Research Methods
in computer science
Spring 2024

Lecture 3

Omprakash Gnawali
January 24, 2024

Agenda

Research Topic Formulation

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

How to Find a Topic?

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?

Do not work on ideas before evaluating them. Learn how to evaluate them.

Finding a research topic - 1

A hard problem

– but some heuristics may help:

Subject candidate topics to four basic questions [Herb Simon]:

1. Will anybody care about the answer?
Is there any utility in answer? Sometimes we care about the answer even without utility (e.g., DNA structure, structure of the Universe).

2. Solvable within the given amount of time?
Is this the right time to start with it? Can I finish it in 2-4 years?

3. Will I be the first to answer this question?
Need to look at past and ongoing work around the world. Are other people working on it now?

4. Do I have good tools to address this question?

Adapted from slides by Marek J. Druzdzel

Finding a research topic - 2

Why will I be successful in my research?

"Because I'm smarter than others"
>bad answer …
>There are scores of smart people around.

"Because I'm a hard worker"
>better …
>But everybody who wants to succeed works hard.

"Because I have a secret weapon"
>Much better!

Adapted from slides by Marek J. Druzdzel

Finding a research topic - 3

What is a secret weapon?

A comparative advantage over your competitors to glory:
  A good problem that nobody has thought about before.

- First to think about this problem because of personal or professional experiences?
  – Should we look for research ideas in journal articles?

- Resources I can access – people, computation resources, software, tools

- My background beyond technical: hobbies, music, interests in other fields, or life situations e.g., diseases common in my family, business links

Adapted from slides by Marek J. Druzdzel

We will see how there are parallels between finding good research topic vs finding good topics for startups.

We will discuss other ways of evaluating ideas next time. E.g., Heilmeier's ideas.

Do not work on ideas before evaluating them. Learn how to evaluate them.

researchdiaries.org

Rodrigo Fonseca

Assignment 1

Please describe two topics of interest in Computer Science, one in your area of research and one related to metaverse 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