TCS Inframind Season 4 Final Round

Problem Statement

AI Infused Coffee Quality Control
(Viz and chem assure your coffee before you drink it)

Quality of any finished product depends upon the quality of the **raw materials** used for its production. As part of the quality control process, the raw materials are examined **visually and chemically** to ascertain its usage for the finished products production.

AI could be infused in the quality control pr**ocess to gather the required information** of the raw materials and would predict final finished products compliance to standards. This information gathered could be in the form of structured data(row colum) or unstructured (Images & Video) too.

Following are some of the processes that could be considered -

1. How to **collect & analyze** data from raw material testing - both structured (row vs colum) as well as unstructured (img video **audio**) (**text to extract**) ?
2. How to create **correlation** among the data points in order to identify potential deviations? (**prediction - right or not**)
3. How to use Images or Video to identify any product defects that would be diffcult for normal eye to identify? (data 50% (leaf , beans) ,
4. How to use **AI techniques** and create corresponding AI/ML models to provide a **comprehensive predictio**n from these parameters and historical analysis on quality compliance?

These are necessary
theses are fed
they tell us we can go ahead further in production
As many pieces as you can --- better prediction
Tie together
All set i=of raw material is good to go --- AI system predict that
Tie together

Sticth diff models together as well

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difficult to detect visually by inspectors
Manufacturing and large scale production have evolved significantly in last couple of decades, we are witnessing hundreds of startups leveraging Artificial Intelligence for Manufacturing sector.
Quality analysis dashboard

There are hundreds of problems AI can solve, When we picked Quality Inspection!

https://towardsdatascience.com/improving-coffee-grind-distribution-using-adaptive-thresholds-194e001f301

Coffeee
https://www.kaggle.com/alvarole/coffee-leaves-disease LEaf disease data imppp

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Sr no	Factors		
1.	Country		
	Altitude		
	Region		
	color		

Quality Measures

- Aroma
- Flavor
- Aftertaste -
- Acidity - critic , tartaric, pyruvic, acids in chemical constituient
- Body
- Balance
- Uniformity
- Cup Cleanliness
- Sweetness - y (glucose)
- Moisture - y
- Defects - y

Bean Metadata

- Processing Method -y
- Color -y
- Species (arabica / robusta) -y

Farm Metadata

- Owner - no
- Country of Origin - y
- Farm Name - y
- Lot Number - no
- Mill -- y
- Company -y
- Altitude -y
- Region -y

Dataset

Structure : https://www.kaggle.com/ankurchavda/coffee-beans-reviews-by-coffee-quality-institute

https://www.kaggle.com/volpatto/coffee-quality-database-from-cqi

Unstructure : https://www.kaggle.com/alvarole/coffee-leaves-disease (image data)

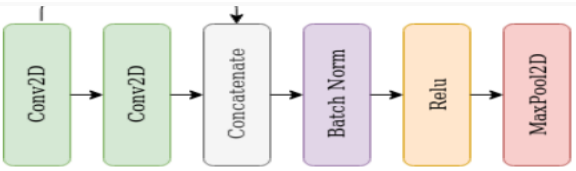
1. Rust
2. Minor

App :

Leaves(**unstructured data) --** Model to detect -- save model -- integrate with web/ app

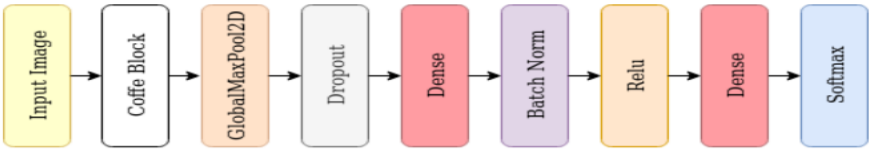
cOFFEE NET / cOFFEE BLOCK

(https://medium.com/swlh/automation-for-coffee-bean-selection-79a6b32b88del)



Coffee Block

The Coffee Block is repeated five times so that the original 224 x 224 image becomes a feature map of dimensions 7x7.
The amount of filters along the blocks are respectively: 32, 64, 128, 256, 512.
These values were defined in preliminary experimentation steps.
Finally, the output of the last block is input to a Global Max Pooling layer which is further input to a MLP classifier which has the same architecture used for the transfer learning approach.



