Matthew W. Repasky Jr.

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EDUCATION

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

PUBLICATIONS & WORKING PAPERS

Journal Articles

1. Neural Stein critics with staged L^2-regularization
   Matthew Repasky, Xiuyuan Cheng, Yao Xie
   IEEE Transactions on Information Theory, 2023.

Conference & Workshop Papers

1. Power grid faults classification via low-rank tensor modeling
   Matthew Repasky, Yao Xie, Yichen Zhang, Feng Qiu
   Fifty-seventh Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2023.
2. Streaming low-rank matrix data assimilation and change detection
   Henry Yuchu, **Matthew Repasky**, Yao Xie
   Fifty-seventh Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2023.
3. 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, Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS), 2022.

Working Papers

1. Deep graph kernel point process
   Zheng Dong, **Matthew Repasky**, Xiuyuan Cheng, Yao Xie
   Twelfth International Conference on Learning Representations (ICLR), 2024. (Submitted)
2. Heterogeneous multi-agent reinforcement learning for joint patrol and dispatch
   Matthew Repasky, He Wang, Yao Xie
3. Marked temporal point processes for corrosion modeling and survival analysis
   Matthew Repasky, Henry Yuchi, Yao Xie

WORK EXPERIENCE

Intern June 2023 – August 2023

NASA Goddard Space Flight Center

Advisor: Dr. Erwan Mazarico

- Implemented and evaluated an array of low-rank matrix decomposition approaches in the hierarchical compression of view factor matrices used for fast radiosity calculations
- Investigated hierarchical decomposition schemes for triangular meshes of planetary surfaces to construct a block-structured view factor matrix

Technical Research Aide May 2022 – July 2022

Argonne National Laboratory

Advisor: Dr. Feng Qiu

- Applied low-rank tensor models to sensor measurements of the power grid that represent types of fault event
- Used online classification techniques in conjunction with these models to identify and localize power grid faults in real-time

RESEARCH EXPERIENCE

Data-Driven Corrosion Modelling to Reduce the Environmental Impact of National Assets July 2020 – Present

Conducted under the supervision of *Dr. Yao Xie* at Georgia Tech H. Milton Stewart School of Industrial & Systems Engineering

- Developing a predictive time series model to capture the degradation of aircraft paint coatings using a marked, temporal Hawkes process
- Applying sequential change point detection techniques such as CUSUM to detect changes in the protective status of coatings
- Collaborating with a Strategic Environmental Research and Development Program (SERDP) team, including experts at Luna Innovations, Southwest Research Institute, Boeing, and the Department of Defense

Reinforcement Learning for Fair Police Dispatch and Patrol March 2021 – Present

Conducted under the supervision of *Dr. Yao Xie* and *Dr. He Wang* at Georgia Tech H. Milton Stewart School of Industrial & Systems Engineering

- Using deep multi-agent reinforcement learning techniques to learn efficient and equitable police patrol policies
- Incorporating dynamic priority queueing for dispatch decisions to unify patrol and dispatch policies
- Building simulations to determine basic optimal patrol patterns in addition to realistic representations of the city of Atlanta

Denoising and Physically Characterizing Switching Spectroscopy Piezoresponse Force Microscopy Data June 2021 – Present

Conducted under the supervision of *Dr. Yao Xie* at Georgia Tech H. Milton Stewart School of Industrial & Systems Engineering

- Exploiting correlations across space and applied excitation to denoise SS-PFM data
- Applying Bayesian matrix modeling to recover correlated, low-rank observations in the PFM data matrices
- Coordinating with a mechanical and materials science engineering research group at Georgia Tech to obtain physical intuition about the data structure

Neural Stein Critics with Staged L^2 Regularization Nov 2021 – Nov 2022

Conducted under the supervision of *Dr. Yao Xie* at Georgia Tech H. Milton Stewart School of Industrial & Systems Engineering and *Dr. Xiuyuan Cheng* at Duke University Department of Mathematics

- Created a new training scheme for neural Stein discrepancy critic functions bound to the space of square integrable functions
- Outlined a strategy for the staging throughout training of the regularization weight that bounds functions to L^2

SKILLS

Programming: Proficient in Python, MATLAB, R; Familiar with C, C++, Java
Tools: Pytorch, Tensorflow, Amazon Web Services, Google Cloud Platform, Microsoft Azure, Spark, Linux, Jupyter Notebooks, Git, SQL
Concepts: Deep Learning, Reinforcement Learning, Convolutional Neural Networks, Recurrent Neural Networks, Spatial-Temporal Modelling, Change Point Detection, Low-Rank Approximation

HONORS & AWARDS

President's Undergraduate Research Award (PURA) — Spring '21
Faculty Honors — Spring '18, '20, & '21, Fall '19 & '20
Dean's List — Fall '17 & '18

TEACHING

Graduate Teaching Assistant/Tutor at Georgia Tech — Fall '21 – Spring '22
ISYE 2027: Probability with Applications
ISYE 4031: Regression and Forecasting