# Teaching Statement

ABM Musa
amusa2@uic.edu
www.cs.uic.edu/~amusa

The combination of research and teaching is a major motivation for me to pursue an academic career. In my opinion, teaching is not only complementary but also necessary for successful research. Teaching responsibility forces someone to think deeply about concepts and ideas and connect them better. Open discussions and inquisitive questions from students often generate new ideas and drive new research directions. Additionally, it is very rewarding to educate students successfully and contribute to their academic endeavor.

**Teaching experience:** During my PhD at University of Illinois at Chicago (UIC), I have been a teaching assistant (TA) for Computer Networks (CS450) for four semesters, Computer Architecture (CS366) for two semesters, Operating Systems (CS385) for one semester, and Introduction to Programming (CS107) for one semester. Computer Networks is widely regarded as one of the most work-intensive courses at UIC, especially because of the challenging programming assignments involving real-world systems. These include implementation of a DNS resolver, development of a simple but protocol-preserving torrent file sharing system, and analysis of internet routing over the worldwide PlanetLab testbed (`www.planet-lab.org`). I was responsible for helping students with the assignments by discussing the basic theoretical principles and implementation strategies. In addition, I developed automated testing and grading framework for the assignments to provide early feedback to the students. The students highly praised this framework, and the professors also adopted the framework in later semesters. In Computer Architecture course, I conducted two lab classes every week, where I gave lectures on various topics, and helped the students with their hardware prototypes and software simulations. In addition to the advanced courses, I was the TA for Introduction to Programming course, where I got the chance to interact with students from various backgrounds.

**Teaching philosophy:** Being an experimental computer scientist, I prefer to teach with real-life examples and hands-on experiments. I believe that students learn the theoretical concepts the best through implementation. Furthermore, real-life examples and applications of various concepts make students genuinely invested in the learning. During my interaction with students at UIC, I took many opportunities to encourage students to show the real-life examples of core computer science concepts. For instance, in computer architecture course, I discussed writing faster programs by taking into account the underlying system architecture, scalability issues in large software services, and vertical vs. horizontal scaling. I observed that these examples demonstrating the actual applications of abstract concepts increased students' curiosity and often led to interesting discussions.

In my opinion, showing the big picture can inspire students to explore an area beyond the required course curriculum. On many occasions, I discussed how various concepts fit together, and how different areas of computer science links together in a real-world system. I often brought examples from my research and other state-of-the-art development in an area. For example, in the Computer Networks class, one assignment required students to analyze network traffic data using Wireshark. There I showed the association process in Wi-Fi networks using the four-way handshake that we used in our research on smartphone tracking. Utilizing this feature, we increased packet reception from a smartphone by up to five times. In my experience, real-life examples like these inspired the students to think beyond the course requirements and encouraged them to explore the real-world applications of various concepts.

For introductory courses, where students come from various backgrounds, it is important to teach core concepts through a lot of examples and visual aids. Additionally, I found that in introductory programming classes, some students have no programming experience at all, while some are quite experienced because of self-learning and emphasis on programming at some schools. Hence it is important to conduct classes in a way that is accessible to all students. Furthermore, it is important to pay attention to individual students so that everyone in the class can learn at the same pace.

For advanced courses, I believe that students should work on projects that involve real-world data-sets and systems. They should also work on research-oriented projects. Working on real systems rather than curated problems prepares students to deal with real-life complexities, enable them to learn by exploration, and inspire them to become life-long learners.

**Teaching interests:** I wish to teach Computer Networks at the undergraduate level. I can also teach Computer Architecture and introductory programming courses. A significant part of my research involves computer networks and computer systems. Additionally, I was the TA for these courses at UIC for many semesters. This experience will be helpful for me to teach these courses effectively. I can teach Wireless Networks at the graduate level. I would also like to design a course on Mobile Computing and Sensing for the graduate level. In this course, I plan to teach data collection methods using various smartphone sensors, sensor fusion, and pre-processing, analysis and visualization of data. In addition, I plan to include semester-long projects where students will build real-world sensing applications using the concepts learned in the course.