

A large iceberg floats in a blue ocean under a cloudy sky. The visible tip of the iceberg is small, while the vast, textured base is submerged beneath the water's surface, illustrating the concept of hidden complexity or depth.

How to Read Research Papers

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Yue Cheng



UNIVERSITY
of VIRGINIA

How to read a (systems) research paper?

- **Paper reading** is an important skill in grad school
 - To learn how to efficiently and effectively read a **systems** research paper
 - Might be slow at the very beginning
 - But you will get better the more you practice reading
- We will read dozens of papers **in thorough detail**
 - Impossible to innovate if you don't know the literature well

#1 rule:

Do **NOT** worship any paper or author

- A paper is **not** a “truth” but an “**opinion**” (or **claim**)
 - You should have your own judgement
- **Critical thinking** is a must in grad school
 - Papers are arguments based on authors’ work / perspective
 - You are welcome to reject the arguments, criticize the approaches, and question the results
 - However, you will need to backup your criticisms and rejections

How to read a (systems) research paper? (Griswold's version)

1. What are the motivations?
2. What is the proposed solution?
3. What is the work's evaluation of the proposed solution?
4. What is your analysis of the identified problem, idea, and evaluation?
5. What are the contributions?
6. What are future directions for this research?
7. What questions are you left with?
8. What is your takeaway message from this paper?

<https://cseweb.ucsd.edu/~wgg/CSE210/howtoread.html>

How to read a (systems) research paper? (Cheng's version)

1. What problem does this paper tackle?
 - Why is it **important** or why do you think it is not as important (do you disagree)?
2. What is the solution **design & implementation**?
 - What is the **limitation** of the solution?
3. What do you learn from this paper?
4. Does it resonate your experience or benefit your own research or work?
 - If so, how do you want to use their solution?
 - If not, why doesn't the paper interest you? (This might help identify/clarify your interest.)

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Use AI as your best tutor, w/ cautions

- AI cannot replace you → Don't simply throw papers at AI, there's **NO** substitute for first-hand reading ← **W/o reading yourself, you won't even know what to ask!**
- Use AI to clarify & reinforce → Ask it to better explain, rephrase, or summarize → Keep asking until you understand it
- **For advanced learners:** Leverage AI to reproduce the problem or build small demos ← Real understanding comes from **DIY**

Example prompt to get started

You are an experienced systems researcher. You are critical, clear, and pretty good at teaching & communicating ideas in an intuitive way.

I am a senior undergrad [or first-year PhD] student in CS. I don't have first-hand experience with KVM, Lambda, serverless computing, or hardware virtualization, but I am genuinely interested in learning more about state-of-the-art research in cloud and serverless computing systems. Do not assume I have prior background in any of these techniques.

Now, read the paper from the attached URL [or PDF]. Answer my questions. [followed by your questions...]

[Why Firecracker is built atop KVM, what is exactly QEMU doing, and why it is not built directly atop QEMU.]