

Teaching Statement

Since college I have been interested in understanding how the brain works and whether it is possible to build a machine that emulates human perception and intelligence. Like many deep questions, these particular problems cut across numerous disciplines, including psychology, neuroscience and computer science. Therefore, my formal education and research experience has spanned these three fields, making me qualified to teach many traditional courses within each field. But more importantly, I am very enthusiastic about teaching novel interdisciplinary courses at the interface of these fields which will be of interest to students in the cognitive, biological and computer sciences alike. For example, a course in computational neuroscience is not only of obvious interest to students of the brain but is also very useful to computer science students interested in brain-style computation. Similarly, a course in computational perception focusing on information-processing models of biological sensory systems is equally useful to students of artificial intelligence as it is to students in cognitive psychology. On the whole, I am a firm believer that a two-way traffic of ideas between the brain and computational sciences is essential to understand the brain and to implement truly effective machine perceptual systems, and therefore it is essential for students to have training in both biology and computation as a part of their education. In addition to teaching novel interdisciplinary courses in computational neuroscience, computational perception and neural computation, I am also very interested in writing undergraduate level textbooks for these courses which will be accessible to students from a variety of backgrounds.

I believe that teaching and scholarship provides the intellectual discipline and the breadth of knowledge needed to pursue fruitful new directions of research. The best way to learn a new field is to teach a course on it, and as my interests evolve I look forward to learning new subjects and teaching them to students at various levels. I do not subscribe to the notion of a scientist as being a narrow specialist in a single research area, but rather as a well-versed intellectual who has the general background to approach interesting questions from novel directions. I also believe that a valuable role for a scientist is that of public intellectual, as fields like neuroscience, cognitive science and evolutionary biology touch upon questions of human nature that mankind has pondered for millennia. My education and intellectual development have been strongly influenced by reading popular science books by Richard Dawkins, E.O. Wilson, Steven Pinker and a host of other scientists, and I hope someday to write books for a general audience which will touch on deeper issues like the biological basis of human nature, or the possibility of neuroscience-inspired machine perception.

I do not view teaching as merely transmitting a set of facts. In my view, it is about helping students learn how to ask questions and think critically about a particular topic, and helping them to develop practical skills which will translate outside of the specific context of the course subject matter. Therefore, my courses will emphasize homework and computer projects rather than tests, and students will get hands-on experience in computer labs running psychophysical experiments on their classmates and simulating neurons and neural networks to solve biological and computer science problems. My main goal as a teacher is to help students get to where they want to go in their careers, using the subject matter of cognitive science and computational neuroscience as a vehicle. Students interested in computer science careers will learn programming skills and biological approaches to the problems of artificial intelligence, psychology students will get hands-on experience running experiments with human subjects, and

premedical students will get a solid foundation in brain and cognitive science along with an appreciation for the use of computation as an essential research tool in modern biomedicine.

In addition to classroom instruction, another important role for a professor is that of a mentor to students. As a post-doc, I have supervised six undergraduate students who have assisted me with image editing tasks and computer programming. I have greatly enjoyed getting to know each of them, and I enjoy giving them advice about their careers and courses during our many long discussions. One undergraduate in particular has shown exceptional interest in the work of the laboratory, and I am preparing him to participate directly in future projects which might possibly result a senior thesis and co-authorship on a publication. Once I am an independent investigator, my laboratory will always have plenty of room for undergraduates as well as graduate students, and there is no shortage of interesting research projects for bright and committed students which can lead to senior thesis, master's thesis or doctoral dissertation in cognitive science, computational neuroscience or artificial intelligence.

As is clear from my CV, I truly enjoy teaching and have pursued far more teaching opportunities than most of my graduate school colleagues. Although most of my teaching opportunities have been at the graduate level, I gained valuable experience teaching a basic course when I was a section leader for an introductory Neuroscience course for first-year medical students at Johns Hopkins. Many of these students had little if any prior exposure to neuroscience, so the first time I was a TA (in 2006) I developed for my section a set of detailed, illustrated solutions to each week's problem set. These solutions became so popular with the students in my section that they were distributed to the entire medical school class, and eventually incorporated by the course director into the official course materials by the second time I was a TA (in 2008). Even my graduate-level teaching experience often involved introducing students to new ways of thinking, and new fields of study in which they have little experience. For instance, as a TA for Professor Lewicki's computational perception course (EECS 600), I spent considerable effort during office hours teaching senior and graduate engineering students about neuroscience and neural computation and their direct relevance to solving problems which arise in artificial intelligence.

Teaching is not only a career to me, but is a fundamental part of my personality. I love nothing more than learning new facts and skills, engaging in intellectual debate, and discussing and explaining new ideas. My desire to lead the proverbial 'life of the mind' is precisely why I am pursuing a career as an academic scientist. I actually started at Cornell as a Philosophy major, and what makes neuroscience particularly compelling to me as is that it sits at the crux of the natural sciences and the social sciences and humanities. Since economic systems and social systems as well as art, music and literature are creations of the human mind, it is important to understand the nature of the human mind to fully appreciate man's creative expression and social institutions. Therefore, I look forward to someday being able to co-teach courses with philosophers, economists, political theorists and other scholars in the humanities and social sciences who are interested in exploring their problems through the lens of cognitive neuroscience and evolution. Ultimately, all explanations of man and his nature must be reducible to the computations performed by the amazing three pound computer in our skulls built by a blind tinkerer over millions of years of evolution, and it is my fondest hope that my work will help us to better understand a little bit more about how it works.