# Research Methods
# in computer science
## Spring 2025

Lecture 2

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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

We build new artificats

    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.

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

# 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

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.

# Assignment 1

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

Title

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

Reason why the idea is interesting