

# Research Methods in computer science

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Lecture 2

Omprakash Gnawali

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# Agenda

PhD Goals and Skills

PhD Milestones and Template

Research Topic Formulation

# 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 way we do things

Describe your technology in a paper

Paper is not the goal. It is a vehicle for  
communication and dissemination.

# 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?

# 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.

# How to Find a Topic?

Read, read, read, discuss, go to talks

Listen to your advisor: sometimes you may not have a choice, but you can still bring small ideas

Lets say you are convinced you found a topic. You are excited

How to know if we should pursue the topic?

Why do (PhD) research?



# Research Formulation

What are you trying to do? Articulate your objectives using absolutely no jargon.

How is it done today, and what are the limits of current practice?

What's new in your approach and why do you think it will be successful?

Who cares?

# Research Formulation

If you're successful, what difference will it make?

What are the risks and the payoffs?

How much will it cost?

How long will it take?

What are the midterm and final "exams" to check for success?