TEACHING STATEMENT

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1 Teaching Philosophy and Expreiences

I firmly believe that every student possesses innate potential. As a teacher, my mission is to help them realize and reach this potential. To achieve this, I strive to motivate students to take ownership of their learning while developing their critical thinking and problem-solving skills.

During my graduate studies at The Chinese University of Hong Kong, I served as a teaching assistant for a wide variety of courses. These ranged from undergraduate courses such as *Discrete Mathematics for Engineers*, *Linear Algebra and Vector Calculus*, and *Service Systems*, to the graduate (Ph.D.) core course *Foundations of Optimization*. Notably, two of these classes had large enrollments with over 150 students each. My responsibilities included conducting at least one oral tutorial session each week, as well as assisting in the preparation of assignments and exam papers. Drawing from this teaching experience, I will share my understanding from my past teaching experiences, which embody and reinforce my teaching philosophy.

1. `Step into the shoes of students.` At the beginning of each course, I conduct a pre-course survey to assess students' backgrounds, goals, and learning preferences. This information helps me design a course that is both engaging and challenging for all students, regardless of their prior knowledge or experience. During the course, I regularly check in with students to understand what students are struggling with. Then, I use this feedback to adjust my teaching style and course content. If I do not pay attention to my students, I will lose them. All the preparation for a class is in vain if the core message is not effectively conveyed.

2. `Take students through my thinking process.` Although most operations research courses are highly relevant to our daily lives, the mathematical concepts can be overwhelming. To keep my students engaged and demystify these concepts, I walk them through my thinking process and show them how new concepts and solution strategies can be built upon their existing knowledge. For example, I often begin with concrete examples to illuminate the underlying idea, then outline my thinking processes on the chalkboard. I favor chalkboards because the act of writing allows students to fully follow my thinking process.

3. `Encourage students to relish the joys of scientific discovery.` After my lectures, I ask students to apply the techniques or methods they have learned to solve problems and address practical scenarios they have not encountered before. This process not only helps students consolidate their knowledge but also allows them to explore extensions of the knowledge independently and sharpen their problem-solving skills. Once they work through these challenges, the positive feedback they receive reinforces their learning journey and encourages them to take ownership of their learning.

2 Teaching Interests

Given my research interests and background, I am best suited to teach topics in optimization, machine learning, and applied probability. These includes courses such as convex optimization, nonlinear programming, robust optimization, optimization algorithms, machine learning theory, foundations of data science, stochastic modeling, and stochastic processes, among others. I also

like to conduct application-focused courses, such as those centered on applying simple optimization algorithms for machine learning applications. Additionally, I am prepared to instruct introductory courses in linear algebra, probability and statistics for engineers, as well as introductions to machine learning and artificial intelligence.

Based on my rich research experience in mathematical optimization and data-driven decision making, I am proposing a new course for graduate students.

Proposals for New Courses

`Computational Optimization for Data Science.` Optimization is the process of finding the best solution to a problem, given a set of constraints. It has applications in many fields, including engineering, business, economics, statistics, data analysis, and everyday life. The main driving force behind this course is to provide an opportunity for both theorists and practitioners in operations research and data science to learn how to design optimization problems that are effective from both theoretical and practical perspectives. Therefore, all participants can explore their own technical findings based on this course. Specifically, in this course, students will learn how to: (1) formulate real-world problems as optimization problems; (2) identify the computational challenges posed by different problem structures, and reformulate the optimization problem to address them; (3) design new algorithms tailored to specific problem structures; and (4) Establish universally applicable principles to conduct convergence analyses for various algorithms.

`New Writing Module.` Moreover, beyond sharpening my students' problem-solving skills, I also aim to instill the significance of technical communication to them. While mathematics and essay writing might seem disparate at first glance, both are vital for a student's future career. To achieve this, I plan to introduce a new writing module in my upcoming courses — writing a technical expository essay as part of the curriculum. I will guide them throughout this process, offering flexibility to explore diverse approaches for articulating and presenting their findings. This exercise will encourage students to deeply engage in their learning, actively build knowledge, and familiarize themselves with key aspects of the discourse in their field.

3 Mentoring Philosophy and Experiences

Advising students is among the most exhilarating and fulfilling roles I have had the privilege to undertake. Over the past few years, I am glad to have the opportunity to supervise 6 Ph.D. students and 1 undergraduate student from different universities, including Stanford University (2), The Chinese University of Hong Kong (3), The Hong Kong University of Science and Technology (1), and Peking University (1). These experiences have shaped my mentoring style.

In my opinion, the core purpose of mentoring is to help students become independent researchers capable of leading and completing their own research projects. I am proud that all of my mentees are making significant progress towards this goal. In fact, 6 of their papers have been accepted to top conferences such as `ICML`, `NeurIPS (Spotlight)`, `ICLR`, and `AISTATS`.

From my mentoring experiences, I learned:

1. `Create an efficient and interactive collaborating environment.` Communication is essential in advising. Identifying the root cause of a project's failure is half the battle. My strategy is to stay actively engaged in the project by: (1) setting up regular meetings to track its progress, and (2) revisiting the most intuitive examples with students to figure out the missing pieces. This approach helps students in deepening their understanding of

the challenges they encounter, by simplifying or breaking down complex issues into more manageable ones.

2. `Build up a long-term research plan.` I always begin a project with students by reviewing the literature (with 5-10 important papers in my mind). This guides them to pinpoint the research questions that are most relevant and promising to explore. As students progress, I advise them on how to position our project within the existing literature and continuously reflect on how their progress integrates into the larger research landscape. This approach ensures they grasp the context of their project and its significance in the broader research community. This process is essential for students to cultivate their research taste, gain the confidence to independently identify new research problems, and develop the capability to undertake them in the future.

All in all, being a parter of my student in their learning journeys has been a highly rewarding experience. It is my desire to use my knowledge, actions, and belief to motivate my students to be active agents in learning and to develop a sense of purpose and responsibility.