



Office of International Relations
Indian Institute of Technology Kharagpur

Student Undertaking to Apply for Foreign Internship

| Section A: Applicant details (to be filled in by student) | | | |
|--|--|------------------------------|--------------------|
| Name : | SAM BHUTI | | |
| Roll Number: | 20CH10054 | Degree enrolled in: | CB B-TECH |
| Department/ School/ Centre: | CHEMICAL | Expected date of graduation: | 1/04/2024 |
| Proposed Foreign internship details (to be filled in by student) | | | |
| Host organization (university/ laboratory) with full address | University of Waterloo, David R. Cheriton School of computer science, Ontario, Canada. | | |
| Name, title, contact of supervisor/mentor (if available) | Justin Wan, Co-director, computing & financial management Professor, Justin.Wan@uwaterloo.ca | | |
| Title of project/ Name of activity: | Computational finance using Machine learning techniques | | |
| Start date of internship: | 4/05/23 | End date of internship : | 21/07/23 |
| Source of funding & other support (self/ scholarship): | Agency | Amount awarded | Amount applied for |
| | IITACCS | CAD 8595 | CAD 8595 |
| Undertaking by student: | <ul style="list-style-type: none">My internship does not violate any academic schedule or policy of IIT Kharagpur. I take full responsibility for my conduct during my visit and agree to strictly follow all guidelines laid down by my host university and host country and I understand that I am answerable to the Dean IR and Dean SA in case of any misconduct that may harm the Institute's reputation.Once I accept the offer of an internship, I shall not renege on my acceptance, nor accept any other offer for internship from CDC/ Dept/ Any other source.I shall keep OIR & CDC informed about internship offers I receive/accept/decline.Failure to comply with the above may adversely affect my placement opportunities | | |
| Post completion requirements (if any): | - | | |
| I am using this form for (tick one): | An application made through OIR or FTP | Requesting NOC from Dean IR | Other (specify): |
| Signature of student with date: | Sambhuti 27/02/23 | | |
| Section B: Departmental Approval (to be filled in by Dept./School/ Centre) | | | |
| Faculty Advisor (signature with date): | 27/02/2023 (As per academic calendar) | | |
| Head of Dept/ School/ Centre (signature with seal and date): | S. Chakraborty 28/2/23 DEPARTMENT OF CHEMICAL ENGINEERING / HEAD Chemical Engineering Dept. IIT Kharagpur - 721302 | | |
| Section C: Institute Approval | | | |
| Chairperson CDC (signature with seal and date): | Prof. Rajakumar A. Chairman, CDC 27/02/2023 | | |
| Dean IR (signature with seal and date): | Sah-Sankalayachak (अंतर्राष्ट्रीय संबंध एवं श्रेणी) Associate Dean (International Relations & Ranking) भा.प्रौ.सं. खड़गपुर/ IIT Kharagpur 2/3/23 | | |

13 February, 2023
Application ID: 138498

**GLOBALINK RESEARCH INTERNSHIP (GRI) AWARD LETTER
DISBURSEMENT INFORMATION AND PLACEMENT TERMS AND CONDITIONS**

Dear Sambhuti ,

Congratulations! You have been selected by Mitacs and Professor Justin Wan from University of Waterloo to receive a 2023 Globalink Research Internship award. You are therefore invited to participate in a research project at University of Waterloo. Pursuant to an agreement with University of Waterloo, Mitacs will administer your funding grant.

Mitacs Globalink Research Internship is a competitive program that pairs top-ranked international students with specific research expertise with faculty at Canadian academic institutions for a twelve (12) week research project of mutual interest between May and October 2023. You have been selected by your Canadian host faculty project supervisor due to your background and skills in the research area and the unique contribution you will be making to the research during your stay. The skills required for your role (as described in the research description below) were found to clearly match your skills set, education, and research experience.

Research internship details

| | |
|--------------------------------|---|
| University/Institution: | University of Waterloo |
| Host professor: | Justin Wan |
| Research project title: | Computational Finance using Machine Learning Techniques |
| NOC code: | 41201 Post-secondary teaching and research assistants |
| Research description: | Optional pricing is one of the central activities in computational finance. The well-known Black-Scholes model of pricing the European option leads to a time dependent partial differential equation (PDE). While analytic solutions exist for special cases, numerical computation is necessary to approximate the solution. Beyond the standard Black-Scholes model for European option, many numerical methods have been developed for pricing American and exotic options such as Asian option. Furthermore, new features such as jumps in underlying asset prices and nonconstant volatility have been incorporated in jump-diffusion, Heston's, and regime-switching models. |

In practice, it is important that one can obtain the solutions fast and accurate. However, the complexity of the solution process depends on the number of underlying assets. When the number of assets are limited to 1 or 2, efficient PDE methods have been developed. In practice, the number of assets is often much higher in the order of tens or even hundreds. Statistical methods such as Monte Carlo have been proposed but still they are inefficient when the asset number is very high.

