

Why, What, and How of Graduate School Applications

(a CMU Robotics Institute perspective)

Carnegie Mellon University



How this Webinar Will Go

5 minutes - Why grad school?

15 minutes - How to apply?

10 minutes - What is it like?

30 minutes - Answering *your* questions

Please ask questions in the chat! We'll try to answer as many as we can.

Everything we talk about is our opinion—one size does not fit all!

Why go to grad school?

Masters vs PhD

Masters degree

- Different types of programs
- Usually self-funded*
- Usually ~2 years long
- Typically more available spots in Masters program than in PhD program

Professional MS

You want additional or specialized training, but don't expect to continue to PhD

- Focus on classes and capstone projects
- Also called "Terminal", "Industry-Focused", or "Course-Based" Masters

Research MS

You want to establish your research credentials, either for a research-based job or to continue to a PhD

- Focus on doing research, but also take classes
- Usually requires a thesis document and/or presentation

* Sometimes research or teaching assistantships are available.

Masters vs PhD

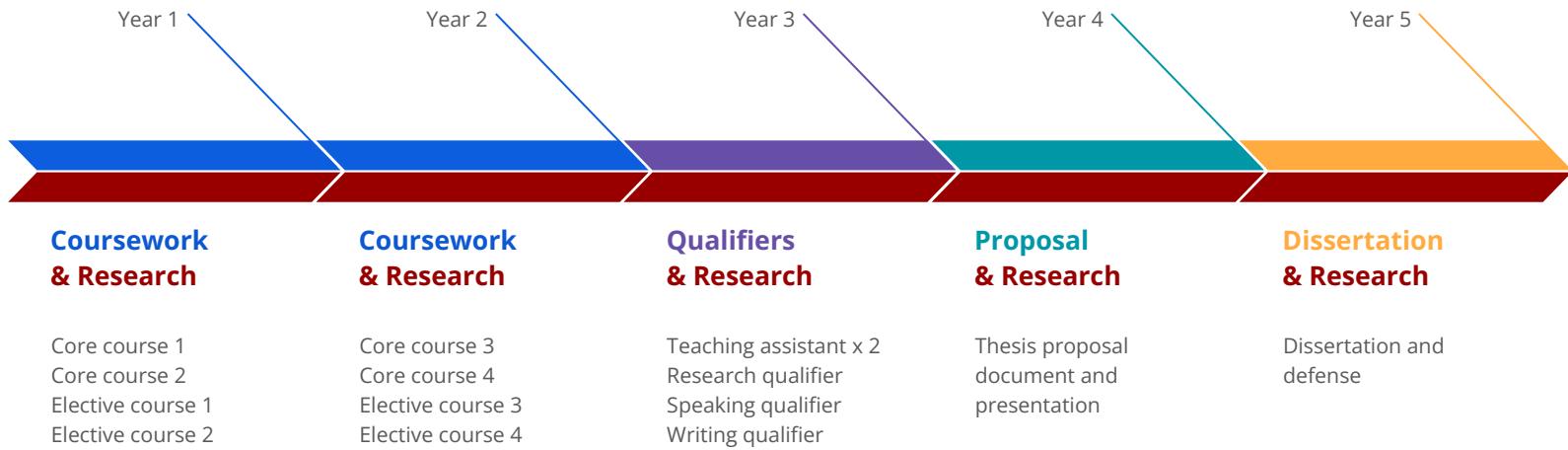
PhD degree

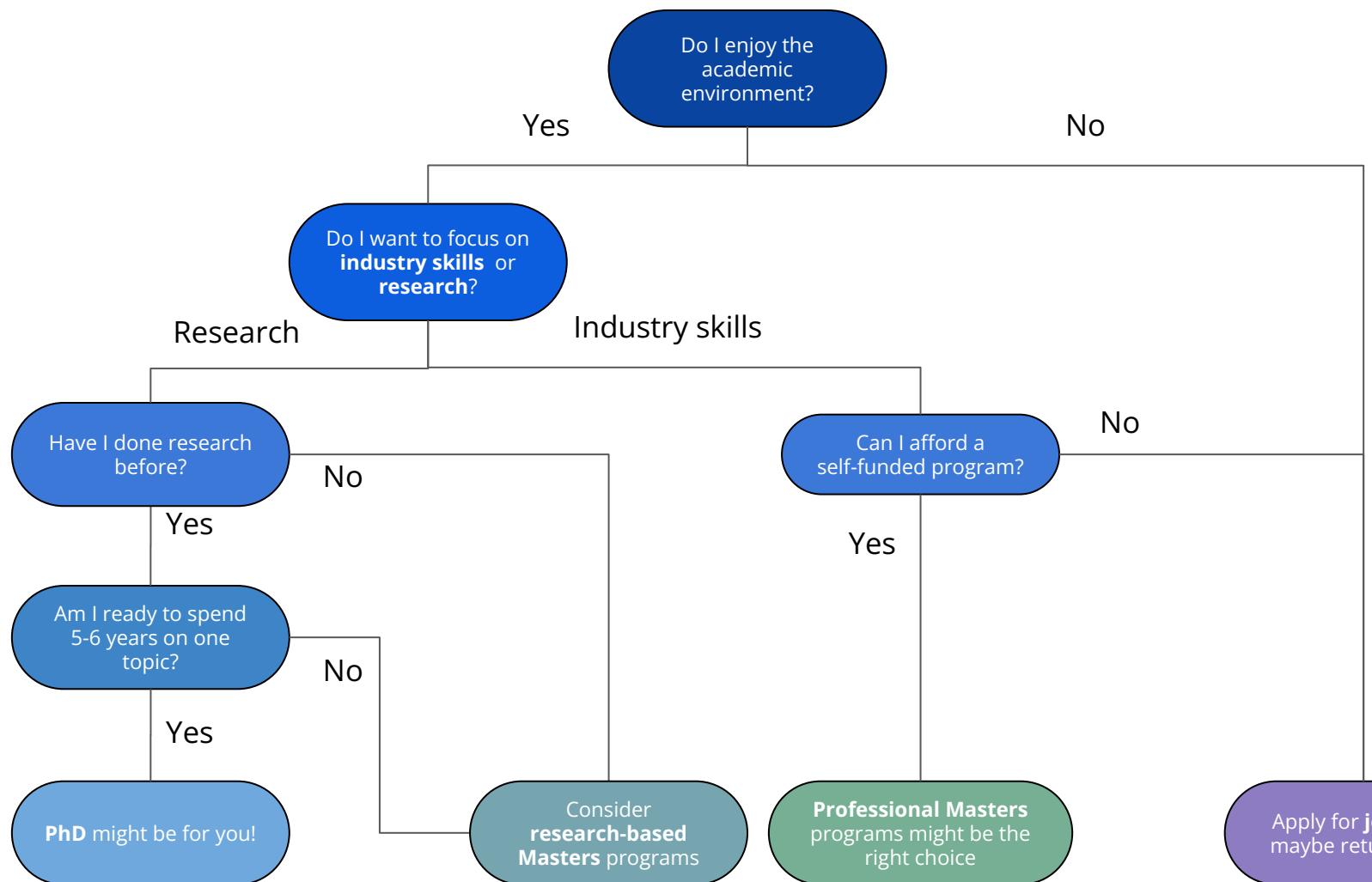
- Focus on doing research and creating new knowledge, rather than coursework
- Opportunities to teach and mentor other students
- Sets you up to be an academic... but also good for industry research
- Typically 5-6 years long
- Typically includes tuition waiver and stipend (i.e., you get paid)



Photo courtesy of CMU

PhD program overview (example)





How to apply to graduate school?

Components of an application

- 1 Curriculum Vitae (CV)
listing of your credentials and experience
- 2 Statement of Purpose (SoP)
description of what you want to do in grad school!
- 3 Letters of Recommendation
3+ letters from other researchers who know you well
- 4 Test Scores & Transcripts
GRE, TOEFL (if applicable), and college transcripts

Curriculum Vitae (CV)

Concisely convey your relevant skills and experience

Definitely include:

- Research experience
- Publications, abstracts, posters, and presentations of research
- Technical internships and long-term projects
- Fellowships and awards
- Academic service, volunteering, mentoring, TA-ing

Probably don't include:

- Semester-long (or shorter) projects
- Personal information: citizenship, marital status, age, photo

Curriculum Vitae (CV) tips

- Typically longer and more detailed than a resume
- Ensure the formatting is clear, concise, and consistent
- Add links to presentations, papers, talks
- There is no page limit, but a good idea to stick to ~2-3 pages
- Write action/results-oriented bullet points
 - o [Action verb] [accomplishment or task] in order to [reason for the task or the results achieved]

[CV Quick Tips](#)

[Step-by-Step Resume Guide & Templates](#)

Statement of Purpose (SoP)

Your SOP should include:

- What problems you are interested in exploring?
Why are they important (to you and the world)?
- Why you are qualified to tackle these problems?
- Why is this specific program right for you?
 - which professors do you want to work with?
 - what resources does the program have?
 - how will this program help you achieve your goals?

Identify what you want to study and why.

Identify research area and motivation

Describe prior experience

Demonstrate fit

Statement of Purpose (SoP) tips

A great SOP includes:

- How have your experience shaped what you aspire to do?
- What are your short and longer term goals?
- How do you plan to give back to the community?

Make sure to not simply repeat your CV.

This is your chance to talk about things that your CV doesn't.

