



CANSSI Quebec Recruitment Scholarship

List of Potential Supervisors (2024)

Funding amounts are in Canadian dollars.

1. Cédric Beaulac

(beaulac.cedric@uqam.ca)

Professor, Université du Québec à Montréal (UQAM) Mathematics

Research Interests: I am developing novel models for image analysis by integrating tools from functional data analysis. The main idea behind the models I am developing is to study shapes in images rather than simply rely on pixels. There are multiple potential projects ranging from edge detection to shape generation.

Standard Support Funding: Students can expect to be supported to about \$35,000, which includes some paid work as teaching assistant and scholarships.

2. Jean-François Renaud

(renaud.jf@uqam.ca)

Professor, Université du Québec à Montréal (UQAM) Mathematics

Research Interests: My research interests fall under the (large) umbrella of stochastic optimization and dynamic decision-making. More specifically, I'm interested in stochastic control problems in which withdrawals (e.g., dividend payments) and injections (e.g., issuance of equity) are possible to alter the evolution of a stochastic system (e.g., cash fund). My approach is rather probabilistic and thus based on stochastic processes, such as diffusion processes or Lévy processes.

Standard Support Funding: I want to guarantee a total funding of (at least) \$30,000 per year to each of my PhD students, including teaching duties, institutional funding and various scholarships

3. Yang Lu

(yang.lu@concordia.ca)

Associate Professor, Concordia University, Department of Mathematics and Statistics

Research Interests: I am interested in statistical applications in insurance and finance.

Standard Support Funding: I have several ongoing grants with NSERC, SSHRC, FRQ, Autorité des marchés financiers, etc. By combining such grants with the CANSSI



recruitment scholarship, I can offer competitive funding packages for interested students.

4. Masoud Asgharian

(masoud.asgharian2@mcgill.ca)

Member of the Faculty of Science (Full Professor), McGill University, Mathematics and Statistics

Research Interests: I have diverse interests and have supervised in the following areas: Survival analysis, Causal inference, Large p Small n problems, Learning theory and OR/Optimization. My current research is mostly focused on causality and learning on selection bias.

Standard Support Funding: Over the past 24 years that I have been at McGill we have always offered financial support to our graduate students, both at the master's and PhD level. My contribution has always been from my NSERC discovery grants.

5. Léo Belzile

(leo.belzile@hec.ca)

Associate Professor, HEC Montréal, Decision Sciences

Research Interests: Modeling of rare events and extreme values: multidimensional and spatio-temporal extremes, Bayesian and likelihood-based inference. Detection and attribution. Applications in hydrology, environment, demography, and climate sciences. *Potential Projects:* 1. Semiparametric models for extremes in survival data, 2. Stochastic generators for extreme precipitation, 3. Extremes based on the geometric approach: estimators and asymptotic theory, 4. Multidimensional spatial extreme models.

Standard Support Funding: PhD students enrolled at HEC Montréal receive guaranteed annual funding of \$30K for four years (provided by supervisors and the school). Doctoral students have the opportunity to teach up to two courses. The school reserves an amount of \$5K for participation in scientific conferences.

6. Johanna Neslehova

(johanna.neslehova@mcgill.ca)

Full Professor, McGill University, Department of Mathematics and Statistics

Research Interests: Extreme-value theory: multivariate modeling, spatio-temporal extremes and causal inference for extremes, extremes of dependent sequences. Multivariate analysis: dependence modeling, rank-based inference for copula models, models for data with ties. Applications of these models in the environmental sciences, health and risk management.



Standard Support Funding: In my department, the amount requested from the supervisor for a PhD student is \$12,000 CAD per annum. This amount is supplemented by TAships (ca. \$4,954.50 CAD per annum) and a Graduate Excellence Award (ca. \$20,150 CAD in years 1-3, but only about \$5,000 CAD year 4 as the tuition fees decrease). These amounts are based on the admission offers made for fall 2024.

7. Alexandre Bureau

(alexandre.bureau@fmed.ulaval.ca)

Professor, Université Laval, Social and Preventive Medicine

Research Interests: Developing statistical methods to infer gene expression regulation mechanisms from 3D genomic contact data obtained using technologies such as single-cell Hi-C. This research is motivated by studies of schizophrenia and bipolar disorder conducted at the CERVO Brain Research Centre and focuses on brain tissues.

