Rest of the semester

Assignment: Visualizing your research

- Overview visualization or diagram of your research
- Should not be a graph of results (unless it is particularly unique)
- Use diagrams.net or whatever tool your lab uses

Poster Session: Last day of classes

- Make a 1 slide poster that represents your research (can be in progress)
- Present your work during class (5 minutes)

Final Report (Dec 10th/19th)

- Combination of Overview, Literature Survey, Experimental Design, and Visual with some more text to glue them together

Consulting

1-on-1 meetings with me at end of each class

- ~10 minutes per student

Advice on how you do your research

- Focus on research process/methods, not your technical area

Come with:

- 1 minute overview of what you are working on
- What is going well
- What do you need help with (process-wise)

Schedule on website

- Starts today!
- Feel free to swap

Research Methods

CSCI 8901:
Grants and Creativity

Prof. Tim Wood
GWU

How are PhD students paid?

Teaching Assistant

Research Assistant

Your own scholarship

Funding in a University

Using GW as an example…

The CS department is allocated ~20 TA positions

- There are about 15 full time faculty
- What if I want a research group with > 1 student?

I need to get external funding!

Sources of Funding

Government

Industry

Non-profit organizations

Internal

US Government

Many different government agencies support scientific research

The big ones:

- Department of Defense (DOD)
- Department of Energy (DOE)
- National Institutes of Health (NIH)
- National Science Foundation (NSF)

NSF

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- Grants and Agreements
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OSDBU Director

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Deputy Office Head

NSF CISE

Computer and Information Science and Engineering

- CCF: Computing and Communication Foundations
- IIS: Information and Intelligent Systems
- CNS: Computer and Network Systems
- OAC*: Advanced Cyberinfrastructure

Margaret Martonosi: Assitant Director

Types of grants

Core Programs

- Each division (CNS, CCF, IIS) has a general call for proposals
- Sizes: Small ($600K, 3 years), Medium ($1.2M, 4 years), and Large ($3M, 5 years)

Special Programs

- Full list: https://www.nsf.gov/funding/programs.jsp?org=CISE

Infrastructure-based grants

- MRI, CCRI, CSSI: funding for equipment or to support software development

Junior faculty focused

- CAREER - 5 years, $400K, must be assistant prof
- CRII - 2 years, $175k, must be unfunded

Grant Timeline

-9 months: Look for RFP (Request for Proposals) from funding agency

- Specify the requirements: specific areas, type of projects, special instructions, etc

-6 months: Start writing a proposal!

- Usually will be based off of some preliminary results - can't just be an idea in your head!

-1 month: Start university paperwork

- Grants office must approve submission and review all docs

-1 week: Submit draft to GW OVPR

- Check all sections for compliance. Mostly trivial stuff

Grant Timeline

0: Submit before deadline!

+3-6 months: NSF forms review panel

- NSF uses peer review
- More in a moment

+6-9 months: Receive acceptance/rejection

+12-18 months: Funding arrives!

- Lump sum, or year by year

+24, 36, 48 months: Submit Reports

- Annual and final reports on progress

GPG

Grant Proposal Guide

Gives all the general guidance for any type of NSF grant

- Formatting
- Bio sketch requirements
- Definition of terms like Broader Impact and Intellectual Merit

Intellectual Merit

The Intellectual Merit criterion encompasses the potential to advance knowledge

Kind of vague

What are your technical contributions?

Broader Impact

The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes

More specific: how will you make the world a better place

- Impact of new technology on society
- Impact of your specific educational and outreach plans

Is it equally important?

- In practice, generally no.
- But you need to have it covered!

Parts of a Grant

Summary Page

- 1 page description of IM and BI
- Perhaps the most important page of the grant!

Proposal body

- 15 pages, single column, single space, not including references
- Specific sections on IM and BI

Data Management Plan, Facilities Document

PI Bio Sketch

Budget

Current and Pending

Summary Page

An extended “abstract”

Needs to get reviewer interested in your work

High level overview of the 3 things the grant will do

- Why 3?

Description of IM and BI

Ask your advisor if they can share a grant with you!

- Especially if you are funded by one it is good to see what they proposed

Proposal Body

Introduction

- Motivate importance of problem, introduce key ideas, brag about PI qualifications

Research Thrust 1…3

- High level plans of what you will do
- Preliminary results of what you've already done
- Emphasize key challenges and insights
- Avoid describing a "fishing expedition"

Evaluation Plan and Milestones

Broader Impacts

- Societal impact
- Educational plans - new courses, K12 outreach, undergrads, etc

Budget

Small grant is typically $500K for 3 years

Spend it on…?