SoP resources

Useful resources:

- [Writing Your Graduate School Application Essay - CMU Academic Success Center](#)
- [Example PhD SoPs - CS-SOP.org](#)



Photo courtesy of CMU

Letters of Recommendation

Strong letters speak to your capabilities as a graduate student. These often come from:

- Research advisors
- Internship mentors
- Professors whose classes you TA-ed

Less strong letters come from:

- Professors who only know you from class (even if you got an A)
- Employers who did not work closely with you

Give a holistic, outside perspective of your performance in research, academics, or work

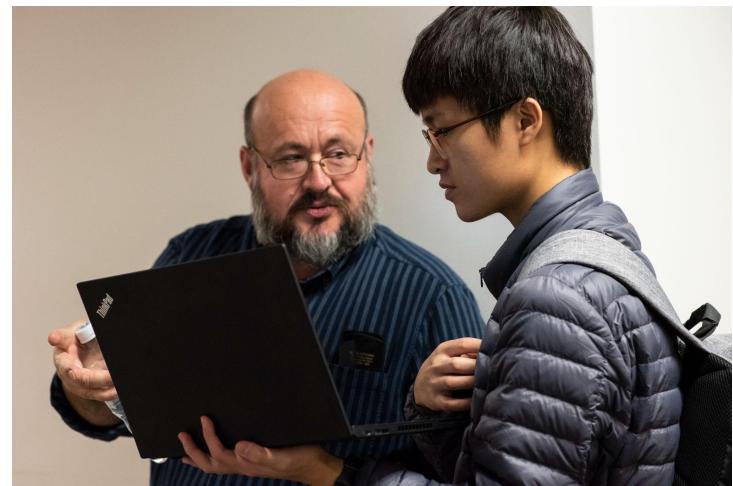


Photo courtesy of CMU

How to Help Your Letter Writers

- Choose people who know you well
- Reach out beforehand (2 months before deadline, follow-up 2-3 weeks before the deadline)
- Include supporting materials & talking points
 - Description of the internship, graduate program, job, etc.
 - Copies of your SoP (even a draft is fine), CV, and transcript
 - Notes about your experience with this letter writer, and anything you think they should highlight

Tips for your letter writer: [Do's and Don'ts of Writing Recommendation Letters](#)

<https://joinhandshake.com/blog/students/how-to-secure-a-great-letter-of-recommendation/>

Fellowships

Not only are fellowships prestigious, they can also make it much easier to match with your advisor of choice

- Fellowships for US Citizens
 - NSF Graduate Research Fellowship Program
 - NDSEG
 - NASA Space Technology Research Opportunities
 - Soros Fellowships for New Americans
 - GEM Graduate Fellowship
- Fellowships for non US Citizens
 - Schlumberger Foundation Faculty for the Future
 - AAUW International Fellowships
 - Fulbright Fellowships
 - Individual country resources (check with your school)
- Fellowships without citizenship requirements
 - Meta Research PhD Fellowship
 - Generation Google Scholarship
 - NVIDIA Fellowship

<http://www.cs.cmu.edu/~gradfellowships/>

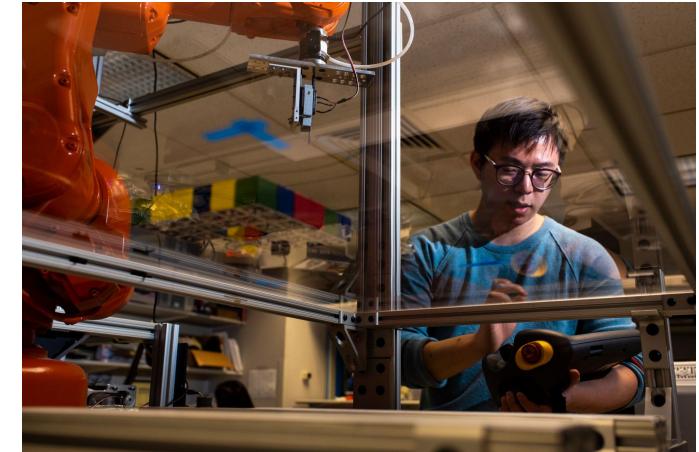


Photo courtesy of CMU

Finding a Program

- PhD admissions often come down to fit: Are there professors who could take this student on?
- Before applying, identify professors in the program whose work you find interesting or exciting
- Mention specific professors you would like to work with and why your interests align with theirs in your SoP
- Should you email professors? It depends! See this link for more information:
https://yonatanbisk.com/emailing_professors.html



Help with
CV and SoP

Graduate Application Support Program

The SCS GASP is a student-led initiative to offer feedback to potential applicants, particularly those from underrepresented groups.

