**Project Design Phase**

**Proposed Solution**

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| Date | 24 June 2025 |
| Team ID | LTVIP2025TMID36354 |
| Project Name | Enchanted Wings: Marvels of Butterfly Species |
| Maximum Marks | 2 Marks |

## Proposed Solution Details

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| S.No. | Parameter | Description |
| 1 | Problem Statement (Problem to be solved) | Accurate identification of butterfly species is challenging due to the high number of visually similar species. Traditional identification methods are time-consuming and require expert knowledge, which limits accessibility for students, researchers, and enthusiasts. |
| 2 | Idea / Solution Description | The project uses a pre-trained Convolutional Neural Network (VGG16) to classify images of butterflies into 75 species. A lightweight Flask web application allows users to upload butterfly images and receive real-time species predictions. The model is trained using a dataset of 6,499 images and fine-tuned with custom layers for efficient classification. |
| 3 | Novelty / Uniqueness | The solution leverages transfer learning to reduce training time and increase accuracy. Its uniqueness lies in combining deep learning with real-time species identification in a web-based interface, making advanced image classification accessible to non-technical users in research, education, and conservation. |
| 4 | Social Impact | The project supports biodiversity conservation, scientific education, and citizen science by simplifying species identification. It enhances ecological awareness and allows even non-experts to contribute to species monitoring, promoting inclusiveness and knowledge sharing. |
| 5 | Business Model (Revenue Model) | Potential revenue streams include: freemium access for public use, subscription-based model for researchers/institutions, licensing to educational platforms, and data-as-a-service for ecological monitoring agencies. Customization services for other species or regions can also generate income. |
| 6 | Scalability of the Solution | The system is designed to be lightweight and modular, allowing easy expansion to include more species or be adapted for different ecological regions. It can be deployed on both local machines and cloud servers, making it scalable for individual users as well as institutional use. |