

Project Reports / Case Studies

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Enhancing Autonomous Vehicle Safety In-Cabin using Integrated Facial and Voice Recognition

Project Title:

Enhancing Autonomous Vehicle Safety In-Cabin using Integrated Facial and Voice Recognition

Duration:

January 2024 – Present

Role:

Lead Developer – In-Cabin Monitoring & Security Module

Tools & Technologies:

Python, TensorFlow, PyTorch, OpenCV, YOLOv8, Wav2Vec 2.0, Flask, Git

Project Overview:

This project focuses on enhancing passenger safety in autonomous vehicles through real-time monitoring using image and voice recognition. The system detects weapons, unauthorized items, aggressive tones, and stress levels to ensure a secure and comfortable in-cabin experience.

Objectives:

- Implement real-time detection of potential threats.
- Monitor passenger emotions and adjust cabin comfort.
- Integrate camera, microphone, and environmental sensor data.

Key Contributions:

- YOLOv8-based object detection for weapons and restricted items.
- Voice tone analysis using Wav2Vec 2.0 and DeepSpeech for speaker verification and aggression detection.
- vehicle environments using Raspberry PI.

- Developed Emotion AI models for stress recognition.
- Designed system architecture for multi-sensor integration.

Challenges & Solutions:

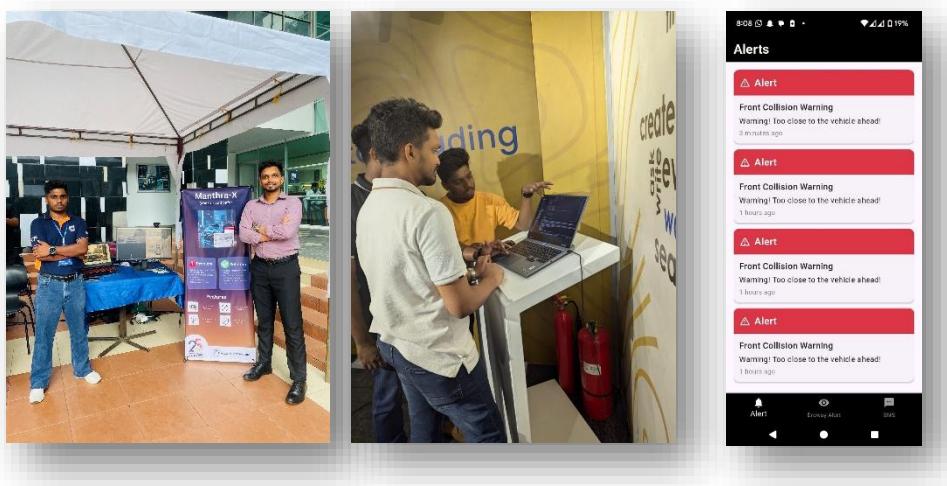
- **Real-time processing lag:** Solved using TensorRT model optimization.
- **Sensor fusion complexity:** Developed synchronized data alignment modules.

Outcome:

- Fast response (<1 second) to security events.
- System capable of real-time comfort adjustments based on passenger emotion.
- Contribution to ethical and perceptive autonomous vehicle decision-making.

GitHub:

[ManthraX Project Repository](#)



Smart Energy Monitoring & Prediction System using ESP32, Firebase, and Machine Learning

Project Title:

Smart Energy Monitoring & Prediction System using ESP32, Firebase, and Machine Learning

Duration:

January 2025 – May 2025

Role:

Developer – IoT and Machine Learning Integration

Tools & Technologies:

ESP32, Firebase Realtime Database, Node-RED, Python, TensorFlow, MQTT, Arduino IDE

Project Overview:

Developed a real-time energy monitoring system using ESP32 microcontrollers, Firebase, and machine learning models for predictive analytics. Enabled live data tracking and energy optimization using smart dashboards.

Objectives:

- Real-time sensor data monitoring.
- Predict future energy consumption.
- Automate alerts to prevent overconsumption.

Key Contributions:

- Configured ESP32 for real-time voltage/current streaming to Firebase.
- Designed Node-RED dashboards for live visualization and event-based alerts.
- Developed regression models in Python for future energy consumption predictions.

Challenges & Solutions:

- **Data loss in transmission:** Solved with data caching and retry mechanisms.
- **Real-time model updates:** Used lightweight models integrated into Node-RED.

