ZALAN FABIAN, PHD CANDIDATE

University of Southern California, Ming Hsieh Dept. of Electrical and Computer Engineering, Los Angeles, CA
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RESEARCH INTERESTS

- Artificial intelligence for the basic sciences - MRI, computational imaging and microscopy
- Inverse problems in computer vision, diffusion models for image reconstruction
- Adaptation of (multimodal) foundation models for scientific applications
- Data-efficient training of deep learning models, data augmentation

ACTIVE PROJECTS

- **Deep learning for the sciences:** designing novel techniques to tackle challenges arising in deep learning for scientific applications, including data scarcity, noise and compute efficiency; particular focus on vision problems in the sciences and emerging MRI technologies
- **Zero-shot classification in AI conservation:** leveraging powerful vision-language foundation models for wildlife image analysis without domain-specific training data; focus on robustness, reliability and interpretability of predictions

RESEARCH EXPERIENCE

Microsoft **AI for Good Lab**

Research Intern *May 2023 to August 2023*

- Mentor: Zhongqi Miao,
- Developed a novel zero-shot algorithm for wildlife classification in camera trap images
- Implemented a novel technique for instruction tuning data generation using GPT-4
- Adapted vision-language foundation models to the application domain

IPAM (UCLA) **Computational Microscopy Long Program**

Visiting Graduate Researcher *September 2022 to December 2022*

- Focus on developing deep learning techniques for inverse problems arising in computational microscopy

Amazon **Alexa Perceptual Technologies**

Applied Scientist Intern *May 2022 to August 2022*

- Mentor: Rajath Kumar,
- Designed and implemented novel data augmentation techniques for speech spectrograms
- Implemented and tested semi-supervised learning techniques for wake word verification models

University of Southern California **Department of Electrical and Computer Engineering**

Research Assistant *Jan 2018 to present*

- Advisor: Mahdi Soltanolkotabi
- Research assistant at USC AI Foundations for the Sciences Center
- Focusing on applications for the basic sciences and medical imaging

University of New Hampshire **Department of Electrical and Computer Engineering**

Research Assistant *Aug 2015 to May 2017*

- Advisor: Se Young Yoon
- Research assistant at UNH Robotics Lab
- Projects on intelligent robotic swarm control both in theory and practice

EDUCATION

- **PhD, Electrical Engineering**, University of Southern California, 2017 - present
  - Advised by Mahdi Soltanolkotabi;
  - Focus: machine learning, deep learning, optimization, medical imaging

- **MSc, Electrical Engineering**, University of New Hampshire, 2017
  - Advisor: Se Young Yoon
  - Focus: non-linear and robust control, multi-agent robotic systems
- **BSc, Electrical Engineering**, Budapest University of Technology, 2014
  - Focus: signals and systems, control theory
- **BSc** (double degree program), **Engineering**, Kyungpook National University, 2014
  - Focus: computer vision, intelligent systems and data mining

AWARDS AND DISTINCTIONS

- Ming Hsieh Institute PhD Scholar 2021-2022
- Annenberg PhD Fellow, 2017-2021
- BSc degree *summa cum laude*, 2014
- Academic Scholarship recipient, 2010-2014

SELECTED PUBLICATIONS

Z. Fabian, B. Tınaz, and M. Soltanolkotabi, *DiracDiffusion: Denoising and Incremental Reconstruction with Assured Data-Consistency*, 2023, arXiv preprint arXiv:2303.14353

Z. Fabian, B. Tınaz, and M. Soltanolkotabi, *HUMUS-Net: Hybrid unrolled multi-scale network architecture for accelerated MRI reconstruction*, 2022, Neural Information Processing Systems

Z. Fabian, R. Heckel and M. Soltanolkotabi, *Data Augmentation for Deep Learning Based Accelerated MRI Reconstruction with Limited Data*, 2021, International Conference on Machine Learning

Z. Fabian, J. Haldar, R. Leahy and M. Soltanolkotabi, *3D Phase Retrieval at Nano-Scale via Accelerated Wirtinger Flow*, 2020, European Signal Processing Conference

Y. Niu, **Z. Fabian**, S. Lee, M. Soltanolkotabi and S. Avestimehr, *mL-BFGS: A Momentum-based L-BFGS for Distributed Large-scale Neural Network Optimization*, 2023, Transactions on Machine Learning Research

S. M. M. Kalan, **Z. Fabian**, A. S. Avestimehr and M. Soltanolkotabi, *Minimax Lower Bounds for Transfer Learning with Linear and One-hidden Layer Neural Networks*, 2020, Neural Information Processing Systems

S. Oymak, **Z. Fabian**, M. Li and M. Soltanolkotabi, *Generalization Guarantees for Neural Networks via Harnessing the Low-Rank Structure of the Jacobian*, 2019, arXiv preprint arXiv:1906.05392

TEACHING AND MENTORING EXPERIENCE

University of Southern California — **Department of Electrical and Computer Engineering**
Teaching Assistant — *Fall 2019*
- Optimization for the Information and Data Sciences

University of Southern California — **Viterbi School of Engineering**
Graduate Mentor — *Fall 2019 - Fall 2022*
- Supporting and advising incoming engineering graduate students

University of New Hampshire — **Department of Electrical and Computer Engineering**
Teaching Assistant — *Fall 2016 - Spring 2017*
- Computer Organizations

CONFERENCE REVIEW

- International Conference on Machine Learning (ICML 2021, 2022 - Outstanding Reviewer)
- International Conference on Learning Representations (ICLR 2020, 2021, 2022, 2023)
- Neural Information Processing Systems (NeurIPS 2020, 2021, 2022, 2023)
- Transactions on Machine Learning Research (starting from 2023)
- IEEE Conference on Decision and Control (CDC 2016, 2017)

OTHER SKILLS

Software Python, Pytorch, Tensorflow, Matlab, C/C++, LaTeX

Languages English: fluent. Hungarian: native. German: basic.