

# Project Design Phase

## Problem – Solution Fit

Date	23 June 2025
Team ID	LTVIP2025TMID36354
Project Name	Enchanted Wings: Marvels of Butterfly Species
Maximum Marks	2 Marks

### Problem:

Accurate identification of butterfly species is a significant challenge for students, nature enthusiasts, and researchers due to the need for expert knowledge, time-intensive classification processes, and the lack of real-time support tools. Traditional guides or manual search methods are inefficient and inaccessible to many users.

### Solution:

The project "Enchanted Wings: Marvels of Butterfly Species" presents an end-to-end AI-powered butterfly classification system:

- A VGG16-based deep learning model trained on a structured dataset (/dataset/train) organized by butterfly species.
- A user-friendly Flask web application (app.py) with a clean frontend using HTML templates (/templates) for real-time butterfly image uploads and predictions.
- Images uploaded by users are handled through a secure file system (/static/uploads) for classification.
- A pre-trained model (vgg16\_model.h5) and its corresponding species label mapping (class\_indices.json) are used to ensure accurate predictions.
- The train\_model.py script provides the complete training pipeline for reproducibility and updates.

## Problem-Solution fit canvas 2.0

Purpose / Vision	
<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Researchers, ecologists, biology students, conservation NGO'S, citizen scientists, and nature enthusiasts	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> Limited internet access in field, lack of species knowledge, limited access to butterfly experts, time constraints in research
<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Identify butterfly species quickly and accurately from images, support biodiversity tracking, and aid ecological studies	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> Butterfly species are highly diverse and often visually similar; traditional ID methods are slow, subjective, and require expert input
<b>3. TRIGGERS</b> <span>TR</span> Seeing a butterfly in the field, needing quick identification for research, interest in learning species, image posted on social media	<b>10. YOUR SOLUTION</b> <span>SL</span> An AI-powered web app using VGG16 model that classifies butterfly species from uploaded images in real-time, offering speed, accuracy, and ease of access for both experts and enthusiasts
<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> Before: Confused, unsure, overwhelmed with species info After: Informed, excited, confident in species recognition	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Printed field guides, online identification forums, manual comparison with online image results, generic image recognition tools
<b>7. BEHAVIOUR</b> <span>BE</span> Take butterfly photos, upload them online or compare manually with images, post on forums asking for help	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> 8.1 ONLINE Use of apps, Kaggle datasets, Flask web tool, Google searches, YouTube tutorials, GitHub 8.2 OFFLINE Nature walks, printed guides, university labs, biodiversity workshops, field research expeditions

### Outcome for Users:

- Educators & Students: Instantly identify butterfly species through a web interface—boosting engagement and learning.
- Researchers & Conservationists: Quickly classify new samples, aiding ecological surveys and biodiversity tracking.
- Nature Enthusiasts: Easily explore butterfly species using only a camera and a browser.

### Repository Resource:

<https://github.com/JeevanKumar009/Enchanted-Wings-Marvels-of-Butterfly-Species-Project>