Website: <https://www.cs.cmu.edu/academics/phd/application-support> (apply via Google Form)

Deadline: November 11, 2022

Application Fee Waivers

"The School of Computer Science [at CMU] offers graduate application fee waivers for reasons related to financial hardship and to participants of certain programs."

-<https://www.cs.cmu.edu/academics/fee-waiver>

An incomplete list; see website above for more

Program	Short Name
AccessComputing	
ACM Richard Tapia Celebration of Diversity in Computing	
American Indian Science and Engineering Society	AISES
Annual Biomedical Research Conference for Minoritized Scientists	ABRCMS
Association for Computing Machinery's Council on Women in Computing	ACM-W
Association for Computing Machinery Special Interest Group on Computer-Human Interaction	ACM-SIGCHI
Black in AI	BAI
CMU alums who graduated with one or more degrees at any level (undergrad, master's or Ph.D.) in any department/college at CMU.	CMU Alum
CMU students currently enrolled in a degree-granting program at any level (undergrad, master's or Ph.D.) in any department/college at CMU.	CMU Student
Engineers Without Borders	EWB
Grace Hopper Celebration	
Historically Black Colleges and Universities	HBCUs
International Society for Computational Biology	ISCB
Jackie Robinson Foundation Scholars Program	
LatinX in AI	LXAI

What is grad school like?

Differences Between US and International Programs

- In the US you apply for a *program* (e.g., PhD in Robotics), not for a specific *project*
- Funding situations vary; PhDs are typically fully funded
- Some people come straight from undergraduate programs
- US PhD takes 5-6 years typically
- The US is huge, your experience will vary:
 - Weather
 - City infrastructure, need for a car
 - Cost of living
 - Culture

