

A detailed illustration of pineapples and slices. At the top, there are two whole pineapples with green crowns and brown, textured skins, flanked by several slices of pineapple showing the yellow-orange flesh and green rind. Below this, a large, semi-transparent white banner contains the text. At the bottom, there are two more whole pineapples and several more slices, mirroring the top section.

Export Best Quality Fruits

-Pineapple-

25-26J-016

Main Problem

- Pineapple grading system is manual and fragmented.
- No single system to predict harvest, check ripeness, detect defects, and grade quality.
- Leads to inconsistent grading and export losses.

Our Solution

- An AI + IoT integrated pineapple grading system.
- Features:
 - Harvest prediction past data and load cells
 - Ripeness detection using camera-based ML
 - Defect & quality grading using vision, weight, and gas sensors
- Ensures accurate grading, reduced waste, and export-ready quality.



Hasara
IT22308566

Specialization : Computer Systems and Network Engineering

Harvest Forecasting

- **Problem?**

- Lack accurate harvest forecasting
- Poor harvest planning.
- Supply - Demand mismatch

- **For Whom?**

- Farmers
- Exporters

- **Solution ?**

- An AI-based harvest forecasting system using historical and current data.



Sample Admin Dashboard



Progress...

	A	B	C	D	E	F	G	H	I	J	K	L	M
Task \ Month	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	
Requirement Analysis	Completed												
Dataset Collecting and cleaning		Completed											
Model Training according to the duration			Completed										
Model Training according to the duration				Completed									
Validation against historic data					Completed								
Edge-case testing for unexpected weather shifts						In Progress							
API intergration							In Progress						
Creating the Admin Dashboard								In Progress					
Connecting the Project to the server									In Progress				
System Testing & Evaluation										In Progress			
Documentation & Final Refinements											In Progress		
		Completed			In Progress								



Santhush
IT22086952

Automated Pineapple Ripeness Detection

Specialization : Computer Systems and Network Engineering

Automated Pineapple Ripeness Detection using YOLO11

Objective

- Detect pineapples in natural images
- Classify ripeness as overripe, ripe, unripe

Model

- YOLO11m (medium variant)
- Transfer learning from pretrained weights

Objective

- YOLO-format labeled images
- Real-world lighting & backgrounds



Model Training and Evaluation Results

- Best F1 score: 0.91 at confidence 0.52
- Overall detection accuracy (mAP@0.5): 94.5%
- Class-wise accuracy:

