

## Proposal Review 4 : 2152988

[Back to Proposal](#)

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| Agency Name:            | National Science Foundation  |
| Agency Tracking Number: | 2152988  |
| Organization:           |  |
| NSF Program:            | CDS&E-MSS  |
| PI/PD:                  | Hickernell, Fred   |
| Application Title:      | Collaborative Research: Quasi-Monte Carlo for Efficient Simulation |
| Rating:                 | Good   |

### Review

#### Summary

In the context of the five review elements, please evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

Topic:  
The main goal of this project is to advance the development of QMCPy, a Python-based software package for quasi-Monte Carlo (QMC) simulations. This will involve incorporating more advanced techniques for QMC (e.g., variance reducing, multilevel, and adaptive sampling schemes), and parallel implementations (multi-core opposed to multiple cpu's). QMC for sampling in the mini-batch stochastic gradient procedure in machine learning and for sampling in Bayesian modeling will also be considered. By enhancing the capabilities of this software package, and with a larger user base, the anticipation is that QMC will be applied to more applications, e.g., data analysis.

Intellectual Merit:

The proposal provides a good summary of QMC and the importance of sampling schemes. However, since most of the techniques to be considered have been available to research community for a while, it appears that software development is the emphasis of this project.

Strengths:  
(i) The team has a lot of experience in QMC and has a large group of collaborators. There is existing software to build upon.

Weaknesses:  
(i) The project appears to be oriented towards software development rather than research.  
(ii) The team does not appear to have background in machine learning.  
(iii) Given the software development emphasis, and the goal of having QMCPy be owned and cultivated by the QMC community, a detailed description of the software maintenance plans should have been given.

In the context of the five review elements, please evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

Strengths:  
Graduate and undergraduate students will be involved in this project (funding has been allocated for these students). These students will be trained in good software development and maintenance practices. The team has a good track record in mentoring students.

Weaknesses:  
none

Please evaluate the strengths and weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Results from Previous NSF Support:

The PI was very productive (publications, theses, and open-source software) in past NSF support.

Summary Statement

This project will investigate QMC, particularly incorporating more advanced sampling techniques in the QMCPy software package. The main weakness in this proposal is the limited amount of new research (or neglecting to highlight the new research and challenges of the proposed work). I ranked this proposal in the bottom half of the proposals reviewed.



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