Through the stages of my academic career, I have been fortunate to receive teaching and mentorship from various "wizards." As an undergraduate, I learned to cast different "spells," from growing heart tissue on patterned fibronectin islands to convincing electrical signals to travel in the right direction (at least most of the time). In graduate school, I learned a new set of spells—perhaps the most valued of all is the rebuttal spell to disarm Reviewer #3. While most of my advisors are probably not actual wizards (but sometimes their appearance could lead one to believe otherwise), like wizards, they have equipped me throughout my career with powerful knowledge and taught me that effective teaching combines foundational knowledge with hands-on experimentation, a philosophy I carry into my teaching and mentoring today. I believe this ancient tradition will always remain the best way to learn these essential skills, and I see it as incumbent on me to help train the next generation of scientists and engineers—just like the wizards who taught me.

Teaching Philosophy and Experience

Start with Curiosity: I aim to cultivate curiosity in my students, which, when combined with hands-on projects, forms the foundation for developing engineering intuition—otherwise known as "the knack"[1]. As a TA at Harvard University, I led lab sections in introductory electrical engineering. While this course had defined learning objectives (e.g., build a circuit with 5X gain), I leveraged my own curiosity to convince students to spend extra time exploring just to see what happens—"What happens to the frequency cutoff if the resistor value is doubled?"—though admittedly, the free pizza may have also played a role. To add to their knowledge, I would also share some valuable circuits, as mentors had done for me. When my students began their final design project, the instincts they gained through the hours we had spent in the lab led them to feel more confident taking on more complex final projects compared to other sections.

Break Down Learning Barriers: After graduating, I joined Harvard's Active Learning Labs as a Design Specialist in Electrical Engineering, a position where I worked alongside faculty to develop engineering curricula for multiple courses. In particular, I worked closely with Professor Demba Ba to revamp a course, Biological Signal Processing, which I had taken as an undergraduate. We developed new homework, laboratory assignments, and midterm/final exams. Most notably, we piloted a concept where we handed students Empatica E4 wearables and Jupyter server instances to use during the semester for laboratory assignments and their final projects. At the time, these choices were very risky, as the Empatica and Jupyter platforms were barely a year old versus the time-tested MatLab/NiDAQ system that tethered students to a workstation. This innovative format allowed students to explore and master concepts independently, leading to overwhelmingly positive student feedback. We presented our pedagogical findings at SciPyCon '16 and JupyterDays '16.

Usable Research Tools *are* Teaching Tools: At the University of Michigan, I repurposed research tools as teaching tools in labs for a new Engineering Interactive Systems course taught by my advisor, Alanson Sample. Specifically, I introduced students to T4Train, a realtime machine learning platform I had developed originally as a user-friendly tool to perform inference tasks off streaming sensor data as a part of my research. Through the labs, we quickly recognized advanced learners could do self-guided learning to get to new concepts. However, given that this course had students of mixed experience levels (undergraduate and graduate), we used a course survey to balance student groups for final projects so that, in addition to direct guidance from the teaching staff, there was an opportunity for peer mentoring and more tailored instructor assistance. The more senior students gained mentoring experience; which was valuable for the PhD students in the class; the more junior students were able to present ideas that may not have been previously considered. Students in these mixed groups developed creative interactive applications and even extended our platform. This mixed experience provided invaluable student feedback, which improved T4Train's usability and performance, thereby closing the loop between research and teaching and making it a better tool in both contexts. This year, we offered a subset of this course at ACM CHI 2024. In short, my teaching approach, which emphasizes fostering curiosity and innovation, directly aligns with the goal of preparing students for interdisciplinary research. By integrating cutting-edge tools and methodologies into my courses, I aim to equip students with the skills necessary to tackle challenges that increasingly require an understanding of both sensing and machine learning. My proposed course on privacy-aware sensing, described in greater detail below, will incorporate these elements from my prior teaching experience, provide hands-on experiences through labs grounded in emerging research, and complement existing course offerings.

