



**AYDIN ADNAN MENDERES
UNIVERSITY**

Faculty of Engineering

Department of Computer Engineering

2024–2025 Graduation Projects

Poster Exhibition Booklet

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FOREWORD

This booklet has been prepared to bring together the poster presentations of the graduation projects carried out by the students of the Department of Computer Engineering during the 2024-2025 academic year. The posters were presented at the exhibition held on May 23, 2025 and attracted great interest. We hope that this booklet will be a permanent resource that carries the scientific knowledge of the department, the productivity of the students and their ties with the industry to the future years.

INTRODUCTION

Graduation projects include the work that students develop by applying the knowledge and skills they have acquired during their undergraduate education to real-world problems. Current topics such as artificial intelligence, web and mobile applications, network and cloud technologies were addressed in the projects. This year, 45 different projects were evaluated and exhibited. Poster presentations were carried out with intense participation of both academia and industry environments. Participants examined the student projects, provided feedback and evaluated the projects that were eligible for awards.

POSTER COMPETITION

Projects were evaluated by both academic and industrial jury members within the scope of the poster exhibition. Evaluation criteria include

- Project topic and originality
- Technical competence and implementation
- Visual layout of the presentation
- Innovation and sectoral applicability

The first three projects have been determined as follows.

1.Project Title: Fabric Pattern Segmentation and Production Using Artificial Intelligence

Project Team: Beyza Şahin, Deniz Türköz, Zahraa Altekreeti

Supervisor: Assoc. Prof. Dr. Ahmet Çağdaş Seçkin

2.Project Title: Deepfake Image Detection with Lightweight Deep Learning Models

Project Team: Ardlı Silan Aydın, Elif Yılmaz, Neslihan Özdil

Supervisor: Assist. Prof. Dr. Samsun Mustafa Basarıcı

3.Project Title: Energy Efficient Virtual Machine Allocation Optimization in Cloud Computing

Project Team: Tamer Kanak

Supervisor: Assist. Prof. Dr Hüseyn Abacı

ACKNOWLEDGEMENTS

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The First Project

Fabric Pattern Segmentation
and Production Using
Artificial Intelligence

FABRIC PATTERN SEGMENTATION AND WEAVING PARAMETER PREDICTION USING ARTIFICIAL INTELLIGENCE



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Bu proje 2209-B Üniversite Öğrencileri Sanayiye Yönelik Araştırma Projeleri Destek Programı kapsamında Ağaoğlu Tekstil Arge Merkezi danışmanlığında yürütülmektedir.

ABSTRACT / ÖZET

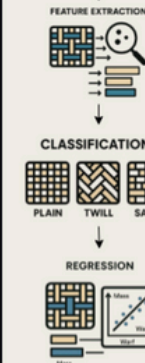
This project focuses on the development of a low-cost, efficient, and scalable solution for automating fabric texture classification and predicting key production parameters in the textile industry. Using a large and diverse dataset of microscopic fabric images, the system classifies texture types—basic, twill, and satin—with high accuracy, while also estimating critical production variables such as weft density, warp density, and fabric weight.

Bu proje, tekstil endüstrisinde kumaş doku sınıflandırmasını otomatikleştirmek ve temel üretim parametrelerini tahmin etmek amacıyla düşük maliyetli, verimli ve ölçeklenebilir bir çözüm geliştirmeye odaklanmaktadır. Geniş ve çeşitli mikroskopik kumaş görüntülerinden oluşan bir veri seti kullanılarak, sistem düz, dimi ve saten doku türlerini yüksek doğrulukla sınıflandırırken; aynı zamanda atkı yoğunluğu, çözgü yoğunluğu ve kumaş ağırlığı gibi kritik üretim parametrelerini de tahmin etmektedir.

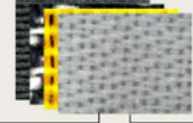
INTRODUCTION

A wide range of handcrafted feature extraction techniques, including GLCM, LBP, GFB, and IFV, were employed and combined with supervised machine learning algorithms like Random Forest, XGBoost, and MLP. In addition to traditional methods, deep learning techniques were integrated into the study. A Convolutional Neural Network (CNN)-based architecture was implemented to allow end-to-end learning directly from image data, enhancing the system's performance and eliminating the need for manual feature engineering. Furthermore, an image-based segmentation module was developed using manually masked training images. This module enables the detection and separation of multiple texture regions within a single fabric image, extending the system's capability to analyze more complex textile structures. The proposed approach significantly reduces human dependency, improves inspection speed, and optimizes material usage—contributing to quality control, operational efficiency, and sustainability in textile production.

A total of 458 features were extracted from single-pattern fabrics using techniques such as GLCM, LBP, GFB, and IFV. The model was then optimized by selecting the 50 most impactful features, successfully preserving high classification accuracy.

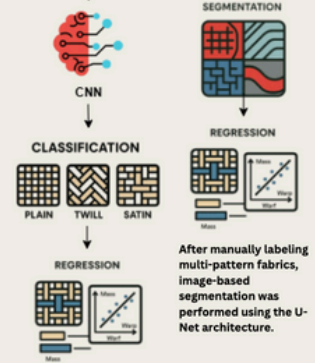


The fabrics were classified according to their texture types as basic, twill, and satin. Weft, warp, and mass parameters were predicted using regression techniques.



Single Pattern

Multi Pattern



After manually labeling multi-pattern fabrics, image-based segmentation was performed using the U-Net architecture.

Automatic feature extraction was performed using a CNN architecture, followed by classification and regression tasks.

RESULTS

The proposed system has demonstrated high accuracy rates in tissue classification, regression, and segmentation tasks.

- Fabric Classification:** The CNN model achieved 97% accuracy, while the XGBoost model maintained 98% accuracy despite a reduction in the number of features, providing fast and reliable real-time predictions.
- Regression:** The Random Forest model delivered the best result for specific weight prediction with a 2.84 g/cm² MAE, while the XGBoost model achieved the highest accuracy in warp and weft predictions, with MAEs of 0.17 g/cm² and 0.086 g/cm², respectively.
- Segmentation:** The U-Net model successfully detected tissue regions with an average IoU value of 0.9866, completing the segmentation process in 0.67 seconds per image.
- Real-Time Application:** The optimized models perform classification with speeds as fast as 0.002 seconds per image, making them highly suitable for industrial applications.

Model	Accuracy	Train Time (s)	Test Time (s)
XGBoost	0.985097	6.06	0.06
Random Forest	0.971684	17.2	0.05
MLP	0.994039	14.01	0.01

The Second Project

Deepfake Image Detection
with Lightweight Deep
Learning Models

Deepfake Image Detection with Lightweight Deep Learning Models

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Özet (TR)

Bu çalışma, derin sahte (deepfake) içeriklerin medya manipülasyonu tehditlerine karşı, CNN ve görüntü işleme teknikleriyle tespit çözümleri geliştirmeyi hedefler. Celeb-DF v2 veri setiyle (345.066 eğitim, 86.482 test görsel) derin öğrenme yöntemleri kullanıldı: 1) Doğrudan video kareleriyle eğitim, 2) MTCNN ile yüz çıkarımı, bilgi damacına ve budama, 3) OpenCV DNN ile yüz çıkarımı, 4) MTCNN ile yüz gösterilerinin doğrudan kullanılması. ResNet18, MobileNetV2, EfficientNet-B0, ResNet50, MobileNetV3 ve Mesonet modelleri NVIDIA GeForce RTX 4060 GPU'da eğitildi; en yüksek performans dördüncü yöntemde EfficientNet-B0 ile elde edildi. SSB ve YOK ile birleştirilerek, SAYZEK koordinasyonunda, ATP 2024-2025 kapsamında desteklenen kalıf, savunma ve güvenlik için yüksek doğruluklu, uygulanabilir çözümler sunar.

Abstract (EN)

This study aims to develop detection solutions for deepfake content threats in media manipulation using CNN and image processing techniques. Four deep learning methods were employed with the Celeb-DF v2 dataset (345,066 training, 86,482 test images): 1) Direct training on video frames, 2) MTCNN-based face extraction with knowledge distillation and pruning, 3) OpenCV DNN-based face extraction, and 4) Direct use of MTCNN-extracted face images. ResNet18, MobileNetV2, EfficientNet-B0, ResNet50, MobileNetV3, and Mesonet models were trained on an NVIDIA GeForce RTX 4060 GPU, with the highest performance achieved by EfficientNet-B0 in the fourth method. Supported by the SSB and YOK collaboration under the SAYZEK coordination within the ATP 2024-2025 framework, this study offers highly accurate, practical solutions for defense and security.

Figure #1 Data Example



Data Preprocessing

The Celeb-DF v2 dataset consists of 5,639 fake and 890 real videos. Using OpenCV, 30 frames were extracted from each video, resulting in a total of 313,526 training images (135,330 real and 178,196 fake) and 78,136 test images (33,840 real and 44,296 fake). To increase the number of real frames, various augmentation techniques were applied using the Albumentations library, including horizontal flipping, brightness/contrast adjustment, rotation, Gaussian blur, and hue modification.

Figure #2 Dataset Table

Stage	Data Type	Video Count	Frame Count	Post-Augmentation Frame Count
Training	Real	890	21,331	135,330
	Fake	5,639	169,170	178,196
Test	Real	890	5,340	33,840
	Fake	5,639	42,279	44,296

Figure #3 Data Augmentation Example



Methods Used

Method 1

Direct Frames Based Training

Frames were extracted from videos using OpenCV. EfficientNet-B0: Accuracy 0.96, training 53,172 s, testing 619 s. MobileNetV2: Accuracy 0.96, training 51,218 s, testing 632 s. ResNet18: Accuracy 0.95, training 49,537 s, testing 601 s. Input Type/Size: 224x224 pixel RGB images. Epochs: 32. Batch Size: 32. Optimization: Adam ($\eta=0.0001$). Loss Function: BCEWithLogitsLoss. Model Modifications: EfficientNet-B0's classifier layer was restructured with nn.Linear for 1 output unit. MobileNetV2's classifier[1] layer was adjusted to produce 1 output based on the final channel count. ResNet18's fc layer was updated to generate 1 output unit. Training/Testing Dynamics: During training, loss was reported every 100 batches, and average loss was calculated at the end of each epoch. In testing, outputs were compressed to [0, 1] range using sigmoid and classified with a 0.5 threshold, with progress monitored every 50 batches.

Method 2

Training with Knowledge Distillation and Pruning

Frames were extracted from videos using MTCNN. ResNet50 (Teacher): Accuracy 0.80, training 48,093.98 s, test 858.17 s. Mesonet (Student): Accuracy 0.77, training 56,416.89 s, test 752.98 s. Mesonet (Pruned): Accuracy 0.77, training 38,515.21 s, test 593.32 s. Input Type/Size: 224x224 pixel RGB images. Epoch: 20 (teacher/student), 15 (pruned). Batch Size: 16. Optimization: Adam ($\eta=0.001$ teacher/student, $\eta=0.0001$ pruned). Loss Function: CrossEntropyLoss (teacher), DistillationLoss (student, alpha=0.1, temperature=3.0). Model Modifications: ResNet50's fc layer replaced with identity and additional layers (128-2 output) were added. Mesonet defined as a customized convolutional network. Training/Testing Dynamics: Loss and accuracy reported at each epoch during training, early stopping (patience=5) was used. During testing, probabilities were calculated with softmax, progress tracked over 50 batches.

Method 3

DNN-Based Face Extraction and Training

Frames were extracted from videos using OpenCV DNN. MobileNetV3: Accuracy 0.81, training 8,428.57 s, testing 83.85 s. ResNet18: Accuracy 0.80, training 6,635.65 s, testing 73.11 s. EfficientNet-B0: Accuracy 0.82, training 6,379.72 s, testing 75.06 s. Mesonet: Accuracy 0.66, training 3,349.26 s, testing 79.62 s. Input Type/Size: 150x150 pixel RGB images. Epochs: 15. Batch Size: 64. Optimization: Adam ($\eta=0.001$). Loss Function: CrossEntropyLoss (class-weighted). Model Modifications: MobileNetV3's classifier[3], ResNet18's fc, and EfficientNet-B0's classifier[1] layers were adapted for 2 outputs. Mesonet was defined as a customized CNN. Training/Testing Dynamics: During training, loss and accuracy were reported each epoch, with early stopping (patience=5) applied. In testing, probabilities were calculated using softmax.

Method 4

MTCNN-Based Face Extraction and Training

Frames were extracted from videos using MTCNN. MobileNetV2: Accuracy 0.97, training 26,467.59 s, testing 204.83 s. EfficientNet-B0: Accuracy 0.97, training 31,669.15 s, testing 204.84 s. ResNet18: Accuracy 0.97, training 23,120.38 s, testing 205.86 s. Input Type/Size: 224x224 pixel RGB images. Epochs: 20. Batch Size: 32. Optimization: Adam ($\eta=0.0001$). Loss Function: BCEWithLogitsLoss. Model Modifications: MobileNetV2's classifier[1], EfficientNet-B0's classifier[1], and ResNet18's fc layers were updated for 1 output unit. Training/Testing Dynamics: During training, loss and accuracy were reported each epoch, with early stopping (patience=5) applied. In testing, classification was performed using sigmoid with a 0.5 threshold.

Figure #4 Methods Diagram



Figure #5 Best Result Report

Classification Report	precision	recall	f1-score	support
real	0.99	0.94	0.97	42180
Fake	0.95	0.99	0.97	42490
accuracy	0.97	0.97	0.97	84670
weighted avg	0.97	0.97	0.97	84670

Results and Conclusion

In this study, various models were evaluated for deepfake detection using four methods: direct frame, DNN and MTCNN-based face extraction, and knowledge distillation and pruning. In the direct frame method, MobileNetV2 and EfficientNet-B0 achieved 96% accuracy, while ResNet18 achieved 95%. With the MTCNN method, the same models reached 97% accuracy. In DNN-based face extraction, accuracy reached up to 82.41%, with faster results. The distillation-pruning method showed lower performance, with Mesonet at 77.92%. Training time in MTCNN was -31,669 s, while in DNN, it was reduced to -8,429 s. In conclusion, the MTCNN face-based approach provided the highest accuracy, while DNN is suitable for scenarios prioritizing speed. Distillation and pruning methods were effective for model lightweighting but resulted in reduced accuracy. EfficientNet-B0 consistently delivered stable results across all methods.

Figure #6 Results Table

Method	Model	Face Extraction	Technique	Celeb-DF Accuracy
1	ResNet18	None	Direct	95%
1	MobileNetV2	None	Direct	96%
1	EfficientNet-B0	None	Direct	96%
2	ResNet50	MTCNN	Teacher	80.95%
2	Mesonet	MTCNN	Distillation	77.17%
2	Mesonet	MTCNN	Pruning	77.92%
3	MobileNetV3	DNN	Direct	81.30%
3	ResNet18	DNN	Direct	80.59%
3	EfficientNet-B0	DNN	Direct	82.41%
3	MobileNetV2	DNN	Direct	66.07%
4	MobileNetV2	MTCNN	Model Training	97%
4	EfficientNet-B0	MTCNN	Model Training	97%
4	ResNet18	MTCNN	Model Training	97%

References

- Helary, R., Messaoud, S., Bouafla, S., Hajaji, M. A., & Mibaa, A. (2023). DTL-ResNet18: facial emotion recognition based on deep transfer learning and improved ResNet18.
- Li, Y., Chang, M. C., & Lyu, S. (2020). Celeb-DF: A Large-scale Challenging Dataset for DeepFake Forensics. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 3207-3216. <https://doi.org/10.1109/CVPR40020.2020.00327>
- Sandler, M., Howard, A., Zhu, M., Zhmoginov, A., & Chen, L. C. (2018). MobileNetV2: Inverted Residuals and Linear Bottlenecks. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, 4510-4520. <https://doi.org/10.1109/CVPR.2018.00474>
- Zhang, K., Zhang, Z., Li, Z., & Qiao, Y. (2016). Joint Face Detection and Alignment Using Multi-task Cascaded Convolutional Networks (MTCNN). IEEE Signal Processing Letters, 23(10), 1499-1503. <https://doi.org/10.1109/LSP.2016.2603342>
- OpenCV Team. (2024). OpenCV: Open Source Computer Vision Library. <https://opencv.org>
- Bustani, A., Piatov, A., Khvedcherrya, E., Igolkov, V. I., & Kaban, A. A. (2020). Albumentations: Fast and Flexible Image Augmentations. Information, 11(2), 125. <https://doi.org/10.3390/info11020125>
- Kingma, D. P., & Ba, J. (2014). Adam: A Method for Stochastic Optimization. arXiv preprint arXiv:1412.6980. <https://arxiv.org/abs/1412.6980>
- Hinton, G., Vinyals, O., & Dean, J. (2015). Distilling the Knowledge in a Neural Network. arXiv preprint arXiv:1503.02531. <https://arxiv.org/abs/1503.02531>

The Third Project

Energy Efficient Virtual
Machine Allocation
Optimization in Cloud
Computing

Alphabetical Sorting by Project Name

Abstract

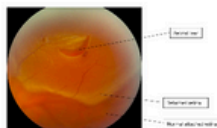
Retinal tear and detachment are serious ophthalmic conditions that can lead to vision loss if not diagnosed early. Accurate analysis of individual risk factors and timely intervention play a critical role in prevention. This study proposes an AI-assisted multi-model system that integrates Convolutional Neural Networks and clustering algorithms to predict the likelihood of retinal tear or detachment based on individual factors including age, gender, myopia, and cataract. A custom risk factor was calculated using epidemiological evidence and it is incorporated into the classification process. Additionally, K-Means clustering was applied to generate normalized risk scores based on the distance between individual profiles and cluster centroids. The results indicate that the model provides systematic and personalized risk estimations, showing strong alignment with established clinical knowledge.

Retinal Tear & Detachment

- A **retinal tear** occurs when the retina develops a small break, often caused by traction from the vitreous gel.
- If fluid passes through this tear, it can cause the retina to lift off from the underlying tissue, leading to a **retinal detachment**.

Risk factors:

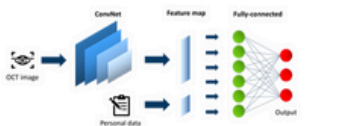
- Aging
- High myopia
- Eye trauma
- Cataract
- Previous eye surgery
- Family history of retinal disorders



Methods

Classification

- A custom **ConvNet** architecture was developed to extract features from retinal images.
- Encoded age and gender data were concatenated with these features.
- The combined vector was input into an **ANN** for classification.
- The model classified samples into myopia, cataract, or normal classes.



Integration of a Custom 'Risk Factor'

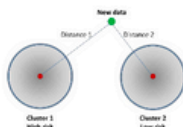
- A feature named **'Risk factor'** was introduced in the proposed model to enhance the assessment of individual variables on disease prediction.
- This feature was specifically designed to reflect the influence of age and gender on ocular conditions.
- Its value was computed by assigning weights based on their established associations with normal, myopia, and cataract diagnoses reported in the literature.

$$\text{Risk factor} = X_{\text{normal}} + W_{\text{myopia}} X_{\text{myopia}} + W_{\text{cataract}} X_{\text{cataract}} + W_{\text{gender}} X_{\text{gender}} + W_{\text{age}} X_{\text{age}}$$

Prediction

- The **K-Means** algorithm was employed to cluster individuals into two groups, representing low and high likelihoods of developing retinal tear or detachment.
- For each subject, the **Euclidean distances** to both cluster centroids were computed.
- The difference between these distances was calculated and subsequently **normalized** to estimate the relative risk level.

$$\text{Risk score} = \text{Norm}(|\text{distance 1}| - |\text{distance 2}|)$$

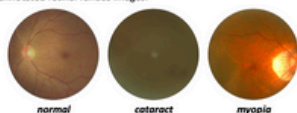


Data sources

This study employs the **ODIR-2019** challenge dataset, using only the myopia, cataract, and normal classes from the annotated retinal fundus images.

Preprocessing:

- Cropping
- Resizing
- Normalizing
- Encoding
- Standardizing
- Data augmentation



<https://codr2019.grand-challenge.org/retina/>

System design



Beyond literature

LITERATURE APPROACHES	PROPOSED MODEL
✓ Only visual data (OCT/Fundus)	✓ Visual and clinical data (age, gender)
✗ Ignores patient-specific risk factors	✓ Patient-specific profiles
✓ CNN-based classifiers	✓ ConvNet + K-Means hybrid
✗ Less interpretable	✓ More interpretable outputs
✗ Generic classification	✓ Risk-group-aware predictions

Results & Conclusion

The system effectively differentiates predicted risk based on:

- age,
 - gender,
 - myopia,
 - cataract
- aligning consistently with established medical literature.

Inputs	Outputs
Fundus image of the eye	Classified disease class (Cataract / Myopia / Normal)
Patient's age	Predicted risk score
Patient's gender	Risk status (Low / Moderate / High)



- The findings reveal how the model's predictions, based on various individual factors, are distributed within the dataset and how they vary according to different variables.
- The model's prediction outcomes demonstrate a systematic and consistent alignment with established ratios recognized in the fields of health and medical sciences.

A RETRIEVAL-AUGMENTED GENERATION (RAG) BASED QUESTION-ANSWERING SYSTEM FOR THE TURKISH LEGAL CONSULTATION

THIS STUDY PRESENTS ADALETDANIŞ, A QUESTION-ANSWERING SYSTEM DEVELOPED USING THE RAG ARCHITECTURE TO ENHANCE THE ACCESSIBILITY OF LEGAL KNOWLEDGE.

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ABSTRACT

Access to legal consultation services remains a significant challenge for many individuals due to the complexity of legal procedures and high associated costs. This study proposes ADALETDANIŞ, an AI-powered chatbot platform that utilizes Turkish legal documents to address this issue. The proposed system is designed using the Retrieval-Augmented Generation (RAG) architecture and leverages advanced deep learning models such as BERT and T5 to generate fast and accurate responses to users' legal questions. In doing so, the system democratizes access to legal information and reduces the reliance on costly legal consultation services.



ÖZET

Günümüzde dijital platformlar üzerinden bilgiye erişim artarken hukuki danışmanlık almak, karmaşık süreçler ve yüksek maliyetler nedeniyle sınırlı kalmaktadır. Bu tez kapsamında geliştirilen ADALETDANIŞ adlı web tabanlı yapayzeka sohbet botu, kullanıcılara hızlı, doğru ve erişilebilir hukuki bilgi sunmayı hedeflemektedir. Sistem, Türk hukuk dokümanlarından yararlanarak RAG (bilgi getirme destekli üretim) mimarisi ile çalışmakta ve BERT ile T5 gibi modelleri bir arada kullanmaktadır. Bu yaklaşım hukuki bilginin daha geniş kitlelere ulaşması sağlanarak yasal danışmanlık ihtiyacına yenilikçi bir alternatif sunulmaktadır.

METHODOLOGY

The proposed system is designed based on the Retrieval-Augmented Generation (RAG) approach. In the first step, a knowledge base was constructed from Turkish legal texts (e.g., laws and court decisions), and these documents were subjected to preprocessing. Then, a BERT-based retrieval model was trained to match user queries with relevant content from the knowledge base. Based on the retrieved content, a T5-based language model was used to generate the final answers. The performance of the system was evaluated on a curated Turkish legal question-answer dataset using metrics such as accuracy, precision, recall, and F1-score.

Kayıt Ol

Username:

Email:

İ-posta adresinizi girin (teşahhüs bağı)

Password1:

Şifre oluşturun

Password2:

Şifreyi tekrar girin

Kayıt Ol

Zaten bir hesabınız var mı? Giriş Yap

Giriş Yap

Username:

Kullanıcı adınızı girin

Password:

Şifrenizi girin

Giriş Yap

Hesabınız yok mu? Kayıt Ol

ADALETDANIŞ

AdaletDanış'a Hoş Geldiniz

Hukuki sorularınıza yapay zeka desteği, hızlı ve güvenilir yanıtlar alın. Üzmayın sistemimiz 7/24 Hizmetinizde.

Hızlı Yanıtlar

Sorularınıza saniyeler içinde profesyonel yanıtlar alın.

