Reviewer's report

Manuscript ID	JMLMC-59453
Article Title	NUMERICAL SPLITTING SCHEMES AS THE CORNERSTONE FOR MINI-BATCH OPTIMIZATION: ON THE IMPORTANCE OF WELL-BALANCED METHODS
Reviewer	Reviewer
Review Date	05/23/2025 13:20
Report	1. **Reviewer's recommendations: Reject** ◦ Paper is unacceptable. Reasons for objection are attached 2. **This paper is poor** ◦ Is the importance such that publication procedures should be accelerated? **NO**
Comments	This paper presents a description of undesirable behaviors in stationary optimizers and investigates a modification of unbalanced operator splitting. The simple modification is analyzed across various benchmarks to explain its behavior. Unfortunately, this reviewer finds that the quality of the manuscript does not meet the standards of the Journal of Machine Learning for Modeling and Computing for the following reasons. First, the impact on the scientific community is unclear. The manuscript does not clearly state the scientific contribution of the proposed method. In the current form of presentation, the proposed modification appears to be a minor incremental improvement of the original work of Speth et al. [80]. Additionally, the validation study is limited to relatively simple benchmark problems, and a larger scale validation on real-world data and algorithms is missing, despite that the authors mention deep learning and the relevant practical concerns as the motivation for this work. Second, the experiments presented in the paper do not appear to have a strong connection to real-world practice in modern data science and machine learning. Stochastic gradient descent in its basic form is rarely the choice for the training of real-world algorithms today. Many of the assumptions and the design of experiments appear to be too simplistic and idealized. Such disconnection may be due to the weak literature review of the relevant literature in the deep learning community. This reviewer also believes that the manuscript can benefit from thorough proofreading and English editing. Additionally, many of the discussions are presented in the form of bullet lists that lack a coherent flow of logic, making it harder to comprehend the message that the authors try to convey.

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