Mohammad Sadegh Akbari

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Github Link

Research Interests

- Data Science
- Machine Learning and Deep Learning
- Algorithms and Advance Algorithms
- NLP and LLM
- llm agent and Reinforcement learning
- Generative Models

Education

Present – September 2022 | M.Sc. | Data Science | Tehran Institute for Advanced Studies (TEIAS), Tehran, Iran

Thesis : *Intelligent system : An LLM-based AI Mathematical Olympiad Solver*

Algorithm Design | NLP | LLM | Agent | Prompt Engineering

2022 – 2016 | B.Sc. | Computer Engineering | Isfahan University of Technology, Isfahan, Iran

- Major : *Computer Security*

Thesis : *Emotion and Big Five Personality Traits Recognition based upon electroencephalogram using Machine Learning and Deep Learning Methods*

Exploratory Data Analysis | Machine Learning

Soft Skills

Critical thinking, Creative Problem Solving, Creative Concept Design, Adaptability, Innovation,Strategic Thinking

Hard Skills

Programming	Python, C, C++, Bash, Matlab,LaTeX
Database Systems	PostgreSQL, Microsoft SQL Server
Data Analysis	Pandas, NumPy, SciPy, Matplotlib, Seaborn, Plotly, Tableau
AI/Vision/NLP	scikit-learn, PyTorch, PyTorch Geometric, TensorFlow, Keras, XGBoost, OpenCV, Transformers, LangChain, Familiar with Gym/Gymnasium
Network/Security	Wireshark, Kali, Nmap, Metasploit
Operating Systems	Windows, Debian-based Linux, macOS
Other	Git, CUDA

Research Experiences

- Research Assistant Under the Supervision of Dr. Behnam Bahrak

Spring 2024

Intelligent system : An LLM-based AI Mathematical Olympiad Solver

- **System** : I Developed an AI-powered mathematical problem solver for complex LaTeX-formatted problems (IMO level) leveraging a Large Language Model (MMOS-DeepSeekMath-7B) and integrating **Tool-Integrated Reasoning**. The system uses an **agent-based** approach, allowing the AI to interact with external tools for enhanced problem-solving capabilities. This solution incorporates LLM, code generation, code execution, multi-agent talk to achieve high accuracy.

› Research Assistant Under the Supervision of Dr. Farzaneh Shayegh and the Co-Supervision of Dr. Zeinab Maleki

March 2022
October 2022

Emotion and Big Five Personality Traits Recognition based upon electroencephalogram using Machine Learning and Deep Learning Methods

› Developed various ML/DL models to discover any feasible **correlation** between **EEG** features, **personality traits** and **emotional states**. The Deep Learning implementation was based on the TensorFlow/Keras framework. I employed ASCERTAIN private dataset which became available upon request to the respected owners. I used **Multiple Imputation by Chained Equations (MICE)** method for **data imputation** since the dataset was heavily corrupted and full of missing data.

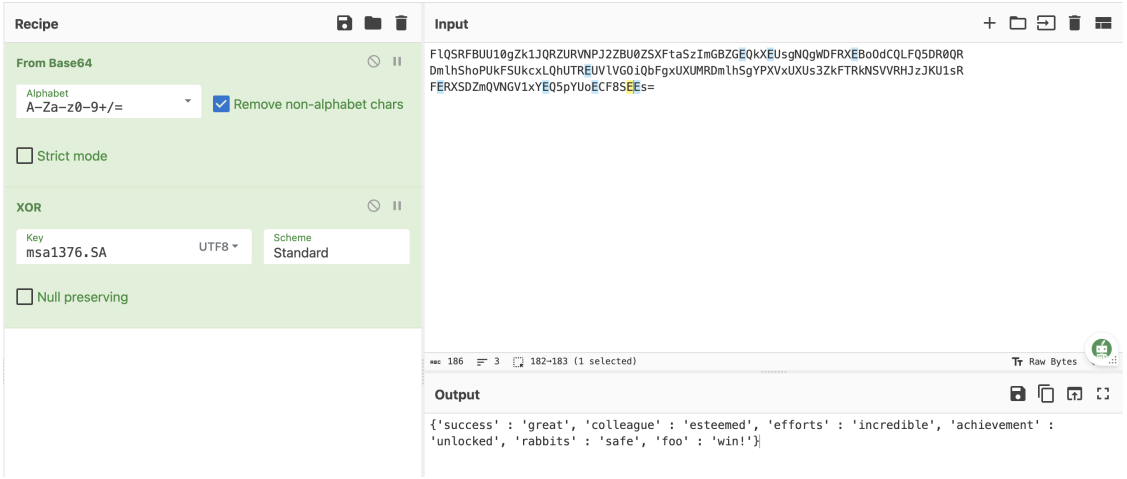
Competitions

Summer 2021

foobar (google)

