Teaching Statement | Earlence Fernandes

The opportunity to work with students and teach them the skills they need to be successful engineers and scientists is the key reason I am pursuing a career in academia. I believe that instilling the security mindset in students will go a long way in enabling better computer security. I am grateful for the opportunity to teach this mindset along with computer science fundamentals to the students who will build the systems of tomorrow. My teaching experience spans research mentoring of undergraduate and graduate students, giving invited talks, and guest lecturing for outreach activities. I've published peer-reviewed papers with two Master's students, and have held CS education seminars at my undergraduate university. I was a primary instructor for EECS 588 (grad computer security) at Michigan, and CSE 590Y (adversarial deep learning) at UW. Student evaluations of the course were consistently high. I look forward to teaching systems, security, and introductory CS courses.

Teaching philosophy and experience. I have a holistic view of teaching and tailor my lecturing to the requisite discipline and to the audience at hand. For classroom teaching, I take a practical approach and prefer explaining concepts through many carefully chosen examples and hands-on projects before introducing a principle. Being an experimental computer scientist, this is generally the method that I follow in my research and I find it to be a valuable tool to learn the "what" and more importantly the "why" about a given principle. I have taught EECS 588, a grad course in computer security at Michigan in the Winter of 2017 with the above precepts. For example, a component of coursework was to replicate recent attacks. I'm currently leading a grad seminar at UW on Adversarial Deep Learning.

Courses I can teach. I am able to teach operating systems, network and distributed systems, and introductory security courses at the undergraduate level, and advanced systems and security courses at the graduate level. I would also like to teach introductory courses on the fundamentals of CS (intro. to programming, data structures, algorithms) and take the opportunity to introduce the security mindset to students at an early stage. Finally, I am also interested in leading a graduate level seminar on security for emerging technologies to identify opportunities for collaboration with students and to educate them on the latest challenges in this space.

Mentoring experience. I've served as a bachelor thesis technical advisor for two students, one at Purdue University and another at Michigan. My role was to provide assistance on technical topics in mobile systems security. One student has a full-time position in data analysis for security, and the other went on to earn a Master's degree at Harvard. I mentored two Master's students and published peer-reviewed papers with both students. The Master's students went on to full-time positions at VMWare and Google. I'm also currently mentoring a graduate student at UW on machine learning security, and an undergrad on end-user programming for IoT. While working with an undergraduate student, the main challenge I faced was scoping the research task and breaking it down into manageable parts for the student. Helping the student on managing work in well-defined pieces helped bring results. Similarly, while mentoring graduate students, the main challenge was that they get bogged down in detail and hence lose focus of the problem we are trying to solve. My strategy here was to continually help them understand how tasks they are doing at that moment contribute to the overall picture. I found that writing about the problem and submitting for peer-review helps in this process. Based on this experience, my mentoring revolves around two principles:

- *Precisely characterizing the problem:* I like to teach students to carefully vet an idea for scientific merit and for motivation. I believe in well-motivated impactful research output and in my experience, having in-depth discussions that question every assumption before diving deep into prototyping systems or attacks leads to such kind of work. Furthermore, one of my first questions to students with research ideas is "How will you evaluate this?". The evaluation forms an important part of characterizing a problem and assessing its merit.
- *Writing early:* I encourage my students to write workshop papers or "mini-proposals." I find that writing about research often helps make concrete the core principles of the work, its contributions, and helps weed out unfruitful paths of investigation. Furthermore, this builds confidence in students, and helps them build ties with the community early on in their careers.

Outreach activities. I regularly conduct guest lectures and seminars at my undergraduate institution in India on pursuing higher-level education, including careers in research in the hope of encouraging more students to take up computer science research. I've also guest lectured (machine learning security) at UW for the 484 undergrad security course. I served on a panel that explained Internet of Things security to engineers and scientists in the

Ann Arbor area (SUMIT 2016 conference). Most recently, I participated in a roundtable discussion organized by Congressperson Pramila Jayapal on policy issues regarding IoT.