Mohammadreza Daviran

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Research Interests

Data Management | Natural Language Processing (NLP) | Information Retrieval
Large Language Models | Database Systems | Text-to-SQL

Education

- **University of Alberta**, M.Sc. in Computing Science, Edmonton, Canada — Sep 2024 - Current
  - GPA: 3.925/4.00
  - Relevant Courses: LLMs for Data Management (CMPUT 605), Reinforcement Learning I (CMPUT 655), Introduction to NLP (CMPUT 501), Neurosymbolic Programming (CMPUT 659)
- **Sharif University of Technology**, B.Sc. in Computer Engineering, Tehran, Iran — Sep 2019 - Feb 2024
  - GPA: 18.58/20 (3.90/4.00)
  - Relevant Coursework: Data Structures and Algorithms (20/20), Natural Language Processing (20/20), Advance Information Retrieval (20/20), Discrete Structures (20/20), Database Design (18.8/20), Introduction to Machine Learning (20/20), Linear Algebra (20/20), Numerical Computation (20/20), Artificial Intelligence (19.3/20), Introduction to Bioinformatics (18/20), Advanced Programming (18.9/20), Engineering Probability and Statistics (19.3/20)
- **Shahid Beheshti High School (NODET)**, Physics and Mathematics, Zanjan, Iran — Sep 2013 - Jun 2019
  - GPA: 4.00/4.00

Publications

[1] **M. Daviran**, B. Lin, and D. Rafiei, "SQL-Exchange: Transforming SQL Queries Across Domains." arXiv:2508.07087. Submitted to VLDB 2026.

Research Experience

- **University of Alberta**, Research Assistant, Edmonton, Canada — Nov 2024 - Current
  Supervisor: Dr. Davood Rafiei
  - **Cross-Schema Query Mapping (SQL-Exchange):** Designed and evaluated a novel framework that transforms SQL queries across heterogeneous database schemas using LLMs. (arXiv:2508.07087)
  - **Schema Matching (Ongoing):** Investigating structural and semantic similarity metrics, graph-based methods, and LLM-assisted pipelines for schema matching on large-scale data.
- **NLP and DH Lab**, Research Assistant, Tehran, Iran — Nov 2022 - Feb 2024
  Supervisor: Dr. Ehsaneddin Asgari
  - **Open-Source Persian Wordnet (B.Sc. Project):** Developing an open-source Persian Wordnet, a comprehensive lexical resource for the Persian language.
  - **Persian/English Medical Question-Answering Model:** Collaborating on the development of a Persian/English medical question-answering model utilizing LLMs. (OpenReview)
  - **Development of Persian Large Language Model:** Engaging in a substantial project to create a Persian LLM. This ambitious endeavor aims to establish a groundbreaking resource for the Persian NLP community.
- **Sharif University of Technology** Research Assistant, Tehran, Iran — Sep 2021 - Jul 2022
  Supervisors: Dr. Fatemeh Baharifard
  - **Pairwise Classification Face Clustering:** Research on solving face clustering task as a classification task between faces and train a classifier to directly determine whether two faces should belong to the identical class.

HONORS AND AWARDS

- Received full scholarship (tuition waiver) from the Sharif University of Technology, the top engineering school in Iran, for Bachelors degree, 2019
- Ranked 157^{th} (top 0.09%) out of 165,000 participants in Iranian National Universities Entrance Exam (Konkour) in Physics and Mathematics.
- Admitted to National Organization for Development of Exceptional Talents (NODET). $\approx 2\%$ Acceptance Rate, 2013.

WORK EXPERIENCE

- **University of Alberta**, Graduate Teaching Assistant, Edmonton, Canada — Sep 2024 - Current
  - Responsibilities:
    * Conducted weekly sessions to demonstrate practical applications of course concepts.
    * Provided support by answering student queries and clarifying complex topics.
    * Graded exams and developed assignments and projects.
  - Courses: Introduction to File and Database Management (CMPUT 291), Algorithms I (CMPUT 204).