Güvenilir Bilgi

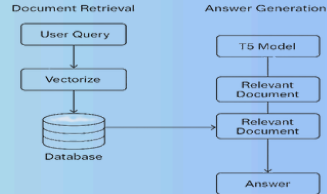
Güncel mevzuat ve içtihatlarla desteklenmiş yanıtlar.

7/24 Erişim

İstediğiniz zaman, istediğiniz yerden hukuki destek alın.

SYSTEM ARCHITECTURE

The architecture of the ADALETDANIŞ system is based on the principles of Retrieval-Augmented Generation (RAG) and is designed with two main components: information retrieval and answer generation. In the first stage, a BERT-based retrieval mechanism searches the legal document database to fetch the most relevant texts corresponding to the user's query. In the second stage, the retrieved texts are fed into a T5-based language model, which generates a natural language response appropriate to the question. This two-step architecture enables the system to provide answers that are both grounded in reliable legal sources and fluently articulated.



RESULTS

The experiments demonstrated that the ADALETDANIŞ system performs effectively in answering legal questions. According to the evaluation metrics, the model achieved approximately 85% accuracy and a comparable F1 score on the test dataset, indicating a high level of correctness in its responses. Furthermore, the system's answers were observed to be consistent and well-articulated, grounded in relevant legal sources.

This project is supported by the following institutions:

- Presidency of Defence Industries (SSB), SAYZEK - Defense Industry Artificial Intelligence Capability Cluster, Artificial Intelligence Academic Thesis Program (ATP)
- The Scientific and Technological Research Council of Turkey (TÜBİTAK), BİDEB - 2209-A University Students Research Projects Support Program
- T3 AI Undergraduate Research Scholarship Program

CONCLUSION

This study marks a significant step toward the democratization of legal knowledge by offering an intelligent consultation platform that users can access free of charge. The ADALETDANIŞ system successfully fulfilled its purpose by providing highly accurate responses to legal questions during testing. The results indicate that this approach can reduce the need for costly legal consultation services and serve as a foundation for future AI-based legal applications.

A Web-Based Stock and Order Tracking System for SMEs

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Introduction

Digital transformation in business operations has accelerated in recent years, particularly among small and medium-sized enterprises (SMEs). According to OECD 2023 data, approximately 70% of SMEs in Turkey are now using basic digital tools such as websites, social media, and e-invoicing systems. This marks a significant increase in digital engagement compared to previous years. However, many SMEs still rely on outdated methods for inventory and order tracking, including manual entries or spreadsheet-based systems, which are prone to human error and inefficiencies. The need for secure, scalable, and user-friendly management tools is more critical than ever.

In this context, our project introduces a web-based stock and order tracking system developed using React.js, Node.js, and MongoDB, specifically designed to meet the operational needs of SMEs. With features like role-based access control, protected routes, and real-time data handling, the system aims to bridge the gap between traditional practices and modern digital solutions.

Recent years have witnessed a notable increase in the digital intensity of small and medium-sized enterprises (SMEs) across Europe. Figure 1 illustrates the rise in the Digital Intensity Index (DI) of SMEs across Europe from 2017 to 2021, highlighting increased adoption of digital technologies. Figure 2 presents the pricings of product entries on our database, the chart has been gathered from MongoDB. Figure 3 provides a high-level view of the backend architecture, developed using Node.js and RESTful API principles. Figure 4 displays a sample dashboard interface summarizing key financial metrics such as monthly and annual sales, profit, and loss. Figure 5 demonstrates example work orders submitted by a customer, including associated machines and products.

Figure #1 Digital intensity index in SMEs of EU27

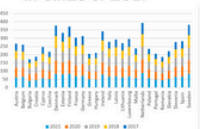


Figure #2 Products Pricing Chart

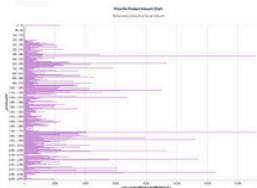


Figure #4 Dashboard



Abstract. In this project, a full-stack web-based inventory and work order tracking system was developed for small and medium-sized enterprises (SMEs). The system allows customers to submit product-based work orders linked to their machines, while admins manage product stock and order statuses.

Özet. Bu projede, küçük ve orta ölçekli işletmeler (KOBİ'ler) için tam yığın web tabanlı envanter ve iş emri izleme sistemi geliştirildi. Sistem, müşterilerin makinelerine bağlı ürün tabanlı iş emirleri göndermesine olanak tanıyan, yöneticiler ürün stoklarını ve sipariş durumlarını yönetir.

Conclusion: The developed system provides an effective and user-friendly digital solution for stock and work order tracking. It reduces operational errors, improves efficiency, and enhances customer interaction. The architecture is scalable and suitable for future integration with mobile platforms or real-time notification systems.

Figure #3 Module Structure



Structure of the System

Figure #5 Work Orders



References

- [1] React Documentation, *Building User Interfaces with React.js*, Meta Inc., <https://reactjs.org>, Accessed May 2025.
- [2] Node.js Foundation, *Node.js v20.x Documentation*, <https://nodejs.org>, Accessed May 2025.
- [3] MongoDB Inc., *MongoDB Manual: Data Models and Aggregations*, <https://www.mongodb.com/docs>, 2025.
- [4] OECD, *Digital Transformation of SMEs*, OECD Publishing, Paris, 2023.
- [5] TÜİK, *Girişimlerde Bilişim Teknolojileri Kullanım Araştırması*, Türkiye İstatistik Kurumu Yayınları, 2021.

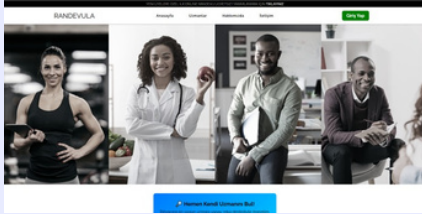
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INTRODUCTION

Remote work and wellness trends have surged, but most booking sites still leave users guessing which expert fits them best. Our AI-driven web platform bridges that gap by analyzing post-session feedback to match clients with the most suitable dietitians, psychologists, teachers and fitness coaches, saving time and boosting satisfaction.



ÖZET

Bu proje, yapay zekâ destekli bir web platformu geliştirerek kullanıcıları diyetisyen, psikolog, öğretmen ve fitness koçu gibi uzmanlarla eşleştirir. Seans sonrası geri bildirimler analiz edilerek en uygun uzmanlar belirlenir ve otomatik Zoom bağlantıları oluşturulur. Böylece kullanıcılar ihtiyaçlarına uygun hizmete hızlıca ulaşırken, uzmanlar da görünürlük kazanır.

Uzman Önerme Sistemi

Uzmanlık Alanı Seçin:
Diyetisyen

İhtiyaçınızı Seçin:
Kilo kontrol

Öneri Al

CONCLUSION

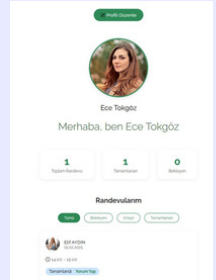
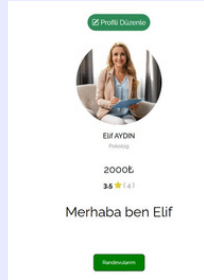
- Focused Service: Reducing trial-and-error and admin tasks, clients focus on progress, experts on care.
- Data-Driven Trust: NLP analysis turns feedback into evidence, strengthening recommendations.
- Accessible Support: AI makes expert guidance accessible from anywhere.

ABSTRACT

This project develops an AI-powered web platform that connects users with dietitians, psychologists, teachers, and fitness coaches. Post-session feedback is analyzed to recommend the most suitable experts, and Zoom links are automatically generated. This streamlines access to relevant services for users while enhancing visibility for professionals.

TECHNOLOGY STACK

- **Programming language:** Python 3.11
- **Web framework:** Django 4 (MVT, REST API, JWT auth)
- **Database:** Django's default, file-based relational engine bundled with Python
- **AI / NLP:** spaCy, scikit-learn, Hugging Face Transformers (BERT fine-tuned on 15 need-tags)
- **Frontend:** HTML5, CSS3, Bootstrap 5, JavaScript
- **Scheduling & video:** Zoom REST API (auto-meeting creation)



RESULTS/FINDINGS

- Quick Need Detection: BERT model maps each review to one of 15 need-tags in seconds.
- Right Match First Time: Category scoring guides users to the right expert, reducing trial and error.
- Auto Booking System: Approved sessions auto-generate Zoom links, saving time.
- Easy Access: Rural users included, anyone can connect with experts without travel.

Analysis and Early Detection of Drug Side Effects with Machine Learning and Artificial Intelligence Methods



Abstract

This project focuses on early detection of adverse drug reactions (ADRs) using machine learning and deep learning. By combining data from FDA and hospitals, models like Random Forest, SVM, LSTM, and ANN were trained. ANN performed best, especially with feature aggregation. Techniques like PCA, oversampling, and weighted loss helped address data challenges. The results show AI's potential to improve drug safety through proactive ADR prediction.

Türkçe Özet

Bu proje, hasta demografisi, ilaç kullanımı ve ADR geçmişi gibi çok kaynaklı verilerle makine ve derin öğrenme teknikleri kullanarak advers ilaç reaksiyonlarının (ADR) erken tespiti amaçlamaktadır. Random Forest, SVM, LSTM ve ANN modelleri geliştirilmiş; veri ön işleme, özellikle mühendisliği ve PCA uygulanmıştır. Veri dengesizliği oversampling ve ağırlıklı kayıp fonksiyonlarıyla giderilmiştir. En iyi sonuç LightGBM modeliyle elde edilmiş, bu da yapay zekânın ADR'lerin erken tespitinde ve hasta güvenliğinde önemli bir rol oynayabileceğini göstermiştir.

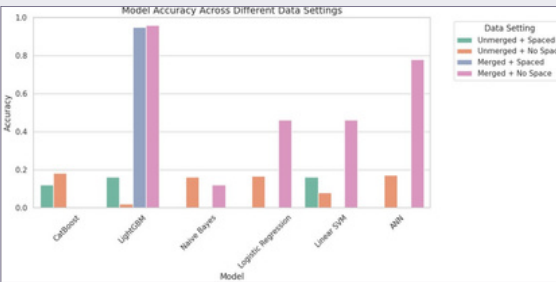
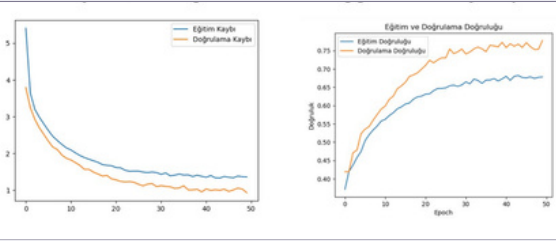
Analysis

This study presents a multi-phase artificial intelligence (AI) framework for predicting adverse drug reactions (ADRs) using real-world patient data. A unified dataset consisting of 44,097 records was created from sources such as FAERS and national health databases. During the preprocessing phase, missing data was handled in two ways: by imputing with mean values and by analyzing the raw data without imputation. Appropriate AI algorithms were applied for both approaches.

In the initial phase, all ADRs were used directly without any grouping or transformation. Later, ADRs associated with records sharing the same primary ID and drug name were merged, and AI models were applied to these grouped records for ADR prediction. Multi-label classification was addressed using the MultiOutputClassifier, allowing prediction of up to 10 different ADRs per patient.

Among the models tested, LightGBM achieved the best overall performance, even when working with incomplete data. The accuracy score obtained with LightGBM was 96%, highlighting its robustness in handling missing values.

On the other hand, when ADRs of patients with the same primary ID were combined, the Artificial Neural Network (ANN) model produced the highest performance in that specific scenario, achieving an accuracy of 79.68% (0.7968). These findings demonstrate that various AI models can effectively operate on both complete and incomplete real-world healthcare datasets, and that properly grouping and preprocessing data can significantly enhance ADR prediction performance. In this study, accuracy was used as the primary evaluation metric.



Results

The study shows that deep learning models, especially ANN and LSTM, outperformed traditional methods in predicting ADRs. ANN achieved the highest accuracy by capturing complex patterns, while LightGBM reached a 96% accuracy score on structured data with missing values. These results highlight AI's potential to enhance early ADR detection and support safer clinical decisions.

Conclusion

The project successfully developed an AI and ML-based system for predicting ADRs. Among the tested models, ANN demonstrated superior performance, particularly when data aggregation techniques (e.g., combining side effects for the same Primary ID) were applied. The results confirmed the feasibility of this approach in clinical decision support systems, showcasing the potential to improve patient safety and streamline healthcare processes.

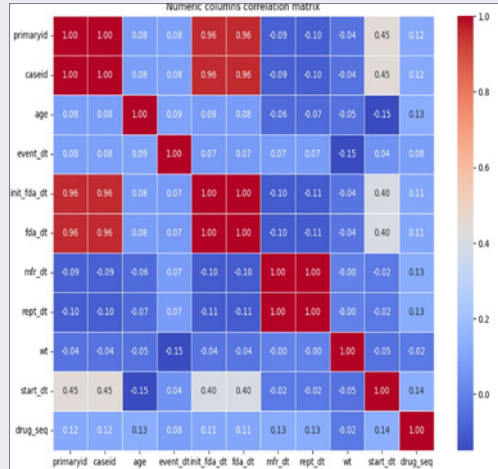
The cost of the project was calculated by taking into account the labor and tool requirements in the data collection, processing, model development and evaluation stages. The use of Python-based open source tools reduced the costs.

Team

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Methodology

The study used clinical data, applied PCA for preprocessing, and trained models like Random Forest, LightGBM, ANN, and LSTM. Tools like MultiOutputClassifier and GPU training helped handle complex data effectively.



FAERS Dataset Field Descriptions

Field	Description
PRIMARYID	Unique ID for the FAERS report.
CASEID	Case identifier for the event.
EVENT_DT	Date of adverse event (YYYYMMDD).
I_F_COD	Initial or follow-up report (IF).
MFR_SNDR	Name of reporting manufacturer or sender.
AGE	Patient's age at the time of the event.
SEX	Patient's gender (M/F/UNK).
REPT_DT	Submission date (YYYYMMDD).
OCCP_COD	Occupation of reporter (MD, PH).
DRUG_SEQ	Sequence number for the drug.
ROLE_COD	Role of the drug (PS, SS, C, I).
DRUGNAME	Name of the drug.
PROD_AI	Active ingredient of the drug.
VAL_VBM	Source of drug name (raw or brand).
DOSE_VBM	Dose, frequency, and route.
PT	Medical term describing the event (adverse effect).

References

- (On et al., 2022) On, J., Park, H. A., & Yoo, S. (2022). Development of a prediction models for chemotherapy-induced adverse drug reactions: a retrospective observational study using electronic health records. *European journal of oncology nursing*, 56, 103964.
- (Wolff et al., 2023) Wolff, P., Blos, B. A., & González, C. (2023). Machine Learning Methods for Predicting Adverse Drug Reactions in Hospitalized Patients. *Procedia Computer Science*, 228, 22-30.
- (Wang et al., 2019) Wang, C. S., Liu, P. I., Cheng, C. L., Tsai, S. H., Kuo, Y. H., & Chang, J. H. (2019). Detecting potential adverse drug reactions using a deep neural network model. *Journal of medical internet research*, 21(2), e13356.
- (Dang et al., 2020) Dang, Y., Xu, X., Gu, Y., Xie, J., Zhang, W., & Liu, S. (2020). A multimodal deep learning framework for predicting drug-drug interaction events. *Bioinformatics*, 36(5), 4316-4322.

Analyzing Elementary Students' Question Answer Performance Through an Assistant Teacher-Supported System

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Samsun Mustafa BAŞARICI



ABSTRACT

This study aims to evaluate elementary students' reading comprehension skills through the systematic analysis of their responses to level-appropriate reading passages. Utilizing an assistant teacher-based framework, the project investigates recurring error patterns in student answers to inform early detection of cognitive learning difficulties.

ÖZET

Bu çalışma, ilkököl öğrencilerinin okuduğunu anlama becerilerini, seviyelerine uygun okuma pasajlarına verdikleri yanıtların sistematik analizi yoluyla değerlendirmeyi amaçlamaktadır. Yardımcı öğretmen temelli bir çerçeveden yararlanılarak, öğrencilerin yanıtlarındaki tekrar eden hata kalıpları incelenmekte ve bu sayede bilişsel öğrenme güçlüklerinin erken tespiti hedeflenmektedir.

REVIEW OF LITERATURE

Reading and comprehension skills are crucial for students' academic success. 5W1H questions are an effective tool for measuring students' text comprehension and information processing abilities (Kintsch, 1998). Questions like "When?" and "Where?" reinforce memory, while the "Why?" question promotes deeper understanding. Brain research shows that the reading process activates different areas of the brain and highlights the impact of environmental factors on attention (Dehaene, 2009; Posner & Rothbart, 2007). When assessing students' reading comprehension skills, 5W1H questions also take these factors into account.

CONCLUSION

This study presents a method for evaluating elementary students' reading comprehension skills using pedagogical approaches and technology-supported tools. The assistant teacher system standardized the data collection process, identifying areas where students struggle. The findings emphasize the importance of personalized teaching strategies. Observational data and performance metrics examined the impact of environmental factors on the comprehension process. The results demonstrate the potential of semi-automated systems to enhance teacher support and diagnostic accuracy.

RESULTS

The study revealed key insights into elementary students' reading comprehension skills, highlighting specific areas where students face difficulties. The assistant teacher system effectively identified patterns in student responses, which helped pinpoint common challenges. Additionally, the integration of cognitive and environmental factors showed a noticeable impact on the comprehension process, suggesting that attention, time management, and external influences play significant roles in students' reading performance. The findings emphasize the potential of technology-assisted tools to enhance diagnostic accuracy and provide better-targeted educational strategies.

REFERENCES

- Russell S. and Norvig P, Artificial intelligence: a modern approach, 4th ed., Pearson, 2002. p. 32-60.
- Santoro A, et al., One-shot learning with memory-augmented neural networks. arXiv preprint arXiv:1605.06065, 2016.
- Braun, Daniel A, Aertens, Ad, Wolpert, Daniel M, and Mehring, Carsten. Motor task variation induces structural learning. *Current Biology*, 19(4):352-357, 2009.
- Brazdil, Pavel B, Soares, Carlos, and Da Costa, Joaquim Pinto. Ranking learning algorithms: Using ibl and meta-learning on accuracy and time results. *Machine Learning*, 50(3):251-277, 2003.
- Caruana, Rich. Multitask learning. *Machine learning*, 28 (1):41-75, 1997.
- Cowan, Nelson. The magical mystery four how is working memory capacity limited, and why? *Current Directions in Psychological Science*, 19(1):51-57, 2010.



Özet

Basit mobil ve 2D aksiyon oyunlarında zorluk seviyesi, genellikle sabit, seviye temelli veya skor odaklı yapılarla belirlenmektedir. Bu geleneksel yöntemler kolay uygulanabilir olsa da, oyuncunun anlık performansına dinamik olarak uyum sağlama konusunda yetersiz kalmaktadır. Bu çalışmada, temel bir 2D aksiyon oyununa entegre edilen Q-learning tabanlı bir adaptif zorluk sistemi önerilmektedir. Sistem; oyuncunun son 10 saniyede aldığı hasar, öldürdüğü düşman sayısı, tamamladığı görevler ve çevresindeki düşman yoğunluğu gibi verileri analiz ederek, zorluk seviyesini gerçek zamanlı olarak ayarlamaktadır.

Abstract

In simple mobile and 2D action games, difficulty levels are typically determined through fixed, level-based, or score-oriented systems. While these traditional approaches are easy to implement, they fall short in dynamically adapting to the player's real-time performance. In this study, a Q-learning-based adaptive difficulty system is proposed and integrated into a basic 2D action game. The system adjusts the difficulty level in real time based on key performance indicators: the number of enemies defeated and damage taken in the last 10 seconds, the number of completed quests, and the density of nearby enemies. These metrics are chosen to reflect both the player's recent success and the level of challenge they are currently facing, enabling the system to increase or decrease difficulty accordingly.



Method

State Representation

The agent defines the player's current state using the following four parameters, collected in Unity (C#) and sent to Python in JSON format:

recentDamage: Total damage taken over the past 10 seconds
recentKills: Number of enemies defeated over the past 10 seconds
recentQuests: Number of tasks completed over the past 60 seconds
nearbyEnemies: Number of enemies in close proximity

These parameters are represented as a 4-dimensional tuple and used as the Q-table key.

Action Space

The agent selects one of three possible actions:

A₁ (Easy): Reduce enemy count, slow enemy speed, decrease weapon delay

A₂ (Normal): Maintain default game settings

A₃ (Hard): Increase enemy count, speed up enemy spawn, increase weapon delay

Each action corresponds to a combination of three difficulty dimensions (enemyCountLevel, enemySpeedLevel, weaponDelayLevel) and is returned to Unity in JSON format.

Reward Function

After each action, the agent receives feedback based on the player's performance. The reward is calculated as:

$$R_t = 5\Delta K + 10\Delta Q - 2\Delta D - 2\|E < 3\| \\ + 5\|A = 2 \wedge (\Delta K > 0 \vee \Delta Q > 0)\| \\ - \mathbb{I}[\Delta K = 0 \wedge \Delta Q = 0 \wedge \Delta D = 0]$$

This dynamic reward design helps the agent distinguish between effective and ineffective difficulty adjustments.

Q-Table Update

Q-values are updated using the Bellman Equation:

$$Q(s_t, a_t) \leftarrow Q(s_t, a_t) + \alpha \left[R_{t+1} + \gamma \cdot \max_{a'} Q(s_{t+1}, a') - Q(s_t, a_t) \right]$$

Action Selection

After evaluating the Q-values, the agent selects the action with the highest value. If the confidence gap (difference between max and min Q-values) is low, the agent defaults to the Normal setting to avoid oscillation.

Result

20 participants played both the base version with fixed difficulty and the version with a Q-learning-based dynamic difficulty system. Every 10 minutes, they rated the combat difficulty on a scale from 0 to 10. The goal was to keep the experience within the 4–6 "ideal difficulty" range. The RL system largely maintained a balanced difficulty, while the base version showed a tendency to become harder over time. However, considering individual play styles, the system appears open to further personalization.

Conclusion

The Q-learning-based dynamic system adapted to player performance and provided a more balanced experience. This approach shows potential to improve player satisfaction and could benefit from further tuning of reward functions and parameters to better accommodate different player profiles.

References

- [1] M. Zohaib, Dynamic difficulty adjustment (DDA) in computer games: A review, *Advances in Human-Computer Interaction*, 2018.
- [2] R. Hunnicke and V. Chapman, AI for dynamic difficulty adjustment in games, *AAAI Workshop on Challenges in Game Artificial Intelligence*, 2004.
- [3] S. Wender and I. Watson, Using reinforcement learning for city site selection in the turn-based strategy game Civilization IV, *IEEE Symposium on Computational Intelligence and Games*, 2008.
- [4] S. Wender and I. Watson, Applying reinforcement learning to small scale combat in the real-time strategy game StarCraft: Broodwar, *IEEE CIG*, 2012.



Autonomous Guided Vehicle Software Design with Voice Commands

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Abstract

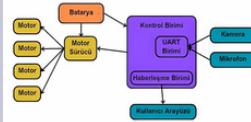
This project aims to develop a low-cost autonomous guided vehicle that operates without LIDAR and traditional guidance systems by combining voice commands and ARUCO code recognition via camera. ARUCO codes provide a flexible solution that eliminates complex infrastructure requirements such as inductive cable or strip tracking, allowing quick adaptation to changes. The navigation system utilizes A* and Dijkstra algorithms, while single-board computers and camera modules significantly reduce hardware costs compared to conventional systems.

