RUTGERS–NEW BRUNSWICK
School of Arts and Sciences

Department of Statistics

Department of Statistics Seminar Series

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Meta Fusion: A Unified Framework For Multimodal Fusion with Adaptive Mutual Learning

Wednesday, September 30th, 2026
12:10-1:30 PM
Hill Center - 116
Light refreshments will be served in Hill Center 452 at 11:40am

Abstract:

Developing effective multimodal data fusion strategies has become increasingly essential across a wide range of applications, from autonomous driving to medical diagnosis. Traditional fusion methods, including early, intermediate, and late fusion, integrate data at different stages, each offering distinct advantages and limitations. In this paper, we introduce Meta Fusion, a flexible and principled framework that unifies these strategies as special cases. Motivated by deep mutual learning and ensemble learning, Meta Fusion constructs a cohort of models based on various latent representation combinations, and further boosts predictive performance through soft information sharing within the cohort. Our approach is model-agnostic in learning the latent representations, allowing it to flexibly adapt to the unique characteristics of each modality. Theoretically, our soft information sharing mechanism reduces the generalization error. Furthermore, we develop an uncertainty quantification framework that provides rigorous coverage guarantees with minimal assumptions. Empirically, Meta Fusion consistently outperforms conventional strategies across extensive numerical studies, including Alzheimer's disease detection and neural decoding.

Bio:

Annie Qu is Professor at Department of Statistics and Applied Probability, and Founding Director of Center for Statistical Foundations of Artificial Intelligence, University of California, Santa Barbara starting. She received her Ph.D. in Statistics from the Pennsylvania State University in 1998. Qu's research focuses on solving fundamental issues regarding structured and unstructured large-scale data and developing cutting-edge statistical methods and theory in machine learning and algorithms for personalized medicine, text mining, recommender systems, medical imaging data, and network data analyses for complex heterogeneous data. Dr. Qu was a Data Science Founder Professor of Statistics and the Director of the Illinois Statistics Office at the University of Illinois at Urbana-Champaign during her tenure in 2008-2019, and Chancellor's Professor at UC Irvine in 2020-2025. She was a recipient of the NSF Career award from 2004 to 2009. She is a Fellow of the Institute of Mathematical Statistics (IMS), the American Statistical Association, and the American Association for the Advancement of Science. She is also a recipient of IMS Medallion Award and Lecturer in 2024. She serves as Journal of the American Statistical Association Theory and Methods Co-Editor from 2023 to 2025, IMS Program Secretary from 2021 to 2027 and ASA Council of Sections of Governing Board Chair in 2025. She is the recipient of the 2025 Carver Medal of IMS, and 2026 ICSA Distinguished Achievement Awardee.