Elevating Cinnamon Industry through Expert Guidance and Support

TMP-23-156

Meet the Team

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INDIVIDUAL COMPONENTS

CINNAMON PRICE PREDICTION.

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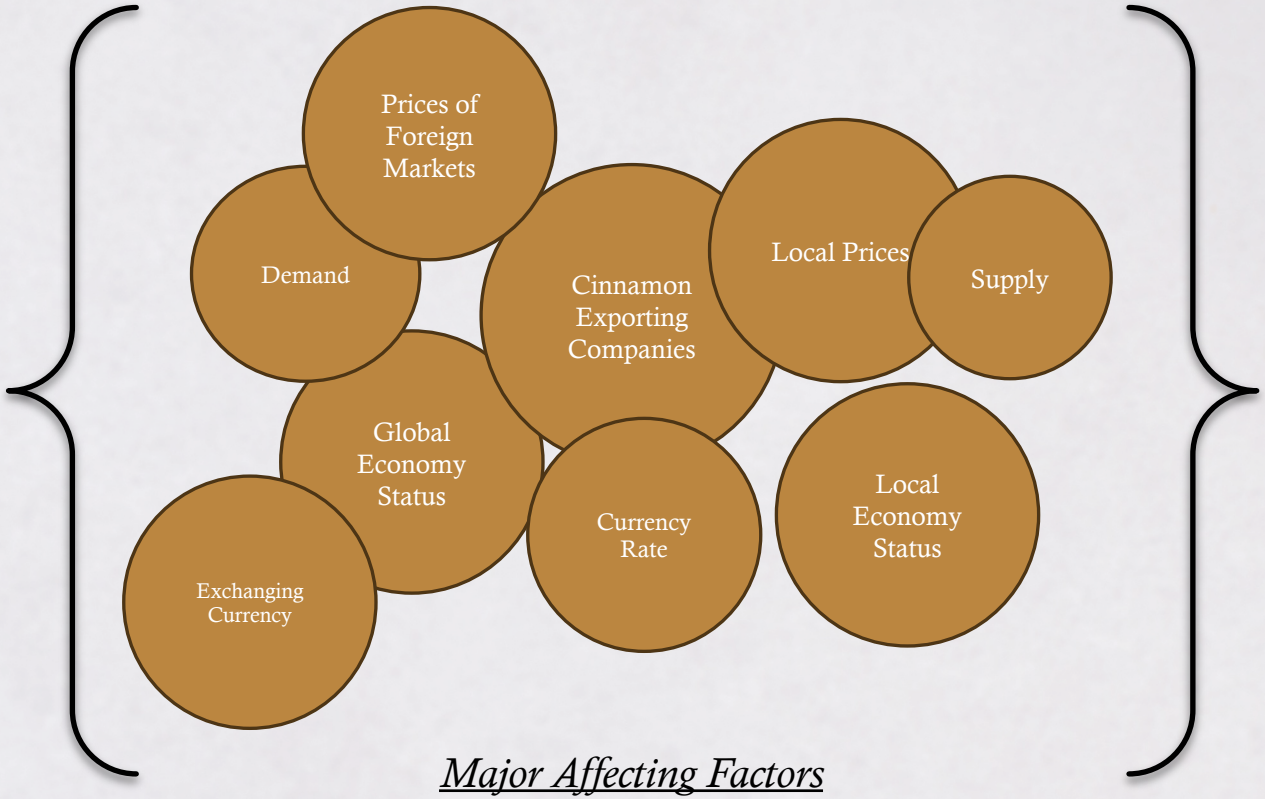
PROBLEM

- No Easy Way to find cinnamon prices
- No Application to predict future prices
- Hard to find location base prices
- Cannot Imagine future cinnamon prices with the local economy situations

NOVELTY



Major Affecting Factors

Dataset for Local Cinnamon Prices

Another Dataset for USD to LKR Rates

- Reduce the effect from those factors on cinnamon prices when predict the price.

RESEARCH GAP

Sri Lanka's Agri-Food Trade: Structure, Opportunities, Challenges & Impacts of COVID-19

- Explain the local economic impact of the Cinnamon Value Chain.
- No Prediction Applications or Models.

Agricultural Price Prediction Based on Combined Forecasting Model under Spatial-Temporal Influencing Factors

- Considering the related Factors.
- Mainly not related to the cinnamon industry

Forecasting of currency exchange rates using ANN: A case study

- Exchange Rates Prediction using External Factors
- Not a product price prediction

SOLUTION

Need to know the Cinnamon Prices in Matara, next week

User

Calculating themselves 1

Analyze with the known data

Ask from an expert 2

Analyze with known wide range of information

Use Agrox Application 3

Analyze with wide range of information with considering Special Factors using Deep Learning

DATASET

Source:
Cinnamon Local Market Prices: https://exagri.info/mkt/index.html

(Collected, Compiled and Published by *the Economic Research Unit Department of Export Agriculture, LK*)

FROM

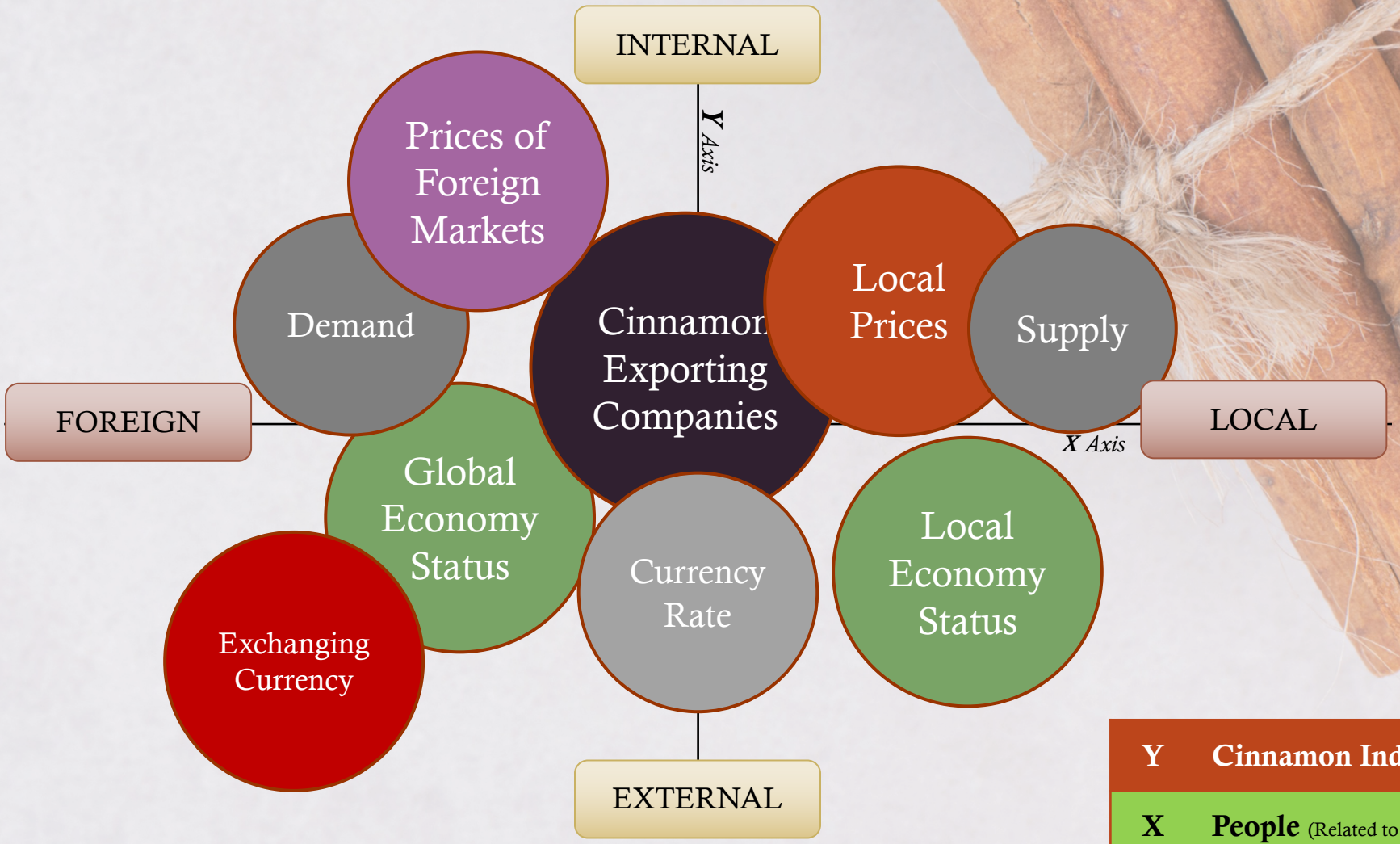
2016 January 05

- **Weekly Prices** Available
- Grades of Cinnamon **Priced separately**
- Include the **Prices base on the Location**

