



# Agathe Fernandes Machado

## PhD Student in Mathematics

I am currently pursuing a PhD program in Mathematics with a specialization in Statistics, at UQAM, in Montreal (Quebec, Canada). My research focuses on exploring fairness and calibration (uncertainty) within Machine Learning methods, with a particular emphasis on their applications in the field of actuarial sciences.

## Professional Experience

- **2022 - 2023 (1 year)**  
Generali | Nantes, France  
**Apprenticeship in Actuarial Science: Reinsurance, CAT Modelling**
  - Familiarisation with **RMS** software to model **natural disasters** (windstorms)
  - Use of Monte Carlo simulations to get reinsurance losses per year
  - Study of **reinsurance pricing** methods: Burning Cost and stochastic methods
  - Programming in Python, PySpark and R
- **2022 (3 months)**  
Seabird | Paris, France  
**Internship in Actuarial Science: Drought Risk, Credit Insurance**
  - Study of withdrawal-swelling of clay soils due to drought and correlation calculation between **drought indices** (KBDI, SSWI) and claims: use of **extreme values theory**
  - Beginning of mission on **credit insurance**: study of pricing factors, calculation of the ultimate cost of claims
- **2021 (4 months)**  
Crédit Agricole | Vannes, France  
**Internship in Data Science**
  - Marketing Research and Development Department
  - Modelling **tracking data** and customer profile to optimize **scores** using Machine Learning techniques (XGBoost, Random Forest)
  - Calculation of a **Machine Learning score** following a comparison of different models
  - Programming in SAS Guide, Python and SQL

## Education

- **2024 - 2023**  
UQAM | Montreal, Canada  
**Ph.D in Mathematics, Statistics | Supervisor: Arthur Charpentier**
  - Coursework at MILA & UQAM: **Probabilistic Graphical Models, Representation Learning, Fairness** and discrimination in predictive models
  - Research on: **Fairness and Calibration** of predictive models, Applications in **Insurance**
- **2021 - 2023**  
EURIA | Brest, France  
**M.Sc. in Actuarial Science**
  - Study of **time series** and duration models, use of the R programming language for **non-life insurance pricing** (GLM)
  - Study of stochastic processes, risk measurement and **statistical learning**
- **2021 - 2019**  
IMT Atlantique | Brest, France  
**M.Sc. in Engineering school**  
Major: **Mathematical and Computational Engineering**
  - Use of the main **Machine Learning** methods: clustering, supervised learning and factor analysis with the library sklearn on Python
  - **Probabilities** and inferential statistics, stochastic processes (Markov chains)
  - Portfolio management course with R
  - Contextual studies: familiarisation with computer languages such as Matlab and Java
- **2017 - 2019**  
Lycée Chateaubriand | Rennes, France  
**Classe préparatoire in Sciences (PCSI, PC\*)**  
Major: Physics, Mathematics and Chemistry

## Contact

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### Homepage

<https://fer-agathe.github.io/>

### Social media

[https://www.linkedin.com/in/agathe-](https://www.linkedin.com/in/agathe-fernandes-machado-a5a950194/)

[fernandes-machado-a5a950194/](https://www.linkedin.com/in/agathe-fernandes-machado-a5a950194/)

## Interests

### Actuarial Science

Climate modelling, Non-life insurance

### Machine Learning

Calibration (Uncertainty), Fairness

## Skills

### Programming

- Advanced in R, Python, SAS and SQL
- Intermediate in Java, Matlab, Javascript, PyTorch
- Beginner in PySpark and C++

### Softwares

- Latex
- Office

### Languages

- French (native)
- English (TOEIC: 965, IELTS: 7.5)
- Spanish (B2)

## Preprints

### Geospatial Disparities: A Case Study on Real Estate Prices in Paris

Agathe Fernandes Machado, François Hu, Philipp Ratz, Ewen Gallic, Arthur Charpentier  
*arXiv:2401.16197*

### From Uncertainty to Precision: Enhancing Binary Classifier Performance through Calibration

Agathe Fernandes Machado, Arthur Charpentier, Emmanuel Flachaire, Ewen Gallic, François Hu  
*arXiv:2402.07790*

# Academic Projects

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## ○ 2023

UQAM | Montreal, Canada

**Contributor:** <https://equilibration.github.io/equipy/>

**Development of a Python package EquipPy:** implementation of **sequential fairness** on the predicted outputs of Machine Learning models, when dealing with multiple **sensitive attributes**, by leveraging multi-marginal **Wasserstein barycenters**

## ○ 2022

EURIA | Brest, France & Sia Partners | Paris, France

**Actuarial Science: Drought risk**

- **Modelling features** related to drought risk in France and **risk prediction** using **GIEC** global warming scenarios for 2100
- Construction of a **climate scenario generator** in R for temperature and precipitation
- Use of NASA database: <https://data.nasa.gov>

## ○ 2021

IMT Atlantique | Brest, France

**Contributor:** <https://github.com/fer-agathe/ML-Project-Classification.git>

**Machine Learning project:**

- **Python** implementation (sklearn) of the **classification** of two datasets (one on a chronique disease to know if a person is sick and one on banknotes to know if these are real)
- Testing different Machine Learning classification methods (Random Forest, Decision tree, SVM, Neural networks) to get the best score and **automating the process**