SCOR-UQAM FINAL REPORT (2023-2026)

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Fairness and insurance, project financed by SCOR Foundation for Science

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- 12 interns, 6 PhD students, 5 postdoctoral fellows, and collaborations with several academic and industry partners.
- Organization of high-impact events, notably the **Confidence and Fairness Workshop** in Paris, **Workshop on Fairness and Discrimination in Insurance** in Québec, the **Workshop on Probability and Machine Learning** in Guanajuato, Mexico and **Mathematical Advances on Emerging Risks** in Merida, Mexico.
- Over 40 peer-reviewed publications, about 20 preprints and working papers, and more than 20 professional or dissemination articles.
- About 200 conference and seminar presentations worldwide.

Main results

- **A clearer framework for fairness in insurance pricing.** The project clarified the distinction between direct, indirect and proxy discrimination, and showed that fairness cannot be reduced to a single statistical criterion. This led to a three-pillar framework combining actuarial adequacy, social solidarity and causal legitimacy.
- **New methods based on optimal transport and causal modelling.** We developed Wasserstein-based methods for mitigating disparities, including sequential and multi-sensitive fairness corrections, together with causal approaches to counterfactual fairness and mediation. These methods also led to practical tools such as the `equpy` Python package.
- **A better understanding of calibration, information and predictive fairness.** The project showed that calibration alone is not sufficient to guarantee that a predictive score is informative or distributionally adequate. New decompositions distinguish reliability, information loss and residual uncertainty, helping identify what can be corrected by recalibration and what requires richer information or a different model.
- **From model fairness to market structure and risk governance.** The project showed that fairness depends not only on the predictive model, but also on selection, competition, portfolio composition and the degree of mutualization. This perspective was extended to climate risk, prevention and emerging AI risks, shifting the question from "How should risk be priced?" toward "How should risk be governed, shared and reduced?"

A project at the intersection of actuarial science, AI, and fairness

The project *Fairness of Predictive Models: An Application to Insurance Markets*, funded by the SCOR Foundation for Science and hosted at UQAM, was designed to shed light on a central tension in contemporary insurance markets.

Insurance relies on risk pooling, but it also uses statistical models to differentiate policyholders according to their expected risk. With increasingly granular data, machine learning, and less interpretable models, this differentiation has become more precise, but also more difficult to justify. A central objective of the project was therefore to understand under what conditions segmentation can be regarded as actuarially relevant, socially acceptable, and legally defensible, and under what

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conditions it becomes direct, indirect, or proxy discrimination.

The quantitative record is substantial: one book, over 40 peer-reviewed publications, about 20 preprints and working papers, more than 20 professional or dissemination articles, and about 200 presentations in a wide range of formats, from major AI conferences to actuarial seminars, professional workshops, graduate courses, and meetings with regulators. Yet the main outcome of the project is less an inventory of publications than a shift in the way the problem is framed. It is no longer sufficient to ask whether a model is accurate, calibrated, or fair according to a given metric. One must also ask what information it uses, which population it represents, which disparities it transfers or amplifies, and how its scores are ultimately translated into premiums, thresholds, exclusions, or justifications.

Training and collective life of the project

Training was a central component of the project. Over the three years, undergraduate and Master's-level interns, PhD students, and postdoctoral fellows participated directly in the scientific life of the team. Their projects covered a broad range of topics: dynamic pricing, pricing games, interpretability, optimal transport, calibration, geospatial data, learning from imbalanced data, causal models, and online data collection to document discriminatory practices. Several former interns subsequently continued into PhD programmes or research positions, illustrating the role of the project as a stepping stone for scientific and professional development.

The PhD students formed the long-term core of the team. Agathe Fernandes Machado's work structured an important part of the research on calibration, probabilistic scores, and sequential transport. Olivier Côté's work anchored the project in questions of direct and indirect discrimination in insurance, combining causal models, statistical tools, and regulatory issues. Other PhD students associated with the project contributed to research on risk-aware bandits, extreme values, imbalanced data, insurance markets, and risk sharing. Postdoctoral researchers also played a central role: François Hu on optimal transport and algorithmic fairness, Marouane Il-Idrissi on interpretability and cooperative game theory, Arsène Brice Zotsa-Ngoufack on stochastic processes and contagion, and Charlotte Jamotton on non-life insurance pricing, synthetic data, and fairness.

This collective dynamic created an active international network connecting colleagues and students in Canada, France, Belgium, Australia, Mexico, the United States, the United Kingdom, Sweden, Switzerland, Japan, and Vietnam. The project also created opportunities for sustained interaction with insurers, reinsurers, actuarial associations, and supervisory authorities. Such openness was essential, because fairness in insurance is not merely a technical question. Legal definitions, market practices, data constraints, and social expectations differ across jurisdictions.

Events organized

Several events played an important role in structuring the life of the project. In December 2023, the **Networks, Games and Risk** workshop, organized at UQAM, opened a line of research on networks, cooperative games, and risk-sharing mechanisms. In May 2024, the second **Fairness and Discrimination in Insurance** workshop, organized at Université Laval, brought together researchers, practitioners, regulators, and representatives of actuarial organizations to discuss discrimination in insurance.

In early 2025, the **Montréal–Guanajuato Workshop on Probability and Machine Learning**, organized at CIMAT in Guanajuato, strengthened collaborations with Mexico and encouraged student mobility. In May 2025, **Confidence and Fairness: Scientific Foundations in AI and Risk**, held at SCOR's offices in Paris, provided an opportunity for a mid-project synthesis. The event brought together close to one hundred participants and combined statistical, information-theoretic, philosophical, social, and operational perspectives.

Members of the team also contributed to the organization of summer seminars, student workshops, OBVIA events, and actuarial meetings. Finally, in early October 2026, the three-year project will conclude with the third

Fairness and Discrimination in Insurance workshop at Université Laval, this time organized over two days.

Scientific contributions

A first contribution of the project was conceptual clarification. Research based on causal graphs helped distinguish direct discrimination, indirect discrimination, and proxy discrimination, while also showing the limitations of simply removing protected variables from predictive models. From this perspective, fairness depends on the information set being used, the assumed causal structure, the reference population, and the concrete use made of a score.