Overripe	Ripe	Unripe
96.8%	94.9%	91.6%

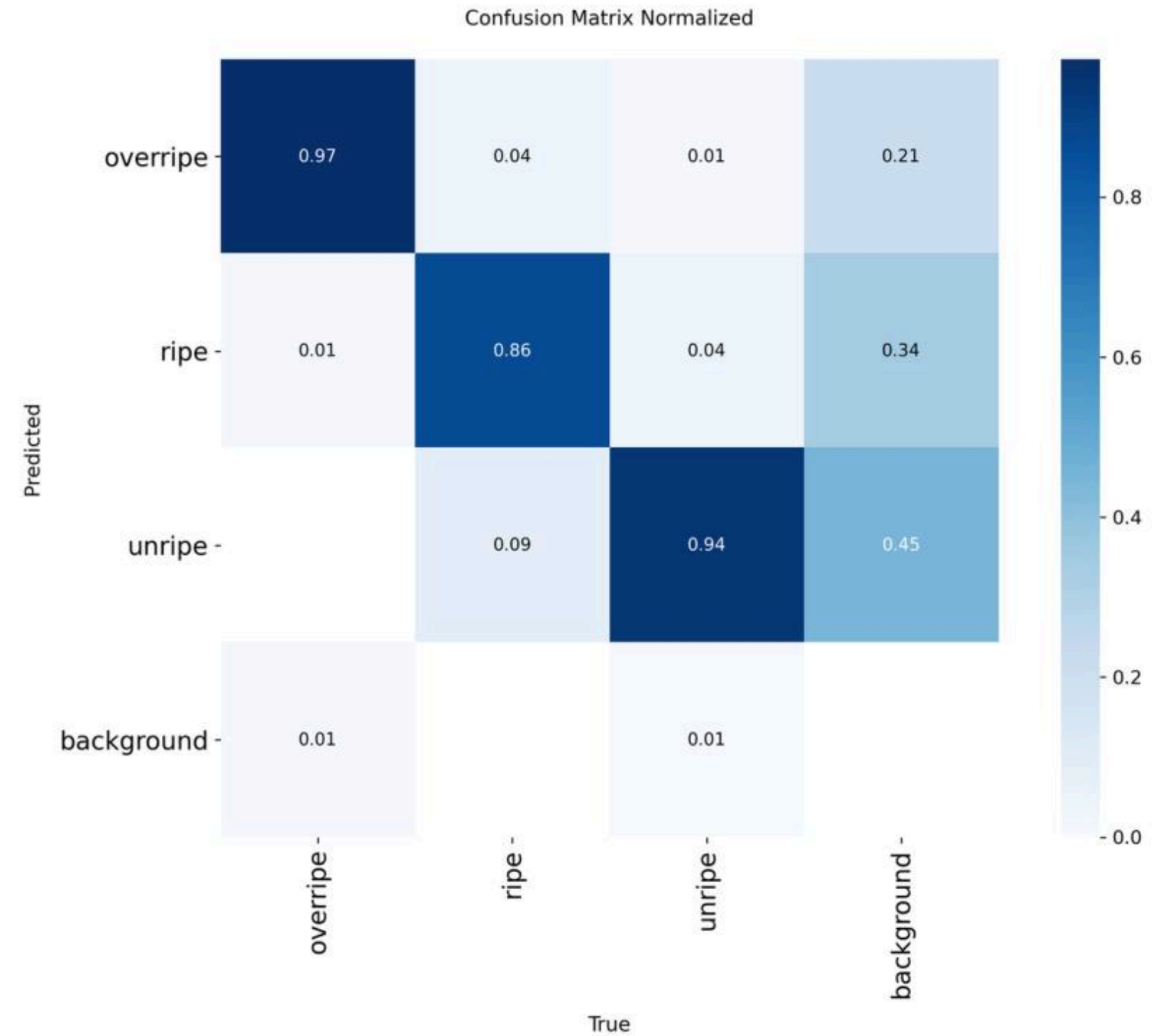
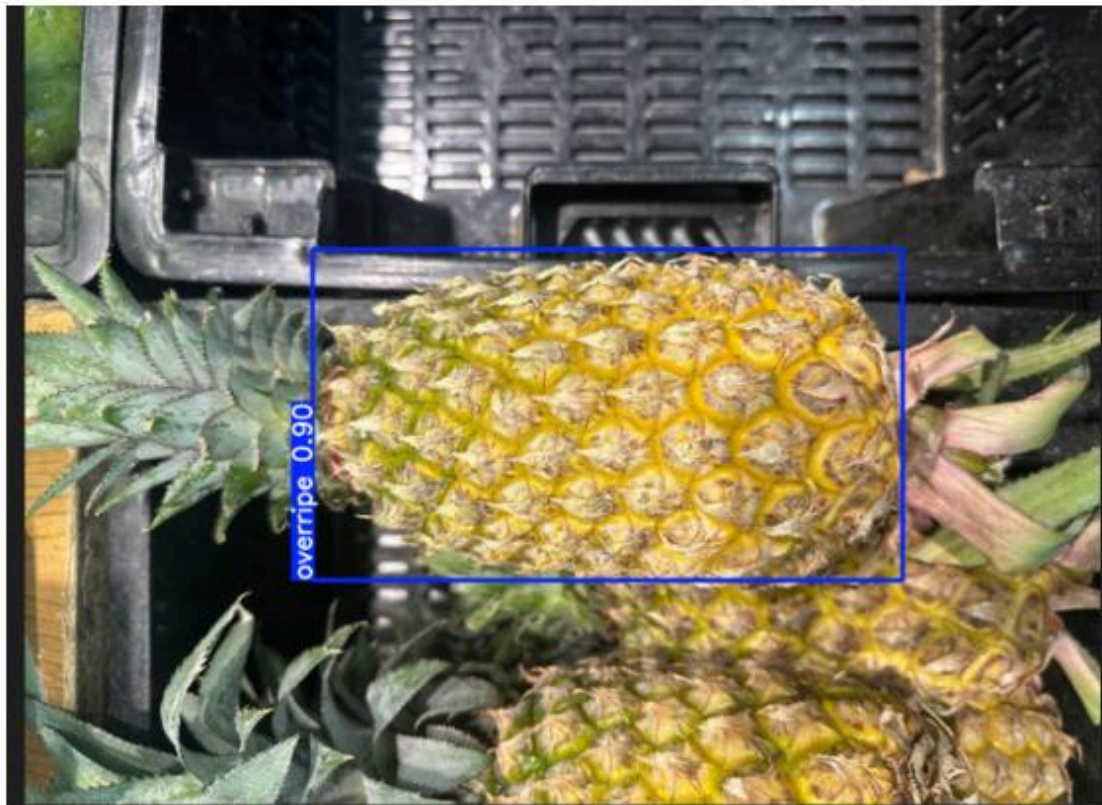
- Training and validation losses decrease smoothly



