How to Read a Math/Stats Paper

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Why papers feel impossible

- They are not written for first-time readers.
- Notation is dense. Definitions are scattered.
- The real idea is often buried inside a proof on page 11.

This is normal. It is not you.

The myth of linear reading

What you imagine:

Start at page 1.

Read every line.

Understand everything.

Finish at page 20.

What actually works:

Multiple passes.

Each pass with one question.

Skip what is not yet needed.

Return when ready.

Nobody reads a math paper linearly. Not even the authors.

Layered reading

Pass 1. Why does this paper exist?

Pass 2. What are the main results?

Pass 3. Where is the difficulty?

Each pass is short. Each pass has one job.

Today: three passes, one paper

1. **Pass 1.** Why does this paper exist? *10 min*
2. **Pass 2.** What are the theorems saying? *15 min*
3. **Pass 3.** Where is the hard part? *15 min*

After each pass: pause, share, regroup.

Pass 1 | Why does this paper exist?

Read: Abstract and introduction only.

Your job:

- Write one sentence. What problem is this paper attacking?
- Write one sentence. What was wrong with what came before?
- Mark every word or symbol you do not recognize. Do not look it up.

10 minutes. Pens out. No phones.

Read.

Pass 1 debrief

Going around the room:

- One sentence on what this paper is doing.
- One thing that surprised you.
- One thing you do not yet understand.

There are no wrong answers in this pass.

Pass 2 | What are the theorems saying?

Read: Only the theorem statements. Skip the proofs.

Your job:

- Circle the main theorem. Box the supporting lemmas.
- For the main theorem: list every assumption. List every conclusion.
- Translate one assumption into plain English.

15 minutes.

Read.

Pass 2 debrief

- Did everyone pick the same main result?
- What do the assumptions buy you?
- Which assumption looks load-bearing?

Pass 3 | Where is the hard part?

Read: Skim the proof of the main theorem. Do not work through it.

Your job:

- Find the one step that looks hardest.
- Find one tool the proof uses that you have not seen before.
- Ask: if I removed one hypothesis, where would the proof break?

15 minutes.

Read.

Pass 3 debrief

- Where did the proof get hardest?
- What tool would you need to learn to follow it?
- Is this a tool we will meet this summer?

What we just did

In 90 minutes you:

- Located the question the paper answers.
- Identified the main result and its assumptions.
- Found where the difficulty lives.

That is a real first reading of a real paper.

Questions?

Take this with you

The next time you open a paper:

- Pick one pass at a time. Resist the urge to read straight through.
- Keep a reading notebook. Date every entry.
- Bring what confused you to our research meetings.