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Eljan Mahammadli

GitHub
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Education

George Washington University — Washington, D.C.
M.S. in Computer Science, GPA: 3.45/4.0 (Overall GPA: 3.62/4.0) — *Sep 2022 – Jul 2024*

- **Concentrations**: Deep Learning & Large Language Models
- **Coursework**: Machine Learning, Neural Networks & Deep Learning, Artificial Intelligence, Cloud Computing
- **Thesis**: Developed the first-ever Pretrained Small Language Model for the Azerbaijani Language from scratch

ADA University — Baku, Azerbaijan
M.S. in Data Analysis, GPA: 3.62/4.0 — *Sep 2022 – Jul 2024*

- **Concentrations**: Deep Learning & Large Language Models
- **Coursework**: Big Data Analytics, Advanced Software Paradigms, Design and Analysis of Algorithms

Khazar University — Baku, Azerbaijan
B.S. in Computer Engineering, GPA: 3.6/4.0 — *Aug 2018 – Jun 2022*

- **Concentrations**: Machine Learning, Recommendation system, Computer Vision
- **Coursework**: Introduction to Neural Networks, Applied Statistical Analysis, DBM, Software Engineering, Game Development

Work Experience

Polygraf AI — Austin, TX
Machine Learning Engineer — *Jan 2024 – Current*

- Design, train, and fine-tune state-of-the-art large language models
- Develop AI agents combined with retrieval-augmented language models
- Build efficient and scalable ML training and inference systems

Unibank OJSC — Baku, Azerbaijan
Data Scientist — *Jul 2022 – Jan 2024*

- Developed and deployed highly accurate credit scoring models, streamlining the decision-making process.
- Established automated model monitoring and maintenance, ensuring real-time performance tracking and timely updates.
- Improved operational efficiency by providing credit analysts with a user friendly dashboard for quicker and more informed lending decisions.

Unibank OJSC — Baku, Azerbaijan
Data Scientist Intern — *May 2021 – Aug 2021*

- Designed and implemented a personalized recommender system for bank customers, enhancing the overall user experience and increasing product adoption.
- Conducted data analysis and feature engineering on customer purchase data, leading to more accurate and effective recommendations tailored to individual preferences.
- Collaborated with a cross-functional team to test the recommender system, contributing to improved customer engagement and research insights.

Data Science Academy — Baku, Azerbaijan
Teaching Assistant — *Nov 2020 – May 2021*

- Assisted in delivering advanced data science concepts and hands-on sessions alongside Ahmad Ahmadov, Senior Data Scientist at Porsche AG.
- Mentored students, reviewed projects, and provided support outside lessons.
- Developed and evaluated weekly case studies and Python assignments.
- Solved real-life data science problems and worked with large datasets.

Freelancer — Baku, Azerbaijan
Teaching Assistant — *Jun 2021 – Aug 2022*

- Data Consulting, Automation, Bot development, Web Scraping
- I was Top Rated Freelancer representing the top 10% of talent on Upwork and I had 100% JSS (Job Success Score)

Projects

- **gradipy: A Lightweight Neural Network Library**: Developed Gradipy, a lightweight Python deep learning library and Autograd engine , as part of my coursework at GW University (CSCI 6366). Built from scratch using only NumPy, Gradipy features a PyTorch-like API and supports essential operations for forward and backward passes. The library includes core components such as linear and convolutional layers, activation functions, loss functions (e.g., cross-entropy, NLL), and optimizers (e.g., SGD, Adam). It also provides implementations of foundational architectures like ResNet-50 and GPT.

