# Mattson Thieme

	EDUCATION
2019-2023	PhD, Computer Science, Northwestern University
2014-2015	MS, Applied Optical Physics, University of Oregon
2010-2014	<b>BS</b> , <b>Physics</b> , Oregon State University
	Experience
2022	Graduate Research Intern, MIT-IBM Watson AI Lab, IBM Research
	<ul> <li>Focus: Graph structured time series forecasting, Mentor: Yada Zhu</li> <li>Developed a heuristic-free, unbiased and interpretable method for learning discrete, task-informed graph structures</li> </ul>
2020- Present	Machine Learning Researcher, <i>Fermilab</i> Supported by the DOE under contract DE-AC02-07CH11359 and the READs project
	<ul> <li>Lead Edge-AI Research and Development for the Loss De-Blending and Slow Spill Regulation projects within Fermilab's Particle Accelerator Division</li> </ul>
2019- Present	Cognitive Science Fellow, MAGICS Lab, Northwestern University Advisor: Han Liu
	<ul> <li>Geometric DL in quantitative finance and computational brain science</li> <li>Developed a novel method for leveraging offline algorithms to inform online forecasting models on US equities (Under Review)</li> <li>Developed a novel method for solving the graph structure learning problem with deep Q-learning (In Progress)</li> </ul>
2017-2019	Machine Learning Engineer, Intel AI
	<ul> <li>Distributed ML Systems Engineering in the Acceleration and Scaling Group</li> <li>Built the first Deep Learning VM on the Microsoft Azure Marketplace</li> <li>Deployed ML Systems for Biomedical Science with the AL Division at CE</li> </ul>

• Accelerated Meta-Learning ML models by 100X with Siemens Healthcare AI

# 2015-2017 Technology Development & Integration Yield Engineer, Intel

- Optical physics and ML automation in the Photomask Operations Group
- $\circ$  Developed ML models that improved plasma etch rate forecasting by 32%
- $\circ\,$  Built an analytics app in python that reduced tool downtime by  $25\%\,$
- CV for characterizing astigmatism in scanning electron microscopes

#### 2014 Graduate Optical Researcher, NASA & Voxtel Inc.

 $\circ~$  Designed, modeled and characterized a gradient index phase plate for aberration testing aboard the James Webb Space Telescope.

# 2013-2014 Physics Teaching Assistant, Oregon State University

• Led laboratory courses and recitation for introductory physics with calculus

#### 2011-2014 **Undergraduate Research Fellow**, Oregon State University Advisor: Oksana Ostroverkhova

• Co-authored four peer reviewed publications on charge carrier photogeneration and transport in organic semiconductor materials.

# PUBLICATIONS

- M. Thieme<sup>\*</sup>, K.J. Hazelwood<sup>\*</sup>, M.A. Ibrahim, H. Liu, S. Memik, V. P. Nagaslaev, A. Narayanan, G. Pradhan, K. Seiya, R. Shi, B.A. Schupbach, and N.V. Tran. "Semantic Regression for Disentangling Beam Losses in the Fermilab Main Injector and Recycler". In *Conference NAPAC'22*.
- A. Narayanan<sup>\*</sup>, M. Thieme<sup>\*</sup>, J. Jiang<sup>\*</sup>, K.J. Hazelwood, M.A. Ibrahim, H. Liu, S. Memik, V. P. Nagaslaev, K. Seiya, R. Shi, B.A. Schupbach, and N.V. Tran. "Machine Learning for Slow Spill Regulation in Mu2e". In *Conference NAPAC'22*.
- K.J. Hazelwood\*, M. Thieme\*, B.A. Schupbach\*, M.A. Ibrahim, H. Liu, S. Memik, V. P. Nagaslaev, A. Narayanan, D.J. Nicklaus, P.S. Prieto, K. Seiya, R. Shi, R.M. Thurman-Keup, and N.V. Tran. "Real-time Edge AI For Distributed Systems (READS): Progress On Beam Loss De-blending for the Fermilab Main Injector and Recycler." In *Conference IPAC'21, Campinas, Brazil.*
- A. Narayanan<sup>\*</sup>, M. Thieme<sup>\*</sup>, K.J. Hazelwood, M.A. Ibrahim, H. Liu, S. Memik, V. P. Nagaslaev, D.J. Nicklaus, P.S. Prieto, K. Seiya, R. Shi, B.A. Schupbach, R.M. Thurman-Keup, and N.V. Tran. "Optimizing Mu2e Spill Regulation System Algorithms". In *Conference IPAC'21, Campinas, Brazil.*
- K. Paudel, B. Johnson, M. Thieme, M. Haley, M. M. Payne, J. E. Anthony, and O. Ostroverkhova, "Enhanced charge photogeneration promoted by crystallinity in small-molecule donor-acceptor bulk heterojunctions" *Applied Physics Letters* 105, 043301 (2014).
- K. Paudel, B. Johnson, M. Thieme, J. Anthony, O. Ostroverkhova, "Charge carrier dynamics in small-molecule and polymer-based donor-acceptor blends" MRS Proceedings, v. 1733, DOI: https://dx.doi.org/10.1557/opl.2014.956 (2014).
- K. Paudel, B. Johnson, A. Neunzert, M. Thieme, B. Purushothaman, M. M. Payne, J. E. Anthony, and O. Ostroverkhova, "Small-Molecule Bulk Heterojunctions: Distinguishing Between Effects of Energy Offsets and Molecular Packing on Optoelectronic Properties" *Journal of Physical Chemistry C* 117, 24752-24760 (2013).

