# Project Canvas

## Team Overview – **HackGPT**

### 1. Jonathan Chacko

* **Email:** jcpattasseril@myseneca.ca
* **Role:** Team Lead / Software Architect
* **Expertise:**
  + **Languages & Tools:** Python, Java
  + **Experience:** AI Course at Seneca; Lead Software Developer in Mumbai; SD Consultant in Canada
  + **Contribution:** Oversees the project’s architecture, ensures technical excellence, and guides integration of AI and data analytics modules.

### 2. Parv Arora

* **Email:** parora67@myseneca.ca
* **Role:** AI & Data Specialist
* **Expertise:**
  + **Languages & Tools:** Python, Machine Learning algorithms, SQL, AWS
  + **Experience:** Pursuing AI at Seneca
  + **Contribution:** Develops data-driven insights, predictive analytics for stock management, and assists in AI module development.

### 3. Raj Singh

* **Email:** rajsingh@loyalistcollege.com
* **Role:** Full-Stack & Systems Integration Expert
* **Expertise:**
  + **Languages & Tools:** C#, C++, Java, MS SQL Server, Angular, Vue.js, React, ASP.NET, .NET Core, MVC, Web API, Microservices
  + **Experience:** Studying Computer Software & Database Development
  + **Contribution:** Integrates front-end dashboards with back-end systems, ensures seamless connectivity between POS systems and central databases.

### 4. Fawad Arshad

* **Email:** farshad2@myseneca.ca
* **Role:** Embedded & Backend Developer
* **Expertise:**
  + **Languages & Tools:** C++, Express, Expo, Python, AWS, Docker
  + **Experience:** 3rd-year student at Seneca
  + **Contribution:** Focuses on hardware-software interfaces (on-cart tablets), real-time system communication, and expanding AI capabilities using TensorFlow.

### 5. Vishal Saini

* **Email:** hellovishal12321@gmail.com
* **Role:** AI/ML & Deployment Specialist
* **Expertise:**
  + **Languages & Tools:** Python, Rust, PyTorch, TensorFlow, MLflow, AWS (EC2, Lambda, SageMaker, S3), Langchain, Docker
  + **Experience:** Studying AI & ML at Humber College
  + **Contribution:** Leads model training, predictive analytics, and containerization strategies for AI solution deployment.

## Project Overview

### Innovative Retail Solution with a Dual Mission:

* **Retail Enhancement:**
  + **Shoppers' Experience:** Interactive tablet-like UI on carts for product selection and in-store navigation.
  + **Managerial Support:** Central dashboard with real-time stock analytics, predictive stock recommendations, and automated notifications.
  + **POS Upgrade:** Advanced POS integration that monitors stock, seasonal trends, and automatically triggers replenishment.
* **Charitable & Food Insecurity Focus:**
  + **Data-Driven Donations:** Analysis of expiry dates and excess inventory to facilitate food donations to local food banks and charities.
  + **Community Impact:** Reduce food waste while supporting community outreach programs.

## Domain & Stakeholders

* **Business Domain:** Retail (grocery, specialty food stores) with a community-centric approach.
* **Industry Focus:**
  + Retailers seeking technology-driven operational efficiency.
  + Charitable organizations, food banks, and community support systems.
* **Key Stakeholders:**
  + **Operational Staff:** Stock clerks, cashiers, logistics administrators.
  + **Management:** Store managers and inventory control teams.
  + **Shoppers:** End users of the interactive cart system.
  + **Community Partners:** Food banks and charitable organizations.

## Problem Statement

* **Operational Inefficiencies:**
  + Traditional POS systems lack predictive analytics for managing seasonal trends and dynamic inventory control.
* **Suboptimal Shopper Experience:**
  + Difficulty in finding products and inefficient in-store navigation slows down the shopping process.
* **Resource Waste:**
  + Excess inventory and near-expiry products are wasted instead of being re-directed for charitable donations.
* **Siloed Operations:**
  + Independent store operations hinder centralized oversight and optimal resource allocation.

*Insights are driven by firsthand experience in sales, stock management, and volunteer work with food banks.*

## Meaningful Scenario

* **For Shoppers:**
  + **Interactive Cart:** A customer uses a tablet interface on a shopping cart to select items. The system guides them via an optimized route to locate products on expansive shelves.
  + **Smart Recommendations:** Suggestions based on current stock levels and seasonal trends enhance the shopping experience.
* **For Managers:**
  + **Dashboard Analytics:** Real-time insights on inventory levels, automated stock alerts, and predictive recommendations help in proactive stock management.
  + **Charitable Triggers:** Identification of surplus or nearing-expiry items prompts automated recommendations for food donations.

## Demo Concept

* **UI Simulation:**
  + **Cart Interface:** Web-based tablet UI (HTML, CSS, JS) demonstrating product selection, dynamic navigation, and quick billing.
  + **Manager Dashboard:** A centralized dashboard displaying inventory metrics, seasonal trend analysis, and automated notifications.
* **AI & ML Integration:**
  + Python-powered backend that leverages TensorFlow (and complementary tools) to analyze demand patterns and provide predictive insights.
* **Indoor Positioning System (IPS):**
  + Simulation of IPS using either ESP32/UWB modules or WiFi triangulation to enhance in-store navigation.
* **Hardware Simulation:**
  + Incorporation of barcode scanners and POS system integrations to simulate a real-time retail environment.

## Feasibility Considerations

### Technical Feasibility:

* **Software:**
  + Use of established web technologies (HTML, CSS, JS) for UIs and Python libraries (TensorFlow, etc.) for analytics.
* **Hardware:**
  + Affordable embedded systems (Raspberry Pi alternatives, tablet interfaces, barcode scanners) integrated with off-the-shelf components.
* **System Integration:**
  + Centralized architecture that connects real-time hardware inputs with cloud-based analytics and dashboards.

### Operational Feasibility:

* **User Adoption:**
  + Intuitive UIs designed for both operational staff and management, ensuring minimal training overhead.
* **Support & Maintenance:**
  + Continuous monitoring and iterative updates based on stakeholder feedback.

### Economic Feasibility:

* **Cost Savings:**
  + Reduced inventory wastage and enhanced operational efficiency contribute to a strong ROI.
* **Funding & ROI:**
  + Potential for public and private funding driven by the dual impact on business efficiency and community support.

### Project Schedule & Milestones:

* **Short-Term:**
  + Develop core functionalities: cart interface, basic dashboard, and initial AI-driven analytics.
* **Mid-Term:**
  + Integrate hardware simulations (IPS, barcode scanners) and refine AI modules.
* **Long-Term:**
  + Pilot implementation in selected retail locations with iterative improvements based on feedback.