

Zehra Demirhan

FULL-STACK DEVELOPER · BACKEND ENGINEER

Cankaya, Ankara, Turkey

☎ (+90) 507 932 48 54 | ✉ zehra.demirhan00@gmail.com | 🏠 zehrademirhan.github.io/portfolio/ | 📱 ZehraDemirhan | 📁 zehra-demirhan-b5a26a233

Education

Ihsan Dogramaci Bilkent University

Ankara, Turkey

B.S. IN MATHEMATICS

2018 – 2024

- GPA: 3.43

Ihsan Dogramaci Bilkent University

Ankara, Turkey

MINOR IN INFORMATION SYSTEMS AND TECHNOLOGIES

2021 – 2024

- GPA: 4.00
- Completed 10 courses as part of the minor program.

Summary

Full-Stack Software Engineer specializing in backend development, system optimization, and scalable architectures. Experienced in automated license plate recognition, face recognition, and object tracking, including implementing a custom tracking algorithm for video stability detection. Skilled in AdonisJS, Vue.js, PostgreSQL, RabbitMQ, Kubernetes, and Docker, with a focus on real-time systems and database optimization. Previously led backend development for an AI chat platform, integrating notifications, embeddings, and automation.

Technical Skills

- **Frontend:** Angular, Vue.js, React JS, Next JS, JavaScript, TypeScript, Bootstrap, SCSS, RxJS, Socket.IO
- **Backend:** Node.js, AdonisJS, NestJS, PostgreSQL, Redis, LangChain, BullMQ, RabbitMQ
- **Mobile:** React Native, Android Studio, XCode
- **DevOps:** Docker, Kubernetes, AWS

Work Experience

Turk AI

Ankara, Turkey

FULL-STACK ENGINEER

Sep. 2024 - Present

- Architected scalable video analysis systems using **AdonisJS**, **Vue.js**, and **PostgreSQL**. Implemented an object tracking algorithm to detect stability in video streams, integrating real-time updates via **Socket.IO** and a custom timeline UI.
- Built modular and extensible job pipelines using **IoC** principles and class-based workers, allowing for flexible and pluggable systems.
- Integrated **RabbitMQ** for distributed messaging between workers and main application services.
- Connected and managed internal PostgreSQL databases via internal IP networking, gaining experience in secure service communication and networking.
- Integrated **MinIO object storage** and used PostgreSQL extensions like **pgvector** and **cube** for high-dimensional data handling and optimization.
- Developed real-time UI for video upload and object detection timeline, including filterable/sortable tables for better UX.
- Implemented backend services in AdonisJS and Vue.js frontend components for a conversational AI product.
- Built a robust notification system using cron jobs and scheduled tasks, preventing duplicate alerts with task state tracking.
- Integrated the company's embedding service with OpenAI's, implementing fallback mechanisms and concurrency handling for performance and reliability.
- Developed a user tracking system for advertisements and campaigns, creating unique hashes using IP and OS to track UTM sources.
- Designed and deployed the "Share Song" feature with presigned and masked URLs for secure content sharing, with engagement tracking.
- Automated a daily news-fetching and publishing system, translating content and posting via the WordPress API, with embedded tracking for analytics.

Cubicl

Ankara, Turkey

PART-TIME FULL-STACK ENGINEER

May 2023 - Aug. 2024

- Engineered integrations between the platform and the APIs of leading enterprise solutions including ClickUp, Line, Mailchimp and more.
- Designed and implemented file management solutions using Node.js and **MongoDB**, including components for compressing files, generating files from base64, retrieving base64 content, and handling binary data.
- Led the end-to-end development of a comprehensive app development feature, coordinating both Node.js-based backend and **Next.js** frontend tasks over a four-month period.
- Developed an intuitive user interface using **Angular.js**, enabling users to design app interfaces via a drag-and-drop functionality.
- Facilitated the creation and management of automations within the platform, empowering users to build, save, edit, and review automation workflows.