Özet

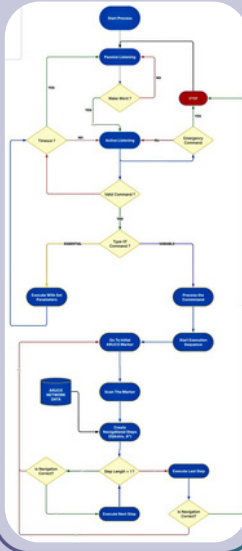
Bu proje, kamera aracılığıyla ses komutları ve ARUCO kod tanıma sistemini birleştirerek LIDAR ve geleneksel kılavuz sistemleri olmadan çalışan düşük maliyetli bir otonom güdümlü araç geliştirmeyi amaçlamaktadır. ARUCO kodları, endüktif kablo veya şerit takibi gibi karmaşık altyapı gereksinimlerini ortadan kaldıran ve değişikliklere hızlı uyum sağlayan esnek bir çözüm sunar. Navigasyon sistemi A* ve Dijkstra algoritmalarını kullanarak, tek kartlı bilgisayarlar ve kamera modülleri geleneksel sistemlere kıyasla donanım maliyetlerini önemli ölçüde azaltır.

System Architecture

The electronic design of the autonomous vehicle developed in the project is centered around a single board computer control system. The system consists of camera, microphone, motor driver, power unit and user interface components. ARUCO's code recognition and voice command processing capabilities eliminate the complex infrastructure requirements of traditional OCS systems.



Methods



Results

For the voice command recognition model, various ML algorithms and CNN/LSTM-based deep learning architectures were trained with a custom dataset. The LSTM model showed highest performance at 95.5% accuracy. A custom OpenCV workflow for ArUco marker detection achieved 100% detection rate across 10 markers. Position data was precisely extracted and successfully integrated into the vehicle's navigation system.



Application Areas

The developed autonomous guided vehicle system can be implemented in industrial environments without requiring traditional guidance systems. The system can be effectively used in the following areas:

1. Automatic control and monitoring in manufacturing facilities
2. Space-saving autonomous navigation in warehouses and logistics centers
3. Flexible production lines that can quickly adapt to infrastructure changes
4. Positioning and alignment operations requiring high precision
5. Smart factory applications that can be integrated with industrial IoT systems

ABSTRACT

Balkania is a Kotlin-based Android app that boosts Balkan tourism with a Firebase backend, providing a unified platform with attraction info, maps, user profiles, and a currency converter for seamless travel.

Balkania, Firebase altyapısıyla Balkan turizmini destekleyen Kotlin tabanlı bir Android uygulamasıdır; turistlik bilgileri, haritalar, kullanıcı profilleri ve döviz çeviricisiyle entegre bir platform sunarak sorunsuz seyahat deneyimi sağlar.

ARCHITECTURE

Frontend: Language Kotlin, Layouts XML
Built with: **Android Jetpack** (Fragments, Navigation, ViewBinding,)



Start collection
TouristPlaces
Users
email: "aj@gmail.com"
firstName: "A"
lastName: "E"
profilePicture: "https://firebasestorage.googleapis.com/v1/b/balkania-app.appspot.com/o/profiles/aj.png?alt=media&token=1234567890"
tags: ["Historical", "Visit"]

Backend: Authentication (User Management)
Database: **Cloud Firestore** for places and user
File Storage: **Firebase Storage** for User images

BALKAN TOURIST APP

Student:
Berkay ÇELİK
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Supervisor:
Prof. Dr. İnci ERHAN

DATA COLLECTION

- Leveraged TripAdvisor API (with API key & Location IDs) for comprehensive details (names, descriptions, ratings, photos).
- Performed Geocoordinate Fetching by querying Google Places API (with API key) using location names, retrieving precise latitude & longitude for map integration.

Bran Castle (Dracula's Castle)



Description

Visit Bran Castle (Dracula's Castle), a beautiful sight & landmarks located in Bran, Romania known for its castles, specialty museum perfect for Couples, Friends getaway, Family travel, Business.

Location

Bran, Romania

Address

Str. General Traian Mosulu nr. 24, Bran

Romania

Start collection
TouristPlaces
Users

Add document
3117348
3117350
3117916
3118607

Location
latitude: 45.514902199999999
longitude: 25.3671637
Name: "Bran Castle (Dracula's Castle)"
OpeningHours: (Friday "09:00-18:00")
Priority: "Couples, Friends getaway"
Tags
"Castles"
"Specialty Museums"
"Rompe (Romance)"

Favorites:
Bookmark preferred spots.

Profile Management: Edit your personal details.

Location Search: Easily find desired places

EXPLORE



Converter

Converted Amount: 114.6 EUR

1000

100

REFERENCES

- <https://tripadvisor-content-api.readme.io/reference/overview>
- <https://developers.google.com/maps/documentation/places/web-service/overview?hl=tr>



BIG DATA OPTIMIZATION OF ALS AND SVD

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ABSTRACT

This study explores and compares two matrix factorization algorithms—Alternating Least Squares (ALS) and Singular Value Decomposition (SVD)—on the MovieLens 20M dataset, which contains over 20 million movie ratings. These algorithms were used to build a movie recommendation system that suggests new movies to users based on the ones they have previously rated. Comprehensive hyperparameter optimization and implementation-level improvements were applied to reduce training time and increase efficiency. Results indicate that while SVD achieved slightly lower RMSE, ALS proved more scalable and trainable when properly tuned in distributed environments.

METHOD

-Matrix Factorization

Matrix factorization is a core technique in collaborative filtering recommender systems. It aims to predict missing user-item interactions.

-Alternating Least Squares (ALS)

- ALS is an iterative optimization algorithm designed to alternately minimize the loss with respect to user and item matrices.
- Optimizations Applied:
 - Removed redundant imports and settings
 - Replaced nested loops with list comprehensions
 - Reduced spark.sql.shuffle.partitions and spark.default.parallelism from 200 → 100
 - Used .cache() instead of .repartition(200) to reduce shuffling
 - Fixed seed to 42 for reproducibility

Best Parameters: rank=50, iteration=200, lambda=0.1

Best RMSE: 0.8018

Best Training Time: ~3959 s (~66 min)

Total Grid Time After Optimization: 1708 min (Initial time was 4190 min before optimization.)

-Singular Value Decomposition (SVD)

- SVD is implemented in the Surprise library and is more suitable for small to medium-scale datasets due to its single-node architecture.
- Best Parameters: n_factors=10, n_epochs=50, reg_all=0.01
- Best RMSE: 0.7911
- Training Time: 1424 s (~24 min)

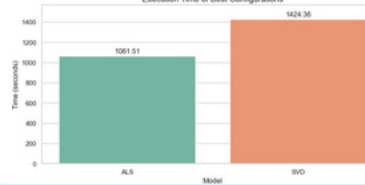
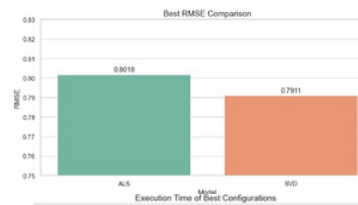
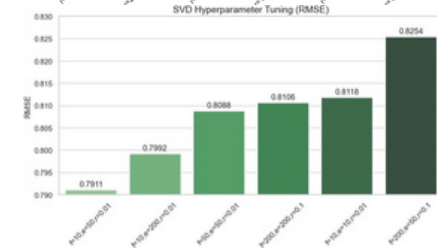
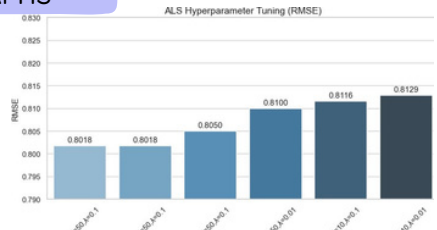
RESULTS

Metric	RMSE (Best)	Training Time (Best Run)	Total Grid Time	Scalability	Optimization Sensitivity
ALS	0.8018	3959 sec	1708 min	High	High
SVD	0.7911	1424 sec	1914 min	Low	Moderate

TÜRKÇE ÖZET

Bu çalışma, Alternating Least Squares (ALS) ve Singular Value Decomposition (SVD) olmak üzere iki matris ayrıştırma algoritmasını, 20 milyondan fazla film puanı içeren MovieLens 20M veri seti üzerinde karşılaştırmalı olarak incelemektedir. Bu algoritmalar, kullanıcıların daha önce puanladıkları filmlere göre onlara yeni filmler öneren bir film öneri sistemi oluşturmak için kullanılmıştır. Eğitim süresini azaltmak ve verimliliği artırmak amacıyla kapsamlı hiperparametre ayarlamaları ve uygulama düzeyinde optimizasyonlar gerçekleştirilmiştir. Sonuçlar, SVD algoritmasının biraz daha düşük RMSE değeri elde ettiğini; ancak ALS algoritmasının, dağıtık ortamlarda doğru şekilde yapılandırıldığında daha ölçeklenebilir ve daha hızlı eğitilebilir olduğunu göstermektedir.

GRAPHS



CONCLUSION

- ALS was highly improved by tuning Spark-specific configurations and restructuring inefficient code, reducing grid training time from 4190 min to 1708 min.
- SVD performed best in terms of RMSE (0.7911) and training time on filtered data, but lacks scalability to handle large distributed datasets efficiently.
- ALS is preferred for production-scale systems with massive, sparse datasets, while SVD is better suited for smaller-scale, centralized applications.
- Both models benefit from hyperparameter optimization—grid searches played a key role in performance gains.
- These findings illustrate how algorithm selection and environment-aware optimization are critical in real-world recommender system implementations.

REFERENCES

- <https://spark.apache.org/docs/latest/api/python/reference/pyspark.sql/index.html>
- Beheshti, A., Yakhchi, S., Mousaei, S., Ghafari, S. M., Golguri, S. R., & Edrisi, M. A. (2020). Towards cognitive recommender systems. Algorithms, 13(8), 176.
- Iqbal, M. H., & Soomra, T. R. (2015). Big data analysis: Apache storm perspective. International journal of computer trends and technology, 19(1), 9-14.
- Karau, H., Konwinski, A., Wendell, P., & Zaharia, M. (2015). Learning spark: lightning-fast big data analysis. "O'Reilly Media, Inc."
- Ramadhan, S. F., Baizal, Z. A., & Rismala, R. (2020). Lodging recommendations using the sparkml engine als and surprise svd. vol. 4, 889-897.
- Zhao, T. (2024). Performance comparison and analysis of SVD and ALS in recommendation system. Applied and Computational Engineering, 49, 142-148.

BLOOD GLUCOSE MEASUREMENT SYSTEM

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Özet

Diyabet hastalarının kan şekeri seviyelerini non-invazif yollarla ölçebilecek bir cihaz geliştirilmiştir. Mevcut invaziv yöntemlerin acı verici ve maliyetli süreçlerini ortadan kaldırmaya odaklanan proje, fotoplethysmografi (PPG) ve basınç sensörlerinden veri toplayarak makine öğrenmesi algoritmaları ile kan şekeri seviyelerini yüksek doğrulukla tahmin etmeyi amaçlanmıştır. Bu projede cihaz, parmak ucundan non-invazif kan şekeri ölçümü yapacak ve parmak ucu üzerinden alınan optik ve biyoimpedans ölçümleri ile kan şekeri seviyelerini tespit edecektir. Veri toplama sürecinde gönüllülerden yaş, boy, kilo, diyabet türü, açık durumu hipertansiyon ve cinsiyet gibi bilgiler alınmıştır ve makine öğrenmesi modeli kullanılarak kan şekeri tahmin edilmesi planlanmıştır. Gönüllülerden veri toplama sırasında parmak ucundan kan şekeri ölçümü yapılmış, max30100 ve basınç sensörü ile veriler toplanmıştır. Toplanan veriler ön işleme tabii tutularak ve özellik çıkarımı yapılmıştır. Karar ağaçları, destek vektör makineleri (SVM), çok katmanlı perceptron ve derin öğrenme yöntemleri ile regresyon uygulanarak en iyi model seçilmiştir. Performans değerlendirilmesi için Clarke Hata İzgarası ve Ortalama Mutlak Görel Fark (OMGF) metrikleri kullanılacaktır. Model seçimi sonrasında sensör azaltma yapılacak ve cihazın üç veya sis hesaplama teknikleriyle çalışması sağlanacaktır. Sonuçlar, diyabet hastaları için ağrısız ve sürekli glikoz izleme çözümü sunma potansiyeli ile umut verici bir doğruluk göstermesi hedeflenmiştir.

Method and Application Process

This project aims to design and develop a portable, low-cost and local device that can measure blood sugar levels of diabetic patients in a painless and non-invasive way. This system, which was developed because existing invasive methods are painful and not suitable for continuous use, estimates blood sugar using photoplethysmography (PPG), pressure, temperature and humidity data taken from the fingertip, along with personal and medical information (age, gender, height, weight, diabetes type, fasting status, hypertension status). Data were collected using Arduino Nano, MAX30100 sensor, blood pressure sensor and supporting electronic units as hardware; data were processed with STFT (Short-Time Fourier Transform) method in the time-frequency domain and feature extraction was performed. The obtained data were used for regression analysis with both traditional machine learning (Random Forest, SVM) and deep learning (1D CNN and LSTM) algorithms, and model performance was evaluated with metrics such as MAE, MSE, R², Clarke Error Grid and OMGF. As a result of five separate tests among CNN-based models, the best success was achieved with a six-layer deep CNN architecture, achieving a MAE value of 7.30. Although the overall performance was limited due to the small amount of data, processing sensor data with energy spectra based on time-frequency analysis increased the estimation accuracy. The results show that the system can provide higher accuracy with sufficient data and can provide a continuous, painless and economical blood sugar monitoring alternative for diabetic patients. This study provides an important basis for wearable health devices to be developed with edge/fog computing techniques and sensor reduction in the future and has the potential to create a competitive alternative to commercial glucose monitors.

Figure #1 STFT Spectrogram Red and IR Value Signal

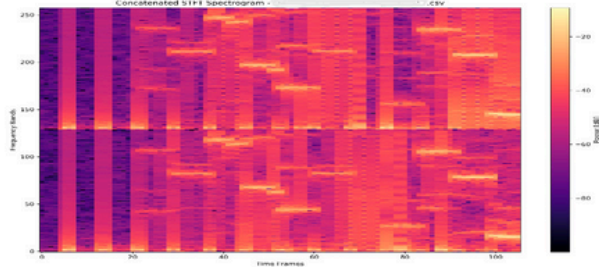


Figure #2 Methodology diagram

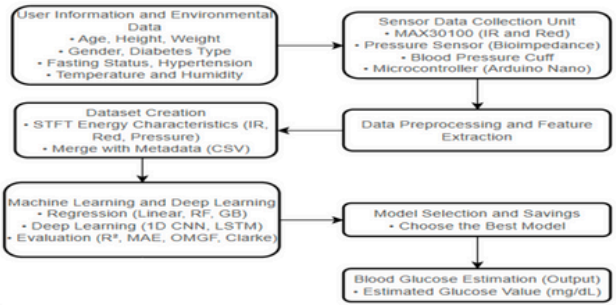
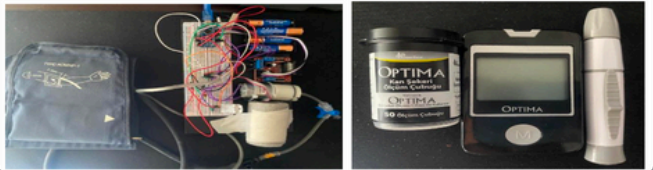


Figure #3 System Design and Blood Glucose Device



System Works

Figure #4 Device and Measurement System

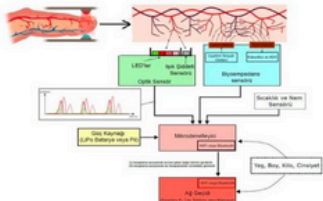
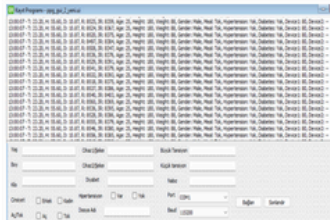


Figure #5 Interface Design



Results

Test No	N. of Layers	B. Filt	Epo chs	Bat ch Siz	Dro pout (%)	Fully Connecte d Layer(s)	MAE
Test 1	10	64	50	16	70	1024	24.89
Test 2	10	128	50	16	50	1024	14.76
Test 3	10	128	100	32	50	1024	11.05
Test 4	16	128	100	32	3x50	2048 → 1024 → 512	7.31

ABSTRACT:

This project introduces an AI-powered mobile book application aimed at improving book discovery and personalized recommendations. Users can register, manage profiles, and explore books by genres, ratings, or authors. A recommendation system built with the ALS algorithm and PySpark offers tailored book suggestions based on user preferences. The app also features a unique fairy tale module, a fine-tuned story generation model for children, delivering custom stories. These stories are brought to life with text-to-speech technology powered by Microsoft Azure Speech API, offering an engaging and interactive experience. Developed with Kotlin in Android Studio and supported by Firebase for real-time data handling, the app continues to evolve with future goals including multilingual support and smarter recommendation features.

ÖZET:

Bu proje, kitap keşfi ve öneri süreçlerini geliştirmek amacıyla geliştirilen yapay zeka destekli bir mobil kitap uygulamasını sunmaktadır. Kullanıcılar kayıt olabilir, profillerini yönetebilir ve kitapları tür, puan veya yazarı göre keşfedebilir. PySpark ile geliştirilen ALS algoritması, kullanıcı tercihlerine göre kişiselleştirilmiş kitap önerileri sunar. Uygulamanın öne çıkan özelliklerinden biri olan "Masal" modülü, çocuklar için özel olarak geliştirilen ve fine-tune edilmiş bir hikaye üretim modelidir. Oluşturulan hikâyeler, Microsoft Azure Speech API ile seslendirilerek etkileşimli ve eğlenceli bir deneyim sağlar. Kotlin ile Android Studio'da geliştirilen uygulama, gerçek zamanlı veri yönetimi için Firebase altyapısını kullanmaktadır. Gelecekte çok dilli destek, daha gelişmiş öneri algoritmaları ve zenginleştirilmiş veri setleriyle kullanıcı deneyimi artırılabilecektir.

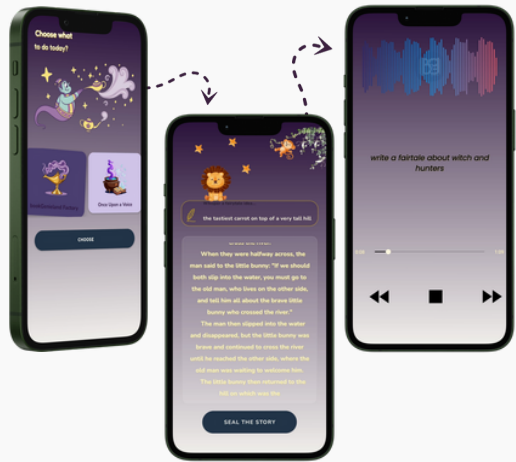


Bu proje 2209-A kapsamında desteklenmiştir

TÜBİTAK



METHOD: The mobile application was developed using Kotlin in Android Studio, focusing on a clean and user-friendly interface. Firebase was used to manage user authentication, real-time database operations, and secure data storage. The recommendation system is based on the Alternating Least Squares (ALS) algorithm implemented with PySpark. To serve personalized book suggestions to new users, the Fold-In technique was applied, allowing the system to generate recommendations based on limited user input. The system also provides suggestions for books similar to ones the user is interested in. The ALS model is hosted in the cloud and accessed through a custom-built API, enabling fast and scalable integration with the mobile app. For the children's storytelling feature, a dedicated fairy tale screen was developed. A custom fine-tuned language model based on LLaMA was trained on our proprietary story dataset to generate personalized children's stories. This model is deployed on Hugging Face Spaces, where the application communicates with it via API. To enhance the storytelling experience, generated stories are converted to audio using the Microsoft Azure Speech API, offering an interactive and immersive text-to-speech feature. Each component was integrated and tested to ensure seamless communication between the app and external services, aiming for scalability, personalization, and a smooth user experience.



RESULTS:

The application successfully provides users with personalized book recommendations and interactive storytelling features. The children's story module and voice narration were especially well-received for their creativity and engagement. Overall, the app offers an effective, user-friendly platform that enhances reading habits and encourages exploration.

CONCLUSION:

This project demonstrates how AI can enhance the reading experience by combining personalized recommendations and interactive storytelling. By integrating advanced technologies into a user-friendly mobile app, the project supports both discovery and engagement for readers of all ages.

REFERENCES:

- [1] Android Studio [2] Charles, F., Mead, S. J., & Coyvaza, M. (2001). Character-driven Story Generation [3] Firebase [4] Goodreads Book Graph Datasets [5] Hugging Face Spaces [6] Meta AI LLaMA Model [7] Microsoft Azure Speech API [8] Wu, Y., Sun, C., & Huang, L. (2022). AI-based Tools for Enhancing Language Development and Creativity in Children [9] Zhang, X., & Li, Y. (2022). Machine Learning Techniques for Personalized Content Recommendation in Digital Libraries

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Deep Learning Model for Blood Hemoglobin Prediction and Efficiency-Oriented Device Design



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Abstract

This study proposes a non-invasive system for estimating total hemoglobin (SpHb) levels using facial video analysis and deep learning. It captures 30-second facial videos via a Raspberry Pi camera and processes them with optimized hybrid neural networks. The system aims for ± 1.5 g/dL accuracy within the 8–17 g/dL range, offering a cost-effective, accessible solution for hemoglobin monitoring. Designed for portability, it is especially beneficial for patients with hemoglobin-related conditions and in areas with limited medical resources.

Özet

Bu çalışma, yüz videosu analizi ve derin öğrenme kullanarak total hemoglobin (SpHb) seviyelerini tahmin etmeye yönelik invaziv olmayan (non-invaziv) bir sistem önermektedir. Sistem, Raspberry Pi kamerası aracılığıyla 30 saniyelik yüz videoları kaydedir ve bu verileri optimize edilmiş hibrit sinir ağıları ile işler. 8–17 g/dL aralığında ± 1.5 g/dL doğruluk hedeflenmektedir. Bu sistem, hem maliyet açısından uygun hem de erişilebilir bir hemoglobin izleme çözümü sunar. Taşınabilir olacak şekilde tasarlanan sistem, özellikle hemoglobine bağlı sağlık sorunları yaşayan hastalar ve tıbbi kaynakların sınırlı olduğu bölgeler için büyük fayda sağlamaktadır.

1. Introduction

Hemoglobin measurement is a critical parameter in the diagnosis and management of various medical conditions, including anemia, thalassemia, and other hemoglobin-related disorders. Traditional SpHb measurement methods rely on invasive blood sampling, which can be time-consuming, costly, and pose a risk of infection. This study aims to develop an innovative, contactless hemoglobin estimation system by leveraging hybrid deep learning models and designing an efficiency-based device for video-based regression

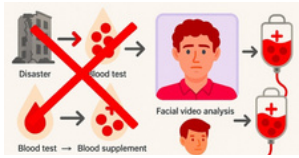


Fig 1: Invasive and non-invasive methods for hemoglobin estimation

2. Methodology

2.1. Data Collection and Segmentation:

The dataset was collected in collaboration with Osmaniye Korkut Ata University as part of the project. Facial regions were detected and tracked throughout the videos using the Haar Cascade algorithm. Face-centered frames were resized to 843x480 pixels. From the middle portion of each video, four segments were extracted with 30, 60, 150, and 250 frames, respectively. The dataset was split into 80% training and 20% testing, with part of the training set used for validation. Each processed segment was stored in .npz format as a 64x64x3 array for training.

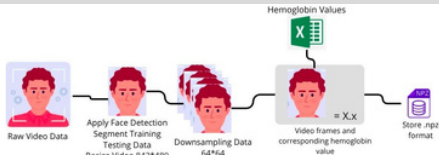


Fig 2: Data Preprocessing Steps

2.2. Model Development:

In this study, different deep learning models were tested to find the most effective way to estimate hemoglobin levels from facial videos. These models combined several smart techniques—such as tracking facial changes over time and focusing on important areas of the face—to better understand the visual patterns related to blood levels. By mixing the strengths of different model types, the goal was to achieve more accurate and reliable results.