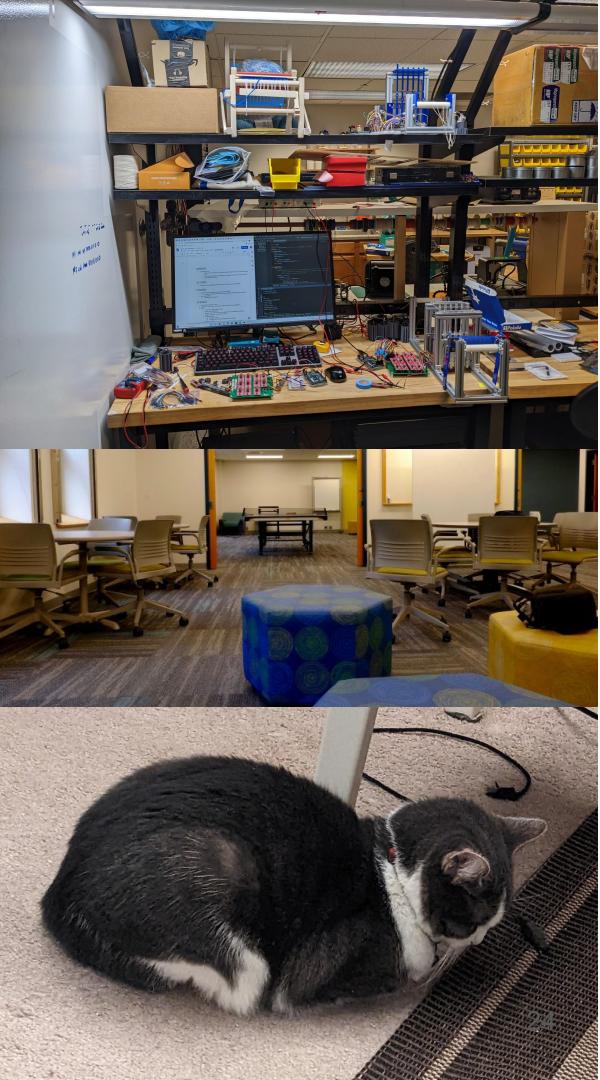


Photo courtesy of CMU

A day in our lives... of research

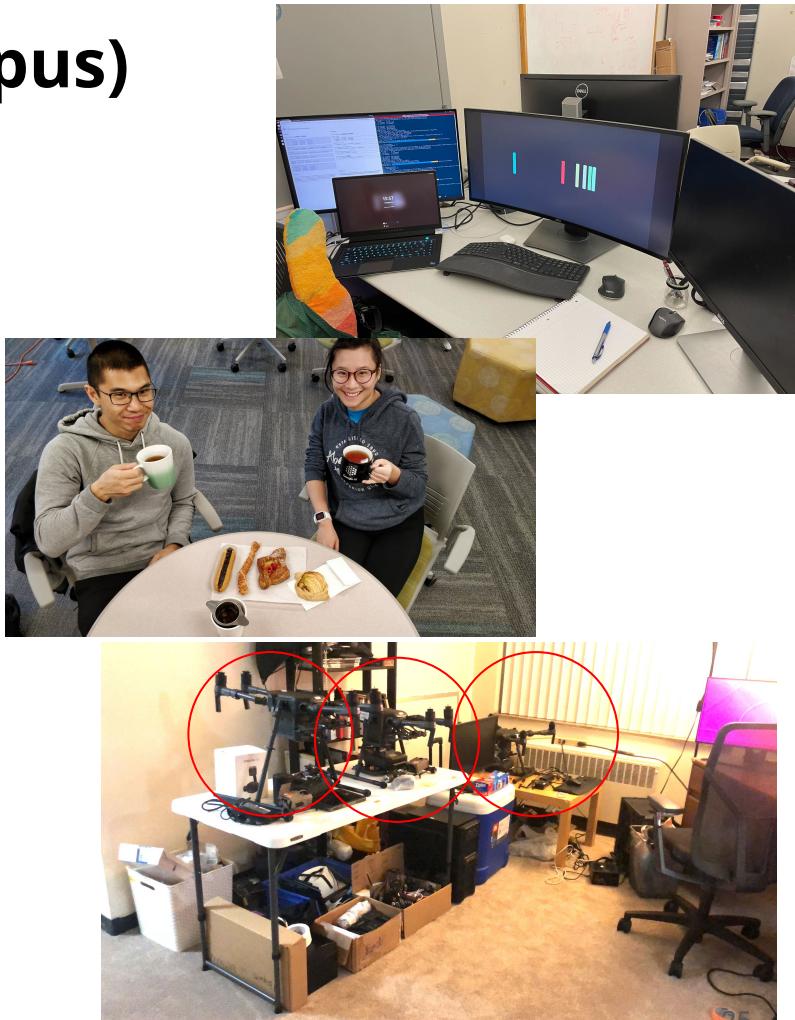
Sam's day in the life

8:00-9:00	Get to campus
9:00-12:30	Working: soldering, staring at multimeter
12:30-1:30	Lunch, chatting with RoboFriends on latest papers
1:30-2:00	Easing back to work with a dose of free coffee
2:00-6:00	Working: asking why my robot is/is not working
6:00-	Heading home to relax with my cat



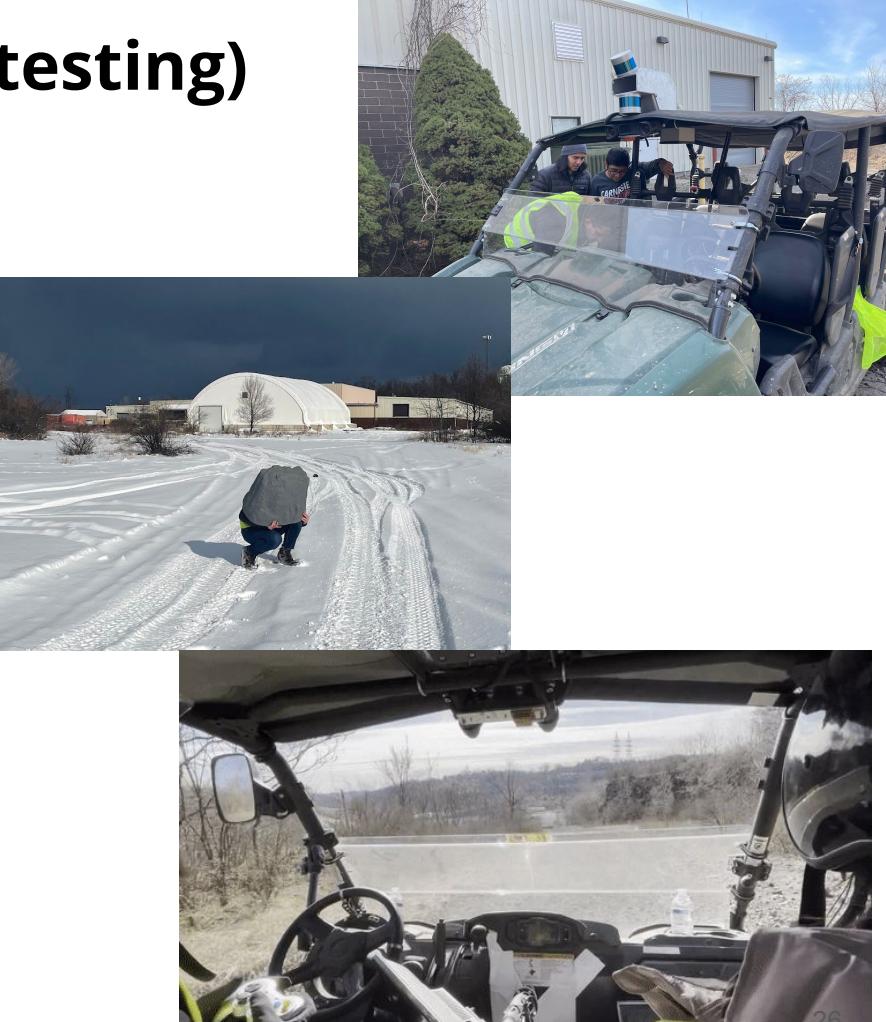
Cherie's day in the life (on campus)

