Matthew W. Repasky Jr.

✉ mwrepasky@gatech.edu   🔗 LinkedIn   ⌨ mrepasky3   🌐 https://mrepasky3.github.io/

Education

Aug 2021 – Present	**Ph.D. in Machine Learning** *Georgia Institute of Technology* *H. Milton Stewart School of Industrial & Systems Engineering* Minor: Geophysics | GPA: 4.00/4.00
Aug 2017 – May 2021	**B.S. in Physics** *Georgia Institute of Technology* *School of Physics* Concentration: Astrophysics | Minor: Data Analytics | Highest Honor | GPA: 3.95/4.00

Publications

Journal Articles

- Neural Stein Critics with Staged L^2-Regularization
  Matthew Repasky, Xiuyuan Cheng, Yao Xie
  IEEE Transactions on Information Theory, 2023.

Conference Proceedings

- Stage-Regularized Neural Stein Critics For Testing Goodness-Of-Fit Of Generative Models
  Matthew Repasky, Xiuyuan Cheng, Yao Xie
  IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2024.

- Real-Time Measurement of Aerospace Organic Coating Condition and Performance in Atmospheric Corrosion Conditions
  Victoria Avance, Rebecca Marshall, Fritz Friedersdorf, **Matthew Repasky**, Henry Yuchi, Yao Xie
  Association for Materials Protection and Performance (AMPP) Annual Conference, 2024.

- Power Grid Faults Classification via Low-Rank Tensor Modeling
  Matthew Repasky, Yao Xie, Yichen Zhang, Feng Qiu
  Asilomar Conference on Signals, Systems, and Computers, 2023.

- Streaming Low-Rank Matrix Data Assimilation and Change Detection
  Henry Yuchu, **Matthew Repasky**, Terry Ma, Yao Xie
  Asilomar Conference on Signals, Systems, and Computers, 2023.

Workshop Papers

- Generative Modeling for Topography Super-Resolution on the Moon
  Matthew Repasky, Erwan Mazarico, Stefano Bertone, Michael Barker, Terence Sabaka
  Space Imaging Workshop, 2024.

- Deep Graph Kernel Point Processes
  Zheng Dong, **Matthew Repasky**, Xiuyuan Cheng, Yao Xie
  Temporal Graph Learning Workshop, Conference on Neural Information Processing Systems (NeurIPS), 2023.
  *Oral Spotlight Paper

- Information Recovery via Matrix Completion for Piezoresponse Force Microscopy Data
  Kerisha Williams, Henry Yuchi, Kevin Ligonde, **Matthew Repasky**, Yao Xie, Nazanin Bassiri-Gharb
  AI for Accelerated Materials Design Workshop, Conference on Neural Information Processing Systems (NeurIPS), 2022.

Working Papers

- Consistency Posterior Sampling for Diverse Image Synthesis
Vishal Purohit*, **Matthew Repasky***, Jianfeng Lu, Qiang Qiu, Yao Xie, Xiuyuan Cheng
In Submission, 2024.
*Equal Contribution

- Lunar Topography Super-Resolution Schrödinger Bridges
Matthew Repasky, Erwan Mazarico, Stefano Bertone, Michael Barker, Terence Sabaka, Yao Xie

- Multi-Agent Reinforcement Learning for Joint Police Patrol and Dispatch
Matthew Repasky, He Wang, Yao Xie

- Marked Temporal Point Processes for Coating Degradation Modeling
Matthew Repasky, Henry Yuchi, Lasya Akshara, Yao Xie

Conference Presentations

- Lunar Topography Super-Resolution Schrödinger Bridges
Matthew Repasky, Erwan Mazarico, Stefano Bertone, Michael Barker, Terence Sabaka, Yao Xie
Poster, American Geophysical Union Annual Meeting, 2024.

- Generative Modeling and Machine Learning for Topography
Matthew Repasky, Erwan Mazarico, Stefano Bertone, Michael Barker, Terence Sabaka, Yao Xie
Poster, American Geophysical Union Annual Meeting, 2024.

