

Teaching Statement

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I believe that students learn best when given space to explore and show initiative. As such, I hope to foster a teaching environment that allows for people to feel comfortable, taking risks and attempting new things. Of course, these freedoms are not free, as someone with a mathematical physics background, I know that some things need to be memorized and that there is not always room for creativity in answers but there is always creativity in teaching a path to an answer, if one exists. I believe, teaching is therefore, a collection of paths, evolving and learning with every individual we are along that path and with every study subject we try to understand. To make these paths easier to traverse and to motivate those I want to travel with me, I try making the unattractive parts as relatable and beautiful as possible, making adjustments here and there, hoping that the next time I am down the same road, the path is as motivating as ever. With some luck and talent, those who learn with me also grow to take the initiative to build a path that takes us to exciting projects we can all learn from, enriched by the multiple backgrounds that we as a pluralistic society share.

My philosophy towards teaching has arisen from my own experiences. I have a bachelors in physics, a masters in computational social science and I have nearly completed a PhD in computer science, so I have encountered myself on multiple paths for a variety of disciplines. Within these years, I have also gained teaching experience at different levels. Particularly, I have worked as a teaching assistant (TA) in several courses, writing course material for graduate classes in data science (*Computational Content Analysis*), helping with lecture materials (*Probabilistic learning and Reasoning*), and grading in essays (*Computers and Society*) written by computer science students, to whom I attempted to teach writing skills to the best of my ability. Additionally, getting reached out regarding my research work from within the chess community and others has given me additional motivation to translate my ideas to the context those people come from.

I have spent my PhD working towards making better teaching tools. A fundamental motivation of my research is towards creating *algorithmic teachers*; AI/machine learning systems that can evaluate a student and provide actionable suggestions. In particular, I have built *individualized* teaching systems that seek to provide feedback to chess players based on the subtleties of their individual performance. This research has contributed to my understanding of the the latent complexities inherent in the students' learning paths.

The paths students take through the academic journey can be complex, which depends on their academic background and expectations, and also on how those factors help them achieve the desired outcomes of a highly regarded school. In fact, expectations and outcomes are often difficult concepts to define and therefore to measure. A grade is a natural way to measure the extent to which a study subject is understood, which should reflect a student's capacity to master concepts and develop new ideas, the potential of

those new ideas to advance the state of the art and their impact on real-life problems. These are then factors I consider when assessing students' progress on their academic journey.

A final important note on my teaching philosophy is that I am aware of and value the diversity of backgrounds and view points possible in a university classroom. While I have mostly attended classes in Canada, I spent two years during my masters as an immigrant in the United States, which brought to my attention the challenges of attending school away from home, same challenges that my partner as an engineering PhD student from a small country has also experienced while studying in Canada.

Potential Classes. My previous experience in teaching has mostly been in data science, and computational social science type of courses. So, I believe that I can teach courses such as *Introduction to Machine Learning*, *Social and Information Networks*, or *Information Visualization*. I also have experience supervising undergraduates, as well as collaborating with and mentoring graduate students on research projects. Thus, I feel comfortable teaching advanced machine learning concepts such as deep learning, transformers in neural networks, and reinforcement learning. I would enjoy teaching courses on these domains, which align with my research interests, by bringing in contemporary research papers and addressing seminal and cutting-edge examples from the literature.

Course Plan. My research is on how we can build AI systems that collaborate with humans. To this end, I will use the class as a way to deepen my understanding of the fundamentals and garner novel ideas and perspectives on my work. An example course outline would be to spend a few weeks getting the students familiar with the area, i.e. answer questions such as 'where do humans and AI collaborate?' or 'What is the background required to understand these topics?'. I also know from experience that getting the students setup to use the required tools would be an important task in the early weeks, and it would be essential to devote tutorial sessions to it. Then, the majority of the lectures would be looking at specific examples of AI systems, e.g. I will introduce the class to large language models, text to image models, recommendation systems, etc, then show how these systems are currently being used, before asking the class to envision how these technologies might be built upon. To close the course, I would present material on where the state of the art is developing, the next major areas that could be disrupted by AI developments and ethical considerations that may arise with it. Doing this type of class with a group of students would let me share my excitement for these technologies. I am particularly excited about the new types of creativity possible with recent AI developments—students are already using GPT-3 to generate essays. What if we graded them on how strong the generated results were?, what methods would they come up with? In this way, I would be preparing the students to work on research projects, which might even lead to the start of collaborating on research papers.