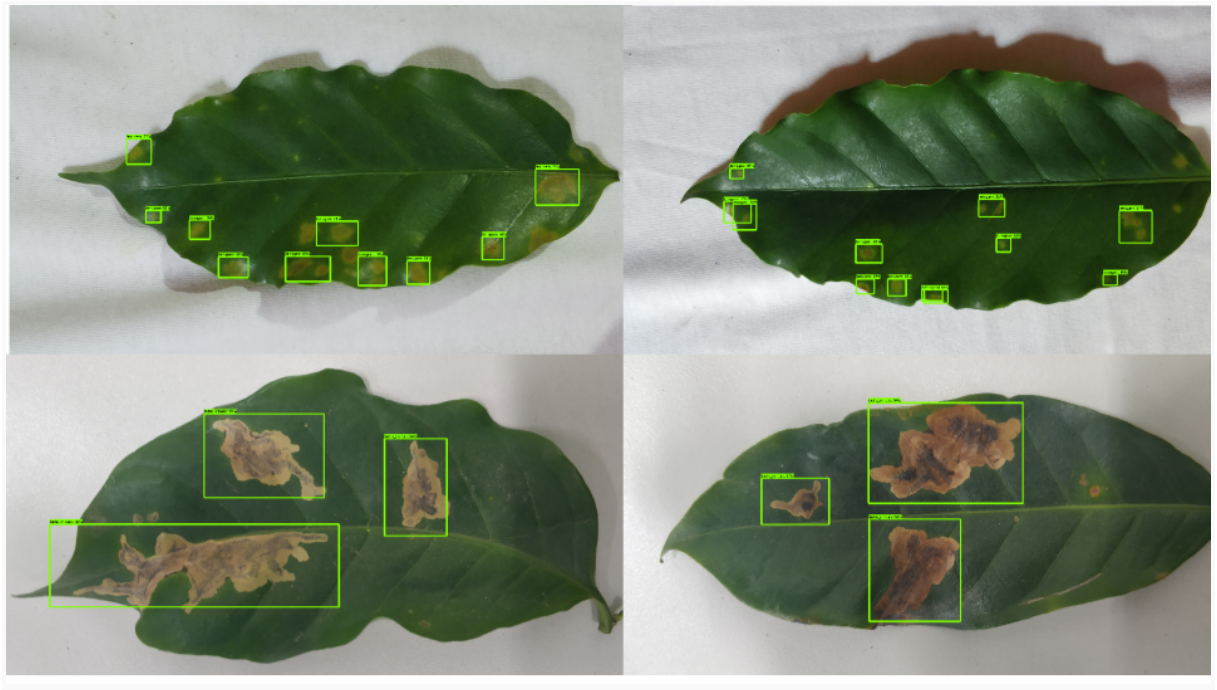
Model 2 : prediction model

- Altitude
- Method
- Countries
- Region
- Species

Steps :
1.Img Dataset acquisition
2. Pre process
3. Scaling (gray)
4. Normalization
5. Extraction

How i planned

Coffee LEaf Abnormalities detection (physical property)



