

Project Design Phase-II Technology Stack (Architecture & Stack)

Date	19 JUNE 2025
Team ID	LTVIP2025TMID32471
Project Name	Enchanted Wings: Marvels of Butterfly Species
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

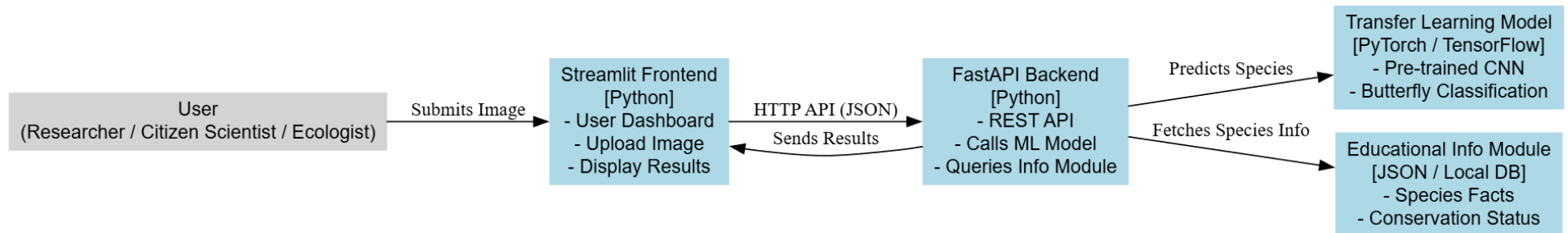


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web-based interface for butterfly image upload and results display	Streamlit (Python)
2.	Application Logic-1	Data loading and preprocessing pipeline for butterfly images	FastAPI (Python)
3.	Application Logic-2	Transfer learning integration and species classification logic	PyTorch or TensorFlow (Pre-trained CNNs)
4.	Application Logic-3	Model evaluation and result formatting	FastAPI (Python)
5.	Database	Storage for butterfly species information and educational content	SQLite (File-based) or JSON files
6.	File Storage	Storage of uploaded butterfly images	Local filesystem
7.	Machine Learning Model	Butterfly species classification using transfer learning	ResNet, EfficientNet (pre-trained models)
8.	Infrastructure	Local development and containerized deployment	Python virtualenv, Docker (future)

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Frontend, backend, and ML components built using open-source technologies	FastAPI, Streamlit, PyTorch, TensorFlow
2.	Security Implementations	Local-only processing, no cloud data transfer	N/A (Offline-first approach)
3.	Scalable Architecture	Modular design separating frontend, backend, and ML model	Microservices (FastAPI)
4.	Availability	Usable locally on researcher or citizen scientist's machine	~99% uptime (hardware-dependent)
5.	Performance	Fast inference time for species predictions	GPU-accelerated inference (4GB VRAM minimum recommended)