3 Year Budget

	Balance
$500K sounds like a lot!	$500K
- it disappears fast…	
You probably have a Co-PI	$250K
University overhead is 59.5%	$104K
PI Summer salary (0.5 month)	$75K
PhD student salary ($30K/year)	$-15K
Tuition ($11K/year)	$-48K
Travel ($4K/year)	$-64K

Needs some creative accounting…

NSF Reviews

Program Managers group incoming grants by topic

Arrange **panels** to discuss and review

Panel is ~10 reviewers

- Faculty, industry
- Prefer faculty who have had a grant funded before

Each panelist reviews 6-8 grants out of ~15 total

- Carefully read and write a review before panel date

2 day review panel meeting

- in person / online
- 8 hours of discussing proposals
- Lead introduces, scribe makes notes

NSF Reviewing

Panelists need to assign a score to each proposal

- Highly Competitive: (~2) very likely to be funded
- Competitive: (~5) might get funded after comparison with other panels
- Low Competitive: (~8) not likely to be funded, can resubmit
- Not Competitive: (0-1) totally irrelevant

NSF program managers make funding decisions based on "guidance" from the panelist reviews and scores

- Take input very seriously!

Proposal Recipe

Leverage your current work and expertise

- **You** should be the perfect person to solve the problem, design the algorithm, or build the system you propose
- Technical content needs to be strong

Have preliminary work

- Convince people you have the start of a solution
- Unfortunately (?) most funding agencies are risk averse

Understand the norms for the funding agency

- Get sample grants, read solicitations carefully, attend an NSF panel once you can

Write your proposal well

- Reviewers will judge you by the end of the first page!

Ideas…

Where do they come from?

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

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!

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!

Academia

Faculty Hiring

Last week the CS department put out an add 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

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?

You got an offer!

Chair will contact you with offer

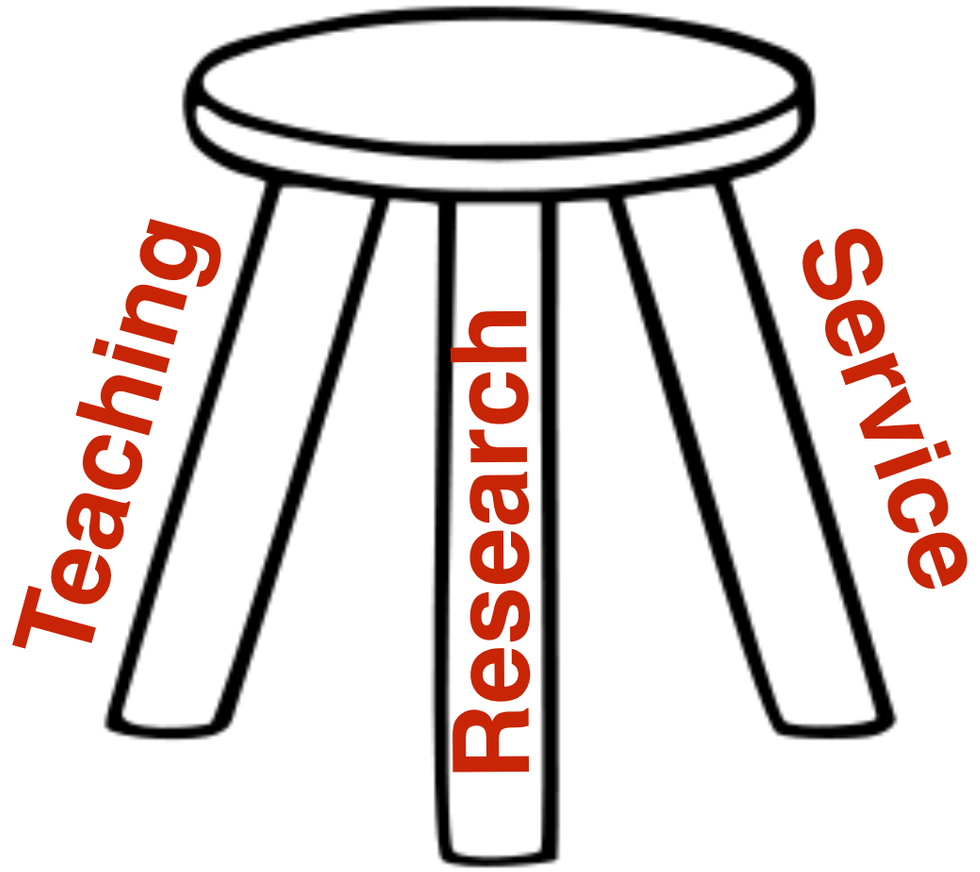
Still many things to negotiate:

- 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



How you will spend your time?

In 2020*

Options

Professor

- Research vs Teaching focus

Industrial Researcher

Startup

Big CS company

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

Other topics?

What else do you want to hear about?