Visual AI Hackathon

PorchProtector

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Problem Statement :

Many delivery packages are left at doorsteps, leading to package theft or misdelivery. Current security cameras record footage but do not actively alert the owner if someone unauthorized picks up the package. We aim to address this problem using modern Computer Vision technology.

Potential Solution

We try to model this problem as a computer vision-based package security system that detects when a package is picked up and checks whether the person is authorized (recognized face) or unauthorized (stranger). If an unauthorized person picks up the package, an instant alert is sent to the package owner.

Challenges

- Acquiring diverse, high-quality training data for real scenarios
- Ensuring reliable performance under varied environmental conditions (lighting, weather, clutter).
- Handling limited or unstable connectivity that can delay or disrupt real-time alerts and app updates

Edge Cases

- Minimizing false alarms by accurately distinguishing between authorized and unauthorized package pickups (for example- relatives/friends).
- Avoiding tagging delivery person when they are delivering the package
- Handling overlapping or stacked packages that obscure the system's view of each parcel.
- Distinguishing user-placed parcels (e.g., outgoing returns) from newly delivered packages.

Sample Dataset

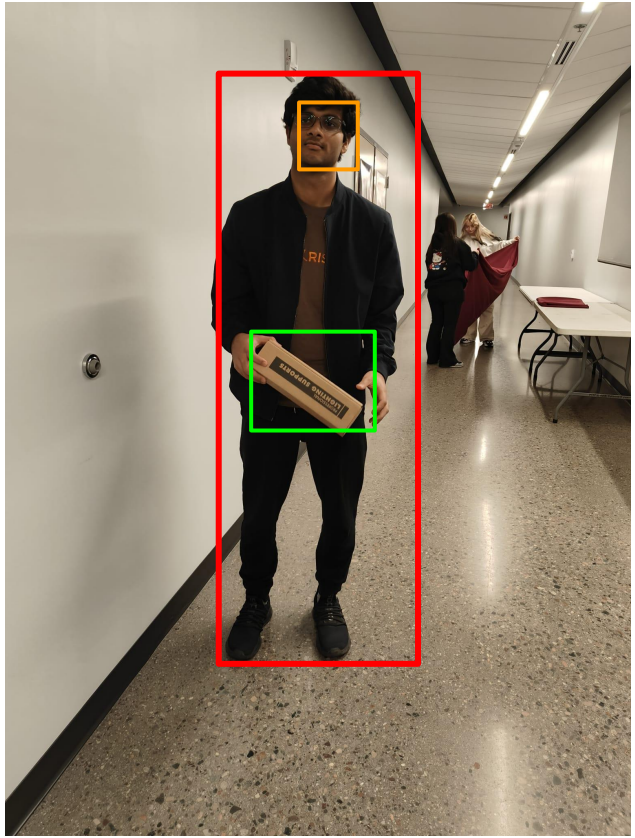
Approach 1

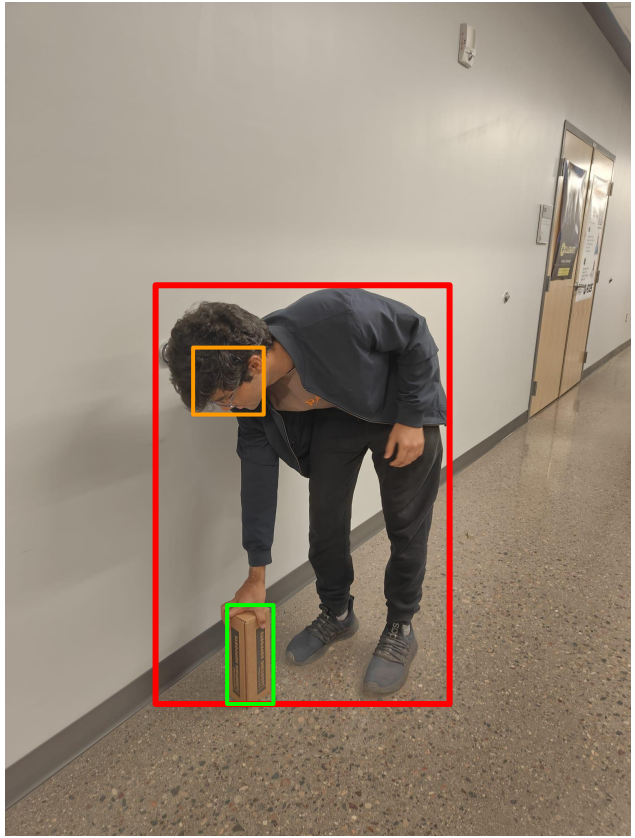
This slide outlines our first approach, which leverages distinct pre-trained models for package detection, face recognition, and body detection. Specifically:

1. **Package Detection**
    - We employ a pre trained object detection model (hosted on Roboflow) to localize parcels within each frame. (link)
2. **Face Recognition**
    - We rely on the Python-based face-recognition library to draw bounding boxes around any detected faces.
3. **Body Detection**
    - Using OpenCV's built-in functions, we identify and bound the person's body region.

After obtaining these three bounding boxes (parcel, face, body) per frame, we compute their overlap. If at least 80% of the parcel's bounding box area intersects with either the face or body bounding box, we infer that the parcel is being picked up. This threshold-based overlap check helps minimize false positives while ensuring robust pickup detection

Approach 1- Samples





Approach 2

There is another approach to solve this problem as described in Lightweight Delivery Detection on Doorbell Cameras

This paper describes a smart, low-power system for doorbell cameras that can tell when a delivery is happening. Instead of sending video to the cloud, the camera itself watches for movement and then uses a small, efficient neural network to decide if someone is delivering a package or food. It also includes a clever way to focus on the most important parts of the video and only alert you when it's really sure about what it sees. This means you get reliable delivery notifications right at your door without needing expensive hardware or compromising your privacy.

Conclusion

This project demonstrates the power of AI in real-world security applications. By combining computer vision, deep learning alerts, we can significantly reduce package theft and misdeliveries. With further improvements, this system can be deployed on a larger scale to ensure safer, smarter, and more secure package deliveries.