Fig 3: Deep Learning Models

3. Results

- **Test Dataset:** 20% of the data used for evaluation
- **Metrics:** RMSE, R^2 , MAPE, MSE, MAE
- **Accuracy Target:** ± 1.5 g/dL within the 8–17 g/dL hemoglobin range
- **Model:** 3D CNN, CNN-VAN Transformer, and ConvNeXt Transformer
- **Performance:** Models achieved performance above 0.5
- **Power Efficiency:** Ensuring optimal battery life for portable use
- **Real-time Evaluation:** Tested on Raspberry Pi with focus on accuracy and power balance
- **Binary Classification:** Used if regression accuracy fails, targeting 80% for transfusion decisions
- **Observation:** When examining the model results, it was observed that the predictions were made with a margin of error of ± 2 units.

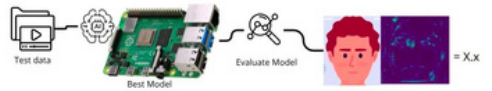


Fig 4: Testing Deep Learning Models

ACTUAL VALUE	PREDICTED VALUE	DIFFERENCE
13.300	14.236	+0.936
11.500	11.760	+0.260
11.900	11.403	-0.497
10.600	11.518	+0.918

Table 1: Sample Prediction Results

4. Conclusion

This research demonstrates the feasibility of non-invasive hemoglobin measurement through facial video analysis and deep learning, providing significant advantages over traditional invasive methods in terms of accessibility, cost, and convenience. The proposed system holds great promise for monitoring patients with hemoglobinopathies, such as thalassemia, aiding in the early detection of anemia, and offering rapid assessment in resource-limited settings. Its contactless nature makes it especially valuable in situations where traditional contact-based measurements are difficult or contraindicated, such as in cases of skin conditions or wounds. Furthermore, this project is supported by 2209-A and is being carried out at Osmaniye Korkut Ata University as part of the 1001 project. Thanks to this support, the system is being integrated into a Raspberry Pi device, offering a portable and efficient solution for hemoglobin monitoring in real-time, further enhancing the accessibility and applicability of the technology.





Development of a Web Platform for JP DMC Advertising Company

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Introduction

JP DMC is an advertising company. This project focuses on creating a simple and effective website to showcase its services, portfolio, and contact information. The platform is designed to be user-friendly and accessible on both desktop and mobile devices. It also includes an admin panel for easy content management.

Abstract

This project presents the development of a web platform for JP DMC, an advertising company. The goal was to create a user-friendly and responsive website that effectively showcases the company's services, portfolio, and contact information. An integrated admin panel enables efficient content, order, and user management. The platform is built using modern web technologies to ensure accessibility and functionality across different devices.

Türkçe özet

Bu proje reklamcılık alanında faaliyet gösteren JP DMC şirketi için geliştirilen bir web platformunu kapsamaktadır. Projenin amacı, şirketin hizmetlerini, portföyünü ve iletişim bilgilerini etkili bir şekilde tanıtan, kullanıcı dostu ve duyarlı bir internet sitesi oluşturmaktır. Entegre yönetim paneli sayesinde içerik, sipariş ve kullanıcı yönetimi kolayca gerçekleştirilmektedir. Platform, farklı cihazlarda erişilebilirliği ve işlevselliği sağlamak amacıyla modern web teknolojileri kullanılarak geliştirilmiştir.

Conclusion

The development platform successfully meets the needs of JP DMC by providing a modern, mobile-compatible website with essential functionalities. The admin panel facilitates smooth operations for content updates and customer management. This project demonstrates how thoughtful web design and appropriate technologies can support business goals in the advertising industry.

Website Structure

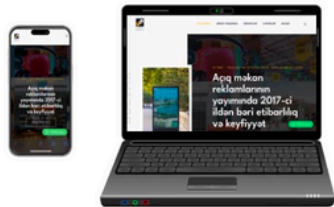


Admin Panel Structure

- Content management
- Order tracking
- User data management

Technologies Used

- Frontend
- Backend
- PHP
- Node.js
- Word Press



References

1. Welling, L., & Thomson, L. (2009). PHP and MySQL Web Development. Addison-Wesley.
2. Flanagan, D. (2020). JavaScript: The Definitive Guide. O'Reilly Media.
3. Node.js Documentation - <https://nodejs.org/en/docs/>
4. WordPress Developer Resource <https://developer.wordpress.org>

DEVELOPMENT OF AN AI-POWERED PERSONALIZED HOTEL RECOMMENDATION SYSTEM IN THE TOURISM SECTOR



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Supervisor: Assoc. Prof. Dr. Fatih SOYGAZI
2209-A - Üniversite Öğrencileri Araştırma Projeleri Destekleme Programı



Abstract

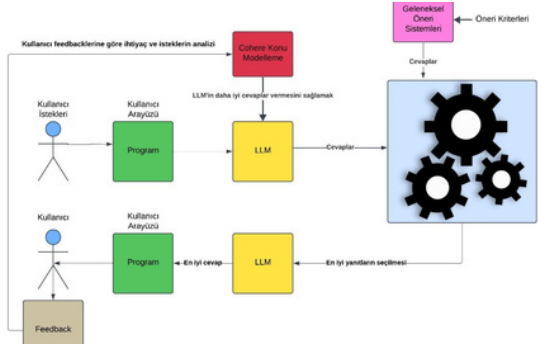
This project presents a hotel recommendation system powered by the DeepSeek-v3 large language model. Users provide location input (city/district), and the system queries a structured SQL database—populated via an external API—to deliver personalized hotel suggestions. The LLM interprets user preferences (e.g., comfort, price, location) and interacts in natural language. If a user asks off-topic questions, the system responds briefly and redirects them to hotel-related content. The design focuses on high-performance responses and up-to-date data synchronization to reflect real-time market changes. Our goal is to enable quick and accurate hotel selections through an intuitive AI-driven interface.

Türkçe Özet

Bu proje, DeepSeek-v3 büyük dil modeli tarafından desteklenen bir otel öneri sistemi sunmaktadır. Kullanıcılar konum bilgisi (şehir/ilçe) girdikten sonra, sistem bir API aracılığıyla elde edilen verilerle oluşturulmuş yapısal bir SQL veritabanına sorgular göndererek kişiselleştirilmiş otel önerileri sunar. LLM, kullanıcının tercihlerini (örneğin konfor, fiyat, konum) doğal dilde analiz eder ve yanıtlar. Kullanıcı sistemin konusu dışındaki bir soru sorduğunda, model kısa bir yanıt vererek kullanıcıyı otel önerileri konusuna geri yönlendirir. Sistem tasarımı, yüksek performanslı yanıtlar ile güncel ve dinamik veri senkronizasyonuna odaklanmıştır. Amacımız, yapay zeka destekli kullanıcı dostu bir arayüz aracılığıyla hızlı ve doğru otel seçimini mümkün kılmaktır.

Method

- LLM Model: DeepSeek-v3 – handles natural language interaction and generates hotel recommendations.
- Data Source: Hotel data retrieved through a third-party API.
- Database Structure: All data is stored in a SQL database for high-speed querying.
- Location Filtering: Based on user input (city/district), hotels are filtered accordingly.
- Dynamic Updates: Due to market changes, inflation, and evolving hotel options, the database is updated periodically.
- Off-topic Handling: For unrelated queries, the LLM gives a short answer and redirects users back to hotel recommendation topics.



Results

- DeepSeek-v3 successfully delivers fast and accurate hotel suggestions based on user-defined criteria.
- SQL-based querying significantly enhances response time and system performance.
- Natural language inputs are effectively interpreted and transformed into relevant search outputs.
- The redirection mechanism improves system focus and avoids irrelevant conversations.

Conclusion

This project demonstrates the integration of large language models into real-time, location-based hotel recommendation systems. By combining DeepSeek-v3 with a structured SQL backend and dynamic data from an external API, the system achieves high accuracy and speed. The chatbot-style interface offers a user-friendly experience while maintaining topic relevance. The project lays the groundwork for scalable AI applications in tourism and personalized travel services.

References

- Naveed, H., et al. (2023). Large Language Models: A Comprehensive Overview, arXiv:2307.06435
- Efimova, D. (2024). AI and Hotel Management, EPAM
- DeepSeek-R1 Retrieved from: <https://huggingface.co/deepseek-ai/DeepSeek-R1>

Detection and Recognition of Drones Using Artificial Intelligence

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Assoc. Prof. Dr. Ahmet Çağdaş SEÇKİN



Abstract

This project focuses on the detection, diagnosis, and recognition of drones by utilizing image processing and artificial intelligence techniques. This project aims to develop an artificial intelligence model capable of detecting drones with high accuracy, particularly from camera data. The research will focus on advanced deep learning models such as RTDETR, YOLO, and Faster-RCNN, DETR, comparing different versions of these models to identify the one with the best performance. For training purposes, the dataset from the International Workshop on Small-Drone Surveillance, Detection, and Counteraction Techniques (WOSDETC) will be used, as it provides a large collection of labeled drone data. The models' performance will be evaluated based on key metrics such as accuracy, precision, and recall.

Ozet

Bu proje, görüntü işleme ve yapay zeka tekniklerini kullanarak dronların tespiti, teşhisi ve tanınmasına odaklanmaktadır. Projenin amacı, özellikle kamera verilerinden yüksek doğrulukla dronları tespit edebilecek bir yapay zeka modeli geliştirmektir. Araştırma, RTDETR, YOLO, Faster-RCNN ve DETR gibi gelişmiş derin öğrenme modellerine odaklanacak; bu modellerin farklı sürümleri karşılaştırılarak en iyi performans göstereni belirlenecektir. Eğitim sürecinde, etiketlenmiş drone verilerinin geniş bir koleksiyonunu sunan Uluslararası Küçük Drone Gözetimi, Tespiti ve Karşı Önlemler Teknikleri Çalıştayı (WOSDETC) veri kümesi kullanılacaktır. Modellerin performansı doğruluk, kesinlik (precision) ve geri çağırma (recall) gibi temel ölçütlere göre değerlendirilecektir.

Introduction

Traditional detection methods, such as radar or acoustic sensors, often fail to reliably identify small drones, especially in complex environments with birds or varying lighting conditions. This study aims to address these limitations by developing a robust, artificial intelligence (AI)-driven system for visual drone detection. The proposed system leverages state-of-the-art deep learning models—RTDETR, DETR, YOLO and Faster R-CNN—to achieve high accuracy and real-time performance across diverse scenarios, including varying distances, lighting levels, and backgrounds. The scope encompasses comparative analysis of these models using the WOSDETC dataset, which includes 106,466 annotated images from 77 videos, ensuring comprehensive training and validation under real-world conditions.

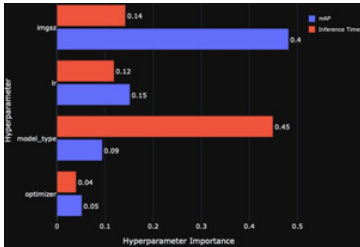


Figure A (Hyperparameter Importance Plot)

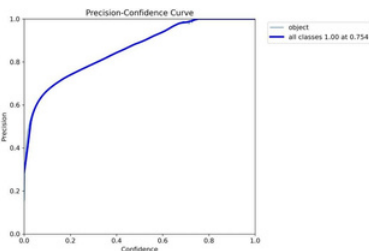


Figure B (Precision/Confidence Curve)

Material and Methods

We used 10 % of the images obtained in the first stage (10 600 images) and preprocessed them to suit each AI algorithm. To identify the best-performing model, we organized our work into three sequential stage. In stages 1 and 2, we trained all selected algorithms across various hyperparameter combinations. In stage 3, we maximized the number of training epochs and concentrated on the ten most successful models.

The parameter ranges explored during training were:

- Image size: 320–1280 pixels (step size 64)
- Pretrained model types specific to each algorithm
- Learning rate: 0.001–0.0001
- Optimizer: SGD or AdamW

Stage 1

The aim of stage 1 was to explore as many hyperparameter combinations as possible. Due to time constraints, each model was trained for a limited number of epochs. Total models trained: 200

Stage 2

Using performance insights from Phase 1, we narrowed the hyperparameter search space and increased the number of training epochs. This allowed us to train a smaller, more refined set of models.

Stage 3

From the Phase 2 results, we selected the ten best-performing models and trained them with as many epochs as time permitted, with no upper limit on training duration.

Results

The optimal hyperparameter configuration, achieving the highest mean average precision (mAP) and favorable training time, was:

- Image size: 960 pixels
- Model type: YOLOv11s
- Learning rate: 0.001
- Optimizer: SGD
- Number of epochs: 146

This configuration yielded a mAP of 68 %.

Conclusion

Our multi-objective hyperparameter analysis (Figure A) reveals that image size is the dominant driver of detection performance (mean average precision), accounting for roughly 40% of the model's accuracy gains, while the choice of model architecture has the greatest impact on computational cost and training/inference time (=45%). Learning rate tuning contributes moderately to both accuracy (~15%) and efficiency (~12%), whereas optimizer selection plays only a minor role in either objective (~4–5%). These results validate our methodological emphasis on exploring a wide range of image resolutions (320–1280 px) and model variants (RTDETR, DETR, YOLO, Faster R-CNN) during the first two stages of experimentation, and explain why the final YOLOv11s configuration at 960 px achieved the best balance of 68% mAP with practical training times. Figure B's precision–confidence curve shows precision increasing from ~30% at low thresholds to 100% at 0.754, after which gains plateau and false negatives rise.

By pinpointing image resolution and model type as the critical levers for accuracy and speed, respectively, this study provides clear guidance for deploying visual drone detection on resource-constrained platforms. Future development will leverage these insights to tailor model and data preprocessing choices for specific edge devices, optimizing frame-level energy consumption without sacrificing detection reliability. Ultimately, our findings pave the way toward a deployable, AI-driven surveillance system that delivers robust drone recognition under diverse real-world conditions.



EDUCATIONAL PLATFORM FOR DRIVING LICENSE EXAM PREPARATION

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Supervisor GÖZDE ALP

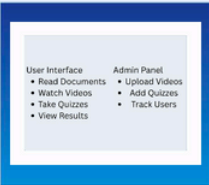


Abstract

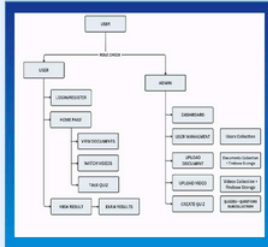
Traffic accidents in Turkey remain a major public safety issue, mainly due to insufficient knowledge of traffic rules. This project introduces a web-based learning platform offering interactive tools like videos, documents, and quizzes. Built with React.js and Firebase, the system includes real-time tracking, content management, and personalized user experiences to encourage safer traffic behavior.

Özet
Türkiye’de trafik kazaları, çoğunlukla trafik kurallarına dair bilgi eksikliğinden kaynaklanan önemli bir güvenlik sorunudur. Bu proje, videolar, belgeler ve testler gibi etkileşimli araçlar sunan web tabanlı bir eğitim platformu geliştirmektedir. React.js ve Firebase kullanılarak oluşturulan sistem, içerik yönetimi ve kişiye özel test deneyimleri güvenli sürüş bilincini artırmayı hedefler.

System Interfaces



Module Structure



Method

This platform was developed using the React.js framework for the frontend and Firebase services for the backend, including Authentication, Cloud Firestore, and Storage. The system consists of modular components that allow users to:

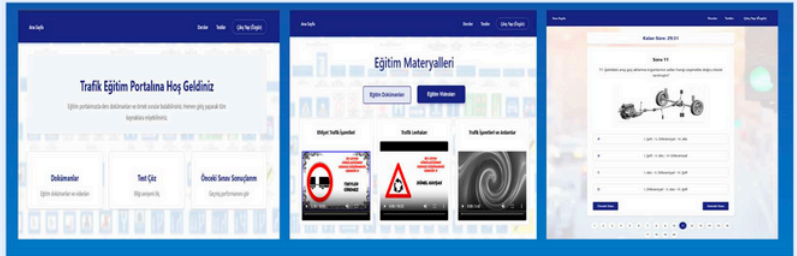
- Watch educational videos
 - Read documents (PDF)
 - Take quizzes and view their results
- The admin panel enables uploading and organizing content, managing users, and tracking activity. The Firestore database is structured into collections such as Users, Videos, Documents, Quizzes, and Exam Results, designed for scalability and real-time updates.



Conclusion

This project was developed to address the lack of public awareness regarding traffic rules, which remains a key factor in preventable traffic accidents in Turkey. By combining modern web technologies such as React.js and Firebase, a user-friendly and scalable educational platform was built to deliver interactive traffic education through videos, documents, and quizzes. The system ensures real-time user engagement, secure authentication, and comprehensive progress tracking through its integrated database structure. The inclusion of an admin panel also supports efficient content and user management. Ultimately, this platform serves not only as a digital learning tool but also as a potential catalyst for long-term behavioral change, contributing to safer traffic habits and improved public safety.

User Overview



Efficient and Scalable Big Data Processing with Dockerized Environments

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Supervisor: Dr. Öğr. Üyesi Hüseyin ABAKCI



Abstract

This thesis explores the use of Docker to deploy and manage PySpark-based Big Data applications. It aims to streamline the development-to-deployment pipeline across various application types, including web apps, standalone scripts, and Jupyter notebooks. By containerizing PySpark environments, the study ensures consistency, reproducibility, and scalability. Benchmarking typical Big Data tasks (e.g., preprocessing, word count, sorting) shows that Docker simplifies environment management, isolates dependencies, and enhances performance, productivity, and deployment flexibility.

Benefits

Containerized systems maintain a small footprint, minimizing disk space usage. They effectively eliminate common installation challenges, such as software version conflicts. Furthermore, this approach enhances portability, enabling students to easily set up and manage complex systems on their local machines without encountering compatibility issues, thereby streamlining the learning and development process.

1. Introduction

The proliferation of Big Data has necessitated robust and flexible platforms for processing and analysis. Apache Spark, with its Python API (PySpark), offers powerful capabilities for handling large datasets. However, managing dependencies, ensuring consistent environments across development and production, and deploying various types of applications (e.g., web services, batch processing scripts, interactive notebooks) can be challenging. Docker, a leading containerization technology, provides solutions to these challenges by packaging applications and their dependencies into isolated containers. This project explores the practical application and benefits of using Docker to run diverse PySpark applications.



2. Results

The benchmark tests yielded the following key performance indicators:

2.1. Preprocessing Task (8,000,000 records)

- Elapsed Time: 16,063 ms
- Avg. Active Tasks: 10.7

2.2. Word Count Task (8,000,000 records)

- Elapsed Time: 45,218 ms
- Shuffle Bytes Written: 39.7 MB
- Avg. Active Tasks: 10.6

2.3. Sorting Task

- Elapsed Time: 8,002 ms
- Shuffle Bytes Written: 2.6 MB
- Avg. Active Tasks: 10.3



Fig. 5: Key Benchmark Performance Metrics (e.g., Elapsed Time Comparison)



Fig. 6: Resource Utilization (CPU Memory Usage) During Benchmarking

Observations: Results indicate stable and predictable performance of PySpark jobs within Docker. Minimal overhead was observed. Docker effectively managed distinct environments, preventing dependency conflicts and simplifying deployment for web apps, Python scripts, and Jupyter notebooks.

3. References

- Docker Inc. (2025). Docker Documentation Retrieved from <https://docs.docker.com/>
- Apache Spark Project. (2025). Apache Spark™: Unified Analytics Engine for Big Data. Retrieved from <https://spark.apache.org/>

Özet

Bu tez, PySpark tabanlı Büyük Veri uygulamalarının dağıtım ve yönetimi için Docker kullanımı incelemektedir. Arayüz, web uygulamaları, tek seferlik betimler ve Jupyter defterleri gibi çeşitli uygulamaları tutmak için geliştirilmiş dağıtım kullanılarak sağlanmaktadır. PySpark ortamlarının kolayleştirilmesi, tutarlılık, tekrarlanabilirlik ve ölçeklenebilirliği sağlar. Tipik Big Data görevleri (örneğin, veri ön işleme, kelime sayımı, sıralama) için Docker ortamının ortam yönetimi, bağımlılıkları izole etme ve performans, verimlilik ve dağıtım güvenliği açısından faydaları araştırılmaktadır.

2. Methodology

2.1. Docker Environment Setup

- Dockerfile Customization: Specific Dockerfiles were crafted for:
 - Web Application (e.g., Flask/Django with PySpark backend).
 - Python Batch Applications (managing different Python versions).
 - Jupyter Notebook Environment (PySpark pre-configured).
- Core Docker Concepts Applied: Images, Containers, Volumes, Networking.

2.2. Application Deployment Scenarios

- Web Apps: Containerized PySpark-powered web application.
- Python Apps (Version A & B): Distinct Python batch apps with isolated dependencies.
- Jupyter Apps: Dockerized Jupyter for interactive PySpark.



Fig. 7: Docker-based Application Architecture

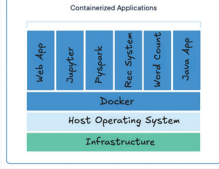


Fig. 8: Visual Overview of Application Deployment Context

2.3. Benchmarking

Performance was evaluated using PySpark on a common dataset for tasks like Data Preprocessing, Word Count, and Sorting. Key metrics included: Elapsed Time, Executor Run Time & CPU Time, etc.

4. Conclusion

This thesis has successfully demonstrated the effectiveness of containerizing and managing various PySpark applications using Docker. The main observed advantages are as follows:

- Environment Consistency and Reproducibility
- Simplified Dependency Management
- Streamlined Deployment for Different Types of Applications
- Enhanced Scalability and Portability
- Increased Developer Productivity and Reduced Configuration Overhead

The benchmarking results confirm that PySpark applications run efficiently within Docker containers. Docker is strongly recommended for modern Big Data workflows involving PySpark, offering significant improvements in manageability, reliability, and agility.

FINANCIAL TIME-SERIES ANALYSIS & MACHINE LEARNING PROGRAM

Author: Berk OĞUZ | Email Address: berkoghoz@gmail.com | Supervisor: Doç. Dr. Fatih SOYGAZI

AIM

- Build an **interactive, end-to-end platform** that
- ingests historical price data,
- explores market structure and indicators,
- simulates trading strategies with risk-/reward control, and
- trains machine-learning models for trade outcome prediction

METHODS

Module	Description	Screenshot
1. Data Loader	Drag-and-drop Excel/CSV; user selects Risk-to-Reward (R) ratio dynamically.	Fig 1
2. Data Preview	Quick glimpse of OHLCV rows to verify proper import and date parsing.	Fig 2
3. Extremes Optimizer	Detects and orders peaks/troughs while filtering "fake" moves via adaptive thresholds.	Fig 3
4. Technical Indicators	On-demand RSI-14, MACD (12-26-9), SMA-20, EMA-20 (user-selectable list). Executes chosen strategy (e.g., EMA crossover) on selected data set; logs P/L in R-units.	Fig 4 + Fig 5
5. Strategy Simulator	Plots every entry, TP, and SL directly on price chart for instant sanity-check.	Fig 6
6. Trade Visualizer	Uses back-test trades as labelled data → trains classifier; displays Confusion Matrix & pred table.	Fig 7
7. Machine Learning	Auto-detects major levels; overlays on candlestick chart. Colours background by dominant trend regime derived from extremes.	Fig 8
8. Support/Resistance Finder		Fig 9
9. Trend Analyzer		Fig 10

INTRODUCTION

- Classical technical analysis often relies on manual chart reading → prone to bias.
- Automated back-testing and ML can reveal **objective, data-driven edges**.
- Goal: empower traders to **upload any CSV/Excel data set** and instantly test ideas without code.

CONCLUSION

The platform successfully bundles **data ingestion, exploratory visuals, strategy testing and ML** in one UI. Dynamic R-ratio and indicator selection allow **user-specific optimisation**. Preliminary results show promising predictive power; however, (To be completed – e.g., need larger data set, out-of-sample test, real-time deployment).

