

Project Design Phase
Proposed Solution Template

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| Date | 23 June 2025 |
| Team ID | LTVIP2025TMID59524 |
| Project Name | Pollen's Profiling: Automated Classification of Pollen Grains |
| Maximum Marks | 2 Marks |

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

| S.No. | Parameter | Description |
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| 1. | Problem Statement (Problem to be solved) | Manual identification and classification of pollen grains under microscopes is a time-consuming, expertise-dependent, and error-prone process. It limits research productivity, causes inconsistencies, and slows down applications in ecology, forensics, and agriculture. |
| 2. | Idea / Solution description | The project uses transfer learning with a pre-trained model (e.g., VGG16) to automate the classification of pollen grain images into specific categories. The solution can be deployed in laboratories or field settings and supports real-time image-based predictions, reducing human effort and enhancing consistency. |
| 3. | Novelty / Uniqueness | This is one of the few accessible AI-powered solutions specifically designed for pollen grain classification. It combines deep learning with microscopy image data to automate taxonomy tasks typically reserved for expert palynologists. The system is scalable, lightweight, and requires minimal manual labeling. |
| 4. | Social Impact / Customer Satisfaction | The system assists researchers, students, and professionals by saving time and improving accuracy. It accelerates ecological and environmental research, improves pollen-based allergy forecasting, and supports biodiversity conservation. It also democratizes access to scientific tools in educational institutions. |
| 5. | Business Model (Revenue Model) | The model can be offered as an open-source academic tool or a freemium cloud service for labs and universities. Paid tiers may include premium features such as advanced analytics, custom model training, institutional licenses, or consulting for dataset integration. Possible collaborations with research organizations. |
| 6. | Scalability of the Solution | The model can be expanded to classify additional pollen types from global datasets. It is adaptable to various imaging systems and |

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| | | can be integrated into mobile apps, lab software, or online research platforms. It also offers potential use in precision agriculture and air-quality monitoring applications. |
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