



The 56th Actuarial Research Conference

Full Meeting Agenda

All events are listed in North America Central Time Zone (UTC -5)

Thursday, August 19

- 09:00 – 09:05 a.m.** **Introduction of Dean of the College of Science and Health**
Yuanying Guan, Director of Actuarial Science
- 09:05 – 09:10 a.m.** **Welcome to ARC 2021**
Stephanie Dance-Barnes, Dean of the College of Science and Health
- 09:10 – 09:15 a.m.** **Instructions and Recognition of Sponsors**
Cynthia Edwalds, Executive Director of Arditti Center for Risk Management
- 09:15 – 10:15 a.m.** **Keynote: How to improve diversity in the actuarial field?**
Dwayne Husbands, FSA, CFA, MAAA, Senior Manager, Ernst & Young
Moderator: Tenesia McGruder, Actuary, Blue Cross Blue Shield of Alabama
Abstract: This session will provide insights into why diversity is important and how to improve diversity in the actuarial profession. In addition, the session will do a deep dive into how the International Association of black actuaries (IABA) are working to address diversity and reduce barriers to entry for underrepresented groups through their programs and industry partnerships.
- 10:15 – 10:20 a.m.** **Break**

Special Invited Session – Climate Risk

Moderator: Rob Montgomery, Society of Actuaries

Panelists: Steven Bowen, Aon



The 56th Actuarial Research Conference

Didier Serre Ruah, Clearsum

Robert Erhardt, Wake Forest University

10:20 – 10:45 a.m. Navigating Catastrophe Risk in an Era of Climate Change

Steven Bowen, Aon

10:45 – 11:10 a.m. Number Crunching and Storytelling: A Framework for Actuaries for Managing Climate Risks and Building Resilience

Didier Serre Ruah, Clearsum

11:10 – 11:35 a.m. Climate, Spatial Dependence and Flood Risk: A U.S. Case Study

Rob Erhardt, Wake Forest University

11:35 – 11:40 a.m. Break

11:40 a.m. – 12:40 p.m. Special Invited Session – Diversity, Equity, and Inclusion Session

Moderator: Cynthia Edwalds, DePaul University

Panelists: Jake Akstins, Nationwide

Trisa-Lee Gaynor, Genworth Financial

Enrique Schulz, Segal Consulting

12:40 – 01:10 p.m. Lunch Break (Guided Virtual Chicago River Architecture Tour)

01:10 – 01:40 p.m. Presentation by the President of the SOA

Announce the Winner of the SOA Actuarial Science Early Career Award

Roy Goldman, President of the Society of Actuaries

01:40 – 01:50 p.m. Break



The 56th Actuarial Research Conference

Special Invited Session – Cyber Risk

Moderator: Michael Philips, DePaul University

Panelists: Michael Bean, ACTEX Learning

Maochao Xu, Illinois State University

Karen Heart, DePaul University

01:50 – 02:15 p.m.

Measuring Exposure in Cyber Insurance

Michael Bean, ACTEX Learning

02:15 – 02:40 p.m.

A Multivariate Frequency-Severity Model for Healthcare Data Breach

Maochao Xu, Illinois State University

02:40 – 03:05 p.m.

Defeating Malware: Short-Term and Long-Term Solutions

Guaranteed to Succeed

Karen Heart, DePaul University

03:05-03:15 p.m.

Break

Parallel Session I – Emerging Risk/Insurance Technology

Moderator: Emiliano A. Valdez, University of Connecticut

03:15 – 03:40 p.m.

Framework for loss distribution of the operational risk of vehicle-to-vehicle cooperation to marshal traffic via monetization of highway space

Petar Jevtic, Arizona State University

03:40 – 04:05 p.m.

