

Ruodu Wang, Ph.D.

Curriculum Vitae

Professor

University Research Chair & Sun Life Fellow
Department of Statistics and Actuarial Science
University of Waterloo
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Academic Appointments

University of Waterloo

Professor, Department of Statistics and Actuarial Science	2022.07 - present
Associate Chair for Research, Department of Statistics and Actuarial Science	2021.07 - present
Sun Life Fellow	2021.07 - present
University Research Chair	2018.07 - present
Associate Professor, Department of Statistics and Actuarial Science	2017.07 - 2022.06
Assistant Professor, Department of Statistics and Actuarial Science	2012.08 - 2017.06

Education

Ph.D. Mathematics, Georgia Institute of Technology. Advisor: Liang Peng	2012.05
M.S. Financial Mathematics, Peking University. Advisor: Jingping Yang	2009.06
B.S. Mathematics, Peking University	2006.06

Research Areas

Probability · Statistics · Actuarial Science · Financial Engineering
Operations Research · Economic Theory · Quantitative Risk Management

Editorial Duties

Co-Editor, <i>ASTIN Bulletin - The Journal of the International Actuarial Association</i>	2018 - present
Co-Editor, <i>European Actuarial Journal</i>	2016 - present
Associate Editor, <i>Canadian Journal of Statistics</i>	2022 - present
Associate Editor, <i>Journal of Mathematical Economics</i>	2020 - present

Associate Editor, <i>Acta Mathematicae Applicatae Sinica (English Series)</i>	2016 - present
Member of the Editorial Advisory Board, <i>Dependence Modeling</i>	2014 - present

Research Grants

Sun Life Research Fellowship (sole PI)	2021 - 2026
The Society of Actuaries CAE Research Grant (one of many Co-PIs; PI: Johnny Li)	2018 - 2021
NSERC Discovery Grant (RGPIN-2018-03823, sole PI)	2018 - 2024
NSERC Discovery Accelerator Supplement (RGPAS-2018-522590, sole PI)	2018 - 2021
International Research Partnership Grant, University of Waterloo (Co-PI; PI: Tao Chen)	2016 - 2018
NSERC Discovery Grant (RGPIN-435844-2013, sole PI)	2013 - 2018

Awards and Honours

Fellow of IMS ↗	Institute of Mathematical Statistics, 2022
<ul style="list-style-type: none"> ◇ “For significant contributions to statistics and applied probability in operations research, risk management, and actuarial science; and highly influential interdisciplinary research bridging statistics and probability.” 	
SOA Actuarial Science Early Career Award ↗	Society of Actuaries, 2021
<ul style="list-style-type: none"> ◇ An international award given annually to one actuarial scholar within 10 years of independent career ◇ The first winner worldwide 	
NSERC Discovery Accelerator Supplement Award ↗	NSERC, 2018
<ul style="list-style-type: none"> ◇ 125 awardees per year in Canada across all scientific and engineering fields 	
University Research Chair	University of Waterloo, 2018
The Faculty of Mathematics Golden Jubilee Research Excellence Award	University of Waterloo, 2017
Annual SAS Department Teaching Award	University of Waterloo, 2017
Laha Travel Award	Institute of Mathematical Statistics, 2012
Bob Price Fellowship	Georgia Institute of Technology, 2011

Keynote and Special Addresses

Keynote Speaker, 56th Actuarial Research Conference	2021
Keynote Speaker, 24th International Congress on Insurance: Mathematics and Economics	2021
Keynote Speaker, 4th European Actuarial Journal Conference	2018

Academic Visits (≥ 2 weeks)

University of Science and Technology of China (School of Management)	2021
Columbia University (Statistics; Industrial Engineering and Operations Research)	2018, 2019, 2022
Stanford University (Management Science and Engineering)	2018
Chinese Academy of Sciences (Institute of Applied Mathematics)	2016, 2019, 2020, 2021
Central University of Finance and Economics (China Institute for Actuarial Science)	2014
ETH Zurich (RiskLab, Department of Mathematics)	2013, 2014, 2015, 2017, 2018
Peking University (School of Mathematical Sciences)	2012, 2013, 2016

Media Coverage of Research

An interview with Ruodu Wang, Expanding Horizons, Society of Actuaries, November 2021 [↗](#)

Riskier CLOs get big boost from S&P in 'new ratings shopping', Bloomberg, April 2020 [↗](#)

Academic Advising

Postdoctoral fellows

Jean-Gabriel Lauzier	2021 - present
Yang Liu (with A. Schied)	2021 - 2022
Postdoc Scholar in Operations Research, Stanford University, USA (2022)	
Xia Han (with D. Landriault)	2020 - 2022
Assistant Professor of Actuarial Science, Nankai University, China (2022)	
Tolulope Fadina	2019 - 2020
Lecturer (Assistant Professor) in Actuarial Science and Finance, University of Essex, UK (2020)	
Peng Liu (with A. Schied)	2018 - 2020
Lecturer (Assistant Professor) in Actuarial Science and Finance, University of Essex, UK (2020)	
Daniel Linders (with F. Yang)	2015 (short term)
Assistant Professor of Actuarial Science, University of Illinois Urbana-Champaign, USA (2017)	
Tiantian Mao (with J. Cai and D. Landriault)	2014 - 2015
Associate Professor in Statistics and Finance, University of Science and Technology of China, China (2017)	

