Saikat Chakraborty
https://saikatc.info Email: saikatc@cs.columbia.edu

Teaching Statement

> It is the supreme art of the teacher to awaken joy in creative expression and knowledge.
> - Dr. Albert Einstein

Teaching Philosophy

Teaching is one of the best ways to inspire others. Teaching a class on a topic helps me refine my understanding of that topic. As an academician, I am committed to inspiring new students through teaching and mentoring. From my teaching experiences as a TA of "Programming Languages and Translator", and a former lecturer at Ahsanullah University of Science and Technology, Dhaka, I prefer to teach in interactive ways. I enjoy demonstrating things with examples as well as showing the bigger perspective to help students engage better. As a teacher, I like to discuss how different components are connected with my students. My teaching philosophy consists of the following three key points.

*** Inspiring creativity.** I personally believe that a creative solution to a problem is equally valuable as a correct solution. Creative thoughts often give vision to a problem through different shades, making it easy to see from an alternative viewpoint. As a teacher, I prefer to encourage students to be creative. From a student's perspective, it is understandable that "too much creativity" may jeopardize attaining a goal. But as a teacher, I always want to inspire students to be creative and guide them if they are likely to derail.

*** Learning for fun and through active participation.** I make sure that the topic I am teaching is fun. I often resort to fun examples while explaining a complex topic. Instead of telling the solution to a problem right away, I like to listen to the students' interpretations of the problem first. Then I ask them to come up with their own solution. In most cases, students can do so themselves, which allows them to feel the joy of accomplishment. However, when any students struggle with understanding, I come up with relatable examples and illustrations. I encourage diversity of thought and background in my classes. I believe teaching style should be guided by the students' needs. Instant feedback helps me to quickly learn the deficiencies and adapt my style. Creating a teaching environment inclusive and encouraging participation from class is essential to maintain the highest standard in the class.

*** Showing the bigger picture.** As a student, I enjoyed seeing how the dots are connected. As a teacher, too, I like showing the big picture while teaching about something. For example, before teaching the control and data flow analysis in source code, I discussed the possible application of data flow. I talked about how data flow is used in detecting bugs, optimizing source code, etc. I genuinely believe that seeing such bigger pictures is necessary for students to concentrate on the topic being taught. I also like to answer "why we are doing" before answering "what we are doing." I believe knowing the answer to such questions gives the students clarity and closure.

Teaching Experience

I have had experience in teaching advanced undergraduate and graduate-level courses throughout my Ph.D. career. During the Fall'2020 semester, I worked as the *lead teaching assistant of "Programming Languages and Translators" at Columbia University.* The course is an advanced undergraduate course with a significant enrollment from graduate students. As the lead TA, I helped the professor design the course. In the course, we mainly taught different layers of Compilers and different design properties of Programming Languages. The main focus of the course was on the backend of the compiler, i.e., machine-independent program analysis, machine-independent optimization, etc. I took the lead responsibility of designing the programming assignment. We designed six programming assignments using the LLVM compiler. To make the assignment engaging, we designed those around real problems. For instance, we designed an assignment[1] to reduce the memory footprint of a source code by eliminating the "*unreachable functions*" and "*dead instructions*." To help the student with their understanding of LLVM, I conducted recitation sessions every week. Despite the challenges with online office hours and recitations brought by the pandemic, the course and the experiences in that course were wonderful. At the end of the course, I received some excellent and heartwarming reviews, learned a few new things about programming languages myself. Most importantly, I inspired a few students to work in programming languages/ software engineering.

[1] https://github.com/PLT-Columbia/Prog-6-Optimization

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I will co-teach a graduate-level course on AI for Software Engineering in Spring 2022 semester with an expected enrollment of 40 graduate and senior undergraduate students. We are designing the course around the discussion of state-of-the-art AI systems in software engineering. We will read and discuss surveys of the developers' need for automated tools, some state-of-the-art automation tools, and their applicability/scalability in real development scenarios. The student in that course will participate in a semester-long research project. I am expecting to supervise 5 research project groups throughout the semester in that class.

Before starting my Ph.D. career, I worked as a lecturer/instructor at Ahsanullah University of Science and Technology (AUST). As a lecturer, I taught (both theory and lab) Digital System Design, Formal Languages & Compilers. I was also responsible for instructing lab in Elementary Structured Programming, Data Structures, Pattern Recognition, and Network Programming. Most of the students I taught at AUST are freshmen and sophomore undergraduates with little to no experience with programming and the basics of computer systems. A vast majority of those students came to college from rural and underprivileged areas. Since I was preparing for my Ph.D. admission at that time, I also mentored some senior students in research and for graduate-level higher studies. I supervised a project from the "Pattern Recognition" lab and published a paper at a conference. My students from AUST are doing great work in both academia and industry.

Mentoring

In my opinion, a teacher's one of the primary responsibilities is to mentor their students. I personally like mentoring students, fellow colleagues, and friends. While working as a lecturer at AUST, I mentored several students for higher studies. Coming from an underprivileged minority group myself in my country, I tried to bridge the privilege gap by mentoring underprivileged students. After leaving AUST, I mentored several past students to graduate school applications by sharing my experience, proofreading their statements, etc. My student Suravi Saha Roy did her master's from the University of Helsinki. Another student, Sanonda Dutta Gupta, is pursuing a Ph.D. at the University of Maine. I feel very fortunate to mentor them and am proud of their achievements.

Throughout my Ph.D. career, I was fortunate to mentor several fellow students. Notable among them are Robin Ding and Ziyuan Zhong, who are currently Ph.D. students at ARiSE lab. I guided both of them with the introduction and research culture in our lab. I mentored them about improving their problem-solving and keeping track of the holistic view while diving deep into the research methodology. In particular, Robin worked with me on several research projects. Starting from pair-debugging a code to editing the manuscript, I gave him feedback wherever necessary and appropriate. In the beginning, I gave him concrete tasks while I was leading a project. I explained to him how the tasks he was doing were connected to the whole project. With Robin's help, we published two papers at TSE. Gradually, Robin started taking the lead on the projects, and I started guiding him on a high level. In one of his recent projects, I took an advisory role. I helped him to design the experiments, mentored him to clarify his research thoughts in the manuscript, which is currently under review. Both Ziyuan and Robin have their own research taste and vision; as a mentor, I helped them to add finesse to it. At the same time, I also learn a lot from them by discussing science, philosophy, art, culture, etc. I personally find training others to be very refreshing.

Teaching Preference

Given my background in Software Engineering and Program Analysis, I will be very comfortable teaching advanced courses in Compilers, Program Analysis, Software Engineering. In the future, I would like to prepare graduate-level courses on *Programming Languages Processing - AI for analyzing source code*.