Error Analysis and Practical Impact

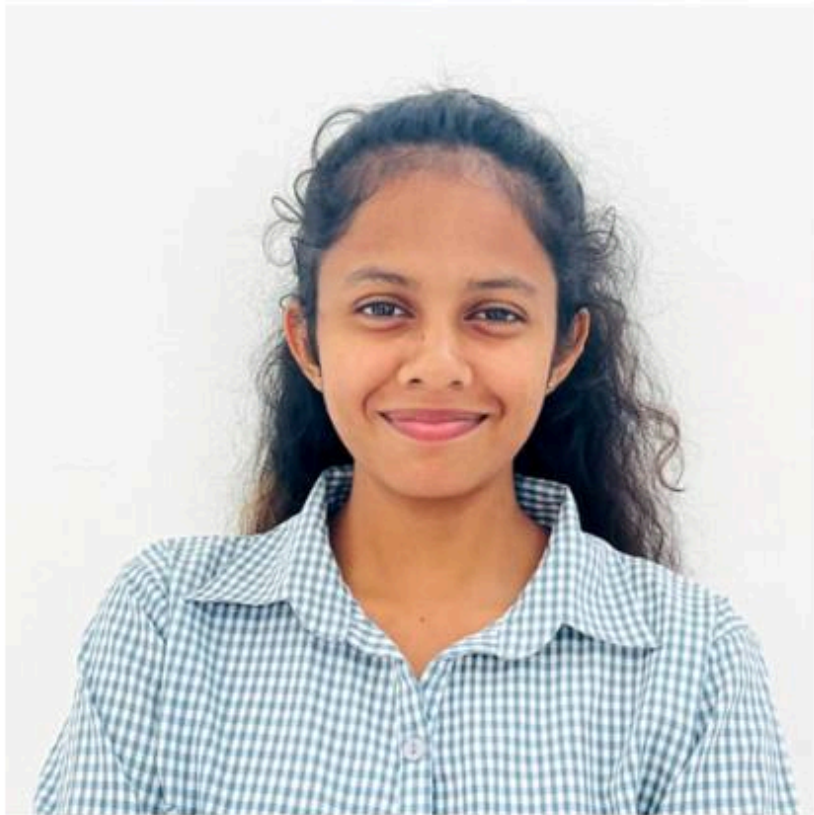
Content

- Confusion mainly between ripe & unripe
- Overripe detection highly reliable
- Suitable for:
 - Automated fruit grading
 - Post-harvest quality control
 - Smart agriculture systems



Progress...

Task \ Month	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26
Requirement Analysis	Completed											
Dataset Collection		Completed										
YOLO11 (Medium) Model Architecture Design			Completed									
Image Preprocessing Pipeline for Ripeness				Completed								
Weight Intergration & Grading Algorithm					Completed		In Progress					
Integration with smell sensor data Dual-Verification							In Progress					
Display the prediction in real time								In Progress				
System Testing & Evaluation								In Progress				
Documentation & Final Refinements											In Progress	
	Completed			In Progress								