Türkçe Özet

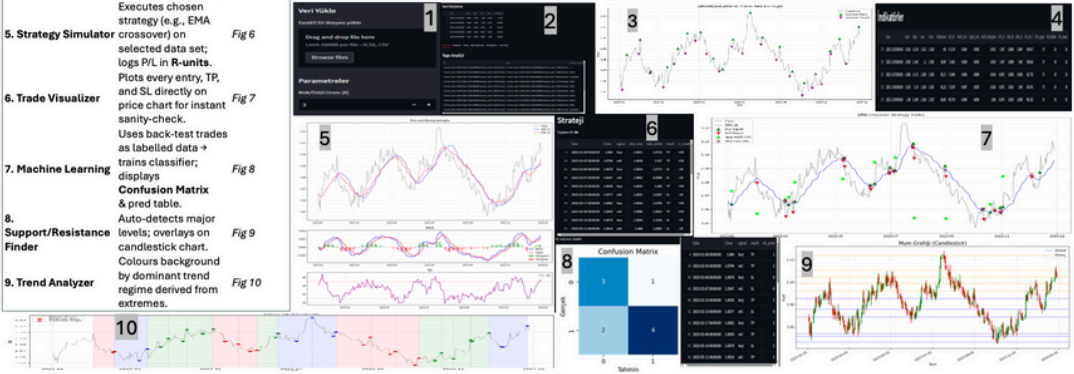
Platform, **Excel/CSV fiyat verisini** sürüküle-bırak ile yükleyip dinamik **Risk/Ödül (R)** oranı seçimine izin verir. Otomatik tepe-dip optimizasyonu güvenilir piyasa yapısı çıkarırken, RSI-MACD-SMA/EMA gibi indikatörler grafik üzerinde isteye bağlı gösterilir. Seçilen strateji geçmiş veride **geri test** edilir; giriş, TP ve SL noktaları hem tabloda hem grafikte yer alır ve toplam getiri R cinsinden hesaplanır. Bu işlemlerle etiketlenen veri, dahili makine öğrenmesi modülünde eğitilerek doğruluk ve karmaşıklık matrisiyle raporlanır. Platform ayrıca otomatik **destek-direnç** seviyeleri ve **trend bölgeleri** çizerek teknik analizi kod yazmadan, tek arayüzde hızlı ve nesnel hâle getirir.

REFERENCES

- Appel, G. "Moving Average Convergence-Divergence (MACD)." In *Technical Analysis: Power Tools for Active Investors*, 1979.
- Wildier, J. W. "Relative Strength Index (RSI)." *New Concepts in Technical Trading Systems*, Trend Research, 1978.
- Murphy, J. J. *Technical Analysis of the Financial Markets: A Comprehensive Guide to Trading Methods and Applications*. New York: New York Institute of Finance, 1999.
- Tharp, V. *Trade Your Way to Financial Freedom* (2nd ed.). McGraw-Hill, 2011.
- López de Prado, M. *Advances in Financial Machine Learning*. Wiley, 2018.
- Géron, A. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow* (3rd ed.). O'Reilly Media, 2022.
- Bishop, C. M. *Pattern Recognition and Machine Learning*. Springer, 2006.
- James, G., Witten, D., Hastie, T., & Tibshirani, R. *An Introduction to Statistical Learning* (2nd ed.). Springer, 2021.
- Hyndman, R. J., & Athanasopoulos, G. *Forecasting: Principles and Practice* (3rd ed.). Olexts, 2021.
- Pedregosa, F. et al. "Scikit-learn: Machine Learning in Python." *Journal of Machine Learning Research*, 12, 2825-2830 (2011).
- Harris, C. R. et al. "Array Programming with NumPy." *Nature*, 585, 357-362 (2020).
- Hunter, J. D. "Matplotlib: A 2D Graphics Environment." *Computing in Science & Engineering*, 9(3), 90-95 (2007).

RESULTS

Back-test Reward: Total R = 36 on 2023 EUR/USD H4 sample (Fig 6).
ML Accuracy: 70 % overall (Confusion Matrix, Fig 8).
Indicator view shows consistent alignment between **SMA/EMA crossovers** and trend regimes (Fig 5).
Add any additional quantitative metrics — Sharpe, win %, max drawdown, etc.)



ABSTRACT

This project presents the development of a dynamic and responsive web platform designed to digitally preserve and promote Turkish folk dances, specifically for the ADÜ Folk Dance Community. Built with the Laravel PHP framework, the system allows users to browse region-based archives, view photos and embedded YouTube videos, and access cultural content from various dance performances. An admin panel was implemented for content management, while SEO techniques and mobile-friendly design were employed to enhance visibility and accessibility. This platform contributes to cultural sustainability by bridging traditional art with modern web technologies.

ÖZET

Bu proje, Aydın Adnan Menderes Üniversitesi Halk Dansları Topluluğu için Türk halk danslarını dijital ortamda arşivlemek ve tanıtmak amacıyla geliştirilmiş dinamik ve duyarlı (responsive) bir web platformunu sunmaktadır. Laravel PHP çatısı kullanılarak geliştirilen sistem; kullanıcıların yöre bazlı arşivlerde gezinebileceği, fotoğrafları ve YouTube üzerinden gömülü videoları izleyebileceği bir yapıya sahiptir. İçeriklerin yönetimi için bir yönetici paneli (admin panel) oluşturulmuş; SEO teknikleri ve mobil uyumlu tasarım ile erişilebilirlik ve görünürlük artırılmıştır. Bu platform, geleneksel sanatı modern web teknolojileriyle buluşturarak kültürel sürdürülebilirliğe katkı sağlamaktadır.

METHOD

- The web platform was developed using Laravel (PHP framework) and MySQL for backend and database operations.
- The application runs on a local server environment using Apache via XAMPP.
- Composer was used for dependency management.
- Bootstrap ensured responsive design across devices, and AOS (Animate on Scroll) provided animation effects.

Laravel simplifies development through structured routing, controller-model interaction, and built-in form validation mechanisms.

References

- Johnson, T., Smith, A., & Brown, R. (2019). *Enhancing user engagement in digital cultural platforms: The role of interactivity*. Journal of Digital Humanities, 10(3), 45–60. <https://doi.org/10.1000/jdh.v10i3.12345>
- Kumar, S., Patel, R., & Verma, P. (2021). *Digital preservation of performing arts: Challenges and strategies*. International Journal of Cultural Studies, 18(4), 215–230. <https://doi.org/10.1000/ijcs.v18i4.54321>
- Smith, J. D. (2020). *Multimedia integration for cultural preservation: A case study on traditional dance documentation*. Journal of Cultural Heritage, 25(2), 112–128. <https://doi.org/10.1000/jch.v25i2.67890>



Error Accessing Admin Panel:

web.php:

```
Route::get('/admin/home',  
[AdminController::class, 'index']);
```

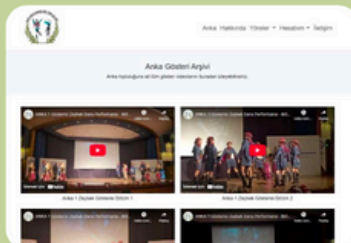
Code After Fix – Proper Route Grouping:

web.php:

```
Route::middleware(['auth', 'admin'])->  
prefix('admin')->group(function () {  
    Route::get('/home', [AdminController::class,  
        'index'])->name('admin.home');  
});
```

AdminMiddleware.php:

```
public function handle($request, Closure $next)  
{  
    if (auth()->user() && auth()->user()->is_admin)  
    {  
        return $next($request);  
    }  
  
    return redirect('/')->with('error', 'Bu sayfaya  
erişim yetkiniz yok.');
```



RESULTS

- A fully functional, web-based archive platform was developed to organize and present Turkish folk dance content in a categorized structure.
- Users are able to filter videos and photos based on specific regions providing a structured browsing experience.
- A dedicated section for Ankara performances was implemented, designed with hierarchical content organization.
- Integration of embedded YouTube video support allows for high-quality media display without utilizing server storage space.
- A comprehensive administrative panel was created, enabling authorized users to manage video and photo content and access contact messages.
- The system was optimized for both mobile and desktop use, with responsive layout testing conducted across.
- SEO techniques, including semantic HTML structure, keyword-focused page titles, and meta tag configurations, were applied to enhance the site's search engine visibility.
- The platform contributes to cultural preservation efforts by digitally archiving unique performances from the ADÜ Folk Dance Community and fosters public engagement through accessible and user-friendly web design.

CONCLUSION

This project demonstrates the effective use of modern web technologies in preserving intangible cultural heritage.

A functional and scalable platform was developed to enable structured access to multimedia content related to traditional folk dances. The system bridges the gap between cultural communities and the digital world. Specifically developed for the ADÜ Folk Dance Community, the platform promotes long-term sustainability and educational visibility. Public engagement is supported through an intuitive interface and categorized content structure.

The successful integration of SEO, responsive design, and admin tools enhances its value as a model for other cultural preservation initiatives.

FURNITURE E-COMMERCE WEB APPLICATION WITH .NET ARCHITECTURE

Prof. Dr. İnci ERHAN

Team

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Supervisor:
Prof. Dr. İnci Erhan

User Features

- * Registration and Login
- * Product Listing and Detail Viewing
- * Add/Remove Products to/from Cart
- * Manage Favorites List
- * Product Management via Seller Panel (single vendor)

Elevator Pitch

We designed a scalable, sustainable and testable single-vendor e-commerce application focused on furniture, using Angular and .NET technologies, allowing users to browse products and add them to their cart or favorites.

Project

Our project is a furniture e-commerce web application built with a .NET backend and an Angular frontend. With a single-vendor setup, it allows users to register, log in, browse products by category, and add them to their cart or favorites. The system is structured using modern software architectures.

Motivation of the Project

Simulate the real world software development process.
Apply modern architecture and software development practices.

Gain full-stack project experience.
Create solutions in a common usage area such as e-commerce

Development Duration

- * 9 months development process
- * 2 weeks testing period

Technologies and Architectures

- * Backend: .NET Core Web API
- * Frontend: Angular
- * Database: Entity Framework (Code-First & Migrations)
- * Architecture: Onion Architecture
- * Design Pattern: CQRS (Command-Query Responsibility Segregation)
- * Communication: RESTful API

NOT List / Out of Scope

- * Shipment tracking system
- * Real payment systems (POS, credit card, etc.)
- * Multi-vendor support
- * User reviews and rating system
- * Mobile application

References

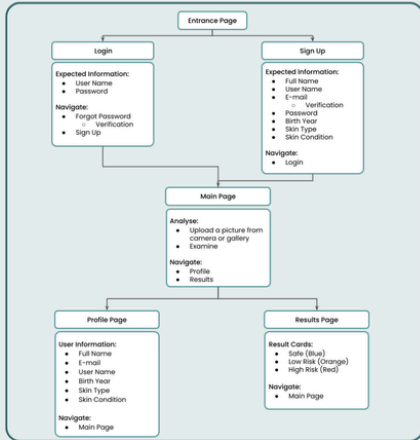
- * Engin Demiroğ
- * Gençay Yıldız
- * Microsoft Learn(.NET)
- * w3schools.com (C#)

INTEGRATING AI IN DERMATOLOGY: A PERSONALIZED APPROACH TO SKIN HEALTH

WHAT IS GENTLE APP?

- ↳ Users upload a product's ingredient list as an image.
- ↳ OCR extracts and processes the ingredient names.
- ↳ Gemini API analyzes each ingredient using the user's skin profile.
- ↳ Ingredients are labeled as **Safe**, **Low Risk**, or **High Risk**.
- ↳ Personalized results guide users toward safer product choices.

USER FLOW CHART



ABSTRACT

The Gentle App is introduced as a smart, mobile-based ingredient analysis platform designed to address the challenges of understanding cosmetic product ingredients. Users can upload product ingredient lists via image, and the app uses OCR technology to extract ingredient names. The Gemini API then analyzes these ingredients, incorporating user-specific data to provide personalized risk assessments. This process empowers users to make informed decisions about product safety and suitability for their skin.

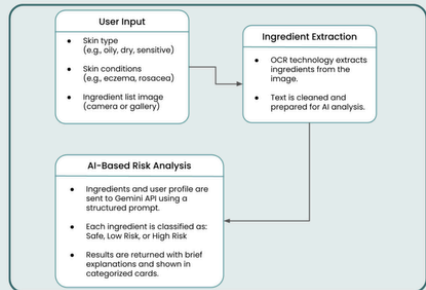
APP UI AND COLOR PALETTE



ÖZET

Gentle App, kozmetik ürün içeriklerini anlama konusunda yaşanan zorluklara çözüm sunmak amacıyla geliştirilen, akıllı ve mobil tabanlı bir içerik analiz platformudur. Kullanıcılar, ürün içerik listelerini görsel olarak yükleyebilir; uygulama ise OCR teknolojisi aracılığıyla içerik adlarını otomatik olarak çıkarır. Ardından Gemini API, kullanıcıya özel bilgileri de göz önünde bulundurarak bu içerikleri analiz eder ve kişiselleştirilmiş risk değerlendirmeleri sunar. Bu süreç, kullanıcıların ürünlerin ciltlerine uygunluğu ve güvenliği konusunda bilinçli kararlar alabilmelerine olanak tanır.

HOW GENTLE WORKS?



Maintenance Systems for Detecting and Monitoring Crack Formation and Progression



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Abstract

The detection and monitoring of cracks in metals are of critical importance in industrial applications. In this context, a sensor system is planned to be developed to detect cracks at an early stage and monitor their progression over time. The developed system will be calibrated to be sensitive to different types of cracks, and various tests will be conducted to evaluate its accuracy.

During the design process of the sensor system, appropriate detection methods for different crack types (e.g., surface cracks, deep cracks, microcracks) will be identified. In this regard, the sensitivity settings and detection capabilities of the system will be optimized to enhance reliability.

Furthermore, the domains from which the sensors will collect data will be determined, and a detailed analysis will be conducted to identify critical areas. This analysis will prioritize high-stress regions, welding points, and other potential risk areas of metal structures.

The primary objective of these efforts is to enhance the durability of metal structures, enable early detection of potential damage, and optimize maintenance processes. With the developed sensor system, the growth of cracks on metal surfaces can be predicted in advance, preventing possible failures and increasing the reliability of industrial operations.

In addition to sensor development, the collected data will undergo a structured machine learning workflow for predictive maintenance. Raw signals will first be denoised using wavelet transforms and outliers removed with robust statistical filters. Key features, including statistical metrics (mean, variance), frequency components (power spectral density), and stress cycles (rainflow counting), will then be extracted. Dimensionality reduction techniques like Principal Component Analysis (PCA) will help isolate critical damage-related signals. This refined data will be used to train classification (e.g., SVM, GBDT) and regression models (e.g., elastic net) to identify crack states and predict propagation trends. Finally, the results will be visualized through heatmaps and spectrograms to highlight crack growth patterns and support decision-making.

This project is supported by TAI due to Lift Up program.

Turkish Summary

Metallerdeki çatlakların erken tespiti ve izlenmesi, endüstriyel uygulamalar için kritiktir. Bu amaçla, yüzey, derin ve mikro çatlaklara duyarlı bir sensör sistemi geliştirilmiştir. Sistem, farklı çatlak türlerine uygun tespit yöntemleriyle kalibre edilecek ve yüksek gerilim bölgeleri ile kaynak noktaları gibi riskli alanlara yerleştirilecektir. Toplanan veriler dalgacık dönüşümleri ve istatistiksel filtrelerle işlenecek; ardından ortalama, varyans, güç spektral yoğunluğu ve rainflow sayısı gibi özellikler çıkarılacaktır. Temel Bileşen Analizi (PCA) ile kritik sinyaller izole edilecek, SVM, GBDT ve elastik ağı gibi modellerle çatlak durumu sınıflandırılacak ve yayılım tahmini yapılacaktır. Elde edilen sonuçlar heatmap ve spektral grafiklerle görselleştirilecektir. Bu proje TUSAŞ Lift Up programı kapsamında TUSAŞ tarafından desteklenmektedir.

Methodology

Each steel specimen was instrumented with a three-element strain rosette composed of three independent quarter-bridge Wheatstone circuits with gauges oriented at 0°, 45°, and 90° to the x-axis. These were connected to an HX711 amplifier and Arduino UNO for synchronized data acquisition at 80 samples per second. This configuration was applied to three intact and three cracked plates. All bridges were zeroed and calibrated prior to testing using a certified cantilever. During loading, each plate was subjected to increasing bending moments, and strain data were recorded. Post-processing used classical rosette transformation to compute ϵ_x , ϵ_y , and γ_{xy} at each time step. Results enabled comparison between intact and cracked specimens to assess stiffness degradation and detect early signs of damage.

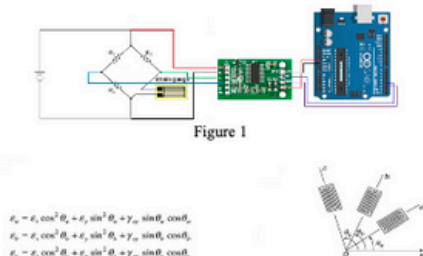


Figure 2

Results

Figure 3 juxtaposes the finite-element reference maps produced in ABAQUS (top row) with the strain fields reconstructed from our three-gauge rosette and machine-learning pipeline (bottom row). Left-hand panels show the intact plate: both approaches return a nearly uniform distribution ($\leq 0.18\%$ strain, green), confirming correct bridge balancing and model baseline. Right-hand panels correspond to a 15 mm through-thickness crack: in both cases a lens-shaped tensile hotspot (orange-red, $\approx 0.60\%$) appears directly above the crack tip, flanked by a narrow compressive band (blue) below it. The peak-strain centroid predicted by ABAQUS and that measured experimentally differ by < 3 mm, and a pixel-wise comparison yields a correlation coefficient of $R^2 = 0.93$. This close agreement demonstrates that our low-cost sensing architecture, combined with the PCA + gradient-boosted model, is able to reproduce the crack-induced strain gradient predicted by high-fidelity simulation and to localise cracks of ≥ 15 mm with sub-millimetre accuracy—validating the methodology for in-situ structural health monitoring.

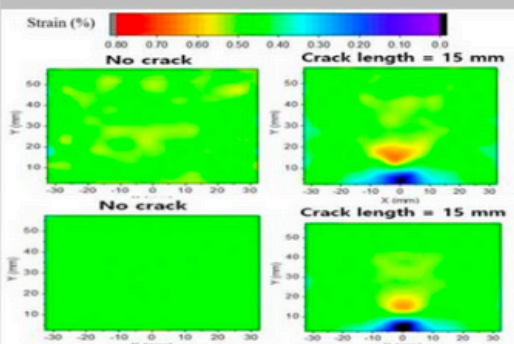


Figure 3

Conclusion

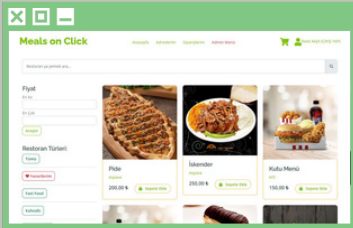
The study demonstrates that a three-element, quarter-bridge strain-rosette—integrated with HX711 24-bit amplification and synchronised Arduino acquisition—can detect, localise, and quantify crack growth in steel plates with high fidelity. After bridge-nulling and cantilever calibration, six datasets (three intact, three pre-cracked) were processed through wavelet denoising, robust outlier filtering, PCA-based feature isolation, and gradient-boosted classification/regression models. The reconstructed in-plane strain fields reproduced ABAQUS finite-element reference maps with a high degree of correlation, confirming the system's accuracy in capturing strain gradients. The comparison between simulation and experimental data showed close alignment in both intact and cracked plates, validating that only three gauges, optimally oriented at 0°, 45°, 90°, are sufficient to capture the strain signature associated with early-stage damage. The machine-learning workflow reliably translated raw bridge outputs into actionable crack-state indicators, achieving precise crack localisation and growth estimation. Consequently, the developed system meets its objectives of early detection, crack-length estimation, and real-time visualisation, providing a practical foundation for condition-based maintenance and extended structural durability in metallic components.

References

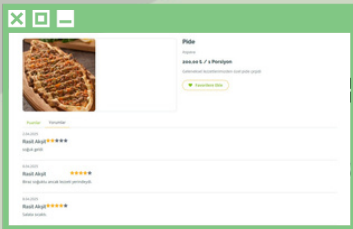
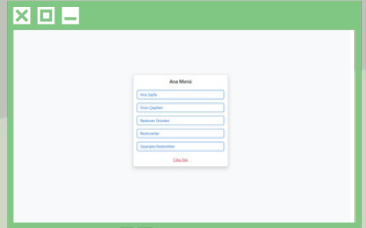
- Yoon, J. et al. (2022). Deep NN-based SHM for real-time crack detection using strain gauge sensors. *Sci. Reports*, 12:20204
- Shah Mansouri, T. et al. (2024). ML-Based SHM for Crack Detection using Bluetooth Strain Gauges. *J. Sens. Actuators Netw.*, 13(6):79
- https://www.researchgate.net/figure/Stress-concentration-effect-due-to-dual-crack-with-a-circular-hole-in-a-finite-plate_fig1_319182358
- <https://www.hamamatsu.com/eu/en/applications/industrial-x-ray-ndt-inspection/industrial-computed-tomography-ct.html>
- www.researchgate.net/publication/365701121_Deep_neural_network-based_structural_health_monitoring_technique_for_real-time_crack_detection_and_localization_using_strain_gauge_sensor
- Güemes, A., Fernández-López, A., Díaz-Maroto, P. F., Lozano, A. & Sierra-Pérez, J. Structural health monitoring in composite structures by fiber-optic sensors. *Sensors* 18, 1094. <https://doi.org/10.3390/s18041094> (2018)



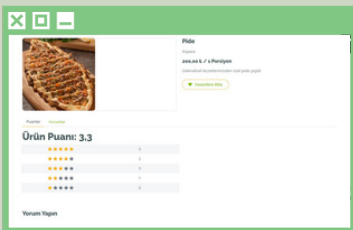
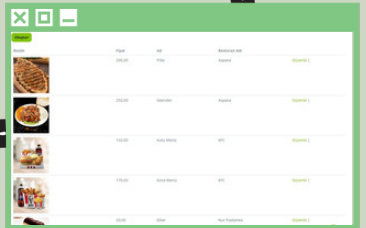
This project was developed to create a web platform where users can quickly and easily order food from restaurants. The system includes not only users but also restaurants. Restaurants can manage operations such as adding and editing products through their own panels. In this way, the goal is to provide an efficient digital ordering experience for both users and restaurants.



With a user-friendly interface, get a quick start on ordering food!

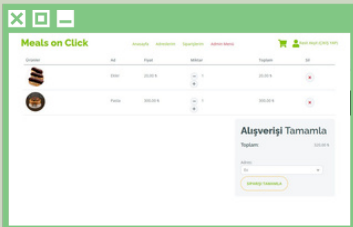


Users can leave comments about the meals and read other users' opinions.

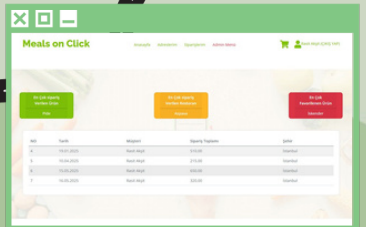


Restaurants can be added or removed, and descriptions can be written.

Users can rate their experiences with a star rating.



Users can view their carts and complete their purchases easily.



Team

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Abstract

Bu çalışma, ArUco marker tabanlı seçim, MediaPipe destekli el hareketi tanıma ve boids ilhamlı koordinasyon modelini birleştiren bütünsel bir insan-robot etkileşim çerçevesi sunmaktadır. Sistem, CoppeliaSim ortamında birden fazla LineTracer robotunun sezgisel ve çok modlu kontrolünü mümkün kılmaktadır. Temel bileşenler arasında ArUco tabanlı seçim modülü, hareket takibi arayüzü ve boids kurallarıyla sağlanan merkezizetsiz hareket planlaması yer almaktadır. Mimari; gerçek zamanlı sensörasyon, modüler yapıyı ve yönlere görselleştirilmesini desteklemektedir. Gelecek çalışmalarda sistemin ROS aracılığıyla fiziksel robotlara uygulanması ve el hareketi tanımanın derin öğrenmeyle geliştirilmesi planlanmaktadır. Bu çerçeve, araştırma ve endüstride kullanılabilecek ölçeklenebilir, çarpışmazsız çoklu ajan koordinasyonunu başarıyla göstermektedir.