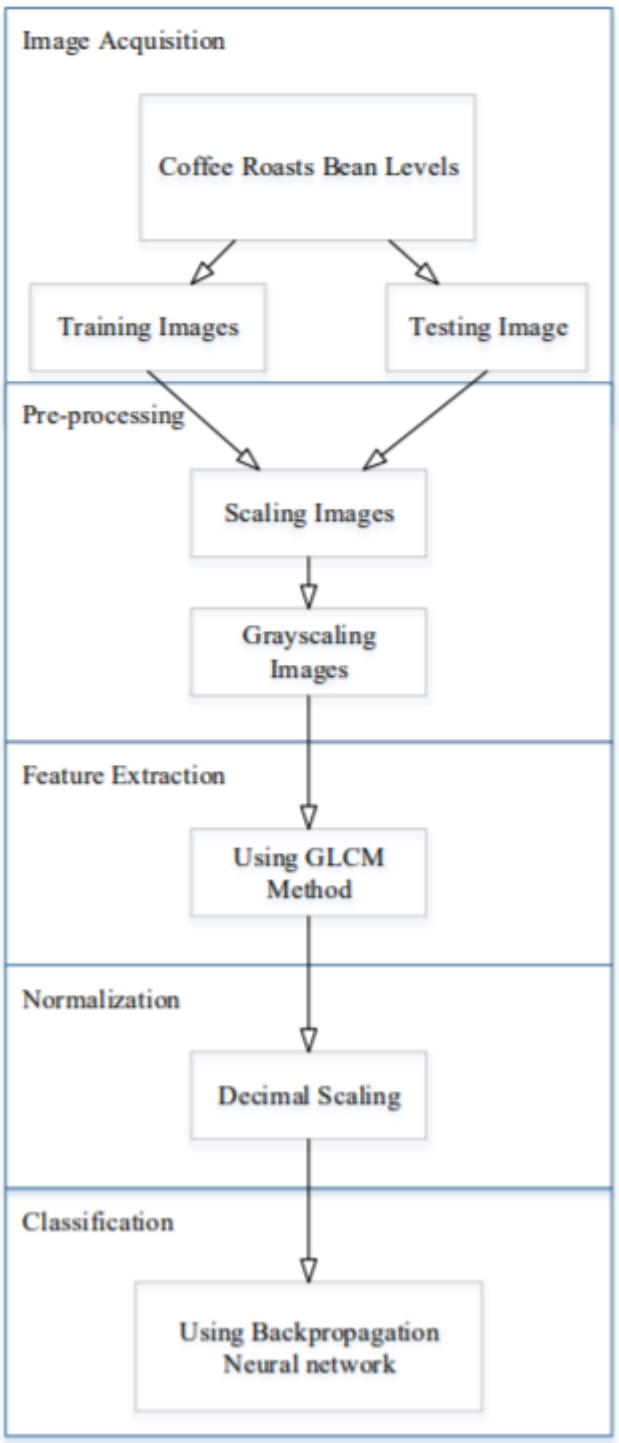
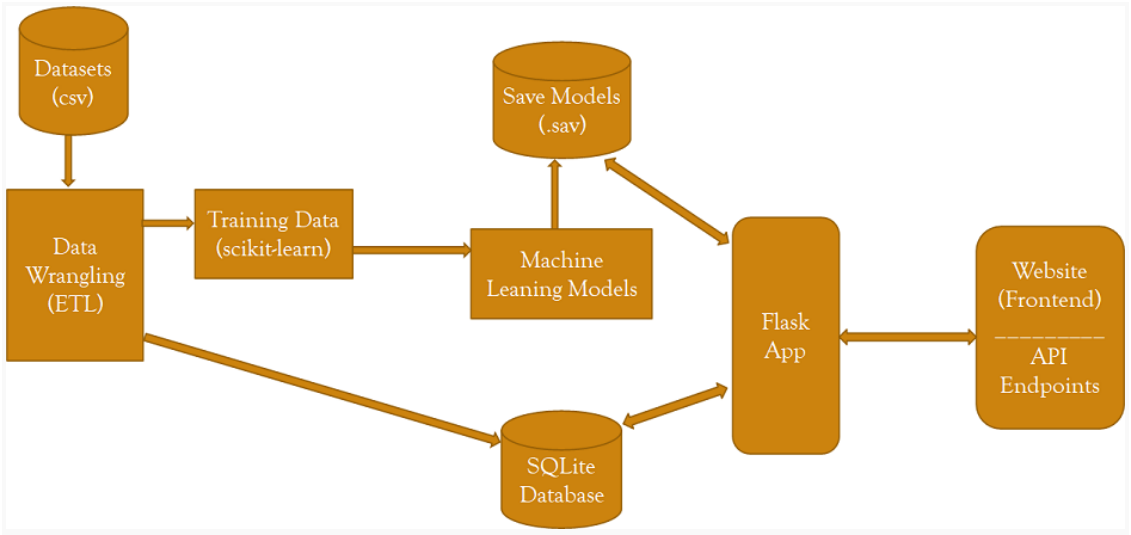
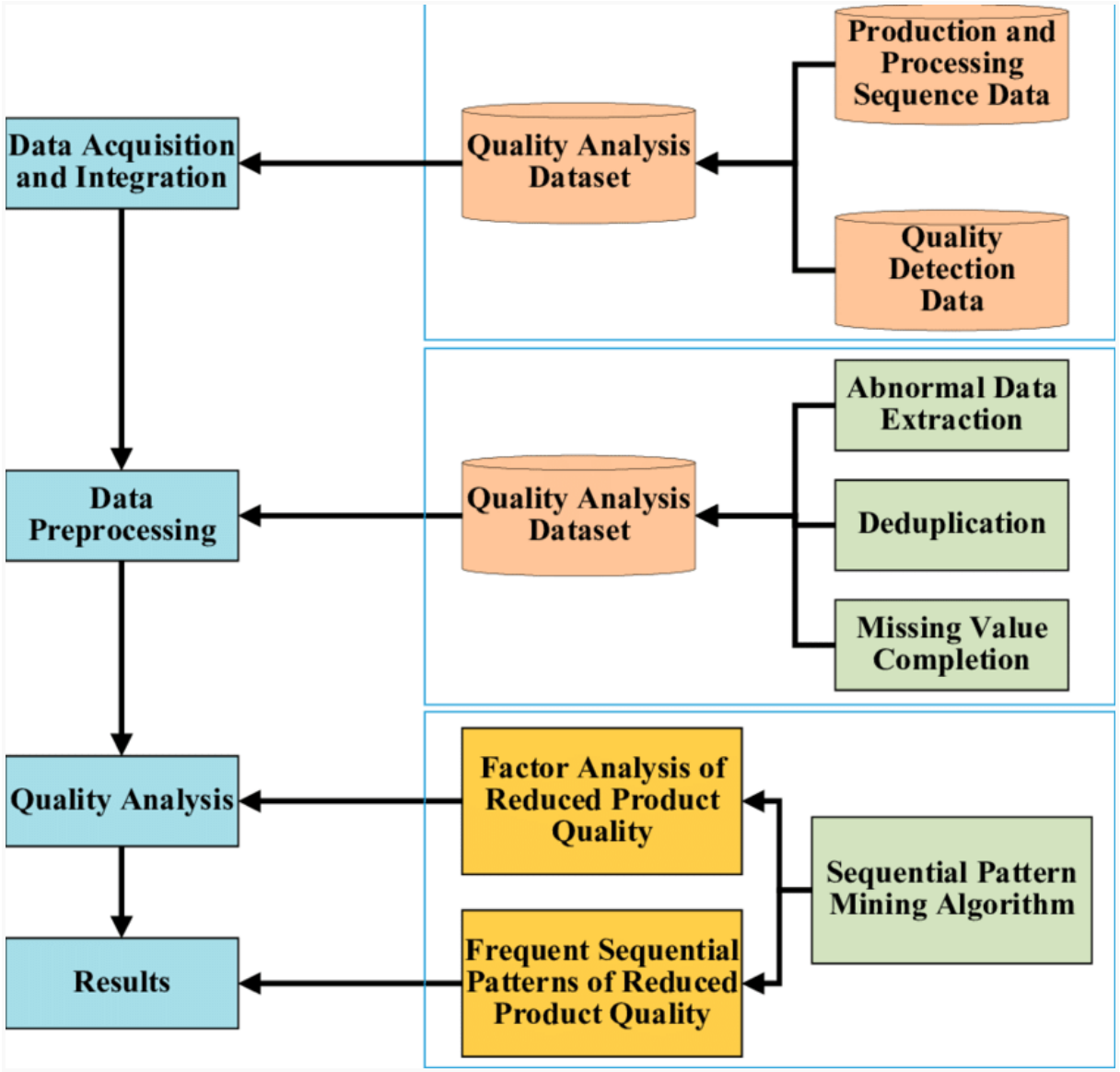


Figure 1. Research Methodology

2.

Option 2 : Coffee Bean Dataset evaluation


Datasets
(csv)
Save Models
(.sav)
Data
Wrangling
(ETL)
Training Data
(scikit-learn)
Machine
Leaning Models
Flask
App
Website
(Frontend)
API
Endpoints
SQLite
Database


Production and
Processing
Sequence Data
Data Acquisition
and Integration
Quality Analysis
Dataset
Quality
Detection
Data
Abnormal Data
Extraction
Data
Preprocessing
Quality Analysis
Dataset
Deduplication
Missing Value
Completion
Factor Analysis of
Reduced Product
Quality
Quality Analysis
Sequential Pattern
Mining Algorithm
Frequent Sequential
Patterns of Reduced
Product Quality
Results