Research Methods

CSCI 8901:
Creativity and Jobs

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Creativity

There are many types of creativity
- Areas: Artistic, literary, musical,
- Styles: constructive, compositional, relational

Are you born with it?

Can you grow it?

Creativity

There are many types of creativity
- Areas: Artistic, literary, musical,
- Styles: constructive, compositional, relational

Are you born with it?
- Maybe?

Can you grow it?
- Definitely!

Improving Creativity

Take a break during work

We tend to spend most of our time thinking about the next worry

- What is due next? What do I need to finish by tomorrow?

Working all the time tends to worsen this

- When you are overworked, exhausted, you can only consider the next small step you need to finish

Take a walk; go get coffee; go out for lunch

- Do this during your work day so that you are still in the context of your research
- Purposefully avoid thinking about your little worries and reflect on where you are and where you want to be

Improving Creativity

Broaden your view

Read a paper or watch a conference talk that isn't directly related to your current project

- Ideally go to a conference so you are surrounded by diverse ideas not just in your main area

Get your brain thinking about **connections**, not low level details

Improving Creativity

Talk to people

Talk with your lab mates

Talk with other PhD students not in your lab
- Might be even more important!
- Doesn't have to be super technical

Talk to people at conferences
- Don't be shy!

Talking is even better than reading papers!
- Allows for back and forth of ideas, helps relate their ideas to your ideas / expertise

More talks!

Open your brain to new connections / ideas!

Improving Creativity

Question everything

At every talk you attend, you should come up with at least one question

- Bring a notepad or device you can write it down on (but don't get distracted)
- This forces you to think about connections around the speaker's main topic, not just passively absorb information

If you are uncomfortable asking questions in public... then force yourself to ask a question at every single talk you attend!

- The only way to become comfortable is to practice
- Easier to practice in our department than at your top conference

Ask questions at every talk!

Dan, Yanlei, and Michael insist on it

- (so do I)

- * This applies to classes too!

Asking Questions

Always makes you look smarter

And makes the whole audience look better

This spring we will have faculty candidates visit who are applying for jobs in our department
- If no students ask any questions, they will assume our students are dumb and uninterested

Please ask questions!

Where do my ideas come?

Most of my ideas come while I am at conferences

At a conference I…

- Don't worry about my classes, research meetings, committee meetings, students, etc
- Spend a lot of time surrounded by new ideas
- Talk with new people working in and around my area
- Have an enforced coffee break every ~2 hours

You can recreate most of these features without having to pay for a conference trip!

- I've had to do this for the last 2 years!

Brainstorming

Actively spend time trying to come up with new ideas

Ingredients:

- Pen and paper or white board and markers
- Broad direction to think about
- Need to have done your "homework" — need to be familiar with the area and how it relates to you
- If possible, have 1-2 other people

Very important:

- Aim for quantity, not quality
- Be positive
- Record enough of an idea to be able to go back to it later…
- But don't get slowed down by making notes
  - A good idea will stick in your mind later

Brainstorming Tip

Constraints bring creativity

Easy to get discouraged by too broad search space!

1. Narrow the scope of the problem

2. Reduce the set of solutions you consider

3. Iterate over possibilities rather than considering them all at once

Brainstorming Tip

Pick the right abstraction layer

It is easy to get caught up in details

- Mathematical formulations, implementation details, etc

It is very unlikely that your contribution will be at that level of detail!

Most interesting research is presenting new abstractions, new problems, new approaches

- Precise details of how things are done are often less important and less likely to be the source of innovation

Storing Ideas

The best ideas will get stuck in your head so you don't forget them…

But most ideas don't start out that way
- Takes some iteration

Where will you incubate your ideas?
- Physical notebook always in your pocket/purse?
- Text document on your computer?
- Drawing app on your tablet?

Store and periodically revisit your ideas so you can expand on them
- You will forget!

Types of Ideas

Most of my ideas are not "new"

- They are extensions of other ideas

My best papers came from applying some tool/technique/algorithm I had already used before…

You need a "toolbox" of techniques

- Usually your tools are found from literature review or your collaborators

Recipe for Creation

1. Purposefully allocate time away from your todos

2. Bring an open mind to brainstorming
   - Quantity over quality

3. Narrow the problem or solution domain when you feel lost

4. Store your ideas for later and keep iterating
   - Also store other people's ideas to use for yourself!

break?

