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What Do You Have That Others Don't?: Succeeding in Academia or Industry

Amit Sheth
University of South Carolina - Columbia, amit@sc.edu

Stack Overflow surveyed ~100,000 developers, more than 50 percent said they spent 9 hours or more on a computer.

What Do You Have That Others Don't?
Succeeding in academia or industry

Over the years, I have had significant involvement in advising or mentoring computer science graduate students—specifically doctoral (28 have graduated so far) and M.S. thesis (about 30 have graduated so far) candidates. The outcomes for these graduates have been exceptional; all of my Ph.D. graduates have successfully competed with their counterparts from top-20 schools, and they have gone on to obtain prominent academic, research lab, and other high-tech positions. Frankly, the Kno.e.sis ecosystem has been instrumental in achieving these outcomes.[1]

I've had many discussions with my students to help them understand the path they need to take to succeed, especially for the most exciting and high-demand jobs. Too many times we focus on external factors—the window dressing—instead of turning inward. It is important to remember ranking is highly overrated. Often it is the advi-

1 Kno.e.sis, or the Ohio Center of Excellence in Knowledge-enabled Computing, has produced top-tier graduates. Read more at http://bit.ly/k-Outcome.

When doing internships at top companies, you will get to observe what it takes to work there and succeed.

sor who plays a more significant role, not the department or the university, in the success of a research student. Malcolm Gladwell's 2013 talk[2] at Google is a convincing account of why top students at mediocre schools consistently have better outcomes than a middle-of-the-pack student at a top school. That is why you should be able to answer a question I often share with my students: "What is it you have that others don't?"

In my view, while traditional research outcomes—as measured by the number of published articles in good venues (a minimum of three in the top venues in your field)—are necessary, they are far from sufficient. Nowadays, successful student preparations rely on a lot more than paper count.

Exceptional teamwork. It is important to learn to appreciate collaborative work, learn from (be mentored by) senior students or postdocs in the group (in addition to the faculty supervisor, of course), and later mentor junior students (both Ph.D. or M.S. thesis students). You will learn to appreciate the different skills others bring to the group.

Good development skills. With the increasing number of competitive industry jobs, a candidate will be subjected to two to four rounds of engineering interviews. You will be expected to know the fundamentals. To prepare, I recommend students build tools and occasionally open source them on GitHub, participate in competitions (e.g., Kaggle) and hackathons, and take part in, or even

2 https://youtu.be/3UEwbRWFZVc

lead, an international standardization effort or significant dissemination activities.

Always ask why. When framing your research or innovation, "what" and "how" are not enough. In fact, without a good answer for "why" it is unlikely you will succeed in your research or any other activity.

Interdisciplinary work. This is more important than ever before: Computer science is evolving as a service discipline. Increasingly, for any major or impactful problem in any other discipline, computer science skills and tools are indispensable. However, it is hard to collaborate with experts in other fields at an arm's length. It is necessary to cultivate a deep appreciation of the field in which you are solving the problem.

Refine your soft skills and be social. Soft skills are as important as hard (technical) skills. Soft skills include the ability to communicate well (have a command of both written and spoken language), network (connect with anyone you may meet at a conference via LinkedIn), and have good overview of areas not in your area of expertise (be aware of major advances in computer science and beyond, not just publications in one or two conferences). I maintain a library of books in fields of broader interest (e.g., neuroscience, cognitive science, behavioral economics, and others), and I expect my students to read as many books as possible. You should attend or participate in advisor/lab group meetings, meet visitors and guests of your advisor/lab, and occasionally attend lunches or dinners when invited by your advisor.

For any major or impactful problem in any other discipline, computer science skills and tools are indispensable.

Learn how to obtain resources. This will be important for anything you want to do. If your advisor allows, help write one or two proposals. Understand how to compete for the resources you will need to conduct your research or innovative work in the future and the associated soft marketing skills required. If you are planning to join academia, be sure to understand various funding agencies (in the U.S., that would be the NIH or NSF).

Learn how to review papers. Do this so you know how others would evaluate your technical work. Serve on program committees, often for top conferences (this is more likely if your advisor receives a lot of invitations to join program committees), and review conference/journal papers (both from your own and your advisor's program committee participation).

Do the work outside of the classroom. Finally, prepare for and later apply for internships. Each of my Ph.D. students completes three or four internships during the typical five to six years of a doctoral program. This is your chance to learn from other mentors and get a sense of what it is like to compete in the real world. When doing internships at top companies, you will get to observe what it takes to work there and succeed. Also try to present a tutorial or co-organize a workshop at a major conference in your area (a majority of my students do). This will require you to be on top of all major happenings in your field. It also provides excellent networking opportunity. Alternatively, write a survey paper (perhaps with your advisor and colleagues). While this is a very demanding endeavor, good surveys tend to garner high visibility and many citations.

I hope I have gotten you to think more about how to plan your professional journey in computer science.

Biography

Dr. Amit Sheth [http://knoesis.org/amit] is an educator, researcher, and entrepreneur. He is the LexisNexis Ohio Eminent Scholar, an IEEE Fellow, an AAAI Fellow, and the executive director of Kno.e.sis—the Ohio Center of Excellence in Knowledge-enabled Computing at Wright State University.