MENG XU

Contact

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Positions

Assistant Professor, Department of Mathematics, Pace University: Sept 2016-Present
Lecturer, Department of Mathematics and Physics, University of New Haven: Sept 2013-Aug 2016
Postdoctoral Associate, Laboratory of Populations, Rockefeller University: Aug 2011-Aug 2013

Education

Ph.D., Mathematics, University of Wyoming: August 2006-July 2011
Dissertation: Stochastic analysis and nonlinear filtering of point vortex dynamics subjected to jump noise
B.S., Mathematics, Shandong Normal University, China: September 2002-June 2006

Awards

Faculty-Student Summer Research Fund, Pace University, 2021
Scholarly Research Award, Pace University, 2020
Undergraduate Faculty-Student Research Award, Pace University, 2019
Scholarly Research Award, Pace University, 2017
Faculty-Student Summer Research Fund, Pace University, 2017
Kenan Professional Development Fund, Pace University, 2017
Summer Research Grant, University of New Haven, 2015
Outstanding Graduate Student in Research, University of Wyoming, 2008
Best Oral Presentation in Graduate Student Symposium, University of Wyoming, 2007
Outstanding Undergraduate Thesis, Shandong Normal University, China, 2006

Teaching Experiences

Pace University, Sept 2016-Present
MAT 104 Finite Mathematics
MAT 117 Elementary Statistics
MAT 134 Introduction to Probability and Statistics
MAT 234 Introduction to Probability and Statistical Analysis
MAT 218 Intermediate Statistics
MAT 222 Applied Multivariable Statistical Methods
MAT 224 Topics in Applied Statistics
MAT 225 Bayesian Statistics and Modeling
MAT 490 Mathematics Seminar Capstone Experience I
MAT 491 Mathematics Seminar Capstone Experience II
BMB 620 Quantitative Methods (graduate level)
University of New Haven, Sept 2013-Aug 2016
MATH 1117 Calculus I
MATH 1118 Calculus II
MATH 2203 Calculus III

MATH 2228 Elementary Statistics
MATH 3371 Probability and Statistics I
MATH 4472 Probability and Statistics II
MATH 4481 Linear Models I
MATH 4482 Linear Models II
MATH 4473 Advanced Statistical Inference
MATH 6605 Biostatistics (graduate course)
MATH 6611 Matrix Theory and Applications (graduate course)

University of Wyoming, Sept 2006-July 2011
MATH 1400 College Algebra
MATH 1450 Precalculus
MATH 2200 Calculus I

Research Interests

mathematical ecology, theoretical ecology, ecological scaling

Publications (*student author)

1. Benassi, F., Naccarato, A., & **Xu, M.** (2022). Taylor's law detects and interprets temporal trends of the spatial distribution of Covid-19 daily infection density across Italian provinces. *Submitted*.
2. **Xu, M.**, Radtke, P. J. (2022). Synthesizing allometric equations and individual size variation for the estimation and approximation of aboveground biomass in North American forests. *Submitted*.
3. **Xu, M.**, Allen, R., & Newman, E. (2022). Maximum entropy modeling reveals shifts in metabolic energy use and partitioning in a monospecific forest disturbed by an earthquake. *Submitted*.
4. **Xu, M.**, Jiang, M.*, & Wang, H. (2021). Integrating metabolic scaling variation into the maximum entropy theory of ecology explains Taylor's law for individual metabolic rate in tropical forests. *Ecological Modelling*, 455, 109655.
5. **Xu, M.**, & Cohen, J. E. (2021). Spatial and temporal autocorrelations affect Taylor's law for US county populations: Descriptive and predictive models. *PLOS ONE*, 16(1), e0245062.
6. Mo, K.*, Condit, R., Hubbell, S., & **Xu, M.** (2020). Phenomenological models for the relationships amongoccupancy, spatial mean, and spatial variance of species population abundance. *In revision*.
7. **Xu, M.** (2020). Parameterized maximum entropy models predict variability of metabolic scaling across tree communities and populations. *Ecology*, 101(6), e03011.
8. **Xu, M.**, & Cohen, J. E. (2019). Analyzing and interpreting spatial and temporal variability of the United States county population distributions using Taylor's law. *PLOS ONE*, 14(12), e0226096.
9. **Xu, M.**, Kolding, J., & Cohen, J. E. (2019). Sequential analysis and design of fixed-precision sampling of Lake Kariba fishes using Taylor's power law. *Canadian Journal of Fisheries and Aquatic Sciences*, 76(6), 904-917.
10. Cohen, J. E., Brunborg, H., & **Xu, M.** (2018). Can Taylor's law of fluctuation scaling and its relatives help demographers select more plausible multi-regional population forecasts? *Vienna Yearbook of Population Research*, 16, 15-24.
11. Wang, H. F., & **Xu, M.** (2017). Individual size variation reduces spatial variation in abundance of tree community assemblage, not of tree populations. *Ecology and Evolution*, 7(24), 10815-10828.
12. **Xu, M.**, Brunborg, H., & Cohen, J. E. (2017). Evaluating multi-regional population projections with Taylor's law of mean–variance scaling and its generalisation. *Journal of Population Research*, 34(1),79-99.
13. **Xu, M.**, Kolding, J., & Cohen, J. E. (2017). Taylor's power law and fixed-precision sampling: application to abundance of fish sampled by gillnets in an African lake. *Canadian Journal of Fisheries and Aquatic Sciences*, 74(1), 87-100.
14. **Xu, M.** (2016). Taylor's power law: before and after 50 years of scientific scrutiny. *arXiv:1505.02033v2* [q-bio.OT].