Life after the PhD

Questions

Question 0: Should you finish your PhD?

- Only if you have a reason to
- Plenty of great jobs available for BS/MS graduates
- Be realistic about the "cost" of a PhD

Question 1: Whose job do you want to have? Why?

- It should be a specific person who inspires you
- If you don't know such a person you need to find them

Question 2: How can you get that job?

- Taking courses and doing some research is probably not enough

Options

Professor
- Research vs Teaching focus

Industry/Government Researcher

Startup

Big CS company

(this is **not** an ordered list!)

Big CS Company

Google, Microsoft, Facebook, Tesla, ...

Pros:
- Highest pay
- Work on largest/realest/hardest problems

Cons:
- Less choice in what you work on
- May need to switch jobs periodically
- Can get lost in massive size
- Do you need a PhD for this?

How to get there?
- Do an internship
- Study for programming interviews

Startup

Join one or create your own?

Pros:

- Exciting fast paced environment
- Most cutting edge problems
- Small size
- ??Get rich??

Cons:

- Fast paced environment can be unsustainable
- Can fail
- Too small

How to get there?

- Find and impress them!

Research Lab

IBM, HP Labs, MSR, NIST, Naval Research Lab...

Pros:
- Continue doing research instead of development
- Academic culture without teaching/grants

Cons:
- Many of these are shrinking or shifting towards development
- Less $$ than a big company

How to get there?
- Do an internship
- Meet people at conferences
- Publish strong papers they care about

Faculty

Research or Teaching? US or International?

Pros:
- Unmatched flexibility and control
- No "boss"
- Work with students
- Tenure process provides long term stability

Cons:
- Not much time actually spent on research
- Less $$ than a big company
- Tenure process is stressful 6 year period

How to get there?
- Publications at top conferences
- Post Doc at a top school

Academia

"How do I become a professor?"

"I love doing research - *should* I become a professor?"

Faculty Hiring

This month the CS department put out an ad to hire 2 new faculty members... what happens next?

Faculty Job Search

Look for schools that are hiring in CS
- CRA.org, various "higher ed job" websites

Prepare your materials:
- CV, teaching statement, research statement, cover letter
- Website, google scholar, git?

Request letters of recommendation
- How to pick?

Submit applications November to January

Interviews

Round 1: phone interviews

- 15 minute discussion with search committee
- *What do you want them to learn from this?*
- typically ~6-8 phone interviews per position

Round 2: on campus interviews

- 1-2 days, very intensive
- Research talk: 1 hour
- 1-on-1 meetings: 30 minutes each
- Meet with dean
- *What do you want **them** to learn from this?*
- *What do **you** want to learn from this?*
- Dinners, lunches
- typically ~3-4 on campus interviews per position

Job Talk

What makes a good job talk?

Questions to ask?

You need to have lots of questions to ask!

- Shows you care!

Behind the scenes

Faculty meeting to discuss candidates

Vote if they are "hirable"

Rank candidates in order

What affects this?

What makes a strong candidate?

Very diverse pool of applicants
- Fresh PhD graduates
- Post Docs
- Assistant/Associate/Full Professors who want to move

What do we look for?
- Research excellence
    - Publication count, impact, and citations
- Teaching experience
    - Anything more than TA'ing? Non-generic teaching statement
- Potential
    - Topic area
    - Fit in department
    - Grant experience (especially if not a current phd student)

