Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	18 JUNE 2025
Team ID	LTVIP2025TMID32471
Project Name	Enchanted Wings: Marvels of Butterfly Species
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Acquisition & Preparation	The system shall load and preprocess butterfly images into training, validation, and test splits to ensure balanced class distributions.
FR-2	Transfer Learning Integration	The system shall integrate pre-trained CNN architectures to extract features from butterfly images, improving training efficiency.
FR-3	Model Training & Tuning	The system shall train a butterfly classification model using transfer learning techniques, optimizing for high accuracy.
FR-4	Model Evaluation	The system shall evaluate the model performance using metrics such as accuracy, confusion matrix, and class-wise precision/recall.
FR-5	User Interface (UI)	The system shall provide a user-friendly interface for uploading butterfly images and viewing classification results.
FR-6	Deployment	The system shall be deployable in a Docker container to ensure portability and scalability of the solution.
FR-7	Biodiversity Monitoring	The system shall enable field researchers to identify butterfly species in real-time for biodiversity monitoring purposes.
FR-8	Ecological Research Integration	The system shall integrate with automated camera systems to collect data for ecological research on butterfly behavior and habitat patterns.
FR-9	Citizen Science & Education	The system shall allow citizen scientists and students to upload butterfly images and receive species identification along with educational information.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The interface shall be intuitive and accessible to researchers, citizen scientists, and enthusiasts with minimal training required.
NFR-2	Hardware	The system shall require a minimum of a 4GB VRAM GPU to achieve optimal model inference performance.
NFR-3	Reliability	The system shall maintain 99% uptime and deliver accurate species classification for valid butterfly images.
NFR-4	Performance	Model predictions shall be generated within 3 seconds for single image uploads.
NFR-5	Privacy	All butterfly images and data shall be processed locally to ensure privacy and data protection.
NFR-6	Scalability	The backend shall support at least 10 concurrent users without significant performance degradation.
NFR-7	Maintainability	The system codebase shall follow modular architecture (separating UI, backend, and model logic) to simplify future updates and maintenance.