A second research direction focused on mitigation methods. Wasserstein barycenters and optimal transport provided a mathematical framework for constructing predictions subject to demographic-parity constraints, including settings with multiple sensitive attributes. This work led to the `equipy` package, results on sequential fairness, and extensions to counterfactual fairness and causal mediation. A recurring objective was to correct disparities without making the model more opaque, while explicitly measuring the trade-offs between predictive performance, fairness, and intersectional disparities.

A third research direction concerned calibration, probabilistic scores, and information. The project showed that a score may be calibrated in the classical sense while still being poorly informative, or while generating a score distribution that is poorly aligned with the underlying distribution of risk. The resulting decomposition into reliability, information loss, and residual uncertainty helps distinguish what can be corrected through recalibration from what requires changing the score itself, enriching the information set, or reconsidering how the model is used.

A fourth research direction placed fairness within insurance markets rather than within predictive models alone. Work on selection bias showed that a fairness correction estimated on one insurer's portfolio does not necessarily generalize to the market as a whole. Research on competition, algorithmic collusion, network risk sharing, demutualization, and climate-related pricing further broadened the perspective. The fairness of a model depends not only on its statistical properties, but also on market structure, competitive incentives, the availability of insurance, and the degree of solidarity that society wishes to preserve.

From science to governance

The project ultimately leads to a broader governance perspective. A three-pillar framework combining actuarial adequacy, solidarity, and causality makes the underlying trade-offs explicit rather than hiding them behind a single fairness metric. Actuarial adequacy protects technical viability and limits unjustified cross-subsidies. Solidarity recognizes that insurance is also a collective institution. Causality helps distinguish useful correlations from socially problematic proxies. No single pillar is sufficient on its own. Their articulation provides a common language for actuaries, insurers, regulators, and other stakeholders.

This governance perspective also gave the project a strong professional dimension. Results were discussed with insurers, reinsurers, actuarial associations, and supervisory authorities. Some of the research was disseminated through reports, regulatory responses, articles in the professional press, and more accessible contributions to professional publications. Such dissemination was important because insurance pricing models do not remain confined to academic papers. They become management tools, market infrastructures, and sometimes arguments used to justify decisions. The project therefore sought to support the transition from theory to practice by emphasizing traceability, contestability, explainability, and accountability in the use of predictive models.

The natural extensions of the project are already visible. Questions of fairness in insurance increasingly intersect with climate risk, prevention, insurability, generative AI, synthetic data, and the growing fragmentation of insurance portfolios. The tools developed throughout the project—whether based on optimal transport, causal inference, calibration, or game theory—provide a foundation for studying these new questions. Above all, they show that predictive accuracy is never, by it-

self, a sufficient justification for a decision. It must be embedded within an architecture of risk-sharing, regulation, and trust.

After three years, the project does not claim to have settled the question of fairness and justice in insurance. It has, however, developed concepts, methods, and examples that allow these questions to be addressed more rigorously, transparently, and collectively. Its main contribution lies precisely in this shift from prediction to governance.

Publications and recent work

One textbook was published

1. **Insurance, Biases, Discrimination and Fairness**. Arthur Charpentier. 2024, Springer, ISBN 978-3-031-49782-7.

one textbook is under open-review

2. **Risk-Priced Society**. Arthur Charpentier. 2026, *also available in French*

as well a almost 60 articles,

3. **A Fair Price to Pay: Exploiting Causal Graphs for Fairness in Insurance**. Olivier Côté, Marie-Pier Côté, Arthur Charpentier. *Journal of Risk and Insurance*, doi:10.1111/jori.12503 (SSRN:4709243)
4. **From Uncertainty to Precision: Enhancing Binary Classifier Performance through Calibration**. Agathe Fernandes Machado, Arthur Charpentier, Emmanuel Flachaire, Ewen Gallic, François Hu. (doi:10.48550/arXiv.2402.07790).
5. **Geospatial Disparities: A Case Study on Real Estate Prices in Paris**. Agathe Fernandes Machado, François Hu, Philipp Ratz, Ewen Gallic, Arthur Charpentier. (doi:10.48550/arXiv.2401.16197).
6. **Parametric Fairness with Statistical Guarantees**. François Hu, Philipp Ratz, Arthur Charpentier. (doi:10.48550/arXiv.2310.20508).
7. **Addressing Fairness and Explainability in Image Classification Using Optimal Transport**. François Hu, Philipp Ratz, Arthur Charpentier. (doi:10.48550/arXiv.2308.11090).
8. **Artificial Intelligence and Personalization of Insurance: Failure or Delayed Ignition?**. Xavier Vamparys, Arthur Charpentier *Big Data & Society*, doi:10.1177/20539517241291817.
9. **Melting Contestation: Insurance Fairness and Machine Learning**. Laurence Barry, Arthur Charpentier. *Ethics and Information Technology*, doi:10.1007/s10676-023-09720-y.
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14. **Generalized Oversampling for Learning from Imbalanced Datasets and Associated Theory**. Samuel Stocksieker, Denys Pommeret, Arthur Charpentier. *Transactions on Machine Learning Research*, (doi:10.48550/arXiv.2308.02966).
15. **Delving into Deep Smoothed Bootstrap: Application in Imbalanced Regression**. Samuel Stocksieker, Denys Pommeret, Arthur Charpentier. DSAA'25 .
16. **Measuring and Mitigating Biases in Motor Insurance Pricing**. Mulah Moriah, Franck Vermet, Arthur Charpentier. *European Actuarial Journal*, doi:10.1007/s13385-024-00390-8, (doi:10.48550/arXiv.2311.11900).