15. **Xu, M.** (2016). Ecological scaling laws link individual body size variation to population abundance fluctuation. *Oikos*, 125(3), 288-299. (*Editor's Choice*)
16. Cohen, J. E., & **Xu, M.** (2015). Reply to Chen: Under specified assumptions, adequate random samples of skewed distributions obey Taylor's law. *Proceedings of the National Academy of Sciences*, 112(25), E3157-E3158.
17. Cohen, J. E., & **Xu, M.** (2015). Random sampling of skewed distributions implies Taylor's power law of fluctuation scaling. *Proceedings of the National Academy of Sciences*, 112(25), 7749-7754.
18. **Xu, M.**, Schuster, W. S., & Cohen, J. E. (2015). Robustness of Taylor's law under spatial hierarchical groupings of forest tree samples. *Population Ecology*, 57(1), 93-103.
19. Sritharan, S. S., & **Xu, M.** (2013). Malliavin Calculus for Stochastic Point Vortex and Lagrangian Models. In *Seminar on Stochastic Analysis, Random Fields and Applications VII* (pp. 223-233). Birkhäuser, Basel.
20. Cohen, J. E., **Xu, M.**, & Brunborg, H. (2013). Taylor's law applies to spatial variation in a human population. *Genus*, 69(1).
21. Cohen, J. E., **Xu, M.**, & Schuster, W. S. (2013). Stochastic multiplicative population growth predicts and interprets Taylor's power law of fluctuation scaling. *Proceedings of the Royal Society B*: Biological Sciences, 280(1757), 20122955.
22. Cohen, J. E., **Xu, M.**, & Schuster, W. S. (2012). Allometric scaling of population variance with mean body size is predicted from Taylor's law and density-mass allometry. *Proceedings of the National Academy of Sciences*, 109(39), 15829-15834.
23. Sritharan, S. S., & **Xu, M.** (2011). A stochastic Lagrangian particle model and nonlinear filtering for three-dimensional Euler flow with jumps. *Communications on Stochastic Analysis*, 5(3), 7: 565-583.
24. Sritharan, S. S., & **Xu, M.** (2010). Convergence of particle filtering method for nonlinear estimation of vortex dynamics. *Communications on Stochastic Analysis*, 4(3), 9: 443-465.
25. Fernando, B. P. W., Sritharan, S. S., & **Xu, M.** (2010). A simple proof of global solvability of 2-D Navier-Stokes equations in unbounded domains. *Differential and Integral Equations*, 23, 223-235.

Conference Presentations

2022 Unifying Ecology Across Scales, Gordon Research Conference, Manchester, NH: Jul 31-Aug 5, 2022
106th ESA Annual Meeting (Virtual): Aug 4, 2021
British Ecological Society Macro 2021 (Virtual): Jul 6, 2021
104th ESA Annual Meeting, Louisville, KY: Aug 14, 2019
11th Black Rock Forest/Hudson Highlands Research Symposium, Cornwall, NY: Jun 24, 2019
102nd ESA Annual Meeting, Portland, OR: Aug 10, 2017
Society for Freshwater Science 2017 Annual Meeting, Raleigh, NC: Jun 4-8, 2017
2017 Applied Demography Conference, San Antonio, TX: Jan 12, 2017
100th ESA Annual Meeting, Baltimore, MD: Aug 10, 2015
9th Black Rock Forest Research Symposium, Cornwall, NY: Jun 22, 2015
9th International Conference on Differential Equations and Dynamical System, Dallas, TX: May 16, 2015
7th International Symposium on Biomathematics and Ecology, Claremont, CA: Oct 11, 2014
8th Black Rock Forest Research Symposium, Cornwall, NY: Jun 17, 2013
2012 AMS Fall Southeastern Meeting, Tulane University: Oct 14, 20122012
AMS Spring Southeastern Meeting, Tampa, FL: Mar 11, 2012
2011 SIAM Conference on Control and Its Applications, Baltimore, MD: Jul 27, 2011
2011 Joint Mathematics Meetings, New Orleans, LA: Jan 7, 2011

Services and Activities

Conference organizer

Panel session at the 2021 Pace Student Research Day, Pace University: April 23, 2021

Panel session at the 39th Annual Meeting of Society of Fellows at Dyson College, Pace University: March 7, 2020

