Project Design Phase
Solution Architecture

Date	23 June 2025
Team ID	LTVIP2025TMID59524
Project Name	Pollen's Profiling: Automated Classification of Pollen Grains
Maximum Marks	4 Marks

Goal

Build an accessible, AI-driven system to automate the identification of pollen grains using transfer learning, reducing manual effort, increasing accuracy, and supporting research and education in botany and aerobiology.

Core Components

- Model: MobileNetV2 + Transfer Learning for classifying various types of pollen grains with high accuracy.

- Frontend: User-friendly web/mobile UI to upload microscope images of pollen grains.

- Backend: Lightweight Flask API or TensorFlow Lite backend for inference.

- Deployment: Designed to run on low-resource environments (e.g., school labs, field stations), with offline functionality**.**

System Flow

1. User uploads/captures a microscope image of a pollen grain.

2. Image is preprocessed (resized, normalized).

3. Model performs classification and returns the pollen type + confidence score.

4. Results are shown to the user and can be saved or shared.

Q **Development Phases**

- **Data Collection**: Acquire and label pollen grain images (different species).

- **Preprocessing:** Standardize image dimensions and formats.

- **Model Training**: Fine-tune MobileNetV2 using the labeled dataset.

- **UI Design:** Create an intuitive interface for students and researchers**.**

- **Testing & Deployment:** Ensure reliability and offline capability.

✅ Technical & Business Requirements

- **Educational & Rural-Friendly**: Designed for schools, labs, and agricultural institutions.

- **Low-Cost Solution**: Requires minimal hardware and runs on standard smartphones.

- **Scalable Dataset**: Easily extendable to include more pollen types.

- **Offline Support**: Ensures usability without constant internet access.

- **Export Features**: Results downloadable for use in academic reports or research.

Example - Solution Architecture Diagram: