Tao Hong

Teaching Statement

hongtao.github.io

Teaching and mentoring are fundamental pillars of being a professor, and I find them both rewarding and enjoyable. Over the past several years, I have gained substantial experience in both roles. Prior to my PhD studies at Technion, I served as a teaching assistant, handling tutorials, lab experiments, and office hours for an undergraduate course, *Signals & Systems*, as well as two graduate courses, *Advanced Signal Processing* and *Signal Analysis*. During my PhD studies at Technion, I mentored course projects for two graduate-level courses: *Multigrid Methods* and *Introduction to Optimization*. These enjoyable and rewarding experiences have enhanced my teaching skills and helped shape my philosophy on teaching and mentoring.

Teaching interests. I am eager to teach and develop courses. Given my background in computational methods, signal processing, and machine learning, I am enthusiastic about teaching undergraduate and graduate-level courses in these areas.

- *Undergraduate* courses: Signals & Systems, Digital Signal Processing, Numerical Analysis, Numerical Optimization, and Numerical Solution of Partial Differential Equations.
- *Graduate* courses: Advanced Topics in Image Processing, Principles of MRI, Iterative Methods for Sparse Linear Systems, First-order Optimization Methods, Optimization Methods in Machine Learning, Multigrid Methods, and Matrix Computation.

Besides, I am interested in teaching some general courses, such as Introduction to Deep Learning/Programming (C/C++/Python)/Algorithms.

Teaching philosophy. I believe that a good teacher not only helps students gain knowledge but also ignites interest in their own research. Based on my previous teaching assistant role and my own study experiences, I've formulated the following teaching philosophy:

- *Teaching with examples.* I find that the most effective way to explain mathematical concepts is through examples. For instance, in the *Introduction to Optimization* course, we can use examples to explain the concepts of convex functions and convex sets, instead of only introducing complex, difficult-to-grasp mathematical equations. In the future, I will continue using vivid examples to explain concepts during lectures.
- *Motivate with applications.* Students may lose interest quickly if we naively present complicated lemmas, theorems, or extensive proof deductions. I've found that the most effective approach is to demonstrate some practical applications so students can understand the usefulness of the knowledge they are learning. For example, in the *First-order Optimization Methods* course, we could use image deblurring as a demo to show the merits of first-order algorithms and spark students' curiosity about how we can develop acceleration algorithms with small changes. Then, I would encourage students to think about why and how we can find the answer through mathematical analysis. Once students become interested, their self-motivation transforms them into enthusiastic explorers.
- *Learning by teaching.* I am convinced that one of the most effective methods of acquiring knowledge is by teaching it to others. Indeed, my previous teaching assistant experience has shown that teaching benefits both students and teachers. As a professor, I will share some related papers from the course with students and encourage them to explain a paper to the class and answer questions to deepen their understanding of the course. Moreover, I plan to organize

small study groups (e.g., via Slack) within the class so students can help each other answer questions and become their own teachers.

- *Constructive feedback.* Students are the ultimate judges of teaching quality, making it essential to consider their feedback along with suggestions from colleagues. Therefore, I plan to pay close attention to student feedback and continually strive to improve my teaching methodologies.

Mentoring philosophy. Through my previous experiences mentoring course projects and learning from my PhD and postdoctoral supervisors, I've formulated my own mentoring philosophy:

- *Be a help.* Students possess diverse interests, backgrounds, and needs. As a mentor, my role is to provide assistance, helping students find their own interests, build personalized research plans, and inspire them to explore their own research. Based on my experience, students tend to be highly productive when they are motivated and pursuing their own ideas.
- *Process over results.* It is better to teach someone to fish than to simply give them a fish. I believe that demonstrating the process of problem-solving is more important than just presenting the solution or results. As a mentor, my aim is to cultivate critical thinking in students and help them improve their independence.
- *Mentor beyond research.* Research is about exploring the unknown, and failure is quite common. However, repeated failures can lead to disappointment. Being a mentor means supporting students beyond just their research. I believe that a good mentor should also be a good friend to students, taking care of their emotional well-being, reassuring them of their abilities, and organizing activities to help them relax and unwind.