TO

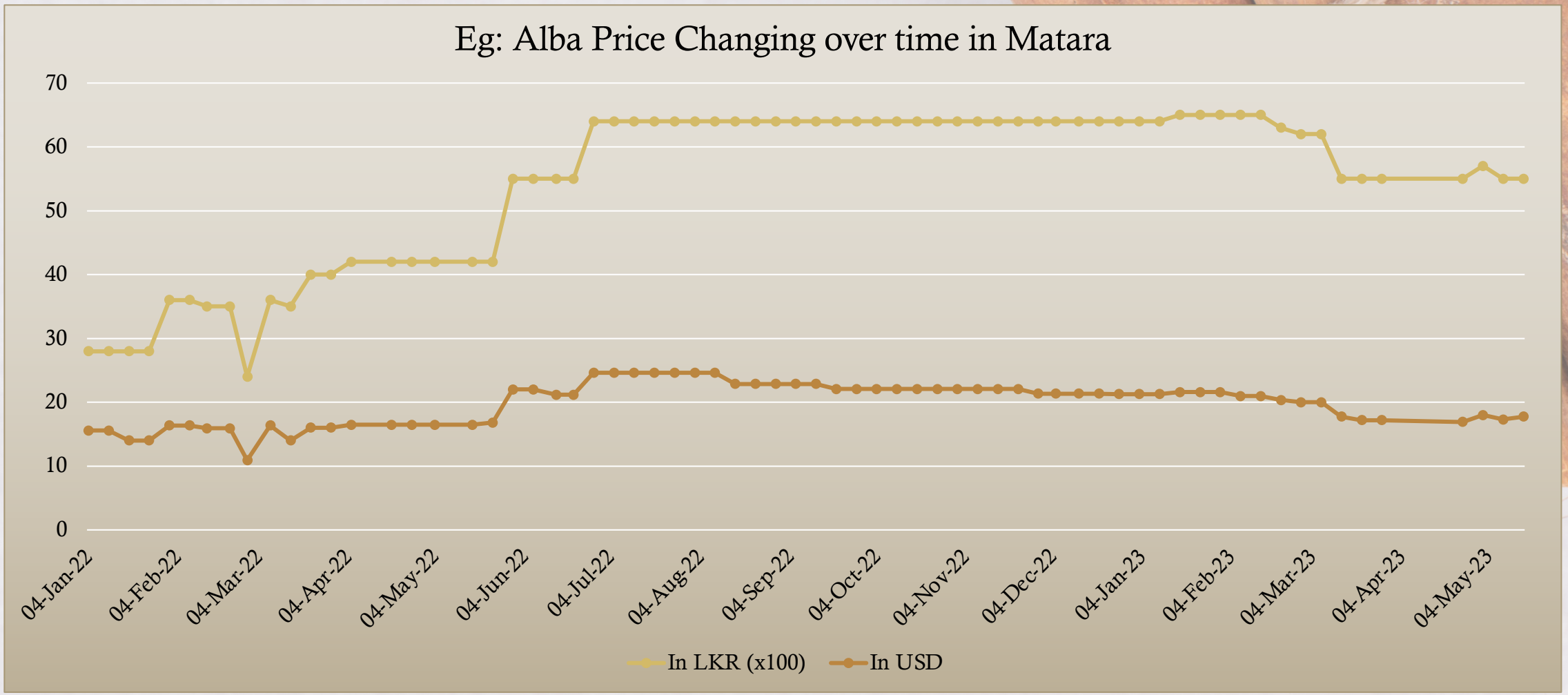
Present

SP. ANALYSIS 1



Y	**Cinnamon Industry**
X	**People** (Related to the Cinnamon Value Chain)

SP. ANALYSIS 2



BEST OPTION

Convert to USD

Finance Dataset for currency conversion

~~**Price Prediction considering LKR**~~

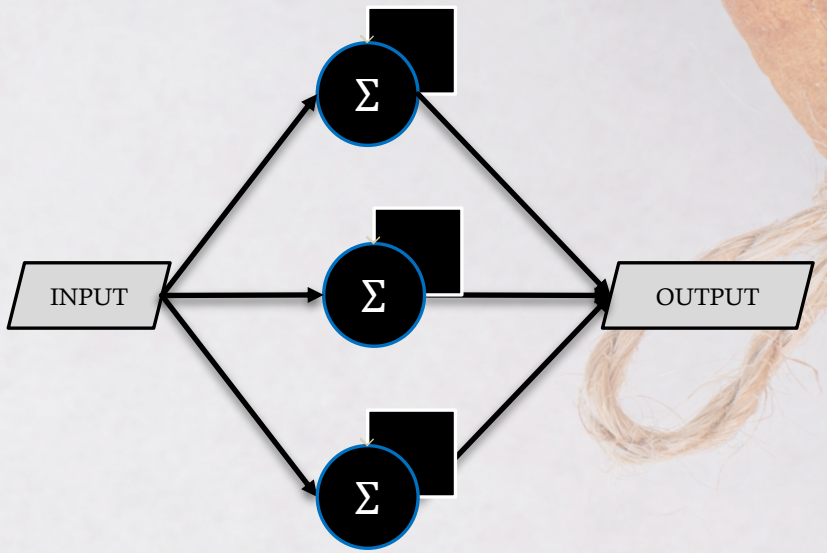
Price Prediction considering USD

Finance Dataset Source (for historical data & convert currency rates):
https://www.federalreserve.gov/releases/h10/hist/dat00_sl.htm

TECHNOLOGIES

Architecture:

Recurrent Neural Network (RNN)

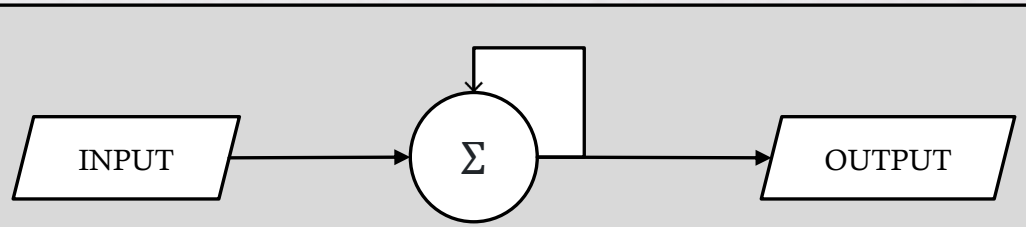


Algorithm

- ANN
- LSTM
- SVM

REQUIRED INPUTS :

1. Cinnamon Grade.
2. Location.
3. Date.



OUTPUTS:

PREDICTED PRICE

(In USD & LKR)

TECHNOLOGIES

Algorithms	Advantages	Disadvantages
Artificial Neural Networks (ANN)	Captures non-linear relationships.	Requires careful hyperparameter tuning.
Long Short-Term Memory (LSTM)	Handles sequential data and long-term dependencies.	Requires careful architecture design.
Support Vector Machines (SVM)	Works well with high-dimensional data.	May struggle with complex non-linear relationships.

TECHNOLOGIES

RISK MITIGATION

Cinnamon Prices from Export Agriculture Department

Location-Based Average Prices

REFERENCES

[1] N. Dissanayaka and M. Thibbotuwana, "Sri Lanka's Agri-Food Trade: Structure, Opportunities, Challenges & Impacts of COVID-19," in Food Security Policy Research, Capacity, and Influence (PRCI) Research Papers, Nov. 2021. doi: 10.21427/0fak-s975.

[2] Y. Guo, D. Tang, W. Tang, S. Yang, Q. Tang, Y. Feng, and F. Zhang, "Agricultural Price Prediction Based on Combined Forecasting Model under Spatial-Temporal Influencing Factors," Sustainability, vol. 14, no. 17, p. 10483, 2022. doi: 10.3390/su141710483.

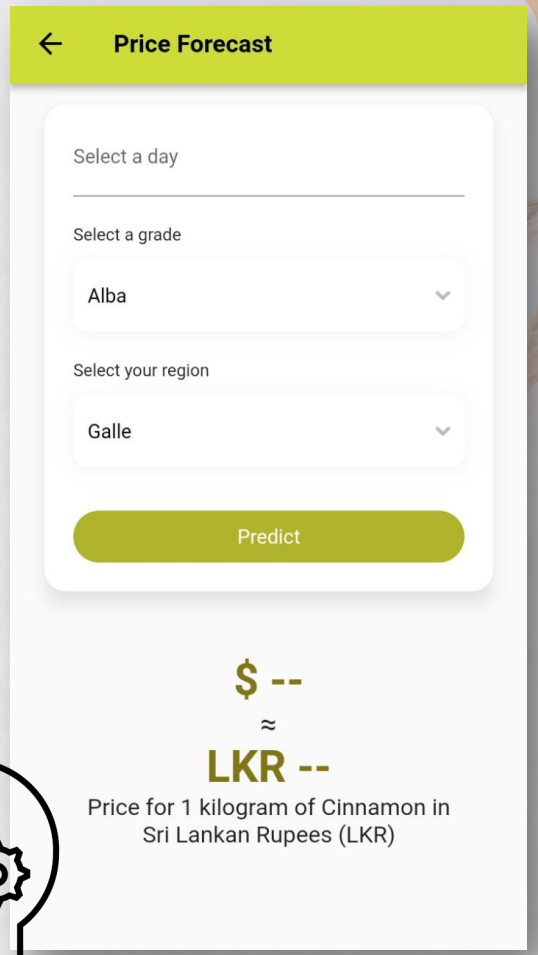
[3] J. Kamruzzaman and R. Sarker, "Forecasting of currency exchange rates using ANN: A case study," in Proceedings of the International Conference on Neural Networks and Signal Processing, 2003, vol. 1, pp. 793-797, doi: 10.1109/ICNNSP.2003.1279395.

[4] R. Senaratne and R. Pathirana, Eds., Cinnamon: Botany, Agronomy, Chemistry and Industrial Applications. Cham, Switzerland: Springer, 2021, doi:10.1007/978-3-030-54426-3.

COMPONENT SUMMERY

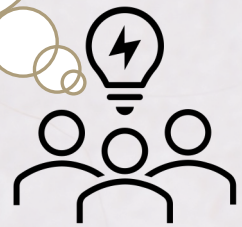
Can we check the Previous Cinnamon Prices?

How accurate is the predicted price?



Location base Cinnamon Prices Available?

How does it predict accurate results with the Local Economy?



