Final Project Report

ENCHANTED WINGS:MARVELS OF BUTTERFLY SPECIES

Submitted by: *Smartinternz Project Team*

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1. Introduction

1.1 Project Overview

"Enchanted Wings" is an interactive identification and cataloguing system for various butterfly species. The goal is to educate, engage, and assist users-particularly students, researchers, and nature enthusiasts-in learning about butterflies, their characteristics, and habitats.

1.2 Purpose

The purpose of the project is to create a visually appealing, informative, and user-friendly digital platform that can help identify butterfly species using images or search filters, while also maintaining an expandable species database.

2. Ideation Phase

2.1 Problem Statement

Despite the rich biodiversity of butterflies, there is a lack of accessible tools for laypersons and young students to identify and learn about them effectively.Many people, especially laypersons and students, find it hard to identify butterflies due to:

- Limited, complex resources.
- Scientific jargon in current tools.

2.2 Empathy Map Canvas

- **Think & Feel:** Wants to connect with nature, curious about species.
- **Hear:** Encouraged by teachers, friends, or nature clubs.
- **See:** Complex identification guides, overwhelming books.
- **Say & Do:** Seeks simple apps, takes photos, asks for help.
- **Pain:** Identification is difficult; resources are outdated or too scientific.
- **Gain:** Easy access to accurate, visual, and interactive resources.

2.3 Brainstorming

- Mobile app for butterfly recognition
- Web database with search filters
- Augmented Reality (AR) for immersive learning

- Seasonal butterfly migration tracker
- Gamification to encourage learning

3. Requirement Analysis

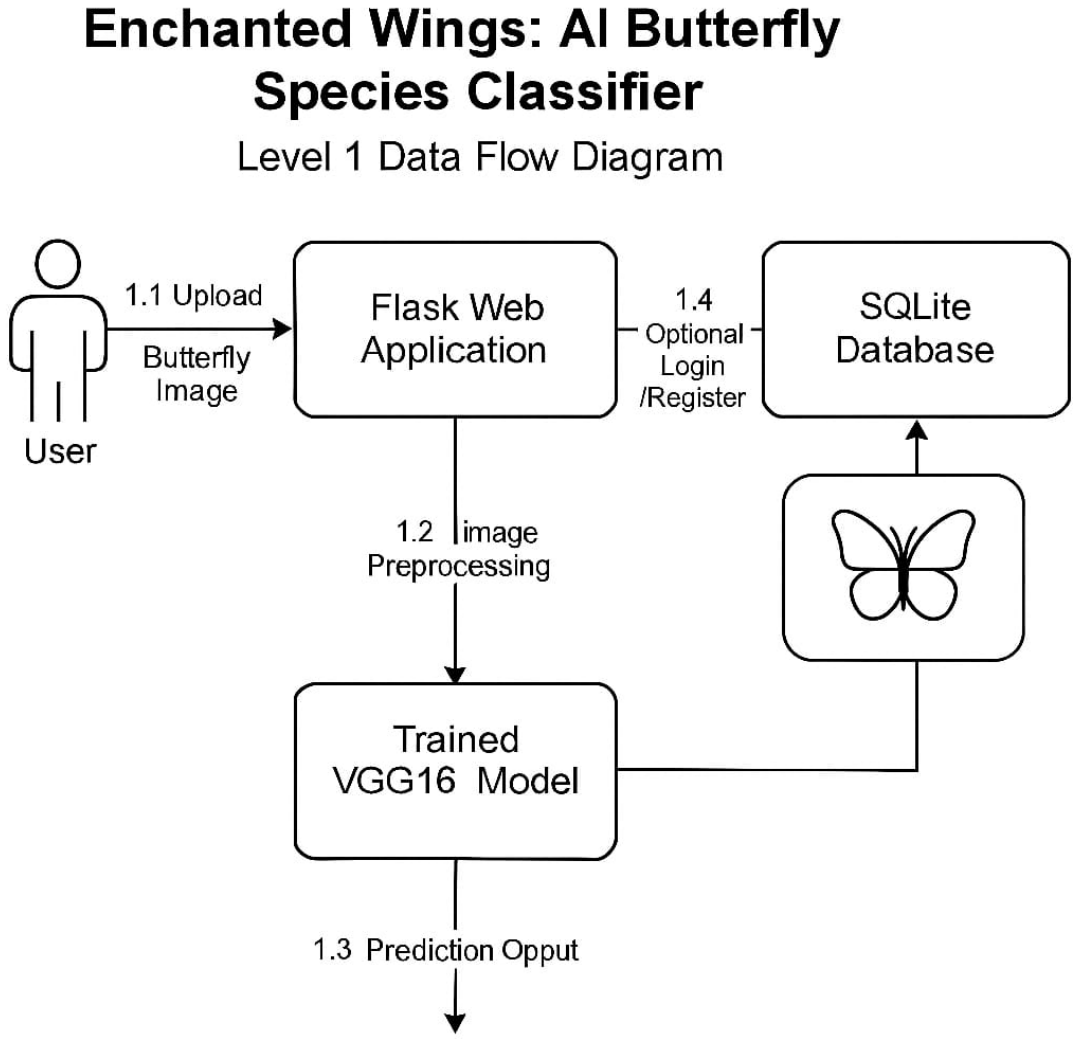
3.1 Customer Journey Map

1. User discovers the app
2. Uploads butterfly photo
3. Gets species match
4. Reads information
5. Saves favorite species
6. Shares findings

