Abrar Zahin

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Personal Summary

I have five years of application-driven research experience in developing machine learning algorithms for networked systems. I am skilled in clustering, classification, fault detection, and the structure recovery of such systems, using various deep learning algorithms and probabilistic modeling. I am also well-versed in (statistically) analyzing existing algorithms to enhance their performance with theoretical guarantees. I am eager to continue utilizing and developing different data mining algorithms to solve real-world industry problems.

Technical Skills

Languages: Python, R, C, C++, MATLAB, SQL, Assembly
Data Analytics Package: TensorFlow, Keras, Scikit-learn, Numpy
Research Expertise: Recommender Systems, Large Language Models (LLM), Graph Machine Learning, Image Processing, Generative AI, Reinforcement Learning with Human Feedback, Statistical Modeling, Multi-armed Bandits, and Deep Learning

Education

Arizona State University (ASU): PhD in Electrical Engineering | CGPA: 3.81/4.00 — Jan 2020 – Current
Utah State University (USU): MSc in Electrical Engineering | CGPA: 3.79/4.00 — Aug 2017 – Dec 2019

Notable Research Projects

Robust Model Selection of Gaussian Graphical Models | *ASU*

- **Developed** a **new** algorithm for probabilistic graphical models, transcending the conventional limits. Our algorithm **extends beyond** the recovery of **tree structures** under **the presence of noise**
- **Implemented** our algorithm on both simulated graphs and **real-world networks**
- **Outcome: Abrar Zahin**, Rajasekhar Anguluri, Oliver Kosut, Lalitha Sankar, Gautam Dasarathy,"*Robust Model Selection of Gaussian Graphical Models*" Submitted to Journal of Machine Learning Research (JMLR)

Rapid Change Localization in Gaussian Graphical Models | *ASU*

- **Developed** a **novel** algorithm for rapid change localization in a probabilistic graphical models
- **Computationally efficient** and performs change localization with **provably low latency**
- Localize changes at least **20% faster** than the traditional algorithms
- **Abrar Zahin**, Wezhi Li, Gautam Dasarathy, "*Rapid Change Localization in Dynamic Graphical Models*". IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2024

Computationally Efficient Active Learning of Gaussian Graphical Models | *ASU*

- **Developed** a **novel** computationally efficient algorithm for probabilistic graphical models
- Offers a significant **computational boost**: **exponential reduction** in **runtime complexity** from the existing methods
- **Abrar Zahin**, Gautam Dasarathy "*Computationally Efficient Active Learning of Gaussian Graphical Models*" Submitted to Asilomar Conference on Signals, Systems, and Computers, 2024

Semi-supervised Learning of Fall Down Action | *USU*

- **Developed** a semi-supervised classifier with **Variational Autoencoder (VAE)** and **Convolutional Neural Network (CNN)**.
- **Our classifier** is at least **5% more accurate** in **classifying different fall down actions** from a real-world data set.
- **Abrar Zahin**, Le Thanh Tan, and Rose Qingyang Hu, "*Sensor-based human activity recognition for smart healthcare: A semi-supervised machine learning*", in international conference on artificial intelligence for communications and networks, pp. 450-472. Springer, Cham, 2019.

Efficient Smart Health Monitoring of Large-scale Networks | *USU*

- **Developed** a **novel** algorithm for smart healthcare monitoring, primarily using **Convolutional Autoencoder** and **CNN**
- **Our algorithm** is at least **27% faster** than the current **state-of-the-art framework.**
- **Abrar Zahin**, Le Thanh Tan, and Rose Qingyang Hu, "*A Machine Learning Based Framework for the Smart Healthcare System*", 2021 in Intermountain Engineering, Technology and Computing (IETC)

Notable Projects from Coursework

- Implemented **Recurrent Neural Network (RNN)** and **Long Short Term Memory (LSTM)** for Electric Vehicle charging demand prediction
- Implemented **CNN** for Human Action Recognition and Handwritten Digit Recognition
- Implemented **VAE** and **Denoising Convoulutional Autonencoder** for reconstructing and denoising images, respectively.
- Implemented **Generative Adversarial Networks** for reconstructing images
- Implemented **Support Vector Machine** for image classification
- Created Named Entity Recognition, Email Spam Detection, and Text Summarization tool with **pre-trained LLM**
- Implemented Q**-learning** for *Monte-Carlo Blackjack* Problem
- Implemented the tabular Q**-learning** algorithm for three standard control problems: mountain car, cart pole, and acrobat
- A technical report exploring the computational statistical tradeoffs in structure learning of graphical models
- A technical report on the information-theoretic approach towards understanding the utility-privacy tradeoffs in databases