Data Science Seminar

Hosted by the Department of Mathematics and Statistics

- Date: Tuesday, May 5, 2026
- Time: 12:15pm – 1:15pm
- Room: Whitney Hall 100E (Zoom talk)
- Speaker: Dr. Jun Yan (University of Connecticut)
- Title: Joint Observation-Constrained Climate Projections for Spatial Fields Using Hierarchical Emergent Constraints.

Abstract

Reliable future climate projection requires statistically principled integration of observations with multi-model climate simulations to reduce structural uncertainty. Emergent constraints achieve this by exploiting across-model relationships between historical and future climate responses and using observations to constrain projections, but existing approaches are typically formulated on scalar summaries and applied marginally at individual locations. This limits spatial coherence and prevents joint uncertainty quantification for climate fields. We propose a hierarchical emergent constraint framework that extends the concept from scalar relationships to field-level mappings between historical and future spatial patterns. The approach enables information from observations to propagate across locations and yields a joint predictive distribution for future climate fields. To ensure stable inference in the small ensemble, high-dimensional setting, we integrate shrinkage-based covariance estimation with structured regularization that captures spatial coherence. The resulting method produces spatially consistent and well-calibrated projections, supported by theoretical guarantees and empirical studies.

Biography of the speaker: Jun Yan is a Professor in the Department of Statistics at the University of Connecticut and a Research Fellow at the Center for Population Health at UConn Health. He received his Ph.D. in Statistics from the University of Wisconsin–Madison in 2003. Prior to joining UConn in 2007, he spent four years at the University of Iowa. Dr. Yan’s methodological research spans networks, spatial extremes, measurement error, survival analysis, clustered data analysis, and statistical computing, often motivated by cross-disciplinary collaborations. His applied work focuses on environmental sciences, public health, and sports, with notable contributions to statistical methods for the detection and attribution of climate change. Committed to open science, he and his collaborators have developed and maintain a suite of open-source R packages. Since 2020, he has served as Editor of the Journal of Data Science. He is a Fellow of both the American Statistical Association and the Institute of Mathematical Statistics.