

Graduate Scholarships

Montréal, Canada (UQAM)

We invite you to apply for a MSc or PhD grant, in the area of economics, statistics and data science, applied to insurance, starting mid-Spring 2023 (MSc) or Fall 2023 (PhD). We are seeking applications of students with a solid background in applied mathematics, theoretical economics, actuarial modeling, statistical learning and/or data science. Students interested in a PhD application (starting Fall 2023) are encouraged to apply for a Spring-Summer internship.

Topics Description :

Here is a list of possible topics:

1. Game theory for insurance

keywords: game theory; dynamic games; insurance markets; bargain

references:

Lemaire, J. (1980). A game theoretic look at life insurance underwriting.

<https://doi.org/10.1017/S0515036100006565>

Lemaire, J. (1991). Cooperative game theory and its insurance applications.

<https://doi.org/10.2143/AST.21.1.2005399>

2. Quantifying uncertainty in risk models

keywords: machine learning; neural networks; uncertainty; autocalibration; MCdropout; bayesian models

references:

Gal, Y. (2016) Uncertainty in Deep Learning <http://mlg.eng.cam.ac.uk/yarin/thesis/thesis.pdf>

Lahlou et al. (2022): *Direct Epistemic Uncertainty Prediction* <https://arxiv.org/pdf/2102.08501.pdf>

3. Dimension reduction and interpretability

keywords: UMAP; T-SNE; Shapley; VAE

McInnes, L. & Healy, J (2018) *UMAP: Uniform Manifold Approximation and Projection for Dimension Reduction*, <https://arxiv.org/abs/1802.03426>

Hinton & Roweis (2002) *Stochastic neighbor embedding*

<https://proceedings.neurips.cc/paper/2002/file/6150ccc6069bea6b5716254057a194ef-Paper.pdf>

v.d. Maaten & Hinton (2008): *Visualizing Data using t-SNE*

<https://jmlr.org/papers/volume9/vandermaaten08a/vandermaaten08a.pdf>

4. Networks and risk sharing mechanism

keywords: networks; dynamic networks; P2P; altruism

references:

Charpentier, A., Kouakou, L., Löwe, M., Ratz, P., & Vermet, F. (2021). Collaborative insurance sustainability and network structure <https://arxiv.org/abs/2107.02764>

Abdikerimova & Feng (2022): *Peer-to-peer multi-risk insurance and mutual aid*

<https://www.sciencedirect.com/science/article/pii/S0377221721007761>

5. Optimal transport for insurance

keywords: optimal transport; multivariate quantiles; risk measures; counterfactual; causal inference

references:

Carlier, G. (2010). Optimal Transportation and Economic Applications.

<http://dedekind.mit.edu/~dws/boulder/IMA-transport-Lecture-Notes.pdf>

Additional Information :

Candidates will be located in the mathematics department at UQAM (Montréal). On some topics, industrial partnerships are associated with the project, and candidates will be working and interacting with either colleagues in Canada and France, or PhD students at UQAM.

The scholarship grants will be at a competitive level, with additional funding for travels (for PhD students) and local workshops and seminars (MSc and PhD)

Applications must be submitted electronically through email before February 1, 2023 to charpentier.arthur@uqam.ca and consist of the following:

- A (short) cover letter ;
- A detailed curriculum vitae ;
- Two contacts for recommendations

Contacts:

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