Teaching and Mentoring Statement

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I have been an instructor and mentor in both formal and informal capacities at multiple institutions and levels of responsibility. This has been personally and professionally rewarding, having shaped me as a person and an academic. Since moving to IBM T.J. Watson Research Center I have been out of the classroom and I've realized I miss teaching and mentoring; I miss how it helps me formalize my thoughts in a way that informs my research in real and meaningful ways. I hope to return to a position which affords time for teaching courses directly and indirectly related to my research. In this statement I summarize my teaching experience; list my capabilities as an instructor; describe my scholarship of teaching; discuss my mentoring and supervision; and state my teaching philosophy.

Teaching Experience. At Data61/NICTA I jointly taught Knowledge Representation and Reasoning at the University of New South Wales for three semesters with responsibility for $1/3^{rd}$ of the course focused on constraint programming and modeling. In each of these semesters we saw growing enrollment from 20 students the first semester to 80 in Fall 2015. This course was delivered with senior faculty from UNSW who provided valuable feedback and helped me develop as an instructor. We integrated videos from various online learning platforms to implement a flipped-classroom for the lectures. This helped us deliver more hands on learning while including the same amount of lecture material. ***In all 3 semesters I received only Strongly Agree (6/6) or Agree (5/6) feedback (median of Strongly Agree) on course evaluations***; including "Encouraging student input and participation during class" and "Overall, I was satisfied with the quality of this lecturer's teaching." with handwritten comments including, "Answered questions well and ensured that people understood," and "Good explanations, use of video, enthusiastic."

During my PhD I was fully responsible for teaching Introduction to Computer Programming at the University of Kentucky for two semesters. I was also, variously, a lab instructor for the second semester programming course for majors and the programming for non-majors course. ***During this time, I won a teaching award from the University of Kentucky Computer Science department in 2008, an honorable mention for the same award in 2010, and was a finalist for the university wide teaching award in 2011.*** Additionally, I lectured several times in the senior level Artificial Intelligence and Comparative Decision Making Studies which is a cross disciplinary program including faculty from CS, biology and economics. To fulfill requirements for my certificate in College Teaching and Learning at the University of Kentucky, I was fully responsible for teaching an introduction to technology course and a Microsoft office skills course while employed as an adjunct instructor at Bluegrass Community and Technical College.

Capabilities as an Instructor. I would like to teach courses in ***artificial intelligence; optimization and modeling; theory of computation; general algorithms and data structures; experimental algorithms; data analysis and data science; AI/computer ethics*** at the undergraduate and graduate levels. I would also like ***develop interdisciplinary courses that touch on my expertise*** including courses at the intersection of computer science and economics as well as decision making/analytics and biology and other science courses. In addition to courses near my research, I am able to teach ***data mining, machine learning, parameterized complexity and algorithms, databases, and discrete mathematics*** courses at the undergraduate and graduate levels. I have enjoyed, and been very successful, teaching ***computer programming*** courses at various levels and for non-majors and would enjoy continuing to teach them. Additionally, I could teach a course on embedded programming and system design, including operating systems at the undergraduate level, drawing on my experience as an engineer at NASA Ames.

Scholarship of Teaching and Professional Development. In addition to my experience as an instructor, I have worked on improving both my teaching and my scholarship of teaching. With Prof. Judy Goldsmith I have published multiple articles focused on leveraging students' interest in popular works of science fiction to increase learning, satisfaction, and retention in artificial intelligence courses. With Dr. Emanuelle Burton and Prof. Goldsmith, we have authored multiple papers focused on using popular fiction to teach students research and societal ethics in computer science that have garnered popular media mentions in *The Guardian* (Link) and *IO9* (Link). We have recently received a grant to jump start the process of converting this research into a textbook.

I received a graduate certificate from the University of Kentucky's Preparing Future Faculty College Teaching and Learning Certificate Program. This rewarding series of courses and practicums focused on research, writing, and preparing students to become instructors and mentors. The program included formal instruction on: grant

writing, pedagogical techniques, developing classroom activities, and student development, which have helped me to implement more comprehensive and clear scoring rubrics; design new, more focused, assignments; and write improved tests and student assessment. The courses, and especially the practicum, which required teaching at Bluegrass Community College, helped me grow as a presenter, course coordinator, researcher, and academic.

