Mohammad Nikbakht

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Education

Georgia Institute of Technology | Atlanta, GA   *August 2019 – Present*
PhD in Electrical & Computer Engineering (Major), Business (Minor), GPA 4.0

Georgia Institute of Technology | Atlanta, GA   *August 2019 – Spring 2022*
M.S. in Electrical & Computer Engineering, GPA 4.0

University of Tehran | Tehran, Iran   *August 2015 – August 2019*
Bachelor of Science in Electrical & Computer Engineering, GPA 3.97

Skills

Programming: Python, MATLAB, C, C++, C#, React JS
Software: Deep Learning, PyTorch, TensorFlow, Keras, PySpark, Flask, Transformer Neural Network, Statistical Machine Learning, Natural Language Processing (NLP), Jupyter, AWS SageMaker Studio, Google Colab, Google Cloud, Hugging Face, NumPy, Pandas, Scikit-learn, Matlab, Simulink, PyCharm, Visual Studio, Linux, Git
Hardware: STM32 ARM Cortex-M4 MCUs, Nordic nRF SoC (BLE), Raspberry Pi, Arduino, PCB design (Altium + Eagle), Embedded System Design, Altium Designer, Autodesk Eagle.
Business: Market research, Customer discovery, Problem solving, Business plan design, Disciplined entrepreneurship

Industry Experiences and Projects

Sequence Modeling Tools for Customer Experience Analysis to Boost Business Intelligence   *Fall 2023*
Cisco | San Jose, CA

- As a data scientist PhD intern, I will be conducting research and analyzing product and marketing data from Cisco ET&I and develop machine learning models for predicting customer's likelihood to purchase products.

Transformer Model for EHR Clinical Text Classification for SDoH Categories (NLP)   *Summer 2022*
OMNY Health | Atlanta, GA

- Performed feasibility analyses on the OMNY Health data platform (N=540k patients) and implemented and validated an NLP product for SDoH labeling of clinical notes for feature expansion of the OMNY Health data platform.
- Performed domain adaptation of BERT, and RoBERTa masked language model on clinical notes from the OMNY Health data platform and fine-tuned it for a multilabel SDoH classification downstream task (Hugging Face and PyTorch).
- Published an abstract in ISPOR 2022 and submitted a journal paper to JMIR (under review).

Deep Learning Model for Activity Classification Using Domestic Sounds   *Summer 2021*
SensorsCall | Atlanta, GA

- Implemented and validated a CNN model for activity detection based on domestic sound classification using TensorFlow. Deployed the model to an IoT device using TensorFlow Lite for processing on the edge, which is currently used by individuals or caregivers for activity detection and monitoring the well-being of seniors living independently.

Research Experiences and Projects

Generative Pretraining for Cardiovascular Signals (Adapting GPT-II)   *Spring 2023-present*
Inan Research Lab | Georgia Tech, Atlanta, GA

- Developing a deep learning model based on the GPT-II architecture to generate the future cardiac beats based on the previous beats, enabling early detection of abnormalities resulting in risk prediction and guided interventions.

Deep Learning Models for Cardio-mechanical Signal Denoising Without Clean Labels   *Spring 2023-present*
Inan Research Lab | Georgia Tech, Atlanta, GA

- Designed a deep learning model based on the Noise2Noise U-Net architecture to reduce the effect of environmental noise on Seismocardiogram signals without having access to the clean ground truth to enable more robust vital sign monitoring during activities and in presence of motion noise.
- Submitting manuscripts to the journal of the American Medical Informatics Association (JAMIA), and the BSN conference.

Deep Learning Models for Pulmonary Blood Flow Sound Classification Tasks   *Spring 2022-Fall 2022*
Inan Research Lab and Children's Healthcare of Atlanta | Georgia Tech, Atlanta, GA
• Designed a CNN-LSTM model to classify heart shunt types (BTTS, DAS, Sano, and Central) from pulmonary blood flow sounds recorded from ductal dependent infants at Children's Hospital of Atlanta (CHOA).
• Implemented a variational autoencoder (VAE) to distinguish at-risk from healthy ductal dependent infants as well as other clinical tasks based on the pulmonary blood flow sounds.

Synthetic Seismocardiogram Generation Using a Transformer-Based Neural Network   *Fall 2021-Spring 2022*
Inan Research Lab | Georgia Tech, Atlanta, GA
• Adapted the "text to speech (TTS)" transformer architecture to design and train a transformer-based neural network to generate synthetic human-like SCG beats from clinically relevant SCG features for dataset augmentation and exploring methods to denoise SCG recordings.
• Published in journal of the American Medical Informatics Association (JAMIA), 2023.
• Filed a provisional patent application, in the process of filing the non-provisional application.

Deep Learning Model Comparison for Speech Emotion Recognition (SER)   *Fall 2021*
Course Project | Georgia Tech, Atlanta, GA
• Designed deep learning models for speech emotion recognition (SER) task using the RAVDESS dataset to explore and compare different architectures for SER. More details and source codes are available on GitHub.

Synthetic SCG/ECG Simulator for Cardiovascular Signal Simulation   *Summer 2021*
Inan Research Lab | Georgia Tech, Atlanta, GA
• Designed a simulator using Raspberry Pi and a Visaton EX 60 S actuator to generate realistic SCG, and ECG signals to work as a phantom to be used as a surrogate to human testing in dangerous environments.
• Published in the Sensors 2022 conference proceeding.

A Multi-node Wireless Wearable Platform for Cardiovascular Health Monitoring (SeismoNet)   *Fall 2020-Spring 2021*
Inan Research Lab | Georgia Tech, Atlanta, GA
• Designed a wireless wearable platform consisting of multiple time-synced wireless nodes supporting Bluetooth Low Energy (BLE) using nRF52840 chips integrated with ECG and SCG sensors enabling cardiovascular signal recordings from multiple points of the human body featuring real-time data transfer with GUIs for signal visualization and processing.

Personal Projects

Georgia Tech BOLD Fellowship 2022   *Spring 2022*
• Developed a summarized and categorized resource for new learners wanting to learn deep learning. Contains 6 Google Colab notebooks with hands-on examples. Available at https://mohnikbakht.github.io/deeplearningexpress.github.io/.

Relevant Coursework

Artificial Intelligence, Statistical Machine Learning, Biomedical Sensing Systems, Innovation Analysis, Innovation & Business Model Design, Computer Networks, Analog Integrated System Design, Interface IC Design

Publications

[1] Nikbakht, M., Gazi, A. H., Zia, J., An, S., Lin, D. J., Inan, O. T., & Kamaleswaran, R. (2023). Synthetic seismocardiogram generation using a transformer-based neural network. Journal of the American Medical Informatics Association, ocad067.
[2] Nikbakht, M., Kumar, V., Gazi, A. H., & Rasouliyan, L., Extracting Social Determinants of Health from Unstructured Clinical Notes Using Transformer Based Natural Language Processing Models, under review at JMIR.
[3] Nikbakht, M., Lin, D. J., & Inan, O. T. Learning Seismocardiogram Beat Denoising Without Clean Data. Submitted to 2023 IEEE BSN
[4] Nikbakht, M., Sanchez-Perez, J. A., Aljiffry, A., Maher, K., Inan, O. T., & Rodriguez, S., Application of Acoustic Signals in Systemic to Pulmonary Shunts in Ductal Dependent Infants using Deep Learning. Under review at IEEE JBHI
[5] Nikbakht, M., Lin, D. J., Gazi, A. H., & Inan, O. T. (2022, October). A Synthetic Seismocardiogram and Electrocardiogram Generator Phantom. In 2022 IEEE Sensors