Tech Expo, Spring/Fall 2025 – Team 54

PPE A.I. Vending Machine PURDUE NIVERSITY.

Team: 54

Problem Statement

Ensuring factory workers use PPE (personal protective equipment) is a daily challenge. Current enforcement includes inconsistent monitoring through manual checks or signage. Many injuries result from inadequate PPE usage. Our team will create an intelligent vending machine system to combat this issue. Utilizing AI, a camera to sense if a worker wears correct PPE and a deployment system to properly dispense missing items to them.

Customer Background

Packaging Systems of Indiana is a local corporation based in Lafayette, IN. With a focus on sustainability, the company provides services various industries such as Food, Distribution, Metals, Recycling, and more.

Majority of products are produced in a warehouse where Personal Protective Equipment, or PPE, is imperative. Most older works choose not to wear PPE such as earplugs, despite company requirements. The goal of the project is to detect when workers aren't wearing PPE and provide missing pieces to encourage ease of wearing it.

Requirements

The project must be able to identify what types of PPE an employee is working through use of computer vision and a camera. The product must determine if any required PPE is missing, then be able to dispense necessary items to the employee. The PPE items we scan for in this project include Helmets, Safety glasses, and Vests.

Linked to a security gate, once the product has determined the employee is wearing, the system will unlock the gate, allowing the employee to pass through.



Members: Adrian Calderon, Christopher Campbell, Max Chen, Aditya Prabhu, Ryan Hay, Cameron Johnson





Polytechnic Institute



Software

Hardware

- stage.





Results

Our result produced a smart vending machine that detects if a user is PPE compliant. Our final model is designed to detect PPE with high yielding accuracy when an individual steps into frame of the camera. Our integrated GUI system will show the respective worker which specific PPE items are missing. The worker will then click on the GUI icon that is highlighted, which will communicate with the vending machine to dispense the specific item.

> **Once approved from** the camera scan, an icon will indicate the safety gate is unlocked. This will transpire only when the requirements are met, and the dispensed missing PPE is worn.

Future Work

Currently the GUI is a very simple script written with PySide6, the application could be further improved with proper Qt application development workflows. The computer vision model right now is trained using public datasets, but to improve accuracy and reliability, the model should be re-trained on custom datasets.

We are at the "proof of concept" stage of the project, so all hardware aside from the main Jetson computer can and should be improved at a later

Actual safety gate implementations requires strict adherence to related safety and worker codes.