Q-KART: Simplified Checkout
Evaluating YOLO for Real-Time Object Detection in Retail Stores

Group Members:

Abhimanyu Kumar:	102215021
Arushi Gupta:	102206190
Khushi Kaushal:	102206269
Tanishka Bhatia:	102206217
Uttkarsh Singh Pathania:	102215291

CPG: 36

Mentor: Dr. Geetika Dua (ECED)

Problem Definition

Traditional retail environments are hampered by systemic inefficiencies like long queues and manual scanning errors, while existing smart cart solutions are either prohibitively expensive or rely on costly infrastructure creating a critical need for an accessible, tag-less, and automated billing system that democratizes smart retail for small-to-mid-sized businesses.

Proposed Approach

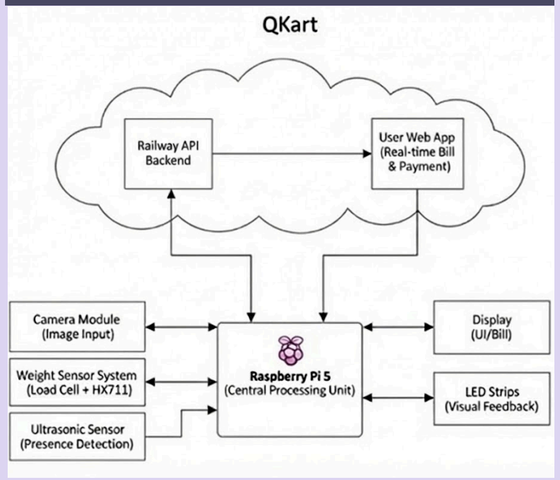
- Utilize Raspberry Pi 5 with a lightweight YOLOv8 model for efficient real-time analysis of products without barcodes.
- Integrate a multi-sensor verification system (Load Cells + HX711) to cross-validate visual detection with weight data for fraud prevention.

Technologies Used

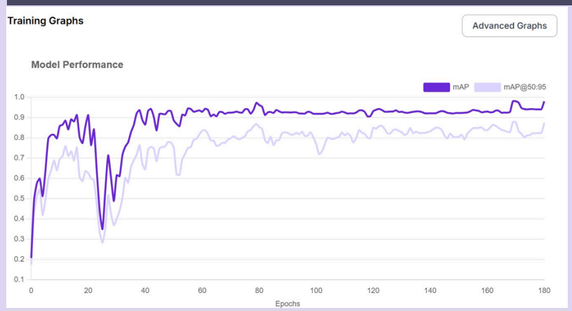
IEEE Standards

- IEEE 802.11: Wireless LAN protocols for cart-to-cloud sync.
- IEEE 29148: Requirements Engineering for system scope.
- IEEE 12207: Software Life Cycle Processes.
- IEEE 2700: Sensor Performance for load cell calibration.

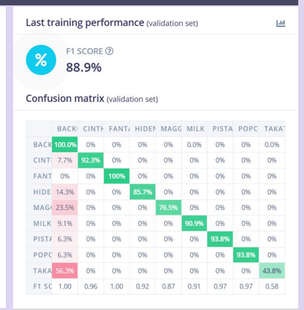
System Architecture



Model Training Statistics

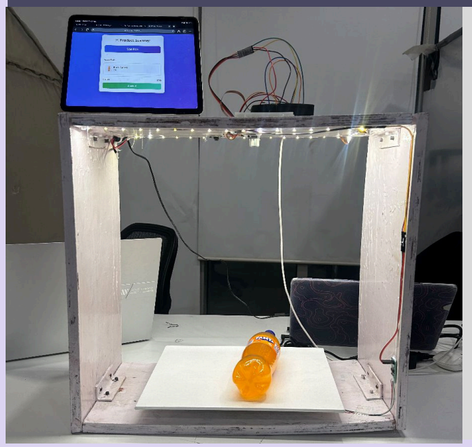


a) Performance Curve

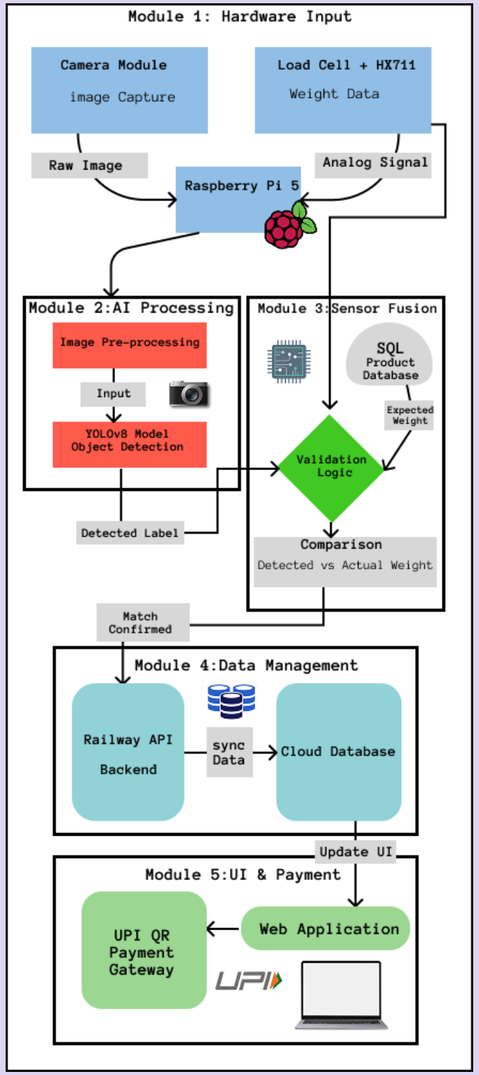


b) Training Performance

Inference and Prototype



Process Workflow



REFERENCES

- M. Khan and L. Zhang, “Object Detection in Smart Indoor Shopping Using an Enhanced YOLOv8n Algorithm,” IET Computer Vision, vol.17, no. 4, pp. 345–356, 2024.
- A. S. Abdullah and R. Kumar, “Real-Time Billing Using Flask-BasedIoT Backend Systems,” IEEE Access, vol. 10, pp. 98532-98541, 2022.