How to Review Research Papers



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Reviewing Research Papers

- Research paper review is an *honest*, and *critical* assessment of the research presented in a paper
  - Journal or conference paper, grant application, …
- The goal is to *analyze the strengths* and *weaknesses* of the research
  - Provide *constructive feedback* and help improve the work
  - And, to *make a recommendation*: accept or reject
- Being invited to review a paper is an honor
  - Recognition of your expertise in your area of research
- Opportunity to serve the scientific community

Outline

- What is a research paper review?
- Principles and guidelines
- How to review a paper
  - Read the paper
  - Write a review
- Structure of a review
- Nine kinds of peer reviewers

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Principles and Guidelines

- Before accepting to review a paper make sure you have the *expertise*
- *Avoid/disclose any conflicts* of interest upfront
- A review should always be *polite*, *respectful*, and *helpful*
  - Regardless of your recommendation for acceptance or rejection
- You should *not manipulate* the process to force your personal preferences/taste

Principles and Guidelines – Cont'd

- Maintain the *confidentiality*
  - Both the *existence*, and *substance* of the manuscript
  - Exception: sharing with junior colleagues, or students
    - Make sure the editor/PC chair is aware of this
- Make sure you can review the paper before the *deadline*
- Keep it *brief*
- Watch for *egocentrism*
- Report any *ethics concerns*, suspected duplicate publication, fraud, plagiarism

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How to Review a Paper – The Process

- Read the paper
  - I suggest Keshav's three-pass approach for reading a paper
- Write a review
  - Organize your thoughts to form a well written review

Writing a good review is a skill that improves with practice.
Develop your own style over time.

The Three-Pass Approach

- The goal is to *efficiently* read a paper
- Mainly used for literature surveys
  - But works great for reviewing papers
- Reading paper in *three passes*, going from the big picture to focusing on more details
  - Helps you spend an appropriate amount of time on a given paper
    - Depending on its relevance and impact
    - Extremely important for literature surveys
  - Also, helps you distinguish the details from high-level ideas
    - Essential for a good review

First Pass: Quick Scan



- Goal: Get a *bird's-eye view* of the paper
- Usually takes *5-10 minutes*.

- Read the title, abstract, introduction, and the conclusion
- Read the section and sub-section headings
- Skim the references

- You should be able to answer the *five Cs*:
  - Category: Is it a systems paper? measurement? theory? …
  - Context: How does it relate to existing work?
  - Correctness: Do assumptions appear valid?
  - Contributions: What are the main contributions?
  - Clarity: Is the paper well written?

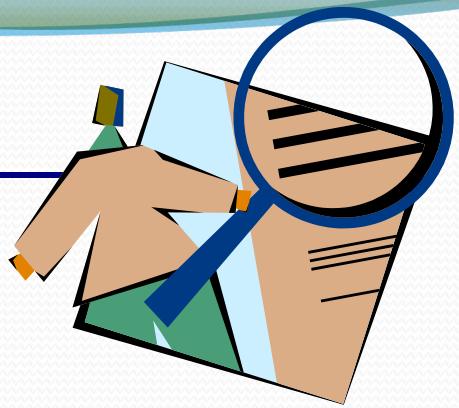
Second Pass: Read with Greater Care

- Goal: Understand the *big picture*
  - Without being distracted by details (e.g. proofs)
- Should take *less than an hour*

- Read the paper with *greater care*, *ignore details*
- Carefully look at figures, diagrams, graphs
- *Take notes* as you read
- Mark relevant unread references for further reading

- You should be able to summarize the paper after this pass

Third Pass: Fully Read the Paper



- Goal: *Complete understanding* of the paper
- Usually takes *1-5 hours*

- Read the entire paper, with *great attention to details*.
- You should be able to *virtually re-implement* the paper.
  - Recreate the work, based on the same assumptions as the authors
  - Pinpoint implicit assumptions, missing citations, potential issues

- This recreation helps you identify
  - Paper's innovations and strengths, and
  - It's hidden failings, and assumptions

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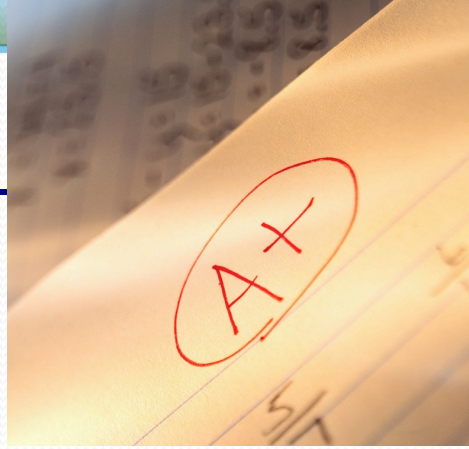
Structure of a Review