17. **Oaxaca-Blinder Decomposition of Changes in Means and Inequality: A Simultaneous Approach**. Emmanuel Flachaire, Arthur Charpentier. *Economics Bulletin*. HAL:04830576.
18. **The Multi-Armed Bandit Problem Under the Mean-Variance Setting**. Hongda Hu, Arthur Charpentier, Mario Ghossoub, Alexander Schied. *European Journal of Operational Research*, doi:10.1016/j.ejor.2025.03.011. (doi:10.48550/arXiv.2212.09192)
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24. **Mitigating Discrimination in Insurance with Wasserstein Barycenters**. Arthur Charpentier, François Hu, Philipp Ratz. *Machine Learning and Principles and Practice of Knowledge Discovery in Databases*, doi:10.1007/978-3-031-74630-7_11.
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26. **The Role of Government vs. Private Sector Provision of Insurance**. Arthur Charpentier. *Journal of Risk and Insurance*, doi:10.1111/jori.12497.
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28. **Equipy, Sequential Fairness Using Optimal Transport**. Suzie Grondin, Agathe Fernandes Machado, Arthur Charpentier, Philipp Ratz, François Hu. doi:10.48550/arXiv.2503.09866.
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30. **The Insurance Market in the Era of Digital Transitions**. Arthur Charpentier, Raphaël Suire. Society of Actuaries Research Institute.
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32. **Hoeffding Decomposition of Black-Box Models with Dependent Inputs / Hoeffding Decomposition of Functions of Random Dependent Variables**. Marouane Il Idrissi, Nicolas Bousquet, Fabrice Gamboa, Bertrand Iooss, Jean-Michel Loubes. *Journal of Multivariate Analysis*, doi:10.1016/j.jmva.2025.105444 doi:10.48550/arXiv.2310.06567.
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67. **Federated Measurement of Demographic Disparities from Quantile Sketches**. Arthur Charpentier, Agathe Fernandes Machado, Olivier Côté, François Hu. doi:10.48550/arXiv.2602.18870.
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We also published some articles in French

72. **Intelligence artificielle et individualisation des garanties en assurance : échec ou retard à l'allumage ?** Arthur Charpentier, Xavier Vamparys. Document de travail de la Chaire PARI #32.
73. **Un cadre de gouvernance à trois piliers pour une tarification équitable de l'assurance**. Arthur Charpentier, Olivier Côté, Marie-Pier Côté. Document de travail de la Chaire PARI #37.
74. **Couvrir les risques de catastrophes naturelles au Japon**. Arthur Charpentier. Document de travail de la Chaire PARI #39.

and some lecture notes

75. **Optimal Transport for Actuarial Science**. Arthur Charpentier. *Lecture Notes*, hal:05684645.
76. **Five Lectures on Fairness and Discrimination in Insurance: An Actuarial Perspective**. Arthur Charpentier. Kyoto University Graduate Lectures.

as well as some dissemination articles (in French and English)

77. **La technologie nous sauvera-t-elle ?**. Arthur Charpentier. *Risques*, no 146.
78. **L'impossible droit à l'erreur, l'impossible droit à l'oubli ?**. Arthur Charpentier. extitRisques, 144.
79. **Les paradoxes de la segmentation et de la discrimination en assurance**. Arthur Charpentier. Risques, 142.
80. **Repenser collectivement les catastrophes**. Laurence Barry, Arthur Charpentier. Risques, 143.
81. **Quand les chiffres nous manipulent / When Numbers Mislead Us**. Arthur Charpentier. *in* Pépites mathématiques et scientifiques (hal:05149008)
82. **Quand voter devient paradoxal : Condorcet, Arrow et la démocratie / When Voting Becomes Paradoxical**. Arthur Charpentier, *in* Pépites mathématiques et scientifiques (hal:05149025)
83. **Le Rapport Langreney : lutter contre le désengagement des assureurs dans la couverture des risques climatiques** Laurence Barry, Arthur Charpentier. Dalloz Actualités.
84. **Croissance, décroissance, de quoi parle-t-on ?** Arthur Charpentier, Ewen Gallic. Risques, no 138.
85. **Peut-on diversifier des risques extrêmes ?**. Arthur Charpentier. Article de dissémination, Risques, 139.
86. **Est-il nécessaire (et utile) d'être en guerre contre tout ?** Arthur Charpentier. Article de dissémination, *Risques*.
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90. **Comment dépasser la froideur des chiffres et agir ?** Arthur Charpentier, Nicolas Marescaux. Risques, 140.
91. **Comment escompter le futur** Béatrice Cherrier, Arthur Charpentier. Risques, 141.
92. **Des primes d'assurance personnalisées moins chères grâce à l'IA ?** Arthur Charpentier. *The Conversation*.
93. **À la fin, qui prendra en charge le coût des assurances ?**. Laurence Barry, Arthur Charpentier. *The Conversation*.
94. **Les événements climatiques extrêmes ne sont plus des risques marginaux, et le secteur bancaire tarde à en prendre la mesure**. Arthur Charpentier. Le Monde.
95. **Et si on misait enfin sur la prévention ?** Arthur Charpentier. Risques 145.
96. **The Price of Proof: Insurance Policies for an AI-Enabled World**. Arthur Charpentier. The Actuary.

97. **Assurance des catastrophes naturelles : faut-il socialiser les risques ou responsabiliser les territoires ?**. Laurence Barry, Arthur Charpentier. Revue Banque.
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100. **Qui doit partager le risque avec qui ?**, Arthur Charpentier, 2026, La Vie des Idées