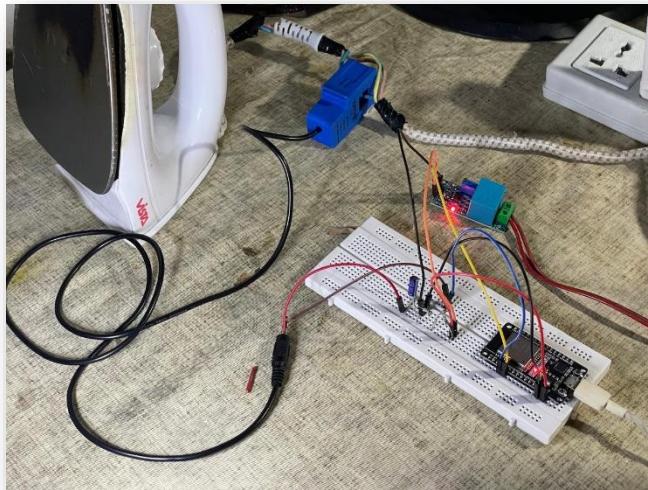
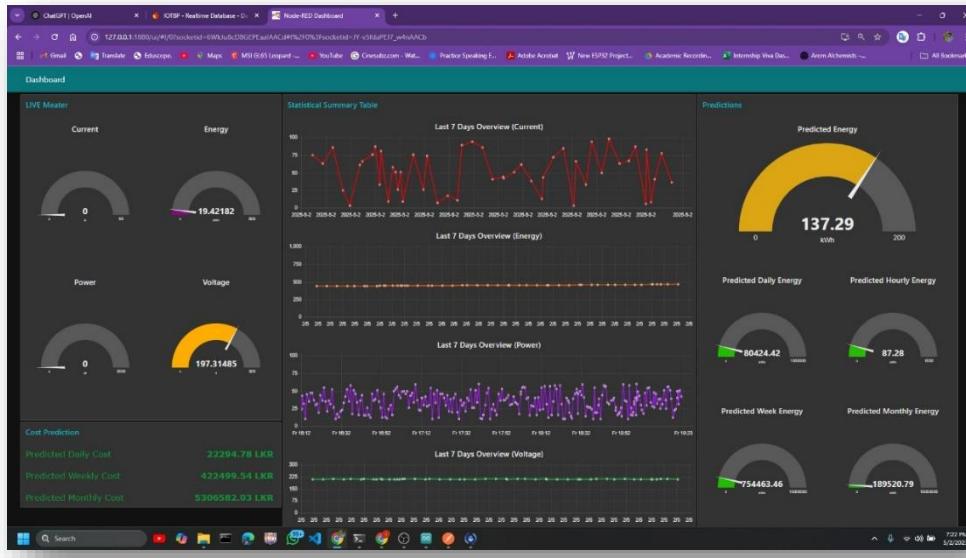
Outcome:

- Achieved >90% accuracy in energy prediction.
- Reduced energy waste by ~15% through smart alerts.

- Built a scalable and user-friendly IoT + ML platform.

GitHub:

[Smart Energy Project Repository](#)



LankaQRMenus – Restaurant Management System

Project Title:

LankaQRMenus – Restaurant Management System

Duration:

July 2024 – Present

Role:

Junior Software Developer (Internship)

Tools & Technologies:

PHP, MySQL, JavaScript, HTML, CSS, GitHub, Bootstrap

Project Overview:

Developed a restaurant management web application that offers menu management, promotional banners, user dashboards, and admin-level functionalities.

Objectives:

- Enable dynamic menu and banner management.
- Provide admin and manager dashboards.
- Ensure security and ease of use for the restaurant management process.

Key Contributions:

- Built menu and banner management features.
- Developed admin and manager dashboards for smooth operations.
- Integrated security best practices to protect user data.

Challenges & Solutions:

- **Responsive design issues:** Solved using Bootstrap-based designs.
- **Security vulnerabilities:** Strengthened input validation and session handling.

Outcome:

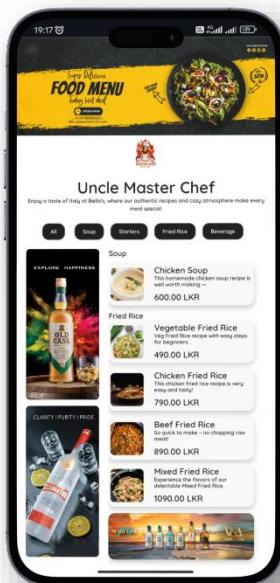
- Successfully deployed a fully functional restaurant management system.
- Enhanced usability with a responsive and secure web interface.

Live Website:

[LankaQRMenus](#)

The screenshot shows the 'Dashboard' page of the 'Restaurant Admin' application. On the left, a sidebar lists 'Dashboard', 'Items', 'Menus', 'Banners', and 'Offers'. A yellow button at the bottom right of the sidebar says 'Add Menu'. The main area displays a table titled 'Items Content' with columns: Name, Category, Price, Status, and Action. The table contains the following data:

Name	Category	Price	Status	Action
Chicken Soup	Soup	600.00	Active	
Green Salad	Starters	500.00	Active	
Chicken with BBQ Sauce	Starters	1000.00	Active	
Vegetable Fried Rice	Fried Rice	490.00	Active	
Egg Fried Rice	Fried Rice	690.00	Active	
Chicken Fried Rice	Fried Rice	790.00	Active	



Student Mental Health Prediction – MindMoodMeter

Project Title:

Student Mental Health Prediction – MindMoodMeter

Role:

Developer – NLP and Chatbot Integration

Tools & Technologies:

Python, Flask, TensorFlow, Keras, MySQL, Tkinter, NLTK

Project Overview:

Created an intelligent chatbot that uses Natural Language Processing (NLP) to predict student mental health patterns and offer supportive responses in a conversational interface.