Ph.D. students

Qinghua Ren (with M. Ghossoub)	2022 - present
Zachary Van Oosten (with Y. Shen)	2022 - present
Zhanyi Jiao (with J. Cai)	2020 - present
Liyuan Lin (with A. Schied)	2020 - present
Qiuqi Wang	2019 - present
Yuyu Chen (with K. S. Tan)	2018 - 2022
Lecturer (Assistant Professor) of Actuarial Studies, University of Melbourne, Australia (2022)	
Yunran Wei (with G. Willmot)	2015 - 2019
Assistant Professor of Actuarial Science, Northern Illinois University, USA (2019)	
Jie Shen (with Y. Shen)	2014 - 2018
Risk Modelling Researcher, Canadian Imperial Bank of Commerce, Canada (2018)	
Haiyan Liu (with J. Cai)	2013 - 2017
Assistant Professor of Actuarial Science, Michigan State University, USA (2017)	

Master's and Bachelor's research students

Ziyu Chi (2021, UW-BMath); Zhenyuan Zhang (2020, UW-BMath); Hengxin Li (2019, UW-BMath); Daiwen Dai (2017, UW-MQF); Muqiao Huang (2014, UW-BMath); Yuchen Zhang (2014, UW-MMath); Xiao Jiang (with C. Bernard, 2013, UW-MQF)

Publications and Manuscripts

Refereed articles

Forthcoming

- [84] Mao, T. and Wang, R. (forthcoming). Fractional stochastic dominance in rank-dependent utility and cumulative prospect theory. *Journal of Mathematical Economics*.
- [83] Guan, Y., Tsanakas, A. and Wang, R. (forthcoming). An impossibility theorem on capital allocation. *Scandinavian Actuarial Journal*.
- [82] Castagnoli, E., Cattelan, G., Maccheroni, F., Tebaldi, C. and Wang, R. (forthcoming). Star-shaped risk measures. *Operations Research*.
- [81] Li, H. and Wang, R. (forthcoming). PELVE: Probability equivalent level of VaR and ES. *Journal of Econometrics*.
- [80] Liu, F., Mao, T., Wang, R. and Wei, L. (forthcoming). Inf-convolution, optimal allocations, and model uncertainty for tail risk measures. *Mathematics of Operations Research*.

- [79] Chen, Y., Liu, P., Tan, K. S. and Wang, R. (forthcoming). Trade-off between validity and efficiency of merging p-values under arbitrary dependence. *Statistica Sinica*.

2022

- [78] Wang, R. and Ramdas, A. (2022). False discovery rate control with e-values. *Journal of the Royal Statistical Society Series B*, **84**(3), 822–852. [↗](#)
- [77] Bellini, F., Fadina, T., Wang, R. and Wei, Y. (2022). Parametric measures of variability induced by risk measures. *Insurance: Mathematics and Economics*, **106**, 270–284. [↗](#)
- [76] Nutz, M. and Wang, R. (2022). The directional optimal transport. *Annals of Applied Probability*, **32**(2), 1400–1420. [↗](#)
- [75] Vovk, V., Wang, B. and Wang, R. (2022). Admissible ways of merging p-values under arbitrary dependence. *Annals of Statistics*, **50**(1), 351–375. [↗](#)
- [74] Liang, X., Wang, R. and Young, V. (2022). Optimal insurance to maximize RDEU under a distortion-deviation premium principle. *Insurance: Mathematics and Economics*, **104**, 35–59. [↗](#)
- [73] Cui, Z., Liu, Y. and Wang, R. (2022). Variance comparison between Infinitesimal Perturbation Analysis and Likelihood Ratio estimators to stochastic gradient. *Operations Research Letters*, **50**(2), 199–204. [↗](#)
- [72] Embrechts, P., Schied, A. and Wang, R. (2022). Robustness in the optimization of risk measures. *Operations Research*, **70**(1), 95–110. [↗](#)
- [71] Wang, Q., Wang, R. and Zitikis, R. (2022). Risk measures induced by efficient insurance contracts. *Insurance: Mathematics and Economics*, **103**, 56–65. [↗](#)
- [70] Chen, Y., Liu, P., Liu, Y. and Wang, R. (2022). Ordering and inequalities for mixtures on risk aggregation. *Mathematical Finance*, **32**(1), 421–451. [↗](#)
- [69] Chen, Y., Lin, L. and Wang, R. (2022). Risk aggregation under dependence uncertainty and an order constraint. *Insurance: Mathematics and Economics*, **102**, 169–187. [↗](#)
- [68] Burzoni, M., Munari, C. and Wang, R. (2022). Adjusted Expected Shortfall. *Journal of Banking and Finance*, **134**, 106297. [↗](#)

2021

- [67] Xu, Z., Wang, R. and Ramdas, A. (2021). A unified framework for bandit multiple testing. *Advances in Neural Information Processing Systems (NeurIPS 2021)*, 16833–16845. [↗](#)
- [66] Liu, P., Schied, A. and Wang, R. (2021). Distributional transforms, probability distortions, and their applications. *Mathematics of Operations Research*. **46**(4), 1490–1512. [↗](#)
- [65] Boonen, T., Liu, F. and Wang, R. (2021). Competitive equilibria in a comonotone market. *Economic Theory*, **72**, 1217–1255. [↗](#)
- [64] Embrechts, P., Mao, T., Wang, Q. and Wang, R. (2021). Bayes risk, elicibility, and the Expected Shortfall. *Mathematical Finance*, **31**(4), 1190–1217. [↗](#)
- [63] Wang, R. and Ziegel, J. (2021). Scenario-based risk evaluation. *Finance and Stochastics*, **25**, 725–756. [↗](#)