OVER TO *EDIRISINGHE B.M.*

ROUGH BARK DISEASE (RBD) DETECTION

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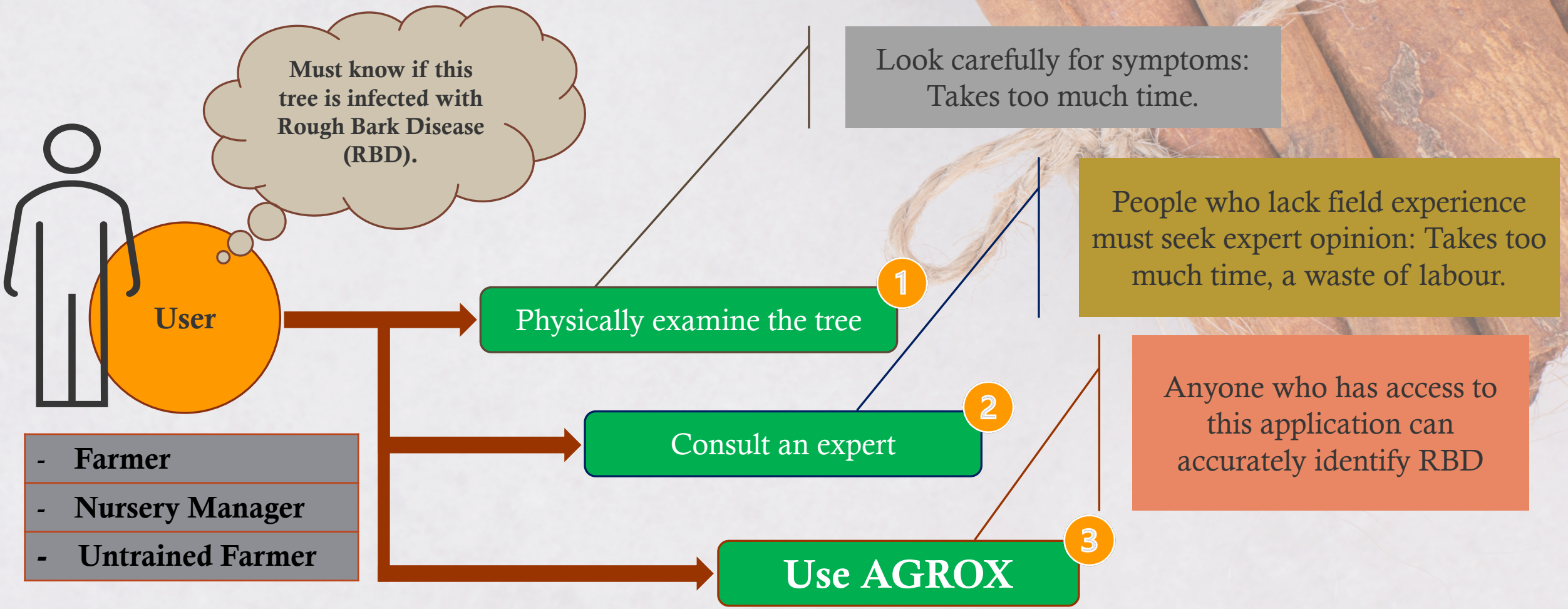
PROBLEM

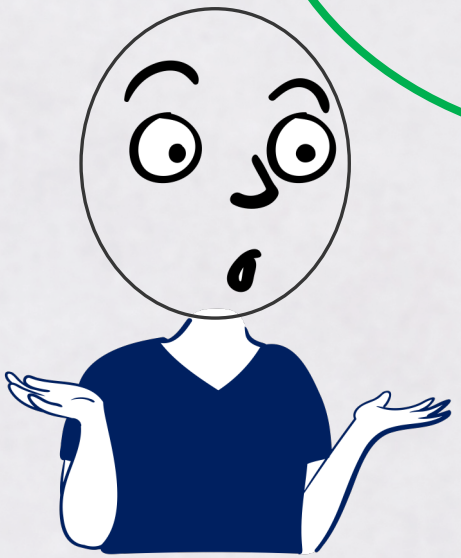

Must know if this tree is infected with Rough Bark Disease (RBD).
User
- Farmer
- Nursery Manager
- Untrained Farmer
1
Physically examine the tree
Look carefully for symptoms: Takes too much time.
2
Consult an expert
People who lack field experience must seek expert opinion: Takes too much time, a waste of labour.
3
Use AGROX
Anyone who has access to this application can accurately identify RBD

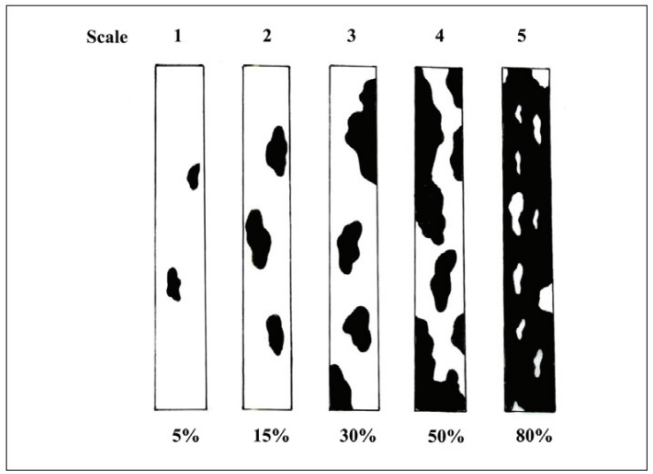
NOVELTY

Identify RBD through a mobile application

Provide solutions to all detected stages of RBD

Detect RBD and categorize it according to the severity





RESEARCH GAP

Existing related research

- Research on RBD.
  - [1] D. L. C. Kumari Fonseka, H. N. Aluthgamage, and W. W. U. I. Wickramaarachchi, "Present situation of cinnamon industry in southern Sri Lanka," *International Journal of Current Research in Biosciences and Plant Biology*, vol. 5, no. 8, pp. 63–70, 2018.
  - [2] "Cinnamon," *Cinnamon | Diseases and Pests, Description, Uses, Propagation*. [Online]. Available: https://plantvillage.psu.edu/topics/cinnamon/infos. [Accessed: 05-Apr-2023].
  - [3] "Rough bark disease on cinnamon (cinnamomum zeylanicum): Disease ..." [Online]. Available: https://www.researchgate.net/publication/315380426_ROUGH_BARK_DISEASE_ON_CINNAMON_Cinnamomum_zeylanicum_DISEASE_SYMPTOMS_DEVELOPMENT_AND_THE_CAUSAL_AGENT_WITH_SPECIAL_REFERENCE_TO_ITS_MORPHOLOGY_HISTOPATHOLOGY_AND_NUTRITIONAL_STATUTES_OF_AFFECTED_PLAN. [Accessed: 05-Apr-2023].
- Detecting diseases through image processing (Olive).
  - [4] Author links open overlay panelAditya Sinha a, a, b, and AbstractThe olive tree is a highly beneficial fruit tree with the earliest known history of its plantation going back to 6000 years. The production of olive oil is facing a significant threat nowadays due to climate change and the spread of diseases. In t, "Olive spot disease detection and classification using analysis of leaf image textures," *Procedia Computer Science*, 16-Apr-2020. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1877050920307511. [Accessed: 05-Apr-2023].
- Identifying RBD and its symptoms.
  - [5] Azad, R., Kumara, K.W., Senanayake, G., Ranawaka, R., Pushpakumara, D. and Geekiyanage, S., 2019. Intensity of leaf spot and rough bark diseases in cinnamon accessions collected from major cinnamon growing areas of Sri Lanka. *Journal of the National Science Foundation of Sri Lanka*, 47(3), pp.297–305. DOI: http://doi.org/10.4038/jnsfsr.v47i3.9403

Research Gap

- Lack of research on **technical approaches** and solutions for Cinnamon RBD.

Our Research

- Implements a mobile application that can detect RBD using computer vision.
- Provide solutions for the RBD through the system.
- Optimized system to respond accurately to lower-quality images.

