RetinAI

Ceyda GİRGEÇ, Cem ÜNSAL, Ömer Faruk KILIÇ
Dr. Sevgi KOYUNCU TUNÇ

Çankaya University, Department of Software Engineering

Abstract

This project presents an AI-based web application developed to detect diabetic retinopathy at an early stage. By classifying retinal images, the system identifies the severity level of the disease, aiming to accelerate the diagnostic process for physicians and increase the chance of early intervention for patients.

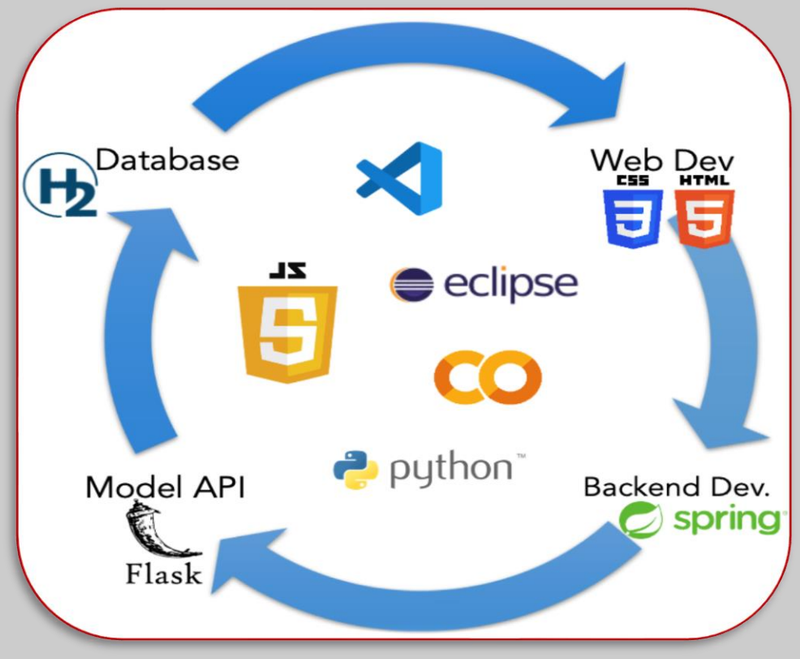

Figure-1 Used Technologies

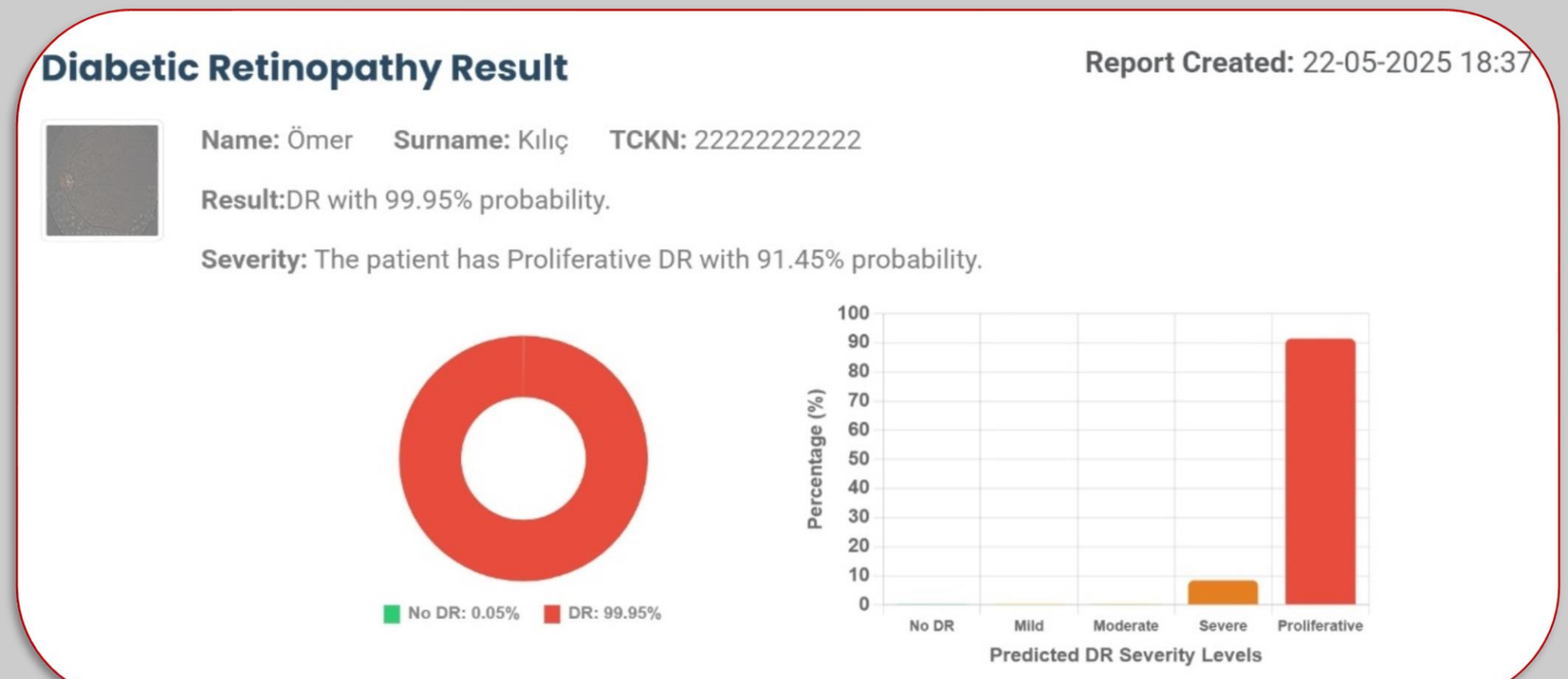

Figure-2 Final Product

Introduction

Diabetic retinopathy is a serious eye disease caused by diabetes and often progresses without symptoms in its early stages. Early diagnosis is crucial to prevent permanent vision loss. In this project, an AI-based web application was developed to analyze retinal images and determine the severity of the disease. The system aims to support healthcare professionals and facilitate early intervention. With its open-source and online accessibility, it can be used for both medical and research purposes.

Company Info

RetinAI is designed to be used both for pre-screening in clinical settings and by individual users. The project is supported by TÜBİTAK under the 2209-A University Students Research Projects Support Program.

Solution

The proposed solution is an AI-powered web application that classifies retinal images into five diabetic retinopathy stages. It uses a fine-tuned EfficientNet-B3 convolutional neural network, trained with advanced data augmentation, oversampling, and regularization techniques to improve generalization. The system accepts an image upload, processes it through the model, and instantly returns the predicted severity level. The user-friendly interface is designed for accessibility and ease of use by both medical professionals and general users. The application requires no installation and runs entirely through the web.

Results & Conclusion

The system was trained using the EfficientNet-B3 model and achieved high accuracy in five-class classification. With its user-friendly interface, fast response time, and web-based structure, the system appeals to a wide range of users. Throughout the project, the applicability and accessibility of AI-powered early diagnosis systems were enhanced. In the future, the system is planned to be tested in clinical environments and improved with larger datasets.

Acknowledgement

We would like to express our sincere gratitude to our advisor, Dr. Sevgi Koyuncu Tunç, for her valuable guidance and support throughout this project. We also thank TÜBİTAK for their financial support under the 2209-A University Students Research Projects Support Program. We are grateful to all academic staff who contributed to the project.