Cost-sensitive Multi-class AdaBoost for Understanding Driving Behavior with Telematics



The 56th Actuarial Research Conference

Emiliano A. Valdez, University of Connecticut

04:05 – 04:30 p.m. **Extending the Insurance Forecasting Time Horizons from Years to Decades**
Stephen Kolk, Kolkulations LLC

Parallel Session II – Actuarial Education

Moderator: Diana Skrzydlo, University of Waterloo

03:15 – 03:40 p.m. **Society of Actuaries Education Update**
Stuart Klugman, Society of Actuaries

03:40 – 04:05 p.m. **CAS Admissions and Education Initiatives**
Ken Williams, Casualty Actuarial Society

04:05 – 04:30 p.m. **Transforming CIA Education**
Bruce Jones, Canadian Institute of Actuaries

Parallel Session III – Data Science and Applications

Moderator: Seulkee Yun, University of Wisconsin-Madison

03:15 – 03:40 p.m. **Self-Organizing Maps to Examine Determinants of Loneliness in Older Adults**
Seulkee Yun, University of Wisconsin-Madison

03:40 – 04:05 p.m. **Pricing and Reserving Wildfire Insurance in North America**
Roba Bairakdar, Concordia University

04:05 – 04:30 p.m. **Ultimate Loss Development using Bidirectional LSTMs**
Lahiru Somaratne, University of Nebraska – Lincoln



The 56th Actuarial Research Conference

- 04:30 – 04:40 p.m.** **Break**
- 04:40 – 05:10 p.m.** **ACTEX Learning Networking Session**
New Paradigm: “Open Content” Actuarial Education Tools for Professors
Bill Marella, ACTEX Learning
- 05:10 – 05:20 p.m.** **Break**
- 05:20 – 05:50 p.m.** **SOA Health Section Networking Session**
Joan Barrett, Axene Health Partners
- 05:50 – 6:00 p.m.** **Break**
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Parallel Session I – Finance

Moderator: Jean Francois Begin, Simon Fraser University

- 06:00 – 06:25 p.m.** **On Complex Economic Scenario Generators: Is Less More?**
Jean Francois Begin, Simon Fraser University
- 06:25 – 06:50 p.m.** **The Reinforcement Learning Kelly Strategy**
Ruihong Jiang, University of Waterloo
- 06:50 – 7:15 p.m.** **Risk-Constrained Portfolio Choice via Quantiles**
Michael Zhu, University of Waterloo

Parallel Session II – Retirement/Pension

Moderator: Thorsten Moenig, Temple University

- 06:00 – 06:25 p.m.** **It’s RILA Time: An Introduction to Registered Index-Linked Annuities**
Thorsten Moenig, Temple University



The 56th Actuarial Research Conference

06:25 – 06:50 p.m. **Valuation of guaranteed minimum maturity benefits under generalized regime-switching models using the Fourier Cosine method**
Yang Shen, University of New South Wales (UNSW Sydney)

06:50 – 07:15 p.m. **Target Volatility Strategies for Group Self-Annuity Portfolios**
Jonathan Ziveyi, University of New South Wales (UNSW Sydney)

Parallel Session III - Risk Measures/Cyber Risk

Moderator: Vytautas Brazauskas, University of Wisconsin-Milwaukee

06:00 – 06:25 p.m. **Smoothed Quantiles for Measuring Discrete Risks**
Vytautas Brazauskas, University of Wisconsin-Milwaukee

06:25 – 06:50 p.m. **Some results on the risk capital allocation rule induced by the Conditional Tail Expectation risk measure**
Nawaf Mohammed, York University

06:50 – 07:15 p.m. **Cyber Risk Assessment for Capital Management**
Linfeng Zhang, University of Illinois at Urbana-Champaign

Friday August 20

09:00 – 10:00 a.m. **Keynote: Navigating the Noise: Bridging the gap between theory and application of insured lives mortality**
Mary Bahna-Nolan, FSA, MAAA, CERA, Pacific Life

Moderator: Cynthia Edwalds, DePaul University

Abstract: The study of mortality and longevity has never been more at the forefront of the news and regulatory environment than it is today. With the



The 56th Actuarial Research Conference

impacts of COVID-19 (actual and projected), the heightened awareness of health and medical disparities by socio-economic and racial groups and significantly more data available, the opportunities for significant research are many. However, within life and health insurance, the research must be translatable for practitioners to leverage and regulators to understand. In spite of the significantly increasing amounts and types of data, there continue to be major hurdles for the life insurance sector to forecast future mortality and the basis risk in leveraging research based on general population studies. Mary will discuss these challenges, what is being done to overcome them and how we might better bridge the gap between research and practice.