SOLUTION

- Accurate
- Efficient

- Easy to use
- Simple and Minimal
- Informative

DATASET

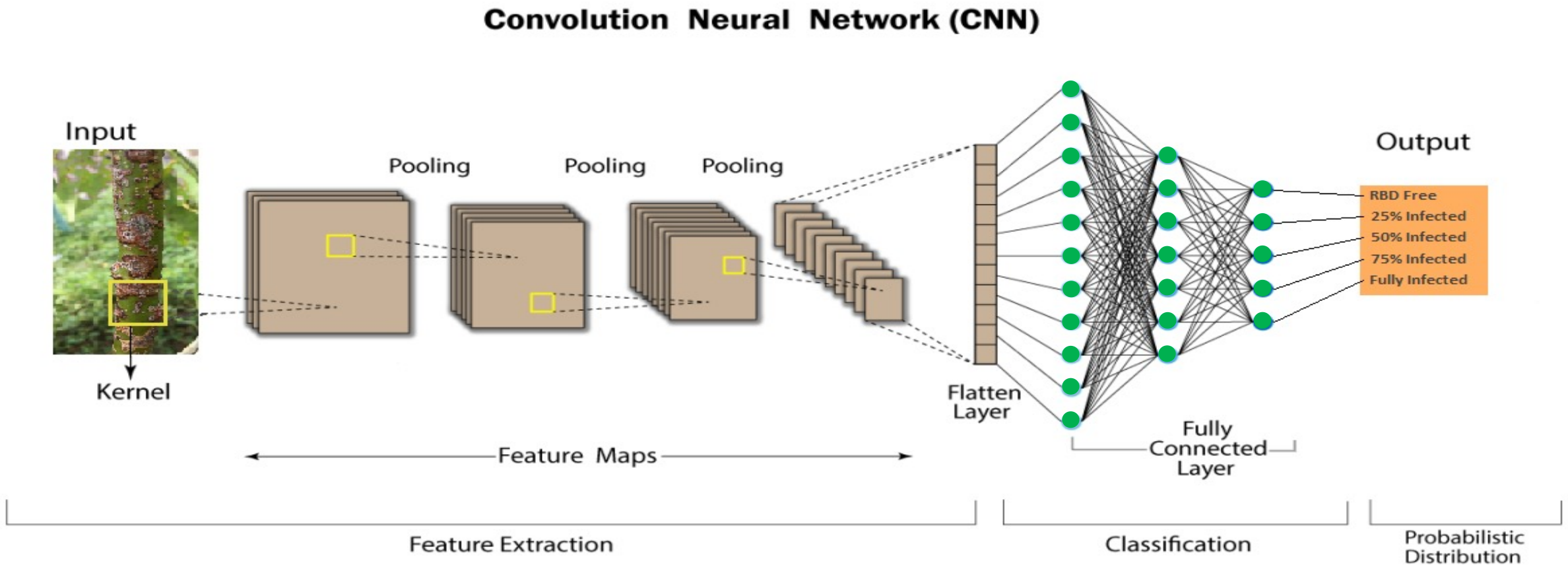
Existing Rough Bark Disease Data Source:
https://www.kaggle.com/datasets/madhavipethangoda/cinnamon-plant-stem-and-branch-disease-dataset

(dataset published on kaggale.com)

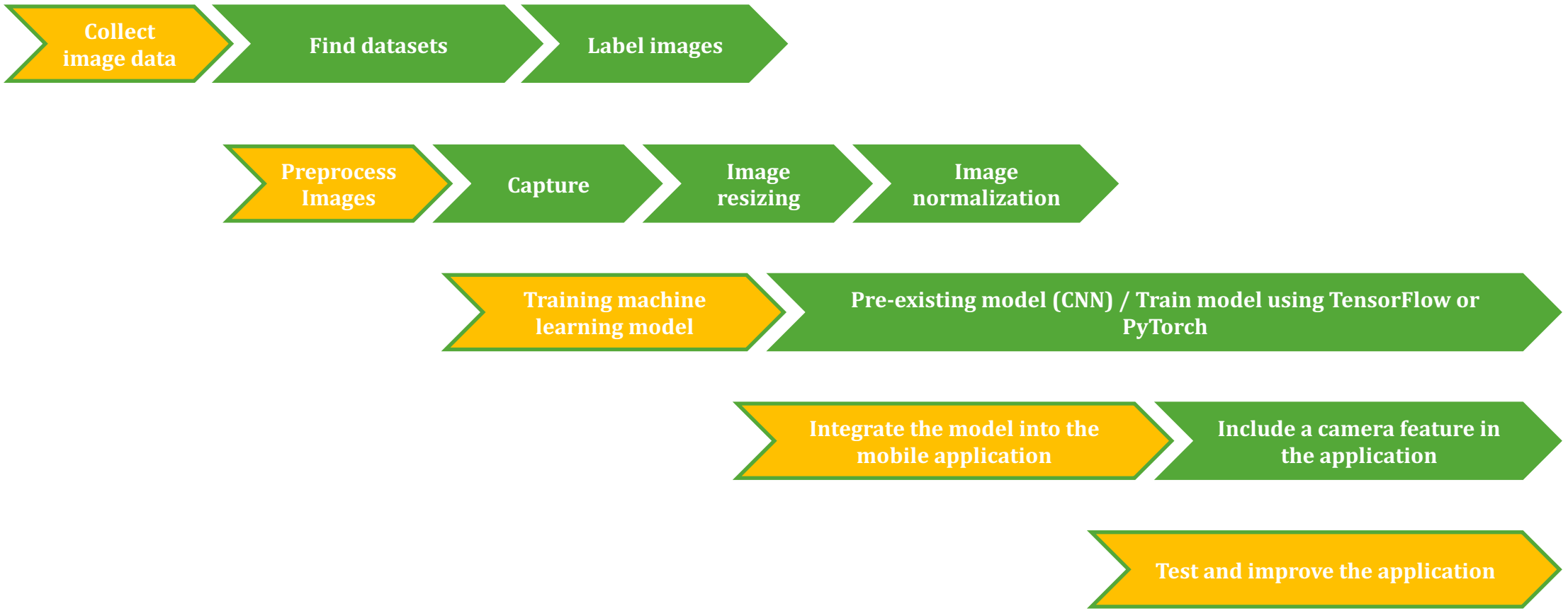
Own Disease Rough Bark Disease Data Source:

file:///F:/SLIIT/Research/Research/Datasets/

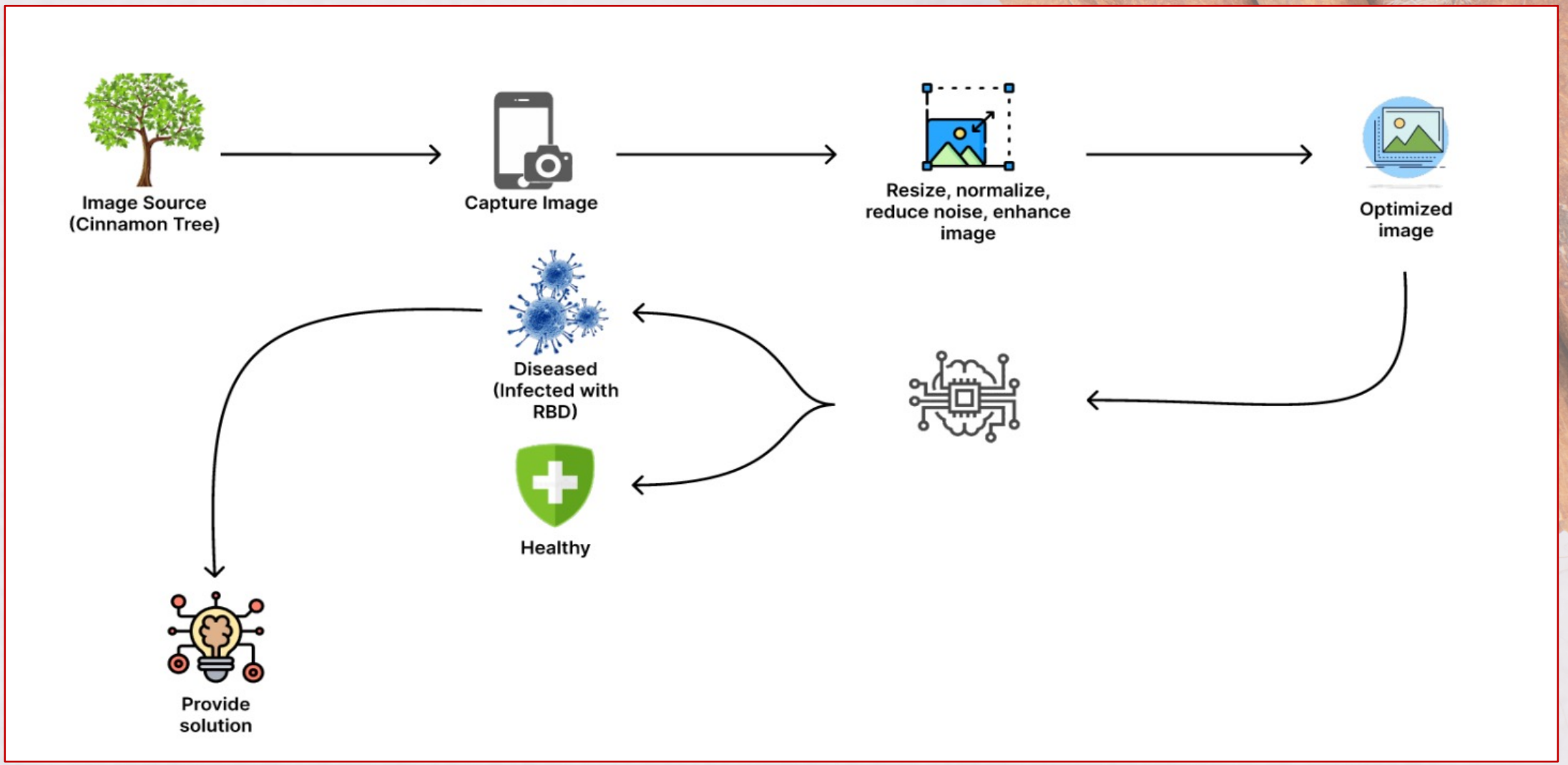
TECHNOLOGIES



TECHNOLOGIES



TECHNOLOGIES



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[1] D. L. C. Kumari Fonseka, H. N. Aluthgamage, and W. W. U. I. Wickramaarachchi, "Present situation of cinnamon industry in southern Sri Lanka," *International Journal of Current Research in Biosciences and Plant Biology*, vol. 5, no. 8, pp. 63–70, 2018.

[2] "Cinnamon," *Cinnamon | Diseases and Pests, Description, Uses, Propagation*. [Online]. Available: https://plantvillage.psu.edu/topics/cinnamon/infos. [Accessed: 05-Apr-2023].

[3] "Rough bark disease on cinnamon (cinnamomum zeylanicum): Disease ..." [Online]. Available: https://www.researchgate.net/publication/315380426_ROUGH_BARK_DISEASE_ON_CINNAMON_Cinnamomum_zeylanicum_DISEASE_SYMPTOMS_DEVELOPMENT_AND_THE_CAUSAL_AGENT_WITH_SPECIAL_REFERENCE_TO_ITS_MORPHOLOGY_HISTOPATHOLOGY_AND_NUTRITIONAL_STATUTES_OF_AFFECTED_PLAN. [Accessed: 05-Apr-2023].

