Daniel Miao

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Education

University of Minnesota Twin Cities, PhD. in Applied Mathematics   *Expected: May 2027*
M.S. in Applied Mathematics (Dec 2024).
B.S. in Mathematics, B.S. in Computer Science (*Summa Cum Laude*, May 2022)

Relevant Coursework: Computer Vision, Machine Learning, Deep Learning, Generative Modeling
and Foundation Models, Optimization, Database, Manifold Learning, Nonstationary Time Series

Work Experience

Graduate Data Science Intern, 3M – Maplewood, MN   Summer 2022

- Built a CNN-based classification pipeline integrated with 3D printed devices, achieving 97 % accuracy on internal datasets. Deployed a Dash web app for visualization, enabling broad use in the company.
- Automated data transfer pipeline in Python between internal storage systems, significantly reducing manual processing.
- Validated code and translated Matlab Code and Python Code for a trade secret model. Developed an image processing algorithm for a trade secret using OpenCV.
- Contributed to 3 invention submissions (patent pipeline).

Teaching/Research Assistant, University of Minnesota Twin Cities   Sept 2020 – Present

Projects

Watermarking in Diffusion Models   Fall 2024

- Investigated and combined multiple watermarking techniques to improve robustness of watermarks against common attacks, achieving measurable improvement. This was part of a course project.

3D Reconstruction with Trifocal Tensors   May 2023 - Present

- Developed the first global synchronization algorithm for trifocal tensors. Developed rigorous theoretical constraints and an algorithmic optimization framework. Significantly improved camera location estimation compared to prior global synchronization methods. Published in NeurIPS 24'.

Sparse Regression for Best Subset of Spectral Bands   Aug 2021 - May 2022

- Applied sparse regression techniques to select optimal spectral bands for agricultural usage with a new modeling technique of spectral bands and regressor pool construction. Validated industrial standards obtained through experiments through a mathematical framework, and produced publishable results. This was part of my undergraduate honors thesis.

Skills

Programming Languages: Matlab (Advanced), Python (Proficient), C, Java, R, Julia, SQL, OCaml, Linux
Frameworks: Pytorch, OpenCV, HuggingFace, Keras, Sk-learn, pandas, numpy, colmap, theia, DUSt3R

Publications and Patents

1. **Miao, D.**, Lerman, G., & Kileel, J. (2024) Tensor-Based Synchronization and the Low-Rankness of the Block Trifocal Tensor. *Advances in Neural Information Processing 2024*.

2. "Trifocal Block Tensor-Based Synchronization in Computer Vision and Sensor Systems", G. Lerman, J. Kileel, **D. Miao**. *USA Provisional Patent*, Appl. No.: 63/694,595. Application date: September 13, 2024

3. Sang, S., Xu, C., Fan, J., **Miao, D.**, Side, C., & Wang, Z. (2023). Accurate Prediction of Microstructure of Composites using Machine Learning. *Advanced Theory and Simulations*, 6(2), 2200674.

4. Sang, S., Xu, C., Wang, Z., Side, C., Fowler, B., Fan, J., & **Miao, D**. (2023). Accurate prediction of topology of composite plates via machine learning and propagation of elastic waves. *Composites Communications*, 37, 101465.

Summary

PhD student in Applied Math with strong background in computer vision, ML, and optimization. Published at NeurIPS, filed US patent, and completed an impactful data science internship at 3M. Seeking research-focused DS/ML/AI/CV internships at top technology companies.