

HASAN ALP CAFEROGLU

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SKILLS

Programming Languages: Python (NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, Flask), JavaScript (React, Next.js), Java, C++, SQL

Cloud & DevOps: AWS (VPC, EC2, ECS, S3, RDS, Lambda, Amplify, Cognito, API Gateway, SES, IAM, WAF, CloudTrail), Docker, Vercel

Data Engineering & Processing: Apache Spark, Apache Airflow, Apache Kafka, Apache Lucene, OpenSearch, MongoDB, MySQL, Qdrant, Redis

ML, LLM, RAG & Agent Technologies: Hugging Face, Ollama, OpenAI API, Gemini API, vLLM, Text Generation Inference (TGI), Model Context Protocol (MCP), LangChain, LangGraph, Unsloth.ai, OpenSearch, Qdrant, Apache Lucene

APIs & Payment Systems: Stripe, API Gateway, OpenAI API, Gemini API

WORK EXPERIENCE

İdea Teknoloji Çözümleri, Turkey

March 2025 – Present

AI Engineer

- Leading the architecture design and end-to-end implementation of an LLM-powered Business Intelligence Agentic System enabling natural language interaction with enterprise data.
- Developing modular, scalable workflows for natural language question understanding, schema-aware data retrieval, and dynamic insight generation using large language models.
- Designing and implementing the project database schema and data pipelines, ensuring seamless integration between relational storage, and agentic workflows.
- Building Retrieval-Augmented Generation (RAG) pipelines leveraging OpenSearch vector databases for knowledge-grounded analytical reasoning and contextual insight generation.
- Implementing vector-based semantic search and entity retrieval systems using Locality Sensitive Hashing (LSH) algorithm for efficient, large-scale indexing and real-time data access.
- Designing and deploying a natural language interface to databases (NLIDB) that enables complex analytical querying through conversational interaction.
- Open-source LLM serving with vLLM to support low-latency inference and scalable deployment within agentic workflows.
- Working on a sandboxed LLM code execution environment for safe and controlled code execution within BI workflows.

Bilkent University, Ankara, Turkey

January 2023 - Present

Teaching and Research Assistant

- Courses: CS101 Algorithms and Programming, CS115 Introduction to Programming in Python, CS353 Database Systems

Epicflow.io, USA, Delaware (Remote)

October 2022 - March 2023

Full Stack Web Developer

- Worked on integrating authentication and payment systems. Developing frontend and backend of the application.
- (JavaScript, React, AWS Cognito, AWS Lambda, Stripe)

ASELSAN, Ankara, Turkey

September 2021 - March 2023

Mechanical System and Design Engineer

Middle East Technical University, Ankara, Turkey

August 2020 - September 2020

Undergraduate Student Researcher

PUBLICATIONS & PREPRINTS

- H. A. Caferoğlu, M.S. Çelik, O. Ulusoy. **SING-SQL: A Synthetic Data Generation Framework for In-Domain Text-to-SQL Translation**, 2025. (In Submission) [PDF] [Code]
- H. A. Caferoğlu, O. Ulusoy. **E-SQL: Direct Schema Linking via Question Enrichment in Text-to-SQL**, 2024. (In Submission) [PDF] [Code]

PROJECTS

Synthetic Data Generation for In-Domain Text-to-SQL Translation (SING-SQL) 🤖 🤖

The project focuses on the real-world enterprise scenarios, where models need to specialize to a single database schema and organizations require to be able to evaluate their Text-to-SQL systems on their own databases. Proposed a fully automated two-stage framework for generating high-quality synthetic Text-to-SQL data tailored to any database without SQL logs or manual annotations. The method hierarchically partitions schemas into sub-schemas, synthesizes multi-level SQL queries, and applies LLM-as-a-judge validation, executability checks, and column balancing for high coverage. Fine-tuned models trained on this data achieved state-of-the-art in-domain performance, outperforming the best baseline (comparable scale) by +16.21%.