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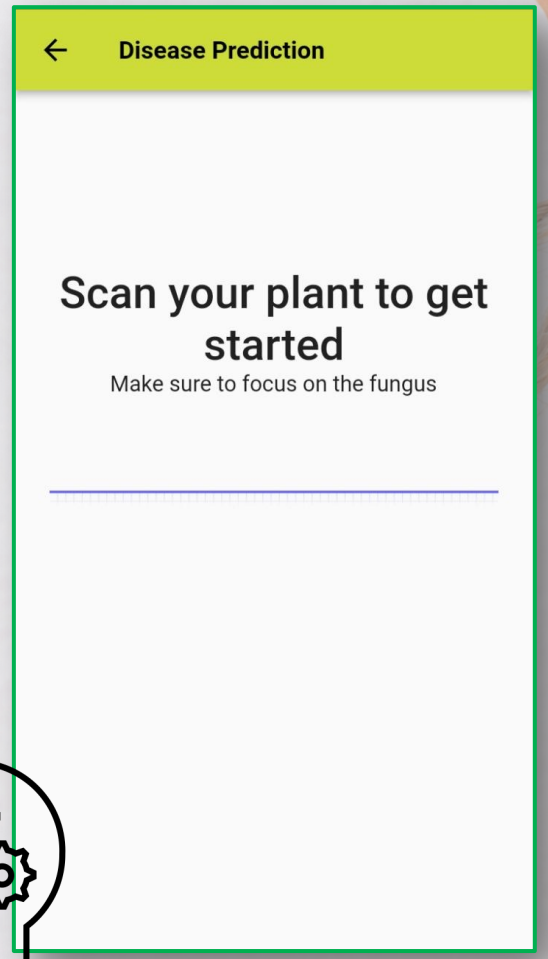
[5] Azad, R., Kumara, K.W., Senanayake, G., Ranawaka, R., Pushpakumara, D. and Geekiyanage, S., 2019. Intensity of leaf spot and rough bark diseases in cinnamon accessions collected from major cinnamon growing areas of Sri Lanka. *Journal of the National Science Foundation of Sri Lanka*, 47(3), pp.297–305. DOI: http://doi.org/10.4038/jnsfsr.v47i3.9403

COMPONENT SUMMERY

Is it really this simple??

How accurate are the results?



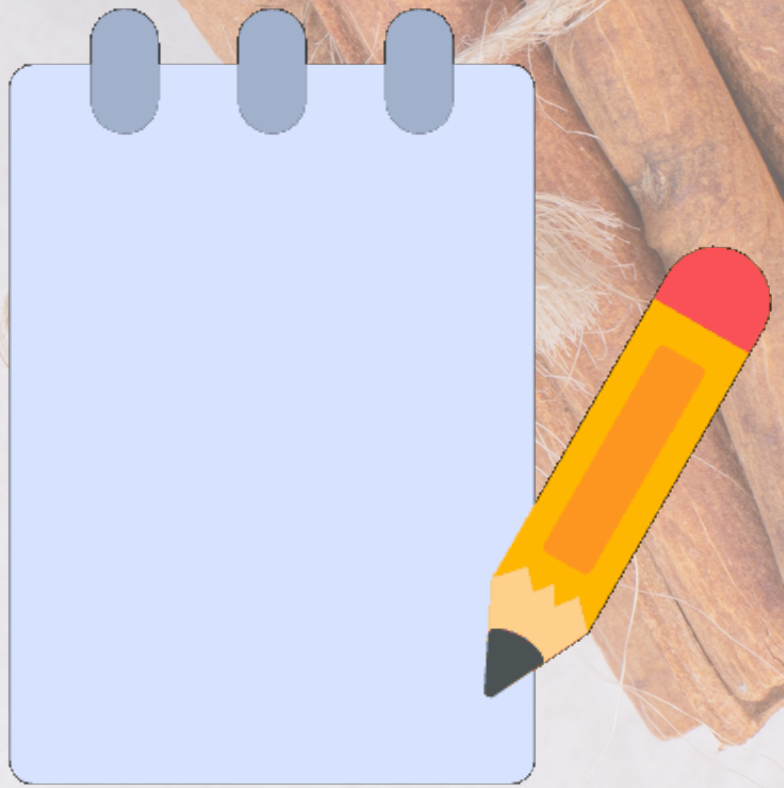
Can I know the severity of the disease

How should we treat infected plants?


OVER TO *EKANAYAKA E.M.A.I.B.*
Agrox

IDENTIFY THE QUALITY OF THE HARVEST

Ekanayaka E.M.A.I.B.
IT20252786



PROBLEM

- Lack of knowledge about cinnamon quality hierarchy
- Selling crops at a loss due to lack of knowledge
- Undervaluing the product due to unawareness of specific grade
- Exploitation of growers' lack of knowledge by middlemen
- Manipulation of prices by middlemen

"No definitive dataset available for grading cinnamon quills."

NOVELTY

Identify the Cinnamon quill grade by a mobile app

Provide the current market price for each grade

No definitive dataset available for grading cinnamon quills.

RESEARCH GAP

Existing related research

- Detecting the cinnamon quill

[1] K. W. a. B. S. .P. Jayasuriya, "IoT based Cinnamon Quality Control Systemthrough Image Processing," Research gate,2018.

[2]N. M. N. M. M. T. D. N. K. A. Malini T1, "Testing the quality of cereals and pulses using LabVIEW," 2021.

- Identifying the cinnamon quill grade

[1] K. W. a. B. S. .P. Jayasuriya, "IoT based Cinnamon Quality Control Systemthrough Image Processing," Research gate,2018.

