**Efficient Shelf Monitoring System using Faster-RCNN**

In the fast paced world of today where marketing and advertisement is at its peak, an effective inventory management is essential for success. Remote Inventory management is traditionally done through Image processing methods in which the images of the shelves are taken and then processed to find the missing objects. This process creates a new set of problems relating to customer privacy. While a majority of the works concentrate on finding the missing objects, this article aims to detect the absence of objects or empty shelves, without disclosing the identity of the customers. Along with this the location of the empty shelf is also pointed out. This work uses the pre trained model Faster RCNN to detect empty regions of shelves of a retail store. Results of the simulation show an accuracy of 99% thereby indicating the use of this method for industrial deployment.

**Existing System:**

Traditional inventory management methods rely on manual inspections, RFID tagging, and basic image processing techniques to monitor shelf availability in retail stores. Image processing methods capture images of the shelves, which are then processed to detect missing products.

**Disadvantages:**

****  Labor Costs and Inefficiency: Manual inspections are labor-intensive and often delayed until off-peak hours, leading to inefficiencies and increased operational costs.

 Sales Losses Due to Delays: A delay in inventory monitoring causes significant sales losses when items go out of stock on shelves, despite having additional stock in storage.

 Privacy Concerns: Image processing methods can raise privacy concerns when customer images are inadvertently captured.

 Limited Scalability: Techniques like RFID tagging and robots with cameras are not scalable to larger retail environments due to high costs and logistical challenges.

 Inconsistent Performance: Basic image processing and early deep learning methods (e.g., YOLO, template matching) suffer from poor performance, especially in complex retail environments.

 Time-Consuming: Traditional methods require continuous real-time data capture, which is resource-intensive and time-consuming.

**Proposed System:**

The proposed system uses a pre-trained Faster R-CNN model, integrating CNN and ResNet-50 architecture, to detect empty shelves without requiring continuous real-time data or compromising customer privacy.

**Advantages:**

1. **High Accuracy**: The Faster R-CNN model achieves an accuracy of 99%, significantly improving detection rates compared to other methods like YOLO and CNN.
2. **Cost-Effective**: The system reduces the need for manual inspections and expensive RFID tagging, making it more economical for retail stores.
3. **Enhanced Privacy**: The model focuses only on detecting empty shelves and does not capture customer identities, thereby preserving privacy.
4. **Real-Time Insights**: It provides valuable real-time insights into inventory status, staff efficiency, and product popularity, which helps in better decision-making and improves overall store management.
5. **Scalability**: The system is adaptable to various types of retail environments, regardless of store size, making it a versatile solution.
6. **Efficient Training and Prediction**: With a training time of about 6 hours and prediction time as fast as 24 seconds, the system is both efficient and responsive.
7. **Simplified Workflow**: By using region proposal networks and robust classification techniques, the system simplifies the workflow, enhancing both speed and accuracy of detection.

**SYSTEM SPECIFICATION:**

**HARDWARE REQUIREMENTS:**

* **System :** Intel i7
* **Hard Disk :** 1 TB.
* **Monitor** : 14’ Colour Monitor.
* **Mouse :** Optical Mouse.
* **Ram :** 16GB.

**SOFTWARE REQUIREMENTS:**

* **Operating system :** Windows 10.
* **Coding Language :** Python.
* **Front-End :** Html. CSS
* **Designing :** Html,css,javascript.
* **Data Base :** SQLite.