

Teaching Statement of Yuan Gong

1 Teaching Philosophy and Experience

The privilege of teaching is a significant factor in my decision to seek an academic position. To me, educating individuals holds more intrinsic value than creating new research. As the field of Computer Science evolves rapidly, equipping students with skills for critical and logical thinking, nurturing their innovative capacities, and preparing them to navigate technological shifts are just as essential as the knowledge conveyed. Hence, my teaching philosophy underscores the importance of **student-centered** and **hands-on learning**, as reflected in my past experiences.

1.1 Advising and Mentoring

I was fortunate to begin mentoring students early in my PhD journey, which allowed me to accumulate substantial experience and hone my mentoring skills. At the University of Notre Dame, I mentored 9 undergraduate and 2 master's students, and I also served on the committee of a master's student, notably, our collaboration resulted in three publications. After joining MIT as a postdoc and later as a research scientist, I have worked alongside 5 PhD students, resulting in 8 publications. My approach to mentoring is built upon the following three fundamental principles:

1. **Being student-centered is particularly important in mentoring.** At the beginning of each research project, I usually ask the student's interest and expectation as the first question, and tailor the project to align with these. I've observed that students are most engaged and learn the most when working on topics that spark their interest. For instance, when I mentored Marisa Cameron, a master's student in the Notre Dame engineering, science, and technology entrepreneurship program in 2016-2017, I noted her keen interest in transforming lab prototypes into real-world applications. Therefore, I oriented the project towards the practical implementation of an emotion recognition model, factoring in cost considerations. This project was subsequently showcased at the 2017 Notre Dame McCloskey New Venture Competition.

2. **Hands-on learning deepens understanding.** I am a firm believer that hands-on practice enables students to grasp concepts that cannot be fully understood through textbooks alone. Some problems only become apparent through direct engagement. Therefore, I encourage students to dive into hands-on experiences as early as possible. For instance, in 2018, I mentored two undergraduate students, Jacob Huber and Mitchell MacKnight, in the field of voice anti-spoofing. I advised the students to devise a concrete plan and undertake some preliminary small-scale data collection. They later shared that it was only through this hands-on approach that they realized the complexity and significance of eliminating nuisance factors, something they had not previously considered. The research resulted in a paper that earned a Best Student Paper nomination at Interspeech 2019.

3. **Diversity leads to innovation.** Many students I have mentored come from backgrounds slightly different from mine. I have found that such diversity significantly fosters innovation, as it allows for the exchange of knowledge across disciplines. For example, in my collaboration with Yu-An Chung, a Ph.D. student at MIT, we merged my expertise in signal processing with his in natural language processing. This synergy led to the creation of a novel model known as AST, which treats audio spectrogram patches as "audio words" - such innovation could not have been achieved independently. The AST model has become an impactful research with over 500 citations.

1.2 Courses and Lectures

I am comfortable and experienced in giving public talks and lectures. I have given two guest lectures on speech processing systems at *Notre Dame CSE60641 Graduate Operating Systems* and one guest lecture on general audio processing at *MIT 6.345 Spoken Language Processing*. In addition, I have presented 11 hour-long talks to various audiences. Notably, I was invited to speak at the MIT Embodied AI Seminar and the 2023 Speech and Audio in the Northeast (SANE) workshop, where the other speakers are typically professors. For each course or talk, I customize the material to fit the audience, using engaging demos and examples to maintain interest before diving deep into the technical details. I have also been a teaching assistant of *CSE60641 Graduate Operating System* at the University of Notre Dame, which is a core course that all graduate students need to take, and gained experience in managing large-scale classes through group projects and peer review.

2 Future Teaching Plans

2.1 Courses Related to My Research Area

I am looking forward to teaching introductory or advanced courses related to my research including **audio and speech processing, natural language processing, signal processing, statistical and machine learning**. In these courses, I plan to draw connections between classical and modern methods, prompting students to consider the reasons behind significant methodological evolutions. I am also passionate about using research challenges to design hands-on modules.

2.2 Courses in Basic Computer Science Curriculum

With a solid computer science background (straight-A for all graduate courses) and previous TA experience, I am also confident and comfortable to teach basic computer science curriculum such as **algorithm, architecture, and operating system** at both undergraduate and graduate levels, particularly, I am comfortable managing big classes.

2.3 New Courses Development

Computer science, and AI in particular, is a rapidly evolving field. I am eager to create new courses, potentially in collaboration with other faculty members, on cutting-edge topics, including **large language models and their application on multi-modal inputs; machine learning based signal processing, and health applications of machine learning**. I envision structuring these courses as seminars, each with a paper reading and a discussion session, to enable students to engage directly with the latest research and developments in critical areas of computer science.

2.4 Graduate and Undergraduate Students Mentoring

I plan to recruit students with slightly different backgrounds, such as those more experienced in speech technology and others in NLP, to facilitate a collaborative environment where students can exchange expertise. I also plan to engage undergraduate students in research through undergraduate research programs. Prioritizing student success is at the forefront of my plan, a key component of my approach is the development of a **personalized curriculum** for each student. For the first project of the students, I will offer more detailed guidance on research methods, experiment settings, and academic writing. This close involvement not only ensures they are proceeding in the right direction but also allows me to understand each student's unique strengths and needs better. For subsequent projects, I plan to adapt my mentorship style to suit the student's skills and needs, progressively encouraging them toward greater independence.