› I completed all five levels of the Google Foobar Challenge, a secret hiring process for top programmers and engineers. The challenge is a series of coding challenges that increase exponentially in difficulty as you progress. Each problem has a specific time limit, and if you fail to solve it within the time limit, you are disqualified. The first problem has a one-hour time limit, and it is designed to help you learn the platform. The last level problem has a one-month time limit, and it requires you to implement and combine state-of-the-art algorithms.
After level 3, Google asked for my personal information. The remaining two levels were beyond what Google typically requires for their hiring process. I believe that completing all five levels of the Google Foobar challenge demonstrates my ability to solve complex coding problems under pressure.
For information about google foobar you can search ”google foobar” on bing
here is my foobar accomplishment :

here is the google certificate after deciphering :



Fall 2023 | **NeurIPS 2023 - Machine Unlearning**

› Competed in the NeurIPS '23 Machine Unlearning Challenge, achieving **34th** place out of **1189** participants. Developed an algorithm to remove the influence of specified training data (forget set) from a pre-trained facial age prediction model while preserving model utility (accuracy on retained data and generalization). The solution focused on efficiently adjusting the existing model weights, rather than computationally expensive retraining, and incorporated randomness to accurately estimate the distribution of unlearned models for evaluation. Successfully navigated the challenge's constraints, including strict time limits relative to retraining and a novel evaluation metric balancing forgetting quality and model utility.
Here you can see the Leaderboard

Fall 2024 | **NeurIPS 2024 - Competition for LLM and Agent Safety (CLAS)**

› Participated in the NeurIPS '24 Competition for LLM and Agent Safety (CLAS), focusing on jailbreaking attacks against aligned LLMs. Achieved **12th** place out of **20** participating teams. Developed an automated jailbreaking attack method to elicit harmful outputs from LLMs, balancing effectiveness (harmfulness score) with stealth (similarity to original prompts). Worked with the Llama-3-8B model during the development phase, adapting the approach for a held-out LLM during the final evaluation. The competition involved optimizing for a combined metric incorporating jailbreak success rate, harmfulness of LLM outputs, and similarity to original prompts, under a constraint on the number of injected tokens.
Here you can see the Leaderboard

Relevant Coursework

- Machine Learning Deep Leaarning(Grad)
  - Dr. Mohammad Taher Pilehvar
- Applied Data Science(Grad)
  - Dr. Amir Hesam Salavati
- Data Visualization(Grad)
  - Dr. Behnam Bahrak
- Large Language Models(Grad)
  - Dr. Yadollah Yaghoobzadeh
  - Dr. Mohammad Javad Dousti
- Mathematics of Data Science(Grad)
  - Prof. Mohammad Mahmoody
- Advance Algorithms(Grad)
  - Dr. sharareh alipour
- Game Theory(Grad)
  - Dr. Masoud Seddighin
- Multimedia Systems
  - Prof. S. Samavi
- Artificial Intelligence
  - Dr. A. mirzaei
- Design and Analysis of Algorithms
  - Dr. M. R. Heidarpour
- Data Structures
  - Dr. A. Mirzaei

Thesis

September 2022 | **B.Sc. Thesis | Emotion and Big Five Personality Traits Recognition based upon electroencephalogram using Machine Learning and Deep Learning Methods**
Supervisor :

- Farzaneh Shayegh | Assistant Professor at Dept. of Electrical and Computer Engineering, Isfahan University of Technology
- Zeinab Maleki | Assistant Professor at Dept. of Electrical and Computer Engineering, Isfahan University of Technology

Spring 2024 | **M.Sc. | Data Science | Tehran Institute for Advanced Studies (TEIAS), Tehran, Iran**
Supervisor :

- Behnam Bahrak | Assistant Professor at Dept. of Computer Science, Tehran Institute for Advanced Studies,TEIAS

Other Notable Projects

2023 | **› I developed a machine learning model to reconstruct 2D seismic lines from scrambled 1D vertical columns. I used an LSTM network to learn patterns within the data, incorporating domain-specific knowledge of seismic data acquisition and geological principles. This LSTM-based model then informed an algorithm I designed to select the optimal sequence of vertical columns for reconstruction.**

2022 | > I worked on text summarization using the CNN/Daily Mail dataset, which contains over 300,000 news articles. I leveraged Large Language Models (LLMs) to generate both extractive and abstractive summaries of these articles. | Dr. Mohammad Taher Pilehvar

2020 | > I solve 100-Queen problem by improvement of Mutation, Selection and Crossover in Genetic Algorithm for this specific task, c++ | Dr. Abdolreza Mirzaei

2019 | > We Design and Implement a Smart Pot | Dr. Majid Nabi