EMERGING RISKS WORKSHOP 2025

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Professor Jean-François Bégin

SIMON FRASER UNIVERSITY

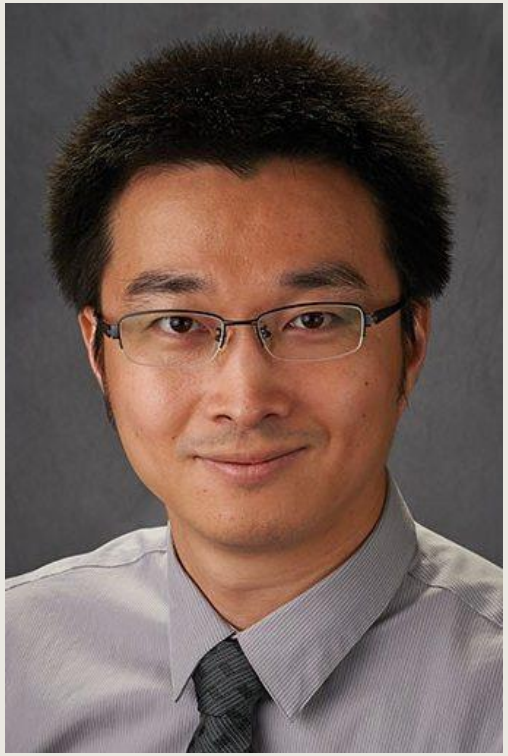
Short-Bio: Dr. Jean-François Bégin is an Associate Professor in the Department of Statistics and Actuarial Science at Simon Fraser University in British Columbia, Canada. He is a specialist in financial modelling as well as statistical and mathematical applications to finance and insurance. Before joining Simon Fraser University, he received his PhD from HEC Montréal in Financial Engineering. He is also a Fellow of both the Society of Actuaries and the Canadian Institute of Actuaries.
Over the past few years, his research program has focused on the construction of complex models for long-term economic predictions, the modelling of option prices, the understanding and management of mortality risk, and the development of sustainable retirement solutions and designs. He was the recipient of the first Young Researcher Award of the Canadian Institute of Actuaries in 2017. He also won the 2019 Bob Alting von Geusau Prize of the AFIR-ERM section of the International Actuarial Association and the 2023 Early Career Faculty Research Award of Simon Fraser University's Faculty of Science.

Title: Modelling the impacts of climate change on deaths caused by heat and cold waves with age–period–cohort models

Abstract: Actuaries increasingly assess physical risks from climate change, including its impact on mortality in life insurance products, annuities, and pension plans. While actuarial methods project mortality decades ahead, they seldom account for climate change. We propose an age–period–cohort framework to capture mortality dynamics from heat and cold waves. The model allows us to capture the high-frequency nature of daily death counts. A seasonal overlay, based on a cyclic spline, and a transformation of temperature variables—which rely on a parsimonious version of a distributed lag non-linear model—enhances projections. Using mortality data from Retraite Québec and climate model ensembles, we estimate mortality rates by age and sex and for various emissions scenarios. This presentation further explores future mortality patterns in Quebec and their implications for life insurers and pension plans.

Professor Peng Shi

UNIVERSITY OF WISCONSIN-MADISON



Short-Bio: Peng Shi is a professor in the Risk and Insurance Department at the Wisconsin School of Business. He is also the Charles and Laura Albright Professor in Business and Finance. Professor Shi is an Associate of the Casualty Actuarial Society (ACAS) and a Fellow of the Society of Actuaries (FSA). He holds a Ph.D. in business with a minor in economics from the University of Wisconsin-Madison.
His interests are problems at the intersection of insurance and statistics, with a particular focus on the development and application of advanced statistical and machine learning methods within the realms of insurance and risk analytics. His expertise includes actuarial data science, probabilistic forecasting and predictive modeling, insurance and risk analytics, dependence models and multivariate analysis, machine learning and statistical learning, and intensive longitudinal data methods.

Title: Bridging the Disaster Protection Gap with Index Insurance

Abstract: Natural disasters are becoming more frequent and severe, driving up global financial losses. Yet, over 60% of losses between 2012 and 2021 were uninsured. Index insurance presents a promising way to close this protection gap. Unlike traditional indemnity insurance, which incurs high adjustment costs and slow claim settlements, index-based contracts can deliver faster and cheaper payouts after disasters. However, index insurance faces basis risk, the mismatch between index payouts and actual losses. This paper develops a framework showing how better index design can reduce basis risk and improve insurance uptake. Focusing on flood insurance, we use complex weather data and deep learning to construct a modeled index that forecasts ultimate flood losses. Our findings highlight how data-driven index design can strengthen disaster resilience.