Standard Support Funding: Scholarship: \$24,000 for the first year, renewable for two additional years. PhD Exam Success Award: A \$3,000 award for passing the PhD exam within the target session. Progression Scholarship: A \$2,500 award for satisfactory academic progress. Offered to students in their 7th semester of full-time PhD enrollment. Writing Scholarship 1: A \$2,000 award for satisfactory progress, available to students in their 9th or 10th semester of full-time enrollment, upon recommendation by the research director to the program director. Writing Scholarship 2: A \$2,000 award for satisfactory progress in the 11th semester. Offered to students in their 11th semester of full-time enrollment, upon recommendation by the research director to the program director. Initial Submission Award: A \$2,500 award for the initial submission of the thesis before the end of the 12th semester. Offered to students who complete the initial submission within the 12th semester of PhD enrollment.

8. Denis Talbot

(denis.talbot@fmed.ulaval.ca)

Professor, Université Laval, Social and Preventive Medicine

Research Interests: My research focuses broadly on the development, adaptation, and evaluation of statistical methods for causal inference from epidemiological health data. Causal inference aims to determine the impact of an intervention, such as a medical treatment or public policy, on an outcome. The research project for which I seek to recruit a PhD student aims to develop new methods for causal inference in personalized medicine when the outcome of interest is time-to-event data (i.e., survival data). Personalized medicine seeks to identify decision rules that consider



individuals' characteristics to optimize their health outcomes. Although several methods have been developed in recent years, significant challenges remain for survival data. For example, many methods require strong assumptions regarding the censoring mechanism and do not handle competing risks in a statistically valid and clinically relevant way. The project's objective is to develop new methods better suited for survival data. We will use semiparametric or nonparametric efficiency theory to develop estimators that integrate machine learning while maintaining desirable theoretical properties (e.g., root-n convergence). This project is motivated by the need to better personalize hormone therapy recommendations for women with breast cancer. This treatment is currently recommended for most women with non-metastatic hormone-dependent breast cancer but does not always produce the desired effects. To avoid unnecessary side effects for women who will not benefit, it is essential to better identify these women. The project will be carried out in close collaboration with epidemiology experts and a patient partner. The project is funded by the Canadian Institutes of Health Research.

Standard Support Funding: The PhD program in biostatistics is a bi-faculty program jointly managed by the Faculty of Medicine and the Faculty of Science and Engineering at Université Laval. The Faculty of Medicine strongly recommends, without being mandatory, a minimum funding of \$21,000 per year in scholarships for PhD students. This is the amount I will offer for a maximum period of four years to the selected candidate. To my knowledge, there is no similar policy at the Faculty of Science and Engineering. PhD students in biostatistics benefit from a progression scholarship program offered by the Faculty of Medicine to encourage and reward progress according to expected timelines. For example, students receive \$500 upon signing their collaboration plan (first semester), \$3,000 for passing the doctoral exam (2nd year), \$2,500 for satisfactory progress in the 7th semester, 9th or 10th, and 11th semester, \$2,000 for initial submission before the end of the 12th semester, \$250 for passing a French or English course, and may receive a scholarship for their first scientific publication as the first author (availability and amount vary). In addition, international PhD students at Université Laval benefit from a waiver of the increased tuition fees for the first 8 semesters of their program. Students interested in research or teaching assistant positions can apply, and the positions are awarded based on experience and merit.



9. Melina Mailhot

(melina.mailhot@concordia.ca)

Associate Professor, Concordia University, Mathematics and Statistics

Research Interests: My research interests are related to spatio-temporal models related to insurable risks affected by natural catastrophes. The potential projects are related to dependence models and multivariate risk measures and risk uncertainty.

Standard Support Funding: At Concordia, students receive a funding package of approximately \$27,000/year for 4 years. I also have additional funding resources which help offering more competitive funding packages to my graduate students.

10. Lisa Kakinami

(lisa.kakinami@concordia.ca)

Associate Professor, Concordia University, Mathematics and Statistics

Research Interests: From the perspective of epidemiology and applied (bio)statistics, my research falls into one of four domains within a broad overview of obesity and cardiovascular disease risk:

- (1) health methodologies (validation)
- (2) the environment (social and built) and health
- (3) socioeconomic determinants of health
- (4) health behaviours and chronic disease

Potential projects include:

- Longitudinal association between neighbourhood socioeconomic position and the built environment on future health
- Measurement uncertainty of the built environment
- Statistical learning approaches to body composition measurements on predicting health
- Health consequences of weight intentions and weight history
- The use of compensatory behaviours, and their health implications

Standard Support Funding: Concordia University offers competitive funding packages for local and international PhD students. In the Department of Mathematics and Statistics, the funding for students is a combination of supervisory support, and research assistantships or teaching assistantships in the department (such as marking assignments, leading tutorials, or course lecturer) and is guaranteed for four years for full-time PhD students.