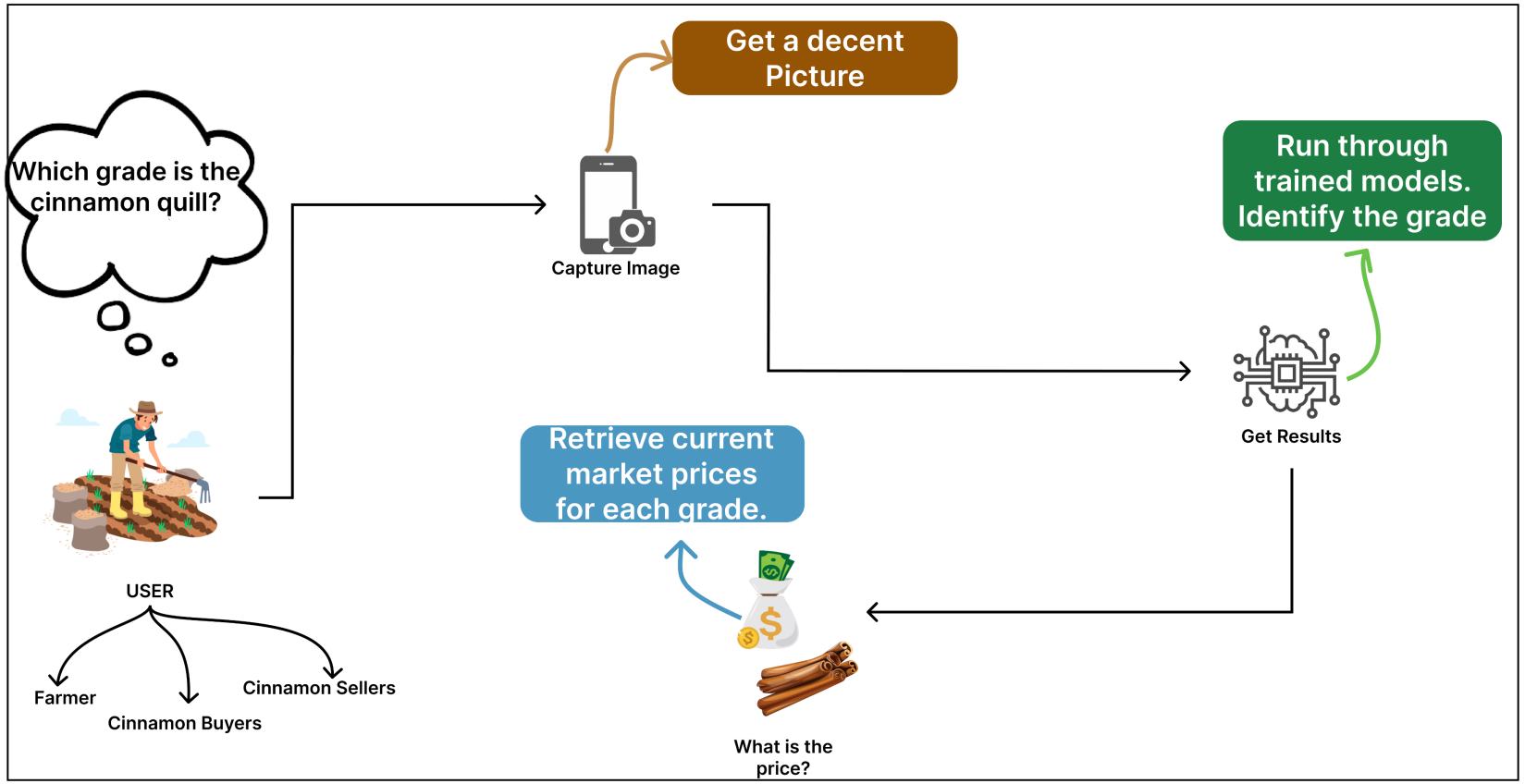
Research Gap

- Lack of research on technical solutions for grading the cinnamon quill

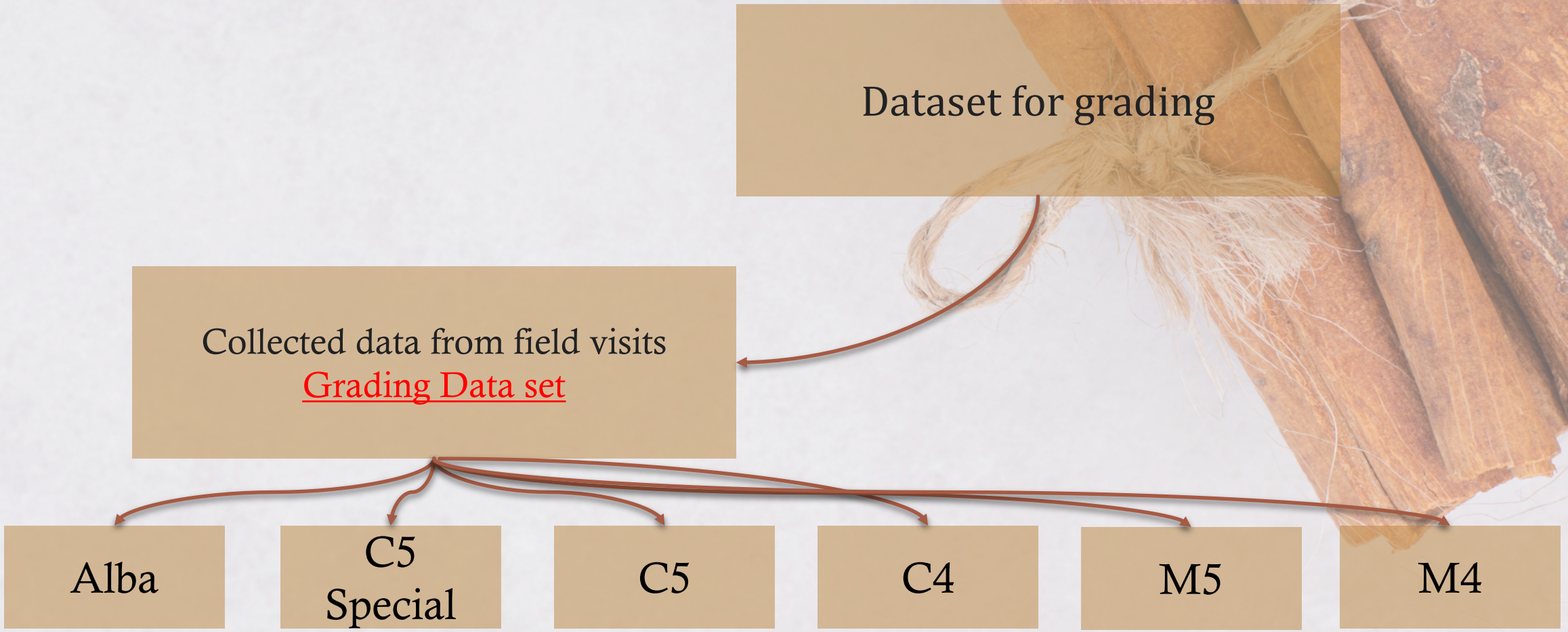
Our Research

- Provides a mobile application that can detect and provide grades for Ceylon Cinnamon
- Provide the Current market price for identified grade
- The system is optimized so that it responds accurately to lower-quality images and memory

SOLUTION


Get a decent Picture
Which grade is the cinnamon quill?
Capture Image
Run through trained models. Identify the grade
Get Results
Retrieve current market prices for each grade.
USER
Farmer
Cinnamon Buyers
Cinnamon Sellers
What is the price?

DATASET


Dataset for grading
Collected data from field visits
Grading Data set
Alba
C5 Special
C5
C4
M5
M4

CINNAMON GRADES

Grade	Characteristics
Alba	Thin, **tightly rolled** quills with a **light color**. Delicate aroma. Highest quality grade.
C5 Special	Slightly thicker quills than Alba grade. **Well-rolled** and may have a **slightly darker color.**
C5	Reasonably good quality. **Quills are thicker and less uniform** compared to the higher grades. Darker color and **may include some broken pieces**.
C4	**Thicker and coarser** quills. **Darker color** and may have a stronger aroma and flavor.
M5	Mix of good and medium quality. May include a **combination of thinner and thicker quills**, resulting in variations in appearance, aroma, and flavor.
M4	Mix of **medium and lower quality**. Quills are **thicker and coarser compared to M5** grade. The **color may be darker.** May have a less refined aroma and flavor.