Automated Export - Quality Pineapple Sorting Unit

S.M.I.P Samarakoon
IT22158468

Specialization : Computer Systems and Network Engineering

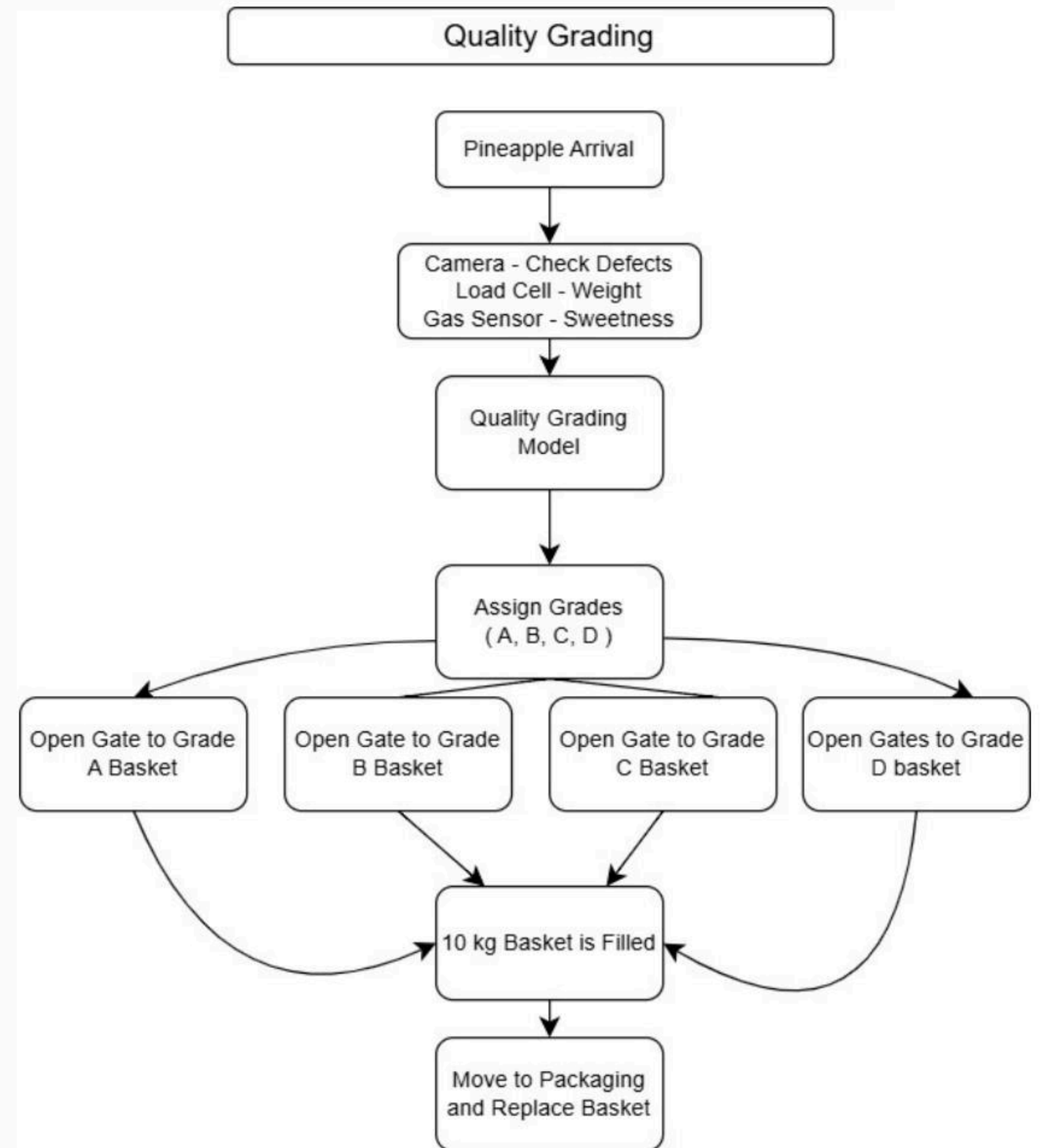


Sub-Problem & Solution

- Problem - Slow and Inconsistent grading
- Solution - AI-based defect detection with two cameras ,Gas sensor and weight data to automate grading.

Prototype Overview

- Two cameras capture pineapple images.
- AI detects defects:
Black spots, Holes, White fungus
- Defect severity + weight + sweetness used to assign grades (A–D).



