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|  | Project Plan |
|  |  |
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Software Design with Artificial Intelligence for Cloud Computing  
Year 4

Contents

# Introduction

[[ Context and overview of the project ]]

# Purpose and Scope

## Purpose

The purpose of this project is to develop a user-friendly application that identifies raw food products and its quantities using image recognition. Based on recognized items and their quantities, the application provides recipe suggestions (where at least one is healthy) which will reduce food waste and household expenses. The application joins object detection with AI recipe generation.

## Scope

The application will recognize common raw products from categories such as vegetables, fruits, meat, and dairy. It will use the Groq API to generate recipes, ensuring at least one healthy option. A basic front-end will allow users to upload images and view the results. After processing, the application will display a pop-up showing the detected items, which users can manually confirm or adjust by adding any missing products in a text field. The backend will filter recognized products based on a confidence threshold of 80% or higher and integrate with an external AI API for recipe generation.

# Goals and Objectives

## Goals

* Develop an AI-powered application using YOLO for object detection
* Integrate Groq AI API for recipe generation
* Create flask-based interface for demonstration

## Objectives

* Collect and annotate raw food datasets with focus on common products from categories like vegetables, fruit, meat and diary
* Custom train and fine-tune YOLO model to get accurate object detection
* Build Flask-based backend to handle image processing and API “post” request
* Develop simple frontend to allow users to upload images, view detected items and add missing ones if necessary
* Ensure seamless integration between the image recognition model, Groq API and frontend components

# Success Criteria

* Fully annotated and validated raw food dataset
* Custom trained YOLO model with at least 80% confidence threshold
* Functional Flask backend capable of filtering recognized items based on confidence levels
* Successful interaction with Groq AI API for recipe generation
* Basic but functional frontend for user interactions and result display
* Comprehensive documentation, including final year project thesis with detailed explanations of the system’s functionality and outcomes

# Work Breakdown Structure (WBS)

## High Level Breakdown

|  |  |
| --- | --- |
| **Phase** |  |
| Planning | Gather and refine requirements |
| Data Preparation | Find and combine appropriate food datasets  Annotate images (if not already done so)  Validate final, custom dataset |
| Model Development | Train YOLO custom model on annotated dataset  Evaluate and fine-tune the model |
| System Integration | Develop backend for object detection and recipe generation |
| Frontend Development | Build basic Flask frontend |
| Testing | End-to-end system testing |
| Refinement | Debugging and performance optimization |

# What’s In and Out of Scope

[[ outline what is and isn’t in scope, include out of scope all available products, reduction to most common to prove concept and ensure that application is still functional as intended. Include different types of meat will all go as one, eg. chicken fillet, diced chicken, whole chicken etc will be classified as “chicken” ]]

# Assumptions

???

# Milestones

[[ describe milestones in detail ]]

# Project Schedule

[[ add gantt diagram ]]

# Approach

[[ define methodology and high level strategies for achieving the objectives – using Python language, using PyTorch with YOLO, training custom model, gathering different types of datasets that were available online in open-source, annotating these images manually, training custom model on college pc due to hardware constrains on my local machine, validating the outputs and fine tuning the model. Developing backend. Developing simple front end

# Resources and Budget

[[ outline costs and available resources – open source datasets for food products, link to fruitveg81 that we got granted access to, groq api free, chatgpt as alternative in case if groq does not work ]]

# Risks and Mitigation

[[ identify potential risks and how to overcome them, example: image annotation taking too long, not enough good quality images to train the model, overwhelimg with college projects and exams, personal exhaustion, stress, accident ]]

# Acceptance Criteria

[[ defined deliverables and outcomes needed for project completion ]]

## Dependencies

## Risks

# Schedule

## Preliminary Schedule

## Preliminary Estimates

* Include Gantt Chart

## Policies and Standards

## Competitor Drivers

# Specific Requirements

# Appendices

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