Proposal: 2152988

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Agency

Agency Name:	National Science Foundation

Application

Agency Tracking Number:	**2152988**
Project Title:	Collaborative Research: Quasi-Monte Carlo for Efficient Simulation
Requested Amount:	$480,588
Received Date:	09/15/2021
PI/PD:	Fred Hickernell
Co-PD(s)/Co-PI(s):	Yuhan Ding
Authorized Representative:	Robert Lapointe
Submitting Institution:	Illinois Institute of Technology
SAM Legal Business Name:	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:	Pena Edsel
Program Contact Phone:	(703) 292-8080
Program Contact Email:	epena@nsf.gov

Application Status History

Status	Status Date
Declined	03/14/2022

Cognizant Program Officer Comments

Lead PROPOSAL ID: 2152988
Non-Lead PROPOSAL ID: 2152989
Lead PI: Hickernell, Fred J.
Non-Lead PI: Mak, Simon
INSTITUTION: Illinois Institute of Technology
Non-Lead INSTITUTION: Duke University
TITLE: Collaborative Research: Quasi-Monte Carlo for Efficient Simulations

Dear Dr. Hickernell and Dr. Mak:

I regret to inform you that your collaborative proposal submitted to the to the Computational and Data-Enabled Science and Engineering in Mathematical and Statistical Sciences (CDS&E-MSS) Program was not recommended for funding. The CDS&E-MSS program received a large number of proposals from an impressive group of researchers. The current budget does not allow the program to support all the competitive proposals that we would like to support. Therefore, the competition is very high.

Great care was taken to give each proposal the careful review it deserves. The two panels which evaluated your proposal was formed by researchers with a broad range of expertise in statistics, computational mathematics, and data science. Reviewers were asked to review the proposals based on the two main NSF review criteria (Intellectual Merit and Broader Impacts).

Your proposal received reviews from eight panelists (3 from Panel 1 and 5 from Panel 2) who rated it G, G, G (from Panel 1) and G, F, G, V, V/G (from Panel 2), respectively. Based on the reviews and the panels deliberations, Panel 1 placed your proposal in the "Not Discussed in Panel" category, while after a long discussion, Panel 2 placed it in the "Not Recommended for Funding" category. The Program Officers managing the CDS&E-MSS Program concurred with the placement by the panels of this proposal, and eventually recommended that this proposal be declined. I concur with this recommendation.

The reviews and panel summary are available through Fastlane. I encourage you to read these comments carefully since they contain suggestions for the research and future proposal preparation. 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 include below a portion of the Review Analysis for this proposal.

Sincerely,

Edsel A. Pena
Program Officer
Division of Mathematical Sciences

-- NSF CDS&E-MSS Team:
Stacey Levine, Yulia R. Gel and Edsel Pena

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Portion of Review Analysis

REVIEW ANALYSIS

Brief Overview of Project: The proposed project aims to develop an open source package called QMCPy, an extension of the QMC (quasi Monte-Carlo) package, in Python. It will also investigate other methodological and theoretical issues associated with QMC. Methods to be developed will have utility and provide computational tools in big data analytics and in Bayesian statistical modeling and analysis.

Intellectual Merit:

Strengths: Reviewers agreed that extending QMCP to QMCPy is important and will provide accessible computational tools helpful in big data analysis and the implementation of Bayesian statistical analysis. Ascertaining the QMC's convergence rates and overall performance from both theoretical and implementation perspectives were also deemed to be significant. The PIs are also judged to be highly capable to make the project successful.

Weaknesses: The eight reviewers of this proposal have divergent views (with ratings going from F to V, with five of them G ratings) on the important focus. Some felt that this was more geared towards the development of software, but that it has a weak theoretical thrust, thereby diminishing its innovative contributions in mathematics and statistics. Others felt that the software development thrust is commendable since it is more in line with the goals of the CDSE-MSS program of developing computational tools. There were also other weaknesses identified by reviewers, such as the need for a more detailed plan on how the software will be created and maintained, and some reviewers felt that more details and thorough discussions of the what the advances of the project will be.

Broader Impacts:

Strengths: There were several strong points pertinent to the Broader Impacts component of the proposal, such as the strong track record of the investigators in terms of mentoring students, both graduate and undergraduate, especially in terms of creating clean and efficient codes. The resulting package will also increase the accessibility to computational tools for big data analysis and Bayesian implementation.

Weaknesses: The panel would have welcomed seeing specific plans for recruiting students from under-represented groups, as well as concrete elements indicating that the students will also acquire more theoretical aspects pertinent to the algorithms.

Panels Recommendation: Panel 1 placed this in the "Not Discussed in Panel" category. Panel 2, after a long discussion placed this in the "Not Recommended for Funding" category.

CDSE-MSS Program Officers Recommendation: In consideration of the written reviews, the panels placement of this proposal in the "Not Discussed in Panel" (Panel 1) and "Not Recommended for Funding" (Panel 2) categories, decided to recommend this for declination. There were strengths in the proposal, especially in consideration of the goals of the CDSE-MSS program, but at the same time there were also weaknesses that made this less compelling than other proposals considered by the program.

