ZAKARIA PATEL

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GitHub: https://github.com/ZakariaPZ

EXPERIENCE

Machine Learning Researcher · Perimeter Institute Quantum Intelligence Lab · Waterloo, ON
Sep 2020 – May 2022

- Implemented a novel unsupervised machine learning method using Siamese neural networks to discover phase transitions in condensed matter systems
- Achieved accuracies over ~95% in estimating phase boundaries of Ising systems
- Reproduced the phase diagram of the well-studied Rydberg atom array in a fully unsupervised manner, with results highly consistent with prior research

Data Scientist · TRIUMF · Vancouver, BC
May 2021 – Aug 2021

- Applied machine learning based particle-type classification with the goal of reducing backgrounds in neutrino oscillation measurements
- Improved a ResNet-based Convolutional Neural Network for classification by analyzing performance and implementing new data transformations to help training and generalization
- Achieved a 5% improvement in the particularly challenging electron vs. gamma discrimination task, with reduced dependence of performance on the particle direction
- Documented and presented research results to a panel of over 15 researchers

Software Developer · AI Endurance · Hamilton, ON
May 2020 – Aug 2020

- Created production-level integration with Garmin API, allowing user's binary activity files to be parsed into the appropriate back-end data structure
- Developed a custom RNN and neural network training strategy to find an optimized training plan for a user after their custom machine learning model is trained. This RNN Training Plan optimization went into production.
- Improved convergence (finding an ideal plan for a user) from 60% to 95% and reduced cloud CPU usage by ~50% using the new custom RNN optimization method

PROJECTS

ADMM Deconvolution with Diffusion Prior · Computational Imaging

- Enhanced image reconstruction quality using a pretrained diffusion model as a denoising prior

Empirical Study on Image Clustering Pipelines · Introduction to Machine Learning

- Studied the performance differences in representation learning-based clustering and PCA-based clustering

PUBLICATIONS

Perimeter Institute Quantum Intelligence Lab
Patel, Z., Merali, E., & Wetzel, S. J. (2022). Unsupervised learning of Rydberg atom array phase diagram with Siamese neural networks. New Journal of Physics, 24 (11), 113021. https://doi.org/10.1088/1367-2630/ac9c7a

AI Endurance
Patel, Z., & Rummel, M. (2021). Extremal Learning: Extremizing the output of a neural network in regression problems. https://doi.org/10.48550/ARXIV.2102.03626

EDUCATION

MSc in Applied Computing (MScAC)
University of Toronto
Sep 2022 – Present
Courses:

- Computational Imaging
- Introduction to ML
- Natural Language Computing (ongoing)
- Introduction to Neural Networks and Deep Learning (ongoing)

BEng in Engineering Physics
McMaster University
Sep 2017 – May 2022

- cGPA: 11.7/12.0 (A+)

AWARDS

Vector Institute

- Vector Scholar in AI (2022)

McMaster University

- P. Tan Academic Grant (2021)
- Leo Seto Scholarship (2021)
- Provost Honour Roll (2020)
- President's Award (2017)

SKILLS

- **Languages:** Python, MATLAB, Maple, experience with JavaScript
- **Tools/Libraries:** NumPy, Pandas, Keras, PyTorch, Scikit-Learn, Git, experience with ReactJS

TEACHING

- Introduction to Quantum mechanics (McMaster University)
- Introduction to Computer Science (University of Toronto)