[1] Dilbert — The Knack https://www.youtube.com/watch?v=Dx6HojLBsnw

Mentorship Approach and Experience

Invest in People, not Projects: I am interested in an academic career because academia gives me the freedom to invest in people who come from different backgrounds yet can bring different perspectives to solving today's challenges. My mentorship philosophy, which emphasizes nurturing individual potential and learning from mistakes, is deeply embedded in my teaching approach. In the classroom, I create a supportive environment that encourages intellectual risks and learning through experimentation, reflecting my one-on-one mentorship approach. For example, building upon my sensing research work at Meta, originally intended for VR applications, I mentored a junior PhD student in developing a low-cost method to sense ECG signals from a single point on the body, enabling greater access to a vital health monitoring tool. When she started working with me, this student lacked the confidence to pursue this line of research as she did not have a background in electronics, know how to solder, or design PCBs. But over a year in the lab, I was able to teach this student the essential skills needed to turn her ambitious ideas into a research paper, which she would later present at IEEE EMBC 2024. One reviewer stated our approach is *"a method that could potentially revolutionize how cardiac rhythms are monitored outside of clinical settings."* Based in part on this work, she received a Qualcomm Scholarship, making her my second mentee recognized with an award from Qualcomm. Most importantly, she now believes in her hardware abilities as an independent researcher.

Mistakes Make the Heart Grow Fonder: Another experience that characterizes why I want to be a faculty member is working with an undergraduate student who, when we started working together, expressed on multiple occasions that he was "afraid" of hardware. Indeed, early on, he accidentally fried a sensor board and, ashamed, he told me he wanted to quit. However, I convinced him that as long as he maintained his enthusiasm to learn, I would always be willing to teach him—releasing the magic smoke is a right of passage for EEs and there's nothing to be mad about. Two more sensor boards later, he realized the value of mistakes as teachable moments and that he actually enjoyed working on hardware. He went on to win the 2022 UM EECS Outstanding Research Award based on our work together on privacy-aware sensing hardware for in-home activity monitoring, which appeared at PETS 2024. He stated in receiving this award: *"My favorite U-M experience so far has been building PCBs—I thought I would never learn how to build one but here I am."* He is now, ironically given his earlier reluctance, a senior hardware engineer at Marvell. My experiences allowed me to have the freedom, resources, and time to invest in challenges that serve the public good as well as invest in people—students with diverse backgrounds, who need patience to develop valuable skills, and who may have otherwise never considered this kind of research—who will go on to do the same.

Teaching Plan

Teaching Existing Courses: With a strong background in EE and CS, I am prepared to teach core undergraduate and graduate courses, such as topics in electronics, embedded systems, and advanced signal processing, as well as introductory programming, Human-Computer Interaction, and embedded ML. In particular, I will introduce real-world examples of these topics in IoT and ubiquitous sensing devices to tie theory to practice through hands-on instruction with laboratory assignments and term design projects.

Proposing Future Courses: My proposed course, "Usable and Privacy-Aware Sensing Systems," will cover key topics such as data security and minimization techniques, Privacy by Design for sensors, and real-world case studies and academic works. Students will engage in hands-on projects, developing sensors that prioritize user privacy, and by the end of the course, students will have designed and tested a prototype privacy-aware sensor. Given the profound utility and ubiquity of AI, I will introduce Responsible AI through the lens of privacy, as the use of AI, particularly with health sensor and sensitive data, may have significant, yet unintended, privacy consequences. To support diverse learning styles, especially given the growth in enrollment of neurodiverse and disabled students, the course will include a mix of accessible lectures and hands-on group and individual projects with continuous feedback to guide student progress. The goal of this course is to provide students with the relevant background in usable privacy and sensor design so that they can have a grounded understanding of how to develop responsible sensing systems that proactively protect user privacy.