- [62] Liu, F. and Wang, R. (2021). A theory for measures of tail risk. *Mathematics of Operations Research*, **46**(3), 1109–1128. [↗](#)
- [61] Vovk, V. and Wang, R. (2021). E-values: Calibration, combination, and applications. *Annals of Statistics*, **49**(3), 1736–1754. [↗](#)
- [60] Mai, J.-F. and Wang, R. (2021). Stochastic decomposition for ℓ_p -norm symmetric survival functions on the positive orthant. *Journal of Multivariate Analysis*, **184**, 104760. [↗](#)
- [59] Wang, R. and Zitikis, R. (2021). An axiomatic foundation for the Expected Shortfall. *Management Science*, **67**(3), 1413–1429. [↗](#)

2020

- [58] Vovk, V. and Wang, R. (2020). Combining p-values via averaging. *Biometrika*, **107**(4), 791–808. [↗](#)
- [57] Wang, Q., Wang, R. and Wei, Y. (2020). Distortion riskmetrics on general spaces. *ASTIN Bulletin*, **50**(3), 827–851. [↗](#)
- [56] Wang, R. and Wei, Y. (2020). Risk functionals with convex level sets. *Mathematical Finance*, **30**(4), 1337–1367. [↗](#)
- [55] Wang, R., Wei, Y. and Willmot, G. (2020). Characterization, robustness and aggregation of signed Choquet integrals. *Mathematics of Operations Research*, **45**(3), 993–1015. [↗](#)
- [54] Wang, R. and Wei, Y. (2020). Characterizing optimal allocations in quantile-based risk sharing. *Insurance: Mathematics and Economics*, **93**, 288–300. [↗](#)
- [53] Embrechts, P., Liu, H., Mao, T. and Wang, R. (2020). Quantile-based risk sharing with heterogeneous beliefs. *Mathematical Programming*, **181**(2), 319–347. [↗](#)
- [52] Mao, T. and Wang, R. (2020). Risk aversion in regulatory capital principles. *SIAM Journal on Financial Mathematics*, **11**(1), 169–200. [↗](#)
- [51] Liu, P., Wang, R. and Wei, L. (2020). Is the inf-convolution of law-invariant preferences law-invariant? *Insurance: Mathematics and Economics*, **91**, 144–154. [↗](#)
- [50] Wang, R. and Zitikis, R. (2020). Weak comonotonicity. *European Journal of Operational Research*, **282**, 386–397. [↗](#)
- [49] Liu, F., Cai, J., Lemieux, C. and Wang, R. (2020). Convex risk functionals: Representation and applications. *Insurance: Mathematics and Economics*, **90**, 66–79. [↗](#)

2019

- [48] Mao, T., Wang, B. and Wang, R. (2019). Sums of standard uniform random variables. *Journal of Applied Probability*, **56**(3), 918–936. [↗](#)
- [47] Wang, R., Xu, Z. Q. and Zhou, X. Y. (2019). Dual utilities on risk aggregation under dependence uncertainty. *Finance and Stochastics*, **23**(4), 1025–1048. [↗](#)
- [46] Asimit, V., Peng, L., Wang, R. and Yu, A. (2019). An efficient approach to quantile capital allocation and sensitivity analysis. *Mathematical Finance*, **29**(4), 1131–1156. [↗](#)

- [45] Puccetti, G., Rigo, P., Wang, B. and Wang, R. (2019). Centers of probability measures without the mean. *Journal of Theoretical Probability*, **32**, 1482–1501. [↗](#)
- [44] Shen, J., Shen, Y., Wang, B. and Wang, R. (2019). Distributional compatibility for change of measures. *Finance and Stochastics*, **23**(3), 761–794. [↗](#)
- [43] Wang, B., Wang, R. and Wang, Y. (2019). Compatible matrices of Spearman’s rank correlation. *Statistics and Probability Letters*, **151**, 67–72. [↗](#)
- [42] Shen, J., Shen, Y. and Wang, R. (2019). Random locations of periodic stochastic processes. *Stochastic Processes and their Applications*, **129**, 878–901. [↗](#)

2018

- [41] Embrechts, P., Liu, H. and Wang, R. (2018). Quantile-based risk sharing. *Operations Research*, **66**(4), 936–949. [↗](#)
- [40] Li, L., Shao, H., Wang, R. and Yang, J. (2018). Worst-case Range Value-at-Risk with partial information. *SIAM Journal on Financial Mathematics*, **9**(1), 190–218. [↗](#)
- [39] Cai, J., Liu, H. and Wang, R. (2018). Asymptotic equivalence of risk measures under dependence uncertainty. *Mathematical Finance*, **28**(1), 29–49. [↗](#)

