

Research Methods in computer science

Fall 2021

Lecture 1

Omprakash Gnawali

August 23, 2021

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/research students

Must have a research topic in mind!

Administrative Information

3 credits

COSC 6321/6110 is a PhD requirement

Meet Mondays/Wednesdays at SEC 104

Office hours Mondays 230-330pm [online]

<http://www2.cs.uh.edu/~gnawali/courses/cosc6321-f21/>

Lectures

- First two weeks, as per University guidance
 - One class in-person, one online each week
- Lecture sessions will be streamed real-time online and saved to MS Teams throughout the semester

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 Teams or Blackboard

Discussions/messages on Teams

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

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.

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

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.

<http://conquer.cra.org/students/what-is-research-in-computer-science>

Computer Science Research

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.

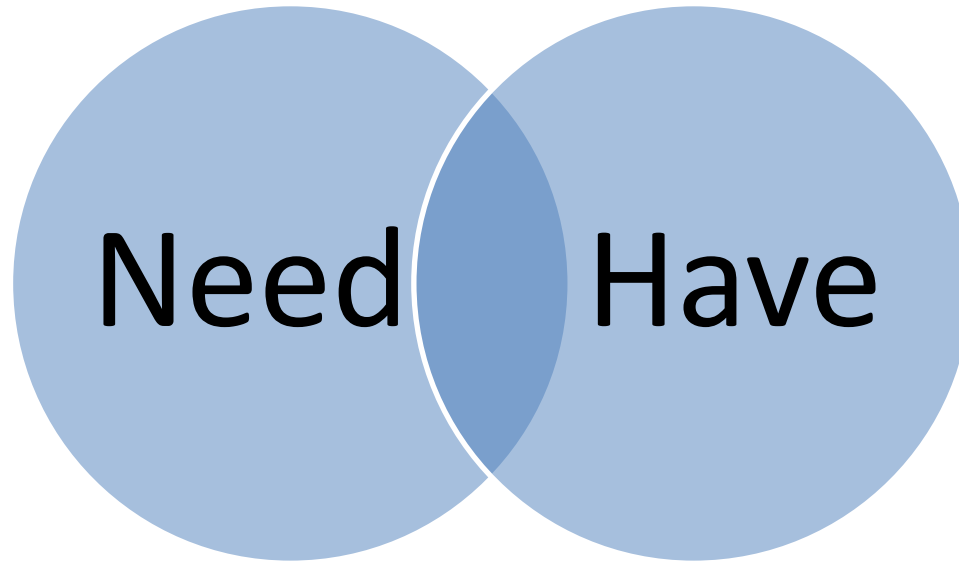
Skills

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



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 related to COVID 19 but 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