## Full Meeting Agenda

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

### Thursday, August 19

<table>
<thead>
<tr>
<th>Time</th>
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| 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** |
| 10:15 – 10:20 a.m. | **Special Invited Session – Climate Risk**  
**Moderator:** Rob Montgomery, Society of Actuaries  
**Panelists:** Steven Bowen, Aon |
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
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**

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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

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
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

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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
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: Vytaras Brazauskas, University of Wisconsin-Milwaukee

06:00 – 06:25 p.m. Smoothed Quantiles for Measuring Discrete Risks
Vytaras 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
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

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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
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 Guszcza, 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:** You 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**
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

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**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
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
Markov Chain Monte Carlo for Inference on Phase-Type Aging Model

Cong Nie, Western University

Structural varying-coefficient regression to differentiate individual policyholder’s risk

Rakheon Kim, Texas A&M University

Natural Language Processing Application in Actuarial Science: Interpretable Language Models

Zhiyu Quan, University of Illinois at Urbana-Champaign

Saturday August 21

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.
10:00 – 10:05 a.m.  Break

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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

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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
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**

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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
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
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