MohamadHosein Vaeedi

Electrical Engineering · Student

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Education

College of Electrical Engineering, Sharif University of Technology **Sep. 2022 – Now**
Master of Science in Electrical Engineering TeleCommunication Engineering *Tehran, Iran*

Cumulative Grade Average: 17.30/20(4/4)

College of Electrical and Computer Engineering, University of Tehran **Sep. 2018 – Aug. 2022**
Bachelor of Science in Electrical Engineering(TeleCommunication Engineering Major) *Tehran, Iran*

GPA of last year : 18.77/20 (4/4)

Cumulative Grade Average: 18.59/20

Mirza kochak khan Highschool **Sep. 2014 – Jun. 2018**
Diploma in Mathematics and Physics *Rasht, Iran*

As a Part of the National Organization for Development of Exceptional Talents (NODET)

Cumulative Grade Average: 19.95/20

Research Interests

- Deep Learning & Neural Networks
- ML for Communications
- ML for Signal Processing
- Wireless Communication
- 5G & 6G
- Information Theory
- Communication Theory & Networks

Research Experience

B.Sc Thesis | *Department of Electrical & Computer Engineering* **Apr. 2022 – Aug. 2022**
Under Supervision of P. Rabiei *University of Tehran*

- working on optimizing Intelligent Reflecting Surfaces (IRS) with Genetic Algorithm.

Research Intern | *Communication Circuits Labratory* **July 2021 – November 2021**
Research Intern Under Supervision of P. Kamarei *University of Tehran*

- During this internship, I was part of a research group working on CFAR Algorithms and detecting targets.

Teaching Experience

University of Tehran **Oct 2020 – June 2022**
Department of Electrical & Computer Engineering *Tehran, Iran*

- **Digital Communication** spring 2022
  Instructor: Prof. A. Rabiei
- **Engineering Probability and Statistics**
  Spring 2021 & Fall 2021
  Instructor: Prof. A. Dehaqani
- **Computer and programming(C & C++)**
  Spring 2022
  Instructor: Prof. J. Kazazi
- **Electrical Circuits I** Fall 2021 & Fall 2022
  Instructor: Prof. J. Rashed
- **Physics 2** spring 2021
  Instructor: Prof. A. Fahim
- **Electronics I** Spring 2021
  Instructor: Prof. Z. Sanaiee

Sharif University of Technology **Feb. 2023 – now**
Department of Electrical Engineering *Tehran, Iran*

- **Digital Communication** spring 2023
  Instructor: Prof. F. Behnia

Honors & Awards

- *2015* **Passing the first stage** of the Mathematics Olympiad for two years.
- *2018* **Top 0.2%** out of 160,000 applicants in the Nationwide Universities Entrance Exam. (**rank 329**)
- Road to Sharif University of Technology for Master degree straightly without exam .

Relevant Courses[1] (Graduate courses are indicated by *)

- Intelligent Systems[2] (20/20
- Deep Learning & Neural Networks * (18.32/20)
- Convex Optimization (19.5/20)
- Adaptive Filters * (17/20)
- Game Theory (ongoing)*
- Advanced Communication (ongoing)*
- Wireless Communication (19.5/20)
- Digital Communication Systems (18.9/20)
- Communication Systems (16.2/20)
- Engineering Mathematics (20/20)
- Computer Networks(19/20)
- Information Theory *(18.5/20)
- Fields & Waves (19.7/20)
- Microwave 1 (18.75/20)
- Digital Signal Processing (17.6/20)
- Numerical Analysis & Computation (20/20)

Academic Projects

Deep Learning & Neural Networks | *Instructor: Prof. Kalhor* **Spring 2022**

- Implementing the VGG-19 model based on Transfer learning.
- Stock-Market Price Prediction using RNN, LSTM, GRU, and CNN-LSTM models.
- Exploring unsupervised methods like SOM, Mexican-Hat, MaxNet, and HammingNet.
- Implementing Feed Forward NN, Madaline, and Adaline algorithms from scratch.
- Implementing memory NNS methods like Hebbian, Hopfield net, Auto-associative network, and Bidirectional associative memory.
- Training a YOLOv5 model for detecting balls and their colors on a "Bocce Bal Game" table and implementing DeepLab & FCN network for a segmentation task using python.
- Sentiment Analysis with BERT and HATEBERT models Using transformer-based embedding to detect hate speeches.
- Implementation of different variants of GANs (CycleGAN, DC-GAN, S-GAN, Stack-GAN) for specific tasks related to the GAN's functionality using python.
- Implementation of several Convolutional Neural Networks, LSTM Networks, and other memory-based networks with the usage of Data Augmentation and Transfer Learning methods for regression and classification tasks using python.
- Implementation of several Recurrent Neural networks used in text generation of "HARRY POTTER AND THE GOBLET OF FIRE" book.
- Implementation of House Price Prediction using Linear Regression.
- Implementation of PCA and VAE algorithm used as dimensionality reduction.
- Implementation of Reinforcement Learning algorithms such as DQN and DDQN in case of training an agent to solve the Lunar-Lander environment.

