

I graduated from the University of Texas at Austin in Spring 2008 and plan to enter a Computer Science PhD program in Fall 2009. I enjoy working in an academic environment and hope to become a professor after completing my graduate degree.

The focus of my undergraduate research was computer architecture. With the guidance of my advisor, Doug Burger, I focused specifically on memory disambiguation, one of the significant challenges in modern microprocessor design. In modern processors, there are many operations in flight at once, including reads and writes to memory, which can be executed out of order to improve performance. The fact that it is unknown in advance which reads and writes will access the same memory location poses a problem for the effective reordering of operations.

My contributions to this area have consisted of two parts. In the fall of 2006, I collaborated with graduate student Simha Sethumadhavan on work which appeared in the 34th International Symposium on Computer Architecture (ISCA 2007). My contribution to the project was the Verilog implementation and verification of an unordered Load-Store Queue (LSQ) design, suited for large-window processors with address-interleaved cache banks. This was a low-level implementation that went through several design iterations as I learned the details of Verilog and the design.

From this project I gained a deeper understanding of the research process and the low-level details of computer architecture. I was then able to move on to a project at a higher level of abstraction that aims to solve the larger problem associated with memory ordering. Modern processors use memory dependence prediction to predict which read instructions can be reordered with respect to which write instructions. Previous dependence predictors achieve near ideal performance but require all information to be centralized and instantaneously accessible, making them unsuitable for an emerging class of distributed architectures. I worked on a software experimental simulator of a dependence predictor targeted to a distributed microarchitecture. Counting Dependence Predictors (CDPs) predict the number of prior writes for which a read instruction should wait. CDPs aim to use as little global information as possible to make a prediction in order to minimize complexity of the distributed protocol. This project culminated in my undergraduate honors thesis and a paper in the 35th International Symposium on Computer Architecture (ISCA 2008).

Moving forward, I am interested in shifting my research focus towards security. Security-related research appeals to me for two main reasons. One is that it is a broad topic which is relevant at each layer of abstraction and to every emerging technology. This lends itself naturally to exciting work that crosses several areas. My first foray into security was a Network Security and Privacy course taught by Vitaly Shmatikov. It piqued my interest to explore the field further, and in doing so, I've found it to be compelling at every layer. Indeed, the second reason I would like to pursue security-related research is that I enjoy the security mindset, that is, viewing designs skeptically. While other areas in Computer Science strive to get things to work better, faster, and smarter, security requires decomposing an existing or emerging design from a different angle.

Besides the appeal of a research career, another reason that I would like to become a professor is that I enjoy teaching. I worked as a tutor for high school students throughout three years in college, primarily tutoring math, science, and English. One of my most rewarding experiences was watching the girl I tutored most frequently grow both academically and personally over the years. This year I am spending seven months as an English Language Teaching Assistant at a high school in Mulhouse, France in part as a way to gain another cultural perspective before beginning my graduate degree.

I believe that I would be a positive addition to the Computer Science graduate program at [school] and that my undergraduate experience has provided me with the ability to succeed in such a program. I thank you for your consideration of my application.