Teaching Statement

Ahmad Rahmati, Rice University

My passion for teaching stems from the sense of satisfaction I gain from it; while I enjoy research as an opportunity to make an impact on society by extending the limits of science, teaching is an opportunity to make a difference in individuals' lives. My most important goal in teaching is not to cover a preset syllabus, but to ignite the students curiosity to discover the course topics by themselves and gain the confidence to think independently in that domain. As Einstein put it best, "Education is what remains after one has forgotten everything he learned in school".

This goal is sometimes triumphed by the presentation style we have become so ever used to in research. We present our research in a top-down manner, presenting the outcome and big picture first, and then digging into details. Yet, using the same approach for teaching can kill intellectual discovery and curiosity; teaching and research are complimentary, but their presentation should be reversed. For the topics I teach, I always look at not only its state of the art, but its history and path as it evolved to become what it is today. This path forms my blueprint on how to present the course material, so students can discover and follow along a similar path. Indeed, to become successful, one day my students must follow non-ventured paths of discovery and innovation on their own, whether in graduate school or elsewhere.

In order to engage students, I use demonstrations and hands on experiments; students rarely forget things they have seen or performed themselves. I use false but seemingly true examples to convince students of the value of scientific rigor. I use the whiteboard alongside PowerPoint slides so that students will remain mentally and verbally involved. Finally, I encourage creativity by providing extra credit in assignments and exams, either as separate questions or, more importantly, as bonus points for better, shorter, and more creative solutions. I have seen the positive impact of such a policy, as students are often wary of exploring creative solutions due to the perceived risk of not achieving full credit, and resort to regular, tested-and-true solutions.

Teaching Experience

Initially being rewarded a scholarship from Rice University and afterwards becoming a research assistant, I was never required to serve as a teaching assistant (TA). Yet, I voluntarily became the TA for the year-long ECE undergraduate Senior Design Course, twice. In this course, students research, design, and create a solution to an engineering problem. In particular, one team built an ECG (Electrocardiogram) monitoring system using our Rice Orbit Platform, and won the first place prize among engineering school senior design projects. Inspired by their design, I later added a low-power general purpose analog interface to the Orbit Platform, which could be used for ECGs and beyond. In addition to serving as a TA, I have helped organize the department's *graduate mentoring program* for one year. In this program, we assigned senior graduate student volunteers to serve as mentors for first year graduate students.

While I have always enjoyed teaching, the first truly rewarding experience of mine was at Sharif University, where I had the chance to revamp the syllabus and methodology of a lab course, Electronic Circuits. Lab courses at the department of Computer Engineering were typically assigned only to senior graduate students, while I was just receiving my Bachelor's. The course had a syllabus that had been unchanged for years, focusing on building predetermined circuits and verifying their operation. I saw room for significant improvement, to focus on creative design and learning instead of breadboard assembly, and I revamped the syllabus and methodology. The new syllabus encouraged students to

discover for themselves and from scratch, the operation characteristics of components such as diodes, transistors, and op-amps, e.g., by plotting their operating curve and fitting mathematical equations to them. Later, they designed their own (albeit much simpler) circuits, and built and verified them. The new syllabus was well received both by students and faculty.

During my undergraduate studies at Sharif University and the year after, I was the lab instructor for the Digital Electronics Lab, Digital System Design (FPGA) Lab, and Electronics Circuits Lab. I have also been the TA for an unprecedented number of courses, including Computer Architecture, Computer Structure and Language, Computer Networks, Electronic Circuits, and Electric Circuits. Finally, I have taught both gifted and normal high school students, as well as volunteering as a tutor for underserved children. I view teaching as a way to reach out and give back out to society as a whole, and I hope to continue this practice in my academic career.

Teaching Interests

Based on my broad research and teaching experience, I would be comfortable teaching any traditional course in the department. In particular, due to the experimental and system nature of my research, I would enjoy teaching courses with strong experimental and system components. I am confident that I can give students hands-on experience and raise the bar of experimental education in such courses. I would be excited to teach courses such as logic design, digital circuits, computer architecture, VLSI, and operating systems. Moreover, at the senior and graduate levels, I propose the following new courses:

Mobile and Embedded System Design (Senior): This course will focus on the design, implementation, and applications of mobile, embedded, and real-time systems. It will first present, by example, the design of systems from application specifications. To this end, I will present an introduction on conventional and state-of-the-art sensors, hardware and system-on-chip (SoC) designs, software and OS choices, wireless standards, and user interfaces. The course will then focus on implementation and prototyping. I will present hardware and low-power design, PCB design and fabrication, and both analog and digital interfacing. Finally, as many such systems interact with users directly, the course will present the technicalities of human factors and user studies for such systems. I will present the fundamentals of ergonomic design and human perception, and give an introduction to the technicalities and ethics of designing and performing user studies. This course encourages students with different backgrounds to apply their own expertise to optimize mobile & embedded system and investigate future applications. Students are expected to design and implement a related project on mobile and/or embedded systems.

Energy Efficiency for Mobile Systems (Graduate): This course will focus on energy efficiency, which has become critically important for modern computing and in particular for mobile systems. It will present the fundamentals and state of the art in energy characteristics, energy-saving mechanisms, and energy characterization. It will then focus on mobile system specifics, such as user interaction and context dependency, and energy harvesting. Students are expected to read several papers for each session and undertake a course project tuned to each students interests and research area.

Statistic Learning for Mobile and Embedded Applications (Graduate): This course will present modern and practical statistical learning methods and tools, in particular for mobile and embedded applications. It will emphasizing the methods and their foundations, rather than the theoretical aspects of statistics, and will be useful for a wide range of research areas, such as mobile, networked, and embedded devices, sensor networks, and systems researchers. The course will be further enhanced by a course project tuned to each student's interests and research area.