10:00 – 10:05 a.m. **Break**

Special Invited Session – COVID-19

Moderator: Nan Zhu, Penn State University

Panelists: Cindy MacDonald, Society of Actuaries

Runhuan Feng, University of Illinois Urbana-Champaign

Junying Zhao, University of Oklahoma Health Sciences Center

10:05 – 10:30 a.m. **COVID-19 Impact on Population and Insured Mortality**

Cindy MacDonald, Society of Actuaries

10:30 – 10:55 a.m. **Epidemic Models and Their Insurance Applications**

Runhuan Feng, University of Illinois Urbana-Champaign

10:55 – 11:20 a.m. **The Financial Impact of COVID-19 on Publicly Traded Healthcare Firms**

Junying Zhao, University of Oklahoma Health Sciences Center

11:20 – 11:25 a.m. **Break**



The 56th Actuarial Research Conference

11:25 a.m.– 12:40 p.m. Special Invited Session – Algorithmic Bias

Moderator: Yuanying Guan, DePaul University

Panelists: Edward (Jed) W. Frees, University of Wisconsin – Madison;

Australian National University (ANU)

James Guszczka, Stanford University

Daniel Bauer, University of Wisconsin – Madison

A Primer on Algorithmic Fairness in Insurance

12:40 – 01:10 p.m. Lunch Break (Virtual Performance from the DePaul Symphony Orchestra)

01:10 – 01:40 p.m. Presentation by the President of the CAS

Jessica Leong, President of the Casualty Actuarial Society

01:40 – 01:50 p.m. Break

01:50 – 03:05 p.m. Special Invited Session – Professionalism

Moderator: Yiou Li, DePaul University

Panelist: Jay Jaffe, Actuarial Enterprises

Engaging Actuarial Students in Professionalism

03:05 – 03:15 p.m. Break

Parallel Session I – Life Insurance



The 56th Actuarial Research Conference

Moderator: Kenneth Zhou, Arizona State University

03:15 – 03:40 p.m. **Stochastic mortality dynamics driven by mixed fractional Brownian motion**
Kenneth Zhou, Arizona State University

03:40 – 04:05 p.m. **Metamodeling for Variable Annuity Valuation: What works and what does Not**
Xiaochen Jing, University of Wisconsin – Madison

04:05 – 04:30 p.m. **Common Mortality Trend Model and Mortality Prediction**
Yechao Meng, University of Waterloo

Parallel Session II – Actuarial Education

Moderator: Stefanos Orfanos, Georgia State University

03:15 – 03:40 p.m. **A comparison of Macaulay approximations**
Stefanos Orfanos, Georgia State University

03:40 – 04:05 p.m. **Loss Data Analytics: Short Course**
Edward Frees, University of Wisconsin-Madison, Australian National University

04:05 – 04:30 p.m. **Teaching and Defining Problem Difficulty For Actuarial Exams**
Russell Hendel, Towson University

04:30 – 04:55 p.m. **All That You Can't Leave Behind: Lessons from Pandemic Teaching**
Diana Skrzydlo, University of Waterloo

Parallel Session III – COVID-19



The 56th Actuarial Research Conference

Moderator: Hee Seok Nam, Kettering University

03:15 – 03:40 p.m.

Actuarial analysis on a deterministic SEIR model

Hee Seok Nam, Kettering University

03:40 – 04:05 p.m.

Epidemiological compartment models and premium calculation

Vajira Manathunga, Middle Tennessee State University

04:05 – 04:30 p.m.

