ARTIFICIAL INTELLIGENCE

Final Project

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Stationary Billing System: A Comprehensive Overview

Introduction:

In the realm of computer vision and image processing, the demand for accurate and efficient object detection systems has been steadily increasing. Among the various object detection algorithms, YOLO (You Only Look Once ☺) has emerged as a popular choice due to its real-time processing capabilities and robust performance. This report provides insights into the development and implementation of an stationary image detection billing system using YOLOv8M.

YOLOv8M Selection and Training:

The journey began with the selection of the YOLOv8M model for its balance between computational efficiency and accuracy. Given the available computational resources and the priority placed on accuracy, we thought of YOLOv8M as the optimal choice. Training the model involved several iterations, with the dataset being trained for 10-15 epochs to achieve satisfactory performance.

Data Augmentation:

To enhance the training dataset's diversity and robustness, data augmentation techniques were employed. These techniques included rotation, flipping, vertical and horizontal scale flipping, saturation adjustments, blur, and segmentation. By augmenting the dataset, the model's ability to generalize to unseen data and variations in real-world scenarios was improved.

Exploration and Research:

Since we were initially unfamiliar with YOLO and its workings, extensive research was conducted by the group members to gain a deeper understanding of the algorithm and its applications. Resources such as the coco dataset and tools like Roboflow for labeling images were discovered and utilized to streamline the data preparation process.

Customization and Model Tuning:

With a desire to tailor the model to specific requirements, customization and fine-tuning of the YOLOv8M model were pursued. This involved understanding the nuances of pre-tuning and leveraging available resources to customize the dataset. Despite encountering challenges, such as compatibility issues with newer YOLO versions, perseverance and thorough scrutiny of code and model directories enabled successful implementation.

GUI INTERFACE

- **Linking Model with GUI:**

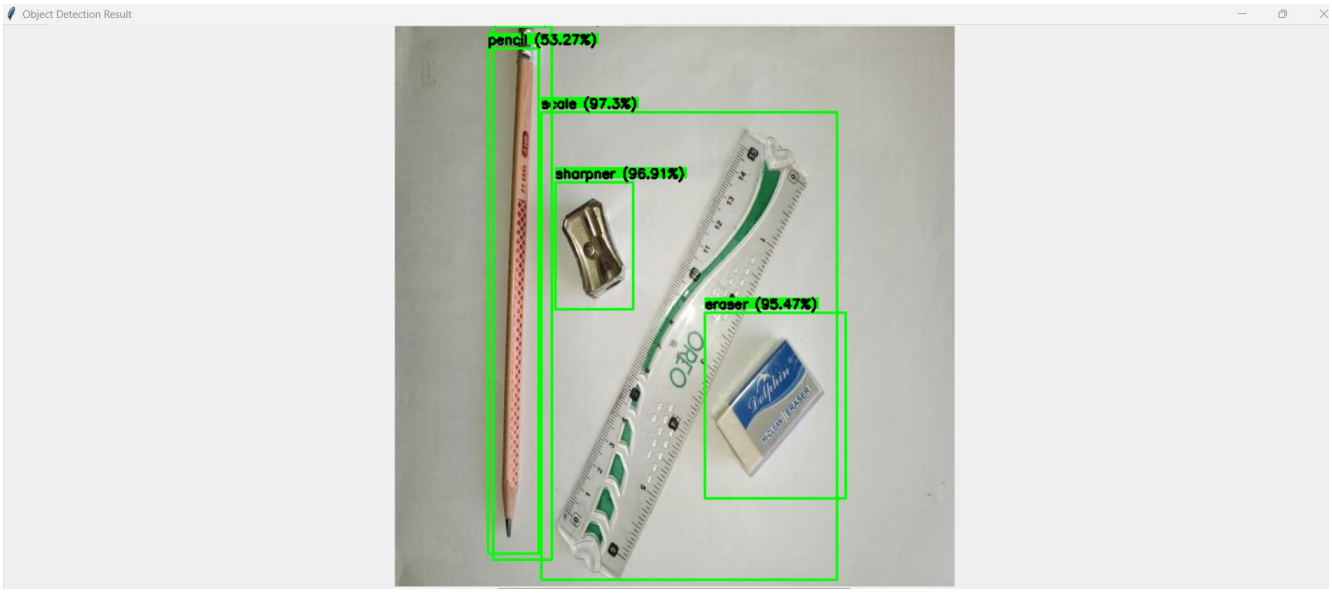
The billing and object detection functionality implemented in the graphical user interface (GUI) represents a significant aspect of the project, aligning with the overarching goal of developing an automated billing system. This section delves into the thought process and working behind this crucial component.