11. Juliana Schulz

(juliana.schulz@hec.ca)

Associate Professor, HEC Montréal, Department of Decision Sciences

Research Interests: My work primarily focuses on dependence modelling, with the goal of developing novel multivariate statistical models appropriate for various types of data, including multi-dimensional discrete and mixed outcomes. With a background in actuarial mathematics, I am particularly interested in developing statistical methods appropriate for the analysis of multivariate claims data stemming from non-life insurance. I am also interested in biostatistical approaches for precision medicine wherein the objective is to develop statistical methods for estimating optimal personalized treatment strategies.

Standard Support Funding: Minimum funding of \$120,000 over 4 years (\$30,000 per year).

12. Taoufik Bouezmarni

(Taoufik.Bouezmarni@Usherbrooke.ca)

Full Professor, Université de Sherbrooke, Mathematics

Research Interests: Survival Analysis; Kernel smoothing for semi and nonparametric methods; Econometrics (Causality and inequality); Dependence modelling: estimation and inference; Independence and conditional independence tests.

Standard Support Funding: \$25,000 All-Inclusive.

13. Maciej Augustyniak

(maciej.augustyniak@umontreal.ca)

Associate Professor, Université de Montréal, Mathematics and Statistics

Research Interests: I am a researcher in actuarial science and quantitative risk management. My research aims to develop new models and methods to quantify and manage long-term risks in actuarial and financial applications. This research program involves multidisciplinary expertise, and therefore, I have research interests in various disciplines. *Econometrics and Computational Statistics:* I seek to contribute methodologically and in modeling within the class of hidden Markov chain processes applied to financial time series. *Keywords in English:* *hidden Markov models, regime-switching models, GARCH models, state space models, filtering techniques, particle filters, Kalman filter, EM algorithm.* *Quantitative Finance:* My goal is to study and develop techniques for more effective management of long-term financial risks. *Keywords in English:* *quadratic hedging, variance-optimal hedging, mean-variance hedging, local risk-minimization, dynamic programming.* *Actuarial Science:* I aim to analyze and improve the efficiency of hedging strategies used in the context of



financial products sold with investment guarantees, known as segregated funds.

Keywords in English: risk management, dynamic hedging, variable annuities, equity-linked life insurance, segregated funds, model risk, lapse risk, stochastic volatility, stochastic interest rates

Standard Support Funding: The typical support aims for \$20,000 per year.

14. Karim Oualkacha

(oualkacha.karim@uqam.ca)

Professor, Université du Québec à Montréal, Mathematics

Research Interests: My research deals with developing multivariate statistical models for analyses of high-dimensional and dependent data, with applications to genomics studies. In many genetic studies, clinically-relevant multiple phenotypes (outcomes) are measured. Understanding their relationship with recent high-throughput genomic data is of primary interest to many practitioners. I have developed several methods to maximize the utility of multiple correlated, e.g., principal components of heritability. This is known as phenotype optimization problem. Modelling the dependence of multiple phenotypes via copulas is another aspect to tackle the phenotype optimization problem, and is also a research area that I am interested in. I have developed several copula-based association models for familial data and both continuous (non-normally distributed), dichotomous and mixed phenotypes. Penalized (robust) regression methods are also another important component in my research given that genomics data are high dimensional, noisy, and heterogeneity prone. I have developed several penalized quantile/expectile regression methods, and penalized generalized linear mixed models, with most appealing penalties.

Potential projet: with my PhD student, Julien St-Pierre (U McGill), who is graduating in October 2024, I have developed a penalized GLMM framework (pGLMM) for high-dimensional setting (St-Pierre et al., Bioinformatics, 2023, btad063). pGLMM accounts for the familial dependency structure between subjects from the same family using a random effect. The model parameters are estimated through a loss function based on the penalized quasi-likelihood (PQL). pGLMM uses block coordinate descent techniques to solve the underlying optimization problem to estimate both fixed and random effects parameters of the model in presence of high-dimensional genetic data. This makes it computationally efficient and allows it to scale to large biobank genomics data. Through both simulation study and analysis of data from UKBiobank cohort study, pGLMM demonstrates its superiority compared to existing penalized models that are dealing with familial structure.



