Algorithms and Software for the Comparison of Phylogenetic Structures

Record number : OPR-1426

Overview

RESEARCH DIRECTION

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INFORMATION

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ADMINISTRATIVE UNIT(S)

Faculté des sciences
Département d'informatique

LEVEL(S)

2e cycle
3e cycle

LOCATION(S)

Université de Sherbrooke, campus principal

Project Description

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The comparison of phylogenetic structures is a central problem in computational biology, particularly in the analysis of data arising from genomics and computational immunology. Phylogenetic trees and evolutionary networks provide models for representing complex evolutionary relationships; however, their large-scale analysis requires the development of efficient algorithmic methods as well as reliable and reproducible software tools.
This project is situated within applied computer science and scientific software development. It focuses on the design, implementation, and optimization of methods for comparing phylogenetic structures, with an emphasis on algorithmic efficiency, implementation robustness, and integration into reproducible computational environments.

Research Themes

The research may include the following directions:

- the design and implementation of algorithms for comparing phylogenetic trees and networks;
- the optimization of data structures and algorithms to improve time and memory efficiency;
- the experimental analysis of the complexity and scalability of the proposed methods;
- the development of robust and reproducible scientific software libraries;
- the implementation of integrated tools for the processing and analysis of phylogenetic data;
- the validation of methods on both simulated and real datasets;
- the integration and comparison of multiple approaches within a unified software framework.

Particular attention will be given to software quality, reproducibility of results, and accessibility of the tools to the scientific community.

Profile

The project is intended for students with a strong interest in applied algorithms and scientific software development. The following skills are expected:

- solid foundations in algorithms and data structures;
- programming experience (Python, C++, or equivalent scientific programming language);
- interest in software development and research tools;
- ability to work on practical problems and design efficient solutions.

Internship students are also encouraged to apply. An internship in this project may serve as a structured introduction to research and as a transition toward graduate studies (M.Sc. or Ph.D.), providing gradual exposure to scientific problems and the tools developed within the group.

Assets

- knowledge of bioinformatics or phylogenetics;
- experience in algorithmic optimization;
- familiarity with scientific software development;
- interest in performance, robustness, and scalability of systems.

Doctoral Supervision and International Collaboration
At the doctoral level, an international co-supervision arrangement may be considered, including collaborations with partners in France or other countries, depending on the candidate's research interests and the direction of the project.

Application

Interested candidates are invited to submit their application to:
Nadia.Tahiri@USherbrooke.ca
The application must include the following documents:
- a curriculum vitae;
- the most recent academic transcripts;
- a statement of motivation;
- a letter of recommendation;
- two references (name, affiliation, address, and email).

Discipline(s) by sector

Sciences naturelles et génie

Biologie et autres sciences connexes,
Informatique, Mathématiques appliquées

Funding offered

To be discussed

The last update was on 30 June 2026. The University reserves the right to modify its projects without notice.