## TEACHING STATEMENT – Matthew Caesar

I am excited about commencing my career as a professor. Through my experiences in teaching, I have acquired a great deal of energy from communicating with students and managing a classroom. Such interactions reignite my passion and curiosity to explore all aspects of the field of networking. Observing the field through the eyes of a student can lead to questioning fundamental assumptions, which in turn can lead to discovering important problems on which to devote attention. Although teaching and mentoring takes effort and focus to do well, it is also a highly enjoyable process that can benefit the teacher as much as the student.

# Teaching philosophies

*Learning through doing:* It is very important for students to gain experience in working with real systems. Many systems appear simple at first glance, but behave counterintuitively at scale or under certain failure modes. Understanding these behaviors is crucial in building a practical system and refining system properties. For example in my work on self-organizing networks, although the system worked correctly during initial deployment, performance was poor. After observing the protocol in execution, I acquired insights into the design that were difficult or impossible to observe from the formalism of the protocol's state design. These led me to an algorithm with much improved convergence properties. I owe much of my success as a systems builder to the numerous class projects I have been exposed to at Berkeley. Hence as a professor I would strive to formulate challenging yet relevant projects for my students.

*Synergy with research:* A professor's job is not simply to teach information, but also to teach students how to think critically. I believe forming a strong synergy between research, industrial collaboration, and teaching can be beneficial towards this goal. Integrating students into research helps them gain experience in solving real-world problems, and maintaining strong ties with industry gives feedback that helps maintain a teaching agenda reflecting the state-of-the-art. For example, my time at AT&T gave me insights into the sorts of problems important to the operation of a large tier-1 ISP, which led to the start of collaboration on several research projects. At Microsoft I obtained a different yet complementary view of the issues important to a large software company. Their adoption of one of my algorithms for a product under development led to a considerable amount of feedback and suggestions for improving the deployability of my protocol. As a professor, I would aim to maintain a strong feedback loop across research, teaching, and industrial collaboration by integrating students into my research and industrial collaborations, working jointly with students on projects, supervising student internships, and offering graduate seminar classes.

*Inspiration through effective teaching:* Building a strong teaching and mentoring agenda can lead to significant payoffs in improving students' understanding and motivation to learn. As a professor, I would aim to maximize my teaching effectiveness in three key ways. First, I consider solid knowledge and constant refinement of course material crucial. During my Ph.D., I served as a teaching assistant five times (four times for the same course). I formulated different projects/homeworks each semester, explored varying topics in my lectures, and otherwise refined my teaching material. I found that the extra time I spent on each class had a significant payoff in improving students' understanding. Second, I consider inspiring and providing motivation for

students to learn to be one of the most important aspects of teaching. I feel the greatest gift from my advisors came not from teaching me technical concepts, but rather by instilling within me a strong enthusiasm for solving problems. Hence I typically incorporate into my teaching real-world practical applications of technical concepts, and how such applications vastly benefit society. Finally, I have found it important to adapt to student needs when teaching. Not all students learn the same way, so it is important to isolate a student's strengths when determining research projects, while at the same time giving them an opportunity to broaden their strengths.

## Teaching plans

There are a wide variety of classes I would enjoy teaching. Given my thesis, I feel well-prepared to teach classes in distributed systems, operating systems, and networking at the undergraduate and graduate levels. I would also enjoy teaching classes in introductory programming and in related systems areas such as databases and algorithm design. If I were given the opportunity to teach a special-topics course on any topic I chose, it would be one of the following:

*Debugging and troubleshooting*: This class would explore online analysis and inference of protocols and applications, including what information can be inferred by observing protocols in execution or by observing interdependencies of application components, and how to design protocols and systems to make troubleshooting simple. I would also discuss tradeoffs in inferring root cause in the absence of complete visibility, for example when diagnosing faults in the presence of privacy and security considerations.

*Sensornets and embedded systems:* One of my primary goals in teaching is to involve students in building and experimenting with the complexities of real systems. Sensornets as a programming environment offer a unique set of challenges, including drastic constraints on memory, power, and processing capabilities. These challenges are becoming increasingly relevant with recent industry focus on building smaller and more functional embedded systems with advanced network capabilities.

*Internet architecture*: In order to understand the design of a large-scale system such as the Internet, it is necessary to understand its constituent protocols, the problems they solve, and how they interact with policies, network structure, and essential feature requirements that give rise to their design. In this class I would touch on key issues in naming, addressing, routing and management, and overview the wide variety of proposed future architectures and the possible role that the GENI experimental facility might play in exploring those designs.

## Summary

In conclusion, I look forward to a career involving teaching due to the wide variety of unique challenges it offers. From my own experiences, I feel that teaching is greatly enhanced via hands-on experience with building systems, maintaining a strong synergy with research, and by demonstrating a strong enthusiasm for the material. I believe my thesis experience best qualifies me to teach systems-related classes, including distributed systems, operating systems, and networking. I would also enjoy teaching related systems-area topics, including security and database systems. I would also enjoy teaching seminar classes on special topics like debugging and troubleshooting, Internet architecture, and sensor/wireless networks.