and assisting in forming policy and procedures relevant to graduate students; and working with departments on issues related to graduate students and implementation of programs in support of graduate student development.

The Office of the AVPGE often partners with the division of Student Affairs to assist graduate students with their Carnegie Mellon experience. Senior members of the student affairs staff are assigned to each college and are often consulted by the Assistant Vice Provost for Graduate Education and departments on an individual basis to respond to graduate student needs.

The Office of the Assistant Vice Provost for Graduate Education (AVPGE) offers a robust schedule of professional development opportunities. Some are geared towards a specific population (master's students, PhD students at the beginning of their program, graduate students seeking tenure track positions, etc.) and others are open to all graduate students (time management, balancing, staying healthy). A full schedule of programs can be found at: http://www.cmu.edu/graduate/.

The Office of the AVPGE also coordinates several funding programs, and academically focused seminars and workshops that advise, empower and help retain all graduate students, particularly graduate students of color and women in the science and technical fields. The fundamental goals of our programs have been constant: first, to support, advise and guide individual graduate students as they work to complete their degrees; second, to contribute to the greatest degree possible to the diversification of the academy. Visit the Graduate Education website for information about:

- Conference Funding Grants
- Graduate Small Project Help (GuSH) Research Funding
- Graduate Student Professional Development: seminars, workshops and resources
- Graduate Women Gatherings (GWG)
- Inter-university Graduate Student of Color Series (SOC)

Office of the Dean Student Affairs
www.cmu.edu/student-affairs/index.html
The Office of the Dean provides central leadership of the metacurricular experience at Carnegie Mellon. The offices that fall under the division of Student Affairs led by Dean of Student Affairs Gina Casalegno, include:

- Career and Professional Development Center
- Counseling & Psychological Services (CAPS)
- Housing & Dining Services
- Orientation & First Year Programs *(note: for undergraduate students)*
- Office of International Education (OIE)
- Student Activities
- Student Life.

Holly Hippensteel, Assistant Dean of Student Affairs, serves as the point person in the division for graduate student resources and concerns. Graduate students will find the enrollment information for Domestic Partner Registration in the Office of the Dean of Student Affairs and on the website. The Office of the Dean of Student Affairs also manages the Emergency Student Loan (ESLs) process. The Emergency Student Loan service is made available through the generous gifts of alumni and friends of the university. The Emergency Student Loan is an interest-free, emergency-based loan repayable within 30 days. Loans are available to enrolled students for academic supplies, medication, food or other expenses not able to be met due to unforeseeable circumstances.

Assistance for Individuals with Disabilities
Students with disabilities are encouraged to self-identify with Equal Opportunity Services by contacting Larry Powell, 412-268-2013, lpowell@andrew.cmu.edu to access the services available at the university and initiate a request for accommodations.

Eberly Center for Teaching Excellence
www.cmu.edu/teaching
Support for graduate students who are or will be teaching is provided in many departments and centrally by the Eberly Center for Teaching Excellence. The Eberly Center offers activities for current and prospective teaching assistants as well as any graduate students who wish to pre-pare for the teaching component of an academic career. The Center also assists departments in creating and conducting programs to meet the specific needs of students in their programs.Specific information about Eberly Center support for graduate students can be found at: www.cmu.edu/teaching/graduatestudentsupport/index.html.

Graduate Student Assembly
www.cmu.edu/stugov/gsa/index.html
The Carnegie Mellon Student Government consists of an Executive Branch and a Legislative Branch. This is the core of traditional student government, as governed by the Student Body Constitution. The Executive Branch serves the entire student body, graduate and undergraduate, and consists of one president and four vice-presidents. The Legislative Branch for graduate students, The Graduate Student Assembly (GSA) passes legislation, allocates student activities funding, and otherwise acts on behalf of all graduate student interests. GSA also plans various social opportunities for graduate students and maintains a website of graduate student resources on and off-campus, www.cmu.edu/stugov/gsa/resources/index.html. Each department has representation on GSA and the department rep(s) is the main avenue of graduate student representation of and information back to the graduate students in the department.

Intercultural Communication Center (ICC)
www.cmu.edu/icc/
The Intercultural Communication Center (ICC) is a support service offering both credit and non-credit classes, workshops, and individual appointments designed to equip nonnative English speakers (international students as well as students who attended high school in the U.S.) with the skills needed to succeed in academic programs at Carnegie Mellon. In addition to developing academic literacy skills such as speaking, reading and writing, students can learn more about the culture and customs of the U.S. classroom. The ICC also helps international teaching assistants (ITAs) who are non-native English speakers develop fluency and cultural understanding to teach successfully at Carnegie Mellon and provides ITA testing.

Office of International Education (OIE)
www.studentaffairs.cmu.edu/oie/
Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. OIE is the liaison to the University for all non-immigrant students and scholars. OIE provides many services including: advising on personal, immigration, academic, social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; supporting international and cultural student groups such as the International Student Union and the International Spouses and Partners Organization; maintaining a resource library that includes information on cultural adjustment, international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website, and conducting orientation programs.

