Mathematical Biology & Differential Equations
January 15-16, 2026

The workshop is hybrid, with both in-person and virtual sessions. The in-person session will be held in room 318 Mathematical Sciences Building (MSB) University of Central Florida, Orlando

Mathematical biology is a dynamic, interdisciplinary field that uses mathematical tools to better understand complex biological systems. From modeling infectious disease spread and tumor growth to studying population dynamics and ecological interactions, mathematics plays a key role in identifying patterns, making predictions, and informing real-world decisions.

At the core of this work are ordinary and partial differential equations, which provide a powerful framework for describing biological change over time and space. This workshop highlights the connection between mathematical modeling and biological discovery, with sessions exploring how recent advances in differential equations, data-driven methods, and AI are helping address questions in biology, medicine, and public health.

The 2026 workshop is themed, but not limited to, "***Advanced Progress in Population Models Driven by Natural Intelligence (NI) and/or Artificial Intelligence (AI)***," and will feature research talks from UCF and visiting scholars across applied mathematics and the life sciences.

Organizers:

Christen Fleming (UCF Biology)
Andrew Nevai (UCF SDMSS/Mathematics)
Yuanwei Qi (UCF SDMSS/Mathematics)
Zhisheng Shuai (UCF SDMSS/Mathematics)

Featured Guest Speakers:

Yanqiu Guo
Florida International University

Wael El Khateeb
University of Toledo

Libin Rong
University of Florida

Junping Shi
College of William & Mary

Brendan Shrader
Georgia Institute of Technology

Poroshat Yazdanbakh
Rollings College

Xinyue Zhao
University of Tennessee, Knoxville

Acknowledgement:

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Schedule: (all in-person sessions in MSB 318)

Thursday, January 15

10:30 am - 10:35 am	Opening remarks (F. Eloy Hernandez, School Interim Director; John Weishampel, Interim Dean, College of Graduate Studies)
10:35 am - 11:35 am	**Junping Shi** "*Asymptotic Profiles of the Basic Reproduction Number for Epidemic Spreading in Heterogeneous Environments*"
11:35 pm - 1:20 pm	Lunch Break
1:20 pm - 2:20 pm	**Hsin-Hsiung Bill Huang** "*Bayesian Spatiotemporal Modeling of Sparse Count Processes: From deer mouse traps (NEON) to imaging-derived landslides (Oregon)*"
2:30 pm - 3:00 pm	**Youle Wang** "*Dynamics of Cascading Failures in Biological Networks*"
3:00 pm - 3:30 pm	Coffee Break (MSB 201)
3:30 pm - 4:30 pm	**Christen Fleming** "*Kernel Density Estimation in Spatial Ecology*"
4:40 pm - 5:40 pm	**Xinyue Zhao** "*Optimal Control of Free Boundary Models for Tumor Growth*"
5:50 pm - 6:20 pm	**Aritra Dutta** "*Kolmogorov–Arnold Attention*"
6:30 pm	Dinner

Friday Afternoon, January 16

2:00 pm - 3:00 pm	**Libin Rong** "*Recent Developments in Modeling HIV Infection and Treatment*"
3:10 pm - 4:10 pm	**Gerrit Welper** "*Approximation properties of Locally Optimal Shallow Neural Networks*"
4:20 pm - 4:50 pm	**Kai Liu** "*Fidelity-Preserving Phenomena Under Mixed Unitary Quantum Channels*"

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Friday Morning, January 16 (Virtual Sessions)

Zoom Meeting ID: 921 2356 4603
https://ucf.zoom.us/j/92123564603

9:00 am - 10:00 am	**Yanqiu Guo** "*Finite-Dimensional Reduction of Dissipative Evolution Equations*"
10:00 am - 10:30 am	**Erika Lin** "*Improving Statistical Methods for Wildlife Corridor Estimation*"
10:30 am - 11:00 am	**Wael El Khateeb** "*Application of Physics-Informed Neural Networks with Topological Validation on Gene Regulatory Networks*"
11:00 am - 11:30 am	**Brendan Shrader** "*Quantifying the Impact of Partial Immunity on Disease Endemicity*"
11:30 am - 12:00 pm	**Poroshat Yazdanbakh** "*From Slow to Fast Dispersal: Impacts on Species Persistence and Infectious Disease Invasion*"

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