PhD Guidance to be Used ONLY by Members of the Human Centered Robotics Lab in Coordination with PI Dr. Sentis

(This information is not applicable to members outside of the lab or without PI guidance)

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Disclaimer

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How Much Do I Need to Work to Pursue a PhD Degree

I will quote Christa Carone, chief marketing officer at Xerox, “Work is no longer a place; it’s a state of mind”.

To conduct a successful PhD degree, your lifestyle must be completely oriented toward the research.

A PhD requires full dedication and concentration. If your lifestyle does not allow you to fully concentrate on research, then a PhD is not for you.

Also, a PhD requires a lot of motivation. Therefore, it is not the type of job that you do when you don’t know what to do. If you don’t have a burning need to pursue a research idea, then you might want to consider other careers.

What Place Should I Work At

PhD students should spend most of their time in the lab. However, reading articles, writing papers, or performing theoretical analysis can also be done in the library, coffee house, or home.
That said, students are expected to be in the lab most afternoons. 

In general, students should maintain enough presence in the lab that allows them to build a strong bond with their peers and PI. If you don’t feel you are well connected to the lab, talk to Dr. Sentis.

**Workweek for 1st and 2nd Year PhD Students**

Students are expected to work 50 hours a week of intense intellectual activity and 10 hours of casual reading or thinking.

15 hours researching original ideas in theoretical areas
10 hours researching original ideas in experimental work or simulations
10 hours maintaining hardware or implementing software
10 hours reading, attending talks, brainstorming
5 hours supporting the PI (papers, proposals, demos)
10 hours attending the class and performing coursework

**Workweek for 3rd, 4th, and 5th Year PhD Students**

Students are expected to work 50 hours a week of intense intellectual activity and 10 hours of casual reading or thinking.

20 hours researching original ideas in theoretical areas
10 hours researching original ideas in experimental work or simulations
10 hours maintaining hardware or implementing software
10 hours reading, attending talks, brainstorming
5 hours educating younger peers
5 hours supporting the PI (papers, proposals, demos)
No coursework

**Dynamics of Work**

Dr. Sentis, favors continuous work until a milestone has been achieved. For instance, if the milestone of a day is to study the stability of a controller, it is best to work until late to finish it up and then take the next morning off. The same applies for longer projects. It is best to work over several weeks real hard followed by a short break, than distributing the work evenly. It is the peaks of intensity that produce the best research.
When you start your new topic of research at the beginning of your PhD, you will feel overwhelmed with the vast amount of information. It is important that you pick a small problem with medium-complexity and you tackle it for the first six months or so. This research process, augmented with thorough readings on the topic and discussions with collaborators will enable within a few more months to understand the key issues on the problem you are working on. After a year, if you don’t feel you understand what contribution you are working on, then you are not doing the right think.

Therefore, the three ingredients of research are tackling small complex problems, reading thoroughly the related research, and discussing research with the PI, peers and collaborators.

In terms of overwork, if you feel you are doing too many things, you probably need to revisit the scope of your work and focus on single issues one at a time.

**Examples of PhD Entry Level Problems**

Since the first problem to tackle for the PhD is key to set the tone, I recommend some examples here. Small problems with medium complexity include: (1) Modeling the drive train of one of our robot actuators and designing model-based position and force controllers; (2) Develop a robust controller to track a trajectory of a locomotion planner; (3) Characterize an IMU or Motion Capture Sensor to be used in realtime control applications of locomotion or mobility; (4) Develop a two degree of freedom controller for a leg that takes into account the rigid body dynamics as well as the actuator dynamics; (5) Design the transmission of a new device; (6) Develop a step planner of locomotion in rough terrain.

**Role of the Advisor**

The role of the Advisor is multifold. In the first year, his role is to expose you with background on his field of expertise and discuss ideas on related topics related to the lab’s focus of research. Later on, the advisor’s role is to brainstorm about diverse technical problems and research questions. Overall, his role is to provide a general framework and environment to conduct great research. After the first couple of years, his role involves helping you to publish in key Journal Publications. By the end of your PhD, his role is to supervise your dissertation writting.

**Project Ownership**

Quickly after starting your PhD, Dr. Sentis will make you owner of a project of your choice. Once this ownerships is understood, you are responsible to ensure that the project advances steadily.

