

Research Methods in computer science

Spring 2026

Lecture 2

Omprakash Gnawali

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Class Introduction

Introduction

Name

Research Topic/Group/Advisor

Year(s) at UH

Undergrad institution/country/city

Topics for today

PhD and Research

PhD template

The concept of deliberate practice

Research Ideas

Computer Science Research

It is a little different from what that wikipedia article says

~~Learn~~. Requires a nuance:

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 Process of Getting a 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?

Frequent Practice

You may write just a few papers during your PhD.

Not enough practice to be a good writer.

You may do just a few conference/external audience presentations during your PhD.

Not enough practice to be a good presenter.

You may think you have infinite time to write your paper.

Not a good environment to learn to be productive.

You may use AI tools to write a paper and do research

Limits your opportunity to practice certain skills

We will try to address these issues in this course.

PhD Goals

What are they?

Push the field forward.

Practical Goals of CS Ph.D.

Generate papers?

Need N papers to graduate??

Create new technology that will change the world and describe it in a/few papers.

Research Skills vs Technical Knowledge

Research skills are different from
discipline-specific knowledge

Research skills are somewhat general
Could even extend to other sciences

We can improve proficiency by practice
Need iterations and pattern matching

Research Skills

What skills do we need to do research?

How to create knowledge?

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

Related Skills

Research Skills

Soft Skills

Skills for Entrepreneurs

Leadership Skills

Systematic Practice

Vs

Try harder

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

How to emulate good practices?

Step 0: Find out which one is a good practice!

There may be multiple layers to identifying what good practices are.

PhD Milestones

What are they?

PhD Template

Work on a project or two, often assisting a senior student; write a little

Work on a major project; write one or two papers on that topic

Write a dissertation

Post-AI Addendum

Intensity of
Volume
Pace

Discussion on variations in the “PhD template”

Think about your post-PhD objectives

Recap...

What do you need to know/learn?

What do you already know/learn?

What do you want to work on?

Practice, observe, adapt, seek feedback, iterate

Finding a Topic

Different from working on a topic

Didn't get a chance to practice this much
until now

An Observation About Ideas...

Rarely do we see an idea with no relation to the existing body of knowledge.