Healthcare loss triangle using epidemiology model

Longhao Jin, University of Illinois Urbana-Champaign

04:30 – 05:00 p.m.

Break for Attendees in Parallel Session I and III

04:55 – 05:00 p.m.

Break for Attendees in Parallel Session II

05:00 – 05:30 p.m.

CAS Networking Session

Brian Fannin, Casualty Actuarial Society

05:30 – 06:00 p.m.

The Actuarial Foundation Networking Session

Debbie McCormac, The Actuarial Foundation

Josh Neubert, The Actuarial Foundation

Parallel Session I - Risk Measures/Risk Management

Moderator: Yuyu Chen, University of Waterloo

06:00 – 06:25 p.m.

Ordered Risk Aggregation under Dependence Uncertainty

Yuyu Chen, University of Waterloo

06:25 – 06:50 p.m.

New Class of Distortion Risk Measures and Their Estimation

Xiwen Wang, Central Michigan University



The 56th Actuarial Research Conference

06:50 – 07:15 p.m.

On the Modeling and Pricing of Storm CAT Bond

Shimeng Huang, University of Wisconsin-Madison

07:15 – 07:40 p.m.

Optimizing distortion riskmetrics with distributional uncertainty

Qiuqi Wang, University of Waterloo

Parallel Session II – Credibility Theory/Credibility Model

Moderator: Michael Baron, American University

06:00 – 06:25 p.m.

Limited-Fluctuation Credibility under Uncertain Priors

Michael Baron, American University

06:25 – 06:50 p.m.

Hawkes Processes in Dynamic Credibility

Bin Zou, University of Connecticut

06:50 – 07:15 p.m.

Approximation of zero-inflated Poisson credibility premium via variational Bayes

Himchan Jeong, Simon Fraser University

07:15 – 07:40 p.m.

Bayesian credibility under a bivariate conjugate prior on frequency and Severity

Eric Cheung, University of New South Wales (UNSW Sydney)

Parallel Session III – Data Science and Applications

Moderator: Changyue Hu, University of Illinois at Urbana Champaign

06:00 – 06:25 p.m.

Imbalanced Learning using Actuarial Modified Loss Function in Tree-Based Models



The 56th Actuarial Research Conference

Changyue Hu, University of Illinois at Urbana Champaign

06:25 – 06:50 p.m. Markov Chain Monte Carlo for Inference on Phase-Type Aging Model

Cong Nie, Western University

06:50 – 07:15 p.m. Structural varying-coefficient regression to differentiate individual policyholder's risk

Rakheon Kim, Texas A&M University

07:15 – 07:40 p.m. Natural Language Processing Application in Actuarial Science: Interpretable Language Models

Zhiyu Quan, University of Illinois at Urbana-Champaign

Saturday August 21

09:00 – 10:00 a.m. Keynote: A tale of two risk measures: Contrasting Value-at-Risk and Expected Shortfall

Ruodu Wang, University of Waterloo

Moderator: Yuanying Guan, DePaul University

Abstract: Value-at-Risk and Expected Shortfall (also called Tail-Value-at-Risk) are the two most important risk measures used in banking and insurance, and they have received considerable interest during the past two decades from researchers in actuarial science, risk management, finance, statistics, and engineering. Although the two risk measures are extensively studied, some important and practical issues are not well understood until recently. In this talk, I will summarize some research advances on the theory of these risk measures over the past few years. Based on my own research, the two risk measures will be contrasted from several important aspects, including technical properties, aggregation, risk sharing, capital allocation, robustness, optimization, and backtesting; we keep in mind that each of them has particular advantages and disadvantages.