2017

- [38] Jakobsons, E. and Wang, R. (2017). Negative dependence in matrix arrangement problems. *Annals of Operations Research*, online publication, December 2017. [↗](#)
- [37] Cai, J., Liu, H. and Wang, R. (2017). Pareto-optimal reinsurance arrangements under general model settings. *Insurance: Mathematics and Economics*, **77**, 24–37. [↗](#)
- [36] Furman, E., Wang, R. and Zitikis, R. (2017). Gini-type measures of risk and variability: Gini shortfall, capital allocations, and heavy-tailed risks. *Journal of Banking and Finance*, **83**, 70–84. [↗](#)
- [35] Bernard, C., Rüschendorf, L., Vanduffel, S. and Wang, R. (2017). Risk bounds for factor models. *Finance and Stochastics*, **21**(3), 631–659. [↗](#)
- [34] Liu, H. and Wang, R. (2017). Collective risk models with dependence uncertainty. *ASTIN Bulletin*, **47**(2), 361–389. [↗](#)

2016

- [33] Wang, B. and Wang, R. (2016). Joint mixability. *Mathematics of Operations Research*, **41**(3), 808–826. [↗](#)
- [32] Embrechts, P., Hofert, M. and Wang, R. (2016). Bernoulli and tail-dependence compatibility. *Annals of Applied Probability*, **26**(3), 1636–1658. [↗](#)
- [31] Bignozzi, V., Mao, T., Wang, B. and Wang, R. (2016). Diversification limit of quantiles under dependence uncertainty. *Extremes*, **19**(2), 143–170. [↗](#)
- [30] Wang, R. (2016). Regulatory arbitrage of risk measures. *Quantitative Finance*, **16**(3), 337–347. [↗](#)
- [29] Han, X. and Wang, R. (2016). Computation of credit portfolio loss distribution by a cross entropy method. *Journal of Applied Mathematics and Computing*, **52**(1), 287–304. [↗](#)

- [28] Jakobsons, E., Han, X. and Wang, R. (2016). General convex order on risk aggregation. *Scandinavian Actuarial Journal*, **2016**(8), 713–740. [↗](#)
- 2015
- [27] Puccetti, G. and Wang, R. (2015). Extremal dependence concepts. *Statistical Science*, **30**(4), 485–517. [↗](#)
- [26] Embrechts, P. and Wang, R. (2015). Seven proofs for the subadditivity of Expected Shortfall. *Dependence Modeling*, **3**, 126–140. [↗](#)
- [25] Embrechts, P., Wang, B. and Wang, R. (2015). Aggregation-robustness and model uncertainty of regulatory risk measures. *Finance and Stochastics*, **19**(4), 763–790. [↗](#)
- [24] Wang, R. (2015). Current open questions in complete mixability. *Probability Surveys*, **12**, 13–32. [↗](#)
- [23] Wang, R., Bigozzi, V. and Tsanakas, A. (2015). How superadditive can a risk measure be? *SIAM Journal on Financial Mathematics*, **6**(1), 776–803. [↗](#)
- [22] Mao, T. and Wang, R. (2015). On aggregation sets and lower-convex sets. *Journal of Multivariate Analysis*, **138**, 170–181. [↗](#)
- [21] Wang, R. and Ziegel, J. (2015). Elicitable distortion risk measures: A concise proof. *Statistics and Probability Letters*, **100**, 172–175. [↗](#)
- [20] Wang, B. and Wang, R. (2015). Extreme negative dependence and risk aggregation. *Journal of Multivariate Analysis*, **136**, 12–25. [↗](#)
- [19] Yang, J., Chen, Z., Wang, F. and Wang, R. (2015). Composite Bernstein copulas. *ASTIN Bulletin*, **45**(2), 445–475. [↗](#)
- [18] Puccetti, G. and Wang, R. (2015). Detecting complete and joint mixability. *Journal of Computational and Applied Mathematics*, **280**, 174–187. [↗](#)
- [17] Wang, R., Peng, L. and Yang, J. (2015). CreditRisk⁺ model with dependent risk factors. *North American Actuarial Journal*, **19**(1), 24–40. [↗](#)
- 2014
- [16] Peng, L. and Wang, R. (2014). Interval estimation for bivariate t-copulas via Kendall’s tau. *Variance*, **8**(1), 43–54. [↗](#)
- [15] Wang, R. (2014). Sum of arbitrarily dependent random variables. *Electronic Journal of Probability*, **19**(84), 1–18. [↗](#)
- [14] Embrechts, P., Puccetti, G., Rüschendorf, L., Wang, R. and Beleraj, A. (2014). An academic response to Basel 3.5. *Risks*, **2**(1), 25–48. [↗](#)
- [13] Peng, L., Qi, Y. and Wang, R. (2014). Empirical likelihood test for high-dimensional linear models. *Statistics and Probability Letters*, **86**, 85–90. [↗](#)
- [12] Wang, R. (2014). Asymptotic bounds for the distribution of the sum of dependent random variables. *Journal of Applied Probability*, **51**(3), 780–798. [↗](#)
- [11] Bernard, C., Jiang, X. and Wang, R. (2014). Risk aggregation with dependence uncertainty. *Insurance: Mathematics and Economics*, **54**, 93–108. [↗](#)

