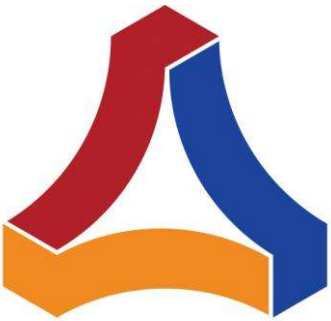
BIL 481 - Project Definition Document:



TOBB ETÜ

University of Economics & Technology

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1. Project Name

AI-Powered Food Ingredient Detection and Recipe Suggestion System (PicDish)

2. Project Summary

This project aims to develop an AI-powered system that allows users to upload images of food ingredients through a web interface and receive recipe suggestions based on detected ingredients. The system utilizes **image processing and deep learning techniques** to identify ingredients in the uploaded images and generates suitable recipes using **OpenAI API**. The core model is based on **YOLO**, fine-tuned with a custom dataset to improve accuracy.

3. Objectives

The main objectives of the project are:

- Accurately detect food ingredients from images using an AI model.
- Generate meaningful and diverse recipe suggestions based on detected ingredients.
- Develop an intuitive and user-friendly web interface for seamless interaction.
- Successfully deploy the application as a web-based platform for end-users.
- Maintain effective collaboration using GitHub for version control and project management.

4. Project Scope

- **Included in Scope:**

Development of an AI-powered food ingredient detection system using **YOLO**.
Integration of **OpenAI API** to generate recipe suggestions.
Development of a web interface for **image uploads and recipe display**. Deployment of the system as a web-based platform.
Implementation of **GitHub-based project management** for collaboration.

- **Excluded in Scope:**

  Handling of non-PNG image formats.
  Advanced NLP processing beyond API-generated results.
  Manual curation of recipe suggestions.
  User authentication and account management.

5. Target Audience

This project is designed for:

- Users looking for new recipes based on available ingredients.
- Individuals searching for recipes based on specific dietary restrictions.
- Users aiming to minimize waste by using available ingredients effectively.
- Companies or websites that want to integrate an AI-based recipe suggestion system.

6. Key Features

The system will offer the following core functionalities:

- **Image Upload:** Users can upload images of food ingredients.
- **Ingredient Detection:** YOLO-based object detection will identify the food items.
- **Recipe Generation:** OpenAI API will generate recipes based on detected ingredients.
- **User Interface:** A responsive and user-friendly web interface will be developed.
- **Web Deployment:** The application will be deployed on a cloud platform.

7. Deliverables

- Trained YOLO-based object detection model for ingredient recognition.
- API-integrated system that generates recipe suggestions.
- Fully functional web interface for user interaction.
- Deployment setup and documentation for reproducibility.
- Project repository on GitHub with well-structured code and version control.

8. Budget and Resources:

Cloud Hosting	Deployment on AWS/GCP	~$20/month (if deployed)
API Costs	OpenAI API calls for recipe generation	Free (academic use)
Development Tools	Python, OpenCV, TensorFlow/PyTorch, Flask/Django (backend), React.js (frontend)	Free/Open-source
Database	PostgreSQL/MySQL for storing data	Free
Miscellaneous	Domain name, hosting	~$30/month (if deployed online)

9. Risks and Mitigation Strategies:

Risk	Potential Impact	Mitigation Strategy
Model accuracy issues	Incorrect ingredient detection may lead to poor recipe suggestions.	Continuous model refinement, expansion of training dataset, and optimization of hyperparameters to improve accuracy.
API request limitations	Excessive API usage might result in rate limits or increased costs.	Implement query optimization, caching mechanisms, and consider alternative or open-source AI models.
Team availability constraints	Delays in development could occur due to unavailability of key members.	Establish backup responsibilities within the team and ensure clear documentation for continuity.
Deployment challenges	System failures or crashes during deployment may hinder usability.	Perform extensive local testing before cloud deployment and use robust CI/CD pipelines.
User experience issues	A complex or unintuitive interface could reduce user engagement.	Conduct UI/UX testing, collect feedback, and iterate designs for optimal usability.

10. Project Success Criteria:

- The AI model achieves an ingredient detection accuracy of at least 85%, ensuring reliable identification.
- The system processes images and generates recipe suggestions within 5 seconds, maintaining optimal user experience.

- The platform provides at least 50 unique recipes based on various ingredient combinations, enhancing content diversity.
- The user interface is intuitive, with at least 90% of test users rating the experience as satisfactory or better.
- The system successfully handles concurrent requests from at least 100 users without performance degradation.