BGSU Department of Mathematics and Statistics

BOWLING GREEN STATE UNIVERSITY

Weekly Calendar – Spring Semester 2025
Week 10, March 17 - 22

Monday, March 17	
Tuesday, March 18	**TTF Candidate Teaching Presentation** 9:00am – 9:30am, McLeod Hall 459 Topic: Candidate's choice from statistics or data science concepts **TTF Candidate Open Meeting with Faculty/Graduate Students** 9:45am – 10:45am, McLeod Hall 459 **TTF Candidate Open Meeting with Faculty/Graduate Students** 2:15pm – 2:45pm, McLeod Hall 459 **Foundational Math Committee** 2:30pm – 3:30pm, McLeod Hall 228 **TTF Candidate Research Presentation** 3:00pm – 4:00pm, McLeod Hall 459 Topic: Data-driven insights into disease prognosis through spatially resolved transcriptomics
Wednesday, March 19	**Graduate Committee** 11:30am – 12:30pm, McLeod Hall 400 **Peer Mentor Meeting** 12:30pm – 1:20pm, McLeod Hall 400 **Analysis Reading Seminar** 2:30pm – 3:30pm, McLeod Hall 459 Speaker: Abraham Orinda Title: Hypercyclicity of the half-angle operator **Peer Mentor Meetings** 3:30pm – 4:20pm, McLeod Hall 459, 238 & 302 **Advisory Committee** 3:30pm – 4:30pm, McLeod Hall 400

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Weekly Calendar – Spring Semester 2025
Week 9, March 10 - 14

Thursday, March 20	**TTF Candidate Teaching Presentation** 9:00am – 9:30am, McLeod Hall 459 Topic: Candidate's choice from statistics or data science concepts **TTF Candidate Open Meeting with Faculty/Graduate Students** 9:45am – 10:45am, McLeod Hall 459 **TTF Candidate Open Meeting with Faculty/Graduate Students** 2:15pm – 2:45pm, McLeod Hall 459 **TTF Candidate Research Presentation** 3:00pm – 4:00pm, McLeod Hall 459 Topic: High-Dimensional Spatial-Temporal Data Analytics with Interpretable Information Fusion
Friday, March 21	**Peer Mentor Seminar** 3:30pm – 5:00pm, McLeod Hall 459
Saturday March 22	**The 10th Edition of the BGSU Mathematics Competition** 9:00am – 11:00am, McLeod Hall 210

ABSTRACTS

TTF Candidate Research Presentation (Tuesday)

Title: Data-driven insights into disease prognosis through spatially resolved transcriptomics

Abstract: Recent advancements in RNA sequencing technologies, such as bulk RNA sequencing, single-cell RNA sequencing, and spatially resolved transcriptomics, provide high-dimensional gene expression data that offers insights into genetic behavior. Analyzing these data presents significant statistical challenges, particularly in modeling spatial dependencies, handling sparsity, and integrating multi-modal information. In the first part of this talk, we present a colon cancer study focusing on cholesterol metabolism as a potential therapeutic target. We analyze differential expression patterns and use statistical modeling to predict cancer prognosis based on bile secretion pathway genes. Our approach improves patient stratification into high- and low-risk groups, demonstrating the predictive power of structured statistical models in biomedical applications. In the second part, we develop a novel statistical framework for identifying high-risk cells and tissue regions from spatial transcriptomics data. Traditional clustering methods associate cell types with disease attributes but fail to assign risk at the individual cell or tissue location level. We propose a latent representation approach with domain adaptation techniques to transfer disease attributes from patients to single cells. By integrating spatial information from such data, our method refines risk assessment within tissue microenvironments, improving disease characterization. These statistical approaches provide a rigorous framework for modeling complex biological systems, enhancing our understanding of disease mechanisms, and identifying potential therapeutic targets.

TTF Candidate Research Presentation (Thursday)

Title: High-Dimensional Spatial-Temporal Data Analytics with Interpretable Information Fusion

Abstract: Spatial-temporal data, which consist of sequences of observations continuously collected over time and space, are increasingly prevalent in a wide range of application domains, including infrastructure system monitoring, urban surveillance, and smart healthcare. Effectively modeling and analyzing such data is essential for system monitoring, anomaly detection, and decision-making. However, three critical challenges hinder accurate modeling: (1) the absence of pre-annotated data for supervised model training, (2) the need for scalable methods to handle high-dimensional spatial-temporal data, and (3) the presence of substantial noise that can obscure underlying patterns. In this presentation, I will introduce my recent research that addresses these challenges through the development of a **knowledge-fused spatial-temporal data analysis methodology**. This methodology explicitly models high-dimensional spatial-temporal data structures and incorporates domain-specific knowledge to improve estimation accuracy and robustness, while mitigating the impact of noise. I will illustrate the effectiveness of this methodology through multiple case studies, including applications in water distribution system monitoring and surveillance video segmentation. These case studies demonstrate how information fusion can systematically enhance system monitoring, anomaly detection, and data-driven decision support. My work contributes to advancing spatial-temporal data analytics by bridging statistical modeling, domain knowledge integration, and scalable computational techniques to address real-world challenges in complex systems.