

<div>  <div> <b>2024 AFOSR Computational Math Program Review</b>            Dr. Fariba Fahroo   August 12-16, 2024   Arlington, VA -hybrid         </div> </div>		
Agenda Day 1   Monday- August 12, 2024 All times are EDT		
Time	Topic	Speaker
8:00-8:20	Zoom Login	
8:20-8:30	Welcome – Opening Remarks	Dr. Fariba Fahroo, AFOSR
8:30	(YIP) Adaptive, Data-Driven Model Reduction for Shock-Dominated Flows to Enable Many-Query Computational Physics	Matt Zahr (University of Notre Dame)
8:55	(YIP'23) Data-Driven Reduced-Order Modeling for Turbulent Combustion Model Development	Cheng Huang (University of Kansas)
9:20	(YIP'24) Ambiguity-aware Artificial Intelligence via Statistical Inference	Edgar Dorbiban (U Penn)
9:40	MURI- Prediction, Statistical Quantification and Mitigation of Extreme Events Caused by Exogenous Causes or Intrinsic Instabilities (Virtual)	Themis Sapsis (MIT)
10:40	BREAK	
10:55	(YIP'24) Structure-Preserving (Scientific) Machine Learning: Theory and Application	Wei Zhu (Georgia Tech)
11:15	(YIP) Active Data Acquisition for Decision Making with Context-Aware Learning from Little Data	Benjamin Peherstorfer (Courant Institute, NYU)
11:40	DeepONet for Fast Data Assimilation in Transitional High-Speed Flows	Tamer Zaki (JHU)
12:05	GPT-PINN and TGPT-PINN: Linear and Nonlinear Model Order Reduction Toward Efficient Non-Intrusive Meta-Learning of Parametric PDEs	Sigal Gottlieb, Yanlai Chen (U Mass, Dartmouth)
12:30	LUNCH	
13:40	New Frontiers in Greedy Approaches for Linear and Nonlinear Model Reduction	Akil Narayan (University of Utah)
14:05	Spectral Correctness of the Approximation of the First-Order Form of Maxwell's Equations	Jean-Luc Guermond, Bojan Popov (TAMU)
14:30	Data-Rich Multi-Fidelity Methods for Aerospace Vehicle Design	Phil Beran, Chris Schrock (AFRL/RQVC)

14:55	Multi-scale Invariant Models Leading to New Understanding of Ductile Damage	Oana Cazacu (University of Arizona)
15:20	<b>BREAK</b>	
15:35	COE RQR Review-- Multi-fidelity Modeling of Rocket Combustor Dynamics	Karthik Duraisamy (University of Michigan)
16:15	<b>Discussions on Foundation Models</b>	Led by Karthik Duraisamy
17:00	<b>MEETING ADJOURN FOR THE DAY</b>	

<b>Agenda Day 2   Tuesday- August 13, 2024</b> All times are EDT		
Time	Topic	Speaker
8:00-8:20	<b>Zoom Login</b>	
8:20-8:30	<b>Intro &amp; Welcome</b>	Fariba Fahroo, (AFOSR)
8:30	Interpolating Many-Electron Wave Functions Through Chemical Space <b>(Virtual)</b>	George Booth (King's College)
8:55	Information Geometric Regularization of the Barotropic Euler Equation	Florian Schafer (Georgia Tech)
9:20	<b>(YIP)</b> Nonlocal Attention Operator: Towards an Interpretable Foundation Model	Yue Yu (Lehigh University)
9:45	<b>(YIP'23)</b> Enhanced Entropy Filtering and Online Bayesian Optimization of Polynomial-Multigrid Cycles for High-Order Methods	Freddie David Witherden (TAMU)
10:05	<b>BREAK</b>	
10:20	Universal Approximation of Dynamical Systems by Semi-Autonomous Neural ODEs and Applications <b>(Virtual)</b>	Enrique Zuazua (Friedrich-Alexander-Universität Erlangen-Nürnberg) (FAU)
10:40	<b>(MURI)</b> Rare Events: Analysis, Computation, and Robustness	Jose Blanchet, Wei Cai (Stanford University)
11:40	Schrödinger's Control and Estimation Paradigm with Spatio-Temporal Distributions	Tryphon Georgiou (UC Irvine)
12:05	<b>LUNCH</b>	
13:15	Program Status Update	Fariba Fahroo (AFOSR)
13:40	Optimal Control of Conditional Processes: Old and New	Rene Carmona (Princeton University)

