

## “Critically reading a research paper” Exercise

**Learning Objectives:** Students learn how to (1) focus and make reading active (without getting lost in details) and (2) analyze and summarize other people's research

**Activity:** Give the student(s) a specific technical article to read at a level appropriate to the understanding of each student and ask them to complete the following short writing exercise on their own. Concise 1-sentence responses to each prompt are strongly encouraged to focus them on the important aspects. After the student(s) has completed the reading and their written critique, spend an hour discussing the paper using their writing as a discussion guide, revising it as needed to demonstrate accurate understanding and appropriate critique. After students have completed this exercise with several papers, mentors should see an improvement in their analytical reading and writing.

### Guide for Technical Reading and Critique:

**Statement of the Problem/Goals:** In one sentence in your own words, state succinctly the open research problem or question the paper addresses. What particular goals do these researchers have in addressing this problem? For example, what requirements have they set for themselves in solving the problem? What contribution are they seeking to make to the state-of-the-art?

**Technical Approach:** In a few sentences in your own words, what is the novel insight of this group's approach to tackling the stated problem? What is their overall approach and/or strategy for solving the problem?

### Discussion/Critique:

Does this paper include empirical or theoretical justification of the results? Is it an experience paper? Answer the questions in each section that apply.

*If it includes empirical justification:* How did the researchers evaluate their efforts? What evaluation questions did they seek to answer, and what kind of experimental setup did they design to answer those questions? Are these experiments sufficient? What conclusions did they draw from their evaluation results? Given the evaluation results, what application/useful benefit/impact do the researchers/you see for this work? What limitations do the researchers mention with their approach? What additional limitations do you think might also occur? How could you solve the problems you identified?

*If it includes theoretical justification:*

What general proof strategies do the researchers employ? What intermediate results/lemmas do the researchers rely on for the proof of their final result(s)? Do the researchers include

proofs of those lemmas/intermediate results in the paper? Can you identify any technical flaws in their proofs? Do the researchers provide practical motivation for the work? What useful benefit/impact do you see for the work? What assumptions do the researchers make that limit the generality or utility of the results? Write one interesting open question or possible new research direction with regard to this paper beyond content understanding.

*If it is an experience paper:*

What evidence do the authors provide for the relevance of their work? What conclusions did they draw from their experience? How might they experimentally evaluate those conclusions more broadly in future work? What useful benefit/impact do the authors/you see for this work? Did the authors make any assumptions that limit the utility of this work or its adoption elsewhere? Do they articulate those assumptions/limitations? What is a question or new direction in this area that this work suggests or related to the work that this paper neglected? What is an open question or possible new research direction with regard to this paper beyond the content understanding?