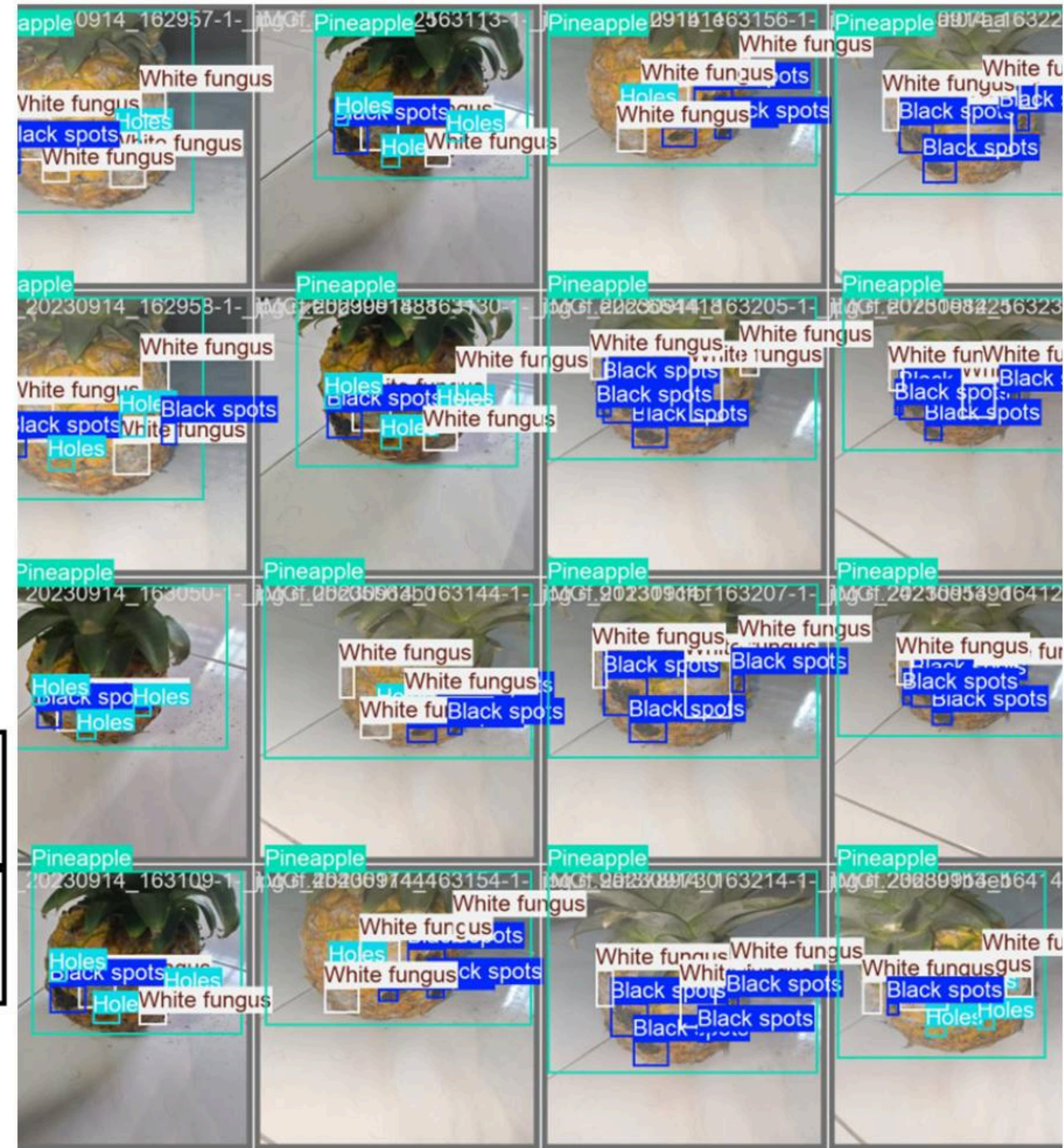
User Requirements Addressed

- Consistent and objective grading
- Faster sorting with less manual labor
- Clear export-quality separation

Model Training and Evaluation Results

- Best F1 score: 0.92 at confidence 0.50
- Overall detection accuracy (mAP@0.5): 92.5%
- Class-wise accuracy:

Black Spots	Holes	White Fungus
91.3%	92.5%	93.5%



Progress ...

Task \ Month	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26
Requirement Analysis	Completed											
Dataset Collection		Completed										
YOLO11 (Medium) Model Architecture Design			Completed									
Image Preprocessing Pipeline for Defects				Completed								
Weight Intergration & Grading Algorithm					Completed	In Progress						
Real-time Inference Optimization						In Progress						
Improving Detection of Minor Skin Bruises							In Progress					
Quality Basket Seperation Logic								In Progress				
System Testing & Evaluation									In Progress			
Documentation & Final Refinements											In Progress	
	Completed			In Progress								