7-7:15	Get to campus
8-9:30	First work session. Debugging code ...
10-10:30	Go to robolounge for free tea, foosball and hangouts. Talk about latest transform and calibration issues
10:30-12	Doing the calibration dance to get extrinsics/intrinsics.
12-1	Ping group chats on who is around for food. Eat.
1-1:30	1:1 meeting with advisor to discuss progress and bottlenecks.
1:30-6	Work in office
6-	Finding free food! Relax



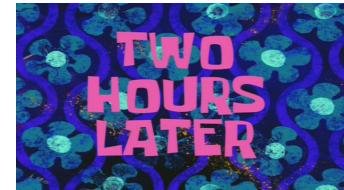
Cherie's day in the life (field testing)

8-9	Meet labmates and discuss test plan. Putting on sunscreen.
9-9:45	Travel to forest test site!
10-11	Loading code on robot and debugging. Some fun test drives. "Drifting" in mud.
11-12	FOOD / scrolling through ubereats
12-4	Autonomy tests, more debugging...
4-6	Ooops, robot got stuck in mud. Waiting to be rescued... (next slide)



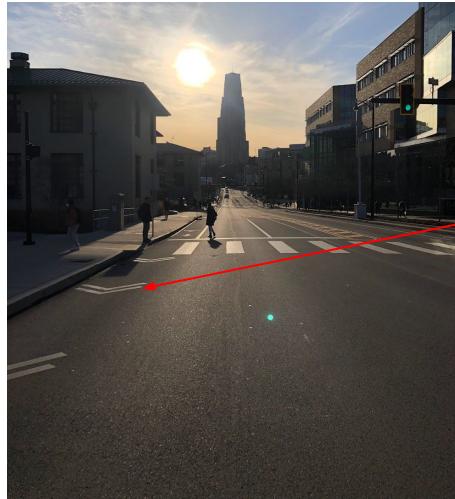
Cherie's day in the life (field testing)

4-6pm: Stuck in mud...



Bart's day in the life

8:45	Bike to campus.
9-10	Zoom chat with collaborators.
10-12	Work on synthetic data collection with Blendr.
12-1	Food and pool with friends.
1-4	Work on homework (geometry-based vision).
4-5	Meet with undergrads
5+	Chill, workout, cook, and a bit more work.



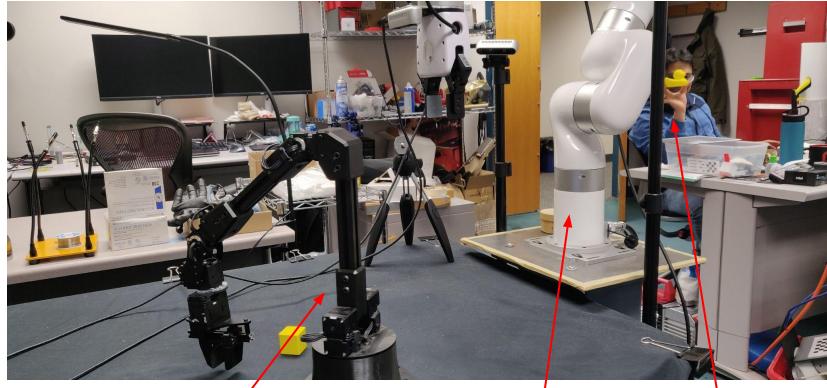
Bike
Lanes!



Mrinal's day in the life

10am	Get to campus
10-11	Catch up on emails and chat with labmates about research ideas
11-12	Meet with undergrads on project progress and try and remove any blockers they have
12-1	Class: Deep Learning for Robotics
1pm	Lunchtime! Could be with friends, collaborators, or both!
2-7pm	Focus time, finish some code implementation, write up a proposal, or make slides for a talk
7pm	First dinner!
8pm+	Workout, make second dinner, finish up some work at home, and relax

Our (very messy) robot setup!