OBJECTIVES

Capture image

Noice Reduction

Edge Detection

Background Extraction

Object Detection

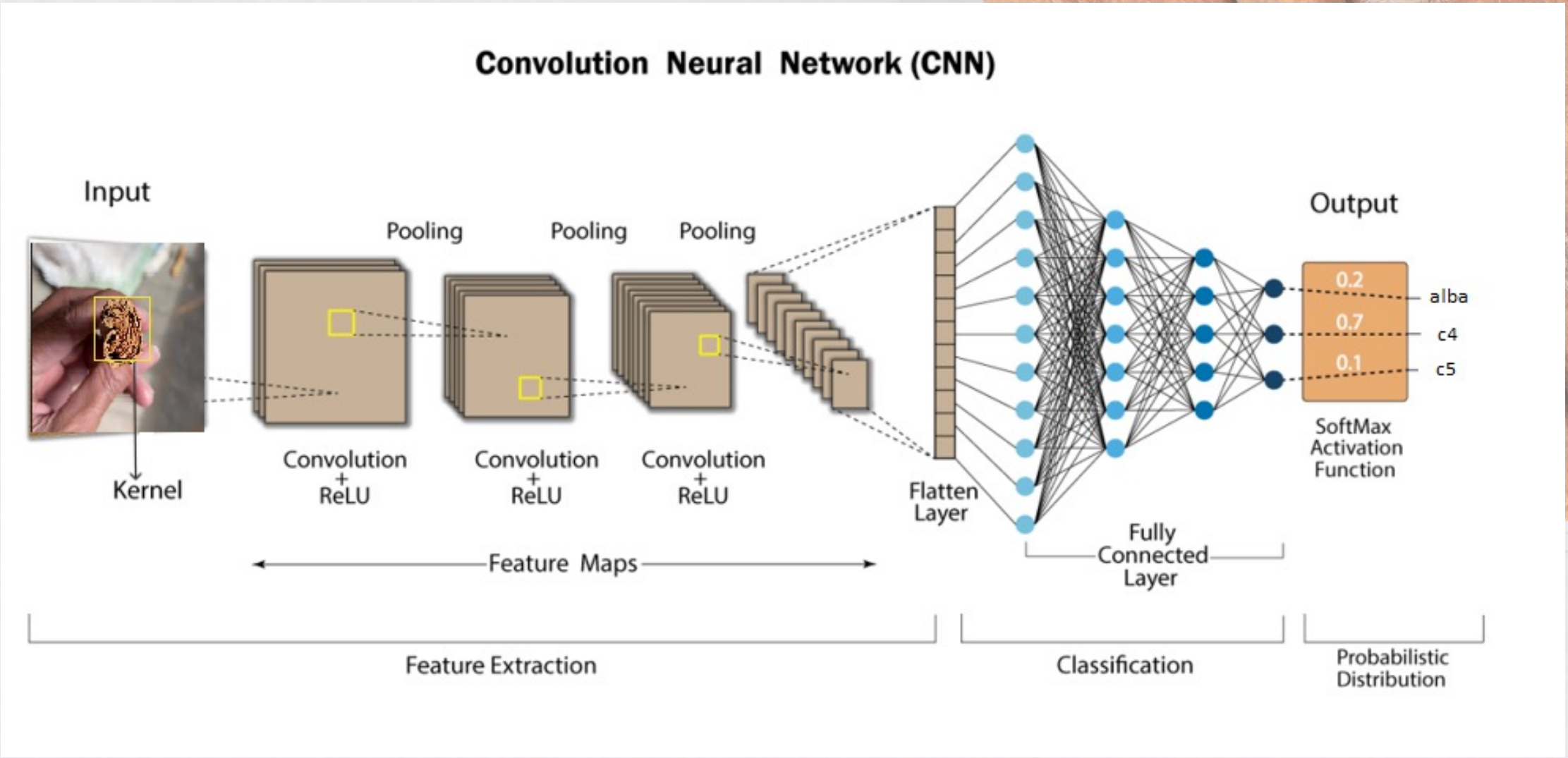
Feature Extraction

Classification quality grade & Validating market price

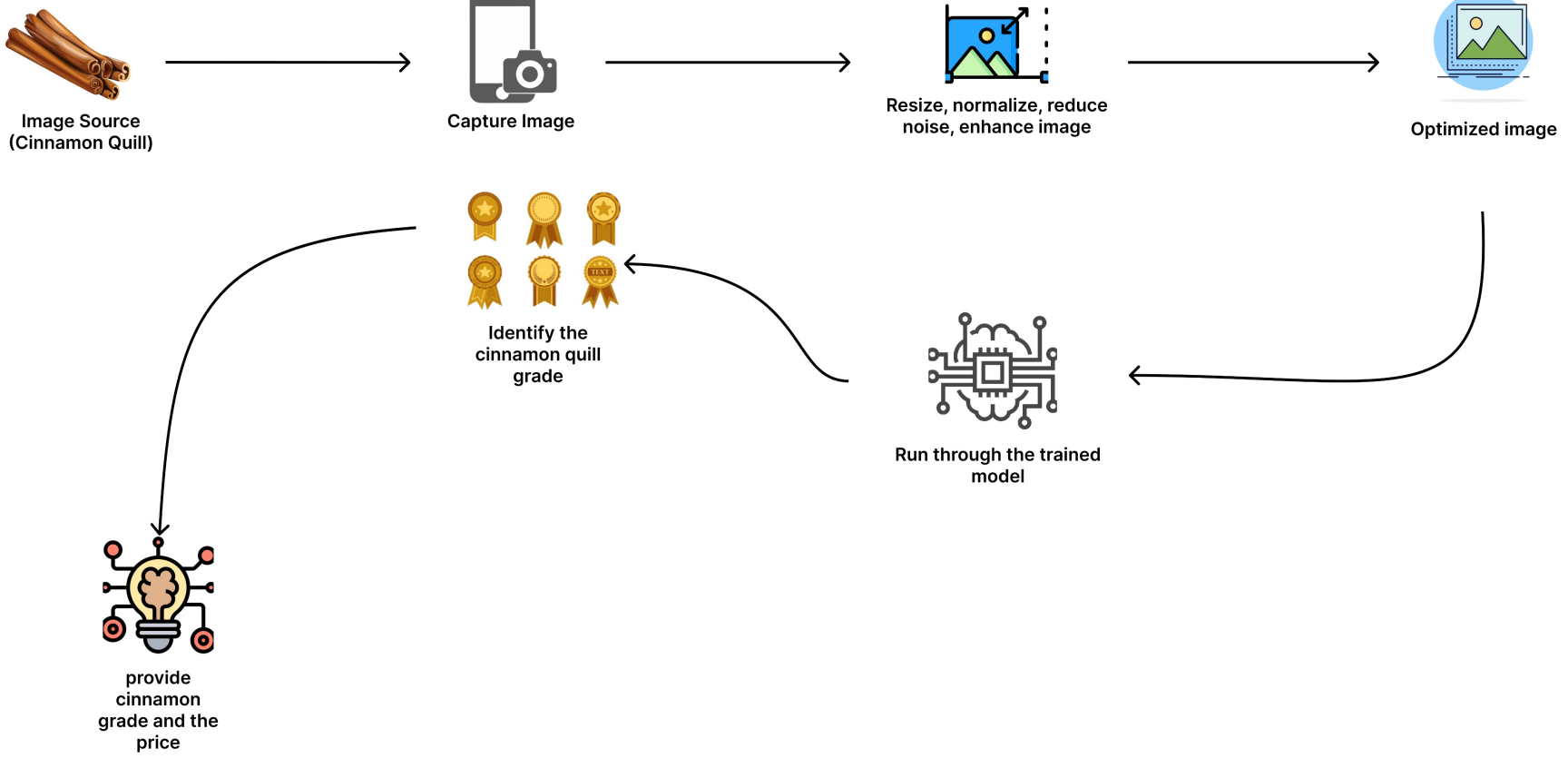
Database

Display quality grade & Market price

TECHNOLOGY


Convolution Neural Network (CNN)
Input
Pooling
Pooling
Pooling
Output
0.2
0.7
0.1
alba
c4
c5
Kernel
Convolution + ReLU
Convolution + ReLU
Convolution + ReLU
Flatten Layer
SoftMax Activation Function
Feature Maps
Fully Connected Layer
Feature Extraction
Classification
Probabilistic Distribution

SYSTEM OVERVIEW



REFERENCES

[1] K. W. a. B. S. .P. Jayasuriya, "IoT based Cinnamon Quality Control Systemthrough Image Processing," Research gate,2018.

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[3] V. S. K. a. B. N. Shaikh:, "Identification And Quality Testing Of Rice Grains Using Image Processing And Neural network," 2017.

[4] G. M. A. C. Devraj Vishnu, "A computer vision approach for grade identification of rice bran," 2017.

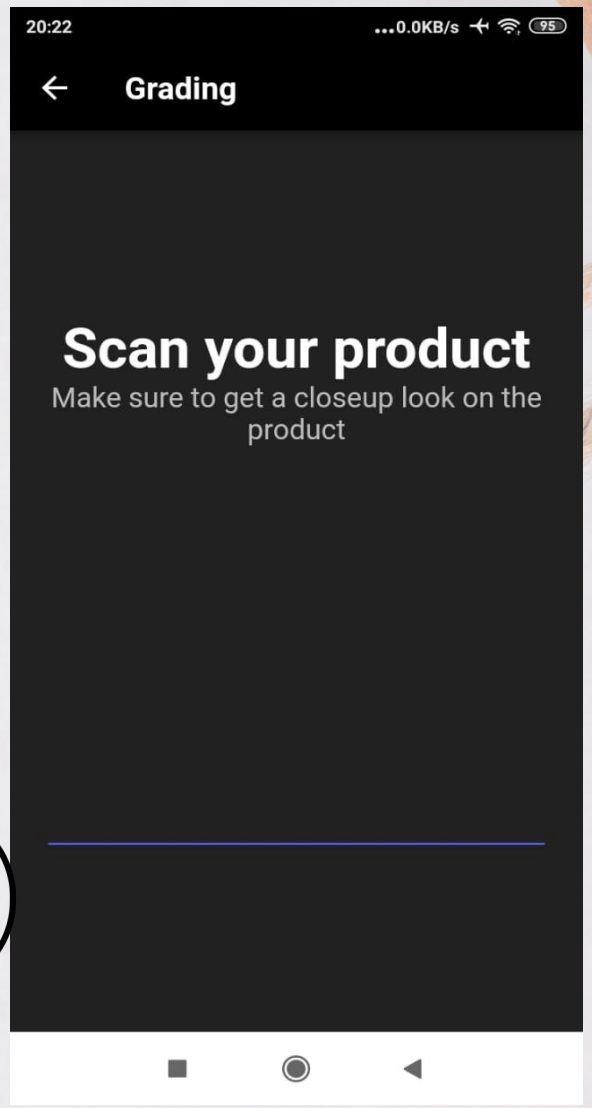
[5] J. S. N. L. S. B. A. U. M. G. Manish Bhurtel1, "DEEP LEARNING BASED SEED QUALITY TESTER," 2019.

[6] A. P. R. Shivpriya Desai, "Seed Quality Analysis Using Image Processing and ANN," 2017.

COMPONENT SUMMERY

Is it really this simple??

How accurate are the results?

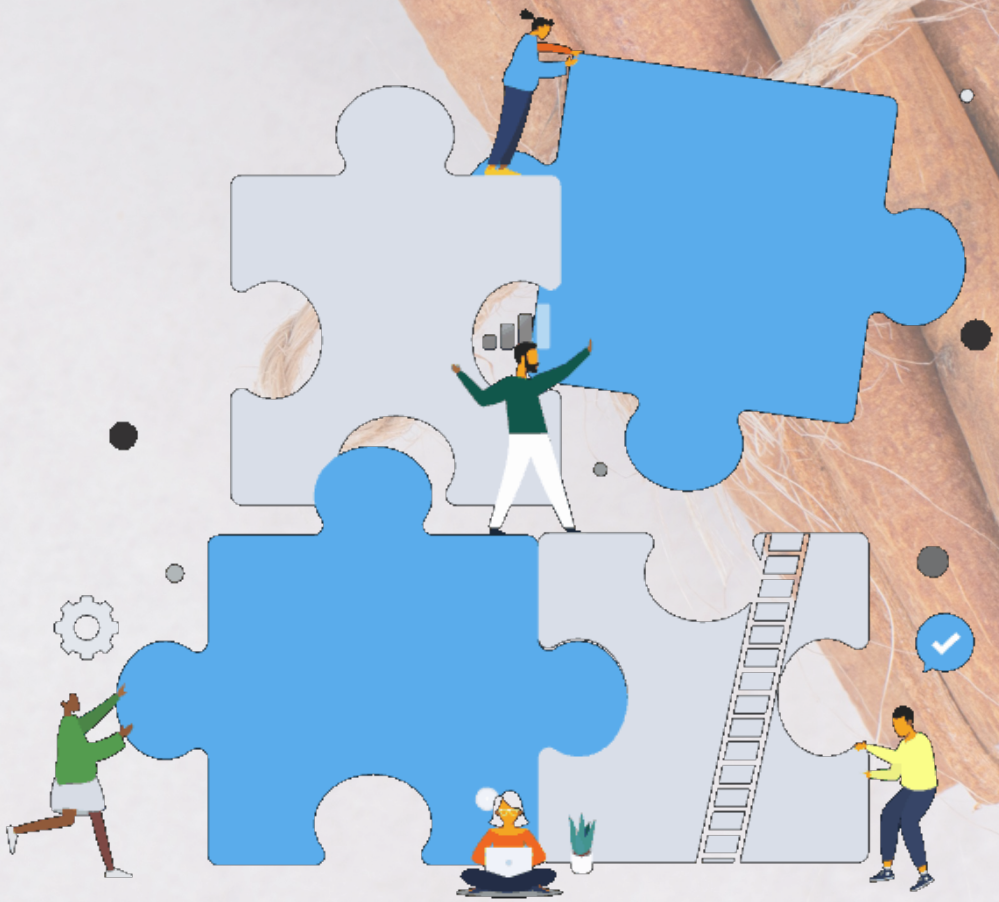


What is the Current market price for alba grade?


OVER TO *GAMAETHIGE G.G.S.A.*
Agrox

CINNAMON FARMER'S SUPPORT COMMUNITY

Gamaethige G.G.S.A.
IT16026476



PROBLEM

- There are no active knowledge transfer from older generation of farmers to youths.
- Technological barrier of computers.
- No interactive online platform to ask user specific questions.
- No centralized source of knowledge that is regularly updated.