  Gradipy emphasizes both practicality and education, making it an ideal tool for understanding and experimenting with neural networks. To ensure accuracy, I developed unit tests comparing outputs and gradients with PyTorch. This hands-on approach enhanced my understanding of deep learning fundamentals and the inner workings of neural network frameworks. Link: https://github.com/eljanmahammadli/gradipy
- **AzLlama: master's thesis on pretraining SLM for Azerbaijani language**: My master's thesis explores the development of an open-source generative language model for Azerbaijani, an underrepresented language in the field of NLP. This project aims to bridge the gap left by large proprietary models, focusing on creating a more accessible solution
  - Objective: Address the absence of open-source, generative small language models for Azerbaijani.
  - Dataset Collection: Compiled the largest corpus of Azerbaijani texts to date, approximately 3 billion tokens which is the largest corpus for Azerbaijani so far, sourced from diverse platforms including Wikipedia, websites, books and various scraped datasets.
  - Model Development: Trained a decoder-only language model with different sizes such as 150 million parameters using the LLaMA-2 architecture, specifically designed for autoregressive text generation in Azerbaijani.
  - Fine-Tuning: Enhanced the model with instruction-based fine-tuning using the Alpaca dataset to enable chat-based interactions in Azerbaijani.
  - Evaluation: AzLlama demonstrates competitive performance against larger state-of-the-art models across key metrics such as contextual alignment (F1: 68.35%), semantic similarity (82.87%), and character n-gram F-score (CHRF: 34.82%). Evaluated with advanced metrics due to the challenges of applying standard multiple-choice benchmarks to small language models, AzLlama-150M outperforms several larger models like Mixtral-8x22B and Llama2-70B, showcasing its efficiency and potential as an open-source resource for underrepresented languages in NLP.
  - Model: https://huggingface.co/eljanmahammadli/AzLlama-152M-Alpaca
  - Demo: https://huggingface.co/spaces/eljanmahammadli/AzLlama-150M
- **CSCI 6511 Group Project: Generalized Tic Tac Toe Agent**:
  - Designed and implemented a Generalized Tic Tac Toe AI agent for n * n boards
  - Achieved **first place** in the Artificial Intelligence class (CSCI 6511) competition on the Notexponential platform (https://www.notexponential.com/qa-notexponential-teams) as team **AI-lliance X n O**.
  - Integrated REST API for real-time game interactions (game creation, move submission, and opponent move fetching).
  - Utilized a minimax algorithm with alpha-beta pruning to optimize decision-making and improve efficiency.
  - Developed a custom heuristic for board state evaluation, prioritizing strategic moves.
  - Refined AI strategies in a competitive tournament setting against other agents.
- **Development of Scalable Recommendation Systems Using Big Data and ML Techniques**:
  - Term Project, Intro to Big Data Analytics, GW University, 2023.
  - Designed a scalable recommendation system using Hadoop, Apache Spark, and collaborative filtering (ALS module).
  - Utilized Yahoo Song Dataset, focusing on data preprocessing, algorithm selection, and performance evaluation.
  - Optimized system architecture on Microsoft Azure with a cluster configuration (1 master, 8 worker nodes, 128 cores, 448 GB RAM) for large-scale data processing.

Involvement

- **SPE Khazar University Student Chapter**: I led a volunteer Python tutoring initiative as part of the SPE (Society of Petroleum Engineers) Khazar team, helping engineers from various universities acquire programming skills during the digitalization of various fields. The program was conducted at Khazar University, when I was 3rd-year Computer Engineering student. The program covered Python programming and Introduction to Data Science.
- **QSS Analytics**: Assisted as an Academic Mentor in a comprehensive Data Science Bootcamp, mentoring students individually and in groups, reviewing projects, and preparing real-life Python case studies to enhance practical coding and data analysis skills.

Patents

- **Patent Pending**: System and Method for Identifying and Determining a Content Source, Application No. POLW-002, Applied November 2024.

Honors & Awards

- **Selected for Dual Degree Master's Program (2022)**: One of 20 students selected annually by BP and the Azerbaijan Education Ministry for the prestigious Dual Degree Master's Program between ADA University (Data Analysis) and George Washington University (Computer Science).
- **Red Diploma, Khazar University (2022)**: Graduated with distinction, awarded for outstanding academic performance.
- **Azerbaijan Government Scholarship Holder (2018 - 2022)**: Granted a full scholarship award due to the high result on the national university entrance exam (649 out of 700).
- **Honor list - Khazar University (2018 - 2022)**: Upon the academic performance of the term, included on Dean's Honor List 7 times.
- **Istak Lyceum Commendation (2013 - 2016)**: Upon the academic and performance and social activity of the term, awarded with certificates 6 times during secondary and high school
- **Top Rated badge - UpWork Inc. (2021)**: Awarded by a badge for delivering quality work with stellar feedback. This badge represents 10% of all freelancers on the platform.
- **IELTS Score: 7.5 (Expired)**: Demonstrated advanced English language proficiency.

Skills

Languages: Python, Java, C++, C, SQL

Technologies & Frameworks: PyTorch, Hugging Face Transformers, scikit-learn, NumPy, pandas, Matplotlib, Docker, Flask, FastAPI, AWS