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Proposal Review 2 : 2053714

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Agency Name:	National Science Foundation
Agency Tracking Number:	**2053714**
Organization:	
NSF Program:	CDS&E-MSS
PI/PD:	Hickernell, Fred
Application Title:	Collaborative Research: Quasi-Monte Carlo Community Software
Rating:	Multiple Rating: (Excellent/Very 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.

The proposal seems to focus on constructing and updating a specific package and the tools it would need. Given the importance of sampling to a host of applied scientific settings, this has good potential and there are a range of potential applications discussed in the proposal. A major concern is that there is no explination of how this software will be integrated with existing software packages. Namely, is the idea simply to recreate existing methods or something else? As an example, to improve posterior sampling would be great, but how will this interface with popular modeling frameworks like Stan? AS another example, `ray tracing' seems thrown in as an aside.

As a software development proposal, it is lacking key details on internal testing, how the API will be handled, and what use cases will be used during development. There is not a userbase discussion or any version control philosophy outlined. Licensing appears to currently be Apache, which does not mesh well with BSD or MIT. There are more detailed argument against the deployment, for example the idea that `Python code does not execute particularly quickly.' I am skeptical of this argument, as when you use something like \verb|numpy| or \verb|cupy| then you can take advantage of this. Writing your backend in C might seem faster, but does this mean a user will have provide a compatible likelihood for example? Moreover, is C the actual package, will python be only used as front end? If so, why not write front ends for several packages like R?

The technical and mathematical developments are sprinkled in with some good ideas, but not fleshed out. The organization is a little odd in terms of a development project. Funding students on project like this can be risky because it requires significant development and less core research. Also, Art

Owen is mentioned quite often but appears to be only an unfunded collaborator.

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

The project would be hugely impactful if deployed correctly, but there are many questions about the development process. There is a lack of discussion of unit/regression tests that would help give users confidence in the method's function. The API should be designed with a userbase in mind to have broad impact, but the proposal does not outline the userbase.

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

This proposal deals directly with software development, but the theory and mathematical results are not described.

Summary Statement

Development of a QMC package for python is important, but there are questions about scope, organization and deployment for this particular project.

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