Professor Qihe Tang

UNIVERSITY OF NEW SOUTH WALES

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Short-Bio: Professor Tang joined the UNSW Business School under the SHARP scheme in 2017. Prior to that, he worked at the University of Iowa, where he was promoted to Full Professor in 2012 and conferred an Endowed Chair in 2014. His expertise centres on extreme value theory for insurance, finance, and risk management. Recently, he has been working on the following topics:

- Modeling, measuring, and managing catastrophe risks
- Systemic risk and financial networks
- Decision making under uncertainty
- Pricing in incomplete markets
- Climate change and insurance

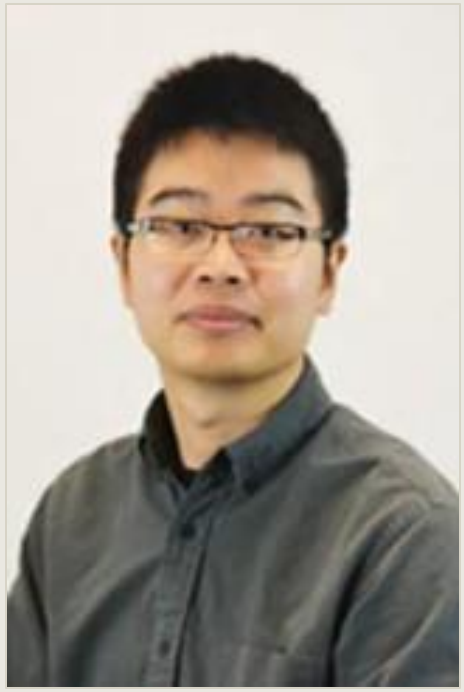
His research on these topics has recently been supported by three Discovery Projects from the ARC. Professor Tang currently serves as an Editor of the journal Insurance: Mathematics and Economics, and as an Associate Editor of several other journals. He is an Elected Member of the International Statistical Institute. At UNSW, he is Co-Director of the Innovations in Risk, Insurance and Superannuation (IRIS) Knowledge Hub.

Title: Distributionally Robust Optimization under Ambiguity across Two Layers

Abstract: With general interest in distributionally robust optimization under multilayered ambiguity, we study a stylized model, the inner product $\boldsymbol{\omega} \cdot \boldsymbol{X} \cdot \boldsymbol{Y}$, where $\boldsymbol{\omega}$ is a deterministic, nonnegative d-dimensional vector representing a strategy, and $\boldsymbol{X}$ and $\boldsymbol{Y}$ are d-dimensional real-valued random vectors representing certain losses and economic factors, respectively, both subject to ambiguity. We first analyze the ambiguity associated with $\boldsymbol{X}$ and $\boldsymbol{Y}$ and separately, and then jointly, with each ambiguity set characterized by a Wasserstein ball. For both settings, we derive explicit expressions for the worst-case expectation of $\boldsymbol{\omega} \cdot \boldsymbol{X} \cdot \boldsymbol{Y}$. Numerical studies further illustrate how to determine the radii of the Wasserstein balls to ensure a prespecified coverage probability.

Professor Maochao Xu

ILLINOIS STATE UNIVERSITY



Short-Bio: Dr. Maochao Xu is a Full Professor of Mathematics at Illinois State University. His research focuses on cyber insurance, statistical modeling, and deep learning. He has published numerous papers in prestigious journals, and his work has been recognized with distinctions such as the Best Paper Award in insurance, Featured Articles in cybersecurity, and a Highly Commended Paper in statistics. In addition to his academic contributions, he provides advisory and consulting services to industry leaders in cyber insurance and co-founded Rankiteo Inc., a cyber risk management company.

Title: An Online Learning Framework for Cyber Risk Modeling and Prediction

Abstract: Cyber breaches continue to pose significant threats to enterprises and society, necessitating robust models for accurate risk assessment and effective insurance pricing. Traditional approaches in industry typically rely on offline model updates, which are time-consuming, costly, and cannot be performed regularly at short intervals; as a result, models are often refreshed only infrequently, delaying the incorporation of new information. In this work, we introduce a novel online learning framework that integrates copula-based dependence modeling with natural gradient boosting techniques to capture both temporal and cross-group dependencies in cyber breach data. Our method continuously updates model parameters as new data becomes available, leveraging online linearization to efficiently adjust to evolving risk profiles. This adaptive framework employs D-vine and bivariate copula structures to flexibly model non-linear dependencies among risk factors while incrementally refining marginal distributions through online updates. Empirical evaluation of the real-world cyber incident dataset demonstrates that our approach not only captures the intricate statistical characteristics of multivariate cyber risks but also outperforms conventional methods in predictive performance.

