To Students

Kaizhao Liu

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1 What is research?

Any research procedure basically follows the pipeline I list below:

1. What is the current understanding of this subject?
2. How can we advance it?
3. Advance it and go back to step 1.

Different people implement different strategies for these steps.

When implementing step 1, we need to learn the state-of-the-art of the subject at hand. The fastest way to do this is asking people who have worked in this area for advices. To delve deeper, we can read some papers. Be cautious that when we are reading, we should always be thinking. For example, we should also use the pipeline when we are reading. This is a microscopic version of doing research.

2 How to Read a Paper

When reading a paper, we expect to learn something. Being more ambitious, we also expect to create something new during this process.

the first thing to do is to establish

Here I list some typical questions that can be asked when reading a paper. This guide can be beneficial when you find yourself uncertain about how to approach a paper. However, don't let it limit your creativity. Remember, you can always pose more engaging questions than the ones I've presented here.

What problem is the paper addressing?

- Is this problem interesting or important?
- What research has been done on this problem before?

What perspective does the author take to address this problem? How do the authors formulate this problem (mathematically or statistically)? To what extent does it address the main problem? What are the key assumptions being made?

What is the key conclusions of this paper?

- Are these assertions substantiated by both theoretical and empirical evidence, or do gaps exist between the paper's claims and the results presented?
- What are the limitations of the claims?
- What are the implications of the key results? How significant are they? *For example, are they surprising? Will they revolutionize future approaches to this problem?*

If you were the author of this paper, what technical challenges would you anticipate facing? Both experimental and theoretical.

Can you break down this paper into distinct sections?

After reading a paper, remember to conduct an evaluation.

- What is the main contribution of this paper?
- How do the authors come up with this idea?
- Can you abstract the paper's technique as one of your weapons for future work? *This may encompass mathematical theorems with their proofs, experimental methodologies (including thought experiments), and even philosophical reflections.*
- What aspects have the authors not addressed (perfectly)? *For instance, this can include a loose bound, a counterexample, or on a broader scale, another facet of this problem left unexplored.*

It is advisable to discuss this paper with senior faculty members afterward.