

Dear Editorial Team,

We are pleased to submit our manuscript titled "MRS-Sim: An Open-Source Framework for Simulating In Vivo-Like Magnetic Resonance Spectroscopy Data" for consideration in NMR in Biomedicine. We believe that our research is highly relevant to the journal and of significant interest to its readership.

In the field of magnetic resonance spectroscopy (MRS), there has been a growing emphasis on addressing the reproducibility crisis through consensus and best practices. However, a major challenge remains the lack of a benchmark dataset for evaluating algorithms and software packages, hindering the comparison of published results. For proper comparisons, one must test the various algorithms themselves. Synthetic data has emerged as a crucial tool for development and validation, as it provides known groundtruth values and the potential for achieving very realistic simulations, which is the vital feature of useful synthetic data.

Our work aims to address these critical issues by introducing MRS-Sim, an open-source framework designed to generate highly realistic synthetic MRS data. The framework will hopefully serve as a benchmark simulator, facilitating the development and validation of artifact correction techniques, spectral fitting pipelines, and other MRS methodologies. Crucially, this will aid machine learning and deep learning research applications which need tens of thousands to millions of samples for training. Such large sets of clinical data are not available, so researchers train on synthetic data and try to apply their models to clinical data at test time. The quality and realism of the synthetic data has a direct and significant impact on the models' performance with clinical data. By providing a comprehensive and customizable simulation platform, MRS-Sim empowers researchers to bridge the gap between limited clinical data availability and the high demands of these AI approaches applied to any variety of tasks in MRS.

Existing literature reveals a current roadblock, which is a lack of consistency in simulation methods. Researchers often rely on their own ad hoc approaches, making unrealistic assumptions, and employing simplistic models. These inconsistent simulation methods perpetuate the reproducibility crisis for both traditional MRS methods and newer AI methods. Our proposed framework aims to establish a gold standard for MRS simulation, offering continuity in data and validation methods, which are fundamental to the field.

Furthermore, by making MRS-Sim open-source, we seek to democratize MRS research, providing access to a wider community of researchers interested in advancing the field. We believe that community contributions will drive further development of the framework, ensuring its ability to simulate various relevant scenarios that arise in clinical practice.

We are confident that the publication of our manuscript in NMR in Biomedicine will greatly contribute to addressing the reproducibility crisis, promoting robust MRS research, and fostering collaboration among researchers from diverse disciplines.

Thank you for considering our submission, and we look forward to your response.