

Project Design Phase Solution Architecture

Date	23 June 2025
Team ID	LTVIP2025TMID43572
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.
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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.
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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.
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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:

