## **Project Overview**

## Al Pipeline for Image Segmentation and Object Analysis

## **Project Objective:**

The goal of this project is to develop an AI pipeline that processes an input image to segment, identify, and analyze objects within the image. The pipeline then outputs a summary table with mapped data for each object.

## **Pipeline Steps and Deliverables:**

## 1. Image Segmentation:

Task: Segment all objects within an input image.

## Deliverables:

- Implement or use a pre-trained model (e.g., Mask R-CNN, DETR).
- Code to input an image and output segmented regions.
- Visual output showing segmented objects.

# 2. Object Extraction and Storage:

Task: Extract each segmented object and store them with unique IDs.

#### Deliverables:

- Code to extract and save objects as separate images.
- Assign unique IDs for objects and a master ID for the original image.
- Save object images and metadata in a file system or database.

## 3. Object Identification:

o **Task:** Identify and describe each object.

#### Deliverables:

- Implement or use a pre-trained model (e.g., YOLO, Faster R-CNN, CLIP).
- Code to generate descriptions for each object.
- Document containing identified objects and descriptions.

# 4. Text/Data Extraction from Objects:

o **Task:** Extract text or data from each object image.

#### Deliverables:

Implement or use a pre-trained model (e.g., Tesseract OCR, EasyOCR).

- Code to extract and store text/data from each object.
- Document containing extracted text/data.

## 5. Summarize Object Attributes:

o **Task:** Summarize the nature and attributes of each object.

#### Deliverables:

- Code to generate a summary of attributes for each object.
- Document containing summarized attributes.

## 6. Data Mapping:

• Task: Map all extracted data and attributes to each object and the master input image.

#### Deliverables:

- Code to map unique IDs, descriptions, text/data, and summaries.
- Data structure (e.g., JSON, database schema) representing the mapping.

## 7. Output Generation:

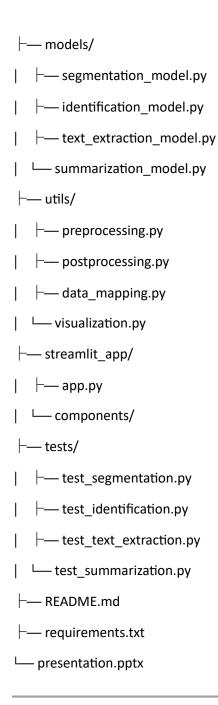
 Task: Output the original image with a table containing all mapped data for each object.

## Deliverables:

- Code to generate the final output image with annotations.
- Table summarizing all mapped data.
- Final visual output showing the original image with segmented objects and accompanying table.

# Page 2: Implementation Details

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## **Key Components:**

## 1. Preprocessing:

- o Load and preprocess images.
- o Resize and convert images to appropriate formats for model input.

## 2. Models:

- Implement or integrate models for segmentation, identification, text extraction, and summarization.
- o Use pre-trained models where applicable.

# 3. Postprocessing:

- o Process model outputs to generate visual results.
- o Save metadata and generate annotated images.

## 4. Data Mapping:

- o Map extracted data to corresponding objects and the master image.
- o Structure the data in a JSON or database format.

#### 5. Visualization:

- o Generate visual representations of segmented objects and final outputs.
- o Display metadata and summaries in a user-friendly format.

## 6. Streamlit App:

- o Provide a user interface for uploading images and viewing results.
- o Allow users to interact with each step of the pipeline.

## **Project Requirements:**

- Ensure code is well-documented and modular.
- Provide test cases to verify functionality.
- Create a presentation summarizing the project approach, implementation, and results.
- Implement a Streamlit UI for easy interaction with the pipeline.

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