The research project is to explore machine learning technology in order to solve option pricing equations from computational finance in high dimensions. The project will particularly focus on applying the state-of-the-art machine learning models to improve the efficiency of financial computation. Machine learning has been showing success in different applications such as computer vision, but relatively few in computational finance. This project is to investigate the possibility of solving finance equations using machine learning technology that would be more effective than traditional approach.

Canada

Alberta  BRITISH COLUMBIA  Research Manitoba  BRUNSWICK  Nova Scotia  Ontario  Nunavut  Québec  Saskatchewan  Yukon 

Thanks to our funding partners. Merci à nos bailleurs de fonds.

During your internship, you will: Students will be involved in:

- 1) studying of machine learning techniques
- 2) studying of numerical methods for computational finance
- 3) implementation of the numerical methods
- 4) writing up of the results including the documentation of the code developed

Duration of research: 12 weeks — to begin between May 1 and July 31, 2023 (unless otherwise approved by Mitacs) and end no later than October 31, 2023 (unless otherwise approved by Mitacs). Shortened durations must be agreed upon with the host professor and Mitacs. Durations of more than twelve (12) weeks will not be permitted.

Hours of work: Forty (40) hours per week.

Your award covers the full twelve (12) week period of your internship unless you fall short of the full twelve (12) weeks, in which case the award amount will be prorated according to time actually spent contributing to the internship project.

As an intern, pursuant to Canada's *Immigrant and Refugee Protection Regulations* s2, you are entering Canada to undertake activities classified as "work". As such, you might be exempt from a work permit under the [Global Skills Strategy](#).

By accepting this internship and agreeing to this Award Letter, you will follow all clauses as laid out in *Appendix A: Terms and Conditions — Obligations of the Globalink research intern*.

You will need to follow all travel and public health requirements as mandated by the Public Health Agency of Canada, your host province, and your host institution in Canada. The following requirements are subject to change at any time; please ensure you keep yourself updated regularly: <https://travel.gc.ca/travel-covid/travel-restrictions/covid-vaccinated-travellers-entering-canada#entry-vaccinated>.

Upon arrival at the Port of Entry, you should have supporting documents, including (but not limited to):

- a printed copy of this Award Letter in its entirety
- your valid passport (at least 6 months validity) and any other document required to enter Canada (see <https://www.canada.ca/en/immigration-refugees-citizenship/services/visit-canada/entry-requirements-country.html>)
- proof that you meet requirements of the job, such as proof of work experience, IRCC approved medical exam (if applicable) and education
- necessary immigration documentation (i.e., letter of introduction, biometrics, visitor visa, eTA, if applicable)
- A printed copy of this webpage: [Short-term \(120-day\) work permit exemption for researchers - Canada.ca](https://www.canada.ca/en/immigration-refugees-citizenship/services/visit-canada/entry-requirements-country.html#short-term-120-day-work-permit-exemption-researchers)

We look forward to welcoming you as a temporary member of the research team at University of Waterloo.

Mitacs Globalink gratefully acknowledges the financial support of the Government of Ontario through the Ministry of Colleges and Universities and the Government of Canada.

Mitacs Globalink is delivered by Mitacs on behalf of the following Academic partners:

| | | |
|---------------------------------------|---|---|
| Acadia University | Ontario Tech University | Université du Québec en Outaouais |
| Algoma University | Polytechnique Montréal | Université Laval |
| Athabasca University | Queen's University | University of Alberta |
| Brandon University | Royal Military College of Canada | University of British Columbia |
| Brock University | Royal Roads University | University of Calgary |
| Cape Breton University | Saint Mary's University | University of Guelph |
| Carleton University | Saint Paul University | University of Lethbridge |
| Concordia University | Simon Fraser University | University of Manitoba |
| Concordia University of Edmonton | St. Francis Xavier University | University of New Brunswick |
| Dalhousie University | St. Thomas University | University of Northern British Columbia |
| École de Technologie Supérieure | Toronto Metropolitan University | University of Ottawa |
| Emily Carr University of Art + Design | Trinity Western University | University of Prince Edward Island |
| HEC Montréal | Thompson Rivers University | University of Regina |
| INRS | Trent University | University of Saskatchewan |
| Lakehead University | Trinity Western University | University of the Fraser Valley |
| Laurentian University | Université Bishop | University of Toronto |
| MacEwan University | Université de Moncton | University of Victoria |
| McGill University | Université de Montréal | University of Waterloo |
| McMaster University | Université de Sherbrooke | University of Windsor |
| Memorial University of Newfoundland | Université du Québec à Chicoutimi | University of Winnipeg |
| Mount Allison University | Université du Québec à Montréal | Vancouver Island University |
| Mount Royal University | Université du Québec à Rimouski | Western University |
| Mount Saint Vincent University | Université du Québec à Trois-Rivières | Wilfrid Laurier University |
| OCAD University | Université du Québec en Abitibi-Témiscamingue | York University |

Sincerely,



Petra Kukacka
Director, Program Operations

Enclosure:

- Appendix A: Terms and Conditions

Canada

Alberta  BRITISH COLUMBIA  Research Manitoba  BRUNSWICK  NEWFOUNDLAND & LABRADOR  NOVA SCOTIA  ONTARIO  MANITOBA  QUÉBEC  SASKATCHEWAN  YUKON 

Thanks to our funding partners. Merci à nos bailleurs de fonds.