Cubicl

Ankara, Turkey

MOBILE APP DEVELOPMENT INTERN

Dec. 2022 - Apr. 2023

- Developed a real-time chat feature for the mobile app, leveraging **React Native** and **RxJS**. Implemented functionalities for sending, receiving, and displaying messages with instant updates.
- Integrated push notifications using **Firebase** for real-time message alerts, ensuring users are notified instantly when a new message arrives.
- Designed and implemented chat history management, allowing users to view past conversations with automatic loading and pagination for large chat histories.

Bilkent University

Ankara, Turkey

TEACHING ASSISTANT, LINEAR ALGEBRA FOR ENGINEERS (MATH-220)

Spring 2022

- Assisted in conducting weekly recitation sessions and helped students with problem-solving techniques related to engineering-focused linear algebra topics.
- Graded assignments and quizzes, and provided feedback.

Bilkent University

Ankara, Turkey

TEACHING ASSISTANT, LINEAR ALGEBRA (MATH-223)

Fall 2022

- Led problem-solving sessions and office hours to support student learning in theoretical linear algebra concepts.
- Graded assignments and quizzes, and provided feedback.

Personal Projects

Scalable Real-Time Leaderboard

Remote

FULL-STACK LEADERBOARD

May 2025

- Responsive **Next.js** UI with drag-&-drop columns, country grouping, and autocomplete search.
- Real-time prizes via **Pusher.js** WebSockets and light/dark themes with **styled-components**.
- High-throughput **AdonisJS/Node.js** backend: Dockerized 3-node Redis cluster (10 000 buckets, ZSETs) and **PostgreSQL** with B-tree indexes serving 10 M users.
- Deployed on AWS EC2 + Docker Compose. **Live Demo**, **Backend Repo**, **Frontend Repo**.

Adonis REST API

Remote

FULL-STACK APP

Sep. 2024

- Developed a web application for employee and company management, featuring secure authentication and access control.
- Built the backend using **AdonisJS** and the frontend with **Vue.js**, incorporating access tokens, session storage, and request interceptors.
- **Project Link**

Portfolio Project

Remote

PERSONAL WEBPAGE

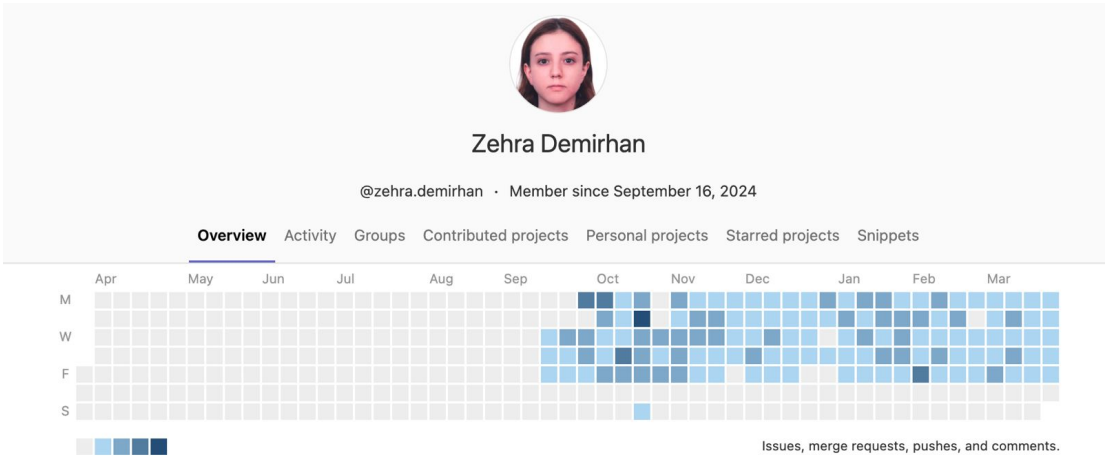
Jul. 2024

- Created a responsive personal website showcasing portfolio, skills, and projects.
- Built with **Angular**, **Bootstrap**, and **Node.js**; features interactive UI but not updated with latest experience.
- **Project Link**

Various Personal Projects

HOBBY - LEARNING PROJECTS

- Online Multiplayer Snake Game using Vite (May 2024), Domino Problem app with AngularJS/SCSS (Apr 2024), Java-based Quiz App with Swing (Fall 2023), My World static site with Materialize CSS/jQuery UI (Fall 2022), Task Manager App with PHP/JS/ClearDB on Heroku (Spring 2022), Initial personal website featuring C, Python, Java and database demos (Spring 2022).