Data Analysis with JMP Statistical Discovery Software, University of New Haven: April 30, 2014

Stochastic Analysis, Control and Computation of Complex Physical and Biological Systems, 2013 SIAM Annual Meeting, San Diego, CA: July 8-12, 2013

Recent Advances in Computational and Stochastic Methods in Fluid Dynamics with Control and Estimations, 36th Annual SIAM Southeastern Atlantic Section Meeting, Huntsville, AL: March 24-25, 2012

Undergraduate mentor

- Hannah Wyllie (Business Management, Pace University, Summer 2021): Linking Taylor's law and individual size distribution of disturbed ecological communities using maximum entropy models.
- Mengke Jiang (Business Analytics & Psychology, Pace University, Summer 2019-Summer 2020): Integrating metabolic scaling variation into the maximum entropy theory of ecology explains Taylor's law for individual metabolic rate in tropical forests.
- Zheng Xue (Business Analytics, Pace University, Spring 2020): Empirical validity and forecasting capacity of Taylor's law for financial time series --- a case study for Fortune 100 stock data.
- David Liu (Mathematics & Finance, Pace University, Spring 2020): Mean variance analysis of Fortune 100 stock price return with applications to risk management and pricing model.
- Kaiying Mo (Marketing & Statistics, Pace University, Summer 2017): Abundance-occupancy relationship revisited: dissecting negative binomial distribution and Taylor's power law.
- Nantaporn Yuennan (Economics, Pace University, Spring 2017): Fluctuation scaling and risk measure of stock prices.
- Michelle Duda (Math, University of New Haven, Spring 2015): a synthetic study of the effect of college loan and debt on students' success by multivariate regression models.
- Christopher Pariso (Criminal Justice, University of New Haven, Fall 2014): statistical analysis of homicide demographics, forensic evidence processing, and clearance rate.

Committee member

Scholarly Research Committee, Pace University: Fall 2021-Present

Academic Resources Committee, Pace University: Fall 2021-Present

Admission and Retention Committee, Pace University: Fall 2019-Fall 2021

Core Curriculum Committee, Pace University: Fall 2019-Present

Academic and Student Affairs Committee, University of New Haven: Fall 2015

Graduate Research Fellowship Program Panel, National Science Foundation: Spring 2015

Mathematics Faculty Search Committee, University of New Haven: Spring 2014

Peer reviewer

- Journals (*ANZIAM Journal*, *Chaos, Solitons & Fractals*, *Communications on Stochastic Analysis*, *Ecology and Evolution*, *Entropy*, *International Journal of Analysis*, *Journal of Animal Ecology*, *Journal of Statistics and Data Science Education*, *Limnologica*, *Oikos*, *Physica D*, *Population Ecology*, *Stochastic Analysis and Applications*, *Theoretical Ecology*, *Theoretical Population Biology*)
- Grant proposals (2015 NSF Graduate Research Fellowship Program)
- Meeting abstracts (2020 ESA Annual Meeting, 2021 ESA Annual Meeting, 2022 ESA Annual Meeting)

Workshop participant

New York University

Faculty Resource Network Summer Seminars: June 10-14, 2018

Pace University

Best Practice Conference on Student Engagement: Mar 23, 2018

United States Conference on Teaching Statistics 2017

A fully customizable textbook for introductory statistics/data science courses: May 17, 2017
Modules for infusing data science into the statistics curriculum: May 18, 2017

University of New Haven

Innovating Curriculum with Entrepreneurial Mindset workshop: June 2-6, 2014
1/2 Day Process Oriented Guided Inquiry Learning workshop: May 27, 2014
Teaching Performance and Classroom Engagement workshop: April 25, 2014

University of Wyoming

Operation of Classroom Technology: Spring 2011
Introduction to Online Course Platforms: Spring 2010
Effective Classroom Presentations: Fall 2009
Using Supplemental Online Courses to Enhance Teaching: Summer 2007

Judge

- Buell/Braun awards at the 2021 Ecological Society of America Annual Meeting
- Lotka and Volterra awards at the 2019 Ecological Society of America Annual Meeting
- Undergraduate Statistics Project Competition, Consortium for the Advancement of Undergraduate Statistics Education (CAUSE) and American Statistical Association: 2019
- Posters on the Hill, Council on Undergraduate Research: 2019
- 20th Annual New Haven Science Fair, Yale University: May 12-14, 2014
- Calculus Bowl Competition, University of Wyoming: Spring 2007

Computer Skill

Text-editing software: Adobe Acrobat Pro, Microsoft Word, Excel, PowerPoint, LaTex
Math and statistical software: R, RStudio, MATLAB, JMP, Maple, Python
Instructional tools: Banner, Blackboard, MyLab, StatsPortal, WeBWorK

Research Visits

Visiting PhD candidate, Research Group in Stochastics, University of Wuppertal, Germany: Fall 2010
Visiting PhD student, Department of Applied Mathematics, Naval Postgraduate School, CA: Spring 2009