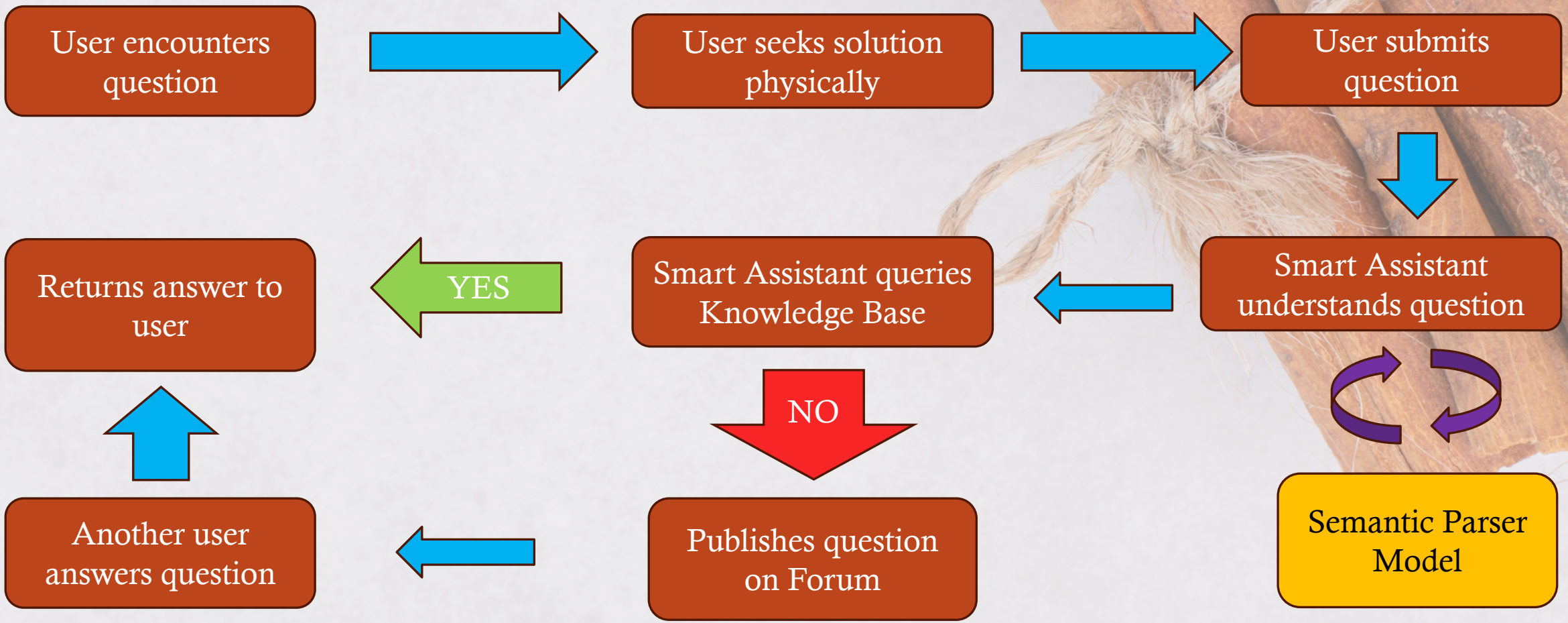
NOVELTY

- Enables the knowledge transfer.
- Lessens the technological gap between farmers and applications.
- Interactive Q & A online platform
- Regularly updated knowledge base

RESEARCH GAP

- Existing research on understanding user feedback. [3]
- However, no focus on cinnamon industry related questions.

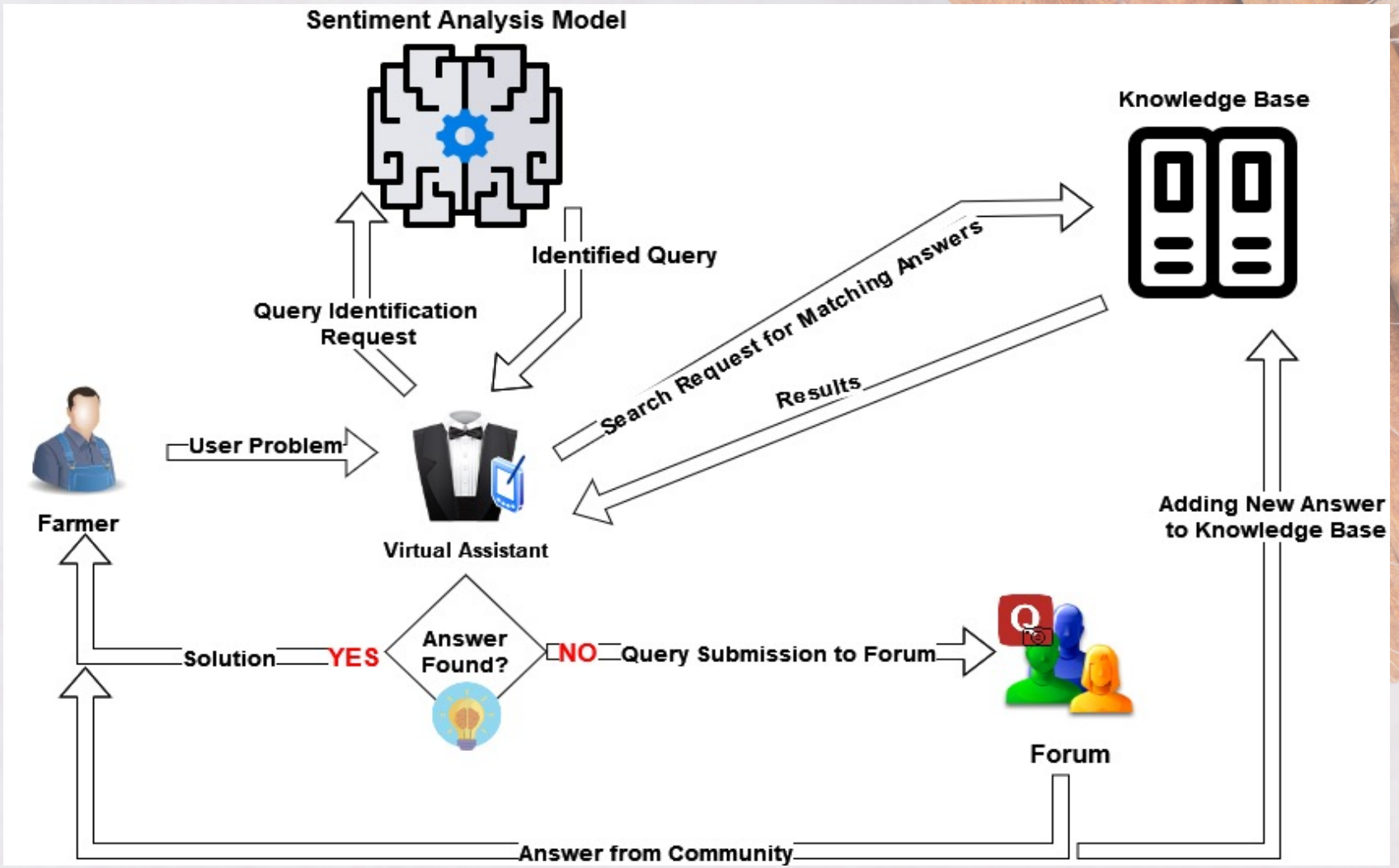
SOLUTION


User encounters question
User seeks solution physically
User submits question
Smart Assistant understands question
Smart Assistant queries Knowledge Base
YES
Returns answer to user
NO
Publishes question on Forum
Another user answers question
Semantic Parser Model

DATASET

- Building a composite data set for this specific requirement
- Sources :
  - Cinnamon Research Center
  - Data.gov.lk (https://data.gov.lk/dataset/cinnamon-plantation-faq)
  - Interview with Cinnamon farmers

SP. ANALYSIS 1



TECHNOLOGIES

Algorithms	Advantages	Disadvantages
Support vector machines	Can learn complex relationships between the questions and answers.	Requires a large dataset to train the model.
TF-IDF	Simple to understand and implement.	Can be computationally expensive for large datasets.
PageRank	Considers the popularity of questions & answers.	Can be susceptible to spam and manipulation.
Random forests	Can be very accurate, even with a small dataset.	Can be computationally expensive to train and deploy.

TECHNOLOGIES

- Bag-of-words model
- N-gram model
- Dependency parser
- Named entity recognizer
- Semantic parser
  - Rule-based semantic parsers
  - Statistical semantic parsers

REFERENCES

[1] Baddegamage, S. I. (2014, April). ICT in Sri Lankan cinnamon industry: Impact of language barriers and digital divide. In 2014 International Conference on Electrical Engineering and Information & Communication Technology (ICEEICT) (pp. 1-6). IEEE.

[2] Aung, K. Z., & Myo, N. N. (2017, May). Sentiment analysis of students' comment using lexicon based approach. In 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS) (pp. 149-154). IEEE.

[3] Wiratama, G. P., & Rusli, A. (2019, October). Sentiment analysis of application user feedback in Bahasa Indonesia using multinomial naive Bayes. In 2019 5th International Conference on New Media Studies (CONMEDIA) (pp. 223-227). IEEE. doi: 10.1109/conmedia46929.2019.8981850

[4] Sales, J. E., Freitas, A., & Handschuh, S. (2018, January). An open vocabulary semantic parser for end-user programming using natural language. In 2018 IEEE 12th International Conference on Semantic Computing (ICSC) (pp. 1-8). IEEE. doi:10.1109/ICSC.2018.00020


THANK YOU!
Agrox