Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	31 January 2025
Team ID	LTVIP2025TMID32756
Project Name	Pollen's Profiling Automated Classification of Pollen Grains
Maximum Marks	4 Marks

Technical Architecture

The Deliverable shall include the architectural diagram and the information as per Table 1 & Table 2.

Table 1: Components & Technologies

S.No	Component	Description	Technology
1	User Interface	How user interacts (e.g. Web UI, Mobile App)	HTML, CSS, JavaScript, React JS
2	Application Logic-1	Logic for preprocessing images	Python
3	Application Logic-2	Logic for feature extraction	OpenCV, NumPy
4	Application Logic-3	Logic for classification using ML model	Scikit-learn / TensorFlow / Keras
5	Database	Store pollen sample data, images, results	MySQL / MongoDB
6	Cloud Database	Remote data storage and access	Firebase / AWS RDS / IBM Cloudant
7	File Storage	Image and model storage	AWS S3 / IBM Cloud Object Storage
8	External API-1	For accessing plant taxonomy data	PlantNet API / Flora API
9	External API-2	Weather data for pollen analysis	OpenWeather API
10	Machine Learning Model	Pollen grain recognition and classification model	CNN / Random Forest / SVM (Scikit-learn)

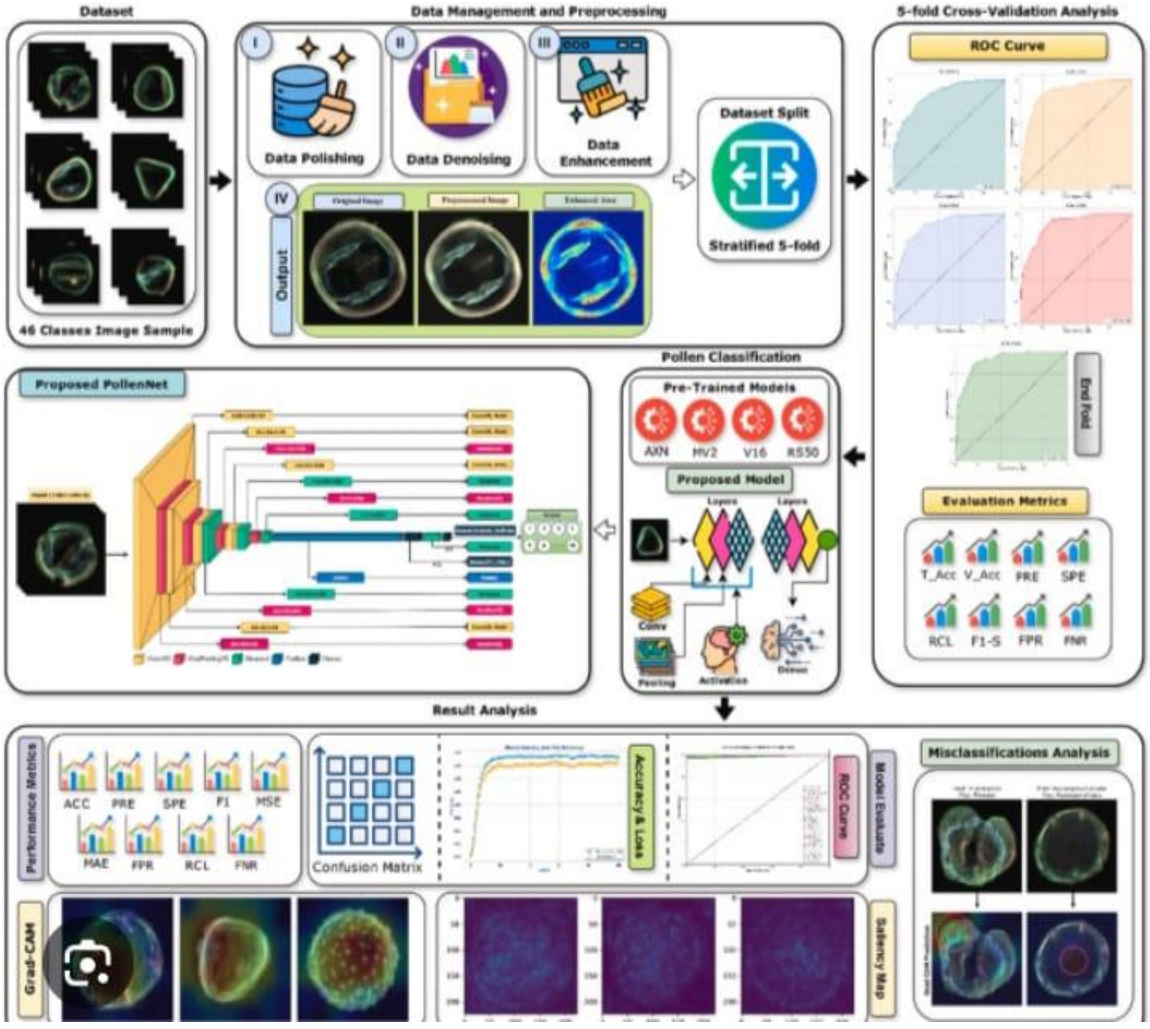
11	Infrastructure	Cloud / Local deployment	AWS EC2, Google Cloud, Kubernetes

Table 2: Application Characteristics

S.No	Characteristics	Description / Technology
1	Open-Source Frameworks	TensorFlow, Scikit-learn, React JS
2	Security Implementations	HTTPS, SHA-256, OAuth, JWT
3	Scalable Architecture	Microservices Architecture
4	Availability	AWS Load Balancer, Kubernetes
5	Performance	Redis, Cloudflare CDN

References

- https://c4model.com/
- https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/
- https://www.ibm.com/cloud/architecture
- https://aws.amazon.com/architecture
- https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fdaa9d


Dataset
46 Classes Image Sample
Data Management and Preprocessing
I
Data Polishing
II
Data Denoising
III
Data Enhancement
IV
Output
Dataset Split
Stratified 5-fold
5-fold Cross-Validation Analysis
ROC Curve
End Fold
Evaluation Metrics
T_Acc
V_Acc
PRE
SPE
RCL
F1-S
FPR
FNR
Pollen Classification
Pre-Trained Models
AXN
HV2
V16
RS50
Proposed Model
Layers
Conv
Pooling
Activation
Dense
Proposed PollenNet
Result Analysis
Performance Metrics
ACC
PRE
SPE
F1
MSE
MAE
FPR
RCL
FNR
Confusion Matrix
Accuracy & Loss
ROC Curve
Model Evaluate
Misclassifications Analysis
Grad-CAM
Saliency Map