Teaching Statement

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My career goal is to excel both in research and teaching. In this statement, I describe some of my teaching methodologies and experiences while teaching computer architecture courses at the undergraduate-level and graduate-level in William & Mary. Many of my teaching efforts are supported by the NSF CAREER Award. Next, I briefly describe my experience of advising and mentoring both graduate and undergraduate students. Finally, I discuss my future plans.

1. Teaching Methodology

I am very passionate about teaching courses related to computer architecture. At W&M, I made continuous efforts to provide the best possible education to students. To this end, I participated in the University Teaching Project (UTP) and Hybrid Instructional Training (HIT) at W&M. These programs helped me to improve my teaching methodologies and material significantly. Specifically, I focused on the following points.

• **Developing Interesting Course Material and Tools.** I focused on bringing clarity to students about various concepts in computer architecture. I designed my lectures in a way so as to stimulate interest for the subject in students. This was achieved by structuring lectures and course material to introduce fundamental concepts followed by in-class activities and discussion on relevant current research topics. I am a proponent of using technology in the classroom. Therefore, I worked with William & Mary eLearning center for developing electronic materials (e.g., sampled recorded lectures for the flip classroom model, slide annotations for in-class teaching/activities). I also developed Python-based simulator assignments to quickly understand architecture concepts (e.g., working of hardware caches).

• **Student-Centered Teaching.** I used a student-centered teaching methodology that involves the active participation of students in learning. For example, I delivered lectures on fundamental concepts using effective power-point presentations, while I reverted to whiteboard/iPad teaching for problem-solving and group activity. To enhance student interactions, I also posed questions in the form of quizzes and in-class activities. The students also actively participated in online discussions on Piazza. I felt that such an interactive atmosphere was both entertaining and a learning experience for the students. Finally, I took student feedback very seriously and improved my courses over a period of time.

Outside W&M, I also taught in a very popular summer school (held annually at Fiuggi, Italy) for Computer Architects (ACACES 2018). Around 100 students took my GPU class over 5 days. More details are available here: `http://acaces.hipeac.net/2018/index.php?page=courseinfo&lecturer=jog`.

2. Course Coverage at William & Mary

2.1. Undergraduate Courses

I have taught a core undergraduate course on computer architecture in Fall 2016, 2017, 2018, 2019. This course introduces the principles of computer design. My goal was to teach students such that they can appreciate various trade-offs and abstractions in the area of computer architecture. I made special efforts to ensure this course is self-contained and covered concepts such as instruction-set architectures (MIPS ISA), data-path design, pipelining, memory hierarchy, and multiprocessor architecture. I heavily used piazza, an online forum, to effectively address students' questions/concerns, and take intermediate feedback via quizzes. The feedback really helped me to pace my course. My course had significant weight to homeworks and simulation-based assignments. From the feedback I received from students, such assignments significantly contributed to the students' learnings.

Across all different versions of my undergrad computer architecture course, I received overwhelmingly positive evaluations. Some of the notable comments were: *a) Professor Jog is one of the best professors that I have had here. He clearly and concisely explained complex topics, b) Professor Jog was absolutely fantastic. Can't be overstated. He's quickly become my favorite professor in the CS department, and one of my favorite professors here, c) Professor Jog really cares a lot about his students learning and it really shows. If he taught all my CS classes, I would be happy, d) Adwait Jog is undoubtedly the best professor I have had in the computer science department. He is very knowledgeable. He values student input, and*

incorporates in into how he teaches us. He teaches a very difficult subject, but is a very very good explainer, and makes the information easily digestible. I was dreading this course by the title, and am now actually very passionate about it. It has been my favorite course in major, e) It is very clear professor Jog is highly knowledgeable and passionate about this subject..., f) Overall, one of the best CS professors I've had in a long time. Good course and a manageable workload, g) Teaching was very clear and professor Jog did an excellent job explaining the material.

2.2. Graduate Courses

The graduate courses were tailored to introduce and train graduate students in area of computer architecture. In my first semester at William & Mary, I taught a course on topics in computer architecture. This course was a seminar-type course, where we discussed research papers on a wide range of topics (e.g., cache or memory systems, scheduling, resource management, micro-architecture, emerging technologies/architectures) in the broad areas of computer architecture and systems. Although this course was seminar-type, I covered a substantial number of classes to provide a good background to the students. Based on the feedback, students are now prepared to do research in the field of computer architecture.

I taught the GPU architecture course in Spring 2016, Spring 2018, Spring 2019, and Spring 2020. It provided an in-depth understanding of the architectural and micro-architectural details of a general-purpose graphics processing unit (GPU). I covered a range of latest papers that have appeared in leading international journals and conferences. Students read a variety of papers, critiqued them, and presented them in front of the class. In addition, students completed a semester-long research project and simulation-based assignments. One of the challenges I faced was the lack of a comprehensive book on GPU architectures. Therefore, I spent a significant amount of time in building my own material in addition to leveraging existing disaggregated materials from different sources. Overall, the student feedback was very positive and I was able to also recruit two students in my group.

3. Advising and Mentoring Students

I am leading Insight Computer Architecture Research Lab (`https://insight-cal.github.io/`) consisting of four Ph.D. students (Mohamed Assem Ibrahim, Gurunath Kadam, Hongyuan Liu, Haonan Wang). I invested a significant fraction of my time in mentoring these students. I met each of them at least once a week (in-person or online) to discuss our research projects. We have a group slack workspace and mailing list where we regularly discuss several research-related and other admin issues. I organized weekly group meetings to discuss research papers and common issues. I provided detailed feedback to students' presentations and prepared them for various talks. Our group meetings (both formal and informal) helped in developing a friendly atmosphere in my group, which is very important for a productive and healthy career.

I provided ample opportunities to students for their professional development. I supported their conference travel through my research grants. My students have traveled both internationally and domestically to present their research work. I also facilitated their internships. In addition to students in my research group, I also mentored and collaborated with Bin Nie and Lishan Yang (W&M students, advised by Prof. Smirni) and have published papers with them. I also advised five MS students and three undergraduate students on their thesis and projects. I served on the Ph.D. committees of several students in my department (details in the CV). Finally, I also advised several first-year undergraduate students (pre-major advising).

4. Future Plans

I strongly believe that a solid background in computer architecture is necessary for all students interested in computer science. Therefore, I am looking forward to teaching introductory as well as advanced courses in computer architecture, which will enable students to design both better hardware as well as software. At the undergraduate level, I am interested to introduce new 200-level courses on logic design and teaching existing computer organization course (CSCI 304). At the graduate level, I will continue to teach GPU architecture course (CSCI 674) and also plan to teach computer architecture course (CSCI 654). Additionally, I also intend to develop a few new graduate courses, e.g., a) embedded systems/IoT, b) applying concepts from machine learning into computer architecture design. Finally, I plan to continuously improve my teaching material and methodologies to further enhance the course experience for the students.