Small arm (5 DOF)

Arka (300? DOF)

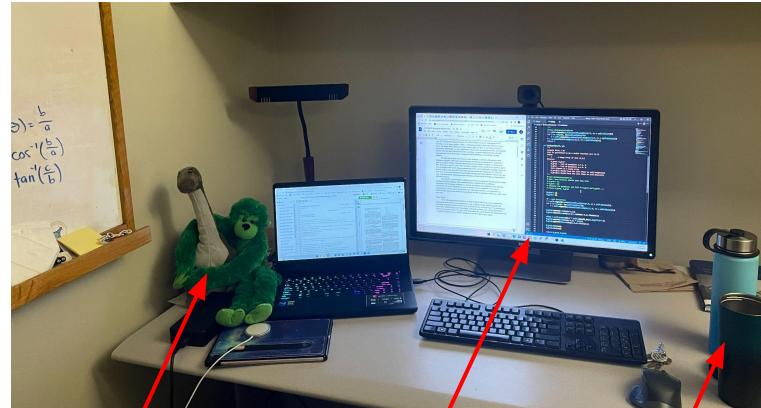
Medium arm (7 DOF)



Large Humanoid (14 DOF)

Ananya's day in the life

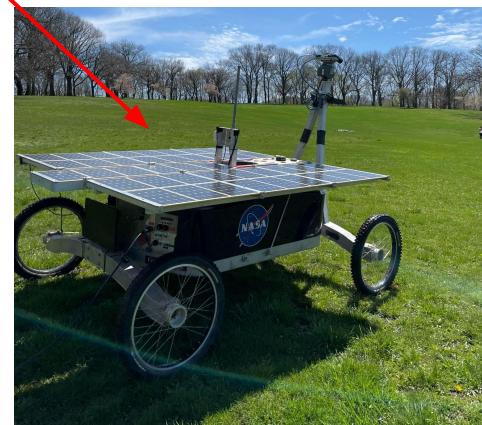
9 am	Get to campus
9 - 10am	Make the day's priority list; Deal with emails
10 - 11am	All the (external) meetings (sponsors, profs and students at other universities)
11 - 1pm	Research: Communication edition (make slides, write proposals, send more emails)
1 - 2pm	Find friends and food
2 - 3pm	Class: Planning for Robotics
3 - 5pm	All the (internal) meetings (advisor, lab group, undergrads, other collaborators)
5 - 8pm	Research: Science edition (write code, read papers, analyze results)
8pm+	Workout, make dinner, homework, finish some more work, relax



Collaborators

Code

Caffeine



Zoe!

Mononito's day in the life

9:30-10 AM	Get to school while solving for $\arg \min_t f(\text{time}_{\text{bus}}, d(h, s), \text{energy}) + \epsilon$
10-10:30 AM	Water plants, fill water bottles, get coffee, briefly discuss developments from 6 PM the day before
10:30-11 AM	Check emails, plan the day
11-12:15 PM	Work (read/write papers, design experiments, meetings, mentoring), attend seminars/talks + tea
12:15-1:15 PM	Lunch with lab mates (free food is a bonus)
1-6 PM	Classes, TA duties, meetings, (execute daily plans), with ample socializing, procrastination + tea
6-7 PM	Workout, socialise or work (depending on mood, deadlines)
7:30-9 PM	Cook dinner & have it, watch TV, socialize

