Teaching Statement

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I relish the experience of teaching and mentoring in academia. I have actively sought teaching and mentoring opportunities. I have been a guest lecturer on several occasions and TAed for five undergraduate and graduate courses. I have co-organized a two-day Verification Mentoring Workshop (VMW) at Computer-Aided Verification (CAV) 2021 that attracted ∼100 students worldwide, have served on a thesis committee, and am actively mentoring Ph.D. students.

Teaching philosophy

My teaching philosophy is *to equip students for self-sufficiency towards technical discovery*. I view my role as a CS teacher to build strong foundations, develop a temperament for experimentation and demonstration, and inspire curiosity. To build foundations, I reflect upon my journey as a student to break the curse of knowledge. I remind myself what all confounded me when I encountered a topic for the first time. By removing assumptions, I strive to present and explain the few fundamental concepts that are critical for advanced development. To develop the temperament, I combine theoretical knowledge with practical tools to encourage students to freely experiment after class. This way students can grasp concepts much better as they can test and play around with the otherwise abstract concepts. Finally, to inspire curiosity, I connect classroom concepts with real-world applications so students can get inspired by their surroundings to develop new computational problems.

Teaching experience

I have been a guest lecturer on several occasions and TAed for **five** courses at the undergraduate and graduate level at Rice, at varying degrees of participation: assignment and exam creation, curriculum development, grading, lecturing, office hours, problem-solving sessions, etc. I discuss selected highlights below.

Guest Lecturer for Logic in Computer Science. I was a recurring Guest Lecturer in Prof. Moshe Vardi's course on Logic in Computer Science (COMP 409/509) at Rice in Fall 2018 and Fall 2019. This is a theory-heavy course. Such courses are at risk of seeming dry and rule-based as opposed to being intuition-driven (which they are in reality). In my lectures, to help students build an intuition, I would encourage them to take *leaps of faith* to first design a high-level proof of a theorem. Once they had the high-level proof, I would ask them to break it into smaller chunks, each one of which they should be able to prove with the logical concepts they had learned so far. If a proof didn't work out, I would ask them to reassess their argument, find the error, and repair, till proof completion. This approach naturally encouraged active participation, as different students could contribute to different parts of the proof-building exercise. Often times, students would correct each other's arguments and build a complete proof with small nudges in the right direction from my end. Finally, I would show how to turn their discussion into a proof by formally writing down their argument on the whiteboard. A moment I cherish deeply is when a student visited my office to discuss a high-level proof she had come up with, different from the one discussed in class. As an educator, I feel blessed to be able to inspire thought.

Graduate TA in Statistical Machine Learning. I was a graduate TA in one of the most sought-after courses at Rice, Statistical Machine Learning (COMP 540), in Spring 2017 taught by Prof. Devika Subramanian. The course had more than 100 students from various departments: senior undergraduates and graduates in Computer Science to graduates in Chemical Engineering. After grading the first assignment on preliminary background, I noticed a vast chasm in students' grasp over linear algebra, probability and statistics, and their programming abilities. Upon realizing that several students would require more instruction, I proposed that graduate TAs conduct optional revision classes to repeat some of the lecture materials. Prof. Subramanian helped us craft our lectures so they would complement her regular lectures. These revision classes were held in addition to our weekly office hours. Despite attendance in revision classes not contributing to the final grade, we saw a 50-70% student footfall. As a lecturer, I found these sessions extremely challenging yet satisfying, as students would come prepared with questions to make the most of the extra instruction. We made these sessions interactive, encouraged student inquisitiveness, and discussed nuances of algorithms in detail. Some undergraduate TAs also expressed interest in teaching, so we trained them to present short 10 minute modules in the revision classes. Our greatest reward arrived a few weeks later when Prof. Subramanian attributed a palpable growth in student confidence levels to our revision classes. Upon student demand, we even increased the frequency of revision classes.

A lasting impact of my initiative has been that revision classes have now become a permanent feature of COMP 540. This experience has made me realize the importance of being cognizant of students' needs, an adaptive style of teaching, and feedback dialogue between students and teachers.