Key Offices for Health, Wellness & Safety
Counseling & Psychological Services
www.studentaffairs.cmu.edu/counseling
Counseling & Psychological Services (CAPS) affords the opportunity for students to talk privately about issues that are significant for them in a safe, confidential setting. Students sometimes feel confused about why they are feeling upset and perhaps confused about how to deal with it. An initial consultation with a CAPS therapist will clarify options and provide a recommendation to the appropriate mental health resource at Carnegie Mellon or the larger Pittsburgh community. CAPS services are provided at no cost. There are, however, limits on the number of sessions. Follow-up

psychiatric services and off-campus referrals for longer term therapy are at the client's expense. Appointments can be made in person or by telephone, 412-268-2922.

Health Services
www.cmu.edu/HealthServices/
University Health Services (UHS) is staffed by physicians, advanced practice clinicians and registered nurses who provide general medical care, allergy injections, first aid, gynecological care and contraception as well as on-site pharmaceuticals. There is a small visit fee to see the physicians and advanced practice clinicians; nurse visits are free of charge. Fees for prescription medications, laboratory tests, diagnostic procedures and referral to the emergency room or specialists are the student's responsibility. UHS also has a registered dietician and health promotion specialist on staff to assist students in addressing nutrition, drug and alcohol and other healthy lifestyle issues. In addition to providing direct health care, UHS administers the Student Health Insurance Program. The Student Health insurance plan offers a high level of coverage in a wide network of health care providers and hospitals. It also covers most of the fees for care at Student Health Services. Graduate students should contact UHS to discuss options for health insurance for spouses, domestic partners and dependents. Appointments can be made by visiting UHS's website or by telephone, 412-268-2157.

University Police
http://www.cmu.edu/police/
412-268-2323 (emergency only), 412-268-6232 (non-emergency)
The University Police Department is located at 300 South Craig Street, Room 199 (entrance is on Filmore Street). The department's services include police patrols and call response, criminal investigations, shuttle and escort services (additional information included in the Parking and Transportation section of the handbook below), fixed officer and foot officer patrols, event security, and crime prevention and education programming. Visit the department's website for additional information about the staff, escort and shuttle, emergency phone locations, crime prevention, lost and found, finger print services, and annual statistic reports.

Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. Graduate students can obtain a copy by contacting the University Police Department at 412-268-6232. The annual security and fire safety report is also available online at www.cmu.edu/police/annualreports.

The Word
http://www.cmu.edu/student-affairs/theword//

The Word is Carnegie Mellon University's student on-line handbook and is considered a supplement to the department (and sometimes college) handbook. The Word contains campus resources and opportunities, academic policy information and resources, community standards information and resources. It is designed to provide all students with the tools, guidance, and insights to help you achieve their full potential as a member of the Carnegie Mellon community. Information about the following is included in The Word (not an exhaustive list) and graduate students are encouraged to bookmark this site and refer to it often:
Carnegie Mellon Vision, Mission
Carnegie Code
Academic Resources & Opportunities
- Academic Advising
- Academic Resources

Academic Standards, Policies and Procedures
- Educational Goals
- Academic and Individual Freedom
- Statement on Academic Integrity
- Academic Policies and Procedures
  - Research
    - Human Subjects in Research
    - Intellectual Property Policy
    - Office of Research Integrity & Compliance

Office of Sponsored Programs
Policy for Handling Alleged Misconduct of Research
Policy on Restricted Research

Campus Resources & Opportunities
- Alumni Relations
- Assistance for Individuals with Disabilities
- Athletics, Physical Fitness & Recreation
- Carnegie Mellon ID Cards and Services
- Copying, Printing & Mailing
- Division of Student Affairs
- Domestic Partner Registration
- Emergency Student Loan Program
- Gender Identity
- GLBT Resources
- Health Services
- Dining Services
- The HUB Student Services Center
- Leonard Gelfand Center
- Multicultural and Diversity Initiatives
- Opportunities for Involvement
- Parking and Transportation Services
- SafeWalk
- Sexual Assault Advisors
- Shuttle and Escort Services
- Spiritual Development
- University Center
- University Police
- University Stores

Community Standards, Policies and Procedures
- Alcohol and Drugs Policy
- AIDS Policy
- Bicycle/Wheeled Transportation Policy
- Damage to Carnegie Mellon Property
- Deadly Weapons
- Discriminatory Harassment
- Disorderly Conduct
- Equal Opportunity/Affirmative Action Policy
- Freedom of Expression Policy
- Health Insurance Policy
- Immunization Policy
- Missing Student Protocol
- Non-Discrimination Policy
- On-Campus Emergencies
- Pets
- Political Activities
- Recycling Policy
- Riotous and Disorderly Behavior
- Safety Hazards
- Scheduling and Use of University Facilities
- Sexual Assault and Harassment Policy
- Smoking Policy
- Student Accounts Receivable and Collection Policy and Procedures
- Student Activities Fee
- Student Enterprises
- Workplace Threats and Violence Policy