Teaching Statement *KMA Solaiman*

1 TEACHING PHILOSOPHY

Accessible Learning My teaching philosophy revolves around active learning and student well-being. Student well-being in a classroom can depend on their sense of autonomy, achievement, and participation. For example, in one of the courses I taught, Network Programming, the students were given a choice for their project topics from reproducible papers, novel idea implementation, or ongoing projects. Also, for the final presentation deliverable, they were asked to choose from multiple modalities i.e., video presentation, demo, or blog write-up. These choices gave the students a sense of autonomy. Satisfying these needs could intrinsically motivate the students to participate and grow in the classroom actively.

Relationship with the Students At the beginning of my classes, I make a conscious effort to know the students' backgrounds and their preferred outcomes from that course. This helps me understand them better, formulate relevant lectures during the teaching, and allow me to adjust the course outline accordingly. *"If you cannot explain it simply, you do not understand it well enough."* - I truly believe that and want that as an outcome for my students. To that end, I ask for *frequent feedback* from my students to learn more about their understanding and thought processes and identify any alternate conceptions students may have that need to be addressed.

Growth-focused Course Design (i) *Course Materials:* I prefer to design courses in a way that gives the students the ability to measure their progress. The courses consist of both the foundational CS knowledge and the application of the concepts to problem-solving. Depending on the audience type, the course will have varying styles of materials. For students aspiring for industry positions, it is imperative that they can apply academic knowledge to solve real-life problems. It is essential for those pursuing research careers to come up with solutions to new problems from existing knowledge. I grew very fond of the concept of *learning by doing* from my courses and prefer to utilize this. Allowing students to do different types of written or programming assignments alongside the relevant lectures bolsters their understanding of theoretical knowledge. (ii) *Assessment:* During grading, I always design fine-grained rubrics with lower stakes and provide detailed feedback to the students so that they can understand their mistakes and learn from them. Along with testing the fundamental and applied knowledge, I frequently add problems during the coursework that make them think on a deeper level.

2 TEACHING EXPERIENCE

My teaching experience consists of hands-on teaching for six years, dating back to 2014, and taking training courses such as *Effective teaching in CS* or *Foundations of College Teaching*. The graduate TA training after COVID-19 has helped me familiarize myself with online teaching while learning about essential tools such as Brightspace, Campuswire, Gradescope, etc.

My first experience teaching undergraduates was in Bangladesh, starting in August 2014. **I instructed in multiple labs of graphics, data structure, and programming language.** While later two involved explaining to students how the core concepts are applied in problem-solving, *graphics* allowed me to mentor students to build tangible outputs. My second experience in Bangladesh was on a much broader scale teaching ***Network Programming, Database,* and *Software Engineering*** with a maximum class size of 143, divided into two sections. **My duties included delivering the lectures, designing labs and course materials, conducting labs with assistants, grading, and advising.** By handling large classes and multiple sections, I learned the process of guiding and evaluating everyone in a balanced manner. All these courses required building full-stack projects. It taught me how to help students throughout semesters while giving continuous feedback. The satisfaction I shared with my students seeing the final projects bolstered my choice of being a teacher. As for academic services, I contributed to curriculum development for several courses, participated in departmental activities, and contributed to accreditation.

After joining Purdue, I became a teaching assistant for **object-oriented programming**, a freshman-level course. By the third semester of teaching this course, I have taken the role of structurally developing this course for the long run. **During 2016-23, I was a teaching assistant for two graduate-level courses along with three undergraduate courses.** The biggest difference from my previous teaching experience was the multicultural and diversified international student body. At Purdue, my responsibilities as a GTA included designing, testing, and grading programming assignments, projects, and written homework, teaching labs, and PSO sessions, assisting in creating and grading exams, and advising students during office hours and in online forums. Through this process, I have realized how differently students at senior and junior levels learn and communicate with instructors. For lower-level undergraduate courses, I was responsible for overseeing undergraduate TAs. For upper and graduate-level classes, I had to handle

complex situations like discussing students' fundamental research questions or mentoring for research reproduction. My goal for the weekly PSO sessions is to help students utilize the concepts learned in the lectures for their assignments with an in-depth understanding. As soon as an assignment is released, I go through the logic behind it and how the core concepts build up to the final outcome. During the grading, I tried my best to leave detailed feedback on their implementation issues so they could learn from their mistakes. The student's mental health is essential to me. I encourage and practice empathy in my class, which includes being aware of their hesitancy to ask questions or being inquisitive about their learning process. Most recently, one of my students in network programming class felt comfortable enough to talk to me about his anxiety. I have tried my best to accommodate and comfort him with Purdue's ongoing support for mental health management.

I have guest lectured on *situational knowledge, knowledge graphs, and multimodal information retrieval* where I talked about *cross-correlation learning, metric learning, decoder-encoder, and attention networks*. The lectures involved *feature extraction from multiple modalities, graph embedding,* and *graph matching techniques*. I have always enjoyed public speaking, which has helped me to deliver presentations at a large scale numerous times during my Ph.D. I have presented our research works at Northrup Grumman Corporation Review Meetings and Techfest (with 100+ attendants), JPL Nasa, and Darpa Review Meetings.

Mentoring: During my time in Bangladesh, I mentored seniors for their final year thesis and projects and served as an external member of the evaluation committee. I also participated as a coach for *ACM-ICPC* at AUST. At Purdue, I have mentored 13+ masters and undergraduate students for independent research.

3 TEACHING PLANS

I am excited to teach both undergraduate and graduate-level students. I am comfortable teaching software engineering, databases, networks, compilers, information retrieval, data management systems (SQL and NoSQL systems), and machine learning courses to both undergraduate and graduate students. I know the differences between them from my teaching experience at both levels. For undergraduate students, I would be happy to teach core courses, including programming languages, data structure, theory of computation, and computer graphics. Specifically, for graduate students, I can offer advanced information retrieval, natural language processing, distributed database systems, data science, or data mining. Moreover, I have plans to offer seminar courses related to multimodal information retrieval and adaptable and explainable AI to students with a research interest. These courses will be based on recently published papers in top conferences in machine learning, information retrieval, OpenAI, and XAI conferences. The course projects will be designed in a way that can lead to publications and can mimic peer reviewing.

Besides that, I would also like to create a new course *"Applied Machine Learning for Open World Systems"* to extend the current curriculum based on my research experience. Tentative topics would include data cleaning, handling lack of annotations, scalability, weakly supervised learning, multimodal information retrieval and feature extraction, intrinsic and extrinsic complexity of system domains, and case study of real-world use cases. Since learning algorithms must be adaptive to real-world situations, it will also include detection, adaptation, and difficulty analysis of novelties in machine learning algorithms.