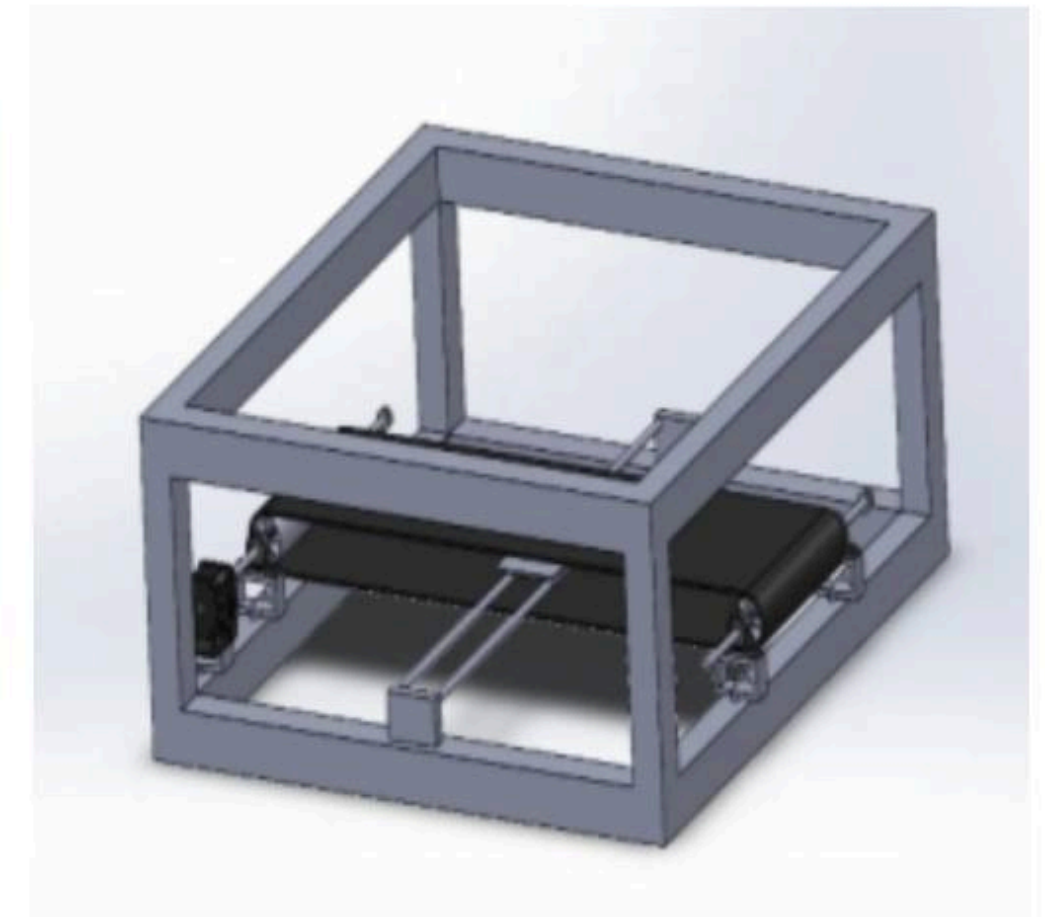
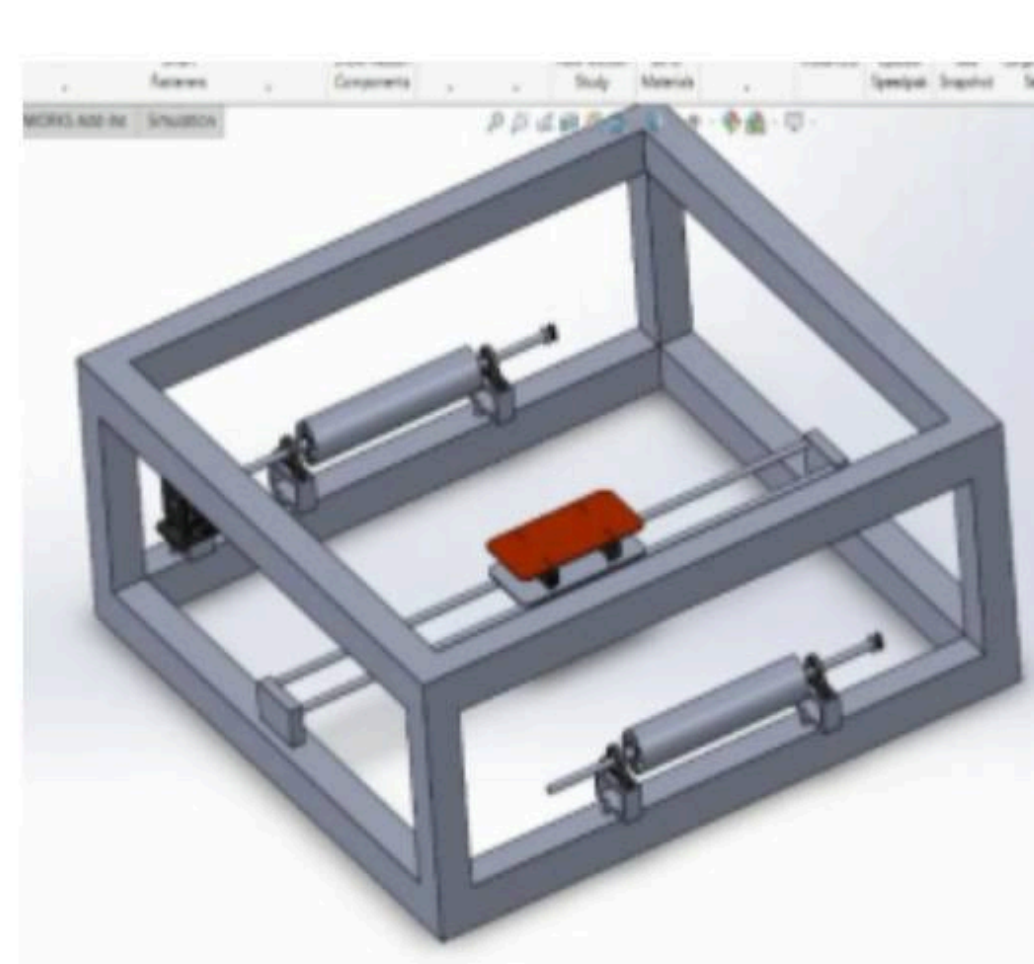
