

University of Illinois at Chicago
Spring 2019

RESEARCH METHODS IN CS (or, how to be a successful PhD student in CS)

Course Syllabus

Room: TH 207

Time: TuTh 12:30 – 1:45

URL: via Blackboard / Piazza

Staff

Instructor: Barbara Di Eugenio

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Office Hours: Tue & Th 3-4:30

1 GOALS

“Research Methods in CS” introduces PhD students to a variety of issues pertaining to doing research in CS. It is meant for first or second year PhD students, to help them start on their research path. It is a **required** class for PhD students.

WHY: Our students come in with varied backgrounds, and for some of them the “how” of doing research is not so easy to acquire. All advisors provide this sort of mentoring, to different degrees. This course is meant to level the playing field, and provide a more solid basis for students, so that they can hit the ground running faster.

PREREQUISITES: Being a first or second year PhD student

2 FORMAT

The format will include presentations, discussions and “hands-on” activities, in which students try their hand at the various activities mentioned above – with feedback provided by the whole class.

3 SUBGOALS & TOPICS

Three broad topics: how to do research; how to present research; research methods in different areas of CS.

3.1 How to do research

1. Orientation: the university, the department and how they work; research areas; finding and working with an advisor; funding opportunities; milestones for PhD students
2. How to do a literature search, and to assess impact of papers, including the tools for that (eg ACM digital library, Google Scholar)
3. How to critically read technical papers, and write reviews
4. How to pick a research topic and how to plan one's research
5. Crucial research matters: ethics, plagiarism, research involving human subjects

3.2 How to present one's research

1. In writing: The process of scientific argumentation
2. In oral presentations

3.3 Research methods in different areas of CS

Faculty from different areas will give one presentation on research methods in their specific areas

4 EVALUATION

Important: the course will be graded Pass/Fail, not with letter grades; and will count for 4 hours of CS599, PhD research hours.

Evaluation will be based on: paper reviewing, paper writing, presentations, **participation in discussions, quality and quantity of feedback provided to others.**

Note: I won't start grading your work until later in the semester. I want to give you some time, and some feedback, so you understand the sort of work and quality I am aiming for.

Required activities:

1. Submit a short sample (400 words) of scientific writing
2. Attend two official department talks, one by February 24 (Sun), one by spring break, and write a one page review of each talk (two reviews altogether). At least one must be a faculty job talk. The critique will be due three days after you attend the presentation.
3. Review talks given / papers written by other classmates, as required.
4. **Project 1 and presentation:** Pair up with a classmate with similar interests to yours; choose a paper from your common area of interest; each of you provide an *in-depth* critique of the paper, and *concrete steps* with which you would reproduce **and extend the research**. Present your critique / analysis together in class.

5. **Final project and presentation.** This will differ according to whether you are a first or second year PhD student. For first year PhD students, it will resemble a mini-WCP; for second year students, it will resemble a mini-proposal.

Tentative Schedule

Note: Here topics are listed linearly, but most likely, faculty presentations will be interspersed with the rest. There also will be a panel by advanced / recently graduated PhD students; two sessions by the engineering librarian; one or two sessions on ethics.

Dates	Topic	Readings
Weeks 1-4		How to do research
Week 1	Computer Science, how to be a PhD student	[Wing, 2006; Denning, 2009; Denning, 2013] [Azuma, 1997; Hong, 2013]
Week 2: Tue 1/22	“ Grad. school and excellence”	Prof Venkatakrishnan
Week 2: Th 1/24	How to read and review papers	[Keshav, 2007; Mitzenmacher and Ramsey, 2000; Smith, 1990]
Week 3: Tue 1/29, Th 1/31	Literature search, plagiarism, citation indices	Mr. David Dror
Week 4: Tue 2/5	Human Subject Research, IRB	
Week 4: Th 2/7	Ethics	Prof. Mandy Burton
Weeks 5-6		How to present research
Week 5	How to write research papers	From [Higham, 1998; Davis, 2004]
Week 6	How to prepare a talk	[Lehr, 1985; Davis, 2004]
Week 7	How to pick topic, plan research	[Hamming, 1986; Loehle, 1990; Pausch, 2007a]
Weeks 8-9		Student presentations
Week 10	Productivity, time management	[Pausch, 2007b]
Weeks 11-13		Methodology in different areas of CS (presentations from faculty)
Weeks 14-15		Final Project Presentations

5 Assignments TENTATIVE Schedule

Date	Event
2/7 (Th)	One short sample (400 words) of scientific writing
2/24 (Sun)	First talk review
3/3 (Sun)	Project 1 Paper
3/5 (Tu), 3/7 (Th); 3/12 (Tu), 3/14 (Th)	Project 1 Presentations
3/24 (Sun)	Second job talk review
3/24 (Sun)	Final Project proposal
3/25-3/31	Spring Break
4/21 (Sun)	Final Project DRAFT to share
4/23 (Tue), 4/25 (Th); 4/30(Tue), 5/2 (Th)	Final Project Presentations
Finals week	Final project due

References

[Azuma, 1997] Ronald T. Azuma. So long, and thanks for the Ph.D.!
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- [Denning, 2009] Peter J Denning. The profession of IT: Beyond Computational Thinking. *Communications of the ACM*, 52(6):28–30, 2009.
- [Denning, 2013] Peter J. Denning. The science in Computer Science. *Communications of the ACM*, 56(5):35–38, 2013.
- [Hamming, 1986] Richard Hamming. You and Your Research. Talk transcribed by J.F. Kaiser, 1986.
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- [Lehr, 1985] Jay H. Lehr. Let there be Stoning! *Ground Water*, 23(2):162–165, 1985.
- [Loehle, 1990] C. Loehle. A guide to increasing creativity in research - inspiration or perspiration? *Bio-science*, 40:123–129, 1990.
- [Mitzenmacher and Ramsey, 2000] Michael Mitzenmacher and Norman Ramsey. How to read a research paper. <http://www.cs.tufts.edu/~nr/students/>, 2000. (From course notes. Ramsey’s web site has many resources for students).
- [Pausch, 2007a] Randy Pausch. The Last Lecture. <http://www.cmu.edu/randyslecture/>, 2007.
- [Pausch, 2007b] Randy Pausch. Time Management. <http://www.youtube.com/watch?v=oTugjssqOT0>, 2007.
- [Smith, 1990] Alan Jay Smith. The task of the referee. *IEEE Computer*, 23(4):65–71, 1990.
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