

# Mohammadjavad Mehditabar

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## Education

### Dalhousie University

Master of Computer Science

- Supervisor: Prof. Tushar Sharma

Halifax, Nova Scotia

Jan 2025 -

### Iran University of Science and Technology

B.Sc. Computer Engineering

- GPA : 18.60/20 (3.94/4)
- Supervisor: Prof. Sauleh Eetemadi

Tehran, Iran

Sep 2019 - Sep 2023

## Research Interests

- Natural Language Processing
- Sustainable Deep Learning
- Large Language Models / Generative AI
- Sentiment Analysis / Question Answering

## Publications

Karamdel, H., Ashtiani, M., **Mehditabar, M. J.**, & Bakhshi, F. (2024). "A consensus-based approach to improve the accuracy of machine learning models." Evolutionary Intelligence, 1-22. [Paper]

Fatehi, S., Anvarian, Z., Madani, Y., **Mehditabar, M.**, & Eetemadi, S. "MBTI Personality Prediction Approach on Persian Twitter." WinLP at EMNLP 2022 workshop [Paper] [Poster]

## Research Experience

### Consensus Reaching in a Group of Machine Learning Models

IUST Social Computing Lab

Research Assistant

Sep 2023 - Jun 2024

- Devised a novel approach, incorporating concepts of **interactive consensus over ML**, outperforming the **traditional ML** and **Ensemble methods**, and can be generalized to any supervised learning tasks.
- Formularized the whole process, and developed a **dynamic matrix** for **models' convergence**.
- Investigated and implemented three weight aggregation methods, **soft consensus**, **hard consensus**, and **trust factor**.
- Designed and adapted to an **arbitrary** number of machine learning models with an automated logic and **smart weight adjustment**.
- Reduced **outlier** effects, and performed **statistical test**.

### MBTI Sentiment Analysis of Long Persian Corpus using Hierarchical BERT

IUST NLP Lab

Final B.Sc. Thesis

Jun 2022 - Sep 2023

- Proposed a novel approach that leveraged **two consecutive BERT models (Hierarchical BERT)** surpassing the performance of two other implemented model **Attention + BiLSTM** and **Sentence Aggregation with BERT**.
- Performed fine-tuning with **Masked Language Modeling** method on ParsBERT.
- Resolved **GPU memory issue** in spite of fine-tuning on both BERT models.
- Calculated **TF-IDF** and **RNF** (Relative Normalized frequency) to determine impact of words.
- Explored **BERT explainability** and intend to implement it.

### Personality Detection Based On Tweets Of Users [GitHub]

IUST NLP Lab

Research assistant

May 2022 - Aug 2023

- Utilized **GPT-3.5** for **data augmentation** as well as **one-shot** and **zero-shot** learning.
- Implemented **sentence generation** based on each label from **GPT2** after fine-tuning our data on them. Furthermore, trained a custom tokenizer based on **sentence piece tokenizer**.
- Proposed three different architecture **BERT** into **BERT**, **truncated BERT** and **Word2Vec + ParsBERT embeddings** for classification.
- Generated **Word2Vec**, **FastText** and **BERT** vector after training our dataset on them.
- Examined papers with various model implementation, including **SVM** with leveraging **LIWC** and **ConceptNet**, **LSTM** and **BERT**.
- Studied and implemented **NRC**, **TF-IDF** approaches, and resolved memory issue using **Keras Data Generator**.

### Long Document Classification Methods On Transformers [GitHub]

IUST NLP Lab

Research Assistant

Mar 2023 - Aug 2023

- Implemented **Hierarchical BERT**, **Sliding Window** and **Sentence Aggregation**.
- Investigated on **LongFormer**, **docBERT**, **Unlimiformer** and **LongNet** as a single transformer with longer input length, also analyzed **ToBERT** (Transformer over BERT) and **RoBERT** (Recurrence over BERT) methods with effect of key sentence extraction.

### Applied DataScience and Machine Learning

IUST NLP Lab

Internship

Jul 2021 - Apr 2022

- Initially focused on data analyzing and visualization, then on text mining and cleaning with **Regex**. Next concentrated on investigating classic machine learning models such as **KNN**, **Logistic Regression**, **SVM**, **Random Forest** and etc. Following this, conducted an in-depth study of neural network approaches such as **ANN**, **CNN**, **RNN**. Furthermore, experimented methods of data normalizing, regularizing, augmenting, and hyperparameter tuning to enhance performance. Finally, evaluated **transfer learning** and **few-shot** learning with pre-trained models.

