TEDDY KOKER

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EDUCATION

Worcester Polytechnic Institute Sep. 2016 - Dec. 2019
B.S. in Computer Science with Distinction

RESEARCH EXPERIENCE

Massachusetts Institute of Technology, Lincoln Laboratory Apr. 2021 - Present
Associate Staff, AI Technology Group

- Created E(3) equivariant neural networks for electron density prediction in materials and organic molecules (ChargE3Net).
- Developed methods for contrastive representation learning of crystalline materials with graph neural networks (CrystalCLR).
- Researched domain adaptation and interpretability methods for timeseries models in collaboration with Zitnik Lab at Harvard Medical School (Raincoat, TimeX).
- Demonstrated a deep learning approach for detection of COVID-19 and influenza from fitness trackers.

Lightning AI Aug. 2020 - Feb. 2021
Machine Learning Research Engineer

- Created a python library with efficient and scalable implementations of common machine learning evaluation metrics (torchmetrics).
- Introduced a method of generating pixel level saliency maps for model interpretability (U-Noise).
- Researched self-supervised learning of image representations through augmented autoencoders (AASAE).

Harvard Medical School Dec. 2019 - Aug. 2020
Research Associate, Image and Data Analysis Core

- Created deep learning model to detect manipulation of microscopy images, along with a new training and benchmark dataset (BINDER).
- Proposed a novel approach to biomedical image retrieval.

PUBLICATIONS

Conference and Workshop Papers

- **Teddy Koker**, Keegan Quigley, Eric Taw, Kevin Tibbetts, Lin Li. *Higher-Order Equivariant Neural Networks for Charge Density Prediction in Materials.* NeurIPS AI4Science Workshop, 2023.[‡]
- Owen Queen, Thomas Hartvigsen, **Teddy Koker**, Huan He, Theodoros Tsiligkaridis, Marinka Zitnik. *Encoding Time-Series Explanations through Self-Supervised Model Behavior Consistency.* NeurIPS, 2023.[†]
- Huan He, Owen Queen, **Teddy Koker**, Consuelo Cuevas, Theodoros Tsiligkaridis, Marinka Zitnik. *Domain Adaptation for Time Series Under Feature and Label Shifts.* International Conference on Machine Learning (ICML), 2023.
- **Teddy Koker**, Keegan Quigley, Will Spaeth, Nathan Frey, Lin Li. *Graph Contrastive Learning for Materials.* NeurIPS AI for Accelerated Materials Design Workshop, 2022.
- **Teddy Koker**, Fatemehsadat Mireshghallah, Tom Titcombe, Georgios Kaissis. *U-Noise: Learnable Noise Masks for Interpretable Image Segmentation.* International Conference on Image Processing (ICIP), 2021.

[‡]Extended version in review
[†]Spotlight award, top 3% of submissions

- **T. Koker***, S.S. Chintapalli*, S. Wang, B.A. Talbot, D. Wainstock, M. Cicconet, M.C. Walsh. *On Identification and Retrieval of Near-Duplicate Biological Images: a New Dataset and Protocol.* International Conference on Pattern Recognition (ICPR), 2020.

Journal Papers

- Nicki Skafte Detlefsen, Jiri Borovec, Justus Schock, Ananya Harsh Jha, **Teddy Koker**, Luca Di Liello, Daniel Stancl, Changsheng Quan, Maxim Grechkin, William Falcon. *TorchMetrics - Measuring Reproducibility in PyTorch.* The Journal of Open Source Software (JOSS), 2022.
- **Teddy Koker**, Dimitrios Koutmos. *Cryptocurrency Trading Using Machine Learning.* Journal of Risk and Financial Management, 2020.

Preprints and In Review

- William Falcon, Ananya Harsh Jha, **Teddy Koker**, Kyunghyun Cho. *AASAE: Augmentation-Augmented Stochastic Autoencoders.* arXiv, 2021.

HONORS & AWARDS

MIT Lincoln Laboratory

- Line Grant, 2023. Awarded $295,000 for research on machine learning for medical decision-making. Co-PI with Keegan Quigley.
- Team Award, 2022. Highest group award at Lincoln Laboratory.

Worcester Polytechnic Institute

- Dean's List, 2017 - 2019. Distinguished academic performance.
- Global Scholarship, 2018. Awarded to defray cost of off-campus project.
- Charles O. Thompson Scholar, 2017. Outstanding performance by first year students.
- Presidential Scholarship, 2016 - 2019.

SERVICE & LEADERSHIP

Talks

- Poster presenter, Graph Exploitation Symposium at MIT. Aug. 2023
- Speaker, Chemical and Biological Defense Science & Technology Conference. Dec. 2022
- Speaker, Recent Advances in AI for National Security at MIT Lincoln Laboratory. Nov. 2021

Volunteering

- Research Lead, OpenMined. Apr. 2020 - May 2021

SELECT PROJECTS

Personal Writing

- *Learning to Learn with JAX* Apr. 2022
- *Performers: The Kernel Trick, Fourier Features, and Attention* Dec. 2020
- *Deep Learning for Guitar Effect Emulation* May. 2020
- *NLP from Scratch: Annotated Attention* Feb. 2020

Software

- torchsort. *700+ stars.* PyTorch library implementing the *Fast Differentiable Sorting and Ranking* algorithm, optimized with custom C++ and CUDA extensions.
- torchmetrics. *1.6k+ stars.* Machine learning metrics for distributed and scalable PyTorch applications.

*Equal contribution