**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 assistants. 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 students 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.

Dr. Sou-Cheng Choi, Chief Data Scientist at Kamakura Corporation will provide in-kind, voluntary expertise in software engineering, documentation, and advising on important use cases. She has co-authored numerous articles in the field of computational mathematics.

*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 new, domestic PhD student at Illinois Tech and developer of QMCPy will be supported by this grant.

The summer undergraduate student stipends will fund smaller scale, but crucial components of QMCPy. These include, for example, novel use cases found in the literature and code essentially built by others but needing to be adapted to the QMCPy architecture.

**Fringe Benefits**

IIT’s federally negotiated fringe benefit rates are: faculty academic salary, 22.4%; faculty summer salary, 7.7%; staff salary, 26.1%; and student stipends, 0.0%.

**Equipment**

None

**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.

**Participant Support**

None

**Other Direct Costs**

Materials and Supplies

Modest resources are needed for software license and website/blog maintenance fees.

Publications

Modest resources are required for making our publications open access.

Tuition

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

Other

None

**Indirect Costs**

IIT’s current federally negotiated indirect cost rate (agreement date 04/30/2021) is 54% 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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Y1 | Y2 | Y3 | Total |
| Direct Costs | $105,065 | $109,267 | $113,638 | $327,970 |
| Indirect Costs | $48,891 | $50,846 | $52,881 | $152,618 |
| Total Costs | $153,956 | $160,113 | $166,519 | $480,588 |
| *Modified Base* | *$90,539* | *$94,160* | *$97,927* | *$282,626* |

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