2013

- [10] Puccetti, G., Wang, B. and Wang, R. (2013). Complete mixability and asymptotic equivalence of worst-possible VaR and ES estimates. *Insurance: Mathematics and Economics*, **53**(3), 821–828. [↗](#)
- [9] Zhang, R., Peng, L. and Wang, R. (2013). Tests for covariance matrix with fixed or divergent dimension. *Annals of Statistics*, **41**(4), 2075–2096. [↗](#)
- [8] Wang, R., Peng, L. and Qi, Y. (2013). Jackknife empirical likelihood test for equality of two high dimensional means. *Statistica Sinica*, **23**(2), 667–690. [↗](#)
- [7] Wang, R., Peng, L. and Yang, J. (2013). Bounds for the sum of dependent risks and worst Value-at-Risk with monotone marginal densities. *Finance and Stochastics*, **17**(2), 395–417. [↗](#)
- [6] Wang, R., Peng, L. and Yang, J. (2013). Jackknife empirical likelihood for parametric copulas. *Scandinavian Actuarial Journal*, **2013**(5), 325–339. [↗](#)

2009 - 2012

- [5] Peng, L., Qi, Y., Wang, R. and Yang, J. (2012). Jackknife empirical likelihood method for some risk measures and related quantities. *Insurance: Mathematics and Economics*, **51**(1), 142–150. [↗](#)
- [4] Puccetti, G., Wang, B. and Wang, R. (2012). Advances in complete mixability. *Journal of Applied Probability*, **49**(2), 430–440. [↗](#)
- [3] Wang, R. and Peng, L. (2011). Jackknife empirical likelihood intervals for Spearman’s rho. *North American Actuarial Journal*, **15**(4), 475–486. [↗](#)
- [2] Wang, B. and Wang, R. (2011). The complete mixability and convex minimization problems for monotone marginal densities. *Journal of Multivariate Analysis*, **102**(10), 1344–1360. [↗](#)
- [1] Yang, J., Qi, Y. and Wang, R. (2009). A class of multivariate copulas with bivariate Fréchet marginal copulas. *Insurance: Mathematics and Economics*, **45**(1), 139–147. [↗](#)

Other publications

- [2] Wang, R. (2021). Discussion of ‘Testing by betting: A strategy for statistical and scientific communication’ by Glenn Shafer. *Journal of the Royal Statistical Society Series A*, **184**(2), 463–464. [↗](#)
- [1] Major, J., Wang, R. and Woolstenhulme, M. (2015). The most dangerous model: A natural benchmark for assessing model risk. *Society of Actuaries Monograph: Enterprise Risk Management Symposium, 2015*. [↗](#)

Pre-publication manuscripts

- [28] Wang, R. and Wu, Q. (2022). Quasi-convexity in mixtures for generalized rank-dependent functions. *arXiv*: <https://arxiv.org/abs/2209.03425>.
- [27] Wang, Q., Wang, R. and Ziegel, J. (2022). E-backtesting. *arXiv*: <https://arxiv.org/abs/2209.00991>.
- [26] Vovk, V. and Wang, R. (2022). Efficiency of nonparametric e-tests. *arXiv*: <https://arxiv.org/abs/2208.08925>.

- [25] Han, X., Wang, R. and Zhou, X. (2022). Choquet regularization for reinforcement learning.
arXiv: <https://arxiv.org/abs/2208.08497>.
- [24] Chen, Y., Embrechts, P. and Wang, R. (2022). An unexpected stochastic dominance: Pareto distributions, catastrophes, and risk exchange.
arXiv: <https://arxiv.org/abs/2208.08471>.
- [23] Jiao, Z., Liu, Y. and Wang, R. (2022). An axiomatic theory to anonymized risk sharing.
arXiv: <https://arxiv.org/abs/2208.07533>.
- [22] Han, X., Lin, L. and Wang, R. (2022). Diversification quotients: Quantifying diversification via risk measures.
SSRN: <https://ssrn.com/abstract=4149069>.
- [21] Ramdas, A. and Wang, R. (2022). E-values as unnormalized weights in multiple testing.
arXiv: <https://arxiv.org/abs/2204.12447>.
- [20] Koike, T., Lin, L. and Wang, R. (2022). Joint mixability and negative orthant dependence.
arXiv: <https://arxiv.org/abs/2204.11438>.
- [19] Assa, H., Lin, L. and Wang, R. (2022). Calibrating distribution models from PELVE.
arXiv: <https://arxiv.org/abs/2204.08882>.
- [18] Xu, Z., Wang, R. and Ramdas, A. (2022). Post-selection inference for e-value based confidence intervals.
arXiv: <https://arxiv.org/abs/2203.12572>.
- [17] Guan, Y., Jiao, Z. and Wang, R. (2022). A reverse Expected Shortfall optimization formula.
arXiv: <https://arxiv.org/abs/2203.02599>.
- [16] Mao, T., Wang, R. and Wu, Q. (2022). Model Aggregation for risk evaluation and robust optimization.
arXiv: <https://arxiv.org/abs/2201.06370>.
- [15] Wang, R. and Zhang, Z. (2022). Simultaneous optimal transport.
arXiv: <https://arxiv.org/abs/2201.03483>.
- [14] Millossovich, P., Tsanakas, A. and Wang, R. (2021). A theory of multivariate stress testing.
SSRN: <http://ssrn.com/abstract=3966204>.
- [13] Han, X., Wang, Q., Wang, R. and Xia, J. (2021). Cash-subadditive risk measures without quasi-convexity.
arXiv: <https://arxiv.org/abs/2110.12198>.
- [12] Fadina, T., Liu, P. and Wang, R. (2021). One axiom to rule them all: A minimalist axiomatization of quantiles.
SSRN: <http://ssrn.com/abstract=3944312>.
- [11] Fadina, T., Liu, Y. and Wang, R. (2021). A framework for measures of risk under uncertainty.
arXiv: <https://arxiv.org/abs/2110.10792>.
- [10] Han, X., Wang, B., Wang, R. and Wu, Q. (2021). Risk concentration and the mean-Expected Shortfall criterion.
arXiv: <https://arxiv.org/abs/2108.05066>.