Mentoring experience

Verification Mentoring Workshop. I co-organized a two-day virtual Verification Mentoring Workshop (VMW) at Computer-Aided Verification (CAV) 2021, the premier conference in formal methods. Our workshop attracted ∼100 senior undergraduate and early-stage graduate students looking to enter the field of formal methods. In addition to students from North Americas, the EU, and the UK, our organization effort reached out to students worldwide including countries like Egypt, Ethiopia, Singapore, etc. from where early-stage students are unable to attend international conferences/workshops due to socio-political conditions and lack of funding opportunities. At the workshop, we organized a series of technical and mentoring talks by eminent researchers in the field, interactive panels, and one-on-one mentorship. The workshop provided significant value to the students, especially to those who do not have alternate avenues for such mentorship due to their situation and background. We also raised funds to provide full scholarships to all students to attend VMW and CAV. I discuss related DEI efforts in my Diversity statement.

Mentoring Ph.D. students. I am currently mentoring two Ph.D. students, Kishor Jothimurugan (University of Pennsylvania) since Fall 2020 and Senthil Rajasekaran (Rice University) since Spring 2021 on two different projects. Kishor is working on formal methods in reinforcement learning. Senthil is working on equilibrium computation in multi-agent systems. I follow the mantra that no two students or projects are alike. I tailor my mentoring style based on student interest to support them to realize their full potential. In addition to our weekly brainstorming sessions and providing technical assistance, I deeply care about their well-rounded development. I encourage my mentees to engage with their research community by participating in relevant workshops and reaching out to related researchers outside of their university. I believe student-driven engagement is crucial for their development, especially as in-person conferences and visitations have been on the decline since the pandemic. Upon my encouragement, my mentees have submitted their works at various workshops, including LAMAS&SR at AAMAS 2021, SYNT at CAV 2021, and SafeRL at NeurIPS 2021.

I am most proud of the works that I have produced with my mentees and am thrilled with their achievements. So far, our work has led to a paper at NeurIPS 2021 (with an open-source codebase), a paper under review at AAAI 2022, and a few more in preparation.

Thesis Committee. I served as an expert external reviewer on the Master's Thesis Committee of Guy Hefetz from ITC Herzila, Israel, advised by Prof. Udi Boker. As the expert member, I suggested critical improvements and additional questions for the thesis. My suggestions were incorporated into the oral defense and the final dissertation. The Master's thesis has successfully culminated into a paper at Computer Science Logic (CSL) 2021, a leading conference in theory and applications of logic in computer science.

Teaching interests

I am excited to teach core and elective CS courses in a wide spectrum of areas, including artificial intelligence, logic, machine learning, programming languages, and theoretical computer science. At the introductory level, I would be interested in teaching core courses like Algorithm Design, Data Structures, and Discrete Mathematics. I would be interested in teaching foundational CS courses in Logic and Theory of Computation at both the introductory and advanced levels. In the areas of my research expertise, I would like to teach courses in Artificial Intelligence, Formal Methods, Machine Learning, and Programming Languages. At the graduate level, I would like to build project-based and/or seminar courses on Automated Reasoning, Computer-Aided Verification, and Reinforcement Learning.

In addition, I am interested in developing and teaching a new course on *Assured Autonomy*. This course would bridge the gap between formal methods and practical applications in robotics and autonomous vehicles. The goal would be to recognize and apply concepts from formal methods to realistic systems using the available infrastructure and to identify new research directions. On the theoretical front, the course will cover topics including foundations of temporal logics, graph games, stochastic games, synthesis in games, probabilistic model checking, and reinforcement learning. On the practical front, it will look into synthesis tools from SYNTCOMP (annual competition on synthesis) and OpenAI Gym for RL. While such a course would be difficult to build a few years ago due to the lack of standardized benchmarks, today realistic simulations of systems of varying complexity are available through several open-source channels. I envision this course to be a meeting ground for students in formal methods, artificial intelligence, robotics, and electrical engineering.