Intelligent Systems[2] | *Instructor: Prof. Hosseini* **Fall 2021**

- Full implementation of Convolutional Neural Networks from scratch used as a discriminator of GAN to contribute as a Generative network in producing MNIST dataset images.
- Implementation of a semantic text analyzer using CNNs based on a supervised learning algorithm.
- Implementing various Model-based and Model-free algorithms such as Policy Iteration and Value iteration algorithms.
- Implementing Q-learning algorithm on a given static map.
- Implementing various Classifiers such as Stochastic Gradient Descent, SVM, K-Nearest Neighbours(KNN), Decision Tree, Random Forest, Naïve Bayes, and Metric Learning methods such as Large Margin Nearest Neighbor (LMNN), and NCA on multiple datasets using NumPy.
- Implementing various Clustering algorithms such as K-Means, and Agglomerative Clustering using NumPy & Scikit-Learn.
- Implementation of Sine estimator using a fully-connected neural network from scratch using NumPy.
- Implementation of a Logistic Regression Classifier to be used in a semi-supervised learning method on the Surgical Binary Classification dataset.

Wireless Communication | *Instructor: Prof. Sabbaghian* **Spring 2022**

[1] All mentioned grades are equivalent to A (4/4).

[2] Has the same syllabus as the Machine Learning graduate course in other universities.

- Full implementation of an OFDM sender and receiver system using a wide variety of sub-carrier power allocation approaches such as water-filling, diversity in time and place, MMSE, and ZF equalizing, and then analyzing channel capacity and error probability.
- Solving a common power allocation problem in a wireless fading channel using the Stochastic Gradient Ascent algorithm as our optimization approach in the presence of noise and ISI.
- Using maximum likelihood optimum decision-making in symbol detecting during BPSK modulation in narrowband fading channel to improve error probability and overcome fading effect as a critical issue in the wireless channels.
- Designed a wireless base station to model large-scale effects of **path-loss** using the **simplified model** which considers the **shadowing effect** to simulate metrics such as **outage probability, SNR, and coverage** during distance from the base station.
- Implementing a multi-path wireless channel with non-resolvable components, which served as a Rayleigh Fading Channel to analyze the small-scale effects of the channel.
- Implementing a simplified model of the Rician and Nakagami fading Channel.

Convex Optimization | *Instructor: Prof. Amiri* **Fall 2021**

- Solving The Illumination problem, a non-convex optimization problem using different optimization methods such as least-square, weighted least-squares, Chebyshev approximation, and Piecewise-linear approximation.
- Implementing Genetic algorithm in case of optimizing a non-convex function using MATLAB.
- Implementing several optimization algorithms such as Stochastic gradient Descent, Armijo Rule, modified-Newton method, Simulated Annealing and applying them to a series of convex and non-convex functions using MATLAB.

Digital Communication Systems | *Instructor: Prof. Rabiei* **Spring 2021**

- AWGN Channel & Binary PAM Modulation: Implementation of an AWGN channel to analyze The BER Performance of Binary PAM through changing SNR in the time domain and also investigate the effect of ISI on telecommunication channel by changing sampling error.
- MAP-vs-ML Detector: An implementation of a communication channel that uses two different operating algorithms (Thresholding) to receive and detect 4-PAM modulating signals provided to compare The BER Performance of each MAP or ML detector.
- Markov-Chain & Shannon's Source-Coding: during this project, we implemented and analyzed some information theory concepts in cases of entropy calculation and average-length calculation based on the Huffman algorithm.

Communication Systems | *Instructor: Prof. Sabbaghian* **Fall 2020**

- In this series of four projects, we got familiar with the basic concepts of modulators, detectors, and different modulating methods such as AM, DSB, SSB, FM, and PM to transmit information through communication channels.

Digital Signal Processing | *Instructor: Prof. Akhaee* **Spring 2021**

- **Additive Watermarking**: Watermarking is the superimposing of a logo or piece of text atop a document or image file. In this project, we use (DSP) to embed and extract certain information atop an audio file to get familiar with watermarking.

Other Projects **Fall 2019 – Fall 2021**

- Implementing various Modulation and Detection algorithms such as QAM, PSK, FSK, MAP, and ML using MATLAB.
- Dot-Line-Game: A graphical implementation of Dot-Line game via C programming language containing a simple user interface.
- MIPS-PipeLine & ARM: Implementing ARM and MIPS Processors using Verilog.

Skills and Qualities

Programming Languages:

- Python(Advanced)
- Matlab(Advanced)
- C/C++(Intermediate)
- VerilogHDL(Intermediate)
- LaTeX(Advanced)

Developer Tools:

- Jupyter Notebooks(Advanced)
- Google Colab Notebooks(Advanced)
- Pspice(Intermediate)
- Altium Designer(Familiar)
- QuartusII(Advanced)
- Modelsim(Advanced)
- Multisim(Intermediate)
- ARM(Familiar)

Frameworks, Softwares, Libraries and Operational Systems:

- Pytorch(Advanced)
- NumPy(Advanced)
- Pandas(Advanced)
- scikit-learn(Advanced)
- Tensorflow(Advanced)
- Keras(Advanced)
- Simulink(Advanced)

Languages

Persian:
Native

English: Fluent