- [9] Pesenti, S., Wang, Q. and Wang, R. (2020). Optimizing distortion riskmetrics with distributional uncertainty.
arXiv: <http://arxiv.org/abs/2011.04889>.
- [8] Wang, R. (2020). Testing with p^* -values: Between p -values, mid p -values, and e -values.
arXiv: <https://arxiv.org/abs/2010.14010>.
- [7] Wang, R. and Wu, Q. (2020). Dependence and risk attitudes: An equivalence.
SSRN: <http://ssrn.com/abstract=3707709>.
- [6] Blanchet, J., Lam, H., Liu, Y. and Wang, R. (2020). Convolution bounds on quantile aggregation.
arXiv: <https://arxiv.org/abs/2007.09320>.
- [5] Vovk, V. and Wang, R. (2020). Merging sequential e -values via martingales.
arXiv: <https://arxiv.org/abs/2007.06382>.
- [4] Vovk, V. and Wang, R. (2020). True and false discoveries with independent e -values.
arXiv: <https://arxiv.org/abs/2003.00593>.
- [3] Vovk, V. and Wang, R. (2019). Confidence and discoveries with e -values.
arXiv: <https://arxiv.org/abs/1912.13292>.
- [2] Guo, N., Kou, S., Wang, B. and Wang, R. (2019). A theory of credit rating criteria.
SSRN: <http://ssrn.com/abstract=3504065>.
- [1] Mao, T. and Wang, R. (2017). A model-free continuum of degrees of risk aversion.
SSRN: <http://ssrn.com/abstract=2907499>.

Dissertation

- [1] Wang, R. (2012). Some questions in high-dimensional data analysis and risk management. *Ph.D. Thesis*. Georgia Institute of Technology, USA.

Books

- [1] Wang, R. (2011). *Sanguosha: The Royal Road*. (Non-academic, in Chinese.) Publishing House of Electronics Industry, Beijing. ISBN-9787121126833.

Regular Courses

University of Waterloo

ACTSC446/846 - Mathematics of Financial Markets	Fall 14; Winters 13, 18, 19, 21, 22
ACTSC625 - Casualty and Health Insurance Mathematics	Winters 13, 14, 15, 17
ACTSC631 - Financial Mathematics III	Spring 15
ACTSC964 - Topics in Quantitative Risk Management	Winters 17, 18, 20, 21
ACTSC970 - Finance I	Fall 16

ACTSC971 - Finance II	Winter 15
ACTSC991 - Topics in Actuarial Science - Copulas and Dependence Modeling	Winter 14
ACTSC991 - Topics in Actuarial Science - Risk Measurement	Spring 15
ACTSC991 - Topics in Actuarial Science - Robust Risk Aggregation	Winter 20
STAT964 - Topics in Statistics - Game-theoretic Statistics	Winter 21
Joint PhD course with Glenn Shafer (Rutgers) and Aaditya Ramdas (Carnegie Mellon)	

Georgia Institute of Technology

MATH1522 - Linear Algebra for Calculus	Spring 12
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Invited Short Courses and Minicourses

Chinese Academy of Sciences

Minicourse - Risk Measurement under Model Uncertainty (4 hours)	Spring 2016
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Peking University

Short Course - Theory and Practice of Risk Measurement (20 hours)	Spring 2016
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ETH Zurich

FIM Minicourse - Risk Aggregation and Fréchet Problems (10 hours)	Fall 2015
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University of Milan-Bicocca

Minicourse - Risk Aggregation and Fréchet Problems (10 hours)	Fall 2015
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Invited Academic Presentations

2022 **Conferences:** EVT & QRM Workshop 2022 (online); Conference on Mechanism and Institution Design 2022 (online); 20th International Conference on Robust Statistics (Waterloo, Canada); 11th Congress of Bachelier Finance Society (online); Safe, Anytime-Valid Inference (Eindhoven, Netherlands); 11th Samos Conference on Actuarial Science and Finance (Samos, Greece); IMSI Workshop on Dynamic Acceptability Indices (Chicago, USA); UCL-Osaka Conference on Risk and Decision (online)

Seminars/Colloquia: Melbourne (Economics, online); Stony Brook (Applied Math & Stat, online); Erasmus (Applied Economics); U Milano-Bicocca (Econ & Stat); Ulm (Insurance Institute); HK/SG FE Seminar (online); Renmin U (Stat, online); Columbia (Stat, online); Florida State (Math, online); Liverpool (Math, online); Georgia State (Risk Management & Insurance, online)

