How to have a good career in computer science

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First...

- Who am I? (why should anyone believe me?)

- This is *advice*, not a rulebook (ask around)

- This mostly isn’t about doing good research (you need to do that too)

- Please interrupt and ask questions
Today’s problem statement

• Input: N years of your effort
  ◆ N = 2ish for M.S., 6ish for Ph.D.

• Goal: you get a job
  ◆ Academic
  ◆ Industrial research
  ◆ Industrial
  ◆ Other: professional gambler, toy designer, assassin

• Problem: what should you do during those N years to maximize your job options?
What do you think is important to get a job?

- Research quality?
- Who your advisor is?
- Problem selection?
- Being able to hack?
- What school you come from?
- Story-telling?
- Being able to prove theorems?
- Publications?
- Who you know?
- Speaking and writing skill?
- Thesis?
Getting a job: top down

• How do you get a job?
  ◆ You interview (1-2 days)
  ◆ You give a **great talk** on fascinating research (research jobs only)
  ◆ Impress everyone in **one-on-one meetings**
  ◆ Various political issues outside your control
    » Area/budget biases, who was out-of-town the day you visited/when the hiring meeting happens, etc

• But… how do you get an interview?
How do you get an interview?

• The people there already like you
• You are highly recommended from leaders in the field
• You have publications in great places
• You have relevant practical experience (esp for industrial jobs)
• Other… (hard place to be)
Note: things I didn’t mention

• How well you did in courses
• How well you did on standardized tests
• How high your IQ is
Rest of today

- Networking
  - Secrets of the A-list computer scientists
- Communications
  - Storytelling
  - Writing
  - Presentation
- Research issues
  - What, how, when, why
- Misc
Networking
(not packets, but people)

• *It’s not who you know, it’s who knows you*

• **Myth:** your work speaks for itself (and you)
  - Little Reality #1: most people haven’t read your paper (feel lucky if they skimmed it)
  - Little Reality #2: many people attending your talk were gossiping in the hall or didn’t listen

• **Reality:** it is *your* responsibility to be “known” to your community, not their responsibility to know you
  - But your advisor, friends and colleagues can help
Networking at conferences/workshops

• **Show up**
  - Go to the top conference in your field each year (even if you have to pay some/all of your own way!)

• **Become visible**
  - Spend time with people from **outside UCSD**
  - Grad students from other schools. Why?
  - Faculty/researchers from elsewhere
  - Your advisor, friends can help (how?)

• **Learn to have a conversation**
  - There are interesting topics outside your research
  - **Do not be arrogant**, but don’t be a pushover either

• **Follow-up**
Networking via research internships

• Do them if you can (why?)
  ◆ Learn about other research, ways of doing things
  ◆ Get strong external reference
  ◆ Be introduced to wider group of researchers
  ◆ If you do well, huge advantage for getting a job
  ◆ Ok to even do 2-3 (best not in last 2 years for Ph.D.)

• Try to write a paper on what you did (even if you have to do all the work)

• If you have choices pick based on mentor and not based on project
  ◆ Keep in touch with your mentors (and fellow interns)

• BTW, you’ll make a pile of $$$ comparatively
Networking at home

• Other faculty
  ✷ You may need 3-5 references, yet you don’t have 3-5 advisors… hmmm?
  ✷ Go to seminars in your area regularly; introduce yourself to other faculty; if your advisor is amenable do a project with another faculty member

• Other students
  ✷ Leave your lab
  ✷ The senior grad student down the hall may be on the hiring committee at some school/lab/corp in two years
  ✷ You have to know more than just your field

• Visitors
  ✷ Go to distinguished lectures in any area
  ✷ If there is a chance to meet visitors in your area, do it
Also, please...

Make a Web page for yourself in CSE (one that isn’t terrible)

(yes, people actually look at these)
Communications issues

- **Myth**: great results shine through
- **Reality**: great communications skills are as important (if not more so) than research
Storytelling

• All papers and talks are first and foremost exercises in storytelling
  ◆ How should you think about my problem?
  ◆ Why should I care about the problem?
  ◆ Why should I care about your solution?
  ◆ Must grab attention without being arrogant

• This isn’t just sophistry: the *story* is a HUGE part of the academic contribution
  ◆ Example: RAID

• Probably the single *most* important skill you don’t have yet
Beginning story-telling tips

• Figure out what *kind* of paper you’re writing

• Find good examples of that *kind* of paper
  ◆ Ask around if you’re not sure

• Try to understand (or copy) the approach taken by those exemplars
Newell’s kinds of theses (applies equally well to papers)