Supervision and Mentoring. I have worked with and supervised both undergraduate and graduate students in both academic and industrial settings on a variety of projects designed in collaboration with the students. These collaborations have led to publications with undergraduates Thomas Dodson and James Forshee at the University of Kentucky and with PhD students Cristina Cornelio (Univ. of Padova) and Thomas E. Allen (Univ. of Kentucky). At Data61/NICTA and UNSW I had the opportunity to work, mentor, and publish with talented PhD students including Simon Mackenzie (UNSW) and Paul Stursberg (TU Munich). I supervised international masters summer research visits by Tobias Kaminski, Manos Thanos, and Emira Ziberi and served as an assessor and advisor for Alexis Shaw (honors thesis), Michael Weiss (masters thesis), and Christian Drescher (UNSW PhD). I also supervised and published with undergraduate interns Jack Lian, Jiashu Chen, and Renee Noble – who the first participant in the NICTA Young Researcher Internship for Undergraduate Women program that I helped create.

Philosophy of Teaching. My teaching has been shaped (so far) by my experiences with high achieving students at UNSW and the University of Kentucky and by students struggling through a local community college curriculum at BCTC. My experiences have led me to focus on three main instructional factors to promote learning: *hands-on learning experiences*, *high expectations of my students*, and *interactive dialog*.

Hands-on Learning. Learners grasp new ideas and principles better when they are rooted in something concrete and immediate – through hands on experience if possible. The combination of learning-by-doing and problem-based learning is an extremely potent. Computer science requires, at times, a designer's eye, a mathematician's rigor, and an engineer's practicality. To emphasize the varying aspects of computer science, I try to maximize the amount of time: writing programs; touching hardware; performing experiments; and interacting with systems or processes related to the current subject. Learning through concrete experiences allows students to gain experience working with, breaking down, and solving complex problems. These skills are invaluable in engineering and science disciplines, especially computer science. I strive to construct problem sets and programming assignments that augment student learning by creating situations that are likely to appear as they practice their profession later.

High Expectations. I believe that everyone has a drive to exceed expectations, to achieve as much as possible. With this in mind, I try to structure assignments in order to challenge students just beyond what they think they can do. This is not to say that the bar should be set unreasonably high, but rather I strive for appropriate standards such that no student dismisses a course or assignment as busy work or below their level. To facilitate the design and implementation of good assignments I do a written pre-assessment in courses or sit down with students and interns to understand their abilities and desires better. These interactions help me to gauge the confidence level and ability of the students. From these interactions, it is easier to clearly and effectively communicate expectations and tailor the course so that classroom activities and assignments fall within the range of student abilities in a particular class or program. Pre-assessment helps me realize when I need to support students and their learning during the course of the semester or internship in order to build an effective scaffolding for the students to learn.

Interactive Dialog. The best way for a student to reinforce their knowledge is to present material, written and orally, to myself as the instructor and/or fellow students. This social constructivist approach to interactions and explanations serves to reinforce concepts and principles the student has learned; it makes them go from reading to explaining. When and if my students take jobs as professionals, there is a high probability they will be working in a team environment. Social interaction and professional communication skills such as argumentation, presentation, and cooperative reasoning are fundamental skills in computer science and engineering. To improve student skills, I strive to interact with students on a one-on-one level throughout the semester or program. I ask them to give mini-presentations in class to their peers or to others in the program; explain their ideas to me in office hours; write clear summaries; and help their neighbors in a lab setting. These activities foster not only a better relationship between the students and myself, but also between the student and their peers.

I am always searching for opportunities to incorporate ideas and pedagogical techniques from other disciplines and instructors to improve my own understanding of teaching and my students' experiences inside and outside the classroom or lab. It is my responsibility to leave the students with more than just notes in a book but also real, hands-on experiences and skills that the students will use for the rest of their lives. I feel that it is important for an academic to not only be a good researcher, but a good developer of minds.