- Multi-Agent Reinforcement Learning for Joint Police Patrol and Dispatch
Matthew Repasky, He Wang, Yao Xie
Invited Talk, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting, 2023-2024.

- Towards Achieving Fast Radiosity for Thermal Modeling of Planetary Surfaces
Matthew Repasky, Erwan Mazarico, Samuel Potter, Norbert Schörghofer, Stefano Bertone
Poster, American Geophysical Union Fall Meeting, 2023.

Work Experience

Jan 2024 – Aug 2024	**NASA Goddard Space Flight Center, Spring/Summer Intern** (*Supervisor: Dr. Erwan Mazarico*): Developed a diffusion-based generative model of planetary topography to improve the resolution of existing lunar topography products. Trained additional generative models for inpainting of missing data in topography models.
Jun 2023 – Aug 2023	**NASA Goddard Space Flight Center, Summer Intern** (*Supervisor: Dr. Erwan Mazarico*): Implemented low-rank matrix decomposition approaches for compression of view factor matrices used in radiosity calculations, constructing block-structured view factor matrices.
May 2022 – July 2022	**Argonne National Laboratory, Technical Research Aide** (*Supervisor: Dr. Feng Qiu*): Applied low-rank tensor models to power grid sensor measurements representing fault events, which were used for online classification to identify and localize power grid faults.

Research Experience

2023 – Present	**Machine Learning Applications to Planetary Topography**: Trained generative models of to solve problems related to planetary topography, such as super-resolution and interpolation. Developed a matrix decomposition approach for shape models derived from planetary topography, enabling more efficient radiosity computations.
2024 – Present	**Deep Learning for Posterior Sampling**: Designed a method for posterior sampling using pre-trained generative models of prior probability distributions. Target posterior distributions include those corresponding to noisy inverse problems, such as super-resolution or inpainting for image data.
2021 – 2023	**Reinforcement Learning for Fair and Efficient Operations**: Jointly trained efficient and equitable police patrol and dispatch policies using multi-agent reinforcement learning (MARL), outperforming baselines using priority queues and a model of true police patrol patterns. Collaborated with the Atlanta Police Department to meet the needs of the city of Atlanta.
2021 – 2022	**Deep Learning for Testing Statistical Goodness-of-Fit**: Developed a training scheme for neural Stein discrepancy critic functions bound to the space of square integrable functions. Annealing the integrability regularization weight throughout training yields more discriminative critics. Such critics can localize regions of poor fit in models of probability distributions, such as generative models.
2020 – 2022	**Statistical Modeling of Physical Systems**: (1) Modeled aircraft coating degradation using a Hawkes process in collaboration with the Department of Defense (DoD) Strategic Environmental Research and Development Program. (2) Developed a change detection procedure for power grid faults using low-rank tensor models with Argonne National Laboratory. (3) Modeled microscopy data using Bayesian matrix completion to denoise and recover measurements corresponding to material properties.

Teaching Experience

Fall 2024	**Graduate Teaching Assistant**: ISYE 4803/8803: System Design for Industrial Engineers
Spring 2022	**Graduate Teaching Assistant**: ISYE 4031: Regression and Forecasting
Fall 2021	**Graduate Teaching Assistant**: ISYE 2027: Probability with Applications

Service

- **Conference Reviewer**: ICLR 2024, NeurIPS 2024, ICLR 2025.

- **Journal Reviewer**: IEEE Transactions on Neural Networks and Learning Systems.

- **Session Chair**: INFORMS 2024 Session: Reinforcement Learning and Causal Inference with Applications in Service Systems.

Skills

- **Programming**: Proficient in Python, MATLAB, R

- **Software**: Pytorch, Linux, Jupyter Notebooks, Git, ENVI, QGIS

- **Concepts**: Machine Learning, Deep Learning, Artificial Intelligence, Generative Modeling, Diffusion, Reinforcement Learning, Spatial-Temporal Modeling, Change Point Detection, Low-Rank Modeling