- Opens up new area
- Provides unifying framework
- Resolves long-standing question
- Thoroughly explores an area
- Contradicts existing knowledge
- Experimentally validates theory
- Produces an ambitious system
- Provides empirical data
- Derives superior algorithms
- Develops new methodology
- Develops a new tool
- Produces a negative result
Other paper philosophies

• Butler Lampson: three “kinds” of papers to strive for
  ◆ First paper
  ◆ Best paper
  ◆ Last paper

• Andy Tannenbaum’s rule
  ◆ One key idea per paper; more can be confusing and less is worthless
  ◆ Less orthodox version: one *main* idea
Writing

[Comic panels showing a character clicking a mouse, another character reading a newspaper, a third character raising a fist in triumph, and a fourth character exclaiming, "I am a writing god!"]

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Writing

• Writing is absolutely critical (by far, easiest way to get your paper rejected)
• Good books: Bugs in Writing, Elements of Style
• Read examples of well-written papers in your field
• Think about writing in three pieces:
  ◆ Introduction (sells the story)
  ◆ Organization (what is beginning, middle, end)
    » What does each section need to demonstrate?
    » How is it linked to its neighboring sections?
  ◆ Paragraph structure within each section
    » Transition, context, meat, resolution, segue
• You must practice
  ◆ Multiple drafts; write routinely and throw it away
  ◆ Try not to get in the habit of letting your advisor write your papers
  ◆ Get help from other students or from other campus resources
Intros

• The *Intro* is perhaps the most important parts of any paper/presentation
  ◆ Sets context
  ◆ Explains how to look at the problem
  ◆ Presents most impressive result
  ◆ Keeps interest of reader in the first minute/page

• What needs to be in there
  ◆ Why does anyone care about this problem?
  ◆ What is done currently?
  ◆ What is your key insight into improving it?
  ◆ How much better are you making it?
Common writing mistakes

• Writing like you speak
• Bad segues (why did the last paragraph end)
• Flat introduction (most important part of paper)
• Don’t define terms (what’s a quatlooo again?)
• Don’t mention limitations or hide weaknesses (kick me)
• Aren’t clear what’s \textit{been} done vs what \textit{could} be done
• Related work (not researched, or dumps on everyone)
• No spell check or grammar check
• One draft and ship it
• Run-on sentences
• Unnecessary passive voice
  ◆ Experiments have been conducted to test the hypothesis (passive)
  ◆ We conducted experiments to test the hypothesis (active)
Speaking/Presentation

• Critical – easiest way to not get a job after getting an interview
• Need to condense story into 20-30min (paper talk) or 50min (job talk) slot
• Need to hold interest and not lose people, yet clearly do something important and hard
• But can’t possibly cover all details
• Need to speak clearly, concisely and confidently
• Then people will try to tear you down (Q&A)
Presentation Tips (mostly from David Patterson)

- Use illustrations – minimize text (this is a very bad talk)
- Be concise in using text (no sentences)
- Use large type (24 point min)
- Use color to separate features
- Skip slides if you need to (figure out which ones you can skip in advance)
- Do not over-animate (only use animation if it helps understanding)
- Allocate 1.5-2 minutes per slide and leave time for Q&A
- Humor – but only if you’re funny (it’s not up to you)
- Go to other people’s practice talks
- You MUST practice in front of real people – multiple times!
- Video – if you’re hardcore
Presentation Q&A issues

- Do practice Q&A – really… do this.
- Prepare backup slides around obvious questions
- Make sure you understand the question before you answer
- If you don’t know the answer, don’t make one up – ever.
- Prepare how to handle tough questions:
  - Questioning the premise
  - We did it at IBM in the 1950s
  - I believe there is a flaw in lemma 6
  - How is this different from xxx?
- Learn how to defer
- If you’re very funny, learn how to use humor to diffuse
Quick aside #1: personality

• Personality issues count… a lot
  ◆ Likeable/admirable people get better support
  ◆ From employers, advisors, colleagues, etc

• We all have personality defects
  ◆ Arrogant, undermotivated, underappreciative, martyr complex, gossip, loner, mean-spirited, unempathic, immature, poor sense of humor, sycophant, manipulative, etc
  ◆ Learn to know yours and try to improve…
  ◆ More than anything else learn to be modest, gracious and hard-working
    » Screwing up on these can be career-limiting
Quick aside #2: Plagiarism

• Wrongful appropriation of someone else’s work as though it were your original work
• But what about…
  ◆ Background/related work material? (not a contribution so…)
  ◆ Figures or photos?
  ◆ Just using the material to “seed” my own work?

