Mohammadjavad Mehditabar

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Education

Iran University of Science and Technology *Tehran, Iran*

B.Sc. Computer Engineering *Sep 2019 - Sep 2023*

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

Research Interests

- **Natural Language Processing**
- **Large Language Models**
- **Sentiment Analysis**
- **Question Answering**
- **Computer Vision / Image Processing**
- **Machine Learning / Deep Learning**

Publications

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

MBTI Sentiment Analysis of Long Persian Corpus using Hierarchical BERT *IUST NLP Lab*

Final B.Sc. Thesis *Jun 2022 - Present*

- 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 — ***Prof. Behrouz Minaei Bidgoli***, *Jan 2023 - Dec 2023*
- **Computational Intelligence**, TA — ***Prof. Naser Mozayani***, *Sep 2022 - Dec 2022*
- **Algorithm Design**, TA — ***Prof. Sauleh Eetemadi***, *Jan 2022 - June 2022*
- **Theory of Languages and Automata**, TA — ***Prof. Reza Entezari Maleki***, *Jan 2022 - June 2022*
- **Data Transmission**, TA — ***Prof. Ahmad Akbari***, *Jan 2022 - June 2022*
- **Data Structures**, Mentor — ***Prof. Sauleh Eetemadi***, *Sep 2021 - Dec 2021*
- **Advanced Programming**, Mentor — ***Prof. Sauleh Eetemadi***, *Jan 2021 - June 2021*
- **Fundamnetal of Computer Programming**, Mentor — ***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 Berekely 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 Security **20/20**
- Deep Learning **20/20**
- Graph Theory **19.75/20**
- Embedded Systems and IoT **20/20**
- Computational Intelligence **18.5/20**
- Software Engineering **20/20**
- Operating System **20/20**
- Artificial Intelligence (CS188) **20/20**
- Data Transmission **20/20**
- System Analysis and Design **19.25/20**
- Algorithm Design **19.3/20**
- 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

Dadmatech [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

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

Honors & Awards

- Ranked 6th 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

Languages

English Fluent (IELTS Exam will be taken soon)
Persian Native

References

Prof. Sauleh Eetemadi
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Prof. Naser Mozayani
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Prof. Behrouz Minaei Bidgoli
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