Teaching Statement

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Classroom teaching is a key responsibility of a faculty member. I view teaching as crucially providing students with tools – algorithmic, analytic, and problem-solving – that will be of use to them throughout their academic and professional careers. A challenge of teaching is to present the material in a way that is not only clear and well-organized, but also well-motivated, compelling, and relevant to the students. Although the course material may be chosen because it is fundamental and the students may have selected the course to fulfill a requirement, it is no less important to justify the importance and relevance of the course content. Answering the question, "Why is this important?", is just as crucial in introductory programming classes as it is in a research talk. Making a conscious and continuous effort to show students why they are learning this material now helps to engage students and to provide an organizing principle for courses that cover a broad topic area.

My undergraduate teaching has concentrated in two main areas: introductory programming and introduction to artificial intelligence. Working to foster engagement and participation in undergraduate students by connecting course material to real-world applications has significantly affected the development of my course design and presentation style. An example is the undergraduate introductory Artificial Intelligence course that I have taught since my arrival at the University of Chicago. The basic course structure has remained consistent, covering search and knowledge representation, machine learning, and "AI at the interfaces", through language, vision, and robotics. However, I have come to focus on drawing explicit connections between real-world applications and concepts introduced in class, with a continuing theme of identifying the basis for the success of techniques through combinations of novel algorithms and increases in computing power. Some examples of applications and associated concepts include:

- Spam Tagging: Naive Bayes' Classifiers
- Deep Blue and computer games: Alpha-beta pruning and iterative deepening

I juxtapose these approaches with the improvements based on increased "horsepower", such as huge inventories of openings and closings in chess, that have contributed to the enhanced capabilities in these areas. The connections are directly reflected in positive student feedback about learning about real-world applications, as well as more interactive and engaged classes. Students' personal experience with these systems stimulates their questions. These discussions of the limitations and strengths of approaches give the students insight into the process of defining research and development problems.

At the graduate level, I have taught topics courses in Natural Language Processing and Discourse and Dialogue. At this level, the tools that students need to develop for their careers include both specific knowledge of the field and research skills. My goal in these courses is to teach the research process through teaching technical content. It is important for students to become familiar with the literature, to be able to evaluate it critically, to identify limitations and open

questions, and to apply strategies to answer these questions. Reading, presenting, and critiquing approaches from course readings develops technical knowledge of the field, analytic and critical skills, and, importantly, the ability to present material in a formal, oral setting. Exercises focus on solving problems through specific approaches, supporting deeper technical understanding and greater awareness of the strengths and limitations of particular methods. Final projects ask the students to bring together the techniques and open questions to develop solutions.

My graduate teaching has also highlighted the interdisciplinary nature of research. Readings draw from computational, linguistic, and psychological sources, and as many as half of the students in the course come from these fields. Using examples from real-world issues and applications, such as automated essay scoring or deployed spoken language systems, establishes common ground as well as providing motivation and focus for the problems presented in class. The flexibility of the final project allows students to draw on both the diversity of the material presented in the course and the diversity of their own backgrounds to explore solutions to problems in this area.

Teaching and research are closely linked. Research yields new knowledge that contributes to course content. Teaching brings new findings into focus, and students at all levels raise questions that challenge existing approaches and understanding. These questions in turn can bring new insights that drive research. An example of this synergy between research and teaching can be found in a new set of hands-on exercises I am developing for multimodal study of discourse and dialogue. These educational tools build on infrastructure and software developed for an NSF-funded multimodal research project and will provide students with a more interactive class experience as well as new tools that they can apply in future research. This opportunity highlights the benefits of a close relationship between education and research.