- 2021 **Conferences:** ECNU Workshop on Actuarial Science (online); 5th Eastern Conference on Mathematical Finance (online); 56th Actuarial Research Conference (*Keynote*, online); 7th Financial and Actuarial Mathematics Iran (online); Joint Statistical Meeting (online); Statistics 2021 Canada (online); 24th International Congress on Insurance: Mathematics and Economics (*Keynote*, online); CORS Annual Meeting (online)
- Seminars/Colloquia:** Bielefeld (Economics, online); Iowa (Stat & Actuarial, online); Temple (Risk & Insurance, online); Chongqing U (Math); Alibaba Math Colloquium (online); Jilin U (Stat, online); U Science & Tech China (Management); UC Berkeley (Stat, online); Central U Finance & Economics (Actuarial Institute, online); International Seminar on Selective Inference (online); U Toronto (Stat, online); Carnegie Mellon (Stat, online); Lyon-Lausanne Actuarial Seminars (online); U Science & Tech China (Management)
- 2020 **Conferences:** CAS Annual Symposium on Probability and Statistics (Beijing, China); CUHK Virtual Symposium on Statistics and Risk Management (online); INFORMS Annual Meeting (online); CSIAM Actuarial Science Forum 2020 (online)
- Seminars/Colloquia:** Peking (Math, online); Beijing Normal U (Math); East China Normal U (Stat, online); Warwick (Stat, online); U Bern (Stat & Actuarial, online); U New South Wales (Actuarial, online); U Science & Tech China (Management, online); One World Actuarial Research (online); Fudan (Math, online)
- 2019 **Conferences:** INFORMS Annual Meeting (Seattle, USA); 6th Workshop on Dependence Modeling (Agistri, Greece); China Insurance and Risk Management Conference 2019 (Chengdu, China); 3rd JXUFE Statistics Workshop (Nanchang, China); 3rd International Congress on Actuarial Science and Quantitative Finance (Manizales, Colombia); SIAM Conference on Financial Mathematics & Engineering (Toronto, Canada); Fields Workshop on Financial Analytics (Toronto, Canada)
- Seminars/Colloquia:** U Toronto (Stat); Purdue (Stat); Ulm (Insurance Institute); U Zurich (Banking & Finance); Tibet U (Math); Chongqing U (Math); Tsinghua (Math); Peking (Math); Chinese Academy of Sciences (Applied Math)
- 2018 **Conferences:** 4th European Actuarial Journal Conference (*Keynote*, Leuven, Belgium); Robust Techniques in Quantitative Finance (Oxford, UK); Workshop on Optimal Insurance (Beijing, China)
- Seminars/Colloquia:** UC Berkeley (IEOR); Stanford (Management Sci & Eng); Columbia (Stat); Singapore U Tech & Design (Engineering Systems); National U Singapore (Risk Management Institute); ETH Zurich (Math); Ryerson (Math); Cornell (ORIE); Waterloo (Pure Math)
- 2017 **Conferences:** 8th Advanced Mathematical Methods in Finance (Amsterdam, Netherlands); 4th Workshop on Dependence Modeling (Aegina, Greece); RiskLab Mini-Workshop (Zurich, Switzerland)
- Seminars/Colloquia:** Wisconsin-Madison (Risk & Insurance); Connecticut (Math); Wuhan U (Math & Stat); Beijing Normal U (Ecology Institute); Qufu Normal U (Stat); U Science & Tech China (Management); Chinese Academy of Sciences (Applied Math); Peking (Math); U Salzburg (Math); U Milano-Bicocca (Econ & Stat); Ryerson (Math); Laval (Actuarial School)
- 2016 **Conferences:** Workshop on Stochastic Control and Finance (Hong Kong, China); Random Complex Structures and Data Analysis (Beijing, China); Financial Engineering and Risk Management Conference (Guangzhou, China); 44th Statistical Society of Canada Meeting (St. Catherines, Canada)
- Seminars/Colloquia:** U Michigan (Stat); Georgia State (Risk Management & Insurance); U Science & Tech China (Management); Qufu Normal U (Stat); Chinese U Hong Kong (Systems Engineering);

- Tsinghua (Econ & Management); Chinese Academy of Sciences (Applied Math); Peking (Math), Central U Finance & Economics (Actuarial Institute); Beijing Tech & Business U (Math)
- 2015 **Conferences:** Workshop on Dependence and Risk Measures (Milan, Italy), Oberwolfach Workshop on Quantitative Risk Management (Oberwolfach, Germany), 7th Advanced Mathematical Methods in Finance (Lausanne, Switzerland); Youth Probability Forum (Beijing, China); Financial and Insurance Risk Management (Beijing, China); CORS/INFORMS Joint Meeting 2015 (Montreal, Canada)
- Seminars/Colloquia:** Liverpool (Math); Cass Business School (Actuarial); U Vienna (Math); U Amsterdam (Econ); Mannheim (Math); EPF Lausanne (Finance); U Toronto (Stat)
- 2014 **Conferences:** 11th Vilnius Conference on Probability and Statistics (Vilnius, Lithuania); Workshop on Dependence Modeling (Brussels, Belgium); 3rd Workshop on Insurance Mathematics (Quebec City, Canada), High-dimensional Dependence and Copulas (Beijing, China)
- Seminars/Colloquia:** Peking (Math); U Science & Tech China (Management); Fudan (Management); U Milano-Bicocca (Econ & Stat); U Bern (Stat & Actuarial); McGill (Math & Stat)
- 2013 **Conferences:** International Chinese Statistical Association - Canada Chapter 2013 (Toronto, Canada); Statistical Science for Society (Waterloo, Canada); Young Mathematician Forum (Beijing, China)
- Seminars/Colloquia:** Peking (Math); Tsinghua (Econ & Management); VU Brussels (Econ); ETH Zurich (Math); U Freiburg (Math); U Lyon 1 (Actuarial); U Minnesota (IMA); Georgia State (Risk Management & Insurance); Georgia Tech (Math)
- 2012 **Conferences:** Quantitative Finance and Risk Management (Changchun, China)
- Seminars/Colloquia:** Waterloo (Stat & Actuarial); Illinois State (Stat); Northern Illinois (Stat)
- 2011 **Seminars/Colloquia:** Georgia Tech (Math); Peking (Math)
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Scientific Service