Cognizant Program Officer Recommendation: I concur with the panels placement of this proposal and the recommendation of the CDSE-MSS program officers. Therefore, I recommend declination of this proposal.

Edsel A. Pena
Program Officer
Division of Mathematical Sciences

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
Panel Summary #1	02/28/2022

Proposal Review Summary of All Reviews

Review	Release Date
Proposal Review #8	02/28/2022
Proposal Review #7	02/28/2022
Proposal Review #6	02/28/2022
Proposal Review #5	02/28/2022
Proposal Review #4	02/28/2022
Proposal Review #3	02/28/2022
Proposal Review #2	02/28/2022
Proposal Review #1	02/28/2022

Process Statement

All proposals submitted to NSF are reviewed according to the two merit review criteria - intellectual merit and broader impacts - as described in the *NSF Proposal & Award Policies & Procedures Guide*. If a proposal is submitted to a specific program solicitation, additional review criteria may also have been used in the merit review of the proposal. Any additional review criteria used in the evaluation of a proposal would be described in the program

solicitation to which the proposal was submitted. If the proposal was submitted in response to a funding opportunity that involved both NSF and one or more external funding organizations, then NSF staff may consult with those external organizations before finalizing a recommendation.

Your proposal received an external review, either by *ad hoc* reviewers only, by panel only, or by a mix of *ad hoc* and panel reviews. Some proposals may be considered by more than one panel. Reviewers have knowledge of the science and engineering subfields involved in the proposal as well as potential applications when relevant. The reviewers' fields of specialty are usually complementary within a reviewer group. Sometimes, reviewers with a broader scientific, technical, or management expertise are required for proposals involving substantial size or complexity, partnerships, broad multidisciplinary content, or significant national or international implications.

When a panel is used, individual reviewers, who may be panelists or *ad hoc* reviewers, are usually asked to submit written reviews to inform the panel discussions. If, after a panel has discussed a proposal, the Program Officer believes that additional expert advice would be helpful, they may request post-panel *ad hoc* reviews. During a panel meeting, written summaries of the panel's discussions of proposals are prepared. These summaries are brief synopses of the salient points emerging from the panel's discussion of each proposal, as they relate to the NSF and solicitation-specific review criteria. Copies of all the reviews and panel summaries used in the decision-making process for your proposal are available to you and your co-Principal Investigator(s), if any, on the Research.gov "Proposal Status" screen.

When a panel is used, the panel usually has an opportunity to categorize proposals with respect to their degree of competitiveness or priority for funding. Panels may decide that the written reviews capture all the salient points and that no further discussion by the panel is warranted; in those cases a panel summary may not be provided.

Panelists and Program Officers with certain conflicts of interest are disqualified from either serving as a reviewer or otherwise participating in the review process. Panelists or Program Officers with conflicts of interest that do not require disqualification are asked to leave the meeting room while the proposal that contains the conflict is discussed and do not otherwise participate in any funding recommendations for that proposal. Any written review received from a reviewer who is identified as having a conflict of interest is not used in the review process.

In reading the reviews, please keep in mind that the reviews are addressed to NSF staff, and not necessarily to you, the Principal Investigator. Occasionally, reviews may contain irrelevant, non- substantive, erroneous or ad hominem statements. The review panel and the Program Officers disregard such statements in arriving at a recommendation for the proposal.

External reviews are advisory; NSF makes the decision to Award or Decline, or in the case of preliminary proposals, to Invite/Not Invite or Encourage/Discourage. While many projects warrant funding, budget limitations necessitate that many of these be declined. In the difficult decision-making process, Program Officers consider the relative strength of each project as well as other factors, such as award balance among sub-disciplines, geographic distribution, types of organizations, and the potential contribution of each award to broadening the participation of individuals from groups traditionally underrepresented in science, technology, engineering and mathematics.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director/Office Head/Office Director or their designee whether the proposal should be declined or recommended for an award (or Invite/Not Invite or Encourage/Discourage in the case of a preliminary proposal). Normally, final programmatic approval is at the division/office level; large or complex awards may receive additional levels of review. Because of the large volume of proposals, this review and consideration process may take six months or longer. Large proposals, particularly complex proposals, or proposals in programs involving external partnerships may require additional review and processing time. Information on funding rates for all NSF divisions can be found at https://dellweb.bfa.nsf.gov.

NSF allows resubmission of substantially revised proposals as described in the *NSF Proposal & Award Policies & Procedures Guide*, but encourages investigators to seek the advice of the Program Officer before resubmissions are prepared. Some program solicitations impose restrictions on the timing of resubmissions. Investigators should be aware that the Foundation will treat the revised proposal as a new proposal that will be subject to the standard review procedures.

Information about reconsideration of declined proposals is found in the *NSF Proposal & Award Policies & Procedures Guide*. If you have questions regarding the review of your proposal, please contact the Program Officer who managed your proposal. Contact information is available on Research.gov.