*This image highlights my contributions to the GitLab project during my most recent role. As the repository is accessible exclusively via VPN, I am sharing this snapshot to showcase my work and involvement.

Writings

Hamiltonian Systems

MATHEMATICAL PAPER

July 10, 2024

- Explored classical mechanics through the lens of Hamiltonian and Lagrangian systems.
- Analyzed the principle of least action and conservation of energy, deriving Euler-Lagrange equations and the Legendre transformation.
- Examined the geometric structure of phase space and the role of Hamiltonian mechanics in quantum and celestial systems.
- [Paper Link](#)

Quantifying Information: Claude Shannon's Legacy and the Source Coding Theorem

MATHEMATICAL PAPER

January 24, 2024

- Investigated Shannon's contributions to the field of information theory through technical lenses.
- Defined key terms such as ensemble entropy, δ -sufficient subsets, and essential bit content.
- Proved Shannon's Source Coding Theorem with supporting mathematical framework and examples.
- [Paper Link](#)

Brownian Motion and the Black-Scholes Model

MATHEMATICAL FINANCE PROJECT (WITH UĞUR ERDEM SEYFİ)

May 20, 2023

- Provided a detailed derivation of the Black-Scholes pricing equation for financial derivatives.
- Introduced stochastic processes, with a focus on Brownian motion and Ito's Lemma.
- Built the mathematical foundation necessary for asset pricing and option valuation.
- [Paper Link](#)

How Did Political Motivations Influence the Christianization of Scandinavia During the Viking Age?

HISTORY PAPER

May 26, 2024

- Explored the political foundations of Christianization in Scandinavian countries during the Viking Age.
- Focused on key figures like Harald Klak and the role of Frankish support in promoting religious conversion.
- [Paper Link](#)

The Black Death and Its Effects on Medieval Europe

HISTORY PAPER

February 5, 2024

- Analyzed the demographic, economic, and social impacts of the Black Death on medieval Europe.
- Discussed disease transmission, social reactions, and shifts in clerical and societal norms.
- [Paper Link](#)

Presentation

Directed Reading Program (DRP Turkey) Symposium

SPEAKER FOR DIRECTED READING PROGRAM (DRP TURKEY) SYMPOSIUM

Spring 2021

- Delivered a talk on p -adic numbers, including a proof of **Ostrowski's Theorem**, as part of the DRP Turkey Symposium.
- Shared insights gained through directed reading sessions and mathematical exploration.
- Presentation recording: [YouTube](#), Slides (PDF): [Google Drive](#)

MOCA 2019 Event Hosted by Sabancı University School of Languages

REPRESENTED BILKENT UNIVERSITY IN MOCA 2019

2019 (Spring)

- Represented Bilkent University at the MOCA 2019 event, hosted by the Sabancı University School of Languages.

Honors & Awards

2018-2024 **High Honour Certificate**, 2021-2022 (Spring), 2020-2021 (Spring), 2019-2020 (Spring)

Bilkent University

2018-2024 **Honour Certificate**, 2023-2024 (Spring), 2022-2023 (Spring), 2022-2023 (Fall), 2020-2021 (Fall)

Bilkent University

2018-2024 **Full Scholarship**, Bilkent University

Ankara, Turkey

Languages

- **Turkish:** Native speaker
- **English:** C1 – Scored 114.5/120 in Bilkent University's PAE exam.
- **German:** B1.1 – Completed four university-level courses with grade A in all.