Also several blog posts, on

https://freakonometrics.hypotheses.org/

1. Qui assure l'assureur de dernier ressort ?, 19/09/2026.
2. Pluralisme, balance, équilibre, et cirque médiatique, 04/06/2026.
3. Des sondages sans sondé(e)s, 28/05/2026.
4. "Pelleter en avant" (sécheresse, cumul et causalité, le cas du RGA en France), 27/05/2026.
5. Pourquoi ne pas générer toute la population (grâce aux données synthétiques) ?, 26/05/2026.
6. Risques climatiques : la donnée et l'intelligence artificielle ne remplaceront pas la solidarité, 05/05/2026.
7. Will Technology Save Us?, 19/04/2026.
8. La technologie nous sauvera-t-elle ?, 18/04/2026.
9. Faut-il socialiser les risques ou responsabiliser les territoires ?, 09/04/2026.
10. If No One Pays for Proof, Everyone Will Pay for the Loss, 19/03/2026.
11. Si personne ne paie pour la preuve, tout le monde paiera pour le sinistre, 18/03/2026.
12. La géométrie de la ville, les lignes et les pôlygones, 11/03/2026.
13. Fukushima : 15 ans après, réflexions sur une inévitable catastrophe, 10/03/2026.
14. Le CV narratif, ou comment remplacer un biais par un autre, 09/03/2026.
15. Crue centennale de la Seine à 42 milliards d'euros ?, 03/03/2026.
16. Prise de décision collective en démocratie, pour ceux qui parlent tout bas, 28/02/2026.
17. Mesurer l'équité "globale" quand les données sont dispersées, 24/02/2026.
18. The Marketplace of Expertise and Authority: Notes from the Noise Ecosystem, 21/02/2026.
19. Identity Theft as Systemic Risk, 21/02/2026.
20. L'usurpation d'identité comme risque systémique, 21/02/2026.
21. Beyond Procedure: Substantive Fairness in Conformal Prediction, 20/02/2026.
22. Au-delà de la procédure, quand "bien calibrer" ne suffit pas à être juste, 20/02/2026.
23. L'écosystème du bruit et la fabrique de l'autorité, 17/02/2026.
24. Jouer collectif au XXIème siècle?, 17/02/2026.
25. Natural disasters, avoidable or unpredictable?, 12/02/2026.
26. Catastrophes naturelles, catastrophes évitables ou imprévisibles ?, 10/02/2026.
27. From Premium to Contribution: Recovering Solidarity, 06/02/2026.
28. De la prime à la cotisation: retrouver la solidarité, 06/02/2026.
29. Correlation, Causation, Circumstance, Context, 03/02/2026.
30. Corrélation et causalité, circonstance et contexte, 03/02/2026.
31. Insurance, biases, discrimination and fairness, 02/02/2026.
32. En faire des tonnes pour quelques grammes, 19/01/2026.
33. On my way to Singapore, 18/01/2026.
34. The Government Will Foot the Bill!, 16/01/2026.
35. C'est l'État qui paiera!, 16/01/2026.
36. Marques du passé, marques du futur, 14/01/2026.
37. Lectures, et écriture, 09/01/2026.
38. Real Estate Wealth and Climate Disasters, 07/01/2026.
39. Patrimoine immobilier et catastrophes climatiques, 07/01/2026.
40. "The era of the business idiot" (in English), 01/01/2026.

41. "The era of the business idiot" (in French), 01/01/2026.
42. 2026, 31/12/2025.
43. Insurance, a Zero Sum Game?, 29/12/2025.
44. L'assurance, un jeu à somme nulle?, 29/12/2025.
45. Key Updates of the International AI Safety Report (1 and 2), 27/12/2025.
46. Key Updates du International AI Safety Report (1 et 2), 27/12/2025.
47. "Dérisquage", mot de l'année, 23/12/2025.
48. Transformer un débat de marché (qui paie ?) en débat d'État (qui est responsable ?), 16/12/2025.
49. Insuring AI: New risks? New models?, 16/12/2025.
50. Assurer l'IA. Nouveaux risques ? Nouveaux modèles ?, 16/12/2025.
51. Qui doit payer un risque lié à une défaillance de maintien de l'ordre ?, 15/12/2025.
52. Sortir enfin de l'élitisme épuisant?, 14/12/2025.
53. Voir le monde depuis le Japon, 12/12/2025.
54. Quand l'assurance se défait, la crise silencieuse de l'indemnisation, 07/12/2025.
55. Supprimer les feux rouges, et loi de Brandolini (ou pas), 04/12/2025.
56. Bridging the Risk Perception Gap ?, 01/12/2025.
57. L'assurance, l'immobilier et la fabrique de l'ignorance, 01/12/2025.
58. "les Américains mangent et vivent comme s'ils avaient l'assurance maladie gratuite", 26/11/2025.
59. Insurers and AI, a systemic risk, 25/11/2025.
60. Assureurs et IA, un risque systémique, 24/11/2025.
61. Assurer pour s'émanciper : le mutualisme noir américain, 19/11/2025.
62. Et si les cyclistes avaient raison de ne pas s'arrêter aux stops ?, 10/11/2025.
63. Et si on misait enfin sur la prévention ?, 27/10/2025.
64. La parité, comme condition d'équilibre stable non dégénéré, 15/10/2025.
65. Marx, Wilde ou l'art de se méfier du consensus, 13/10/2025.
66. Certitudes collectives et incertitudes individuelles, les données massives changent-elles la donne ?, 06/10/2025.
67. Deux tiers d'une indemnité : une histoire de discriminations en assurance vie aux États Unis, 06/10/2025.
68. Équité : traiter différemment ou ne pas traiter différemment ?, 29/09/2025.
69. Entre statistiques et destin, deux visions de la justice, 22/09/2025.
70. Du déni des risques climatiques, du déni des responsabilités, 20/09/2025.
71. Discrimination par proxy, et les tatouages au Japon, 15/09/2025.
72. Les actuaires, des apprentis-sorciers ?, 08/09/2025.
73. In the end, who will bear the cost of insurance?, 06/09/2025.
74. Personalized Insurance Premiums Cheaper Thanks to AI? Here's Why It's a Slippery Slope, 06/09/2025.
75. Classer, comparer, assurer, 01/09/2025.
76. Cartographie des risques, les routes de l'enfer sont pavées de bonnes intentions, 28/08/2025.
77. L'impossible droit à l'erreur, l'impossible droit à l'oubli ?, 27/08/2025.
78. À la fin, qui prendra en charge le coût des assurances ?, 27/08/2025.
79. The (non-)Ethics of Capitalism, 15/08/2025.
80. Des primes d'assurance personnalisées moins chères grâce à l'IA ?, 05/08/2025.
81. Is the median far away from the mean (for variables with finite variance)?, 22/07/2025.
82. When voting becomes paradoxical Condorcet, Arrow, and democracy, 17/07/2025.
83. "Life insurers can predict when you'll die with about 98% accuracy", 15/07/2025.
84. When Numbers Mislead Us, 10/07/2025.
85. Extreme weather events are no longer marginal risks, and the banking sector is slow to take stock of the situation., 09/07/2025.
86. Crise climatique : la prochaine bombe à retardement du système financier, 07/07/2025.

