13 February, 2023
Application ID: 125691

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

Dear Yubo Cai,

Congratulations! You have been selected by Mitacs and Professor Maryam Daryalal from HEC Montréal to receive a 2023 Globalink Research Internship award. You are therefore invited to participate in a research project at HEC Montréal. **Pursuant to an agreement with HEC Montréal, 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:	HEC Montréal
Host professor:	Maryam Daryalal
Research project title:	Mathematical Programming Methods for Semantic Web and Logical Inference
NOC code:	41201 Post-secondary teaching and research assistants
Research description:	World Wide Web is our main tool for dealing with data. It has been developed with its focus only on humans, not on the processing elements of the system. Its ultimate purpose is to store and deliver documents, hence the name "web of documents". In this context, machines do not comprehend the data they are transferring, and knowledge is mainly extracted by humans. Accordingly, due to the rapid growth of data, this knowledge can easily become out of date or remain largely unexplored. Semantic Web is an attempt to extend the current Web, in such a way that makes data comprehensible for machines. To facilitate communication between various autonomous agents in the Web, the Semantic Web needs to establish a common terminology between them through a set of standardized axioms called an "ontology". Then, knowledge is derived by making logical inferences over these ontologies. This is not an easy task and many studies focus on developing reasoning algorithms that scale well with the ever-increasing size of the data. The goal of this project is to address the problem of reasoning scalability for ontologies, and consequently Semantic Web, using Integer Linear Programming (ILP) techniques. It is defined based on the observation that the axioms in an ontology can be modelled by inequality restrictions. Therefore, logical inference corresponds to satisfying a set of inequalities or finding out that they have a conflict. ILP is an optimization tool directly dealing with satisfiability problem, with an extensive body of work focused on tackling the computational issues as the number of inequalities grow. However, very few studies have so far leveraged the power of ILP techniques for ontology reasoning. In this work, we will design novel reasoners employing decomposition methods for ILP and large-scale optimization, and extract data models from large-size ontologies.

During your internship, you will:	- Under the supervision of the advisor, the student will gather and summarize the related scientific articles focused on optimization techniques and description logic. - The student will participate in formulating the standard logical axioms as inequalities suitable for integer linear programming techniques. - The student will participate in programming the obtained models, with the goal of developing a working reasoner towards the end of the internship. - The student will participate in testing the implemented reasoner with existing ontologies to evaluate the performance of the newly developed reasoner. - The student will prepare a complete report including the related literature of the work, the steps taken, the developed algorithm, the numerical experiments, and a conclusion.
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

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

100 College St #522
University of Toronto
Toronto ON M5G 1L5

405 Ogilvy Avenue # 101
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56 Sparks Street # 300
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6190 Agronomy Road, # 301
University of British Columbia
Vancouver BC V6T 1Z3

Appendix A: Terms and Conditions

<u>**Obligations of Mitacs**</u>

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.

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