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# Proposal: 2053714

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## Agency

Agency Name: National Science Foundation

## Application

Agency Tracking Number: **2053714**

Project Title: Collaborative Research: Quasi-Monte Carlo Community Software

Requested Amount: \$395,338

Received Date: 09/15/2020

PI/PD: Fred Hickernell

Authorized Representative: Toni Allen

Submitting Institution: Illinois Institute of Technology

## Program

Program Title: CDS&E-MSS

Program Code: 8069

Funding Opportunity Number: PD 20-8069

Division/Area of Science: Division Of Mathematical Sciences

Program Contact Name: Yong Zeng

Program Contact Phone: (703) 292-7902

Program Contact Email: [yzeng@nsf.gov](mailto:yzeng@nsf.gov)

## Application Status History

Status	Status Date
Declined	03/14/2021

## Cognizant Program Officer Comments

Proposal ID: DMS 2053714

PI: Fred J Hickernell

Institution: Illinois Institute of Technology

Title: Collaborative Research: Quasi-Monte Carlo Community Software

#### Collaborative Proposal Information

Proposal ID: DMS 2053715

PI: Simon Mak

Institution: Duke University

Dear Professors Hickernell and Mak,

I regret to inform you that the National Science Foundation is unable to support the proposal referenced above.

During the FY21 competition, the CDS&E-MSS program received a number of outstanding proposals representing many different areas of CDS&E-MSS from both junior as well as established senior researchers. The quality of the submissions was very high, and we are simply unable to fund all deserving proposals.

Your proposal was reviewed by a CDS&E-MSS panel, whose members represent a broad range of expertise within the mathematical, statistical and computational sciences. The panel was asked to review the proposals on the basis of the two main NSF review criteria, (1) Intellectual Merit and (2) Broader Impact. Each proposal was reviewed by at least three members of the panel. During the panel meeting, all proposals were discussed and a panel summary of the discussion was prepared as part of the review process. Following the discussion, the panel was asked to place proposals into one of the following three categories: (I) Highly Recommended for Funding, (II) Recommended for Funding if Possible, and (III) Not Recommended for Funding.

Your proposal received reviews with ratings: E/V, V, F and F. respectively. Based on the reviews and the panel deliberations, your proposal was placed in the lower half of Recommended for Funding if Possible category.

My recommendation is based on the following analysis of the reviews and panel summary:

#### Project Overview:

The PI propose to grow QMCPy, a Quasi-Monte Carlo (QMC) Python software library in three directions: (1) implement in a broader offering of low discrepancy sequence generators, (2) implement a broader array of algorithms, and (3) develop and implement a broader spectrum of use cases for QMC.

#### Intellectual Merit:

While the reviewers and panel noted that industry collaborators are mentioned and viewed it as a strength, the panel had divergent opinions on the proposal. Some panelists felt that the proposal, framed as a software development project for easy access to quasi Monte Carlo methods, presents new statistical methodology as well, not just software. Other panelists felt that there is just potential for the software development to spur statistical methodology development. One reviewer, who rated the proposal high, acknowledged that "The technical and mathematical developments are sprinkled in with some good ideas, but not fleshed out," and that "This proposal deals directly with software development, but the theory and mathematical results are not described." Another reviewers who also rated high commented that "It would have been helpful to include a page or so with a worked example on a real application, to provide some evidence that this is useful for real problems." And another reviewer remarked that "It is not clear that the project will produce substantial methodological innovations. It is not clear if the project will have an impact outside the community dedicated to QMC." One more reviewer wrote that "Details on the actual tasks, their challenges, innovations, etc would have made the proposal competitive."

#### Broader Impacts:

Beside potential impacts in Bayesian inference, financial risk, uncertainty quantification, and machine learning where QMC employs, the PIs describe plans for open-source software development, educating and mentoring cross-disciplinary computational researchers including both undergraduate and graduate students, outreaching and mentoring under-represented minorities, women, and students from colleges where research experiences are rare.

#### Outlying Review:

One reviewer felt that the development of a QMC package for python is important and impactful, and rated the proposal as E/V. However, the reviewer pointed out several weaknesses of the proposal, including “questions about scope, organization and deployment for this particular project.” The reviewer also agreed with the panel summary, ranking and placement.

Summary: The reviewers found strengths and several weaknesses in this proposal. While some panelists felt that the proposal also presents new statistical methodology, other panelists and reviewers felt differently. The panel and the reviewers raised several concerns including the insufficient description on the actual tasks, the challenges, and the innovations as well as the vagueness of the impact outside the community dedicated to QMC. These concerns made the proposal less compelling than other proposals in the competition and ranked higher.