87. Repenser collectivement les catastrophes, 06/07/2025.
88. Insuring an uninsurable world – the pricing actuary's Mission Impossible?, 25/06/2025.
89. Collectively rethinking disasters, 21/06/2025.
90. Paradoxes of segmentation and discrimination in insurance, 10/04/2025.
91. Les paradoxes de la segmentation et de la discrimination en assurance, 08/04/2025.
92. Comment escompter le futur, 28/03/2025.
93. Artificial Intelligence and Personalization of Insurance: Failure or Delayed Ignition?, 12/02/2025.
94. Mitigating Discrimination in Insurance with Wasserstein Barycenters, 11/02/2025.
95. Assurance des catastrophes : les routes de l'enfer sont pavées de bonnes intentions, 22/01/2025.
96. Discounting the Future?, 05/12/2024.
97. Les algorithmes et la bureaucratie, 08/11/2024.
98. More neurons in the hidden layer than predictive features in neural nets, 25/10/2024.
99. The $m = \sqrt{p}$ rule for random forests, 19/10/2024.
100. How to Go Beyond the Coldness of Numbers and Take Action?, 11/10/2024.
101. Comment dépasser la froideur des chiffres, et agir ?, 11/10/2024.
102. Calculating an LOOCV MSE by hand, 11/10/2024.
103. "Éloge du bug" de Marcello Vitalli-Rosati, 03/10/2024.
104. Croissance, décroissance, de quoi parle-t-on ?, 05/07/2024.
105. Can we diversify extremal events?, 23/06/2024.
106. Peut-on diversifier des risques extrêmes ?, 21/06/2024.
107. Discrimination by proxy (a real case study), 15/02/2024.
108. Who benefits from data sharing?, 15/02/2024.
109. Partage des données, à qui profite le crime ?, 13/02/2024.
110. Assurances : des collectivités désemparées face aux effets du dérèglement climatique, 12/02/2024.
111. The whole is greater than the sum of the parts, 10/12/2023.
112. Est-il nécessaire (et utile) d'être en guerre contre tout ?, 24/10/2023.

People involved

- **Stagiaires de bac/licence et de maîtrise**

  Suzie Grondin, Noé Bosc-Haddad, Florent Crouzet, Julien Siharath, Ana Patrón Piñérez, Cassandra Mussard, Raphaël Dalbarade, Bertille Tierny, Lucas Offroy, Iryna Voitsitska, Mahery Andriamadison, Allison Lara Nieva et Vincent Croteau.

- **Doctorantes et doctorants**

  Agathe Fernandes Machado, Olivier Côté, Philipp Ratz, Samuel Stocksieker, Raphaël Dalbarade, Hongda Hu, Lucas Offroy et Sang Huynh.

- **Stagiaires postdoctoraux**

  François Hu, Marouane Il-Idrissi, Arsène Brice Zotsa-Ngoufack et Charlotte Jamotton.

Presentations

1. **Workshop on Insurance Mathematics (WIM), Montréal**, 2024 (Olivier Côté).
2. **UNSW actuarial seminar, Australie**, 2024 (Arthur Charpentier).
3. **Autorités des Marchés Financiers (AMF), Québec**, 2024 (Arthur Charpentier, Olivier Côté et Marie-Pier Côté).
4. **StatQAM seminar, UQAM, Montréal**, 2024 (Arthur Charpentier).
5. **AAAI'24, 38th Annual AAAI Conference on Artificial Intelligence, Vancouver**, 2024 (François Hu).
6. **17th Financial Risks International Forum, Big Data & Algorithmic Finance, Paris**, 2024 (François Hu).
7. **Workshop on Insurance Mathematics (WIM), Montréal**, 2024 (Agathe Fernandes Machado).

8. **Workshop on Insurance Mathematics (WIM), Montréal**, 2024 (Olivier Côté).
9. **Séminaire Modélisation Financière, Centre d'Économie de la Sorbonne, Paris**, 2024 (rthur Charpentier).
10. **ARC seminar, Sorbonne Université, Paris**, 2024 (Arthur Charpentier).
11. **Journée d'étude sur le blanchiment et la fraude, Université de Nîmes**, 2024 (Arthur Charpentier).
12. **Chaire Thélèm / ILB, Orléans**, 2024 (Arthur Charpentier).
13. **Data Talk Generali, Paris**, 2024 (Arthur Charpentier).
14. **TD Insurance Pricing Seminar, Montréal**, 2024 (Arthur Charpentier).
15. **3e Colloque International de l'Actuariat Francophone, Paris**, 2024 (Arthur Charpentier).
16. **Akur8 Pricing Seminar, Paris**, 2024 (Arthur Charpentier).
17. **Data Science Institute, Montréal**, 2024 (Arthur Charpentier).
18. **International Joint Conference on Neural Networks (IJCNN'24), WCCI, Yokohama**, 2024 (Samuel Stocksieker).
19. **16th International Conference of Thailand Econometrics Society**, 2024 (Arthur Charpentier).
20. **JoCo'24, Joint Colloquium of all IAA Sections, Bruxelles**, 2024 (Mulah).
21. **Insurance Data Science Conference (IDSC 2024), Stockholm**, 2024 (Agathe Fernandes Machado).
22. **Insurance Data Science Conference (IDSC 2024), Stockholm**, 2024 (Arthur Charpentier).
23. **Insurance Data Science Conference (IDSC 2024), Stockholm**, 2024 (François Hu).
24. **Workshop on Decentralized Insurance and Risk Sharing, Chicago**, 2024 (Arthur Charpentier).
25. **Insurance: Mathematics & Economics Conference**, 2024 (Arthur Charpentier).
26. **Insurance: Mathematics & Economics Conference**, 2024 (Olivier Côté).
27. **Colloque de Cerisy, L'assurance au défi des ruptures**, 2024 (Arthur Charpentier).
28. **Workshop on Optimal Transport, Cargèse**, 2024 (Arthur Charpentier).
29. **Mathematical Foundations of AI day, DATAIA/SCAI, Paris**, 2024 (Arthur Charpentier).
30. **Centre d'Économie de la Sorbonne**, 2024 (Arthur Charpentier).
31. **Journée de la Recherche, UQAM, Montréal**, 2024 (Agathe Fernandes Machado).
32. **Journées de l'Optimisation, HEC Montréal**, 2024 (Arthur Charpentier).
33. **23e Congrès des Actuaires, France**, 2024 (Arthur Charpentier, Florence Picard et Laurence Barry).
34. **Journées de Statistiques (JDS) et Rencontres des Jeunes Statisticiens (RJS), Bordeaux**, 2024 (Samuel Stocksieker).
35. **Workshop on Trustworthy Artificial Intelligence, Montréal**, 2024 (Arthur Charpentier).
36. **Workshop on Trustworthy Artificial Intelligence, Montréal**, 2024 (Agathe Fernandes Machado).
37. **Workshop on Trustworthy Artificial Intelligence, Montréal**, 2024 (Olivier Côté).
38. **Journées de la Société Canadienne de Sciences Économiques (SCSE), Montréal**, 2024 (Agathe Fernandes Machado).
39. **Journées de la Société Canadienne de Sciences Économiques (SCSE), Montréal**, 2024 (Ewen Gallic).
40. **Canadian Economic Association, Toronto**, 2024 (Ewen Gallic).
41. **Akur8 Seminar, en ligne**, 2024 (Philipp Ratz et François Hu).
42. **Scientific Discovery in the Light of Artificial Intelligence (SDAI'24), El Ghazala/-Tunisie, en ligne**, 2024 (Arthur Charpentier).
43. **KU Leuven, ACP actuarial contact program**, 2024 (Arthur Charpentier).
44. **Université de Copenhague, Danemark**, 2024 (Arthur Charpentier).
45. **Warsaw Actuarial School, Université de Varsovie**, 2024 (Arthur Charpentier).