- Recommendation
- Summary
- High level comments
- Constructive criticism
- Minor issues
- Comments to editor(s), PC members/chairs
  - Not seen by the authors

Recommendation



- Make a recommendation to accept or reject the paper
  - Clearly state the *bottom line*
  - This is your overall evaluation of the paper given all the positive and negative points you have seen
- **Question**: What is the right criteria for accepting or rejecting?
  - Be wary of egocentrism
- Sometimes you have the option of asking for revisions
  - Mostly in journals
  - Use this option with extra care

Summary

- Provide a *succinct*, and *dispassionate* summary of the paper
  - No criticism here
- Do not simply copy the abstract
  - Use your own understanding
  - Write it from memory if you can
- Comes from *passes 1* and *2*

High Level Comments

- Focus on the *big picture*
  - Explain the *strengths* and *weaknesses* or the work
  - Ignore the details for now
  - Talk about *importance*, *impact*, and *timeliness*
- Be honest, but keep the tone respectful and positive
- Comes from *passes 2* and *3*

Constructive Criticism

- Being "*constructive*" is the key here
- Give an *in depth overview of technical issues*
  - Clearly state the problem(s)
  - Be specific
    - Avoid generic statements like: "the data set used for experiments is not suitable." What is suitable?
  - Provide as much details as you can; give examples if it makes sense.
  - Help the authors improve the work.
  - Be careful in recommending further experiments
- Also, talk about *clarity*

Minor Issues



- Provide a *list of minor issues*
  - Typos, mistakes in figures, graphs
- Clearly show where the problem is
  - E.g. Page 1, Col. 2, Par. 3, Line 4.
  - Or, throughout the paper change “x” with “y”.
- Suggest a fix if possible
  - E.g. we show this in figure 1 → Figure 1
- Ideally, a well written paper should not have many problems like these.

Comments to the Editor/Chair



- Usually hidden from authors
  - You should still be respectful and positive
- Bring up any *concerns/issues* that you believe the editor(s)/PC chair(s) should be aware of
  - E.g. ethics concerns, plagiarism, …
- If you are *not confident* in your review, this might be a *good place to admit* that too.
  - Ideally, you should not accept to review a paper that is outside your expertise area in the first place.
- You can also include comments that can help the *discussion* with other reviewers

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Nine Kinds of Peer Reviewers

- Scientific battlefield analogy from Matt Might

"Feeling gloomy about your latest reviews?

Re-read them in light of the classes below.

Lick your wounds. And, then try again. (And again.)"



1. The Soldier

- Not an expert in your area
  - But can understand it
- Will plod through to produce an honest, and (mostly) correct review
- Not much passion
  - No strong argument …
  - … for either acceptance or rejection
- Most reviewers are soldiers.



2. Heavy Weapons Guy

- Expert in your area
- Will either *love* or *hate* your paper
  - Champion your paper, or fight to reject it
- Intense, focused and unstoppable





3. The Demoman

- Your paper has to be rejected
  - He knows it right from the beginning
- Willing to do whatever it takes to reject
  - Your paper is simply too dangerous
  - It must be stopped
- Will prove your incompetence
  - Instead of a traditional peer review
- Your paper must be identified through dental records
  - After receiving the Demoman's gentle touch!



4. The Sniper

- Reads until the first mistake
  - Perceived mistake!
- Headshot, reject, next!



5. The Medic

- Wants to save your paper
  - But ends up killing it!
- Will give you suggestions for improvement
- But, will conclude “it’s premature to publish these results at this time.”



6. The Engineer

- Loves experimentation!
- Always sees room for improvement
- "… promising idea, need more experiments!"



7. The Scout

- Delivers a flawless summary …
  - … of your abstract!



8. The Spy

- Working on exactly the same problem
- Has the "*same idea*" for a solution!

- Your idea *will* appear in print!
  - Not with your name on it.



9. The Pyro

- Your topic is out of scope
- Your writing is terrible
- Your problem is not important
- Your idea sucks
- Your solution doesn’t work
- Your theory is broken
- Your experiments are flawed



- Plus, you are duplicating a classic result!

Discussion

- What kind of reviewers have you dealt with recently?
- Which one do you prefer to review your papers?
- What kind of reviewer are you?

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