

Abstract

College Name: Vivekanand Education Society's Institute of Technology (VESIT)

Team Details

Name	Member/Leader	Year (Second/Third/Final)
Dyotak Kachare	Leader	Third
Atharva Sardal	Member	Third
Himanshu Goyal	Member	Third
Khalid Sayyed	Member	Third

Problem Selection: Reduce grain loss during storage

Kindly elaborate on your understanding of the problem chosen?

a. Understanding of the Problem

The problem before us wants us to devise a solution for the issue that arises during the storage of grains. Now if we investigate it, grain has two essential factors for a farmer, firstly his salary and then food for the livestock. When it comes to storing grain, we must ensure that the grain is in dry and cool conditions. The Problem Statement mentions two factors that are **biotic and abiotic factors**. But these factors are interlinked having very **high temperatures** or **high humidity** means that's it will lead to **growth of insects and pests** in the grain. We have come up with a solution that will prevent the abiotic factor as much as possible and check that there are no biotic factors affecting the grains.

b. Most Challenging aspect of the problem

The most challenging aspect of the problem is that we can't control much, like we can't control the weather or the fact of pests growing but we can only try to prevent it. The problem statement mentions that the grain is kept open (implying no proper storage facility i.e. grain bins) which is very bad, at least cover and keep under tarp.

c. Reason for Choosing this problem

Farming is essential everywhere, and what will be the use of farming if we can't properly store what we have grown? Coming up with a solution to this problem can help many.

Kindly share how does you plan to approach the problem chosen?

a. Approach

Tackling Abiotic Factors -

1. We must ensure that before storing grain their humidity and temperature is checked, so we plan to use IOT integration. These devices will be connected to a centralized software system, providing details about grain storage and a comprehensive view of environmental conditions and enabling timely interventions.
2. After storing the grain, we will have IOT sensors keeping track of grain storage and check with weather API of surrounding if the condition of grain is appropriate or not. For example, the surrounding should not be more than 15 F of the grain.
3. Supply Chain Management using weather and previous data in planning and execution of storage and transportation process.
4. A full-stack inventory management dashboard of grain, with routine check, reminder, status, maintaining records, information.

Tackling Biotic Factors -

1. Train convolutional neural network (CNN) models using the GrainSpace dataset to classify grain images into categories of infested and non-infested samples. These models can effectively identify the presence of insects, fungi, or any visual signs of contamination in the grains.
2. Pesticide Contamination Identification based on ML models will be capable of detecting the presence of pesticides or any chemical residues on grain surfaces
3. Leveraging historical data from various sources to develop predictive models that can anticipate potential outbreaks of pests or fungi on environmental conditions, seasonality, and previous infestation patterns.

4. Finally, creating a dashboard for Monitoring and Alerts which will provide a comprehensive view of grain status, alerts on detection of fungi, pests or disrupting residues and suggest appropriate interventions.