46. **Statistical Society of Canada (SSC'24) Annual Meeting**, 2024 (Marie-Pier Côté).
47. **Centre sur l'intelligence en gestion de systèmes complexes (CRI2GS), Montréal**, 2024 (Arthur Charpentier).
48. **SCOR Foundation Colloquium**, 2024 (Arthur Charpentier).
49. **European Actuarial Journal Conference (EAJC'24), Lisbonne**, 2024 (Arthur Charpentier).
50. **Seminario de Matemáticas Aplicadas, Quantil Research Group, Bogotá**, 2024 (Agathe Fernandes Machado).
51. **Summer Seminar in Statistics and Actuarial Science, UQAM**, 2024 (Ana Patrón Piñérez).
52. **Summer Seminar in Statistics and Actuarial Science, UQAM**, 2024 (Florent Crouzet).
53. **Summer Seminar in Statistics and Actuarial Science, UQAM**, 2024 (Agathe Fernandes Machado).
54. **NeurIPS, workshop Bayesian Decision-making and Uncertainty, Vancouver**, 2024 (Agathe Fernandes Machado).
55. **39th AAAI Conference on Artificial Intelligence, Philadelphie**, 2025 (Agathe Fernandes Machado).
56. **Financial Conduct Authority (FCA) seminar, Londres**, 2024 (Arthur Charpentier).
57. **Actuarial and Financial Mathematics Conference, Bruxelles**, 2025 (Marie-Pier Côté).
58. **Actuarial and Financial Mathematics Conference, Bruxelles**, 2025 (Agathe Fernandes Machado).
59. **HEC Montréal**, 2025 (Marie-Pier Côté).
60. **Association des Masters d'Actuariat, France**, 2025 (Arthur Charpentier).
61. **CRM-ISM Montréal Probability Seminar, McGill**, 2025 (Marouane Il-Idrissi).
62. **SUMM 2025, Montréal**, 2025 (Ewen Gallic).
63. **Colloquium du CIMAT, Guanajuato**, 2025 (Arthur Charpentier).
64. **Université de Toronto**, 2025 (Arthur Charpentier).
65. **Présentation en ligne des nouveaux numéros de l'EAJ**, 2025 (Mulah).
66. **Séminaire étudiant de l'IID**, 2024 (Olivier Côté).
67. **39e réunion annuelle du Canadian Econometrics Study Group (CESG), Toronto**, 2024 (Arthur Charpentier).
68. **Communauté Sensitivity Analysis sur Discord**, 2025 (Marouane Il-Idrissi).
69. **Séminaire mensuel de l'ANÉA**, 2025 (Olivier Côté).
70. **Conférence sur les Nouveaux Développements en Probabilité, Université de Montréal**, 2025 (Marouane Il-Idrissi).
71. **31st International Conference on Neural Information Processing (ICONIP'24), Auckland, distanciel**, 2024 (Samuel Stocksieker).
72. **Workshop on Probability and Machine Learning, CIMAT, Guanajuato**, 2025 (Marouane Il-Idrissi).
73. **Workshop on Probability and Machine Learning, CIMAT, Guanajuato**, 2025 (Arsène Brice Zotsa-Ngoufack).
74. **Séminaire Milliman R&D, Paris**, 2025 (Agathe Fernandes Machado).
75. **Séminaire actuariel LP Lyon-Lausanne-Paris**, 2025 (François Hu).
76. **IRL-CNRS de Montréal**, 2025 (Ewen Gallic).
77. **Séminaire du LSAF, ISFA Lyon**, 2025 (Samuel Stocksieker).
78. **Séminaire EDF R&D, Paris**, 2025 (Agathe Fernandes Machado).
79. **Séminaires ULB et UCLouvain**, 2025 (Marie-Pier Côté).
80. **Journée CRM-Statlab, Québec**, 2024 (Arthur Charpentier).
81. **IJCAI'25, Montréal**, 2025 (Agathe Fernandes Machado).
82. **Doctoral Consortium, IJCAI'25, Montréal**, 2025 (Agathe Fernandes Machado).
83. **Workshop Explainable AI (XAI), IJCAI'25**, 2025 (Marouane Il-Idrissi).
84. **Actuarial Research Conference (ARC), CAS session Fairness and Insurance, Toronto**, 2025 (Arthur Charpentier).
85. **Actuarial Research Conference (ARC), Toronto**, 2025 (Marie-Pier Côté).