You got an offer!
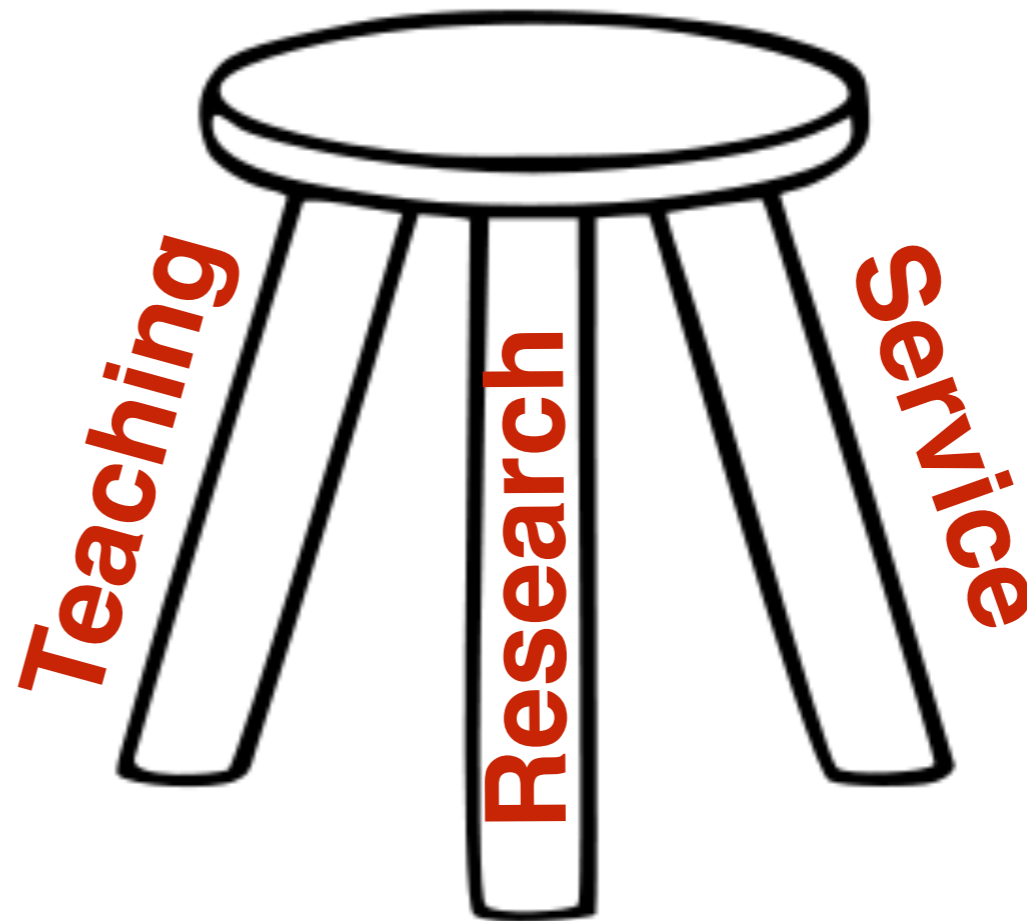
Chair will contact you with offer

Still many things to negotiate:
- Teaching load
- Salary
- Startup package

Why be a professor?

You must love:

- Working hard
- Making your own decisions about what to work on
- Presenting your ideas
- Writing
- Teaching

Teaching

Research

Service

How do I spend my time?
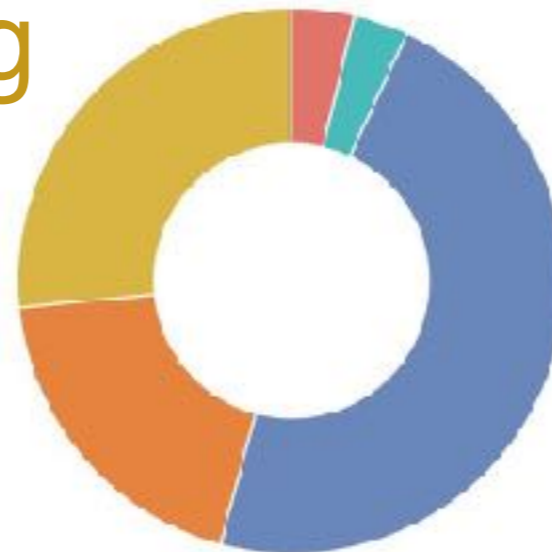
In 2020*

Back   Yearly Report ▾

Jan 01, 2020 - Dec 31, 2020 ▾

27% Teaching

1 course per semester

19% Service

Department Committees
(hiring, curriculum,
outreach)
Conference Reviewing

47% Research

Project management
Advising students
Writing grants
Writing papers
Dealing with budgets

...
actual research

□	All Timers	1952:48
□	Commuting	72:00 >
□	Consulting	63:41 >
□	Research	922:29 >
□	Service	375:51 >
□	Teaching	518:46 >

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