TEACHING STATEMENT

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I believe that a well-rounded faculty should be not only a talented and enduring researcher but also an inspirational and enthusiastic teacher. I look forward to the challenges of conducting my original research that advances human knowledge and the opportunities to transfer my limited yet valuable knowledge to students through my teaching.

Teaching experience

Before starting my graduate study, I gained invaluable experience as a course assistant in the Introduction to Computational Engineering and Fundamentals of Electrical Engineering courses at Rice University. I learned that to become an effective teacher, not only do I need to understand and articulate the complex technical concepts at students' levels, but I also have to organize the materials in a transparent and comprehensible fashion. Moreover, from my experience as a math tutor at the Houston Community Colleges (HCCs), I found out that students are from different backgrounds, and I need to understand them from their viewpoints to design the course and explain the materials to the students effectively.

These initial but critical insights benefitted my first teaching assistant (TA) role for the first Deep Learning courses at Rice University, ELEC 631: Deep Learning and ELEC 677: Introduction to Deep Learning, in the Spring of 2015 and the Fall of 2017, respectively. These courses aim to introduce and expose undergraduate and graduate students at Rice University to deep learning models and methods. The challenges of these courses are 1) not only deep learning but also machine learning was still very new to students and researchers at Rice at that time, and 2) people in these courses are from a variety of backgrounds, including undergraduate students, graduate students, post-doctoral researchers, and researchers in the Texas Medical Centers with different majors. I was in charge of co-designing the course materials with the instructor, preparing lecture slides, writing the homework assignments and their solutions, and assisting students with their studies during office hours. My previous experience as a math tutor at HCCs and as a course assistant at Rice came in handy. Since many students and researchers at Rice have a good understanding of signal processing and applied mathematics from their study and research, in the lectures, I tried to connect techniques in deep learning with methods in these fields. Interestingly, such connections play an essential role in my research later. For the final projects in ELEC 677 and ELEC 631, I let the students freely explore and discuss various topics in deep learning while continuously steering them in the right direction, especially those related to their majors, expertise, and research. Whenever they came up with challenging yet promising topics, I introduced and familiarized them with fundamental deep learning and machine learning techniques that are commonly utilized to handle such topics. From these elementary but crucial steps, the students eventually developed their approaches to unravel their initial questions partially.

In the later years of my Ph.D. time at Rice University, I was very fortunate to have an opportunity to mentor a group of undergraduate students and junior Ph.D. students at the California Institute of Technology (Caltech) via my collaboration with researchers there and the Summer Undergraduate Research Fellowships (SURF) program at Caltech. We regularly had group meetings where I taught my mentees advanced concepts in deep learning and generative models. Equipped with this knowledge, the students could initiate their research problems in these directions.

Apart from being a teaching assistant for deep learning courses at Rice, I was also an instructor for a Machine Learning course at UCLA, MATH156. Different from the deep learning courses at Rice, this class is taken by undergraduate students who major in mathematics. Thus, the focus of the class is to introduce the students to the mathematical aspects of modern machine learning and deep learning

models. To make my lecture effective for the students, my strategy was to combine abstract mathematical notions with illustrative examples related to practical machine learning methods while maintaining the appropriate portion of mathematical formulations. It not only led to considerable improvements in the student's understanding of course materials but also sparked an interest in employing mathematical tools to study and develop machine learning and deep learning models from the students.

Teaching philosophy

There are at least three fundamental features that characterize a good teacher. First, a teacher should be not only passionate about the subjects but also able to stimulate the student's interest in challenging concepts. During my TA role in ELEC 631 and ELEC 677, the deep learning courses at Rice, I frequently encountered students' complaints about ambiguous ideas of variational autoencoders (VAEs). To facilitate their understanding, I encouraged them to conduct numerous simulations with these models to obtain insights from their experiences. In the meantime, I told them about the literature on VAEs, as well as their advantages and disadvantages in certain applications. I realized that students were enthusiastic about their learning progress since they could gradually grasp the intuition behind the difficult concepts.

The second characteristic of a good teacher is her or his responsibility to students. When I was a TA for the courses at Rice and an instructor for MATH156 at UCLA, I found that students coming to my office hours would feel comfortable if I was available whenever they needed my help. Additionally, some students frequently could not make it to my scheduled office hours due to overlapping with other classes. As a consequence, I increased my office hours to accommodate them. For students who could not master course materials sufficiently well, I also held extra review sessions for them before their exams. I believe that by consistently making myself responsible and available, students will have a strong aspiration to succeed in their classes.

The final trait that determines a good teacher is concerned with the adaptability of her or his teaching approaches based on students' strengths and backgrounds. Even though machine learning and deep learning are data-driven subjects with numerous applications in real life, many concepts are frequently complicated and difficult to digest by non-mathematical majors students. When I taught foundational yet elementary concepts to these students, I regularly used concrete and simple examples to illustrate these notions while simultaneously telling them the intuitions behind such concepts. On the other hand, for complex and abstract concepts, my strategy was to decompose their complicated technical formulations into several self-explanatory and intuitive parts. The students are then encouraged to associate these straightforward parts with previous fundamental concepts they have learned. These extra efforts appeared to greatly enhance the student's understanding and appreciation of the materials.

Teaching interest

I am looking forward to teaching courses in most areas of optimization, statistics, machine learning, and deep learning. At the graduate level, I would also like to contribute to teaching special topics courses associated with my current research interests, including principled approaches for designing deep learning models and reasoning models. As these areas continue to grow tremendously, my courses will focus on equipping students with fundamental backgrounds while simultaneously keeping them up with active research directions.