- K. Paudel, B. Johnson, A. Neunzert, M. Thieme, J. Anthony, O. Ostroverkhova "Effects of energy offsets and molecular packing on exciton and charge carrier dynamics in small-molecule donor-acceptor composites" *Proc. of SPIE*, v. 8827, 88270Q, 2013.
- Industrial White Papers

**Thieme, Mattson**, et al. "Intel Optimized Data Science Virtual Machine on Microsoft Azure." *Intel AI*, 8 Mar. 2019, <u>*Article*</u>.

**Thieme, M.**, et al. (2018) Training Deep Convolutional Neural Networks with Horovod on Intel High Performance Computing Architecture. [White paper] Intel AI: <u>PDF</u>.

**Thieme, M.**, et al. (2018) Accelerating Memory-Bound Machine Learning models on Intel Xeon Processors. [White paper] Intel AI: <u>PDF</u>.

**Thieme, Mattson**, et al. "Amazon Web Services Works with Intel to Enable Optimized Deep Learning Frameworks on Amazon\* EC2 CPU Instances." *Intel AI*, 26 Apr. 2018, <u>Article</u>.

**Thieme, Mattson\***, and Reina, Anthony\*. "Biomedical Image Segmentation with U-Net." *Intel AI*, 23 Jan. 2018, <u>Article</u>.

#### TALKS

- 2020 Northwestern CS Seminar: Deep Reinforcement Learning
- 2020 Northwestern CS Seminar: Graph Neural Networks
- 2019 Microsoft Build Developer Conference: Large-Scale ML Model Training
- 2018 Siemens AI Lab: Memory Management in Meta-Learning tasks
- 2018 Amazon Web Services: Introducing the Deep Learning VM
- 2018 Intel AI Developer Conference: Scaling AI in Healthcare
- 2017 Intel AI-for-good Symposium: ML for social good

#### – Awards

- 2019 Northwestern Cognitive Science PhD Fellowship
- 2019 Intel Division Recognition Award (ML Engineering)
- 2014 Undergraduate Research Fellow Distinction
- 2013 Undergraduate Research, Innovation, Scholarship & Creativity Award
- TECH STACK
- Languages | Fluent: Python, Conversational: Javascript, C++, Java
- **Tools** | PyTorch, TensorFlow, Keras, scikit-learn, CUDA, Linux, Docker, Conda, AWS, Azure, GCP, Git, Jupyter, Pandas, NumPy, LATEX, and many more.

# PROJECTS

# 2021 Forecasting Cryptocurrency Prices with Graph Neural Networks

Built and deployed a GNN model that learns representations of the complex interrelationships between cryptocurrencies and exploits them to inform price forecasting and, transitively, trading decisions.

# 2020 Deep Reinforcement Learning for Cryptocurrency Trading

Developed an algorithmic trading agent based on a modified deep Q-learning model and custom data acquisition/preprocessing strategy using ccxt.

# 2020 Learning to Simulate Multivariate Time Series

Developed a novel autoregressive graph neural network model to generate multivariate financial time series data. Instead of relying upon predefined relations or covariances, this approach provided a data-driven way to model temporal interactions between series.

# 2019 Cryptocurrency Arbitrage

Built a cloud-based algorithmic crypto-arbitrage system for intra- and interexchange arbitrage across hundreds of currencies and dozens of exchanges. Colocated the scripts' execution with the physical location of the primary exchange using AWS to reduce latency and improve win/loss ratio.

# 2018 AI for Social Good

Working with Thorn, I built an alternative data pipeline that reduced our ML age-estimation model error by 3 years (from  $\pm 5$  years to  $\pm 2$  years). This allowed local and federal law enforcement to respond with greater confidence.

ACADEMIC SERVICE

- $2022 \quad \mathbf{ICML}, \, Reviewer$
- 2021 ICLR, Reviewer

# TEACHING

- 2021 CS348: Intro to Artificial Intelligence (TA)
   o Held office hours, designed homeworks and wrote autograding code.
- 2014 PH213: Physics with Calculus (TA)
   Taught recitation, held office hours and led laboratory courses.

# — Advising

- 2022 Isaiah Jones, Raw L1 Tick Data Processing Project
- 2022 Yunshu Joyce Zhang, Raw L1 Options Data Processing Project

# — Outreach

- 2017-2019 ML Scientist, Thorn: Defending children from online exploitation
- 2017-2019 Lecturer, Portland School District STEM outreach
- 2018-2019 Mentor, Thinkers and Tinkerers after school program
- 2018-2019 Instructor, Teaching STEM in Title 1 schools