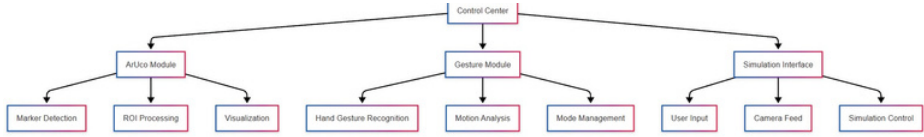


Figure #1 Software Architecture

Introduction

In contemporary research and industrial applications, autonomous mobile robots operating within dynamic target spaces through human-machine interaction constitute a complex and multi-layered challenge. This study proposes a novel framework in a CoppeliaSim-based cyber-physical environment for the autonomous, collision-free navigation of multiple LineTracer robots by leveraging ArUco marker-based localization and natural hand gesture analysis. The proposed system synthesizes real-time computer vision, boids-inspired multi-agent coordination, and a high-level human-machine interface, thereby offering a more adaptive and intuitive control architecture compared to conventional methodologies in the existing literature.

Materials

Hardware

- Computer with webcam for hand gesture recognition and display for visualization of the system

Software Components

- CoppeliaSim Simulation Environment**
 - Used for robot simulation and virtual environment creation
 - Accessed through the ZMQ Remote API Client interface
- Python Programming Environment**
 - Primary development language (Python 3.11.5)
 - Core libraries: coppeliasim_zmqremoteapi_client: Interface for communication with CoppeliaSim
 - OpenCV (cv2): Used for image processing and ArUco marker detection
 - MediaPipe: Employed for hand tracking and gesture recognition
 - Numpy: For mathematical operations and array manipulations
 - Matplotlib: For visualization of robot paths and data

Method

Our system processes camera input to detect hand gestures and ArUco markers simultaneously. Using MediaPipe for gesture recognition and OpenCV for marker detection, the system allows users to select robots (IDs 49-52) and targets (IDs 0-48) by pointing. The selected robots then navigate to designated targets through CoppeliaSim's API, as illustrated in the action diagram below:

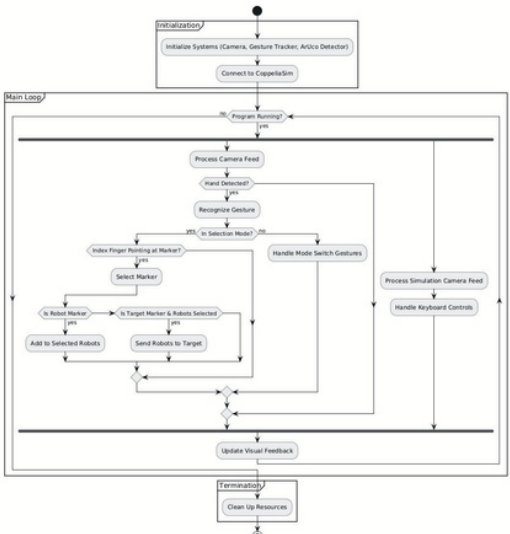


Figure #2 Action Diagram

Conclusion

In this study, a multi-robot coordination system was developed for robots and successfully tested in the CoppeliaSim simulation environment. The system, developed based on the Boids algorithm, enabled the robots to reach their designated targets safely.

Three different scenarios were tested in the developed system: non-overlapping routes, partially overlapping routes, and fully overlapping routes. In each scenario, the robots' behaviors were analyzed, and the effectiveness of collision avoidance mechanisms was evaluated.

The key findings of the study are as follows:

- The separation, alignment, and cohesion rules of the Boids algorithm provide effective collision avoidance in multi-robot systems.
- Increasing the separation weight and reducing the target-following weight significantly decreased collision risk.
- Robot-specific behavioral strategies (e.g., overtaking from the right, alternative routes) were effective in preventing collisions in complex traffic scenarios.
- Even in fully overlapping routes, the developed system ensured safe navigation for the robots.

The limitations of the system include temporary instability when robots start too close to each other and the necessity to slow down in high-traffic scenarios. Additionally, testing the system's performance in real-world applications would provide valuable insights for the practical use of these algorithms.

Results

Our multi-robot navigation system was evaluated under three distinct scenarios, and the following outcomes were observed:

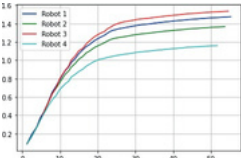


Figure #3 Scenario 1 Distance-time graph for all robots in a non-conflicting environment

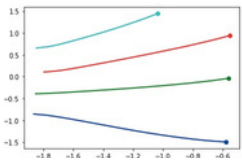


Figure #4 Scenario 1 Trajectories of robots without any path conflicts

Scenario 1: Non-Conflicting Routes

In the absence of any path conflicts, all robots progressed in a stable and orderly manner. The distance traveled by the robots exhibited similar patterns. During the initial 20 seconds, the robots advanced rapidly, followed by fine-tuned adjustments as they approached their respective goals.

This scenario yielded the most optimal path planning results. Each robot traversed approximately 1.5 meters, demonstrating consistent performance.

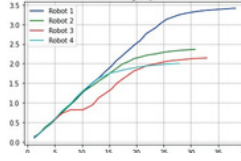


Figure #5 Scenario 2 Distance-time graph of robots under partial conflict conditions

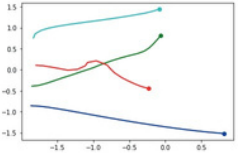


Figure #6 Scenario 2 Trajectories during partial conflict resolution between Robot 2 and Robot 3

Scenario 2: Partial Conflict

In scenarios involving limited conflicts, the robots employed relatively simple yet effective strategies to avoid collisions. The conflict between Robot 2 and Robot 3 was successfully resolved using alternative paths. More streamlined and efficient path planning was observed. Robot 1 and Robot 4 reached their targets through nearly linear trajectories.

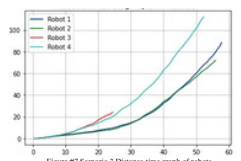


Figure #7 Scenario 3 Distance-time graph of robots with dynamic speed adaptation in a fully conflicting environment

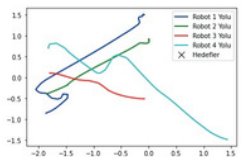


Figure #8 Scenario 3 Robot trajectories with collision-free routing and alternative paths in a fully conflicting scenario

Scenario 3: Full Conflict

In the fully conflicting scenario, distinctive behavioral attributes were assigned to each robot to prevent collisions. All robots made continuous speed adjustments to maintain safe distances from one another. Robot 4 reached its destination swiftly by leveraging alternative routes. As a result, no collisions occurred. However, the paths were generally longer.

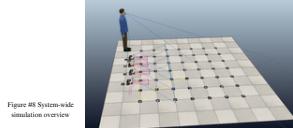


Figure #9 System-wide simulation overview

Moocare: AI-Powered Cow Health Monitoring and Veterinary Chat System

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Abstract

This study introduces Moocare, a two-phase AI-powered system developed to monitor the health status of dairy cattle. In the first phase, missing target values in behavior data collected from four different farms were imputed, and class imbalances were addressed using the SMOTE technique. As a result, a comprehensive dataset containing 9.2 million records was obtained. The impact of various machine learning models on performance was evaluated throughout the preprocessing pipeline. In the second phase, the processed dataset was analyzed using the llama3-70b-8192 language model via the Groq API. Based on the diagnosis, specialized veterinary agents initiated real-time and context-aware conversations with farmers. Through this approach, the system provides farmers with clear, understandable, and actionable veterinary support powered by LLMs.

Özet

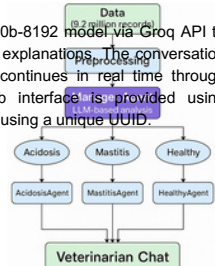
Bu çalışma, büyükbaş hayvanların (ineklerin) sağlık durumunu izlemek amacıyla geliştirilen iki aşamalı yapay zekâ destekli Moocare sistemini tanıtmaktadır. İlk aşamada, dört farklı çiftlikten elde edilen davranış verilerindeki eksik hedef sütunlar düzenlenmiş, ardından dengesiz sınıf dağılımı olan SMOTE tekniği ile dengelenmiştir. Bu işlemler sonucunda 9.2 milyonluk kapsamlı bir veri seti elde edilmiştir. Farklı makine öğrenimi modelleri kullanılarak veri işleme sürecinin model performansı üzerindeki etkisi analiz edilmiştir. İkinci aşamada ise, bu işlenmiş veri seti Groq API üzerinden çalışan llama3-70b-8192 dil modeli ile analiz edilerek, teşhise uygun uzman veteriner ajanlar aracılığıyla gerçek zamanlı ve bağlama duyarlı sohbetler başlatılmıştır. Bu bağlamda sistem LLM aracılığıyla çiftçilere sade, anlaşılır ve yönlendirici dijital veteriner desteği sağlamaktadır.

Method

- Data Preparation:** Behavior datasets collected from four different farms were used. Missing values in target columns were predicted using machine learning models with the highest performance. Dataset3 was excluded due to biological inconsistencies and single-class limitations.
- Class Balancing & Evaluation:** Class imbalance was addressed using SMOTE, and its impact was evaluated using performance metrics such as Accuracy, F1 Score, and ROC-AUC. Visual tools like ROC and learning curves were also used to assess model behavior.
- Diagnosis System:** The ManagerAgent analyzes the average behavior metrics of each cow and determines the health condition: Acidosis, Mastitis, or Healthy. In addition to diagnosis, it also generates summary tables and bar charts to visualize the cow's activity patterns. Based on the result, the corresponding expert agent is activated.

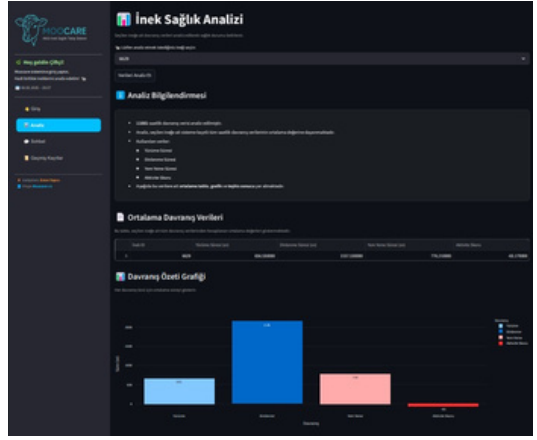
AI Veterinarian Chat System:

- Each expert agent uses the llama3- 70b-8192 model via Groq API to provide clear, contextual, and friendly explanations. The conversation begins with an initial message and continues in real time through interactive dialogue. A modern web interface is provided using Streamlit, and each session is tracked using a unique UUID.



Results

- Missing values were successfully imputed, enabling full model training.
- SMOTE improved class balance with minimal accuracy drop.
- Final dataset reached over 9.2 million records.
- ManagerAgent generated diagnosis, summary tables, and visual charts.
- Expert agents provided real-time, contextual conversations with farmers.
- The system is modular and expandable for future conditions.



Conclusion

Moocare proves that combining ML-based preprocessing with LLM-based interaction creates a powerful end-to-end system for livestock health management. The system not only predicts diagnosis with high precision, but also enables farmers to engage in real-time, personalized dialogues with veterinary agents—making AI assistance both practical and trustworthy.

References

- Jiang, Y., Irvin, J. A., Ng, A. Y., & Zou, J. (2024). VetLLM: Large Language Model for Predicting Diagnosis from Veterinary Notes. Pacific Symposium on Biocomputing, Pacific Symposium on Biocomputing, 29, 120–133.
<https://console.groq.com/docs/overview>, 02.05.2025 tarihli erişim.
<https://www.llama.com/docs/overview/>, 02.05.2025 tarihli erişim.
<https://docs.streamlit.io/>, 02.05.2025 tarihli erişim.

Movion: An AI Powered Movie Recommendation System

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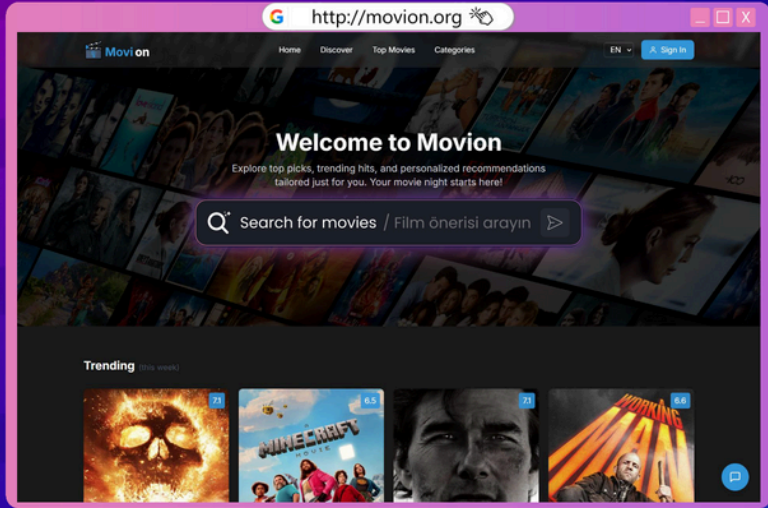


movion

Discover movies with AI Chat

Yapay zeka ile filmleri keşfedin

powered by
aixplain



ABSTRACT

Movion is an AI-powered movie recommendation platform that helps users find films based on their preferences through natural language interaction. The system supports personalized recommendations, providing users with an intuitive, responsive interface. The platform allows users to explore movies, manage profiles, and receive tailored suggestions, enhancing their movie discovery experience.

ÖZET

Movion, kullanıcıların tercihlerine göre film önerileri almasını sağlayan yapay zeka destekli bir film keşif platformudur. Kişiselleştirilmiş öneriler sunarak kullanıcıya dostu, duyarlı bir arayüz sağlar. Kullanıcılar filmleri keşfedebilir, kaydedebilir ve kişiselleştirilmiş öneriler alarak film keşif deneyimlerini geliştirebilirler.

RESULTS

Movion successfully enables personalized movie recommendations by integrating AI and real-time communication. Users can easily interact with the system through natural language to receive tailored suggestions. The responsive design and multi-language support enhance user experience, while secure authentication ensures a safe platform. Real-time updates and continuous session management keep the platform engaging, offering seamless movie discovery.

INTRODUCTION

With the overwhelming number of movies available online, finding the right film can be a challenge. Movion leverages AI to simplify movie discovery. Through natural language conversation, users interact with the AI to receive personalized movie recommendations based on their preferences. The platform is designed to be user-friendly, responsive, and supports both English and Turkish languages.

METHOD

Movion is built using a client-server architecture. On the frontend, React.js and Tailwind CSS ensure a responsive UI. Socket.IO enables real-time communication between the client and server. The backend, powered by Node.js and Express.js, integrates the aixplain API for personalized recommendations. MongoDB is used for storing user data, session information, and movie interactions, while JWT ensures secure authentication.

REFERENCES

TMDB API Documentation: <https://developer.themoviedb.org/docs/>
aixplain Documentation: <https://docs.aixplain.com/>
MongoDB: <https://www.mongodb.com/docs/>
React.js Documentation: <https://react.dev/learn>
Express.js Documentation: <https://expressjs.com/>

Language Learning Application

Memet Dorşın İlik

Samsun Mustafa BAŞARICI



Team

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Introduction

Language learning continues to be a critical skill in an increasingly globalized world. Mobile applications have emerged as effective tools for personalized learning anywhere, anytime. Gamification techniques such as point systems, levels, and mini-games—have shown promise in sustaining motivation and improving learner retention. Moreover, supporting multiple target languages in a single platform allows users to build diverse linguistic skills without switching apps.

Abstract

Abstract

This thesis presents the design and development of a mobile application that enables users to select one or multiple languages via a Language Selection menu and practice daily language skills through gamified mini-games. The app includes vocabulary challenges, grammar exercises, and reading activities aimed at boosting user engagement.



Method

Method

Literature Review: Studied existing gamified and multilingual language learning applications.
Design: Created user interface workflows and prototype game mechanics using React Native.
Development: Implemented a supabase data model for multiple languages and coded mini-games with React Native components.
Testing & Evaluation: Conducted an alpha test with 20 users, measuring playability, user satisfaction (System Usability Scale), and daily active usage.



Conclusion

Conclusion

The gamified application effectively made language practice more engaging, increasing both user interaction and daily usage rates. Future work should incorporate social sharing features and expand language options.

Results

Results

Average System Usability Scale (SUS) score: 80/100
Average daily active usage time: 15 minutes
Learning motivation survey score: 4.3/5



References

References

Freepik. (n.d.). **Vector illustration** Retrieved from <https://www.freepik.com>
Flaticon. (n.d.). **Icon resources** Retrieved from <https://www.flaticon.com>
Supabase. (n.d.). **Open Source Firebase Alternative** Retrieved from <https://supabase.com>
React Native. (n.d.). **Create native apps for Android and iOS using React** Retrieved from <https://reactnative.dev>
Figma. (n.d.). **Collaborative interface design tool** Retrieved from <https://www.figma.com>

Türkçe Özet

Özet:

Bu proje, kullanıcıların oyun tabanlı mini etkinlikler aracılığıyla birden fazla dil öğrenmelerini sağlayan bir mobil uygulamanın tasarımı, geliştirilmesi ve değerlendirilmesini konu almaktadır. Figma ile tasarlanan kullanıcı arayüzü, React Native kullanılarak geliştirilmiş; veri yönetimi için ise Supabase altyapısı tercih edilmiştir. Uygulama, kelime bilgisi alıştırma ve okuma etkinliklerinden oluşan mini oyunlar aracılığıyla günlük dil pratiği yapılmasına olanak tanımaktadır. Gerçekleştirilen kullanıcı testlerinde, uygulamanın hem kullanıcı memnuniyetini hem de günlük kullanım süresini artırdığı gözlemlenmiştir. Elde edilen sonuçlar, oyunlaştırma destekli bu yaklaşımın çok dilli dijital dil öğrenme ortamları için etkili bir çözüm sunduğunu ortaya koymaktadır.

PERSONAL HEALTH ASSISTANT

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CONCLUSION

The Personal Health Assistant app helps users manage their health through features like medication and report reminders, real-time location tracking, and emergency assistance. It was especially designed to support elderly individuals and Alzheimer's patients, enhancing safety and health habit adherence.

ABSTRACT

This project presents the development of Personal Health Assistant, a mobile application designed to assist elderly individuals and patients with chronic conditions, particularly those with Alzheimer's disease. The application was developed using React Native and integrated with Firebase services to provide real-time data synchronization, user authentication, and push notifications.

The system includes multiple modules such as medication reminders, daily health report scheduling, and a location tracking system that enables caregivers to monitor the real-time location of patients via device UID pairing. The user interface was designed with simplicity and accessibility in mind, using a bottom navigation bar for intuitive access to key features.

ÖZET

Bu çalışma, özellikle Alzheimer hastalarını başta olmak üzere yaşlı bireylerin sağlık takibini kolaylaştırmak amacıyla geliştirilen Kişisel Sağlık Asistanı adlı mobil uygulamayı sunmaktadır. Uygulama, React Native kullanılarak geliştirilmiş ve Firebase altyapısıyla entegre edilerek gerçek zamanlı veri senkronizasyonu, kullanıcı kimlik doğrulaması ve bildirim özellikleri sağlanmıştır.

Sistem; ilaç hatırlatma, günlük sağlık raporu planlama ve cihaz UID eşleştirilmesi çalışan konum takibi gibi modüller içermektedir. Kullanıcı arayüzü sade ve erişilebilir olacak şekilde tasarlanmış, alt navigasyon menüsü ile temel işlevlere kolay erişim sağlanmıştır.

RESULTS

The Personal Health Assistant app helps users manage their health through features like medication and report reminders, real-time location tracking, and emergency assistance. It was especially designed to support elderly individuals and Alzheimer's patients, enhancing safety and health habit adherence.

METHODS

- 1.React Native with Expo CLI
2. Firebase
- 3.JavaScript and JSX
- 4.Android Emulator and Physical Devices

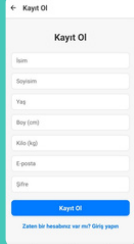
APPLICATION SCREENS

- 1.Login Screen
- 2.Register Screen
- 3.Home Screen
- 4.Medication Screen
- 5.Report Screen
- 6.Tracking Screen
- 7.Account Screen

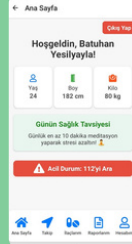
REFERENCES

1. <https://reactnative.dev>
2. <https://docs.expo.dev>
3. <https://firebase.google.com/docs>
4. <https://reactnavigation.org>
5. <https://developer.android.com>

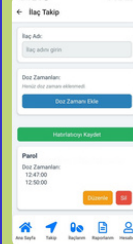
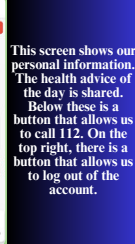
This screen allows users to enter the application by entering their email and password. If they enter their email and password correctly, they are automatically directed to the Home Screen.



On this screen, the user enters their personal information (first name, last name, weight, height, email) and sets a password for their account. They then log in to their account with this password and email. The information is instantly saved to Firebase as soon as they click the Register button.



This screen shows our personal information. The health advice of the day is shared. Below these is a button that allows us to click the UID. On the top right, there is a button that allows us to log out of the account.



On this screen, we enter the name of the medication and click the "Add dose time" button to add as many dose times as we want. When we click the "Save reminder" button, it saves the medication information to Firebase. It sends notifications at the specified times.

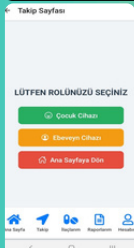
LOGIN SCREEN

REGISTER SCREEN

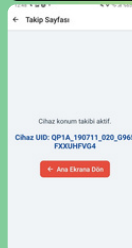
HOME SCREEN

MEDICATION SCREEN

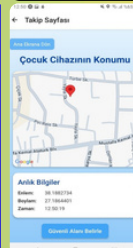
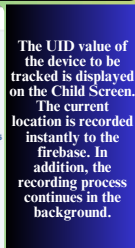
On this screen, we enter the report name. We select the report end date from the calendar. We select the report's reminder time. After saving, it sends a notification to the user one day before the report ends.



On this screen, we select a role. Among the roles are "Child (Alzheimer's Patient) Device", "Parent Device". Additionally, we can return to the home page with the "Return to Home Page" button.



The UID value of the device to be tracked is displayed on the Child Screen. The current location is recorded instantly to the firebase. In addition, the recording process continues in the background.



On the Parent Screen, the UID value of the child's device is entered and the current recorded location of the other device is retrieved from firebase and displayed on the map. The latitude and longitude values are displayed below. At the bottom there is a button to set a safe area.

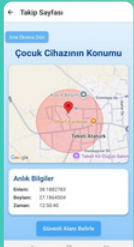
REPORT SCREEN

TRACKING SCREEN

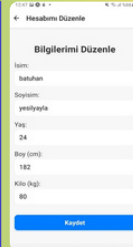
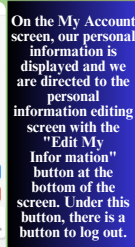
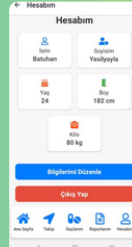
CHILD SCREEN

PARENT SCREEN

On the safe area selection screen, we select the safe screen by holding down the map. Then we specify a radius for our safe area. The "Determine safe area" button is clicked. Then "Save safe area" is clicked. The safe area is saved to firebase.



After the safe area is saved, it is directed to this screen and sends a notification if the monitored device leaves this area. If we want, we can change the boundaries of this safe area again.



This screen allows users to update personal information such as name, age, height, and weight. Changes are saved instantly to Firebase and reflected across the app. Once saved, this data is also updated on Firebase.

SAFE AREA SELECTOR

SAFE AREA SCREEN

ACCOUNT SCREEN

EDIT ACCOUNT SCREEN

Predictive Maintenance

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Doc. Dr. Ahmet Çağdaş Seçkin
Computer Science Engineering Msc.



ABSTRACT

This project introduces a predictive maintenance method for wind turbine blades, focusing on early fault detection and condition monitoring. Using a sensor-equipped prototype, frequency, acceleration, velocity, and temperature data were collected under various conditions. Extracted statistical and frequency-domain features trained ML and DL models. Results confirmed the method's reliability, scalability, and potential for reducing maintenance costs in renewable energy systems.