Appendix A: Terms and Conditions

Obligations of Mitacs

a) Financial arrangements

Mitacs will be responsible for providing the following:

1. An airfare stipend of Can\$1,500;
2. A stipend of Can\$175 to contribute to the cost of transportation from the Canadian airport to accommodation, unless otherwise arranged by your host institution
3. A living stipend of Can\$200 per week, for the duration of your research internship, up to a maximum of 12 weeks
4. A housing allowance of Can\$315 per week, for the duration of your research internship, up to a maximum of 12 weeks
5. A stipend of Can\$300 for any student fees charged to you by your Canadian host institution (the intern must pay the student fees to the institution directly; student fees above Can\$300 are the responsibility of the intern)
6. Reimbursement of immigration document application fees (as required to participate in the research internship — up to a maximum of Can\$240)
7. An additional stipend of Can\$500, which may be used for COVID-19 and inflation-related expenses (e.g. COVID tests, living expenses, etc.)
8. Ensuring that you receive Canadian medical insurance

Under Mitacs's funding policy, we are unable to provide you with any funds in advance of your internship start date and arrival in Canada. In order to receive funding, all interns must possess a valid immigration permit for the duration of their internship. Interns will be responsible for opening a Canadian bank account, following Mitacs's instructions, in order to receive funds once in Canada. Funds will be disbursed in installments to the intern; dates and exact amounts will be provided via email to the intern.

b) Local arrangements

You are responsible for finding and booking your own accommodations for the duration of your stay in Canada. Mitacs will provide you with tools to assist you with your search.

Mitacs will assume responsibility for the following aspects of your local arrangements:

1. Provision of medical insurance to cover you for the duration of your research internship
2. Professional skills courses and/or networking opportunities to enhance the experience of your research internship
3. Provision of a Mitacs-approved Globalink Mentor for you to consult with about issues and questions that arise during your stay in Canada and act as your emergency contact. (Please note that the University of Alberta provides their own mentors.)
4. Other activities at the sole discretion of Mitacs.

Obligations of the Globalink research intern

1. This award is contingent on the permission of Canadian governments, the host institution, as well as the government of your home country for free movement of interns across borders for research purposes. In circumstances where you are not able to travel to Canada, this Award Letter will be terminated. Please note that you will not be reimbursed any costs if you are not able to travel to Canada to carry out your internship. Please ensure you follow Mitacs's instructions in preparation for your internship and that such costs have not been incurred against the advice of Mitacs.
2. Upon your arrival in Canada and throughout your stay, you are required to follow all public health protocols and guidelines of the federal government, the province in which you are hosted and the Canadian institution at which you are performing research, if applicable. You must also comply with all instructions provided by Mitacs including, but not limited to, arrangement of flights and housing, arrangement of immigration documentation, dates of travel, etc. Mitacs will not cover any costs incurred where the intern has not complied with instructions delivered through Mitacs.
3. Please be advised that, for immigration purposes, Mitacs is not your representative and cannot provide advice on immigration matters. Mitacs will provide you with information as available on public government websites to potentially help navigate through the immigration process, but Mitacs cannot guarantee nor make any representation regarding positive immigration outcomes.
4. Please be advised that immigration requirements vary depending on your profile and country of origin. Therefore, all wait times listed on the Canadian immigration website: <https://www.canada.ca/en/immigration-refugees-citizenship/services/application/check-processing-times.html> are subjective. It is your responsibility to start your process as soon as possible and to research all immigration requirements when applying as these can change at any time.
5. You are required to participate in the program for 12 weeks, working 40 hours per week for your host supervisor on the research project, unless otherwise arranged with the Canadian supervisor and approved by Mitacs. You are also required to report any absences to your supervisor. Mitacs may terminate your internship if you do not adhere to these guidelines. If the duration of your internship needs to be shortened, contact Mitacs at helpdesk@mitacs.ca.
6. As a key component of the Globalink program, Mitacs may offer you opportunities to engage in professional skills courses, networking meetings, and other events to supplement your research experience. Mitacs will, whenever possible, schedule meetings and courses in such a way as to minimize the impact on your primary focus, that of contributing to the research project. You are encouraged to participate in such Mitacs-arranged meetings and courses, and your host professor will be asked to support this component of the Globalink program. You are normally expected to dedicate 40 hours per week on your research project and will need to make arrangements with your host professor regarding time away from your research project.
7. You are expected to complete a mid-term survey and a final survey administered by Mitacs to rate your experience of the program and to receive a final certificate of completion.
8. You are required to check with your home institution regarding any conditions or actions involved with participating in the GRI program.