Workshop on Supporting Diversity in Systems Research (Diversity '10)

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Summarized by James Mickens (mickens@microsoft.com)

Research Agendas: Picking Good Ones and Publishing Successfully

Dawn Song, University of California, Berkeley; Anthony Joseph, Intel and University of California, Berkeley

Dawn Song, a professor at Berkeley, provided several pieces of advice for students who were struggling to publish or pick compelling project ideas. First, she observed that many students only read papers in their particular subfield of computer science. Song recommended that students read a broad range of literature in computer science and beyond; by doing so, they will learn about important problems and techniques in other areas which may relate to their own subfield. In a similar vein, Song advised students to communicate frequently with professors and other students, both through formal channels like reading groups and informal channels like lunch meetings. Such face-to-face interaction provides

students with valuable networking opportunities and also exposes them to a wider variety of perspectives on computing research. Finally, Song also advised students to not treat class projects as busywork, but as opportunities to create publishable research.

The next presenter was Anthony Joseph, a professor at Berkeley and director of Intel Research Berkeley. Joseph encouraged students to do industrial internships and gain exposure to pressing real-world problems. However, Joseph also advised students to avoid working on problems that are too short-term or whose solutions only require an incremental improvement to the current state of the art. Joseph described his personal research methodology, explaining how he decomposes large projects into separate, short projects so as to get early results and quickly determine whether the overarching goals are actually as interesting as they originally seemed. Joseph said that with the advent of utility cloud infrastructures such as Amazon's EC2, even graduate students can evaluate their system's behavior at a large scale. Joseph recommended the use of these platforms to generate realistic evaluation results, and he encouraged students to take a statistics class so that they can properly validate their raw data. Joseph also emphasized that the research community will count the number of projects you finish, not the number you start. Thus, it is important to prefer simple solutions to complex ones, gather external feedback during a project's life cycle, and be flexible in adapting a project's goals and scope.

Getting the Most from a Conference

Carla Ellis, Duke University; Yvonne Coady, University of Victoria

Carla Ellis and Yvonne Coady gave an interactive presentation which taught students how to derive the maximum benefit from a conference. The presentation began with a skit in which Ellis and Coady pretended to be shy graduate students who were too intimidated to talk to a well-known researcher. The pair used the skit as a launching point for a discussion about how to successfully network. Ellis described the importance of having an elevator pitch which succinctly describes your research problem and your proposed solution. Coady observed that most academics love to talk about their own research, so students should not be afraid to initiate conversations with more established members of the community. Throughout the presentation, audience members asked questions or provided additional advice. Jonathan Appavoo, a professor at Boston University, reminded students of the importance of sincerity, and said that whether you talk to a first-year graduate student or a senior professor, you should always treat people with respect and kindness. James Mickens of Microsoft Research said that the academic community is actually quite small, but that attending conferences will never be fun until you know other people within the community. Thus, he encouraged students to network widely; for students who are shy, Mickens recommended that they talk to other students and build confidence before talking to more senior members of the community.

Hot Topics in Systems Research

Monica Lam, Stanford University; James Mickens, Microsoft Research

Monica Lam gave the first of two purely technical presentations in the Diversity workshop. She began with an overview of her research focuses, which have included compilers, software bug detection, system management, and security. Lam spent the rest of her talk describing her most recent research, which focuses on devising social networking applications that are decentralized, easy to use, and do not force all users to entrust all of their data to a few large companies. Lam observed that Facebook is headed towards a monopoly on personal information similar to the monopoly that Microsoft and Intel have over the desktop computing platform. The key challenge in creating a privacy-preserving alternative for social networking is that Facebook already has an enormous user base, and these people will be loath to move to a new privacy-preserving system, both for reasons of convenience and because many users do not treat privacy leakage as a first-order concern. Thus, Lam's research goal is to allow users to interact socially using an open, federated standard that lacks a central authority.

