

# TEDDY KOKER

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[teddykoker.com](http://teddykoker.com) ♦ [github.com/teddykoker](https://github.com/teddykoker)

## EDUCATION

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### Massachusetts Institute of Technology

Sep. 2024 - Present

Ph.D. in Electrical Engineering and Computer Science

Advised by Prof. Tess Smidt

### Worcester Polytechnic Institute

Sep. 2016 - Dec. 2019

B.S. in Computer Science with Distinction

## RESEARCH EXPERIENCE

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### Massachusetts Institute of Technology, Lincoln Laboratory

Apr. 2021 - Aug. 2024

*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 the Zitnik Lab at Harvard Medical School ([Raincoat](#), [TimeX](#)).

### 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 with 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](#)).

## PUBLICATIONS

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- **T. Koker**, K. Quigley, E. Taw, K. Tibbetts, L. Li. *Higher-Order Equivariant Neural Networks for Charge Density Prediction in Materials*. npj Computational Materials, 2024. Also at NeurIPS AI4Science Workshop, 2023.
- S. Gao, **T. Koker**, O. Queen, T. Hartvigsen, T. Tsiligkaridis, M. Zitnik. *UniTS: Building a Unified Time Series Model*. NeurIPS, 2024.
- O. Queen, T. Hartvigsen, **T. Koker**, H. He, T. Tsiligkaridis, M. Zitnik. *Encoding Time-Series Explanations through Self-Supervised Model Behavior Consistency*. NeurIPS, 2023.<sup>†</sup>
- H. He, O. Queen, **T. Koker**, C. Cuevas, T. Tsiligkaridis, M. Zitnik. *Domain Adaptation for Time Series Under Feature and Label Shifts*. International Conference on Machine Learning (ICML), 2023.
- **T. Koker**, K. Quigley, W. Spaeth, N. C. Frey, L. Li. *Graph Contrastive Learning for Materials*. NeurIPS AI for Accelerated Materials Design Workshop, 2022.

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<sup>†</sup>Spotlight award, top 3% of submissions

- N. S. Detlefsen, J. Borovec, J. Schock, A. H. Jha, **T. Koker**, L. D. Liello, D. Stancl, C. Quan, M. Grechkin, W. Falcon. *TorchMetrics - Measuring Reproducibility in PyTorch*. The Journal of Open Source Software (JOSS), 2022.
- W. Falcon, A. H. Jha, **T. Koker**, K. Cho. *AASAE: Augmentation-Augmented Stochastic Autoencoders*. arXiv, 2021.
- **T. Koker**, F. Mireshghallah, T. Titcombe, G. Kaissis. *U-Noise: Learnable Noise Masks for Interpretable Image Segmentation*. International Conference on Image Processing (ICIP), 2021.
- **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.
- **T. Koker**, D. Koutmos. *Cryptocurrency Trading Using Machine Learning*. Journal of Risk and Financial Management, 2020.

## HONORS & AWARDS

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### MIT

- Robert J. Shillman (1974) Fund Fellowship, 2024.

### 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

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### Talks

- Speaker, Graph Exploitation Symposium at MIT Jul. 2024
- Poster presenter, Gordon Research Conference on Computational Materials Science Jul. 2024
- 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

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### 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

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\*Equal contribution

## 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.