# Teaching Statement

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Teaching is one of the most fulfilling aspects of my academic journey because it allows me to impart knowledge, empower students, and be part of their journey as they go on to make real-world impacts across diverse professions. From an early age, I recognized that my understanding of concepts solidified when I taught others, starting in high school when I helped classmates with challenging problems. This passion continued through my undergraduate years at Carnegie Mellon University, where I served as a course assistant from freshman to senior year, and further developed during my graduate studies at Texas A&M University as a lab instructor. I felt fulfilled guiding new students and valued the opportunity to give back by supporting them as they adapted to university life and developed independent learning skills. This sense of responsibility to nurture the next generation of innovators continues to inspire my commitment to teaching.

My teaching vision is shaped by my own experience and focuses on "*empowering students to become independent learners*", enabling them to adapt and thrive throughout their careers. The ability to "learn to learn" has empowered me to use my background in computer science and artificial intelligence (AI) to conduct independent research in fields like medical imaging and biomedical signals. To realize this vision, my teaching philosophy is grounded in a three-part approach. First, I focus on providing students with a foundational **intuition** and the background they need to understand concepts. Next, I guide them through how these concepts can be **implemented**, specifically through methods in fields such as programming. Finally, I emphasize how the concepts they learn can make an **impact** in real-world contexts.

With the rapid rise of generative AI, the conventional way of assigning homework and assignments to enforce learning has become less effective. Most homework questions in introductory courses can be answered by AI tools, rendering them inadequate in gauging true implementation capabilities of the student. Instead of preventing the use of AI, which is neither practical nor productive in educational settings, I have chosen to integrate it into my teaching philosophy. **AI tools can enhance intuition, assist in implementation, and showcase impact.** To overcome the challenges posed by generative AI, I will introduce graded recitations where AI-generated models will be inaccessible, limiting students to only the programming language documentation. Additionally, I plan to reduce the weightage on homework while increasing it for projects, exams, and quizzes, which will better assess students' deeper engagement with the material. Furthermore, I will include short conceptual assessments at the end of each class, using simple true/false or fill-in-the-blank questions to focus on key concepts. Additionally, I recognize that all students do not learn at the same pace. To accommodate them, I will implement an open-door policy during designated hours, including lunch hours when students are more likely to be available. This will allow students who need extra help to ask questions. Having addressed these concerns, I will now explain the three-part approach of my teaching philosophy in context of my teaching experiences.

Providing **intuition** is essential for helping students truly understand concepts, as it allows them to see beyond memorization and grasp the underlying principles that can be applied in various contexts. This focus on intuition has been a core part of my teaching approach, a habit I cultivated during my time as a course assistant for a diverse range of courses at Carnegie Mellon University (2017-2020). Specifically, I served as a course assistant for Fundamentals of Programming (15-112), Principles of Computing (15-110), Looking at Making (62-146), and Looking at Shapes (62-238). My duties involved helping students with homework assignments and guiding them through different concepts, enabling them to better tackle their coursework. I also graded assignments and held office hours to address students' questions, focusing on providing clear intuition. For instance, when students struggled to attempt questions involving "for loops", I did not simply provide answers. Instead, I guided them through the process of breaking down the question, helping them understand the core task and how a "for loop" can repeat a set of instructions a certain number of times. I explained in context of specific fields, such as biology, that a "for loop" might be used to simulate repeated steps in an experiment. This method allowed students to grasp the underlying concept in a context they could relate to, helping the idea settle in their minds and enabling them to solve similar problems independently with minimal guidance. Moving forward as a postdoc, I aim to enhance this approach by integrating AI tools, such as ChatGPT, to provide personalized examples tailored to students' backgrounds. I will provide students with customizable prompts that they can adapt to their specific fields and interests, creating a personalized experience for building their intuition. Simultaneously, I will educate them on the shortfalls and biases of generative AI, encouraging them to fact check the responses. By integrating AI tools and providing students with customizable prompts, I aim to help students develop deeper intuition not only for my course but also for other subjects, equipping them with the skills to independently tackle new fields

**Implementing** concepts is crucial because it allows students to apply their theoretical knowledge to practical tasks, reinforcing their intuition through hands-on experience and problem-solving. I have gained valuable experience in showcasing implementation of

concepts while serving as a lab instructor for Medical Imaging (ICT-684) and Introduction to programming (Engr-102) at Texas A&M University (2022-pres). In this role, I have collaborated closely with professors to understand the specific topics covered in lectures and then designed engaging exercises relevant to students' backgrounds. My main duties involve developing recitations that reinforce theoretical concepts, assisting students with homework, and performing grading of assignments and quizzes. For example, in medical imaging class, I have developed code scaffoldings related to Ultrasound processing, such as performing histogram equalization, noise reduction, and image enhancements. Using tools from libraries like OpenCV, scikit-image, or custom functions, I demonstrated how to implement the concepts programmatically and also walked the students through advanced pipelines such as image classification and segmentation. To build student confidence in implementing concepts, I have relied on project-based learning. For my medical imaging class, I introduced open-ended projects that involve skin images with varying lighting conditions, diverse skin tones from different populations, variations in pigmentation, and hair presence, ensuring students tackle a wide array of complexities in skin cancer detection. This experience is crucial for preparing the students for the ambiguity and challenges they would face in professional environments. At the undergraduate level, like introduction to programming class, I guided students through well-defined projects that progressively required them to apply foundational programming concepts (e.g., loops, recursion, code complexity). I played a key role in validating project ideas to ensure they were solvable within the course timeframe and aligned with the concepts being taught. Additionally, I offered guidance when students faced bugs/obstacles and helped them prepare for final presentations. As a postdoc, I aim to work course instructors to implement projects as a central component of the course, enabling students to integrate diverse concepts covered in class and apply them to practical settings. I also plan to encourage students to leverage generative AI tools for parsing extensive library documentation, exploring APIs, and integrating them into their coursework and projects. This approach will equip students to independently learn new frameworks and programming languages, enhancing their adaptability and proficiency in internships and future career.

To help students understand the real-world **impact** of the concepts they learn, I integrate my own research and professional experiences into my teaching. For instance, when teaching ultrasound preprocessing techniques such as denoising and image enhancement in my medical imaging class, I presented my research from Hamad Medical Corporation (HMC), where I developed a real-time segmentation neural network for liver ultrasound videos. I demonstrated the effect of image denoising and enhancement on the overall segmentation accuracy of the framework, showing students the practical importance of concepts being taught. Additionally, I've worked with the course instructors to invite industry professionals and researchers to classes, exposing students to real-world applications of the concepts they are studying. Moving forward, I plan to collaborate with industries and research labs in Qatar, such as QCRI, HMC, by arranging exciting presentations for the class. This will allow students who are passionate about learned concepts to explore opportunities for internships or independent research projects, taking their learning beyond the classroom. Furthermore, I will encourage students to explore the application and impact of concepts in their own fields using generative AI tools like ChatGPT, which offers personalized insights on industry-specific applications. This approach fosters independent learning by encouraging students to explore impact and application of concepts autonomously.