86. **Actuarial Research Conference (ARC), table ronde American Academy of Actuaries**, 2025 (Olivier Côté).
87. **Journée d'Économétrie Appliquée, Université de Montpellier**, 2025 (Arthur Charpentier).
88. **Journée d'Économétrie Appliquée, Université de Montpellier**, 2025 (Ewen Gallic).
89. **Journée d'Économétrie Appliquée, Université de Montpellier**, 2025 (Samuel Stocksieker).
90. **Les lundis de l'IA et de la finance, Télécom & ACPR-Banque de France**, 2025 (Arthur Charpentier).
91. **5e semaine de l'Actuariat Francophone**, 2025 (Marie-Pier Côté).
92. **Workshop Calibrating Prediction Uncertainty, Isaac Newton Institute, Cambridge**, 2025 (Agathe Fernandes Machado).
93. **Séminaire étudiant d'actuariat et de statistique, UQAM**, 2025 (Lucas).
94. **CANSSI Postdoc Day, Montréal**, 2025 (Marouane Il-Idrissi).
95. **CCR / Chaire PARI**, 2025 (Benoît).
96. **Insurance Data Science Conference, City University of London**, 2025 (Marie-Pier Côté).
97. **Webinaire mensuel de la Fondation SCOR pour la Science**, 2025 (Arthur Charpentier).
98. **Journées PrivSec ETS-UQAM, Montréal**, 2025 (Agathe Fernandes Machado).
99. **Journées PrivSec ETS-UQAM, Montréal**, 2025 (Marouane Il-Idrissi).
100. **Université de Lausanne**, 2025 (Marie-Pier Côté).
101. **Assemblée annuelle de l'ILAC, Luxembourg**, 2025 (Arthur Charpentier).
102. **Association des Actuaires issus de l'ULB**, 2025 (Marie-Pier Côté).
103. **Colloque étudiant sur les méthodes quantitatives en santé, ESPUM, Montréal**, 2025 (Arsène Brice Zotsa-Ngoufack).
104. **Journée scientifique de la communauté de l'OBVIA**, 2025 (Agathe Fernandes Machado).
105. **Séminaire CANSSI Ontario**, 2025 (Marie-Pier Côté).
106. **BIRS, Emerging Connections between Reaction-Diffusion, Branching Processes, and Biology**, 2025 (Arsène Brice Zotsa-Ngoufack).
107. **Bermuda Monetary Authority**, 2025 (Arthur Charpentier).
108. **PARTY'25, Liverpool**, 2025 (Olivier Côté).
109. **24e Congrès des Actuaires**, 2025 (Arthur Charpentier).
110. **Séminaire R&D Milliman, Paris**, 2025 (Arthur Charpentier et Olivier Côté).
111. **University of Mississippi**, 2025 (Arsène Brice Zotsa-Ngoufack).
112. **Society for Mathematical Biology Annual Meeting, Edmonton**, 2025 (Arsène Brice Zotsa-Ngoufack).
113. **Journée annuelle StatQAM, UQAM**, 2025 (Agathe Fernandes Machado).
114. **Journée annuelle StatQAM, UQAM**, 2025 (Arsène Brice Zotsa-Ngoufack).
115. **INFORMS Applied Probability Conference, Georgia Tech, Atlanta**, 2025 (Arsène Brice Zotsa-Ngoufack).
116. **Université de Lausanne, séminaire de science actuarielle**, 2025 (Arthur Charpentier).
117. **Chaire PARI / CCR, Paris**, 2025 (Arthur Charpentier).
118. **Chaire ACTIONS, CNAM Paris**, 2025 (Arthur Charpentier et Olivier Côté).
119. **KES 2025, Osaka**, 2025 (Samuel, Denys Pommeret et Arthur Charpentier).
120. **Institut des Actuaires, France**, 2025 (Arthur Charpentier).
121. **Canadian Automobile Insurance Rate Regulators (CARR) webinar**, 2025 (Marie-Pier Côté).
122. **AAAI'26, Singapour, main track**, 2026 (François Hu).
123. **AAAI'26, Singapour, AAAI Student / 3MT**, 2026 (Bertille Tierney).
124. **ESSEC Asia-Pacific, Singapour**, 2026 (Arthur Charpentier).
125. **ESSEC Asia-Pacific, Singapour, working group on risk**, 2026 (Arthur Charpentier).