<b>14:05</b>	Foundations of Geometric Deep Learning	Amin Saberi (Stanford University)
<b>14:30</b>	Multi-Scale Approaches for Physics Understanding and Model Development of Turbulent Combustion	Matt Harvazinski, Ramakanth Munipalli (AFRL/RQRC)
<b>14:55</b>	A Scientific Foundation Model for PDEs: Multi-Operator Learning and Extrapolation <b>(Virtual)</b>	Hayden Schafer (UCLA)
<b>15:20</b>	<b>BREAK</b>	
<b>15:35</b>	Digital Twin MURI	Daniel Tartakovsky (Stanford)
<b>16:00</b>	<b>Discussions on Digital Twins</b> - Real Time Bayesian Inference and Prediction for High Fidelity Digital Twins Governed by Linear Time Invariant Dynamical Systems	Led by Omar Ghattas (UT Austin)
<b>17:00</b>	<b>MEETING ADJOURN FOR THE DAY</b>	

<b>Agenda Day 3   Wednesday - August 14, 2024</b> <b>All times are EDT</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
<b>8:00-8:20</b>	<b>Zoom Login</b>	
<b>8:20-8:30</b>	Intro & Welcome	Fariba Fahroo (AFOSR)
<b>8:30</b>	A Semi-Lagrangian Adaptive-Rank Method (SLAR) for Linear Transport and Nonlinear Vlasov-Poisson Systems	Jingmei Qiu (U. Delaware)
<b>8:55</b>	Structure-Preserving Particle Method for the Landau Equation Modeling Plasma Collisions – Some Extensions	Jingwei Hu (University of Washington)
<b>9:20</b>	Versatile Mathematical Tools for Directed Energy Simulations	Leszek Demkowicz (UT Austin) Jay Gopalakrishnan (Portland State University)
<b>10:00</b>	Koopman Operator Theoretic Methods for Efficient Training and Analysis of Deep Neural Networks	Maria Fonoberova (AIMDyn Inc.)
<b>10:25</b>	<b>BREAK</b>	
<b>10:40</b>	Modeling Unknown Stochastic Systems via Generative Models	Dongbin Xiu (Ohio State University)
<b>11:05</b>	Tensor Networks: Structure learning, Uncertainty Quantification, and PDE Solutions	Alex Gorodetsky (University of Michigan)

11:30	<b>LUNCH</b>	
12:45	Information Metrics and Stochastic Optimization Methods for Robust and Trustworthy Statistical Learning	Markos Katsoulakis, Luc Rey-Bellet (U Mass- Amherst), Paul Dupuis (Brown University)
13:25	Towards Large-Scale Quantum Accuracy Materials Simulations	Vikram Gavini (U. Michigan)
13:50	Bi-fidelity Optimization and Failure Probability Estimation	Alireza Doostan (University of Colorado – Boulder)
14:15	MURI '24 --Tensor Network	Jingmei Qiu (U. Delaware)
14:35	<b>BREAK</b>	
14:50	Multiscale Stochastic Modeling, Conditioning, and Simulation of Rare Events	Roger Ghanem (USC)
15:15	From Many-Body Quantum Systems to Classical Turbulence: Novel Horizons of Tensor Networks	Peyman Givi, Juan Jose Mendoza-Arenas (U. Pittsburgh)
15:40	Adaptive Sparse Sampling for Scalable Rank-Adaptive Reduced-Order Modeling of Nonlinear Matrix Differential Equations with Time-Dependent Bases	Hessam Babaei (U. Pittsburgh)
16:05	<b>MURI:</b> Revolutionary Advances in Correlated Electron Materials: From Strongly Correlated Electrons to Large Scale DFT and Quantum Embedding ( <b>Virtual</b> )	Garnet Chan (Caltech), Carlos J. Garcia Cervera (UCSB)
16:35	<b>Discussions</b>	
17:00	<b>MEETING ADJOURN FOR THE DAY</b>	