Professor Yiying Zhang

SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Short-Bio: Zhang Yiying is now a tenure-track Assistant Professor in the Department of Mathematics at the Southern University of Science and Technology. He obtained the bachelor's and master's degrees from the School of Mathematics and Statistics at Lanzhou University, and the PhD from the Department of Statistics and Actuarial Science at the University of Hong Kong. After completing his PhD in September 2018, he conducted academic visits to KU Leuven and the University of Amsterdam. From January 2019 to August 2021, he worked as an Assistant Professor at the School of Statistics and Data Science, Nankai University. In August 2021, he joined the Department of Mathematics at the Southern University of Science and Technology as a tenure-track Assistant Professor. His main research interests include optimal (re)insurance design, catastrophe insurance, risk reduction, and systemic risk. He has published more than 70 academic papers, and his research results have been published in leading journals in the fields of actuarial science, economics, financial mathematics, and management and operations research, such as Insurance: Mathematics and Economics, ASTIN Bulletin, Scandinavian Actuarial Journal, North American Actuarial *Journal*, *Journal of Economic Dynamics and Control*, *Quantitative Finance*, *European Journal of Operational Research*, *Naval Research Logistics*, *TEST*, *Reliability Engineering & System Safety*, and *Computers & Industrial Engineering*. He also serves as a statistical Area Editor on the editorial board of the international SCIE-indexed journal *Hacettepe Journal of Mathematics and Statistics*.

Title: Catastrophe risk sharing with insurance levy under distorted probabilities

Abstract : This paper considers a risk-sharing arrangement within catastrophe insurance, where the government implements a first-layer limit insurance by collecting the insurance levy at the time the decision-maker opts for purchasing such a kind of insurance. The levy is structured as an increasing convex function of the coverage cap. The decision-maker employs distorted probabilities, reflecting her ambiguity compared to real-world probabilities, so as to minimize her total risk exposure. This work also accounts for the insurer's potential default, in a case where the indemnities exceed the insurer's regulated capital threshold. Under the well-known risk management measures like VaR and TVaR, we identify the optimal pair, consisting of the optimal indemnity schedule and the coverage cap in the limit insurance. Numerical analyses validate our theoretical results and demonstrate how optimal strategies adapt to the levy structure, solvency constraints, and the risk attitude from the decision-maker's side.

Professor Min Zheng

CENTRAL UNIVERSITY OF FINANCE AND ECONOMICS

Short-Bio: Min Zheng, Professor and Doctoral Supervisor, Deputy Head of the Department of Actuarial Science, Senior Research Fellow at the Business School of the University of Technology Sydney, and Visiting Scholar at the Macquarie University Business School. Main research directions include risk management, health management, asset pricing, and behavioral finance. She has presided over the National Natural Science Foundation of China, Beijing Natural Science Foundation and Beijing Social Science Foundation, and participated in multiple national and provincial-level research projects. She has published more than twenty papers in top-tier domestic and international academic journals such as the Journal of Economic Dynamics and Control, Journal of Economic Behavior and Organization, International Review of Financial Analysis, and European Journal of Finance.

Title: A Nation Prospers When It Cares for Its Workers: The Impact of Artificial Intelligence on China's Labor Market

Abstract: Based on the rapid development of artificial intelligence and the policy context of China's "AI+" initiative, this study focuses on AI's impact on China's labor market and occupational transition paths. Using the LightGBM algorithm combined with occupational characteristic data, six major occupational categories are classified into three replacement risk levels (high, medium, and low), revealing the systemic impact of AI on the labor market and the differentiated risks of different occupations. The research finds that practitioners in high-risk occupations have shown unfavorable trends in working hours and salary levels, making occupational transition an inevitable choice. The transition index constructed based on occupational similarity indicates that transition can be achieved through internal conversion within major categories or cross-category conversion. Therefore, the study proposes three-party countermeasures: universities establish a dynamic adjustment mechanism for disciplines and majors, the government improves the social security and vocational training system, and workers update their professional skills in a timely manner. This research provides theoretical support and practical guidance for addressing employment changes caused by AI, emphasizing that mastering AI application capabilities is crucial for adapting to the future job market.

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