# Mathematical Sciences and Bioinformatics 2025 Colloquium Series

Dr. Guo-Wei Wei,

Michigan State University

January 24, 2025, at 3:00pm
Biosciences Research Building,
Room 2.168 and online via Zoom
*Scan the QR-code to access the link*

## The Unreasonable Effectiveness of Mathematical AI in Biosciences

Abstract: In E.P. Wigner's famous essay "The unreasonable effectiveness of mathematics in the natural sciences," he did not anticipate the resilience of biological sciences to mathematics in 1960. Since the 1960s, it has been unreasonably challenging to apply contemporary mathematics to contemporary biology, such as cellular biology, molecular biology, chemical biology, genomics, and genetics. Artificial intelligence (AI) has fundamentally changed the landscape of science, engineering, and technology in the past decade and holds great promise for discovering the rules of life. However, AI-based biological discovery encounters challenges arising from the intricate complexity, high dimensionality, nonlinearity, and multiscale biological systems. We tackle these challenges with mathematical AI paradigms. We devised algebraic topology, differential geometry, and geometric topology tools to significantly enhance AI's ability to tackle biological challenges. Using our mathematical AI approaches, my team has been the top winner in D3R Grand Challenges, a worldwide annual competition series in computer-aided drug design and discovery for years. By further integrating mathematical AI with millions of genomes isolated from patients, we discovered the mechanisms of SARS-CoV-2 evolution and accurately forecast emerging dominant SARS-CoV-2 variants months in advance.

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**Reception to follow Presentation & Hosted by: Dr. Lin Li and Dr. Ming-Ying Leung**

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