Objectives:

- Enable mental health detection using language patterns.
- Develop a chatbot for friendly and supportive conversations.

Key Contributions:

- Built NLP modules for mental health pattern recognition.
- Designed chatbot flow for customer-friendly interaction.
- Integrated machine learning models with Flask backend.

Challenges & Solutions:

- **Complexity in language understanding:** Used NLTK and refined preprocessing for better language interpretation.

Outcome:

- Developed an accurate, interactive chatbot for mental health support.
- Provided a scalable solution for educational institutions.

Chatbot for Online Customer Support in E-commerce

Project Title:

Chatbot for Online Customer Support in E-commerce

Role:

Developer – NLP and Chatbot System

Tools & Technologies:

Python, Flask, TensorFlow, NLTK, MySQL

Project Overview:

Developed a smart chatbot to enhance customer service in e-commerce platforms. The system provides instant responses, order tracking, and customer query management.

Objectives:

- Improve customer support responsiveness.
- Automate order tracking and FAQs.

Key Contributions:

- Integrated NLP algorithms for natural language understanding.
- Created chatbot flows for order inquiries, complaints, and product information.
- Deployed the chatbot on a simulated e-commerce website.

Challenges & Solutions:

- **Handling unstructured queries:** Solved using pattern recognition and response classification.

Outcome:

- Increased efficiency in handling customer queries.
- Delivered a scalable, intelligent chatbot solution.

Eye Care Management System

Project Title:

Eye Care Management System

Role:

Full Stack Developer – Blog & User Management

Tools & Technologies:

React, Node.js, Express, MongoDB, Bootstrap, JavaScript

Project Overview:

Built a full-featured Eye Care Management System with blogging, user interaction, and doctor management capabilities.

Objectives:

- Manage eye care blogs and appointments.
- Provide user-friendly blog creation and editing tools.

Key Contributions:

- Developed CRUD operations for blogs.
- Designed user-friendly blog view and management interface.
- Integrated MongoDB for efficient data storage.

Challenges & Solutions:

- **Ensuring responsive design across devices:** Solved using Bootstrap and grid layouts.

Outcome:

- Fully functional eye care blog management system.
- Provided an organized platform for eye care professionals and users.

GitHub:

[Eye Care Management System GitHub](#)

Online Education Platform (Mobile App)

Project Title:

Online Education Platform – Mobile Application

Role:

Android Developer – Quiz Management

Tools & Technologies:

Kotlin, Firebase, Android Studio, Figma

Project Overview:

Developed a mobile application that supports online learning with quiz features, course materials, and student engagement.

Objectives:

- Deliver an interactive mobile-based learning solution.
- Provide a flexible quiz management system.

Key Contributions:

- Built functionality for quiz creation, update, and deletion.
- Designed intuitive user interfaces using Figma.

Challenges & Solutions:

- **Synchronizing data between quizzes and Firebase:** Solved by structuring real-time database queries effectively.

Outcome:

- Enhanced student engagement through a dynamic quiz platform.
- Provided scalable online education support.

GitHub:

[MAD Project GitHub](#)

Computer Part Store System

Project Title:

Computer Part Store System

Role:

Database Designer & Group Contributor

Tools & Technologies:

PHP, MySQL, HTML, CSS, JavaScript, XAMPP

Project Overview:

Developed a computer part store system focusing on feedback collection, inventory management, and SQL-based database design.

Objectives:

- Design and normalize the database.
- Manage store feedback and part inventories.

Key Contributions:

- Created SQL schemas and database structure.
- Developed feedback collection modules.

Challenges & Solutions:

- **Complex schema relationships:** Solved through database normalization.

Outcome:

- Successfully built a functional system for managing store feedback and inventory.
- Improved data consistency and query performance.

Online Medical Portal (Group Leader)

Project Title:

Online Medical Portal

Role:

Group Leader – User Management Module

Tools & Technologies:

PHP, MySQL, HTML, CSS, JavaScript

Project Overview:

Created an online medical portal with doctor booking, appointment management, and user dashboards.

Objectives:

- Develop a secure medical appointment system.
- Provide user-friendly booking features.

Key Contributions:

- Built CRUD features for appointments and doctor management.
- Designed search functionalities and user-friendly interfaces.

Challenges & Solutions:

- **Data accuracy in booking system:** Solved by using input validation and server-side checks.

Outcome:

- Provided a scalable platform for online doctor appointments.
- Delivered a smooth and responsive user experience.

GitHub:

[Online Medical Portal GitHub](#)