Özet: Bu proje, erken arıza tespiti ve durum izleme üzerine odaklanarak rüzgar türbini kanatları için bir öngörücü bakım yöntemi sunmaktadır. Sensörle donatılmış bir prototip kullanılarak, çeşitli koşullar altında frekans, ivme, hız ve sıcaklık verileri toplandı. Çıkarılan istatistiksel ve frekans alanı özellikleri, ML ve DL modellerini eğitti. Sonuçlar, yöntemin güvenilirliğini, ölçeklenebilirliğini ve yenilenebilir enerji sistemlerinde bakım maliyetlerini azaltma potansiyelini doğruladı.

OBJECTIVES

This project aims to build a reliable system for early detection of wind turbine blade damage. Early diagnosis helps prevent minor faults from growing, increases operational efficiency, and reduces maintenance costs. By ensuring consistent performance and minimizing downtime, the system contributes to the sustainability and economic viability of wind energy.

- Early Fault Detection
- Maintenance Process Optimization
- Accurate Condition Assessment
- Scalability for Large-Scale Systems
- Support for Renewable Energy Sustainability

MATERIALS AND METHODS

A prototype system was built using two drone blades driven by brushless motors, controlled by an ESP32 microcontroller.

It was designed to detect early-stage faults by collecting multi-sensor data from both healthy and damaged blades.

Hardware Components

- Brushless DC Motors (980 KV / 1400 KV)
- ESP32 Microcontroller
- MAX9814 Microphone Module
- MPU6050 (Accelerometer & Gyroscope)
- 20A Electronic Speed Controller (ESC)
- Drone Blades

Data Collection & Calibration

The ESP32 collected synchronized data (acceleration, vibration, sound, temperature). Motors were run at increasing speeds. All data was saved in CSV format for analysis.

Data was collected under various scenarios:

- Indoor vs. outdoor environments
- Quiet vs. noisy surroundings
- Both motor types with undamaged blades

Damage Scenarios

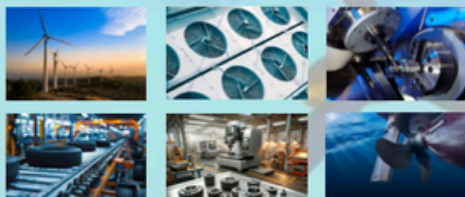
Eight types of physical defects were simulated:

- Long/Short Notch, Scratch
- Single & Double Cuts (Long/Short)
- Warped Blade

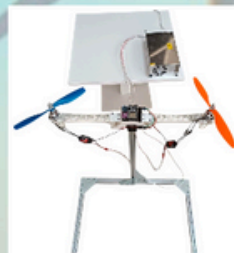
Data Visualization and Analysis

Time-domain plots were used to detect anomalies in the sensor signals. STFT-based spectrograms were generated to analyze frequency-domain changes.

Feature extraction was performed for model training using metrics such as mean, variance, skewness, and entropy.



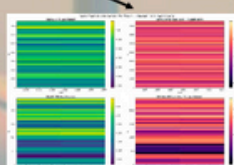
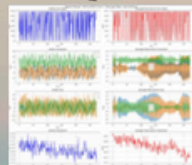
Industrial Application



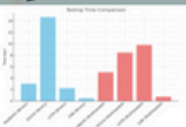
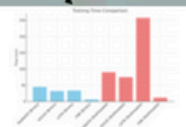
Calibration



Feature Extraction



Deep Learning Model Comparison



Classification Strategy

Binary classification separated healthy and damaged blades, while multiclass classification identified the specific damage type.

Machine Learning: Random Forest, Gradient Boosting, XGBoost, LightGBM, SVM.

Deep Learning: CNN, LSTM, ResNet50, VGG16.

Model Evaluation: Cross-validation and performance metrics: Accuracy, precision, training/testing time.

RESULTS

These results confirm that predictive maintenance for wind turbine blades using deep learning approaches is both technically feasible and highly effective. In particular, the performance of ResNet50 shows strong potential for deploying high-accuracy models in real-world maintenance systems. While machine learning models offer speed, their lower accuracy makes them more suitable for pre-screening or lightweight embedded applications. The successful implementation of real-time processing and high-accuracy models paves the way for scalable, efficient, and intelligent maintenance solutions not only for wind turbines but also in other domains such as automotive, aerospace, or industrial machine monitoring.

CONCLUSION

This project successfully developed and tested a small-scale prototype for early detection of wind turbine blade damage. Using frequency, vibration, and speed data, the system achieved reliable fault detection. Binary models, especially deep learning architectures like ResNet50, reached near-perfect accuracy, while multi-class models identified specific damage types. Although deep learning models delivered high performance, machine learning models offered faster training and inference, making them ideal for embedded applications.

While the prototype proved the concept's feasibility, further research is needed for scaling, environmental adaptability, algorithm optimization, and cost-effectiveness. Future efforts will focus on real-world deployment, cloud integration, and enhanced multi-class performance. The project establishes a strong foundation for more reliable, efficient, and sustainable wind energy systems.

REFERENCES

- [1] Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
- [2] Zhang, Z., et al. (2019). "Wind turbine blade damage detection using vibration analysis and machine learning." Renewable Energy.
- [3] ESP32 Technical Reference Manual, Espressif Systems.
- [4] Hochreiter, S., & Schmidhuber, J. (1997). Long Short-Term Memory. Neural Computation.

ACKNOWLEDGEMENTS

We thank Dr. Ahmet Çağdaş Seçkin for his guidance, Deniz Bulut and Benu Emir for their collaboration, and Aydın Adnan Menderes University for its support and resources.

PRICE DIRECTION PREDICTION ON STOCK EXCHANGE BY DIFFERENT STRATEGIES

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Abstract

In this project, our goal is making predictions and simulating with backtests. We used different strategies and different indicators. Let's see this journey.

Proje Özeti

Bu çalışma, borsa hisselerinin fiyat yön tahminlemesi üzerine odaklanmış bir araştırma projesidir. Çalışmamız primarily NYSE (New York Borsası) üzerinde gerçekleştirilmiştir.

• Veri toplama için Yahoo Finance (yfinance) kullanılmıştır.

Introduction

This project is mostly tested on NYSE. We used yfinance (Yahoo) for data collecting. Also used different strategies like graduat buy-sell, buy&hold, leverage, risk decreasing, stop-loss. We used different indicators and different tickers. First, we decided if we were going to work on price or direction prediction, so first question was regression or classification. Direct price prediction is hard to catch true predictions over %60. We decided to work on direction prediction. [1] According to technical analysis informations that we have, we decided to use 1 momentum, 1 volatile and 1 trend indicator at once.



Indicators

- 1) MA20: Moving Average of 20 days. (20 günlük Hareketli Ortalama)
- 2) ADX: Average Directional Index (Ortalama Yön Endeksi)
- 3) ATR: Average True Range (Ortalama Gerçek Aralık)
- 4) ROC: Rate of Change (Değişim Oranı)
- 5) RSI: Relative Strength Index (Göreceli Güç Endeksi)



Strategies

First option is always the classical, buy&hold strategy. But there are so many strategies. We tried a few rules to generate signals. We made regime detection. We used Leveraged Trading, Long/Short Positions, Stop-Loss, Risk-Limit, Dynamic Leverage, Portfolio Based Management. We tried all of them step by step. We combined some of them in every single trial.

- Al ve Tut (Buy & Hold)
- Kademeli Alım-Satım
- Kaldıraçlı İşlemler
- Risk Azaltma Stratejileri
- Stop-Loss Uygulamaları
- Portföy Bazı Yönetim

References

- [1] <https://scholarworks.lib.csub.edu/cgi/viewcontent.cgi?article=1435&context=ijim>



Results

After we tried all of these strategies and combine them, We found that when we don't use risk-limits and stop-loss block, total profit is a few times higher. If we use leverage, profit is better but risk is higher. Since we have over %90 prediction success, that risk is acceptable. In the last simulation, we tried to watch 25 stocks and process the best 5 signal Powers everyday. That is the most guaranteed strategy and there isn't any loss process. So, after using machine learning on these strategies, we can backtest again. If the tests are successful, we can use this model on a process bot.

- Fiyat tahmini yerine yön tahmini daha başarılı sonuçlar vermiştir
 - Risk limitleri ve stop-loss kullanılmadığında toplam karı birkaç kat daha yüksek çıkmıştır
 - Kaldıraç kullanımı artırarak bir miktar riski de yükseltmiştir
 - %90'ın üzerinde tahmin başarıları elde edilmiştir
 - En güvenilir stratejiler olarak, 25 hissesinden 5 tane takip edilip 5 sinyal gücüne sahip olanların işleme alınması belirlenmiştir.
- Proje, makine öğrenme teknikleri ve çeşitli trading stratejilerinin kombinasyonu ile yüksek başarı oranına sahip bir tahmin modeli ortaya koymuştur. Özellikle portföy bazlı yaklaşım sayesinde güçlü ve az riskli kapsız strateji geliştirilmiştir. Bu model, ileride bir trading bot üzerinde kullanılmak üzere hazırlanmıştır.

ABSTRACT

This study introduces dual-platform system that promotes recycling through a reward-based incentive model. It aims to encourage environmentally responsible behavior by allowing users to earn points via recycling and redeem them in a digital marketplace. The system comprises two main components: a local desktop application (GreenEye) for scanning and logging product barcodes, and a cloud-based web application (GreenStore) for viewing balances and redeeming rewards. Built with .NET MVC and Azure SQL Server, the system features client-server architecture, barcode recognition, and secure data management. The results show increased user engagement and validate the system's effectiveness in promoting recycling. The study highlights how digital tools can drive environmental awareness and positive behavioral change.

MATERIALS AND METHODS

System Architecture

The system consists of two integrated components:

Greenify (Desktop Application):
A standalone application that scans recyclable product barcodes using ZXing.Net, classifies them by material type (e.g., plastic, glass, metal), and assigns reward points. These points are stored in a Azure SQL Server. (Online)

Greenify Store (Web Application):
A web platform developed with ASP.NET MVC 5, Entity Framework, and Bootstrap. It allows users to view their balances, redeem points, and manage rewards through a responsive, browser-based interface.

Technologies Used

- **Frontend:**
 - HTML5, CSS3, and Bootstrap were used for responsive and user-friendly UI design in Greenify Store.
- **Backend:**
 - ASP.NET MVC 5 and Entity Framework (C#) handled business logic, data flow, and ORM operations.
- **Database:**
 - Azure SQL Server for online storage in Greenify; Azure SQL Server for centralized data management in Greenify Store.
- **Libraries:**
 - ZXing.Net was used in Greenify for barcode scanning.
- **Development Tools:**
 - Visual Studio IDE & Azure Data Studio supported all coding, debugging, and deployment activities.

Data Flow

- **Barcode Scanning:** Greenfly allows users to scan barcodes of waste materials to automatically detect recyclable items. The system identifies the material type (plastic, glass, metal, etc.) and categorizes it accordingly.
- **Point Assignment:** After classification, points are assigned based on the material's predefined environmental value. This motivates users to recycle materials with higher ecological impact.
- **Storage:** All recycling activities and point data are stored securely in Azure SQL Server. This enables real-time access and centralized data management.
- **Balance Display:** Users can view their current point balance through the Greenfly Store Interface. The displayed balance updates instantly with each recycling activity.
- **Redemption:** Collected points can be spent on eco-friendly rewards in the Greenfly Store. After redemption, the user's balance is updated immediately to reflect the transaction.

REFERENCES

- Gibelev, O., & Białłajski, A. (2021). Incentives for plastic recycling: How to engage citizens in active collection. Empirical evidence from Spain. *Recycling*, 6(3), 41.
- Rosenlund, J., Holmér, M., Johansson, M., & Enström, R. (2021). Levelling up the recycling experience: Gamification of recycling through an innovative recycling station. *Circular Economy and Sustainability*, 5, 253–272.
- Microsoft Corporation. (n.d.). ASP.NET MVC Documentation. Retrieved from <https://learn.microsoft.com/aspnet/mvc>
- ZXing.Net. (n.d.). Barcode Scanning Library Documentation. Retrieved from <https://github.com/micjahn/ZXing.Net>

ÖZET

Bu çalışmada, ödül tabanları bir teşvik mekanizmasıyla geri dönüşüm alanlarındaki artıma katkı yapmayı amaçlayan bir bilimsel bir sistem sunulmaktadır. Kullanıcılar, geri dönüşüm faaliyetleriyle puan toplayarak çevreye duyarlı davranışlar geliştirmek ve bu puanları dijital bir mağazada kullanabilmektedirler. Sistem, yerel bir masaüstü uygulaması (Greenify) ve çevrim içi bir web platformu (Greenify Store) olmak üzere iki entegre bileşenden oluşur. Greenify, ürün barkodlarını taramak materyali türüne göre puan kazandırırken; Greenify Store, kullanıcıların bakiyeleri görüntüleyip puanlarıyla alışveriş yapmasına olanak tanır. Kol tabanlı minari ile geliştirilen sistem, NET MVC ve Azure SQL Server altyapısı üzerinde çalışmaktadır. Çalışma, kullanıcıların çevreye duyarlı davranışlar geliştirmelerinde etkili bir araç olarak değerlendirilmiştir. Edilen sonuçlar, sistem kullanıcı etkileşimlerini artırarak geri dönüşüm davranışlarını desteklediğini göstermektedir. Bu yönüyle proje, dijital teknolojilerin çevresel farkındalık ve sürdürülebilir davranış değişimi üzerindeki etkisini ortaya koymaktadır.

THE PROBLEM

Despite increasing environmental awareness, recycling participation remains low due to a lack of tangible incentives and perceived inconvenience. Traditional systems rely solely on voluntary efforts, failing to provide immediate feedback or rewards, resulting in weak engagement. Many individuals, particularly younger generations, are unaware of the environmental impact of their actions, further hindering recycling efforts. This project seeks to address these challenges by integrating gamified incentives into recycling processes, providing real-time feedback and rewards to encourage sustainable behavior.

SIGNIFICANCE OF THE STUDY

The rising global waste crisis underscores the need for innovative recycling solutions. While awareness campaigns exist, their impact is limited without sustained engagement strategies. This thesis introduces a reward-based system that gamifies recycling, transforming it into a measurable and interactive activity. Targeted particularly at younger audiences, the system leverages real-time feedback and reward redemption to foster consistent recycling habits. Additionally, its modular architecture enables scalability across diverse contexts, from schools to municipalities, promoting localized sustainability efforts.

CONCLUSION

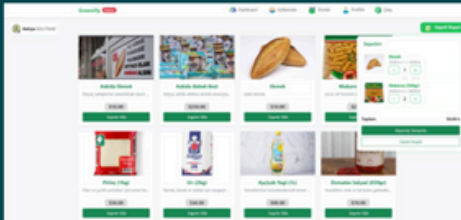
This study introduced a dual-platform digital solution aimed at promoting recycling through a reward-based incentive mechanism. By integrating a local desktop application (Greenify) for barcode scanning and a web-based marketplace (Greenify Store) for reward redemption, the system effectively motivated users to engage in environmentally responsible behavior. The functionality of Greenify ensured data collection in areas with internet access, while Greenify Store provided a centralized, visually appealing interface for tracking and redeeming points. Pilot testing confirmed the system's usability, data accuracy, and potential to encourage sustainable practices. The secure role-based access system further enhanced operational integrity, establishing a solid foundation for broader adoption. These findings underscore the system's feasibility for real-world implementation and scalability to larger audiences.

Barcode Scanning



The barcode scanning screen provides an interface that enables users to effectively scan the barcodes of waste products, facilitating their participation in the recycling process.

Shopping Screen



Users can click on the products to review their detailed information and utilize their earned points to add the products to the cart and complete the purchase process.

Entity Relationship Diagram





REDINGALE

AI Supported Tshirt Design App

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Introduction

This project involved the development of the frontend and backend for a custom t-shirt design e-commerce website using ReactJS and C#. The platform encompasses essential e-commerce functionalities including a homepage, design interface, user address management, shopping basket, and order history. This poster provides an overview of the implemented frontend features and the chosen backend architecture.

Abstract

This project presents a custom T-shirt design web application leveraging AI for enhanced user personalization. Features include AI-generated artwork, background removal, and virtual try-on. Users can create unique designs with custom text and uploaded graphics. The system employs a React frontend for an interactive canvas and a C# backend for AI processing and data management. This application offers a seamless design and visualization experience for custom apparel. Keywords: Custom T-Shirt Design, AI, Virtual Try-On, Background Removal, React, C#.

Turkish Summary

Bu proje, kullanıcıların yapay zekâ ile üretilen görselleri, özel metinleri ve yükledikleri resimleri kullanarak kişiselleştirilmiş tişört tasarımları oluşturabildiği web tabanlı bir uygulamadır. Ayrıca kullanıcılar, arka plan kaldırma ve sanal deneme gibi AI destekli araçlarla tasarımlarını gerçekçi bir şekilde görselleştirebilirler. Uygulama, React.js ile geliştirilmiş ön yüzü ve C# / ASP.NET Core tabanlı arka uç yapıyla, teknik bilgiye ihtiyaç duymadan profesyonel tasarımlar yapılmasına olanak tanır. Amaç, yaratıcı tasarımı herkes için erişilebilir hale getirmektir.

Methodology

This project was developed using a full-stack architecture, combining React.js for the frontend and ASP.NET Core with C# for the backend.

- Frontend: Built with React and Redux for dynamic state management. Fabric.js and Konva.js were used for canvas rendering and design customization.
- Backend: C# was used to build scalable and secure REST APIs. Image generation (via OpenAI), background removal, and virtual try-on were handled using HuggingFace API.
- Database: SQL Server managed user and design metadata. Firebase Storage was used for user-uploaded assets.
- Key Tools: OpenAI API, HuggingFace, Stripe, JWT-based authentication.



Conclusion

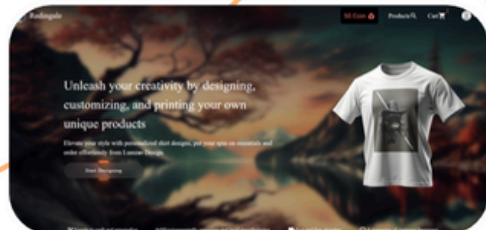
Custom t-shirt design platform was successfully developed to support interactive design, AI integration, and e-commerce functionality. The system enables users to:

- Design t-shirts intuitively without graphic design skills
- Generate images using AI and manipulate them on a canvas
- Remove image backgrounds and preview them using virtual try-on
- Finalize and purchase designs through a secure, subscription-based flow

This project demonstrates how modern web technologies and AI can be integrated to enhance personalization and accessibility in digital product design.

Future work may include 3D visualization, AR integration, and direct links to print-on-demand services for real-world production.

Workflow Diagram



References

Sentiment Analysis in Turkish Sign Language Through Facial Expressions and Hand Gestures

Murat TAN
Assoc. Prof. Fatih SOYGAZI



Team

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Abstract

Abstract: In this Project by using machine learning, we extracted sentiments from hand gestures and facial expressions.

Özet: Bu projede makine öğrenmesini kullanarak el hareketleri ve yüz ifadelerinden duyguları çıkardık.

Introduction

Sign languages are a set of gestures that is used in various scenarios. Because of various reasons sign languages have variations that is sometimes personal or cultural. We are here to fill the gap by extracting sentiments from gestures specifically from Turkish Sign Language(TID). With the aim of filling the gap between intent and interpretation.

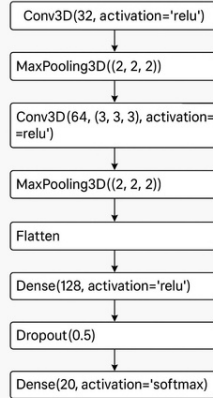
Using existing data, we trained assortment of models which will be used to evaluate given images.

Review of Literature

TID is a sign language that is apart from other sign languages, because it not only uses hands but also the mouth and the tongue.[1]
TID has an obscure history[2], decentralized learning system and is apart from the local language[3]. Thus, it is crucial that regardless of its meaning, sign languages need to consider intent as well.

Methods

Taking data from RAF-DB, AUSTL datasets, taking equal sized data from each label. They will be reshaped normalized and enumerated. The data will then be processed and evaluated. This will then be shown using a simple interface in which one can train a model and write it to memory, load an existing one and evaluate a given dataset and project the findings onto the screen.



Model diagram

CNN model:	precision	recall	f1-score	support
surprise	0.82	0.78	0.80	870
fear	0.87	0.72	0.79	840
disgust	0.67	0.66	0.67	910
happy	0.84	0.78	0.81	887
sad	0.67	0.66	0.66	865
angry	0.77	0.78	0.78	859
neutral	0.58	0.74	0.65	894
accuracy			0.73	6125
macro avg	0.74	0.73	0.73	6125
weighted avg	0.74	0.73	0.73	6125

Result Table

Results

The study concludes that while initial results are promising, limitations in dataset amount and model performance resulted in a limited success. Future work should include different sign languages and pair them with a vocabulary to give clarity to unorthodox use of sign languages. Doing so would increase the eligibility of sign languages and increase the accessibility by bridging experience and knowledge. Given that disabled people can have multiple disabilities, the work concerning communication should include as many ways to communicate as possible lest we inadvertently cause affected individuals more obstructions due to misinformation.

Conclusion

There is a lot more work that needs to be done to bridge the gaps between the disabled and the public. This work while advancing our comprehension towards the problem leaves a lot to be desired.

For this reason, continuation of this project is paramount towards a better-connected public.

References

- [1] sefer, hasan & İkiz, Fatih. (2023). A general overview of Turkish Sign Language.
- [2] Miles, M.. (2000). Signing in the Seraglio: Mutes, dwarfs and gestures at the Ottoman Court 1500-1700. Disability & Society - DISABIL SOC. 15. 115-134. 10.1080/09687590025801.
- [3] Dikyüva, Hasan & Makaroğlu, Bahtiyar. (2017). Turkish Sign Language Grammar

Acknowledgement

I am grateful for Research Assistant, Şeyma Takır, Research Assistant Barış Bilen, Research Assistant Doğukan Arslan for their inspiration and my professor in guiding me for his readily given advices and guidance.



SERVISHANEM: USER EXPERIENCE ENHANCEMENT AND AUTOMATION IN DIGITAL CAR SERVICE MANAGEMENT

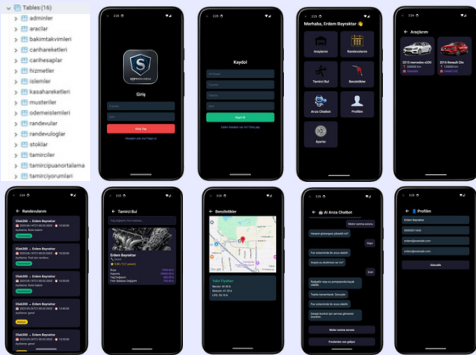
Authors Erdem BAYRAKTAR **E-mail:** stueigroup@gmail.com

Supervisor Doç. Dr. Fatih SOYGAZI

INTRODUCTION

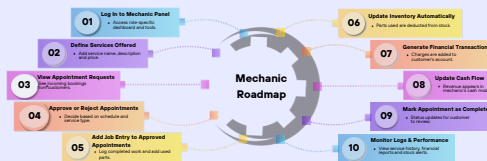
The local automotive repair sector in Türkiye still heavily relies on traditional, manual workflows. This leads to inefficiencies such as customer dissatisfaction, communication breakdowns, and operational delays.

Servishanem is a multi-platform digital service management system that allows car owners to search for services, browse mechanic profiles, and create appointments online. Meanwhile, mechanics can define services, manage incoming jobs, and track inventory and payments. By streamlining interactions between customers and mechanics, the system facilitates a modern transition in Türkiye's automotive service ecosystem.



RESULTS

- Customers can search services, view profiles, and book appointments
- Mechanics can define services, add job entries, and manage financial transactions
- All operations are integrated with real-time stock, account, and cash modules
- Role-based dashboards optimize the user experience for each type of user



CONCLUSION

Servishanem improves efficiency in vehicle maintenance workflows by digitalizing service operations and facilitating smooth interaction between customers and service providers. With fully integrated modules for jobs, inventory, financial records, and role-based access, it offers a sustainable and scalable infrastructure for digital transformation in the traditional automotive repair sector.