Affiliated Member

Waterloo Artificial Intelligence Institute	2018 - present
RiskLab, ETH Zurich	2015 - present
Centre for Computational Mathematics, Waterloo	2015 - present
Big Data Research Lab, Waterloo	2014 - present
Waterloo Research Institute in Insurance, Securities and Quantitative Finance	2012 - present

Conference Organizing Committee

INFORMS Annual Meeting (Co-Chair, Finance Cluster), Indianapolis, USA	2022.10
International Conference on Robust Statistics, Waterloo, Canada	2022.07
INFORMS/CORS International Conference (Chair, Finance Cluster), Vancouver, Canada	2022.06
2nd Waterloo Student Conference in Statistics, Actuarial Science and Finance (Faculty mentor) Waterloo, Canada	2021.11
1st Waterloo Conference in Statistics, Actuarial Science and Finance (Chair) Waterloo, Canada	2019.04

Workshop on Risk Measurement and Regulatory Issues in Business, Montreal, Canada	2017.09
Workshop on Random Complex Structures and Data Analysis in Finance, Beijing, China	2016.08
4th Québec-Ontario Workshop on Insurance Mathematics, Waterloo, Canada	2016.02
6th Annual Graduate Student Probability Conference, Georgia Tech, Atlanta, USA	2012.04
5th Annual Graduate Student Probability Conference, Georgia Tech, Atlanta, USA	2011.04
Conference Scientific Committee	
5th European Actuarial Journal Conference, Tartu, Estonia	2022.08
Extreme Value Theory and Quantitative Risk Management Workshop, Shanghai, China	2022.08
Online International Conference in Actuarial Science, Data Science and Finance (OICA)	2020.04
2nd International Workshop on Optimal (Re)Insurance, Beijing, China	2018.07
6th International Gerber-Shiu Workshop, Beijing, China	2016.06
PhD Committee and Thesis External Examiner	
Yixuan Li, Economics, Waterloo	
Xiyue Han, Statistics and Actuarial Science, Waterloo	
Gracia Dong, Statistics and Actuarial Science, Waterloo	defended in 2022
Zhiwei Tong, Risk and Actuarial Studies, University of New South Wales	defended in 2021
Ou Dang, Statistics and Actuarial Science, Waterloo	defended in 2021
Takaaki Koike, Statistics and Actuarial Science, Waterloo	defended in 2020
Ahmed Abdalrahman, Electrical and Computer Engineering, Waterloo	defended in 2020
Edgars Jakobsons, Mathematics, ETH Zurich	defended in 2016
Fangda Liu, Statistics and Actuarial Science, Waterloo	defended in 2015
External Program Review	
Applied Mathematics, Ryerson University	2018
External Committees	
Alibaba Global Mathematics Competition Exam Committee, Alibaba (China) Co.	2020, 2021, 2022
CAS Exam 9 Committee, Casualty Actuarial Society	2020

Peer-review Service

Some Journals

- Annals of Statistics ◦ Annals of Applied Statistics ◦ Journal of the American Statistical Association
- Biometrika ◦ Journal of the Royal Statistical Society - Series A/B ◦ Statistical Science ◦ Bernoulli
- Management Science ◦ Operations Research ◦ Mathematics of Operations Research
- SIAM Journal on Optimization ◦ European Journal of Operational Research
- Mathematical Finance ◦ Finance & Stochastics ◦ SIAM Journal on Financial Mathematics

- Journal of Banking & Finance ◦ Journal of Business & Economic Statistics
- ASTIN Bulletin ◦ Insurance: Mathematics & Economics ◦ Journal of Risk & Insurance
- North American Actuarial Journal ◦ Scandinavian Actuarial Journal ◦ European Actuarial Journal

Grant Proposals

- CANSSI (Canada) ◦ FRQNT (Canada) ◦ NSERC Discovery (Canada) ◦ SNSF (Switzerland)

Total: 68 journals, 175 papers, 10 grant proposals

Personal

Born in Beijing (1984), citizen of China, permanent resident of Canada

Number of countries visited: 53

Number of continents visited: 7 (✓ July 2018)

Number of invited academic talks: 156 (in 15 countries)

Number of courses taught: 22 regular courses, 1 short course, 3 minicourses (in 6 institutions)

Erdős Number: 3 (Ruodu Wang ← Ričardas Zitikis ← Endre Csáki ← Paul Erdős)

Last updated: September 2022