• Don’t mess around with this… be super conservative
  ◆ People have been forced to leave this program this issue (and I’m aware of similar situations at other schools)
Research issues

• Topic selection
  ❖ Pick a topic that someone cares about
  ❖ Improvement on known problem vs new problem (how to demonstrate innovation)
  ❖ Short term vs long term (tradeoff)
  ❖ Track technology trends and changes
  ❖ Learn how to change the assumptions
  ❖ What is your secret weapon or unfair advantage?

• Problem definition
  ❖ Avoid LPUs
  ❖ But don’t need to solve everything in one paper (art)

• Publications
  ❖ Venue more important than quantity
  ❖ Collaboration is good, not bad
Quick aside: collaboration

• **Myth**: I shouldn’t work with other students because then I have to *share the credit*
  ◆ This is a **HUGE** mistake

• **Reality**:
  ◆ Huge multiplier in publication (breadth, quantity and quality)
  ◆ Provides more opportunities to learn
  ◆ More opportunities to impress faculty (remember those 3-5 references)
  ◆ Moreover, in industry and labs, working in a group is the norm – people look for this
Meta issue: Understanding your community

- You need to understand your community, both for selling your research and for networking
- What is a community?
- Who are the leaders in your community
  - Whose papers get published?
  - Who is on the PC?
  - Who is being cited?
- What are the hot/contentious topics?
  - Read the last two proceedings of the top conferences
  - Ask around which were the best papers
  - Ask why? Do you agree?
  - Join community mailing lists, organizations, blogs
Research issues #2

• How long on a problem?
  ◆ Your approach will have flaws (don’t give up)
  ◆ Don’t follow a rat-hole forever
    (no results for a year is a big warning sign)

• Methodology
  ◆ Be rigorous in your evaluation
  ◆ Strive to do realistic evaluations
    » This may mean implementing something!
    » Or at least get real data!
  ◆ Experimental fields: especially true
  ◆ **Must** compare to best known work
Quick aside: the advisor/student relationship

• Your advisor
  ◆ You cannot succeed without your advisor
  ◆ Your advisor can’t succeed without you
  ◆ This is co-dependence; live with it

• What to expect
  ◆ In the beginning your advisor will generate ideas, you will be asked to generate solutions/evaluations
  ◆ You need to learn to generate ideas too; so just try
  ◆ Expect to have your ideas shot down; don’t let it get to you and don’t stop
  ◆ Different advisors are different; learn to work with yours
Research and education

• It is easy to be spoon fed knowledge…
  ◆ Class readings, obvious background refs for your current project

• But the most successful students learn much more… aspire to develop a *voracious appetite* for information
  ◆ At least skim all the papers in the top conferences in your area (what is happening in your area?)
  ◆ Periodically go see what is happening in other fields (what trends can you see? Are there new opportunities for you?)
  ◆ Go educate yourself about a subfield you’ve become curious in
  ◆ Read the industry press and the geek press (what are the hotbutton issues?)
  ◆ Read mainstream technology/science press
  ◆ Go see good external speakers regardless of area
Don’t go down a rabbit hole

• Very tempting to sit in your office and just work hard – resist
• Get involved with the rest of the department
  ◆ Grad/faculty recruiting
  ◆ Going to see unrelated talks
  ◆ Random technology projects
  ◆ Playing foosball with other students, etc.
• Realize that you can’t solve everything
  ◆ If you feel lost, depressed, worthless, etc… learn to ask for help
Graduate Career Pitfalls

- I need the most famous advisor
- I rule (arrogance)
- I suck (self-deprecation)
- Wait for advisor to tell you what to do (kiss of death)
  - Be assertive about what you need
- Follow advisor’s advice blindly (hug of death)
  - Need to be able to argue with advisor (at least eventually)
- Ignore advisor and just go it on your own (plain ‘ol death)
  - Need to learn how to work with your advisor to succeed
- I need to do great work from day #1
- I need to work solo/carve out my niche on day one
  - Group projects help your career
  - Counterpoint: be careful with very large group projects (2yrs+)
- Not honest with self about career prospects
Questions?

WHAT DO YOU MEAN YOU HAVE DOUBTS ABOUT BECOMING A PROFESSOR?

SURELY YOU'VE BEEN IN GRAD SCHOOL ALL THIS TIME BECAUSE YOU ASPIRE TO BE JUST LIKE ME?

UH...

HA HA, DON'T ANSWER THAT. I'M JUST KIDDING...

OH. HA HA...

OF COURSE YOU ASPIRE TO BE ME. WHY ELSE WOULD YOU FOLLOW MY EVERY WORD?

IT DOESN'T MAKE SENSE OTHERWISE, DOES IT?

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