

Research Methods in computer science

Fall 2021

Lecture 3

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Agenda

HW1 review

Research Topic Formulation

Research Topic Evaluation

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?

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

Different people have different opinions.

Parallels between the process in research and other endeavors (startups, products)

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?

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!

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

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?

Other Approaches

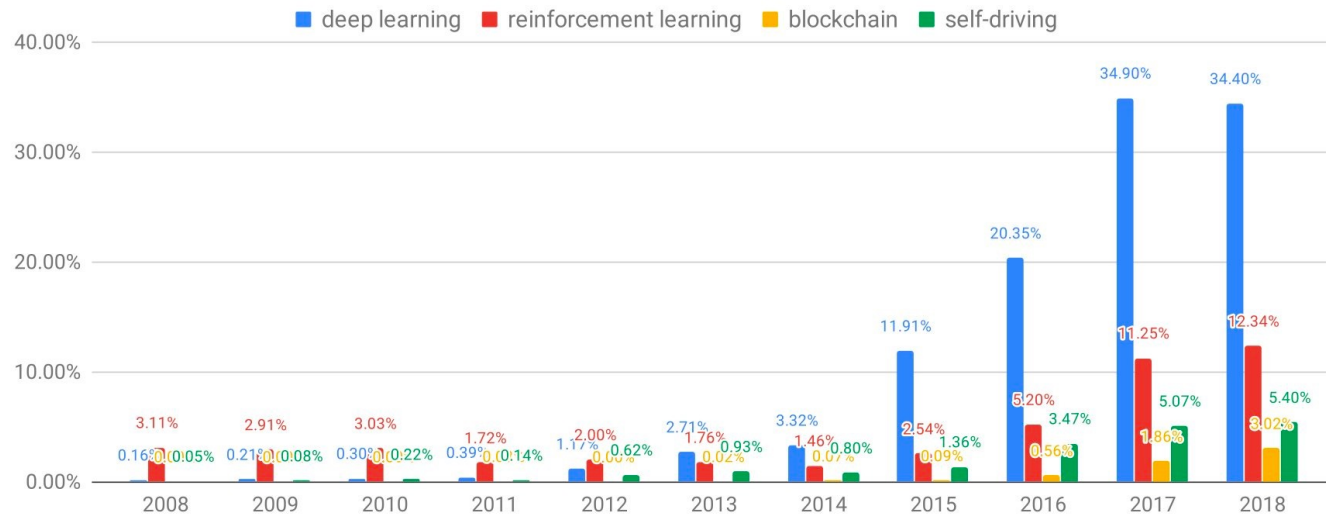
Random

Top trends and lists

Interestingness

CMU School of Computer Science

Grad School Applications Keywords



Andy Pavlo [twitter]

Parallels to Products

Research can be thought of as a Product

Product Viability Evaluation

Companies do this all the time

Lets look at some examples

Viability of Product Idea

1. What is the potential market size or demand?
2. Who are your competitors?
3. Is it a trend, fad, flat or growing market?
5. Who are your target customers?
6. What is your potential selling price?

<https://www.shopify.com/blog/13640265-the-16-step-guide-to-evaluating-the-viability-of-any-product-idea>

Research vs Startups

What should you work on? Are you working on the right problem?

MVP.

Usually resource constrained and must prioritize.

Small team.

Selling process.

Marketing.

(Thanks to Guo)

HW2 - Research Formulation

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

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Who cares?

HW2 - Research Formulation

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