b. Approach Diagram

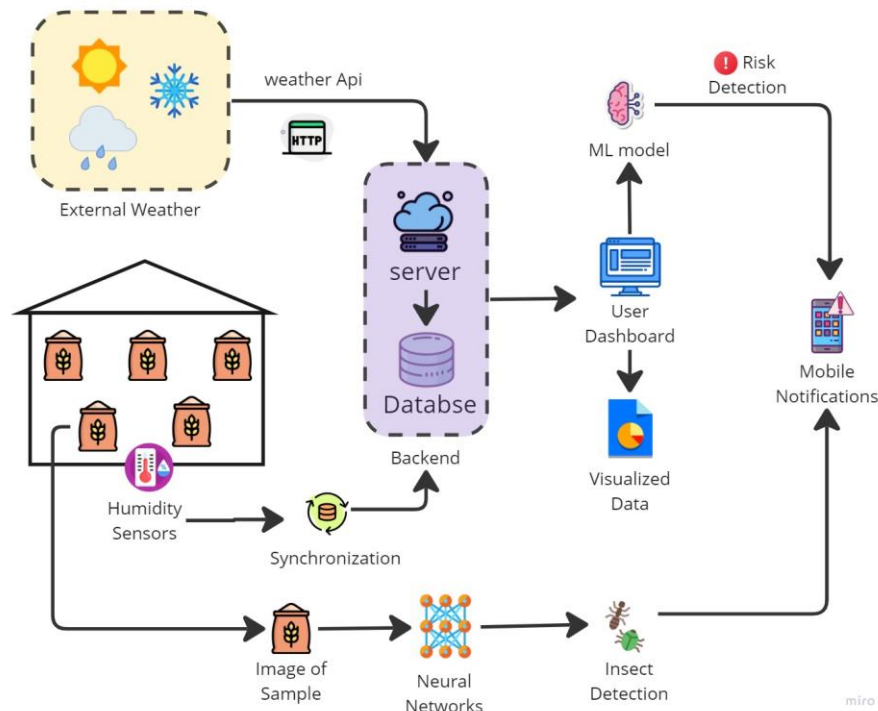


Fig. System Design

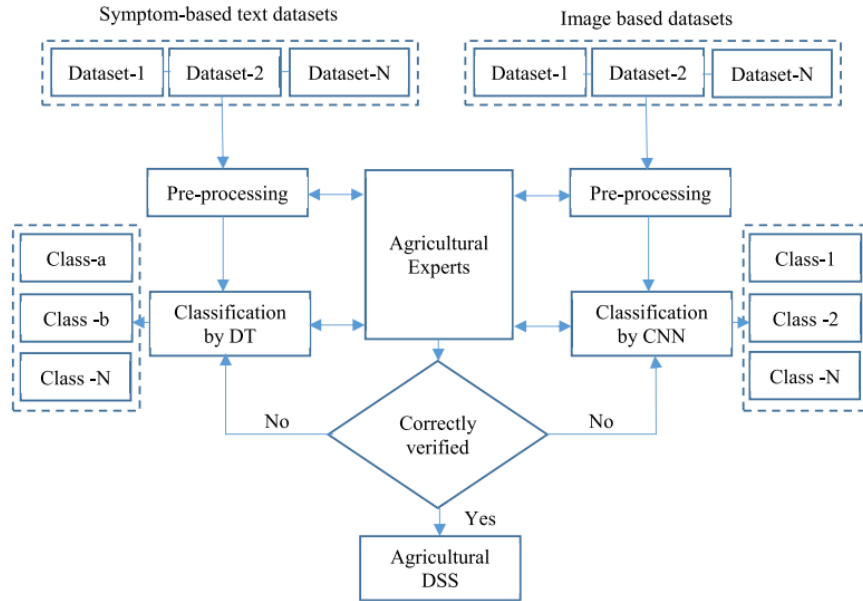


Fig. Proposed model for diseases identification and classification

c. Platform/Coding Language/Framework

We are planning to make a **cross platform app** using flutter. A website dashboard for visual representation of grains status and other environmental factors by using **React.js** as frontend, Node and **Express.js** for backend. And **Firebase Cloud Messaging (FCM)** for notifications and alerts. We will be using Python as it excels in deep learning thanks to **TensorFlow** and **Keras**. These libraries empower neural network creation and training, particularly CNNs. **OpenCV** manages image processing tasks, while **Matplotlib** and **Seaborn** handle image visualization, model evaluation and statistical analysis.

d. Database

Our Primary database will be **MongoDB**. But to store the data from IOT devices we will use the **Firebase Firestore** database.

Dataset used for predictive models: **GrainSpace** includes a total of 5.25 million images determined by professional inspectors, since all extra matters (e.g., impurities or foreign cereals) in raw grain samples are removed manually. The grain samples including **wheat**, **maize** and **rice** are collected from five countries and more than **30 regions**.

e. External Tools

LM35 temperature sensor, BOLT IOT API to receive IOT data. GitHub, OpenWeatherMap API

f. Fortnightly target

Week 1-2: Project Setup and Planning, Prepare and preprocess dataset.

Week 3-4: Real-time Monitoring and Notifications, Data Modeling.

Week 5-6: Weather API Integration and Supply Chain Management, Model Evaluation.

Week 7-8: Inventory Management Dashboard, Model Deployment.

Why do you think your team will be able to implement a winning solution?

a. Previous Projects Undertaken

Our team boasts a history of successful projects that showcase our adept problem-solving skills and innovative thinking. As a team we have made projects for problems statements like **Streamline of blood donation process**, Incentives based Marketplace for **Legal service providers**, soil-based **crops recommendation**, **supply chain optimization** for biomass

b. Team Strengths

Our team consists of members with different skills sets and passion to innovate something. Comprising experts in **Machine Learning**, **Full Stack development**, **App development**, and domain-specific fields, our multidisciplinary approach empowers us to address problems from different perspectives. This diversity fosters a collaborative environment, promoting creativity and robust solutions.

c. Team Achievements

We as a team have participated in **6+ Hackathons** and won 2 of them and finished in the top 5 twice.

d. Personal Motivations

Each team member is personally motivated by a passion for pushing boundaries and creating meaningful solutions. This intrinsic drive fuels our commitment to continuous learning, adaptability, and a relentless pursuit of excellence. Our shared motivation ensures that we

approach the hackathon with enthusiasm, resilience, and a collective determination to overcome any challenges that may arise.