Lam gave several concrete examples of this architecture. In her Partyware project, people within immediate physical proximity share their profiles using their mobile phones, creating an ad hoc social network only consisting of people in a certain place at a certain time; individual users or supportive businesses like coffee shops run a lightweight rendezvous server that forwards traffic between phones or other user devices. Lam also described how email can be used as the transport protocol for decentralized social networking applications. Email is an attractive medium for several reasons. First, email providers typically provide much stronger privacy policies than those provided by social networking companies. Second, users can create new online personas simply by creating new email addresses. Finally, since there are multiple email providers (Google, Microsoft, Yahoo, etc.), no one party can control the aggregate social graph.

James Mickens began the second technical presentation by describing the fundamental insight behind his recent research: using JavaScript, Web pages have sufficient computational abilities to act as heavyweight participants in distributed systems. Mickens then described two projects that leverage the power of Web pages running within unmodified

browsers. The first project, named Silo, exploits two insights to reduce the load time for a Web page. First, a Silo Web server aggressively inlines the textual objects in a Web page (e.g., HTML, CSS, and JavaScript), reducing the number of fetches a browser needs to collect the objects. Second, the server and the Web page running on the client use JavaScript and AJAX to engage in a custom delta-encoding protocol similar to that of the LBFS distributed file system. Thus, the inlining reduces the number of round trips needed to build the page, and the delta-encoding allows the browser to cache data for the inlined objects even though the page no longer references them using explicit URLs. The resulting protocol can reduce end-to-end load times for some Web pages by over 50%.

After describing Silo, Mickens provided an overview of Mugshot, a tool for recording and then replaying the execution of JavaScript-based Web applications. Mugshot leverages JavaScript's extensive facilities for reflection to introspect upon all of the nondeterminism within a Web page (e.g., GUI activity, the reception of AJAX data, random number generation, etc.); this introspection works using standard JavaScript running on unmodified browsers. If the user encounters a problem with a Web page, she can opt to send her event log to a developer, who can then replay the events, recreating the session and stopping the event flow at any point to examine the page's dynamic state in a debugger.

Mickens concluded his talk by posing several open-ended questions about the future of Web research. First, he asked whether the standard Web stack (HTTP, HTML, and JavaScript) was becoming ossified like TCP/IP, and whether this discouraged exciting yet disruptive research that would break backwards compatibility. Mickens also asked whether the same domain policy should be revamped, and what kinds of fundamental programming abstractions are needed to expose cloud servers to Web pages.

Graduate School: The Things I Wish I'd Known

Lakshmi Ganesh, Cornell University; Nalini Belaramani, Google; Susan Horowitz, University of Wisconsin—Madison

This session contained presentations from three people at different points in their careers. The first presenter was Lakshmi Ganesh, a fifth-year graduate student at Cornell University. She described a variety of factors to consider when a student must pick an advisor. A good rapport is obviously critical, but Ganesh explained that a professor's level of funding is also important to consider, since working for a professor with few grants may force a graduate student to become a teaching assistant or a grader, resulting in less time for research and a longer time to graduation. Ganesh also advised students to consider a potential advisor's tenure status. Younger professors are often more motivated to publish frequently, but may micromanage. In contrast, tenured professors may be more relaxed and more interested in deeper, more impactful research, but they may not push students to work as hard as they can, and students may feel uncomfortable betting the early part of their career on high-risk, high-reward research.

The next presentation was given by Nalini Belaramani, who graduated from the University of Texas at Austin in 2009 and now works as a software engineer at Google. Belaramani emphasized the importance of communication skills, saying that the ability to explain one's work in a confident, articulate manner is crucial for getting papers published and succeeding in the job market. She encouraged students to practice writing and presenting as often as possible. In particular, Belaramani said that successful graduate students excel at motivating their work to others, either through the introduction section of a paper or the first few minutes of a verbal presentation. Seeking early feedback from professors or other students may result in criticism, but it will ultimately improve your research skills and your presentation abilities. Belaramani also mentioned that students should not bet their entire career on a single paper getting published in a specific venue; instead, students should work on multiple projects and multiple papers, and be willing to adapt the scope of projects in reaction to paper reviews or newly discovered knowledge.

