Aref Afzali

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Education

Concordia University **Sep 2024 - Now**
Master of Science in Computer Science
Supervisor: Prof. Hovhannes Harutyunyan

University of Tehran **Sep 2017 - Jul 2022**
Bachelor of Science in Engineering Science (Software Engineering Branch) (GPA: 16.20/20)
B.Sc. Thesis on an Application of Basket Analysis Using Data Mining Approaches
Minors: Computer Science *Sep 2019 - Jul 2022*

Publications

- Afzali A., Bashizade M., Akbarein H. (2023). **The Application of Spiking Neural Network in Schizophrenia.** *1st International Congress of Artificial Intelligence in Medical Sciences (AIMS 2023)*. (A Poster Presentation)
- Shayegh B., Afzali A., MohammadHashemi S., MohammadTaheri K., Mohammadi S. (2021). **Discrete Mathematics: An Introduction with an Academic Approach.** *GitHub (to be accessible to the public)* (A Book)

Experience

RomaParvaz Travel Agency **Mar 2022 – Mar 2023**
Software Team Lead

- Managing a team to implement a software application from designing to deploying for selling airplane tickets in Scrum methodology.
- We used Microservice architecture, NestJS for backend, React for frontend, and PostgreSQL, MongoDB, and Redis for its database.
- Connected to different GDSs such as Amadeus, Gabriel, TravelPort, and others.

Carriot Company **Jul 2020 – Apr 2021**
Data Specialist

- Vehicle Routing Problem (VRP) API using Metaheuristic approaches by Google ORTools library and self-implemented algorithms
  - Features: Pickup and Delivery, with Time Windows, Open Depots, and Multi-Depot
- Address Geocoding API Based on Sent2Vec Model with clustering for Persian Addresses
- Geographic Heat Map
- Acceleration Axis Calibration
- Car Stop Type Detection According to their speed, acceleration, and geographical coordinates data

Teaching

Concordia University **Sep 2024 – Now**

Combinatorics
- Tutor and Marker, *Instructor: Prof. Hovhannes Harutyunyan*

Introduction to Theoretical Computer Science
- Tutor and Marker, *Instructor: Assis. Prof. Denis Pankratov*

Salam High School **Sep 2023 – Mar 2024**

CPP Programming
- Lecturer and tutor

University of Tehran **Feb 2019 – Feb 2022**

Engineering Probability and Statistics
- Chief TA, *Instructor: Assis. Prof. Behnam Bahrak*

Introduction to Computer and Programming
- Tutor and Marker, *Instructor: Assis. Prof. Ali Kamandi*

Numerical Computation
- Tutor and Marker, *Instructor: Assis. Prof. Ali Fahim*

Introduction to Computer and Programming

- Tutor and Marker, *Instructor: Assoc. Prof. Manouchehr MoradiSabzevar*

Digital Logic Circuits

- Tutor, *Instructor: Dr. Noushin Karimian*

Projects

Complex Networks

- Implemented MGCLTransformer for Multimedia-based Recommendation Systems
  - Combined Graph Transformers with Multimodal Graph Contrastive Learning (MGCL) to process user-item interactions and multimodal content (image and title of items)
  - Achieved 21.4% improvement in Hit Ratio and 44.1% in NDCG over baseline models
  - Used PyTorch, PyTorch Geometric, SentenceTransformer, and ResNet-50 for implementation
- Centrality in graphs on multiple datasets
  - Eigenvector Centrality, Betweenness Centrality, and others
- Community Detection on multiple datasets
  - Using clustering algorithms like Spectral Clustering and K-Means
  - Dimensionality Reduction with PCA and Laplacian Eigenmaps
- Fuzzy Community Detection using C-means and NMF algorithms
- Using Graph Convolutional Neural Networks in Image Classification

Business Intelligence

- Basket Recommender Application (B.Sc. Thesis)
  - Supervisor: Assis. Prof. Ali Fahim
  - This application recommends products and customers to sell based on their previous purchases using Association Rules algorithms
  - The technologies used are Flask-Restful for backend, VueJS for frontend, and PostgreSQL for its database
  - Achieving the Second rank among Bachelor thesis chosen by the faculty

Computational Neuroscience

- Literature Review of Neural Network Models of Schizophrenia
  - Supervisor: Assoc. Prof. Mohammad Ganjtabesh
  - Reviewed symptoms, modeling approaches, and all neural network modeling papers up to 2020 for my Computational Neuroscience Course's lecture
- Deep Learning Models of ADHD
  - Reviewed some deep learning models for ADHD for the project in Cognitive Neuroscience Competition (2019)
- Implementation of Spiking Neural Network Framework
  - Neuron Models: LIF, ELIF, AELIF
  - Connections: Fully Connect, Random Connect
  - Weigh Initial Distribution: Uniform, Normal
  - Encoding: Time-to-First-Spike Encoding, Positional Encoding, Poisson Encoding
  - Learning Rules: Unsupervised Learning (STDP, Flat-STDP), Reinforcement Learning (RSTDP)
- Image Classification using Deep Spiking Neural Network in the NengoDL framework
  - Using the MNIST Dataset

Machine Learning & Artificial Intelligence

- Working on Music Genre Classification on Neuromatch Academy (2022)
- Implementation a CNN model with CUDA in float16 instead of float32 on MNIST Dataset
- Image Classification with Deep Neural Network using PyTorch on the Fashion-MNIST dataset
- Text Processing in News Classification using Bayesian Networks
- Replacement Decoding using Genetic Algorithm
- Classification Task using various Machine Learning algorithms with SciKit-Learn Library

Skills

Data Manip. Python (Pandas, Numpy, Pytorch, Networkx, Matplotlib, Statistics, Folium, ...), R, Matlab
DBMS PostgreSQL, MySQL, MongoDB
Version Control Git, DVC
Parallel Prog. POSIX, OpenMP, CUDA
Back-end Dev. C++, NestJS, Java, Django
Others LaTex, Verilog

Familiar with (used in at least one project):
scripting Shell
Big Data Spark, Hadoop
DBMS Neo4j, Elasticsearch, Casandra
Func. Prog. Scala
CI/C Docker, Kubernetes
Game Designing C#, Unity
Front-end Dev. HTML, CSS, VueJS
Others Arduino, SEO, Go

Extracurricular Activities

- Participated in Neuromatch Academy Deep Learning.
- Participated in The 2nd and 3rd Cognitive Neuroscience Competition (Training and Research Phase)
- Participated in ANITI's Reinforcement Learning Virtual School
- Audited in Convolutional Neural Networks (CS231n Stanford Course)
- Member of the Scientific Student Association of Engineering Science Department
- Judged the Mechatronics Student Competition in Iran hosted by the University of Tehran
- Playing Guitar

Honors

- Participated in Neuromatch Academy Deep Learning.
- Ranked in the top 1% in the National Entrance Examination for Iranian universities; was granted full tuition fee waiver for B.Sc. studies.
- Achieving 2nd rank among Bachelor thesis chosen by the faculty
- Achieving rank five among the same entries in the program
- Acceptance of the first stage of the two national Mathematics and Computer Olympiads
- 3rd-dan black belt in Kyokushin Karate (Instructing Certificate and Judging Certificate):
  - 1st, 3rd, and 3rd places in Feb of 2016, 2018, and 2021 in the national competitions

Languages

- Persian (Native)
- English (TOEFL Overall: 86, R: 22, L: 21, S: 22, W: 21)
- French (Elementary)
- German (Elementary)