Therefore, ownership is a proof that you can offer help to the lab and not only take resources. It is also fundamental to enable the lab to pursue several areas of research at once.
**Funding**

If you enter the lab without funding, you will need to apply for fellowships in your first or second year or help Dr. Sentis to write proposals for your research. Both of these paths are extremely competitive and therefore there is no guarantee that support will come in a timely manner.

When agencies give awards to the PI, he will announce it to the group and seek for ideal candidates for the research. However, if you didn’t take part on writing the proposal, the funding might be for a different project for which you might not be able to fit in.

**PhD Expectations**

The soundest metric for achieving PhD goals is the number of Journal Publications that the student has lead in first tier Journals. This is roughly equivalent to the number of original contributions from the student. Two Journal papers and a few conference paper are needed to fulfill PhD requirements in our lab. These publications don’t include research that has been lead by the PI with not much intelectual contribution from the student.

Therefore, the main goal of the PhD is to find interesting ideas and conduct research to demonstrate their feasibility and importance.

**Journal Readings**

There are two ways to know if students’ ideas are worthwhile. One is reading Journal Papers and the second one is going to conferences and talks. Therefore, the PhD requires students to be intelectually motivated from the very beginning.

A PhD degree does not start until the student has read the publications from the lab’s PI and related publications with his/her area of research. It is then that the student start realizing how much it has been done and what might be missing.

**Duration**

It is relative to the intensity of the work. It typically varies between 4 years to 6 years after the Master’s degree. It is really the Journal publications and impact of his/her research that tell the student and advisor when he/she is done.

**Time Line**

Year 1: Take 1 course per semester. Focus on a small complex problem. Read 2 Journal papers per week. Write an abstract report to be sent to a conference. Attend a local conference. At the end of the year, the student should know what are unsolved research questions that he/she could address.
Year 2: Take 1 course for one semester followed by no courses for the next semester. Focus on another small complex problem. Read 2 Journal papers per week. Write a conference paper. Attend a national conference. End of the year, take the Interdisciplinary Qualifying Exam. The student, should be focused now on a difficult concrete problem with certainty that is original research. Also, at the end of the year, the student should have enough tools to create his/her own problems and conduct independent research.

Year 3: No courses. Use previous year results to explore a more complex problem. During the year, this research should lead to the first Journal publication. Attend an international conference. Intense literature review should be conducted. At this stage, the student should possess advanced knowledge of his/her field of research.

Year 4: Take 1 course on a new topic for one semester followed by no courses for the next semester. This is a repeat of Year 3 and should lead to a second Journal publication.

Year 5: Wrap up. The PhD dissertation should be elaborate and take the entire year to write. At the end of the year the student can defend his thesis.

**Summers, Christmas and Spring Break**

Summers are the prime time to conduct research. If you take more than 2 weeks of continuous holidays you will forget your PhD and it will incur significant delays on your progress. It is best to break your holidays into shorter trips.

The days before Christmas and the Spring Break are also prime times to do research. You are not a Master’s student anymore. Taking off after classess in a regular basis will delay your progress.

**Teaching Assistanships**

According to an MIT study, these are one of the reasons why PhD studies take longer than expected (up to 2 years more). It is very important to secure funding before you start your PhD. Fellowships or GRAs are the best way to go about.

**Mental and Physical Health**

Maintain and entourage of friends that you can see for coffee or on the weekends. It is very important that your friends are sympathetic of the research environment as it is a different lifestyle that requires much concentration. I recommend you to do simple sports that don’t require a lot of energy such as Yoga or non-competitive swimming. Build a strong emotional basis with family and loved ones to withstand the pressures of the PhD. Seek support from relatives and loved ones in your quest for the PhD and let them know about the needed support.
In case you feel depressed, talk to Dr. Sentis and seek counseling help as soon as possible. The University offers free health and mental care for all of the students.

**Policy on Helping Other Groups**

PhD candidates are not supposed to engage in research or teaching for other groups unless permitted by Dr. Sentis.

In principle, because of the limited time and the need for focus, offers to participate with other groups in their research should be declined or consulted with Dr. Sentis. In simple words, anything that distracts PhD candidates from fully concentrating on their PhDs will delay their graduation and weaken their research pursuit.

**Doctorate Online Material**

http://www.utexas.edu/ogs/pdn/#df