- **Alberta Machine Intelligence Institute (Amii)**, WILO Participant, Edmonton, Canada — Sep 2024 - Apr 2025
  - Responsibilities:
    * Created and refined educational content for a Generative AI Coursera specialization, including curated research and scripts.
  - Program: Work Integrated Learning Opportunity (WILO) Training Team, Amii

- **Artificial Intelligence for Better Health**, Summer Intern, Tehran — Jul 2022 - Sep 2022
  - Trained a model to segment lungs from X-ray images (binary segmentation).
  - Developed and applied Convolutional Neural Networks and Fully Connected models for image classification.
  - Experienced in transfer learning, GANs, image processing, and statistical analysis for AI and ML applications.

- **Sharif University of Technology**, Undergraduate Teaching Assistant, Tehran, Iran — Sep 2020 – Feb 2024
  - Responsibilities:
    * Led recitation sessions and office hours to support student learning.
    * Designed and graded assignments, homework, and exams.
    * Assisted instructors with course administration and student guidance.
  - Courses: Artificial Intelligence, Numerical Computation (**Head TA**), Engineering Probability and Statistics, Advanced Information Retrieval, Programming Languages: Design and Implementation, Introduction to Bioinformatics, Linear Algebra, Data Structures and Algorithms, Fundamentals of Programming (Python), Advanced Programming (Java).

SELECTED COURSE PROJECTS

- **Prompt Utilization for Library-based Synthesis Enhancement** — Winter 2025
  - Developed **PULSE**, a framework that builds a reusable prompt library to guide LLM-based program synthesis. Improved modularity and success rate in synthesizing complex LOGO graphics programs compared to zero-shot generation; project report under preparation for workshop submission (Report).

- **Effects of Depth on Rapid Learning in Reinforcement Learning** — Fall 2024
  - Investigated the effects of network depth on rapid learning in linear models within Reinforcement Learning by implementing linear DQNs of varying depths while controlling parameter counts. (Report).

- **Awesome NLP and Information Retrieval** — Spring 2023
  - Established the 'awesome-nlp' repository on GitHub, compiling a portfolio of my NLP endeavors encompassing **eight projects** like bias detection, question answering, and sentiment analysis in both Persian and English.

- **Stock Price Prediction** — Summer 2023
  - Developed and deployed a TinyML-powered LSTM model on a Raspberry Pi for real-time stock price prediction and automated trading, focusing on compact and low-power solutions.

- **Breast Cancer Survival Prediction** Fall 2022
  - The objective of this project is to utilize advanced machine learning techniques to analyze and predict survival outcomes in breast cancer patients. By integrating clinical data, such as patient age, stage of cancer, and treatment history, with detailed gene expression profiles, we aim to develop a predictive model that can accurately forecast survival rates.
- **Microarray Data Analysis for Leukemia** Fall 2021
  - Used a GEO database to analyze microarray data for Leukemia (blood cell cancer) using R language.
- **Digital Currency Fluctuation** Spring 2021
  - Developed Android application to monitor live streaming of digital currency fluctuation.
- **Online Shop** Spring 2020
  - Designed an online shopping application using Java.

SKILLS

- **Programming Languages:** Python, R, Java, C, C^{++}, SQL, Android, Swift, MATLAB
- **Libraries & Frameworks:** PyTorch, TensorFlow, scikit-learn, NumPy, Pandas, SciPy, NLTK, Hugging Face Transformers, LangChain, NetworkX, SQLGlot
- **Tools:** Git, PostgreSQL, SQLite, MongoDB, LaTeX

ACADEMIC SERVICE

- **Sharif Cognitive Sciences Community (Shenasa)**, Student Member, Tehran, Iran Sep 2021 - Jan 2022
  - Collaborated with other students to manage events and programs to promote Cognitive Sciences studies, including Cognitive Neuroscience, Linguistics, Psychology, and Philosophy of Mind.

LANGUAGES

- English (Professional)
  - TOEFL iBT: 111 (Reading: 30, Listening: 29, Speaking: 25, Writing: 27)
- Persian (Native)
- Azeri (Native)