Through my experience as a teaching assistant (TA), mentoring undergraduate students at Rensselaer Polytechnic Institute (RPI), and guiding PhD students at the University of Michigan, Ann Arbor, and Columbia University, I have developed a clear understanding of how to achieve effective teaching and mentoring. Specifically, this involves (1) providing clear motivation and intuition, (2) fostering an inclusive and encouraging class environment, (3) bridging theory to practice, and (4) building a broader perspective. In the following, I will briefly summarize my past teaching and mentoring experiences, share my philosophy for effective teaching, and outline my teaching plan as a faculty member.

### Teaching Experiences

At RPI, I served as a TA for the undergraduate courses: ECSE-2500: Engineering Probability, with approximately 200 students, and ENGR-2350: Embedded Control, with around 120 students. I also served as a TA for the graduate-level course ECSE-4510: Digital Control Systems, which had about 20 graduate students. I hosted office hours, developed homework problems, and graded student assignments and exams. I was honored to receive the Charles M. Close '62 Doctoral Prize, awarded to a PhD candidate in the ECSE department for exceptional contributions as both a researcher and teacher.

### Teaching Philosophy

Effective teaching is defined by its ability to enhance student achievement [1]. A skilled educator actively seeks to understand the students' perspectives, recognizing that true learning occurs when there is a meaningful connection between teacher and student. I believe that successful teaching lies in creating this resonance, where mutual understanding promotes deeper engagement and academic growth.

**Clear Motivation and Intuition:** I believe that providing clear motivation and intuition in the classroom is essential for helping students move beyond rote learning and toward a deeper understanding of abstract concepts. One useful strategy is to provide concrete examples to develop intuition, followed by an introduction to the underlying principles. For instance, when some students struggled with the concept of Independent and Identically Distributed (i.i.d.) events in ECSE-2500, I brought dice when hosting office hours. By allowing students to roll dice and explaining why each roll is a separate, independent event, they were able to improve their comprehension and apply the concept in their homework analyses. Visualization is another powerful tool for conveying intuition. Pictures and drawings make abstract concepts more accessible, helping students grasp underlying ideas more effectively. I will also have real-time evaluation during each lesson, asking questions after key concepts to determine if further clarification is needed.

**Inclusive and Encouraging Class Climate:** In undergraduate-level classes, students come from diverse backgrounds and exhibit varying learning paces. A crucial aspect of respecting these differences is *identifying their starting points and knowledge gaps.* Engineering courses, due to their math-intensive nature, rely more heavily on prior knowledge than many other disciplines. While working as a TA, I came to understand that students often begin with *different levels of knowledge.* Concepts that seemed obvious to me were not always clear to them. After encouraging them to articulate their confusion, I could identify gaps in their knowledge and develop mini-lectures to help them review key concepts. These strategies proved invaluable during my office hours. Although addressing the basic concepts that students find confusing requires more effort from the instructor, it can significantly deepen their understanding. In practice, this approach demands patience, as students may hesitate to seek help if they feel judged.

**Bridging Theory to Practice:** A cornerstone of my teaching philosophy is that *theory and practice are deeply interconnected*, and bridging this gap is essential for enhancing conceptual understanding, critical thinking, and student engagement. The engineering laboratory course, ENGR-2350, was the most effective course I TAed for helping students apply theoretical concepts in practice. It starts with basic circuit building and C programming, progresses through troubleshooting, and culminates in building a microcontroller to control a smart car. I was impressed by the depth of thought and creativity students demonstrated during our discussions for projects, where they applied class knowledge to real-world applications. In my future teaching, I aim to provide students with a solid theoretical foundation, grounded in practical questions that reinforce the real-world relevance of their learning. I plan to incorporate more hands-on experiences by including small implementations in homework assignments. For example, in a data analytics or introductory engineering course, I will ask students to code their own data analysis algorithms using Python or MATLAB, rather than relying on pre-built commercial packages. In power system courses, students could experiment with IEEE bus systems to test the performance of their methods, directly linking theory to practical outcomes.

**Building Broader Perspectives:** One key lesson I've learned from past experience is to *know your audience*. In my teaching, I will make it a priority to understand students' backgrounds and expectations. For example, teaching undergraduates requires a different approach than teaching graduate students. Undergraduates often benefit from engaging examples that spark their interest, while graduate-level courses should equip students to seamlessly integrate into the research community in their field. For undergraduate courses, I will focus on exposing students to various career paths and application domains. Since undergraduates have limitless possibilities for their futures, showcasing different application areas can inspire them to explore their true interests. For graduate students, I plan to introduce foundational research papers alongside traditional textbooks, offering them the opportunity to connect state-of-the-art research with course content. I will incorporate oral presentations and group discussions to help students develop their presentation and communication skills. In power system-related courses, I will invite guest lecturers from the industry or organize field trips to local utilities. This would allow students to see how real-world practices connect to the basic concepts taught in class, creating a bridge between academic knowledge and its practical applications.

**Mentoring Experience and Thoughts.** As a PhD student at RPI, I mentored seven undergraduates in integrating my algorithms into the Streaming Synchrophasor Data Quality (SSDQ) software. The developed software is delivered to the EPRI and is running on several EPRI utility members. As a postdoc at the University of Michigan, I mentored a PhD student, which resulted in one paper submitted to Joule. As a postdoc at Columbia, I am mentoring two PhD students and two graduate students. Together, we are developing electricity forecasting software for an energy trading company, and the demo version has been deployed on a cloud-based platform. My collaboration with the PhD students has resulted in one paper published in Electric Power Systems Research and another paper submitted to IEEE PES General Meeting.

Mentoring is like sailing a ship [2]. My mentoring philosophy centers on *providing guidance when students need it, while allowing them to fully engage with the creative and rewarding aspects of research on their own.* I have the following thoughts on mentoring. (i) Ask thoughtful research questions. A well-formulated research question is the foundation of any project. It shapes the project's direction, informs the methodology, and ensures meaningful outcomes. Advisors play a crucial role in helping students develop strong research instincts to ask the right questions. (ii) Balance guidance and independence. While achieving project goals and advancing the mentor's research is crucial, students also need the freedom to explore their own ideas. Clear communication and a careful research plan are essential to aligning these priorities, allowing both mentors and students to grow and succeed together. (iii) Create a collaborative environment. A supportive group atmosphere encourages open communication and the free exchange of ideas. Ensuring that students feel comfortable asking questions promotes creativity and collaboration.

# References

[1] R. Coe, C. Aloisi, S. Higgins, and L. E. Major, "What makes great teaching? review of the underpinning research," 2014.

[2] R. A. Revelo and M. C. Loui, "A developmental model of research mentoring," *College Teaching*, vol. 64, no. 3, pp. 119–129, 2016.