126. **Nanyang Technological University, actuarial science seminar**, 2026 (Arthur Charpentier).
127. **Polytechnique Montréal**, 2026 (Agathe Fernandes Machado).
128. **III Congreso Universitario Internacional sobre Seguros y Reaseguros, Lima**, 2026 (Arthur Charpentier).
129. **ASTIN Bulletin Conference, ETH Zürich**, 2026 (Olivier Côté).
130. **ASTIN Bulletin Conference, ETH Zürich**, 2026 (Sang).
131. **Actuarial Technology Summit 2025**, 2026 (François Hu).
132. **Algorithmic Fairness and Causality, Paris**, 2026 (Agathe Fernandes Machado).
133. **Actuarial and Financial Mathematics Conference, Bruxelles**, 2026 (Olivier Côté).
134. **Workshop on Insurance Mathematics (WIM), Université de Toronto**, 2026 (Marie-Pier Côté).
135. **CAS Annual Meeting, Austin**, 2026 (Olivier Côté).
136. **Séminaire JFLI, National Institute of Informatics, Tokyo**, 2026 (Arthur Charpentier).
137. **Stockholms universitet**, 2026 (Olivier Côté).
138. **StatQAM, Montréal**, 2026 (Marouane Il-Idrissi).
139. **AXA pricing seminar**, 2026 (Arthur Charpentier).
140. **AXA technical seminar**, 2026 (Arthur Charpentier).
141. **Dalhousie Statistics Seminar, Halifax**, 2026 (Marouane Il-Idrissi).
142. **Séminaire d'économétrie de l'AMSE**, 2026 (Agathe Fernandes Machado).
143. **American Academy of Actuaries, Bias in Assessing Financial Risk**, 2026 (Olivier Côté).
144. **SIAS, Amsterdam Universiteit**, 2026 (Agathe Fernandes Machado).
145. **Erasmus Universiteit Rotterdam**, 2026 (Agathe Fernandes Machado).
146. **Séminaire PSPP d'EDF**, 2026 (Marouane et Lucas).
147. **AI in Risk Assessment and Mitigation, ICMS/Bayes Centre, Edinburgh**, 2026 (Agathe Fernandes Machado).
148. **Club de lecture CIRRELT/GERAD**, 2026 (Marouane Il-Idrissi).
149. **Groupe de travail de l'Institut Louis Bachelier**, 2026 (Arthur Charpentier).
150. **CAS Canada Connection, Toronto**, 2026 (Olivier Côté).
151. **Séminaire de mathématique de l'UBO, Brest**, 2026 (Agathe Fernandes Machado).
152. **Séminaire d'économétrie de l'AMSE**, 2026 (Marouane Il-Idrissi).
153. **Séminaire Quantact, Université Laval**, 2026 (Agathe Fernandes Machado).
154. **Institut des Actuaires, France**, 2025 (Benoît).
155. **Séminaire de statistique de l'Université Laval**, 2026 (Marouane Il-Idrissi).
156. **TD Assurance, Montréal**, 2026 (Olivier Côté).
157. **IntactLab Methodology Meetings, Montréal**, 2025 (Marouane Il-Idrissi).
158. **JPMorganChase R&D**, 2026 (Agathe Fernandes Machado).
159. **IRIT UT Capitole Seminar, Toulouse**, 2026 (Marouane Il-Idrissi).
160. **ECAI 2025, 28th European Conference on Artificial Intelligence, Bologne**, 2025 (Stéphane Mussard).
161. **Séminaire de Statistique de l'Université de Sherbrooke**, 2026 (Marouane Il-Idrissi).
162. **IEEE DSAA, Birmingham**, 2025 (Denys Pommeret).
163. **10th Annual Global Congress of Knowledge Economy (GCKE), Osaka**, 2025 (Arthur Charpentier).
164. **Journée IARD de l'Institut des Actuaires, France**, 2025 (Raphaël).
165. **Journée IARD de l'Institut des Actuaires, France**, 2025 (François Hu).
166. **Economics Seminar, ENSAI, Rennes**, 2025 (Ewen Gallic).
167. **Mathematical Foundations of AI, Paris**, 2026 (Agathe Fernandes Machado).
168. **Séminaire de la Chaire PARI**, 2026 (Arthur Charpentier).

169. **Tsinghua University, Renmin University et Peking University, Beijing**, 2026 (Arthur Charpentier).
170. **Chinese University of Hong Kong et University of Hong Kong**, 2026 (Arthur Charpentier).
171. **International Workshop on Risk and Insurance, avant IME'26, Séoul**, 2026 (Arthur Charpentier).
172. **ICML'26, Séoul**, 2026 (Jesse Cresswell).
173. **G7, Workshop on the Economic Impacts of Extreme Weather Events and Natural Hazards, Évian-les-Bains**, 2026 (Arthur Charpentier et Laurence Barry).
174. **ETH Zürich, Workshop Advances in Risk Modelling**, 2026 (Marie-Pier Côté).
175. **University of Melbourne**, 2026 (Agathe Fernandes Machado).
176. **Institut du Risk Management**, 2026 (Arthur Charpentier et Stéphane Loisel; deux interventions sur la fairness et son opérationnalisation).
177. **Institut des Actuaires, Paris**, 2026 (Bertille).
178. **CAS Webinars**, 2026 (Olivier Côté).
179. **Actuarial Research Conference, Ohio State University**, 2026 (Olivier Côté).
180. **Congrès annuel de la Société Statistique du Canada, McMaster**, 2026 (Marouane Il-Idrissi).
181. **Séminaire Lyon-Lausanne**, 2026 (François Hu).
182. **7th European Actuarial Journal Conference, Istanbul**, 2026 (Arthur Charpentier).
183. **Semaine IA et société, Université de Rennes**, 2026 (Arthur Charpentier).
184. **Séminaire mensuel de la Chaire PARI**, 2026 (Arthur et Raphaël Dalbarade).
185. **Journée annuelle StatQAM**, 2026 (Olivier Côté).
186. **UNSW Sydney**, 2026 (Agathe Fernandes Machado).
187. **NAIC CASTF, National Association of Insurance Commissioners**, 2026 (Olivier, Marie-Pier et Arthur).
188. **6th European Congress of Actuaries, Paris**, 2026 (François Hu).
189. **Conférence de l'Association des actuaires IARD du Québec (AAIARD)**, 2026 (Olivier et Marie-Pier).
190. **29th International Congress on Insurance: Mathematics and Economics (IME'26), Séoul**, 2026 (Arthur Charpentier, Olivier Côté et Charlotte Jamotton).
191. **Projet MIRTE / Maths-Vives, demi-journée sur la transition environnementale**, 2026 (Raphaël Dalbarade).
192. **CANSSI Québec Postdoc Day, Concordia University, Montréal**, 2026 (Charlotte Jamotton).
193. **CEMRACS, Modeling and AI for Environmental Transition, CIRM Marseille**, 2026 (Raphaël Dalbarade).
194. **Rencontre de la communauté en intelligence artificielle, Desjardins**, 2026 (Marouane Il-Idrissi).
195. **Séminaire de la Chaire PARI – Quantifier la mutualisation**, septembre 2026 (Arthur Charpentier).
196. **IFoA AI Ethics Governance & Risk Management Forum**, 2026 (Arthur Charpentier).
197. **Climate Change and Insurance 2026, Segovia**, 2026 (Arthur Charpentier).
198. **Applied Math Seminar, McGill, Montréal**, 2026 (Charlotte Jamotton).

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