Research Methods
in computer science
Spring 2020

Lecture 1
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Class Introduction

Introduction
Name
Research Topic/Group/Advisor
Year(s) at UH
Undergrad institution/country/city
Why do a PhD?

Some possible reasons

Like research
Want to get a research/faculty job
Learn how to read and write
Leadership in technology
Acquire analytical and technical skills
Objective

Learn how research is done in computer science

Improve research productivity
PhD Skills?

What skills do we need to do a PhD?
  To become a good researcher
  To become an effective and productive technologist
Topics Covered

Papers: Read, write, evaluate
Presentations: create, perform, evaluate

Other topics
Research thinking
Graphs and visualization
Tools
Statistics and data analysis
Experiment design
Ethics, Intellectual property, and startups
Guest Lectures

Other faculty and experts in research, writing, presentation will come to the class to share their ideas.

Important to understand different views and emphasis. They may be your co-advisor, peers, or thesis committee member.
Who Should Take this Course?

Ph.D. Students in early career

MS Thesis students

Must have a research topic in mind!
Administrative Information

3 credits
COSC 6321/6110 is a PhD requirement
Meet Mondays/Wednesdays at F 162
Office hours Mondays 230-330pm

http://www2.cs.uh.edu/~gnawali/courses/cosc6321-s20/
Grading

Pass/Fail

To Pass

Submit all homework
Each homework graded 0 or 1
Average grade must be > 0.8
Participate in activities (conference, etc.)
Logistics

Most HW submission on Moodle
Communication/Discussion on Piazza
Topics for today

PhD and Research

What skills do we need to be successful?

The concept of deliberate practice
PhD

Courses?

Research?

Networking and other activities?
Research comprises "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humans, culture and society, and the use of this stock of knowledge to devise new applications." It is used to establish or confirm facts, reaffirm the results of previous work, solve new or existing problems, support theorems, or develop new theories.

Some research is theoretical and involves developing and analyzing new algorithms and techniques and some is more applied and involves experiments, design, implementation, and testing. In every case, research is an enterprise of intellectual exploration that seeks to advance our field.

https://en.wikipedia.org/wiki/Research

http://conquer.cra.org/students/what-is-research-in-computer-science
It is a little different from what that Wikipedia article says.

We build new artifacts:

What are the desirable properties?
How does it perform?
How well does it solve the problem?

Closer to engineering than natural sciences.
Practical Goals of CS Ph.D.

Generate papers?
   Need N papers to graduate??

Create new technology that will change the way we do things
   Describe your technology in a paper
   Paper is not the goal. It is a vehicle for communication and dissemination.
Skills

What skills do we need to do research?

How to create knowledge?

(Practical) How to produce output such as: paper/presentations/software?
PhD (Research) Skills

Need

Have

Make lists
Deliberate Practice

Observe
- Find good papers and presentations
- Study the content and style

Identify Skills
- Compare with your habits/skills/outputs
- Details (not high level like “writing”)

Practice
- Drills to challenge and improve
- Iterate with feedback
Assignment 1

Please describe two topics of interest in Computer Science, one in your area of research and one outside your area of research. Each paragraph must have:

Title

Clear and short explanation of the topic, understandable to a broader CS audience.

Reason why the idea is interesting