The 56th Actuarial Research Conference

10:00 – 10:05 a.m. **Break**

Parallel Session I – Insurance Technology

Moderator: Arnold Shapiro, Penn State University

10:05 – 10:30 a.m. **Machine learning (ML) applications in insurance**

Arnold Shapiro, Penn State University

10:30 – 10:55 a.m. **Leveraging High-Resolution Weather Information to Predict Hail Damage**

Claims: A Spatial Point Process for Replicated Point Patterns

Lisa Gao, University of Wisconsin-Madison

10:55 – 11:20 a.m. **Peer-to-peer multi-risk insurance and mutualaid plan**

Samal Abdikerimova, University of Illinois at Urbana-Champaign

Parallel Session II - Data Science and Applications

Moderator: Margie Rosenberg, University of Wisconsin-Madison

10:05 – 10:30 a.m. **Two-Stage Clustering to Assess the Impact of Low Dental Expenditures on**

Outcomes for Children

Margie Rosenberg, University of Wisconsin-Madison

10:30 – 10:55 a.m. **Patterns and Anomalies of Loss Development in P&C Insurance Market**

Steve Guo, Ball State University

10:55 – 11:20 a.m. **Loss amount prediction using a double GLM with shrinkage and selection**

Gee Lee, Michigan State University



The 56th Actuarial Research Conference

Parallel Session III – Finance

Moderator: Yong Xie, University of Illinois Urbana Champaign

10:05 – 10:30 a.m. **Model-Free Implied Dependence and the Cross-Section of Expected Stock Returns**

Yong Xie, University of Illinois Urbana Champaign

10:30 – 10:55 a.m. **The Hurst roughness exponent and its model-free estimation**

Xiyue Han, University of Waterloo

10:55 – 11:20 a.m. **Valuing Lifetime Withdrawal Guarantees in RILAs**

Chenxin Xu, Temple University

11:20 – 11:25 a.m. **Break**

Parallel Session I – Insurance Economics

Moderator: Mario Ghossoub, University of Waterloo

11:25 – 11:50 a.m. **Bowley vs. Pareto Optima in Reinsurance Contracting**

Mario Ghossoub, University of Waterloo

11:50 a.m.– 12:15 p.m. **S-shaped narrow framing, skewness and the demand for insurance**

Shengchao Zhuang, University of Nebraska Lincoln

12:15 – 12:40 p.m. **Pseudo-Model-Free Hedging for Variable Annuities via Deep Reinforcement Learning**

Yuxuan Li, University of Illinois at Urbana-Champaign



The 56th Actuarial Research Conference

Parallel Session II - Risk Measures

Moderator: Lu Xiong, Middle Tennessee State University

11:25 – 11:50 a.m. Reducing the runtime of Least Squares Monte Carlo in Risk Management

Lu Xiong, Middle Tennessee State University

11:50 a.m.– 12:15 p.m. Precise Large Deviations of Aggregate Claims with Arbitrary Dependence between Claim Sizes and Waiting Times

Yiqing Chen, Drake University

12:15 – 12:40 p.m. Robust Estimation of Parameters for Log-Normal Insurance Payments with Data Truncation and Censoring

Qian Zhao, Robert Morris University

Parallel Session III - Data Science and Applications

Moderator: Liang Hong, The University of Texas at Dallas

11:25 – 11:50 a.m. A nonparametric sequential learning procedure for estimating the pure premium

Liang Hong, The University of Texas at Dallas

11:50 a.m.– 12:15 p.m. Fixed and Random Tail Probabilistic Robust Parametric Estimation Methodology

Chudamani Poudyal, University of Central Florida

12:15 – 12:40 p.m. Adstools - An open source R library for Actuarial Science

Trang Tran, Massachusetts Mutual Life Insurance Company (MassMutual)

12:40 – 12:45 p.m. Break



The 56th Actuarial Research Conference

Closing Ceremony

12:45-12:50 p.m.

Closing Remark

Kyle Petersen, Chair of the Department of Mathematical Sciences

12:50 – 12:55 p.m.

ARC 2022 Conference Teaser

Runhuan Feng, University of Illinois Urbana-Champaign

12:55 – 1:00 p.m.

Announce the Winners of Student Presentation Awards

Yuanying Guan, DePaul University