The final presentation was given by Susan Horwitz, who received her PhD in 1985 and is now a professor at the University of Wisconsin—Madison. Horwitz told the student attendees to expect occasional hardships during the PhD process, but to take solace in the fact that everyone will experience challenges during graduate school. Horwitz encouraged students to be social and have fun during their graduate studies, and to converse with other students and faculty during the inevitable periods of feeling lost or unmotivated. Horwitz also told the students that if they were considering a job at a research university, they should prepare not just to do research but to teach, write grants, and review papers. Horwitz encouraged students to experience all of these tasks while in school so that they could determine whether a job at a research university would be a good career path for them.

Finishing the Dissertation: Techniques for Success

Anne Rogers, University of Chicago; Jinyang Li, New York University

The session began with a presentation from Anne Rogers, a professor at the University of Chicago. Rogers' talk was grounded in her experience as the director of graduate studies for her school's computer science department; this role gave her unique insights into the pitfalls that students often encounter as they try to complete their dissertations. Rogers

said that many students initially think of their dissertation as a movie, but it should really be an excellent short story—articulate and impactful, but no longer than necessary. Rogers emphasized that continual dialog between a student and her committee is crucial for ensuring that the dissertation is finished on time and with minimal revisions. Rogers also stressed the usefulness of communication with people outside the dissertation committee. By exchanging ideas with other students, visiting researchers, or people in completely unrelated fields, students can remain intellectually stimulated and get crucial feedback on their thesis work.

Jinyang Li, a professor at New York University, advised students not to worry too much about the thesis. Instead, students should focus on devising good projects and publishing papers about those projects. Once a student has two or three strong papers, a thesis will often naturally emerge. Li observed that individual publications will be read by your peers much more often than your thesis, so students should not agonize over creating a perfectly polished thesis. However, Li said that the thesis provides an excellent opportunity for poor writers to focus on their prose. In particular, writing the introduction for the thesis provides good practice in the art of selling your work to the larger academic community, a skill which is invaluable for writing grants and giving public presentations.

Job Choices: Academia versus Industry

Jonathan Appavoo, Boston University; Cary Gray, Wheaton College; John Wilkes, Google

Jonathan Appavoo described his personal career path from graduate student at the University of Toronto, to researcher at IBM Watson, to his current post as professor at Boston University. Appavoo said that a key factor in deciding where to work is the quality of the people who work there, not just in terms of their intellectual caliber but in terms of whether they create a friendly and productive workplace environment. Appavoo also emphasized that wherever you work, it is extremely important to be passionate about what you do. People who are energized by working with students may not thrive in an industrial environment; similarly, people who like to have impact on ready-to-ship projects may become frustrated with a university job. Appavoo said that he eventually transitioned from industry to academia because he felt that he had more freedom to explore his research agenda without regard to whether that research immediately impacted a company's revenue.

Cary Gray from Wheaton College provided another perspective from academia; however, in contrast to Appavoo, who worked at a large research university, Gray worked at a smaller academic institution which focused on undergraduate education. Gray said that he loved working at such an institution because it allowed him to form deep relationships with students and have a direct impact on their intellectual growth. However, Gray said that undergraduate-focused institutions are not suitable for people who do not like to teach, since these institutions require professors to teach two, three, or sometimes four classes per semester. Gray also mentioned that many teaching-focused institutions are in smaller cities, which may or may not be an advantage, depending on one's affinity for the big-city lifestyle.

The session concluded with a talk from John Wilkes, an industrial researcher who worked at HP Labs for 25 years before moving to Google in 2008. Wilkes said he enjoyed industrial research because it continually introduced him to interesting real-world problems whose solutions could immediately impact millions of people. Like the prior two speakers, Wilkes emphasized the importance of being passionate about what you do, and he encouraged the workshop's student attendees to think carefully about what really excited them. Wilkes advised students to do industrial internships to gain experience with the different workflow in that environment. Wilkes also encouraged students to take on bold projects during these internships, since impressing people during an internship can lead to fruitful collaboration or even a future job offer.