Teaching Statement

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I am passionate about teaching and mentoring students. Higher education has an enormous impact on improving the world we live in and I would be honored to contribute to this great cause. As someone who has benefited greatly from teachers and mentors, I take it as one of my most important responsibilities to provide the best guidance I can to graduate and undergraduate students.

Teaching

I have assisted with courses both when I was an undergraduate and a graduate student. As an undergraduate student, I was a teaching assistant for three classes. I held complementary sessions for students to ask questions about the course material, the course project, and the assignments. As a graduate student, I was an assistant for three different courses. I helped the students with the course project, taught a guest lecture in the class, and graded their homework.

In teaching courses, I will pursue three important principles. First, I will use a **hands-on project**, which is especially important for courses on computer systems as it helps the students internalize important systems concepts. For example, a course on architectural support for operating systems will feature a project on implementing the Linux support for a minimal instruction set architecture. Second, I will provide the **bigger picture** of the course material since it is important for the students to learn how the course topic is connected to other topics in the fields and why the specific techniques and tools taught in the course have been developed. Finally, I will pursue an **engaging and interactive** class environment by actively encouraging the students to participate in the discussions. In my own experience, I have learnt much more in such classes. In addition to improved learning for everyone, this approach also helps students who are shy or less confident.

Mentoring

I have had the pleasure of mentoring several students, either junior Ph.D. students, masters students, or undergraduate students. I will follow two principles in my mentoring. First, I will help my students to find their interests and pursue their research on a topic they are passionate about. Second, I will encourage my students to spend time early on in order to master the fundamental concepts of the system they are working on. This principle is important for computer systems projects as it gives the students a deeper insight on the system and increases the development efficiency. As an example of applying this principle, I taught one of my mentees about memory management in operating systems, virtualization, and device drivers early in our work. He later became quite proficient on the topics and managed to contribute significantly to our research project.

Courses to Teach

Given my background, I am well suited to teach several staple computer engineering and computer science courses including embedded systems, operating systems, and computer architecture. I am also willing to teach other courses according to the department needs. Moreover, I will be able to teach the following courses.

Mobile Systems (senior, graduate): This course will offer an in-depth overview of the mobile system hardware and software, emphasizing on their fundamental differences from those of desktops and servers. The first part of the course introduces the System on a Chip (SoC), commonly used on mobile systems. The second part discusses the system software including the operating system (such as Android and iOS) and system services. It will focus on their distinctive features, such as their vertically-integrated software stack and their application development framework. The final part will cover the unique requirements of mobile software, such as energy efficiency and support for disconnected operation. The course will feature a project on building applications, services, or operating system components for an Android smartphone. Students will be presented with project options, each of which will be based on different parts of the course. As an example, one project will be on developing an efficient sensing service that leverages the low-power cores on the mobile SoC.

Architectural Support for Operating Systems (senior, graduate): This course aims at filling the gap between courses on operating system and computer architecture, focusing on the interface between the two. The first half of the course introduces the elements of an instruction set architecture (ISA), or the software and hardware interface. These elements include the instructions and their operands, software-visible registers, interrupts and exceptions, memory model including segments and page tables, thread context and context switch, etc. The second part of the course discusses the differences between some important ISAs such as x86 and ARM, and how an operating system (such as Linux) is designed to support these ISAs despite the differences. The course will feature a project on building a minimal ISA in a simulator and porting Linux to run on the simulated ISA. Each project consists of two large groups (about five students), with one group working on the ISA simulation and one group working on the Linux support. In addition to the technical merits, this project aims at teaching students how to operate in large groups and collaborate with other groups to achieve a unified goal.

System Virtualization (graduate): This will be a seminar course consisting of student presentations on seminal work on system virtualization. The first part of the course discusses the early work in this area dating back to 1960s with the groundbreaking work on IBM System/360 and System/370 mainframes. It also discusses the work that fueled the resurgence of virtualization including paravirtualization by Xen and hardware support from processor manufacturers such as Intel. The second part of the course presents the roles and challenges of virtualization in today's data centers. Its roles include consolidating hardware resources and providing strong isolation between untrusting software. Its challenges include virtualizing accelerators, e.g., in order to provide GPU acceleration for data center workload.