ABRAR ZAHIN

1123 East Apache Boulevard, Apt-306 ⋄ Tempe, Arizona 85281
(435) − 764 − 1745 ⋄ azahin@asu.edu

EDUCATION

Arizona State University Sring 2020 -Current
PhD, Electrical, Computer & Energy Engineering, Current CGPA: 3.81/4.00
Advisor: **Prof. Gautam Dasarathy**
Research interests: Probabilistic graphical models, Multi-armed bandits

Utah State University November 2019
Masters of Science, Electrical & Computer Engineering, CGPA: 3.79/4.00
Advisor: **Prof. Rose Qingyang Hu**
Research interests: Deep Learning for Smart Healthcare

Islamic University of Technology November 2014
Bachelor of Science, Electrical & Electronic Engineering, CGPA: 3.25/4.00
Research interests: Delay Tolerant Networking

TECHNICAL SKILLS

Programming Language: Python, C, MATLAB.
Deep Learning Framework: TensorFlow, Keras.

SELECTED RESEARCH PROJECTS

Robust Model Selection of Non Tree-Structured Gaussian Graphical Models
Outcome: ArXiv Preprint.
We consider the problem of learning the structure of a Gaussian graphical model when the observations are corrupted by independent but non-identically distributed noise. In this work, we devised a novel algorithm that can provably handle a more general family of graphs when the generated samples are corrupted by additive noise. The algorithmic techniques introduced here could be of general interest, especially to model selection in latent variable models.

Online Edge Tracking in Gaussian Graphical Models
Outcome: In preparation for submitting to a top-tier machine learning conference. ***Matlab was used.***
We consider the problem of edge change tracking in power system graphical models. Current structure learning problem in power system graphical models is focused almost exclusively on stable environments in which the underlying generative process does not change. However, in real-world power system environments, such changes often occur without warning or signal. In this work, we devised a novel algorithm which can not only learn the underlying structure, but also can track any sudden changes in the network.

Big Data Management for Secured Smart Healthcare
Outcomes: Two accepted Papers. ***Matlab and Python were used.***
In our first paper, we developed a semi-supervised classifier for time series human actions using convolutional variational autoencoder. The proposed classifier can be implemented in various wearable user modules to detect a fall event promptly and notify a caregiver.
In our second paper, we developed an energy-efficient framework for detecting *fall actions* from surveillance videos by leveraging the concepts of *compressive video sensing* and *denoising autoencoder*. The proposed framework can be adopted in any IoT-based smart healthcare monitoring.

Reinforcement Learning in Electric Vehicle Cost Optimization.
Outcome: Research report in coursework. ***Python was used.***
Given a fixed battery capacity in a charging station, predicted time-series load and real-time energy price, we determine an optimal battery configuration for the Electric Vehicle charging station to decide whether to sell electricity to customer or to buy electricity from grid for maximizing profit from charging station perspective.

Study on Vehicular Ad-hoc Delay Tolerant Networking for Infrastructure-Less Areas
Outcome: Undergraduate Thesis
We used vehicles as a node or router to pass data in a medium such as highways, where there is no fixed infrastructure. We used "NetLogo 5.0.3" software to measure the variation of throughput resulting from the velocity of the vehicle and their direction.

PUBLICATIONS

Accepted and Published:

1. **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.
2. **Abrar Zahin**, Le Thanh Tan, and Rose Qingyang Hu, "*A Machine Learning Based Framework for the Smart Healthcare System*", 2020 in Intermountain Engineering, Technology and Computing (IETC).

ArXiv Preprint:

1. **Abrar Zahin**, Rajasekhar Anguluri, Oliver Kosut, Lalitha Sankar, Gautam Dasarathy, "*Robust Model Selection of Non Tree-Structured Gaussian Graphical Models*". Link.

In Preparation:

1. **Abrar Zahin**, Gautam Dasarathy, "*Online Edge Tracking in Power System Graphical Models*".
2. **Abrar Zahin**, Gautam Dasarathy, "*Active Structure Learning of Non Tree-Structured Latent Gaussian Graphical Models*".

GRADUATE COURSEWORK

Random Signal Theory, Information Theory, Statistical Machine Learning, Mathematical Methods for Signals and Systems, Convex Optimization, Introduction to Computer Networking, Communication Systems I, Wireless & Mobile Networking, Advanced Wireless Communication, Reinforcement Learning.

NOTABLE PROJECT IMPLEMENTATION

- Implementing **Recurrent Neural Network (RNN)** for Electric Vehicle charging demand prediction and **Long Short Term Memory (LSTM)** for Electric Vehicle charging demand prediction.
- Classification of MNIST digit using **Neural Network**.
- Implement **Variational Autoencoder** for reconstructing MNIST datasets and **Convolutional Autoencoder** for Denoising MNIST images.
- Analyzed performance variations of wireless transmission on fading channels.
- **Markov Chain** to model channel condition and evaluated the performance of different ARQ protocols.
- **Phase Recovery System** and **Timing Recovery System** for baseband QPSK.
- **TCP transmission mechanism** and **server application** according to standard Linux socket.