Automated Checkout System for Corporate Cafeterias

Name: Ronan Kenkare

Class: CS 437

Assignment: Final Project Proposal

1. Executive summary

In many large companies and factories, cafeterias are a key service that must be provided, offering meals to employees who have taken time from their schedule for a break. Most of these depend on cashiers for a manual transaction in which employees pick up their food and head toward a checkout line. This process, as functional as it is, leads to several inefficiencies, particularly during peak times. Long lines often form, reducing the amount of time employees have to eat and at times making them late to get back to work.

The situation has continuously deteriorated during the last years, especially after the COVID-19 pandemic, with more and more employees coming back to office work. With increased employee presence, cafeteria operations have taken on growing work strain that results in bottlenecks at cashier stations. Besides influencing employees' experience, such inefficiency reduces productivity in general.

Recent breakthroughs in artificial intelligence and IoT technologies such as affordable camera systems and machine learning algorithms, offer a chance to solve the problem. Using AI for the automation of checkout would identify food items and directly charge those to employees' accounts without any human involvement. These promise streamlined operations, reduced queue time, and increased employee satisfaction due to being able to use their break time more appropriately.

2. Problem statement

Currently, company cafeterias rely on manual checkout processes, leading to long lines and inefficiencies. However, this results in reduced employee break times and potential delays in returning to work. Therefore, an automated system that uses AI to identify food items and charge employees directly is needed to streamline the checkout process.

3. Motivation

I have always been passionate about using technology to find solutions for operational problems within the business context, especially in terms of how those things can be optimized in a business context for efficiency. In my work as Director of Illinois Business Consulting, I successfully applied technology to various processes. This includes developing software for consultant recruitment and using data for performance evaluations. This project provides another opportunity for me to enhance these skills by considering a hardware-based problem in IoT.

Recently, while speaking to the VP of Operations at a Fortune 500 company, I asked him, "What keeps you up at night?" They had just moved to fully in person work model and mentioned the problem identified in the problem statement - bottlenecks at cafeteria cashier stations resulting in inefficiencies during employee lunch breaks. This piqued my interest as this is the exact type of problem I hope to solve in my career.

The given assignment focuses on the development of an IoT solution. This is an excellent opportunity to create a practical technology-driven system that not only will meet course objectives but also address a real-life business challenge.

Solving this problem could go further and be applied in other high traffic situations such as airports, hospitals, malls, etc. By addressing this issue in this context, the underlying solution could be applied to a broad variety of areas.

4. Work plan & deliverables

Project start date: Monday, September 30th

Project submission date: Sunday, December 15th

Phase 1 – Ordering components

Sept. 30 – Oct. 6

- Conduct an assessment to identify components needed and existing components
- Order additional components such as RFID chips and scanners
- Document components list to be included in final report

Phase 2 – Develop and test modules

Oct. 7 – Oct. 27

- Develop and test the food recognition model using images of food or actual food
- Identify the best solution for food recognition that maximizes efficiency and reduces false results
- Test employee identification methods (RFID or facial recognition)
- Identify the best employee identification method
- Document testing methodologies to be included in final report
- Document reasoning for employee identification method selection

Phase 3 – Develop final product

Oct. 28 – Nov. 24

- Combine modules into a final product using the best employee identification method
- Document any bugs seen and solutions to them
- Conduct testing and note any false positive or false negatives

Phase 4 – Write final paper and develop demo video

Nov. 25 – Dec. 15

- Write final paper that details the process as described in prior phases
- Develop video demoing final version of the product