# Teaching Philosophy and Statement

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## Teaching Philosophy

There is something my advisor, Professor Blanton, might never know—I actually look forward to his conference trips. As Head TA for his digital testing course, these trips allow me to lecture, which I find to be a deeply rewarding and even relaxing experience. I truly enjoy sharing my thoughts with an audience and experiencing that wonderful spark of intellectual exchange with students.

However, since the emergence of LLMs, I fell into a period of deep anxiety, a feeling of "shattered confidence" akin to what professional Go players felt when they first faced AlphaGo. I realized that LLMs are far superior to me at summarizing knowledge and conveying information. I often wondered if students would continue to attend Office Hours to get the answers they seek. And then I thought: does my passion for teaching still hold any meaning in this new reality?

My perspective shifted only after I read a passage by Prof Leong[1]: "*Teaching is the business of inspiration.*" No matter how human-like or knowledgeable an LLM becomes, it remains a passive respondent. A teacher, however, can proactively create an environment where students experience, engage, and truly discover where their interests lie. The act of inspiring is more important than simply transferring knowledge: It allows curiosity and the love for learning to become the inner drive, rather than being pushed by deadlines or earning high grades.

Since then, I have been particularly mindful of "how to inspire" during my time as a TA. For instance, when introducing my project, differentiable ATPG, I use real-world examples of autonomous driving accidents. If an ATPG tool misses a hidden "delay fault," it could result in a one-millisecond braking lag in a high-speed vehicle. Connecting the technical to the tangible evokes a sense of responsibility and intrinsic motivation. In another instance, for a project on circuit failure diagnosis, where students need to analyze tester responses and identify potential faults, I encouraged students to write their reports as "detective stories", viewing themselves as detectives who peel back layers of mystery to uncover the truth. This narrative approach worked wonders; the students' enthusiasm for the project reached an all-time high.

My teaching philosophy has evolved significantly through my transition from student to educator. My early academic training emphasized discipline and rigorous performance, which helped me develop a strong technical foundation and respect for high standards. Over time, however, I came to recognize that such rigor is most effective when paired with a sense of purpose and ownership in learning. During my time at CMU, I see so much that I want to emulate as a future teacher. In the testing course I mentioned above, for example, we invite senior engineers or directors from industry every week to share real-world problems. When students realize that the methodologies, design tasks, etc. they learn in class could directly impact the reliability of millions of chips, they develop a profound sense of identity and contribution. Similarly, in our Design for Testing (DFT) competition held in partnership with Qualcomm, we invite the campus community and Qualcomm engineers in the final presentations. When students explain their results and receive recognition, they cease to be passive learners and become active creators of knowledge.

The creativity students demonstrate in such an environment is incomparable to anything driven by external pressure. In this year's DFT competition, one team proposed a new cost metric that went beyond testability and area to include "engineering effort", recognizing that technological evaluation must account for time and human cost as well. This particular outcome was highly praised by the Qualcomm engineers. Another team noticed that the penalty for area overhead was relatively low and proposed the bold idea of "duplicating" the entire circuit. While duplication is not always practical for all real-world scenarios, innovation of this nature stems from a desire to push boundaries, not just a pursuit of grades (in fact, they would have earned an A even without this "duplication" trick).

Many people live by the creed "Live life on one's own terms." Yet, unfortunately, many do not know what their own terms truly are. As teachers, we have the opportunity to help them find the joy and meaning in life; this is not only my mission, but also my privilege.

[1]Prof Leong is a well-known computer scientist and educator at National University of Singapore.

## Teaching and Mentoring Experience

I have relatively extensive teaching experience, having served as a teaching assistant seven times for courses including Embedded Systems, Computer Architecture, Mathematics for Electrical Engineering, and Testing. Beyond regular recitations, office hours, and grading, I made many attempts to enhance the course experience: for example, implementing an auto-grading system so students could see a live scoreboard, or mentoring struggling students individually to ensure they grasp the material. It is heartening that many students have told me they eventually joined companies to work in related fields because of the course. For example, Yixin Liang, a student in the testing course and very soon a testing engineer at NVIDIA, told me that the course inspired her to pursue a career in testing.

Beyond teaching, I also have substantial mentoring experience. Rather than simply assigning tasks, I prefer to guide them to become better individuals—to discover their own interests and learn to work effectively towards them. When a paper gets rejected, I talk about how my first paper was rejected multiple times, telling them, "This is all part of the process." Furthermore, we maintain weekly free-form discussions with no fixed agenda, creating an environment where no one fears asking questions of any nature. I share recently-published papers that excite me. Even if they don't understand all the technical details yet, I believe that as a mentor, my enthusiasm and curiosity can inspire them.

In fact, what I am proudest of as a mentor is not the papers we published together at DAC or ASP-DAC, nor winning a Best Paper Award (though that is also commendable). Instead, what brings me joy is that I help guide them onto the path of research, watched them find their own interests, and grow to the point where they can independently explore the frontiers of technology—this feeling is truly amazing:

- Yuxiao Qu, whom I mentored at CUHK on a routing project, is now a second-year CMU PhD student;
- Yang Zou, a CMU senior with whom I developed BRIDGES and DEFT, decided to pursue EDA research influenced by our work and is now applying for PhDs in related areas;
- Rebecca Dettmar and Zifeng Wang, CMU Master's students, collaborated with me this year on LLM projects. They too found the joy of research and are applying for PhDs in related directions.

I often feel that researchers throughout history are like long-evolved stars. Though their original forms are gone, their starlight continues to illuminate us. And if I too can have the chance to be a beam of starlight, guiding my students to pursue truth in the darkness, allowing them to explore forward with confidence and courage, then one day, they too will become starlight. I believe this is the ultimate romance of teaching, mentoring, and research.

## The iDAT Lab: Education through Research

As I transition to a faculty role, I view the research lab as a natural extension of the classroom, a venue for "education through research." My goal is to engage students across all levels, PhD, MSc, and undergraduates, within a collaborative framework. My mentoring experience taught me the power of vertical mentorship: when experienced students guide newcomers, they solidify their own understanding while fostering a sense of community. As the iDAT Lab becomes established, I plan to extend this pipeline even further by integrating K-12 outreach initiatives, providing younger students with early exposure to research while giving my university students the opportunity to serve as mentors to the next generation of scientists.

## Teaching Interests

I am interested in teaching at all levels of undergraduate and graduate study. My core expertise enables me to teach foundational and advanced courses in Computer-Aided Design, Digital Testing, Machine Learning, Computer Architecture, Data Structures and Algorithms, and VLSI systems. Beyond established curricula, I am eager to develop new, research-inflected courses that explore the intersection of Large Language Models (LLMs) and Chip Design. Such a course would provide students with a rigorous foundation in LLM architectures while addressing the unique challenges of hardware engineering. Key topics would include multimodal LLMs for hardware contexts, LLM agents for automated tool execution, and strategies to improve LLMs such as advanced memory systems. My goal is to equip students with the cross-disciplinary skills necessary to lead the next generation of AI-driven EDA innovation.