My undergrad research philosophy

If you're reading this there's a high probability that you're an undergrad who is interested in research in robotics. That's great! Robotics is an exciting field to work in right now, with really bright people and really important problems we're trying to solve! All the flashy demos online make it seem like there aren't any unanswered questions in the field, but if you ask around you'll discover there's so much work left to do and the field needs bright, energetic minds like you to help solve them!

I love working with undergrads (and grad students) who are excited to tackle problems. This document outlines the 'what' and 'why' behind my undergrad collaborations. I know this is a bit of a read, but if you're seriously interested in trying out this research thing I ask that you give it a genuine read through. Part of working together is we both are committing time to this collaboration, which really works best if we're on the same page as to what that means.

Before going through my own readings, please look over the collected blog-posts I've attached in the next section. After that section I talk a little about how my experiences as an undergrad shaped my philosophy on undergrad research and then discuss some of my expectations of an undergrad researcher wanting to work together.

Resources

Before diving into my own ramblings, here are some really great blog posts that I very much agree with. Before you do anything else, I'd encourage you to read through these and think about how their ideas sit with your own philosophies. I don't think it's a coincidence that these separate blog posts all came to relatively similar conclusions about getting the most out of undergrad research and, based on my own experiences, these ideas extend beyond just research but really getting the most out of your time as an undergrad in general.

- Rose Wang's Blog Post: Dear future undergraduate researcher
- Shashank Srikant's Post: Aspiring Academics
- Will Chrichton's Post: Making the most out of CMU

A little on me :)

Why I care about undergrad research: As an undergrad I was fortunate to have some outstanding mentors, including the grad student I worked with and the professor who ran the group. I had some other great mentors too, but for the sake of context I'll focus on those I had through undergraduate research here. Both shaped the way I observe the world, tackle technical problems, and encouraged me to think about how the work we do can make a real impact on the world. Because I credit my mentors for any success I've had so far, I've felt it's important to try to give back and attempt to be to others what my mentors were to me. For this reason, I'm always open to working with undergrads who are interested in my field and are prepared to make a commitment to their work.

Why I emphasize commitment (from both parties): Tying into that last sentence, I place a lot of importance on both parties (undergrad and grad student mentor) making a serious commitment to their responsibilities. In the case of the grad student, this means committing to spending time discussing problems, offering ideas, and providing general support to the undergrad. In the case of the undergrad this is a commitment to spending time independently learning the tools and techniques necessary to accomplish their work and generating, testing, and evaluating their own thoughts and hypotheses.

One of the key realizations I had in undergrad was that if I needed to determine what my priorities were and focus on them. I had seen that if I wasn't able to commit a substantial amount of time to something

then I wasn't able to get out of it what I wanted. I saw this with my research, where at first I was doing the bare minimum to keep up with what was needed but wasn't able to make the progress or experience the learning that I had wanted to get out of it, making it feel less rewarding. I want students who work with me to feel as if the experience is rewarding and they are benefiting from it. Admittedly, I also want to feel as if the experience is rewarding and my time is being valued just as I value the time of those who work with me. For me, the reward is in seeing the growth in skills, independent thought, and problem solving that naturally occurs during the research process.

Being an undergraduate researcher can (and should) be an amazing experience! To make it amazing requires buy-in from both parties.

Why I want peer-based interactions: As an undergrad both my grad student and supervising professor treated me as a peer. Of course, I was a peer who did not have the same level of expertise or knowledge and this was apparent in some of our interactions, but my ideas were always valued and respected. This helped me to freely ask questions and propose ideas and made our interactions not only helpful, but enjoyable. For these same reasons that made me to appreciate this dynamic, I aim to maintain this peer-based relationship with any students that I work with.

Why it's okay to not be certain: As an undergrad I originally worked in a manufacturing research group. The work I did there was a long way from the research I do now. Beyond that, my first two years as an undergrad I was dead-set on graduating and going into industry - grad school wasn't a consideration. As a junior I took a robotics course that changed my trajectory and set me on my current path as a robotics researcher. When I realized this, I talked with my mentors about my desire to work in robotics and they helped me hash out a plan to transition fields. I know most people aren't certain that this is the 'one thing' they want to do in their life (and for most there really isn't a singular objective). If you want to try out robotics because you think it might be cool or fun but you aren't sure if it's what you want to do in the long-run - that's completely okay! As long as you're willing to make a serious commitment to finding out if it's what you want to do, I am happy to help in that exploration and will completely support you in switching into whatever other field if you discover that the type of work isn't what you want.

Expectations

So far I've loosely discussed things like commitment, interactions, and support. I'm going to try to make those statements more concrete here. Some of these statements center around in-semester undergrad research but the sentiment can be readily extended to non-academic time periods (e.g. IAP or Summer).

Time Commitment: from experience I've found that making notable progress generally requires a planned commitment of at least 12 hours a week. I understand some weeks may be less, and that life is unpredictable. That's completely okay, just communicate this so that we're on the same page.

Communications: communication channels should be crystal clear. I want for you to feel free to ask or say anything. If you need anything - shoot me an email or drop by our lab. If you have any questions you've been wondering - shoot me an email or drop by lab. If you feel like there is a better way I could support or help you, please let me know!

Organization: some degree of organization is necessary. Many researchers are naturally disorganized (myself included at times). I've found that a minimum level of organization and documentation greatly benefits productivity, communication, and the impact of work. Organizing your thoughts and problems before discussing them helps not only your discussion partners, but yourself. Similarly, keeping some level of organized notes of problems you've encountered and how you've solved them will inevitably pay dividends for you and anyone who touches on this work afterwards. One of my old bosses had a phrase, "an engineer has done nothing until it has been documented".

Meetings: I like to have a formally scheduled meeting once a week with undergrads and am generally available to meet more to address technical issues, ideas, and questions that may arise.

Interactions: undergrads should feel comfortable talking to anyone else in our lab and are encouraged to discuss technical topics with them. This is a huge part of the learning experience!

Workspace: work wherever and whenever you want, but working in and around our labspace is encouraged. It makes it easier to collaborate, fix issues, and learn from each other :)

Credit: If you do great work, I recognize it! I like to sing the praises of the great job done by people who work with me. If your work is a serious contribution to a publication you will be made an author. I want you to feel recognized and your work respected.

Abilities: Pretty much anything can be picked up as you go. I'm happy to help you learn whatever skills are necessary and encourage any directions you want to work on. Programming skills are generally helpful, and almost certainly something you will end up learning, but prior experience is not outright necessary.