The image below is an unlabeled and undetected simple image:

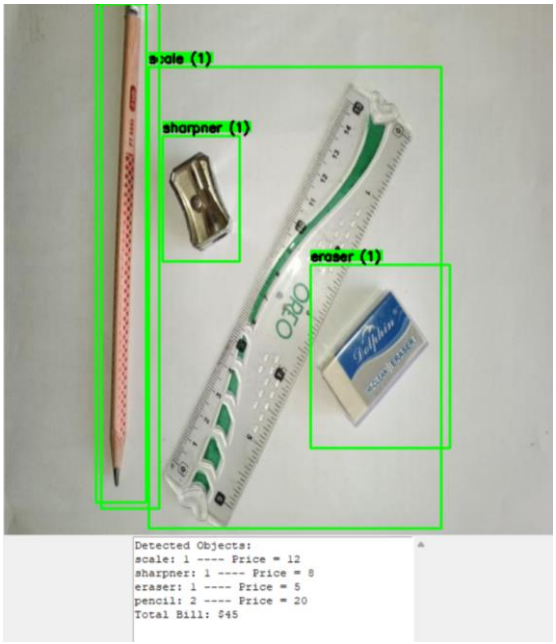
Object Detection: Utilizing the YOLOv8M model, the system is capable of detecting objects within images uploaded by the user. Upon selecting an image file, the system employs YOLO's object detection capabilities to identify various objects present in the image. Through bounding boxes and labels overlaid on the image, users can visually perceive the detected objects along with their

corresponding counts. This real-time object detection mechanism ensures accurate and efficient identification of products, laying the foundation for automated billing.

The image below shows the labelled version of image1:



Billing Calculation: Integrated with the object detection functionality is the billing calculation mechanism, enabling the system to generate total bills based on the detected objects and their respective prices. As each object is identified, its count is tracked and stored in a dictionary. Simultaneously, a predefined dictionary maps each object to its corresponding price. By multiplying the count of each detected object by its price, the system calculates individual item costs. These costs are displayed alongside the detected objects in the GUI's text box, providing users with transparent pricing information. Additionally, the system aggregates the total cost across all detected objects to compute the final bill, facilitating seamless checkout and payment processes.



Enhancing User Experience: By presenting both the detected objects and their associated prices in the GUI, users gain valuable insights into their purchases. The transparent display of itemized costs fosters trust and confidence in the billing process, reducing ambiguity and potential errors.
Moreover, the intuitive interface ensures user-friendly interactions, enabling customers to review and confirm their purchases effortlessly. Through the fusion of object detection and billing functionality in the GUI, the system endeavors to enhance user experience, streamline retail operations, and ultimately drive customer satisfaction.

Conclusion:

In conclusion, the development of the image detection billing system using YOLOv8M involved a journey of exploration, research, and iterative refinement. By leveraging state-of-the-art techniques, including data augmentation and model customization, an efficient and accurate object detection system was realized. The insights gained from this project not only contribute to advancing object detection technology but also underscore the importance of adaptability and perseverance in overcoming challenges encountered during the development process.

Note: *Attached images showcase various stages of the development process, including dataset augmentation, model training, and system implementation.*