Teaching Statement

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To me, the goal of teaching is to positively impact students and help them make a difference for the world in their own ways. Teaching goes beyond lecturing and also involves mentoring and apprenticeship. My previous experience in teaching includes serving as a teaching assistant for undergraduate Computer Science (CS) classes, guest lecturer in graduate Machine Learning (ML) classes, and project mentor for a diverse student body ranging from high school students to senior Ph.D. students. My teaching philosophy can be summarized from the following four perspectives:

1. Teaching is more than lecturing
2. Student-centered learning experience should be created
3. Transparency plays an important role in class design
4. Empathy is what goes a long way in mentoring

I elaborate on each of these perspectives and my teaching experience in chronological order in the following sections. I conclude the statement with classes I am interested in teaching and my future teaching and mentoring plans.

Teaching is More Than Lecturing

I grew up in a family that produced several teachers. When I was young, I would play beside my mother's desk when she prepares for classes. I was even put in her high school classrooms when nobody else could take care of me. I used to believe that teaching is all about lecturing the knowledge in front of the students. However, it was not until my graduate teaching assistantship at UIC that I realized that teaching is more than just lecturing. It is the process of creating learning experiences for students such that they grasp and apply knowledge. During and outside the lecture, teachers and TAs work together to help students achieve their learning goals. As a TA for the fundamental CS class: Introduction to Programming and Computing, I was responsible for answering questions from the students during my office hours, preparing quizzes, and leading the lab discussions. I also graded the assignments and gave feedback to students regarding homework solutions. I shared the joy of intellectual accomplishment and the aha moments with the students. I also understood their frustration and encouraged them to keep working when they faced obstacles. In this process, I realized that teaching is such a rewarding process shared between teachers and students. I have then considered academia as my career pursuit.

Creating Student-centered Learning Experience

In the era of MOOC and online learning, a student-centered learning experience is a key advantage a university could still offer. We should design our class and curriculum with the student's needs in mind, such that they can learn and grow with knowledgeable mentors and motivated peers, and also in a supportive environment. In my postdoc at Caltech, I gave guest lectures and helped mentor research projects in the graduate-level ML class: Foundations of ML. Besides instructing the mathematical foundation, I asked my mentees what they want to achieve in the class project. After realizing their interest in research that blends physics and ML, I connected them with senior researchers with similar interests. Even it is only a 5-week project, I purposefully cultivated collaborative conversations and guided them on problem definition to the literature survey. I helped two applied physics students to go

through the life cycle of an ML research project. According to them, the experience opened the door for them to explore the exciting intersection between physics and machine learning. Therefore, I believe the student-centered design of class and curriculum will help make every minute of their time with us worthwhile.

Designing Class in A Transparent Way

In the second year of my postdoc, I audited the class "Principles of University Teaching and Learning in STEM" to obtain a better mastery of available theory and teaching strategies in pedagogy. From backward design to active learning, from student assessment to inclusive classroom, this class empowered me to apply modern pedagogical tools in my teaching. In this class's mini-project, I chose to design a new course that I am passionate about: Ethics in Machine Learning. I paid particular attention to make the class transparent. The learning outcome for this class was to bring students' attention to an increasingly important topic– the social impact of machine learning algorithms, as well as identifying underlying risks in specific applications of machine learning. As a general consensus, scientists and engineers should be aware of the potential misuse of the technology. In the project, I envisioned myself as a presenter of recently published articles and research papers, a discussion moderator in class, and a consultant on open-ended questions after class. I outlined a complete syllabus, which includes a whole plan of teaching such a class. I collected reading materials, designed assignments and evaluation metrics, and set class discussion guidelines. To accommodate different students' prior knowledge, I also prepared supplemental materials from multiple angles and perspectives. Thanks to this class, I feel more prepared for my future teaching. I also have the curriculum ready if I am teaching such an ethical ML class in the future [1].

Incorporating Empathy in Mentoring

As a teacher, empathy is what helps me work with diverse student groups. In Caltech, I had the opportunity to mentor high school students, first-year undergraduates, graduating undergraduates, summer visiting students, and graduate students. Understanding their different knowledge foundation and structure, adapting my concept interpretation and communication, reminding myself to be patient, and practicing dealing with difficult situations, I gained massive improvement in different levels of "teaching" in my postdoctoral training. I also believe student evaluation should be based more on their learning process rather than the final results. Their progress should be valued. In my mentoring, I aim to provide space for my students to flourish and mature. I was extremely fortunate to have amazing mentees to work with me. In particular, I wrote several papers with undergraduate students. Even though not every project worked out, I focused on their growth in the project and encouraged them to explore their research interest.

I feel confident teaching both introductory ML classes and more advanced ML classes, as well as seminar classes on ethics (bias, fairness, and safety issues) of ML. I have a particular interest in co-teaching an interdisciplinary class with faculty in areas like social sciences on the application of ML in specific areas, if possible. Given my research interest, I am also interested in teaching special topics ML classes on distribution shift and robust ML. Following my teaching philosophies, I look forward to helping my students make a difference for the world in their unique ways.

[1] Link to the syllabus: https://github.com/Angie-Liu/ethicsML/blob/main/Ethics_in_Machine_Learning.pdf