**REVISED BUDGET JUSTIFICATION**

**Illinois Institute of Technology**

**Senior Personnel**

Prof. Fred J. Hickernell, Professor of Applied Mathematics at Illinois Tech, will provide overall leadership for this project, and mentor the graduate and undergraduate student research assistant(s). He will contribute expertise in QMC methodology, especially error analysis and the theory underlying stopping criteria. The one-month summer salary compensates his time on the project.

Dr. Yuhan Ding, Senior Lecturer of Applied Mathematics at Illinois Tech, will co-lead this project, mentoring the student(s) and carrying out the theoretical and methodological development. Dr. Ding has co-authored several articles on adaptive algorithms. The one-month summer salary compensates her time on the project.

*Note: For purposes of NSF PAPPG section II.C.2.g(i)(a), the term “year” at Illinois Institute of Technology refers to IIT’s fiscal year (June 1 – May 31).*

**Other Personnel**

The graduate tuition scholarships and stipends will support PhD student(s) engaged in building out QMCPy as explained in the project. This includes ensuring that new contributions by themselves or others adhere to the QMCPy architecture, testing, and documentation requirements. The PhD students will also help develop some of the theoretical and methodological underpinnings of the new algorithms to be included in QMCPy. Aleksei Sorokin, a third-year, domestic PhD student at Illinois Tech and developer of QMCPy will be supported by this grant.

The modest undergraduate student support will fund a summer undergraduate student to learn how to contribute to large software projects and to build out some of the important auxiliary parts of QMCPy.

**Fringe Benefits**

IIT’s federally negotiated fringe benefit rates are: faculty academic salary, 27.9%; faculty summer salary, 8.5%; staff salary, 29.8%; and student stipends, 0.0%.

**Travel**

The senior personnel and research students will disseminate their results and introduce a broader audience to QMCPy through attendance at US and international conferences devoted to QMC and its applications. Major conferences that we anticipate attending are Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing, August 18–23, 2024 in Waterloo, Canada, Monte Carlo Methods and Its Applications (MCM), July 28 – August 1, 2025 in Chicago, and Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing (MCQMC) 2026, place to be determined, likely the summer. The conferences also provide us an opportunity to meet other experts in the field, engage in collaborative research, and discuss research problems of mutual interest.

At MCQMC 2018 and 2022, and at MCM 2023, we organized a lunch of attendees interested in promoting (quasi-)Monte Carlo software (food paid for by non-federal funds). This has rallied the QMC software community to establish standards and push for inclusion of QMC software in broad-based libraries. We wish to continue this tradition.

**Other Direct Costs**

Tuition

The PhD student(s) will be supported at 9 credits/yr. so that they may continue their studies while working on this grant.

**Indirect Costs**

IIT’s current federally negotiated indirect cost rate (agreement date 04/14/2023) is 55% of modified total direct costs (MTDC). MTDC include all salaries and wages, fringe benefits, materials, supplies, services, travel and up to the first $25,000 of each subaward. MTDC excludes equipment, participant support, capital expenditures, student tuition, rental costs of off-site facilities, as well as the portion of each subaward in excess of $25,000.

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|  | Y1 | Y2 | Y3 | Total |
| Direct Costs | $77,010 | $82,814 | $83,049 | $242,873 |
| Indirect Costs | $33,881 | $37,735 | $36,511 | $107,127 |
| Total Costs | $110,981 | $119,549 | $119,560 | $350,000 |
| *Modified Base* | *$61,602* | *$66,790* | *$66,384* | *$194,776* |

An inflationary rate of 4% is used for all categories for all years of the project.