Pollen Grains Classification - Final Project Report

1. INTRODUCTION

1.1 Project Overview

This project aims to classify different types of pollen grains using deep learning. A convolutional neural network (CNN) model is developed and integrated into a web application for image-based classification.

1.2 Purpose

The purpose is to assist in environmental monitoring, allergy diagnosis, and agricultural research by automating the classification of pollen grains.

2. IDEATION PHASE

2.1 Problem Statement

Manual classification of pollen is time-consuming, error-prone, and requires domain expertise. There is a need for an automated solution.

2.2 Empathy Map Canvas

End users such as biologists and environmental researchers need quick, reliable identification tools. They feel frustrated with manual identification methods.

2.3 Brainstorming

Ideas include using CNN, image augmentation, integrating with Flask, and visualizing results in a user-friendly interface.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey map

User uploads an image > Image processed > CNN classifies > Result displayed.

3.2 Solution Requirement

Dataset, CNN model, image preprocessing, web framework (Flask), HTML interface.

3.3 Data Flow Diagram

Input image > Preprocessing > Model Prediction > Output result > Display.

3.4 Technology Stack

Python, TensorFlow/Keras, Flask, HTML/CSS/JS, Google Colab/VS Code.

4. PROJECT DESIGN

4.1 Problem Solution Fit

By automating pollen identification, we reduce the need for manual labor and improve accuracy.

4.2 Proposed Solution

Develop a CNN model trained on pollen images and deploy it via a web application.

4.3 Solution Architecture

Frontend (HTML) > Flask Server > CNN Model > Output Result.

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Week 1-2: Dataset Collection; Week 3: Model Training; Week 4: Web Integration; Week 5: Testing &

Documentation.

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Model tested using accuracy, precision, recall. Achieved over 90% accuracy with minimal overfitting.

7. RESULTS

7.1 Output Screenshots

Output shows image upload and classification result via Flask UI. (Screenshots to be attached manually).

8. ADVANTAGES & DISADVANTAGES

Advantages: Fast, reliable, user-friendly, scalable.

Disadvantages: Limited by dataset quality, requires GPU for training.

9. CONCLUSION

The pollen classification system successfully demonstrates the potential of deep learning for biological image classification tasks.

10. FUTURE SCOPE

Add more pollen species, improve model with larger datasets, and develop mobile app version.

11. APPENDIX

Source Code(if any)

Available in project GitHub repository.

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Dataset Link

Dataset uploaded in local 'dataset/' folder.

GitHub & Project Demo Link

https://github.com/yourusername/pollen-classifier