# **AIOT Auto-checkout System**

A comprehensive automated retail solution combining RFID technology, computer vision, and web interface for seamless shopping experience.

## **System Overview**

This system consists of three main components:

* **Arduino-based RFID controllers** for access control and item management
* **YOLOv11 AI model** for object detection and recognition
* **Web application** for system monitoring and management

## **Project Structure**

├── Arduino/

│ ├── RFID1.ino

│ ├── RFID2.ino

│ └── RFID3.ino

├── Yolov11/

│ ├── yolo\_detect.py

│ ├── my\_model.pt

│ └── [other AI model files]

└── webapp/

├── app.py

└── [web application files]

## **Arduino Components**

### **RFID1.ino - Entrance Control System**

* **Purpose**: Controls the main entrance gate
* **Hardware**: ESP32, RFID reader, servo motor
* **Function**: Reads user cards at entrance and controls servo motor for gate operation

### **RFID2.ino - Item Sorting Mechanism**

* **Purpose**: Manages the singularity mechanism for item processing
* **Hardware**: ESP32, RFID reader, 2x servo motors
* **Functions**:
  + Controls servo for singularity mechanism
  + Reads RFID tags on items
  + Activates rotation servo to sort items into designated containers

### **RFID3.ino - Billing System**

* **Purpose**: Handles checkout and payment processing
* **Hardware**: ESP32, RFID reader
* **Function**: Processes user card scan for automatic transaction completion

## **YOLOv11 AI Model Setup**

### **Prerequisites**

* Anaconda installed on your system
* USB webcam connected to computer

### **Installation & Usage**

**Create and activate virtual environment**:  
 bash  
conda create -n yolo-env1

1. conda activate yolo-env1
2. **Navigate to model directory**:  
    bash  
   cd <your\_path\_to\_Yolov11\_folder>
3. **Run object detection**:  
    bash  
   python yolo\_detect.py --model my\_model.pt --source usb0 --resolution 1280x720

### **Additional Resources**

For detailed setup instructions, watch: [YOLOv11 Tutorial](https://www.youtube.com/watch?v=r0RspiLG260&t=1137s)

## **Web Application Setup**

### **Prerequisites**

* Python installed on your system
* Visual Studio Code

### **Running the Application**

1. **Open project in VS Code**:  
    bash  
   code webapp/
2. **Launch Git Bash terminal in VS Code**
3. **Start the application**:  
    bash  
   py app.py
4. **Access the application**:
   * Ctrl + Right-click on the localhost link in terminal
   * Application will run locally in your browser

## **System Workflow**

1. **Entry**: User scans card at entrance (RFID1) → Gate opens
2. **Shopping**: Items are automatically detected and sorted (RFID2 + YOLOv11)
3. **Checkout**: User scans card for automatic billing (RFID3)
4. **Monitoring**: Web application provides system overview and management

## **Hardware Requirements**

* 3x ESP32 microcontrollers
* 3x RFID readers
* 4x Servo motors
* USB webcam
* RFID cards and tags
* Mechanical components for gates and sorting mechanism

## **Software Dependencies**

* Arduino IDE for ESP32 programming
* Anaconda/Python for AI model
* Visual Studio Code for web development
* Required Python libraries (specified in respective folders)

## **Contributing**

Please ensure all hardware connections are properly secured and test each component individually before integrating the complete system.

## **Support**

For technical issues or questions, refer to the documentation in each respective folder or the provided tutorial video for YOLOv11 setup.