Project Design Phase
Solution Architecture

Date	20 JUNE 2025
Team ID	LTVIP2025TMID32471
Project Name	Enchanted Wings: Marvels of Butterfly Species
Maximum Marks	4 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture:

• Frontend:

- **User Interface**: A web or mobile app interface that allows users to upload images and view results.
- **Frameworks Used**: Built using **React** (Web) or **Flutter** (Mobile) to provide interactive, responsive user experiences.
- **Purpose**: Sends image data and receives predictions for display.

• Frontend Logic:

- Handles UI interactions, prepares the request, and manages routing and state logic.
- Ensures smooth user experience while interfacing with the backend API.

• Backend:

- **Framework Used**: Built with **FastAPI** for handling HTTP requests and managing user authentication (if required).
- **Responsibilities**:
    - Receives image data from the frontend.
    - Sends image to the AI engine.
    - Returns model predictions to frontend.

• AI Engine:

- **Model Type**: A **Convolutional Neural Network (CNN)** implemented using **Transfer Learning**.
- **Function**: Performs core image classification task (e.g., identifying butterfly species).

- **Scalability**: Model can be updated or replaced without changing the API structure.

• **Feature Modules:**

- **Image Preprocessor**: Resizes and normalizes the image before feeding to the model.
- **Species Classifier**: Core classification component that predicts the butterfly species.
- **Confidence Estimator**: Calculates how confident the model is in its prediction.
- **Feedback Collector**: Optionally collects user feedback for continuous model improvement.

• **Response Formatter:**

- Combines **species prediction** and **confidence score** into a human-readable format.
- Ensures the response is ready for direct rendering on the UI.

• **Final Output:**

- Results are shown on the frontend with species name, confidence score, and possibly image overlays.
- Designed for clear and engaging user interaction.