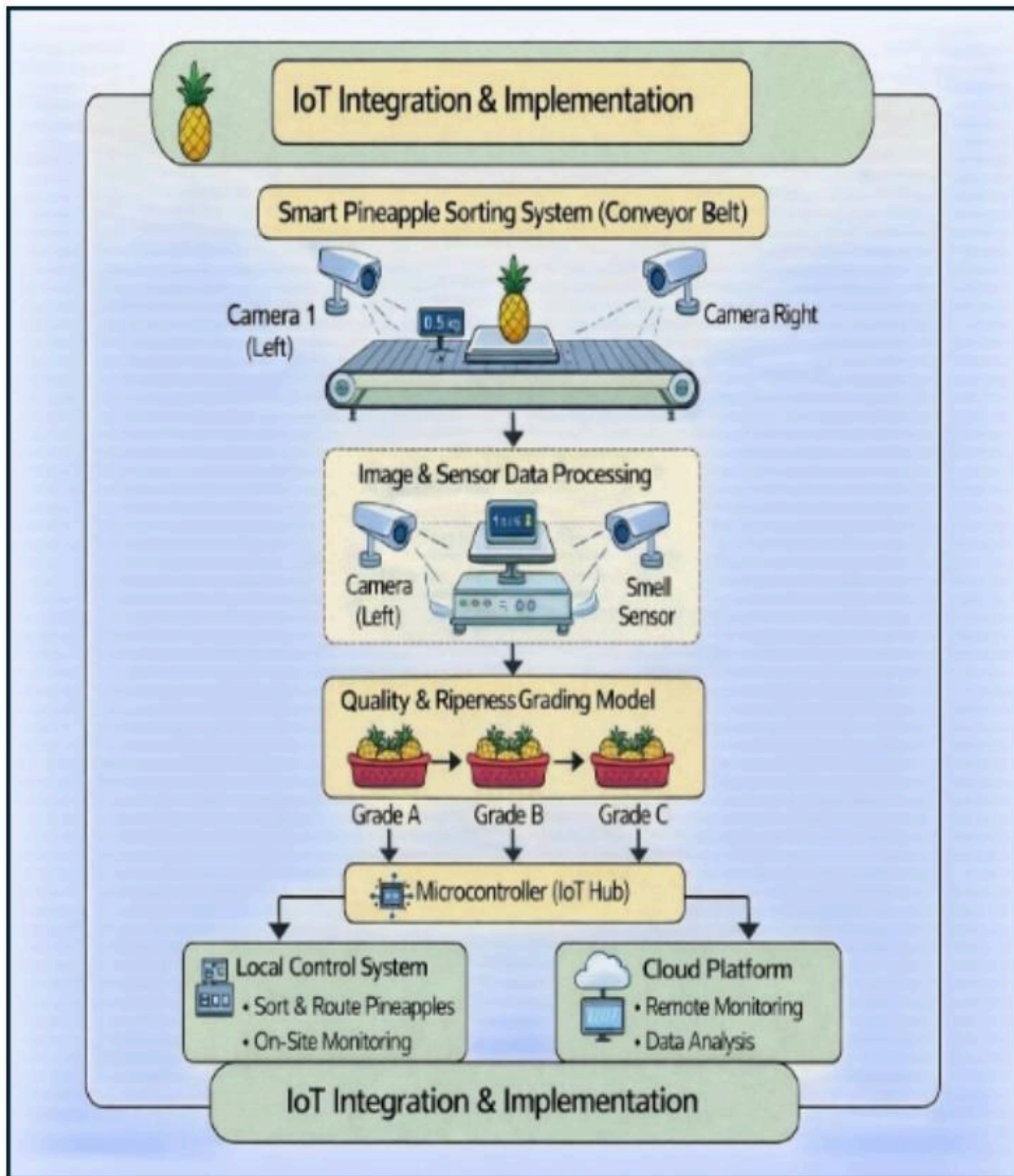