Recommendation: In the current highly competitive funding situation, those concerns put the proposal at a disadvantage compared with other highly rated proposals. Taking into account the comments of the reviewers, the goals of the program, and the available budget, unfortunately this proposal is not as competitive as several other proposals submitted to the CDS&E-MSS competition this year and ranked higher.

The Management Team of the CDS&E-MSS Program recommended that this proposal be declined.

The reviews and panel summary are available through Fastlane. Please understand that reviewers address their comments chiefly to NSF, not to Principal Investigators. Reviews containing irrelevant, non-substantive, or erroneous statements are not used in evaluating the merits of a proposal.

I hope you will find the reviews of assistance in the preparation of future proposals. Please do not hesitate to contact me for more information regarding this decision.

Sincerely,

Yong Zeng  
Program Officer  
CDS&E-MSS Program  
Division of Mathematical Sciences  
National Science Foundation

#### Review Information

*Please note: The Sponsored Projects Office (or equivalent) at the submitting organization is NOT given the capability to read the below review information.*

## Panel Summary

Panel Summary	Release Date
<a href="#">Panel Summary #1</a>	03/11/2021

## Proposal Review [Summary of All Reviews](#)

Review	Release Date
<a href="#">Proposal Review #4</a>	03/11/2021
<a href="#">Proposal Review #3</a>	03/11/2021
<a href="#">Proposal Review #2</a>	03/11/2021
<a href="#">Proposal Review #1</a>	03/11/2021

## Context Statement

Virtually all proposals submitted to the DMS CDS&E-MSS Program requesting support with Fiscal Year 2021 funds were reviewed in two virtual panels through Zoom run by the program. The panels, composed of researchers with inter-disciplinary expertise in a variety of mathematical, statistical, and computational sciences, were asked to review the proposals based on the two main NSF review criteria of Intellectual Merit and Broader Impacts, as described in the solicitation.

For each proposal, three or more independent reviews were obtained. Each proposal under panel review was considered, one at a time, as a candidate for detailed discussion of the proposal's intellectual merit and broader impacts. All conflicted panelists and NSF staff members left the Zoom virtual panel room prior to discussion and did not participate in any way in the review and decision process. Following the discussion, the proposal was placed into either one of three categories: (1) Highly Competitive, (2) Competitive, and (3) Not Competitive; or one of the three: (1) Highly Recommended for Funding, (2) Recommended for Funding if Possible, and (3) Not Recommended for Funding. The proposals reviewed also received a Panel Summary reflecting the panel's discussion and recommendation.

With a few proposals, Program Directors sought further ad-hoc mail reviews after the panel. These additional reviews were deemed necessary to arrive at a funding decision. The number of ad-hoc reviewers depended on the complexity of the proposal and the areas of expertise required.

Verbatim copies of all reviews and the panel summary are provided to the PIs. The PIs are advised that reviewers address their comments to the NSF, not to the principal investigators. Reviewers may make remarks without giving detailed references or specific suggestions for improvement. Any lined-out statements in a review were judged irrelevant, non-substantive, or erroneous, and were not used by the NSF in making decisions.

While reviewer ratings are taken into account in a recommendation, the content of their reviews is more important in assessing the merits of individual proposals. Different reviewers may offer insights into different aspects of a proposal (e.g., problem formulation, qualification of the PIs, relevant work in other areas, perspectives on the problem's importance, assessment of its importance to the discipline, and relevance to applications or other disciplines when the research has an interdisciplinary thrust). Thus, ratings are not the sole determining factor in a recommendation; rather, an assessment of each proposal's strengths and likely impact is sought.

Decisions about individual proposals are often difficult, and factors beyond reviewer comments and ratings influence end recommendations. For renewal applicants, additional information not available to reviewers, such as progress reports, may be important. Other factors Program Managers consider include: NSF policies and emphases, balance among subfields, balance between new and repeat investigators, contribution to Federal initiatives or interdisciplinary efforts, effect on education and human resource development, the availability of external funding, and the total funding available to the program. Sometimes, revised versions of proposals declined one year are awarded in subsequent years; conversely, research that has been supported for multiple funding cycles can be declined as new, more promising, proposals enter the competition.

The hallmark of a successful proposal is one or more salient strengths. Due to budgetary constraints, it is not possible to fund all meritorious proposals. Proposals recommended for an award, as distinguished from other proposals "of fundable quality," have a strong potential to impact the field or general science. Taken collectively, the funded proposals strike a balance across the dynamic and essential areas of the discipline. This means that recommendations for awards go beyond a simple panel ordering of proposals.

The Program Directors for CDS&E-MSS in FY2021 are

Malgorzata Peszynska, [mpeszyns@nsf.gov](mailto:mpeszyns@nsf.gov)

Andrew Pollington, [adpollin@nsf.gov](mailto:adpollin@nsf.gov)

Yong Zeng, [yzeng@nsf.gov](mailto:yzeng@nsf.gov)

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