Joseph Shenouda

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Research Interests

Signal Processing, Machine Learning, Deep Learning, Network Science

Education

University of Wisconsin-Madison 2021-2026
Ph.D. Electrical and Computer Engineering (In Progress)
Advisors: Kangwook Lee & Robert D. Nowak

Rutgers University 2017-2021
B.S. Electrical and Computer Engineering
Summa Cum Laude

Publications

- **Joseph Shenouda**, and Waheed U. Bajwa. *"A Guide to Reproducible Research in Signal Processing and Machine Learning."* IEEE Signal Processing Magazine (2022).
- Liu Yang, Jifan Zhang, **Joseph Shenouda**, Dimitris Papailiopoulos, Kangwook Lee, Robert Nowak. *"A Better Way to Decay: Proximal Gradient Training Algorithms for Weight Decay"* NeurIps OPT-ML Workshop (2022)

Research Experience

Proximal Point Algorithms for Training Neural Networks with Weight Decay

- Developed computational experiments implementing a novel proximal point algorithm to accelerate weight decay regularization in neural network training.
- Provided empirical and theoretical evidence that our approach can learn neural networks that are more robust than those trained with standard weight decay. (Tools: PyTorch)

Industry Experience

MIT Lincoln Laboratory: Summer Research Intern **Summer 2021**

- Compared graphical and deep learning methods for segmenting RF spectrograms.
- Developed and implemented modified spectral clustering algorithms on both synthetic and real RF spectrograms.
- Presented our algorithm to technical staff highlighting its advantages to the deep learning method.

Undergraduate Research Assistant (INSPIRE Lab) **Fall 2020-Spring 2021**

- Senior thesis investigating hypergraph signal processing advised by Prof. Waheed Bajwa.

Los Alamos National Laboratory: Electrical Engineer Intern **Summer 2020**

- Research and development of digital signal processing algorithms for X-Ray radiation detection in space, to replace current analog approaches.
- Optimized simulation scripts to decrease simulation time by 75%
- Conducted analysis to determine the best parameters for our filter to accurately measure the energy levels of the signals coming into the detector.

Undergraduate Research Assistant (INSPIRE Lab) **Fall 2019-Spring 2020**

- Researched reproducibility of computational experiments in signal processing and machine learning under Prof. Waheed Bajwa.
- Read through recent publications of the lab to reproduce results of computational experiments; codebases can be found at `https://github.com/INSPIRE-Lab-US`.
- Created a set of standards and best practices for the lab to ensure that all computational experiments are readily reproducible by other researchers at the time of publication.

Lockheed Martin: Software Engineering Intern **Summer 2019**

- Successfully implemented a new messaging interface in C++ for radar simulation software.
- Independently worked to incorporate this new protocol into an existing system while learning about new technologies such as C++, gdb and network programming.

Relevant Coursework

- High Dimensional Statistics
- Detection and Estimation Theory
- Stochastic Signals and Systems
- Convex Optimization
- Error Control Coding
- Linear Algebra
- Analysis
- Mathematical Methods of Machine Learning
- Theoretical Foundations of Large Scale Machine Learning
- Non-linear Optimization

Service

- Organizer for Signal and Information Processing (SIP) Seminar at Rutgers University.
- Reviewer: Asilomar Conference 2021
- Organizer for Systems Information Learning Optimization (SILO) Seminar at University of Wisconsin-Madison
- Led reading group on High Dimensional Statistics Summer 2022

Awards and Memberships

ECE 2021 Wisconsin Distinguished Graduate Fellowship-Richardson
JJ Slade Scholar
Tau Beta Pi
Recipient of the Kuhl Memorial Engineering Scholarship