## Teaching Experiences

- **Software Engineering**, Mentor
- **Computational Intelligence**, TA
- **Algorithm Design**, TA
- **Theory of Languages and Automata**, TA
- **Data Transmission**, TA
- **Data Structures**, Mentor
- **Advanced Programming**, Mentor
- **Fundamental of Computer Programming**, Mentor

*Prof. Behrouz Minaei Bidgoli, Jan 2023 - Dec 2023*

*Prof. Naser Mozayani, Sep 2022 - Dec 2022*

*Prof. Sauleh Eetemadi, Jan 2022 - June 2022*

*Prof. Reza Entezari Maleki, Jan 2022 - June 2022*

*Prof. Ahmad Akbari, Jan 2022 - June 2022*

*Prof. Sauleh Eetemadi, Sep 2021 - Dec 2021*

*Prof. Sauleh Eetemadi, Jan 2021 - June 2021*

*Prof. Sauleh Eetemadi, Sep 2020 - Dec 2020*

## University Projects

### Personality Detection (NLP Course Project) [GitHub]

*Feb 2023 - Jun 2023*

- Introduced novel model architectures for classification and incorporated additional non-text features to enhance performance.
- Implemented sentence generation with language modeling on GPT model.
- Automated the process of crawling, cleaning, and analyzing data, including word count histograms, TF-IDF, RNF, and more.

### Visual Question Answering [GitHub]

*May 2023 - Jun 2023*

- Built a custom transformer-based MiniVQA model from scratch. It involved extracting image embeddings, obtaining question embeddings from pretrained BERT embeddings, passing the question embedding through encoder and decoder layers, and generating answers by concatenating them and applying a linear layer at the end.
- Worked on ResNet as a pretrained image feature model and utilized a sentence transformer with Distil-BERT as the base model.

### Covid Detection on X-Ray Chest Images (Deep Learning Course Project) [GitHub]

*Dec 2022 - Jan 2023*

- Initially, data augmentation techniques, including rotation, flipping, and noise addition, were employed. The SqueezeNet model was selected for transfer learning, with the addition of two layers, Conv2d and Adaptive pooling, at the end. During training, the initial layers were frozen, and fine-tuning was conducted on the last two layers. Evaluation incorporated new criteria such as sensitivity and specificity, along with the generation of a confusion matrix and ROC curve.

### Computational Intelligence [GitHub 1, 2, 3]

*Feb 2022 - Jun 2022*

- Designed a Kohonen (SOFM) network to recognize and cluster MNIST dataset numbers based on similarity. Additionally, used the Kohonen network to approximate solutions to NP-Hard TSP problems, providing results close to the actual solutions.
- Implemented a Hopfield model which could remove noise from images.
- Implemented a neural network from scratch containing all forward and backward computation as well as custom hyperparameters.

### Artificial Intelligence [GitHub]

*Oct 2021 - Dec 2021*

- This course project consists of CS188 Berkeley project. DFS, BFS, A\* were implemented in the first phase. In the second phase adversarial methods such as multiagent minimax, expectimax algorithms were implemented. Finally, in the last phase implemented Reinforcement Learning methods such as value function, Q Learning, and Approximate Q learning.

### Saku (Software Engineering Course Project) [GitHub]

*Feb 2022 - Jun 2022*

- Developed a web-based application as a front-end developer using ReactJS. The application primarily functions as an auction platform and includes features such as in-app chat, auction trading, and bid proposal.

## Course Accomplishments

### ACADEMIC

- Natural Language Processing (CS224N) **20/20**
- Computer Systems Security **20/20**
- Deep Learning **20/20**
- Graph Theory and Algorithms **19.75/20**
- Embedded and Real-time Systems **20/20**
- Fundamentals of Computational Intelligence **18.5/20**
- Software Engineering **20/20**
- Operating System **20/20**
- Artificial Intelligence and Expert Systems (CS188) **20/20**
- Data Transmission **20/20**
- Systems Analysis and Design **19.25/20**
- Algorithms Analysis and Design **19.3/20**
- Principles of Database Design **20/20**
- Theory of Languages and Automata **19.6/20**
- Data Structures **20/20**
- Advanced Programming **20/20**

### COURSERA

- Deep Learning Specialization [Course]
  - Neural Network and Deep Learning [Certificate], Improving Deep Neural Network [Certificate], Structuring Machine Learning [Certificate], Convolutional Neural Network [Certificate], Sequence Models [Certificate]
- Data Structures and Algorithms Specialization [Course]
  - Algorithmic Toolbox [Certificate], Data Structures [Certificate], Algorithm on Graphs [Certificate], Algorithm on Strings [Certificate]
- Introduction to Data Science in Python [Course] [Certificate]
- Python for Everybody Specialization [Course] [Certificate]

## Working Experience

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### Dadmotech [[Linkedin](#)]

Tehran, Iran

Data Scientist

June 2022 - Jan 2023

- Initially, developed a questionnaire web app using Django. Subsequently, retrieved user Twitter data through web crawling, followed by data cleaning using regex commands and data manipulation with pandas. Finally, focused on SQL queries for data extraction.

## Skills

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**Programming Languages** Python, C#, Javascript, SQL

**Machine Learning** Pytorch, Tensorflow, Keras, OpenCV , Scikit Learn, Pandas, Numpy, Matplotlib

**Web Development** Django, ReactJS

**Tools & Methods** Git, Docker, LaTeX, Scrum, Trello

**Languages** English (Fluent) - TOEFL iBT : 106 (R:29, L:28, S:24, W:25), Persian (Native)

## Honors & Awards

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- Ranked 5th among 90 students of Computer Engineering Bachelor Science with GPA 3.94/4
- Permitted to apply as a Master Science student without taking National Entrance Exam
- Ranked among top 0.4% from 144k National Universities Entrance Exam participants