The proposed PhD project aims to extend pGLMM to penalized L_p -quantile framework, including both penalized quantile and expectile regression methods, in presence of related subjects and/or hidden relatedness. This aim will be achieved by adding random effects into the L_p -quantile regression model to control for familial (or hidden relatedness) dependency. In fact, if one assumes that a (continuous) outcome of interest is generated from the skewed power exponential distribution (Nelson (1991), *Econometrica*, 59, 347-370), some simple calculation can show that the L_p -quantile loss function estimation is equivalent to the maximum likelihood estimation. Thus, we will assume that, conditionally on the covariates and the random effects, the outcome follows skewed power exponential distribution. This allows us to write the conditional likelihood as the integral of the L_p quantile loss. To get rid of the integral and obtain the marginal likelihood, Laplace approximation technique, similar to what we did in pGLMM, can be used. To allow for variable selection, a penalty term, in a same way as in pGLMM, will be added to the L_p -quantile model to perform variable selection in the context of genetic association studies.

Standard Support Funding: Support amount:

The Faculty of Science of UQAM provides a tuition waiver of \$12,000 each year, for international PhD students, for three years. Additionally, having been admitted to the PhD program at the Université du Québec à Montréal (UQAM), upon their arrival to the university, the student automatically receives a UQAM Doctoral Universal Support Scholarship worth \$13,000 for the first three years of their PhD. This scholarship is distributed as follows: \$5,000 in the first year, \$4,000 in the second year, and \$4,000 in the third year of the PhD program. For more details about the UQAM Doctoral Universal Support Scholarship, please refer to the following link:
<https://bourses.uqam.ca/trouver-une-bourse/programme-de-bourses-de-soutien-universel-au-doctorat/>

Of note also that I will encourage the student to apply for a scholarship, of amount around \$5,000/per year (for two years), from the Institut des sciences mathématiques du Québec (ISM). As an international PhD student, they have high chance to be awarded the ISM scholarship because the selection criteria (in our department of mathematics at UQAM) favour the recruitment of students from outside both Quebec and Canada.

In addition, being admitted to the doctoral program of the Université du Québec à Montréal (UQAM), student can apply for a doctoral recruitment scholarship from the Centre de recherche facultaire en statistique et sciences des données de l'UQAM, STATQAM. This scholarship is worth \$5,000 and will be paid in full to student, in the fall



of 2025, when they arrive at UQAM. For more details about this recruitment scholarship program, please consult the following link:
<https://statqam.uqam.ca/bourses-recrutement/>.

It is also important to note that student will become eligible to perform teaching assistantships in our department. Such teaching assistantships can guarantee a total (on average) of 50 hours of work per semester, for a total amount of approximately \$4,000 each year.

In addition, I will support the recruited doctoral student during the completion of their doctoral thesis with a support grant from my own Natural Sciences and Engineering Research Council of Canada (NSERC) funds.

To sum up, depending on which scholarships they will obtain each year, I will complete their funds, conditional on satisfactory performance throughout the duration of the doctorate, to secure for them an amount around \$27,000-\$30,000 per year.

Support plan:

Together with the student, we will develop a clear research plan that outlines the specific objectives, methodologies, and timelines for the PhD projects.

We will hold regular meetings to discuss the progress of the research, address challenges, and plan next steps. These meetings will provide the opportunity for feedback and guidance.

We will identify technical skills and theoretical knowledge needed for the research.

Recommend courses, workshops, or seminars that will help the student acquire these skills.

15. Kirill Neklyudov

(kirill.nekliudov@umontreal.ca)

Assistant Professor, Université de Montréal, Mathematics and Statistics

Research Interests: My studies include Artificial Intelligence for applications in natural sciences, Optimal Transport, Differential Geometry of probability spaces, and Monte Carlo methods.

Standard Support Funding: Currently, the standard support amount for a PhD student is 25 thousand CAD. Fortunately, a lot of internship opportunities are available for students in our area. These, however, expect some level of seniority of the applicant. Thus, I believe the CANSSI Quebec Recruitment Scholarship would relieve some financial burden from junior students beginning their scientific careers.



Canadian Statistical Sciences Institute
Institut canadien des sciences statistiques

Simon Fraser University
8888 University Drive
Burnaby BC Canada V5A 1S6

canssi.ca | incass.ca

16. Abbas Khalili

(abbas.khalili@mcgill.ca)

Professor of Statistics, McGill University, Mathematics and Statistics

Research Interests: The main theme of my research is:

1. High-dimensional statistics
2. Distributed learning in big data problems
3. Neural Networks: theory and applications in latent variable models
4. Post-model selection inference

Standard Support Funding: The standard contribution from supervisor(s) to support a PhD student in our dept is \$12K per year, for four years. In addition, there will be money from teaching assistant and scholarships.

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CANSSI is hosted at Simon Fraser University. L'INCASS est hébergé à l'Université Simon Fraser.