**Project Design Phase**

**Solution Architecture**

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| Date | 22 June 2025 |
| Team ID | LTVIP2025TMID40098 |
| 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.

**🧩 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:**

