Teaching Statement

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I have seen students deeply engaged in theory-heavy courses with slide decks and bi-weekly assignments, and seen equal engagement in courses without slide decks and only three assignments in a semester. At the same time, I have taken classes where most students would skip through entire lectures for fairly-engaging topics, and others where half the class would be rushing to take notes in the absence of slide decks. From these experiences, I've learned that there is no secret blueprint to designing a great and engaging course. Instead, it's about great educators and a mindset of focusing on quality and engagement, over quantity and arbitrary rubrics. This is indeed my ambition as an educator—to continuously improve and evolve as a teacher, aspiring to create learning experiences that genuinely inspire and empower students

I believe students, after having taken a course, should emerge with a solid understanding, grounded confidence, and a positive attitude towards the subject. They should not feel like they endured the course due to its difficulty or how demanding it was. My goal is for students to be able to actively think and apply their learning to problems, not just know how to solve questions or assignments in a particular format. One key enabler is collaborative assignments that emphasize critical thinking and the process of solving problems, rather than getting to the solution itself. In my personal experience, the most fun and engaging assignments were ones where we worked on them in small groups, driven by a genuine interest in the subject, rather than ones where we worked in isolation to come up with solutions that we would confirm with our peers at the most. Keeping this in mind and drawing inspiration from my advisor, I aim to design assignments to appeal to students' interests, rather than incentivizing them solely through grades.

For instance, in a course I was a TA for (Computational Biology), we used Jupyter notebooks for assignments, providing sufficient boilerplate code to encouraging collaboration and focus on relevant learning. We aimed to make assignments interesting by generating synthetic data for Pokémon, prompting students to become familiar with relevant software (SnapGene) and observed that nearly all students became comfortable with the software. We guided students with screenshots of the software at relevant steps, aiming to connect concepts taught in class with the software's features and help students navigate entirely new and interdisciplinary software. Additionally, we assessed students based on their demonstrated understanding and effort rather than on just finding correct answers. Correctness is still desirable, but the focus should be on the process students use to tackle engaging problems that require critical thinking.

Having received education in both American and Indian institutes, I have observed a clear difference in the general approach taken by most professors. In Western culture, the onus to explain a concept lies on the speaker, while in India it's often up to the listener to put in most of the effort to understand concepts. I believe that expecting the speaker to communicate well is indeed the better approach, pushing educators to think more about communicating their ideas effectively, instead of sharing technical knowledge as-is and hoping listeners put more effort to understand it. Many concepts in machine learning and cryptography, for instance, are very technical for beginner students, and providing good intuition behind these technical details can be the difference between students rote-learning concepts and formulas, and students truly understanding techniques like VC-dimension. At the same time, allowing some room for retrospection enables students to think of concepts in their own way, and possibly discuss their concepts with peers. Continuing my post-graduate studies in the US has helped me see how both approaches have their merits and can be combined effectively. For instance, when teaching a class on machine learning, my approach would be to convey ideas like matrix multiplication and non-linear activations, and encourage students to reason about facts like how consecutive linear layers without non-linear activations, do not help increase model complexity.

Designing a course and teaching it is a great learning experience for professors as well. I recall reading through several papers for each presentation I gave as part of seminar courses, as well as the guest lecture I gave on Privacy in Genomics. I think teaching a course also plays a crucial role in sparking research interest in students, and can double as a great place to find potential students to work with. I have worked with several excellent undergraduate students and even high school students, many of who ended up contributing significantly to my research projects. Most of them were interested in ideas my advisor talked about in courses. Looking back, this was true for me as an undergraduate student as well: it was the design of courses, via interesting project ideas and challenging assignments that got me interested in concepts like adversarial robustness and active learning.

While I have given a few guest lectures for a couple courses, most of my first-hand teaching experience has been based on TA-ship, where the closest I have come to semester-long teaching was solving problems as a small group (20-25 students) for Linear Algebra during my undergraduate studies. I plan on designing my first course based on these principles, and teaching while keeping the above outlined principles in mind. Since it would be my first course, being open to feedback *throughout* the course (and not just at the end) would be key to designing a course that is both enjoyable and useful for students.

I have two different course ideas that I believe would be valuable for students and would like to at least cover aspects of these courses at some point. First, I would teach a graduate-level course focused on privacy and security in machine learning, with a hybrid format that explains useful concepts and thinking strategies in the first half, and transitions into a seminar-like format for the second half where students cover interesting and seminal papers from the field. The first half would cover concepts such as Differential Privacy and Adversarial Robustness, and help students develop a better intuition and understanding of these challenges, such as membership inference. For the second course, I would like to focus on causal learning and causality in machine learning via an undergraduate-level course. I find this approach to ML interesting and principled. Causal learning is utilized extensively across domains such as medicine and chemistry, and this added knowledge would serve as a great enabler for students to expand their knowledge and consider inter-disciplinary research. I initiated and co-lead a reading group on this topic last summer, which turned out to be a great experience that further made me want to develop a course, and learn about concepts related to causality in more detail.