(Python, PyTorch, Supervised Fine-Tuning (SFT), Low-Rank Adaptation(LoRA), Unsloth, Gemini API)

Sparse & Dense Retrieval Comparison

December 2024 - January 2025

Developed an information retrieval system to compare sparse and dense (embedding-based) retrieval methods on the multilingual Istella22 dataset. Implemented sparse retrieval using PyLucene and BM25 scoring, and dense retrieval via multilingual transformer-based embeddings indexed with HNSW for approximate nearest neighbor search. Evaluated multiple models and embedding aggregation strategies (first-passage vs. average) under various dataset scales. Additionally, implemented the HDCT framework using fine-tuned BERT for context-aware term weighting. Assessed performance using NDCG, MAP, and MRR, highlighting trade-offs between retrieval quality and computational efficiency.

(Python, Apache Lucene, PyTorch, Supervised Fine-Tuning (SFT))

Text-to-SQL Agentic Workflow Using LLMs (E-SQL)

June 2024 - January 2025

Developing a challenging NLP application utilizing large language models (LLMs) for translating natural language queries into SQL statements (i.e., NL2SQL). This approach significantly lowers the barriers to accessing relational databases by parsing and understanding the structure of natural language to accurately generate corresponding SQL queries. E-SQL ranked 12th on the BIRD benchmark at submission, highlighting its competitiveness among leading NL2SQL models.

(Python, PyTorch, Hugging Face, OpenAI API)

Image Segmentation with R2U-Net 🤖 🤖

January 2024 - May 2024

Implemented a Recurrent Residual Convolutional Neural Network based on U-Net (R2U-Net) and trained and tested it on the Oxford-IIIT Pet dataset for image segmentation.

(Python, PyTorch)

GelGit Travel: A Cloud-Native Application 🤖 🤖

January 2024 - May 2024

Gelgit Travel is a cloud-native application which showcases transportation ticket management and purchase platform. It is developed to learn and utilize fundamental AWS cloud services.

(VPC, EC2, RDS, API Gateway, Lambda, Cognito, SES, Amplify, IAM, WAF, CloudTrail, CloudWatch)

NLIDB Keyword Mapping 🤖 🤖

October 2023 - January 2024

An NLP application that employs weak-supervision techniques to identify the relation between natural language query tokens and database entities, treating the keyword mapping problem as a sequence tagging problem using pre-trained language models like BERT and T5.

(Python, PyTorch, Hugging Face)

Stance Detection - Stream Data 🤖 🤖

October 2023 - January 2024

A Stance Detection project that identifies the attitude of a textual content under the changing nature of the data. Adaptive model which tries to maintain its accuracy overtime by fine-tuning itself using new data.

(Python, PyTorch, Tensorflow, Hugging Face)

EDUCATION

Bilkent University, Ankara, Turkey

September 2023 - Present

Master of Science in Computer Engineering; GPA: 3.95/4.00

Courses: Algorithms, Deep Learning, Machine Learning, Artificial Intelligence, Information Retrieval, Web Search, Computer Vision, Data Science for Software Engineering, Cloud Computing

Bilkent University, Ankara, Turkey

January 2023 - August 2023

Academic Preparation Program in Computer Engineering; GPA: 3.93/4.00

Courses: Fundamental Structures of Computer Science I, Fundamental Structures of Computer Science II, Programming Languages, Database Systems

Middle East Technical University, Ankara, Turkey

August 2016 - July 2021

Bachelor of Science in Mechanical Engineering; GPA: 3.63/4.00 - High Honor

CERTIFICATES

- IBM ETL and Data Pipelines with Shell, Airflow, and Kafka (Credential ID: QNAJ4F6P46FA)
- IBM Introduction to Big Data with Spark and Hadoop (Credential ID: H8XX69LC8LQV)
- DeepLearning.AI Deep Learning Specialization (Credential ID: TY5EEQVRBT8H)

HONORS AND AWARDS

Bilkent University Comprehensive Scholarship

January 2023 - Present

Full tuition waiver, stipend, health insurance, and accommodation during M.Sc.

TUBITAK 1001 Project Scholar

October 2025 - Present

***Project Topic:** Translating Natural Language Queries into Structured Query Language (SQL) Using Large Language Models (LLM) **Project No:** 125E386*

EXTRACURRICULAR ACTIVITIES

METU Business Club, Ankara, Turkey

June 2016 - Jan 2018

Leadership Committee Coordinator & Active Member

Professional Swimmer

2008 - 2015