# Chemical Waste and Safety System Project

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Github link: https://github.com/gescobar19/Chemical_Waste-Safety_Identification

**Overview:**

○ Train a machine learning or deep learning model for classification of labels of chemicals.

○ Analyze input of visual data from image of a chemical label on a container to identify the chemical components

○ AI will read and cross reference the label with the database of known chemicals using PubChem to get information of safety handling and waste disposal measures with web scraping.

**Key Components and Progress**

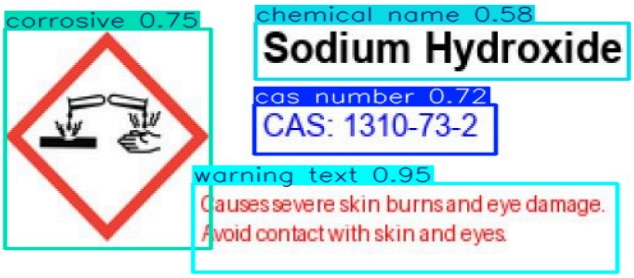
1. **Object Detection with YOLOv8**
   Trained YOLOv8 on a custom dataset with 13 classes, including chemical names and GHS symbols. Integrated OCR to extract text from "chemical name" regions.
2. **OCR Integration**
   Integrated Tesseract OCR to extract chemical names from detected bounding boxes, improving accuracy with preprocessing steps like grayscale conversion and thresholding.
3. **Web Scraping with Selenium**
   Developed a scraping pipeline to extract "Disposal Methods" and "Preventive Measures" from PubChem, using the PUG REST API for CID mapping and addressing dynamic content loading.
4. **Summarization Model**
   Integrated the summarizer model to summarize safety and disposal information into concise bullet points, refining prompts for more focused summaries.
5. **User Interface with Tkinter**
   Created a Tkinter interface to display summaries for disposal methods and preventive measures, allowing users to select images and view results.

Chemical Identification System (Waste & Safety)

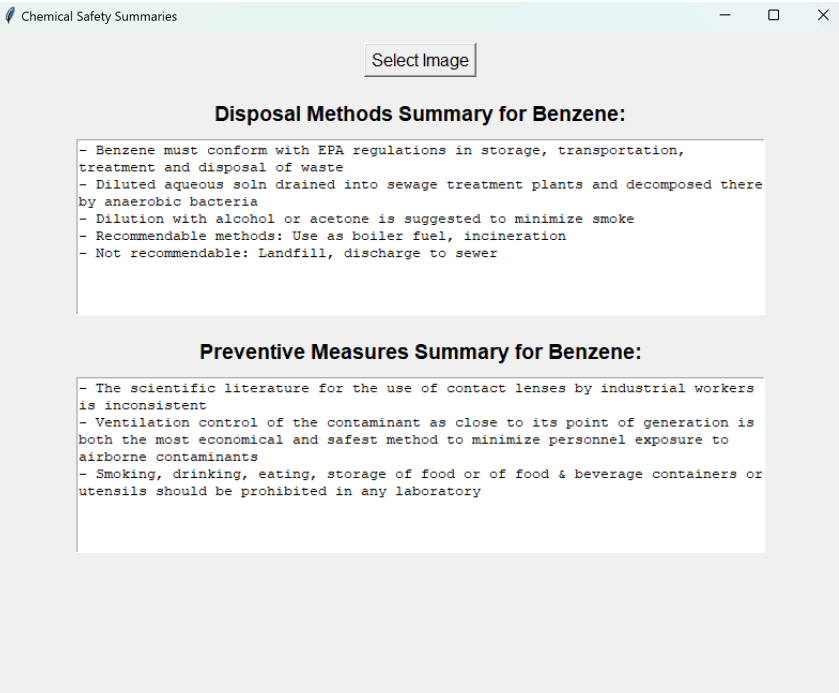
- Object Detection (yolov8)

    Training: 68 images


Testing:



- Safety and Waste Disposal Information:




**Future Development:**

An AR system that can identify a chemical in a real world environment and display the safety and disposal information. A warning system that can detect if a chemical is handled unsafely (no gloves) or an AR training program that can explain how to dispose of chemical (and nuclear) waste.