

Sampling, Inference, and Data-Driven Physical Modeling in Scientific Machine Learning

Monday July 14, 2025

- 8:00 *SESSION CHAIR: Rongjie Lai*
- 8:00–8:55 *Check-In/Breakfast (Hosted by IPAM)*
- 8:55–9:00 *Welcome and Opening Remarks*
- 9:00–9:40 **Stanley Osher** (University of California, Los Angeles (UCLA))
A Characteristic-Based Deep Learning Framework for Hamilton–Jacobi Equations with Application to Optimal Transport
- 9:50–10:05 *Break*
- 10:05–10:45 **Hayden Schaeffer** (University of California, Los Angeles (UCLA))
Models and Theory for Multi-Task Operator Learning
- 10:55–11:10 *Break*
- 11:10–11:50 **Wenjing Liao** (Georgia Institute of Technology)
Exploiting Low-Dimensional Data Structures and Understanding Neural Scaling Laws of Transformers
- 12:00–2:15 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Wenjing Liao*
- 2:15–2:55 **Scott McCalla** (Montana State University - Bozeman)
Tracking bacterial growth using a nonlocal interfacial model
- 3:05–3:30 *Break*
- 3:30–4:10 **Lars Ruthotto** (Emory University)
Mixed-Precision Algorithms for Training Neural ODEs
- 4:20–4:40 *Lightning Poster Round*
- 5:00–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday July 15, 2025

- 8:00 *SESSION CHAIR: Scott McCalla*
- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00–9:40 **Haomin Zhou** (Georgia Institute of Technology)
A supervised learning scheme for Hamilton-Jacobi equation via density coupling
- 9:50–10:05 *Break*

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- 10:05–10:45 **Rongjie Lai** (Purdue University)
Unsupervised In-context Operator Learning for Mean Field Games
- 10:55–11:10 *Break*
- 11:10–11:50 **Benjamin Zhang** (Brown University)
Probabilistic operator learning: generative modeling and uncertainty quantification for in-context operator learning
- 12:00–2:00 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Wenjing Liao*
- 2:00–2:40 **Alex Cloninger** (University of California, San Diego (UCSD))
Using Linearized Optimal Transport to Predict the Evolution of Stochastic Particle Systems
- 2:50–3:05 *Break*
- 3:05–3:45 **Siting Liu** (University of California, Riverside (UC Riverside))
Score-Based Generative Models through the Lens of Wasserstein Proximal Operators
- 3:55–4:10 *Break*
- 4:10–4:50 **Li Wang** (University of Minnesota, Twin Cities)
Learning-enhanced structure preserving particle methods for Landau equation

Wednesday July 16, 2025

- 8:00 *SESSION CHAIR: Lars Ruthotto*
- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00–9:40 **Luc Rey-Bellet** (University of Massachusetts Amherst)
Title not available
- 9:50–10:05 *Break*
- 10:05–10:45 **Zecheng Zhang** (University of Notre Dame)
Deep Operator Learning Approximation and Distributed Applications
- 10:55–10:10 *Break*

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- 11:10–11:50 **Nisha Chandramoorthy** (University of Chicago)
Toward physical generative modeling
- 12:00–12:15 *Group Photo*
- 12:15–2:00 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Haomin Zhou*
- 2:00–2:40 **Guang Lin** (Purdue University)
Scalable algorithms for Bayesian deep learning via stochastic gradient Monte Carlo and Beyond
- 2:50–3:05 *Break*
- 3:05–3:45 **Yuanqi Du** (Cornell University)
Bridging Non-equilibrium Simulation and Probabilistic Machine Learning
- 3:55–4:10 *Break*
- 4:10–4:50 **Jiajia Yu** (University of California, Los Angeles (UCLA))
Learning and Inference in Mean-Field Games

Thursday July 17, 2025

- 8:00 *SESSION CHAIR: Zecheng Zhang*
- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00–9:40 **Markos Katsoulakis** (University of Massachusetts Amherst)
Hamilton-Jacobi Equations, Mean-Field Games, and Optimal Control for Robust Machine Learning
- 9:50–10:05 *Break*
- 10:05–10:45 **Tingwei Meng** (Amazon Robotics)
HJ-sampler: a Bayesian sampler for inverse problems of a stochastic process by leveraging Hamilton–Jacobi PDEs and score-based generative models
- 10:55–11:10 *Break*
- 11:10–11:50 **Fuqun Han** (University of California, Los Angeles (UCLA))
Regularized Wasserstein Proximal Algorithms for Nonsmooth Sampling Problems
- 12:00–2:00 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Markos Katsoulakis*
- 2:00–2:50 *Mini Talk 1- Sichen Yang - 2:00 -2:15pm | Zhaiming Shen - 2:20-2:35pm | Hyemin Gu - 2:40-2:55pm*
- 3:00–3:15 *Break*
- 3:05–3:55 *Mini Talk 2- Kelvin Kan 3:15-3:30pm | Xue Feng 3:35-3:50pm | Elisa Negri 3:55-4:10pm*
- 3:55–4:10 *Break*

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4:10–5:00 *Discussion*

Friday July 18, 2025

8:00 *SESSION CHAIR: Friday Li Wang*

8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*

9:00–9:40 **Levon Nurbekyan** (Emory University)
System Identification via Invariant Measures

9:50–10:05 *Break*

10:05–10:45 **Wei Zhu** (Georgia Institute of Technology)
Structure-preserving machine learning and data-driven structure discovery

10:55–11:10 *Break*

11:10–11:50 **Rachel Ward** (University of Texas at Austin)
Generating synthetic data for neural operators