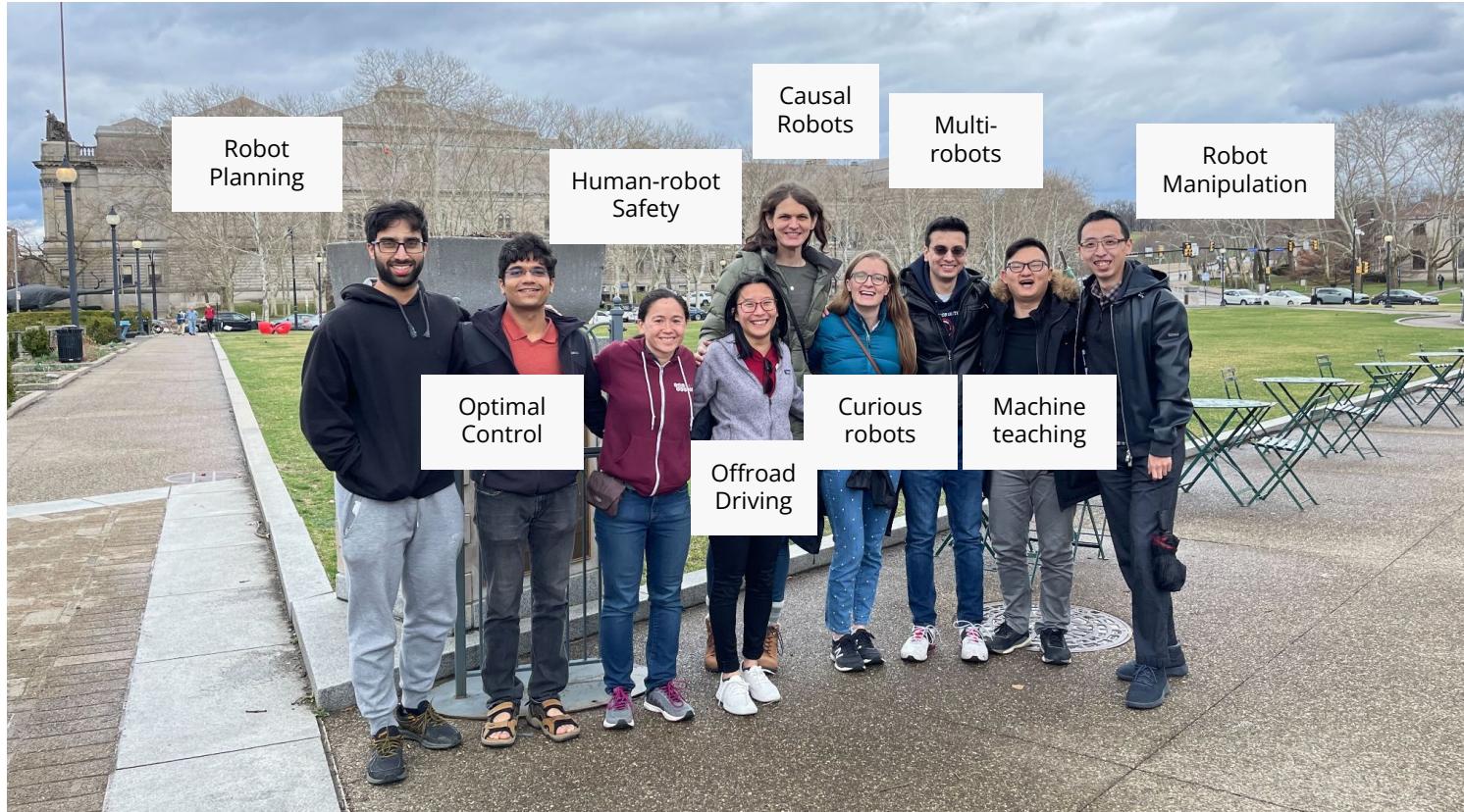


Rebecca's day in the life

8am	Workout, eat breakfast, emails
9:30am	Go to campus
10-12pm	Attend class
12-1pm	Food and pool with friends, commute to lab
1-4pm	Work on research (reading papers, code development, project meetings, etc)
4-6pm	Homework
6pm	Go home, eat dinner
7pm	RoboOrg/department volunteering
8pm	Unwind and plan for next day



Group Lunch ~ Mini robot conference



CMU Students At Conferences



Why CMU?

Top Robotics programs

- 60+ faculty, 500+ students
- Breadth and depth
- First PhD in Robotics worldwide

Strong collaborations with:

- Industry ([140+ local orgs](#))
- Government
- Other academic departments (ML, EE, ME, ECE, HCI, bio, physics...)

Good cost of living

- One-bedroom rent (10min walk):
~\$800-\$1300
- With flatmates (2-4 bedroom):
\$500-\$800/person
- Typical \$\$ (2 dollar sign) dinner:
\$15-20/person

Health insurance

- FREE (university-supported) for PhD students
- Also covers mental health resources

Pittsburgh is fun! ([VisitPittsburgh](#))

If you earn RI PhD Stipend (\$38,400) in Pittsburgh, You need to around __ in these cities to maintain same standard of living (2022)

Pittsburgh → San Francisco

\$69,653

Earnings needed to maintain current standard of living

Cost of Living in San Francisco
▲81.4% higher

Housing in San Francisco
▲261.2% higher

Pittsburgh → New York

\$88,390

Earnings needed to maintain current standard of living

Cost of Living in New York
▲130.2% higher

Housing in New York
▲412.8% higher

Pittsburgh → Boston

\$57,136

Earnings needed to maintain current standard of living

Cost of Living in Boston
▲48.8% higher

Housing in Boston
▲126.1% higher

Pittsburgh → Seattle

\$57,484

Earnings needed to maintain current standard of living

Cost of Living in Seattle
▲49.7% higher

Housing in Seattle
▲112.2% higher

Here's the cost of living calculator! :

<https://www.payscale.com/cost-of-living-calculator/Pennsylvania-Pittsburgh>

Frequently Asked Questions

1. How much research experience/background in robotics should I have before applying for a PhD/research-based masters? How many publications?
2. How important are standardized testing (GRE, IELTS, TOEFL) scores?
3. What's the FERPA (Buckley Amendment) Waiver?
4. What's more important: the SOP, LORs, grades/scores, or research experience?
5. Other opportunities besides MS/PhD degrees?
6. How do we know which faculty are currently hiring new PhD students?



Questions?

Additional Frequently Asked Questions

1. How long does a PhD take usually?
2. Should I reach out to professors before applying?
3. Do you get paid while doing a PhD/research-based masters?
4. What's the typical profile of a RI PhD/Masters student?
5. When listing my programs on the application, how will this order affect my admission to each program?