Gamage M. G.
IT22889492

**Design an IoT-enabled
system for real-time data
collection, edge inference**

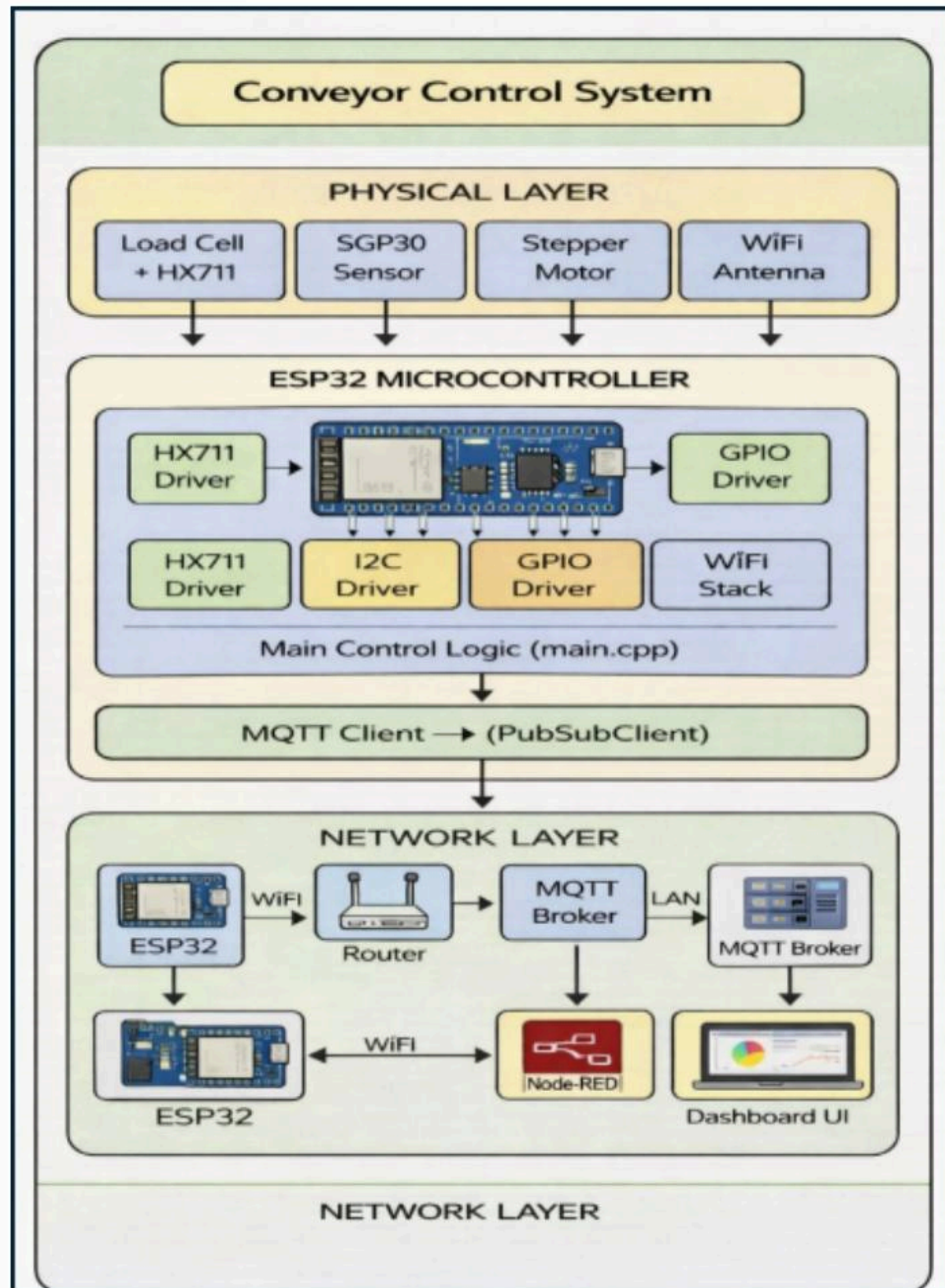
Specialization : Computer Systems and Network Engineering

IOT Intergration & Implementation



System Diagram

- The **Physical Layer** contains real devices: sensors and the motor driver.
- The **ESP32 Layer** is the embedded controller where firmware runs: it reads sensors, controls motors, and prepares data.
- The **Network Layer** connects everything: ESP32 sends and receives data via Wi-Fi using MQTT. Node-RED receives that data, processes it, and shows it



Progress...

Task \ Month	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26
IoT System Requirement Analysis	Completed	Completed										
Hardware Component Selection & BOM Preparation		Completed	Completed									
Sensor Subsystem Development (Weight & Gas)			Completed	Completed								
Motor Control Subsystem Development				Completed	Completed							
ESP32 Firmware Architecture & Optimization					Completed	In Progress						
Mechanical Integration with Conveyor Prototype						In Progress	In Progress					
MQTT Communication Design & Integration							In Progress	In Progress				
End-to-End System Integration								In Progress	In Progress			
System Testing & Evaluation									In Progress	In Progress		
Documentation & Final Refinements											In Progress	In Progress
	Completed				In Progress							

Commercialization & Sustainability

Customer Persona

- Exporters, large-scale farmers, processing centers

Market Need

- High demand for export-quality fruits
- Need for automated, integrated grading and prediction systems
- Reduction of post-harvest losses and manual labor

Solution Uniqueness

- End-to-end AI + IoT system
- Harvest prediction, ripeness classification, and defect detection
- Multi-sensor grading (camera, weight, gas) with automatic basket separation

Cost Recovery

- Scalable to other fruits
- Can export quality products



Thank You