ABSTRACT

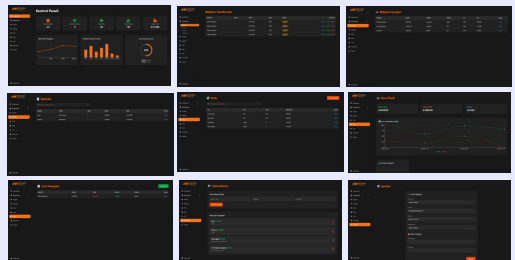
Servishanem is a cross-platform service management system that connects car owners with auto repair shops, integrating appointment scheduling, service tracking, inventory, and account management in a unified digital platform.

ÖZET

Servishanem, araç sahipleri ile oto servis tamircilerini dijital ortamda buluşturan, randevu oluşturma, hizmet takibi, stok ve cari yönetimi gibi süreçleri entegre eden çok platformlu bir servis yönetim sistemidir.

OBJECTIVE

The objective of this project is to develop a multi-platform automation system that digitalizes car service operations, enhances user-mechanic interaction, and reduces manual workload through seamless process integration.



METHODOLOGY

- Frontend:** React.js (Next.js), TypeScript, TailwindCSS
- Backend:** Node.js, Express.js, JWT-based authentication and authorization
- Database:** PostgreSQL
- Testing:** Manual endpoint testing via Postman
- Process Flow:** Service Search → Mechanic Selection → Appointment Creation → Job Entry → Stock Deduction → Account & Payment Updates
- User Roles:** Customer, Mechanic, Administrator



REFERENCES

- Microsoft SQL Server Documentation
- JWT Authentication Standards (W3C)
- React, TailwindCSS, Express.js Developer Docs

SmartNutrition: AI-Powered Daily Diet Tracker MobilApp



Team

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Abstract

This project introduces an AI-enhanced mobile application developed using React Native that allows users to calculate and track their daily nutritional needs based on personal data. The application supports secure login via a MySQL database with hashed passwords and offers advanced features such as adding, editing, and deleting food entries, quick manual nutrient input, and weekly nutrient consumption analytics. A unique functionality allows users to select a food photo from their gallery, which is analyzed via the Ollama platform using the llava:7b model to identify the food and estimate its nutritional values. Users can instantly add these values to their daily totals with a single tap, enabling a seamless and intelligent nutrition tracking experience.

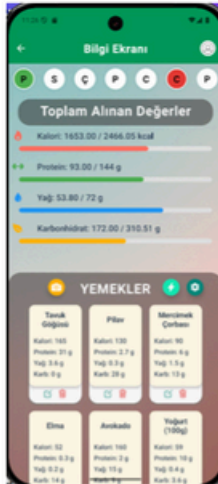
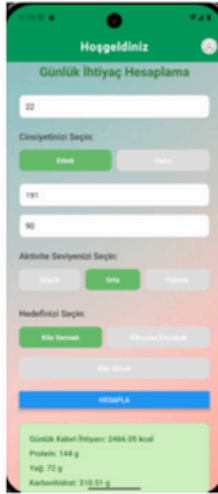
Türkçe Özet

Bu proje, kişisel verilere dayalı olarak günlük besin ihtiyacı hesaplayan ve takip etmeyi sağlayan React Native ile geliştirilmiş AI destekli bir mobil uygulamayı tanıtmaktadır. Uygulama, hash lenmiş şifrelerle güvenli bir şekilde giriş yapılabilen MySQL tabanlı bir sistem içermektedir. Kullanıcılar, yiyecek ekleme, silme, düzenleme, hızlı besin girişi (yalnızca kalori, yağ, protein, karbonhidrat), haftalık besin analizi gibi gelişmiş özelliklere erişebilir. Ayrıca kullanıcı, galerisinden bir yemek fotoğrafı seçerek bu görseli AI üzerinden gönderip yemeği tanıtabilir ve tüm besin değerlerini öğrenebilir. Bu değerler tek bir butona günlük alımına eklenebilir.

AI

To improve the user experience and reduce the friction of manual data entry, the application integrates AI in the following ways:

- Visual Food Recognition**
 - Users can select a photo of their meal from their gallery. This image is sent to the locally hosted Ollama server, which runs the llava:7b vision-language model to detect the food and estimate its:
 - Food Name
 - Calories (kcal)
 - Protein (g)
 - Fat (g)
 - Carbohydrate (g)
- One Tap Nutrient Addition**
 - Once the food is identified, the app presents an "Add to Daily Intake" button. When pressed, the values are automatically added to the user's daily consumption stats.
- Intelligent Logging**
 - The AI-generated entries are stored alongside manual ones, providing a hybrid system that adapts to both tech-savvy users and those who prefer traditional input.
- Local AI Hosting**
 - The AI inference runs on-device or within a local network via Ollama, ensuring faster response times and increased data privacy.



Introduction

Proper nutrition management requires accurate tracking of dietary intake and personal goals. While most mobile apps focus only on manual entry, this project combines user-friendly design with artificial intelligence to enhance the experience. The app not only calculates daily nutritional needs but also supports real-time food recognition and secure cloud-based user authentication, enabling smarter health tracking.

Method

- Frontend: React Native
- Backend & Authentication: MySQL with password hashing
- AI Integration: Ollama + llava:7b model for image-based food analysis
- Core Features:
 - Add/Edit/Delete foods
 - Quick manual entry (calories, protein, fat, carb)
 - Weekly nutrient intake chart
 - Daily automatic reset of values
 - AI-based photo recognition and instant value entry

Results

- Users could enter meals both manually and via AI suggestions
- Daily nutrient goals were reached more consistently with the visual AI feature
- Weekly charts provided insight into dietary patterns and deficiencies
- High usability and accuracy based on test feedback
- Login system with hashed passwords improved data security

Conclusion

The integration of visual recognition AI with traditional diet tracking offers a seamless, modern approach to personal health management. This project demonstrates how combining mobile technologies with machine learning can improve consistency, accuracy, and user motivation in achieving nutritional goals.

References

- Harris, J.A., & Benedict, F.G. (1919). A Biometric Study of Basal Metabolism.
- React Native Documentation - <https://reactnative.dev>
- Ollama + llava:7b - <https://ollama.com>
- Ngrok Documentation. <https://ngrok.com/docs>
- MySQL Documentation. <https://dev.mysql.com/doc>

STOCK PATTERN PREDICTION WITH DEEP LEARNING

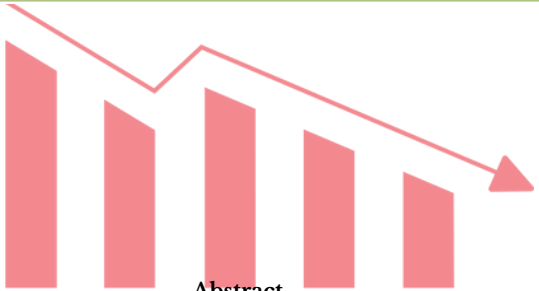
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RESEARCH SUPERVISOR
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Introduction

Chart patterns help traders identify trends and turning points in financial markets. The Zigzag indicator is commonly used to filter noise and highlight price swings, but standard versions rely on fixed percentage thresholds and often miss complex formations.

This study introduces an improved Zigzag algorithm using the argrelextrema function to detect local highs and lows. These points are grouped into segments and classified into patterns like Head & Shoulders or Double Top using the XGBoost machine learning model. The approach aims to provide a fast and interpretable method for pattern recognition.



Abstract

This study presents a hybrid method for detecting chart patterns by improving the Zigzag indicator using local extrema and machine learning. Instead of fixed percentage changes, local peaks and troughs are identified with the argrelextrema function. Segments formed from these points are labeled as known patterns (Head & Shoulders, Double Top, etc.) and classified using XGBoost. The system, tested on GARANIS stock data, provides fast predictions and interactive visualizations with Plotly.

METHODOLOGY

- 1 - Data Collection
- 2 - Preprocessing
- 3 - Zigzag Detection
- 4 - Segment Constructions

METHODOLOGY

- 5 - Pattern Labeling
- 6 - Feature Extraction
- 7 - Model Training
- 8 - Evaluation and Visualization

ÖZET

Bu projede, finansal zaman serisi verileri üzerinde grafik formasyonlarını tespit etmek amacıyla geliştirilen Zigzag algoritması ile XGBoost tabanlı bir makine öğrenimi modeli entegre edilmiştir. Yerel zirve ve dip noktaları belirlenerek, Ömüz-Baş-Ömüz, Çift Tepe ve Çift Dip gibi formasyonlar otomatik olarak sınıflandırılmış ve Plotly ile görselleştirilmiştir.

Results

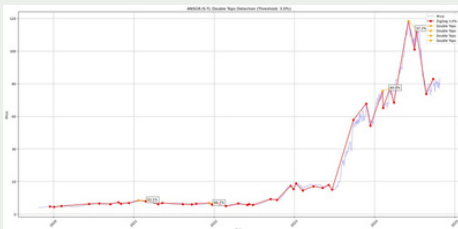
The machine learning model (XGBoost), trained on labeled pattern segments derived from Zigzag turning points, demonstrated fast prediction capabilities with moderate accuracy. Particularly, Double Top and Double Bottom formations were more frequently identified with some success. However, complex structures like Head & Shoulders were underrepresented, indicating the need for larger and more balanced datasets. Compared to manual technical analysis, the model offers automation and speed but still lacks consistency in classification.



ANSGR.IS results with deep learning pattern prediction methods.

Conclusion

This study compared rule-based technical analysis using an enhanced Zigzag indicator with a supervised machine learning approach for chart pattern recognition. While the technical method is transparent and interpretable, it is manual and time-consuming. In contrast, the machine learning-based system (XGBoost) achieved faster inference times but still suffers from class imbalance and limited pattern variety. Therefore, we conclude that ML-based detection should not be solely relied upon without human supervision. Combining both approaches provides a promising hybrid model for future financial analysis



ANSGR.IS technical analysis using peak valley methods

Team

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Abstract

Abstract: In this project, a web-based platform named EduCoach is developed to enhance educational experiences through personalized coaching. The platform connects educators and students, providing tools for interactive learning, assignment management, and online meetings.

Özet: Bu projede, kişiselleştirilmiş koçluk yoluyla eğitim deneyimlerini geliştirmeyi amaçlayan web tabanlı bir platform olan EduCoach geliştirilmiştir. Platform, eğitimciler ve öğrencileri bir araya getirerek etkileşimli öğrenme, ödev yönetimi ve çevrimiçi toplantılar için araçlar sunmaktadır.

Methods

The EduCoach platform was developed using Flask, a Python web framework, with MongoDB for data management. The system follows a modular architecture with separate components for models, routes, and views. The database includes two primary models: LectureNote and Announcement, maintaining referential integrity through structured document relationships. Authentication and authorization were implemented using Flask-Login, ensuring role-based access with teacher-specific and student-restricted functionalities. The file management system supports multiple formats, secure uploads, and efficient storage. RESTful routing was applied to organize teacher and student interactions. The frontend utilizes Bootstrap for responsiveness, Jinja2 for dynamic rendering, and AJAX for real-time updates. Comprehensive error handling, integration testing, and secure deployment practices ensure system reliability and maintainability.

User Management

- Authentication
- Role-Based Access
- Profile Management

Student Functions

- Course Enrollment
- Assignment Submission
- Grade Tracking
- Performance Analysis

Teacher Functions

- Course Management
- Assignment Creation
- Grading
- Content Sharing
- Announcement Publishing

Admin Functions

- User Management
- System Settings
- Data Management

Communication Tools

- Message
- Meeting Scheduling
- Notifications
- Attendance Tracking

File Management

- File Sharing
- Storage
- Access Control

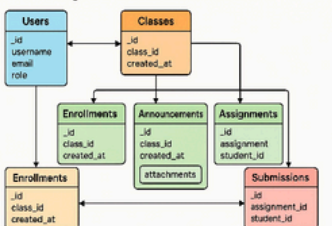


Figure: Homepage of EduCoach website

Results

The implementation of the EduCoach system has proven to be highly effective in managing educational processes. The platform successfully streamlines user management, class organization, assignment tracking, and the submission process. As a result, students and teachers experience enhanced communication and efficient workflow within the platform.

MongoDB Database Structure



Conclusion

The EduCoach system is designed to efficiently manage user roles, classes, assignments, and submissions, providing a flexible and scalable solution for educational environments. Beyond academic use, this system's versatile structure can also benefit professional settings by facilitating employee management, file sharing, task assignment, and meeting planning. Its adaptability makes it a valuable tool for both learning and corporate collaboration.

References

- [1] Grinberg, M. (2018). Flask Web Development: Developing Web Applications with Python.
- [2] MongoDB, Inc. (2025). MongoDB Documentation. Retrieved from <https://www.mongodb.com/docs/>
- [3] Bootstrap. (2025). Bootstrap Documentation. Retrieved from <https://getbootstrap.com/>
- [4] Flask-Login. (2025). Flask-Login Documentation. Retrieved from <https://flask-login.readthedocs.io/>
- [5] Mozilla Developer Network. (2025). AJAX: Asynchronous JavaScript and XML. Retrieved from <https://developer.mozilla.org/>

AYDIN ADNAN MENDERES UNIVERSITY
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THE BIOGRAPHY-BLOG WEBSITE

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Türkçe özet

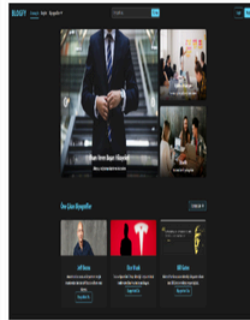
Bu proje, kullanıcıların ilham verici biyografi ve yaşam hikâyelerini paylaşabilecekleri bir web platformu olan The Biography-Blog Website'i geliştirmeyi amaçlamaktadır. Platformda kullanıcılar hem başkalarının hikâyelerini okuyabilir hem de kendi yaşam deneyimlerini paylaşabilir. Proje sürecinde planlama, tasarım, yazılım geliştirme, veritabanı oluşturma ve test aşamaları uygulanmıştır. Kullanıcı dostu bir arayüz ve içerik denetimi gibi temel özelliklerle, güvenli ve etkileşimli bir ortam sunulması hedeflenmiştir.

Introduction

In today's digital age, personal stories and life experiences hold immense value—not only as sources of inspiration but also as means of connecting people across different cultures and backgrounds. With this motivation, we developed The Biography-Blog Website, a dedicated platform for sharing and discovering real-life biographies and personal journeys. This project aims to provide a space where writers can express meaningful moments of their lives and readers can find stories that resonate with their own experiences. By bridging the gap between storytellers and audiences, the platform encourages a sense of community built around authenticity, empathy, and human connection.

Abstract

This project introduces The Biography-Blog Website, a web-based platform designed for users to share and explore inspirational biographies and personal stories. The main objective is to foster a community where authentic life experiences are expressed, archived, and appreciated. The platform features a user-friendly interface, content management system, and moderation tools to ensure quality and safety. The development process included phases such as UI/UX design, frontend and backend implementation, database structuring, and testing. Targeting readers, writers, and academic contributors, the website emphasizes meaningful content over trending or AI-generated materials.



method

The project was developed using an agile approach and completed in several stages:
Planning: Identified the main goals, target users, and key features of the platform.
Design: Created simple and user-friendly UI/UX designs.
Frontend Development: Built web pages using HTML, CSS, and JavaScript.
Backend Development: Implemented core features like user login, blog posting, and moderation.
Database: Designed a structure to store users, posts, and comments.
Testing: Checked the system for bugs and improved based on feedback.

conclusion

The Biography-Blog Website successfully provides a platform where users can read and share inspiring life stories. By focusing on simplicity, usability, and meaningful content, the project creates a space for storytelling and connection. The modular design and planned future updates (like mobile support) ensure the system can grow with user needs. This project highlights how digital tools can support authentic human experiences.

References

- Sommerville, I. (2016). Software Engineering (10th ed.). Pearson Education.
Pressman, R. S., & Maxim, B. R. (2014). Software Engineering: A Practitioner's Approach (8th ed.). McGraw-Hill Education.
W3C. (n.d.). HTML & CSS Standards. Retrieved from <https://www.w3.org/>
Mozilla Developer Network (MDN). (n.d.). JavaScript Documentation. Retrieved from <https://developer.mozilla.org/>
ISO/IEC 25010. (2011). Systems and Software Quality Requirements and Evaluation (SQuaRE) – System and Software Quality Models. Meta. (n.d.). React – A JavaScript library for building user interfaces. Retrieved from <https://reactjs.org/>
Supabase Inc. (n.d.). Supabase – The open source Firebase alternative. Retrieved from <https://supabase.com/>



WEAPON-DETECTION USING OBJECT DETECTION MODEL

Team

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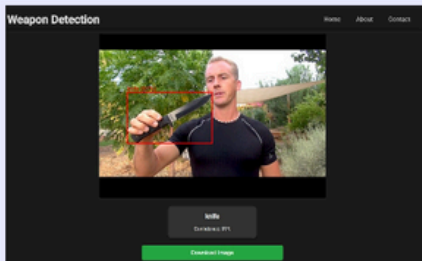
Asst. Prof. Dr.
Samsun M. BAŞARICI

INTRODUCTION

The primary goal of this project is to develop a weapon detection system using YOLOv10. This system will analyze images and videos to detect the presence of weapons (such as guns, knives) with high accuracy, providing a robust solution for enhancing security in public spaces and law enforcement operations.

RESULTS

The weapon detection system developed using YOLOv10 achieved success in detecting hazards, such as guns and knives, with accuracy in both images and videos. The system was evaluated on multiple datasets, including surveillance footages, where it demonstrated the ability to identify weapons in diverse environments.



CONCLUSION

The findings suggest that integrating weapon detection systems can greatly enhance hazard management and also prevent. Future work may focus on improving detection accuracy in complex environments and expanding the system's capabilities to identify additional hazardous objects.

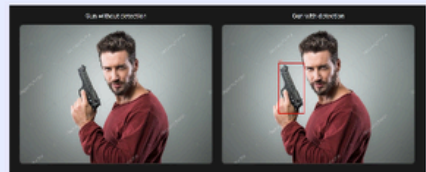
OBJECTIVE

Reduce Security Risks, Automate Weapon Detection for Law Enforcement & Security, Fast & Accurate Detection, Deployable for Different Use Cases.

ABSTRACT

Abstract: This project aims to develop a system for detecting hazardous situations and equipment in various environments. The focus is on identifying potential risks related to objects that could lead to safety issues. By integrating machine learning algorithms; the system will be able to detect hazardous objects. This research contributes to improving safety and minimizing the occurrence of incidents by leveraging technology for proactive hazard management.

Türkçe Özet: Bu proje, çeşitli ortamlarda tehlikeli durumları ve ekipmanları tespit etmek için bir sistem geliştirmeyi amaçlamaktadır. Odak noktası güvenlik sorunlarına yol açan potansiyel objeleri belirlemektir. Makine öğrenmesi algoritmalarını entegre ederek sistem; tehlikeli nesneleri tespit etmektedir. Bu araştırma, teknolojiye dayanarak güvenliğin artırılmasına katkıda bulunur.



REFERENCES

<https://universe.roboflow.com/joao-assalim-xmovq/weapon-2/dataset/2>
<https://github.com/ultralytics/ultralytics>
<https://docs.ultralytics.com/tr/models/yolov10>

We would like to express our gratitude to Supervisor Samsun M. BAŞARICI for their invaluable guidance, support and expertise throughout the development of this project.

Wi-Fi Channel State Information Based Positioning for Indoor Applications

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Abstract

In this study, an indoor positioning system was developed using channel state information (CSI) of Wi-Fi (Wireless Fidelity) signals. Location estimation was performed using XGBoost and deep learning (DL) models under various data preprocessing scenarios such as under-sampling, filtering, and floor-based classification. The best floor-based accuracy was obtained with the XGBoost model on the third floor dataset, reaching 98% accuracy. In terms of overall classification performance, the highest accuracy score of 94% was obtained by the XGBoost model on the non-filtered dataset. The system aims to provide a low-cost and effective solution for applications such as personnel and equipment tracking in industrial facilities and logistics environments.

Introduction

In recent years, advancements in signal processing and machine learning have paved the way for innovative applications in various fields. One of these fields is indoor positioning systems. Accurately determining the location of a device within an indoor environment is crucial for a wide range of applications, including navigation, asset tracking, and smart building management.

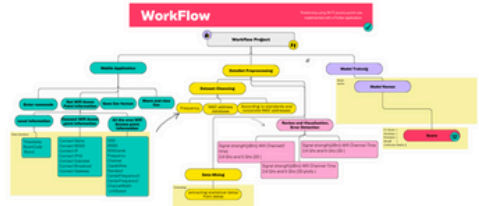
This project aims to develop an indoor positioning system using the channel state information (CSI) of Wi-Fi signals. Wi-Fi-based positioning systems offer a cost-effective and widely accessible alternative, as most modern devices are equipped with Wi-Fi modules.

This project has been approved within the scope of the TUBITAK 2209-B Industry-Oriented Undergraduate Research Projects Support Program. Wi-Fi-based positioning systems also have significant potential in industrial areas. They can play a vital role in applications such as real-time tracking of workers and vehicles in large factories and logistics warehouses, determining the locations of equipment, and optimizing smart manufacturing processes. Additionally, by tracking the location of maintenance and repair teams, response times can be reduced, and operational efficiency can be increased.

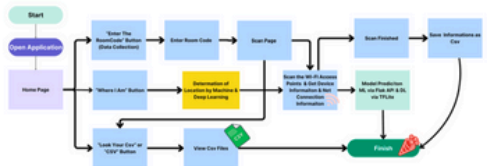
Method

A mobile application was developed to collect Wi-Fi access point signal data along with room codes, which were saved in CSV format. The dataset was cleaned based on MAC address standards and frequency values. After visualization and error detection, statistical features were extracted for model training. Machine learning and deep learning models were trained, and their performances were evaluated using accuracy, precision, recall, F1 score, and confusion matrix.

Workflow of The Project



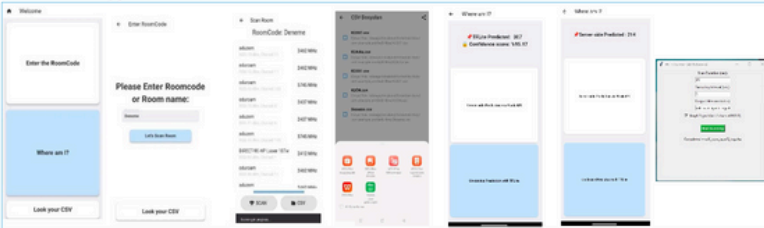
Workflow of The Application



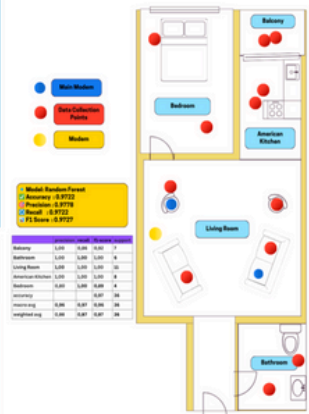
Results of The Project

Model Train	Accuracy	Precision	Recall	F1 Score
Under-sampling				
XGBoost	%74	%78	%74	%74
Deep Learning	%50	%54	%51	%48
Filtered Data				
XGBoost	%93	%94	%93	%93
Deep Learning	%82	%85	%82	%82
Non-Filtered Data				
XGBoost	%94	%94	%94	%94
Deep Learning	%74	%77	%75	%75
Floor 1th Data				
XGBoost	%96	%96	%96	%96
Deep Learning	%86	%80	%80	%78
Floor 2th Data				
XGBoost	%92	%93	%92	%92
Deep Learning	%79	%79	%74	%75
Floor 3rd Data				
XGBoost	%98	%98	%98	%98
Deep Learning	%76	%77	%76	%75

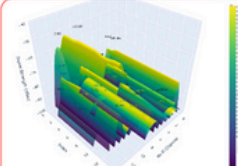
Application User Interfaces



Home and Office Test



2.4GHz Wi-Fi Channel Signal Strength



THANK YOU
for your attention

Contact Us

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