<b>Agenda Day 4   Thursday - August 15, 2024</b> <b>All times are EDT</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
8:00-8:20	<b>Zoom Login</b>	
8:20-8:30	Intro & Welcome	Fariba Fahroo (AFOSR)
8:30	Machine Learned Turbulence Modeling	Chris Schrock (AFRL/RQ)
8:55	Rigorous Optimal Uncertainty Quantification & Optimization	Adam Gerlach (AFRL/RQQA)

9:20	New Shock Mathematics: Humans, Machinery and AI	Neil Johnson (GWU)
9:45	<b>MURI:</b> Learning and Meta-Learning of Partial Differential Equations via Physics-Informed Neural Networks: Theory, Algorithms, and Applications	George Karniadakis (Brown University) Mike Kirby (University of Utah)
10:45	<b>BREAK</b>	
11:00	Inference of Forcing Kernels in Generalized, Multi-Physics, Dynamic Systems	Guus Jacobs (SD State University)
11:25	Mesh Generation and AI-Enhanced Algorithms for Modeling Complex Materials Systems	Soheil Soghrati (Ohio State University)
11:50	A Machine Learning Framework for High-Dimensional Mean Field Games and Optimal Control <b>(Virtual)</b>	Lars Ruthotto (Emory)
12:15	<b>LUNCH</b>	
13:30	<b>MURI:</b> Innovations in Mean-Field Game Theory for Scalable Computation and Diverse Applications	Stan Osher (UCLA)
14:30	<b>(YIP'24)</b> Inference-Oriented Model Reduction for Linear Bayesian Smoothing Problems	Elizabeth Qian (GA Tech)
14:50	Feature Informed Data Assimilation	Daniel Tartakovsky (Stanford University)
15:15	<b>(YIP'23):</b> Transport Information Geometric Computations	Wuchen Li (University of South Carolina)
15:40	SDDC Solutions of Kinematic Dynamo Problems	Chunlei Liang (Clarkson University)
16:05	<b>BREAK</b>	
16:15	Kernel Methods with Machine Learning and Adaptivity	Jonah Reeger (AFIT)
16:40	Developments for Design under Uncertainty of Transient Systems	Ed Forster (AFRL/RQ)
17:00	<b>MEETING ADJOURN FOR THE DAY</b>	

Agenda Day 5   Friday, August 16, 2024 All times are EDT		
Time	Topic	Speaker
8:00-8:20	Zoom Login	
8:20	Intro & Welcome	Fariba Fahroo (AFOSR)

<b>8:30</b>	Heterogeneous Data Fusion by Graph-based Stochastic Models to Achieve Combinatorial Generalization of New Insights into Powder-based Fabrication <b>(Virtual)</b>	Hui Wang (FAMU)
<b>8:55</b>	HBCU-led Center for Scientific Machine Learning for the Materials Sciences <b>(Virtual)</b>	Yunjiao Wang (Texas Southern University)
<b>9:20</b>	AFRL/RX COE Review	Megna Shah (AFRL/RXNMD)
<b>9:50</b>	<b>AFRL/RX Lab Task</b>	Megna Shah & Jeff Simons
<b>10:10</b>	<b>MURI:</b> A Robust Multi-Physics Design Analysis and Optimization Framework for Hypersonic Systems Grounded in Rigorous Model Reduction	Charbel Farhat (Stanford University)
<b>11:10</b>	<b>MURI:</b> The Science of Learning from Observations: Leveraging Scientific Computation with Intrinsic Machine Learning Models and Lifelong Learning	Mauro Maggioni (Johns Hopkins)
<b>12:10</b>	<b>Concluding Remarks –Discussions</b>	
<b>13:00</b>	<b>MEETING ADJOURN</b>	