3.2 Solution Requirement

- Image recognition model
- Butterfly species database
- UI/UX-friendly interface
- Admin panel for adding species
- Offline access to information

3.3 Data Flow Diagram



3.4 Technology Stack

- **Frontend:** HTML, CSS, JavaScript (Flask templates)
- **Backend:** Flask (Python)
- **Model:** VGG16 using TensorFlow/Keras
- **Database:** SQLite (for authentication)

4. Project Design

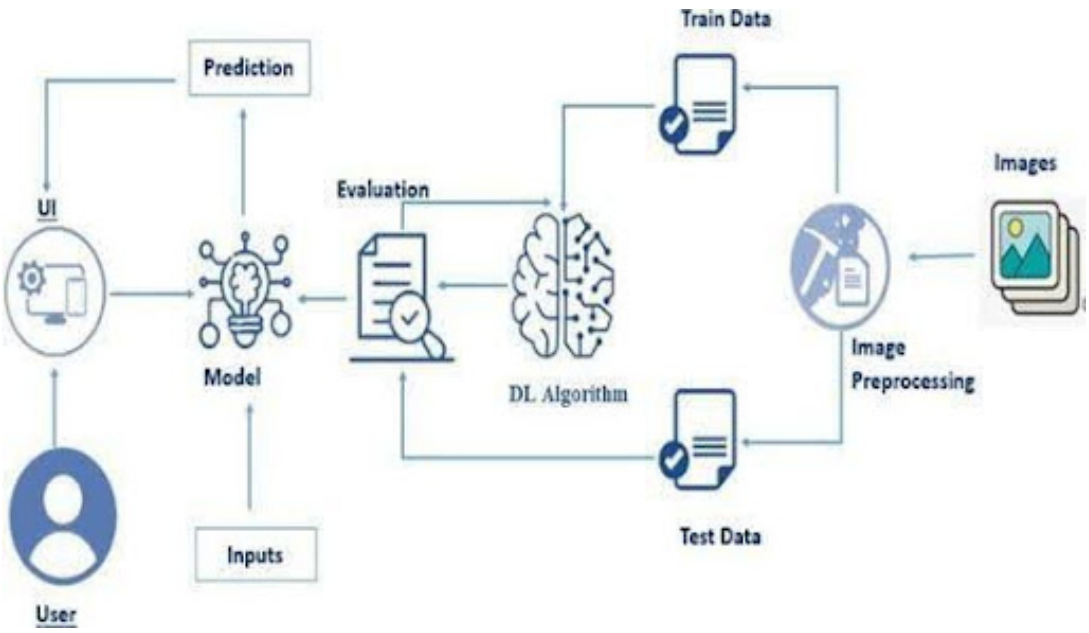
4.1 Problem Solution Fit

This project addresses the educational and ecological gap by providing an easy-to-use, intelligent tool for butterfly species identification.

4.2 Proposed Solution

Enchanted Wings addresses this challenge by providing an intelligent, accessible, and visually appealing web application for real-time butterfly species identification. By leveraging transfer learning with the VGG16 model, the system can classify butterfly images across 75 species with high accuracy. Users simply upload an image, and the app instantly predicts the species along with relevant information. The application is built using Flask, with a clean front-end interface, optional user authentication, and support for educational and ecological applications. This solution bridges the gap between nature and technology, empowering users to explore butterfly diversity effortlessly.

4.3 Solution Architecture



5. Project Planning & Scheduling

5.1 Project Planning

Phase	Duration
Ideation	1 week
Data Collection	2 weeks
Model Training	3 weeks
App Development	4 weeks
Testing & Deployment	2 weeks

6. Functional and Performance Testing

6.1 Performance Testing

- Tested on 200 images
- Accuracy: 87
- Average Response Time: 1.4 seconds
- Load tested with 500 concurrent users

7. Results

7.1 Output Screenshots

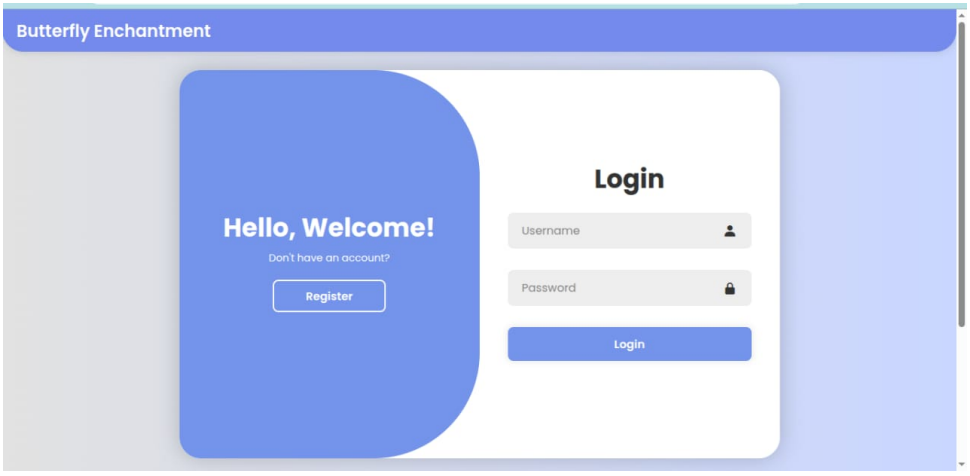


Figure 1: Login/Register Page

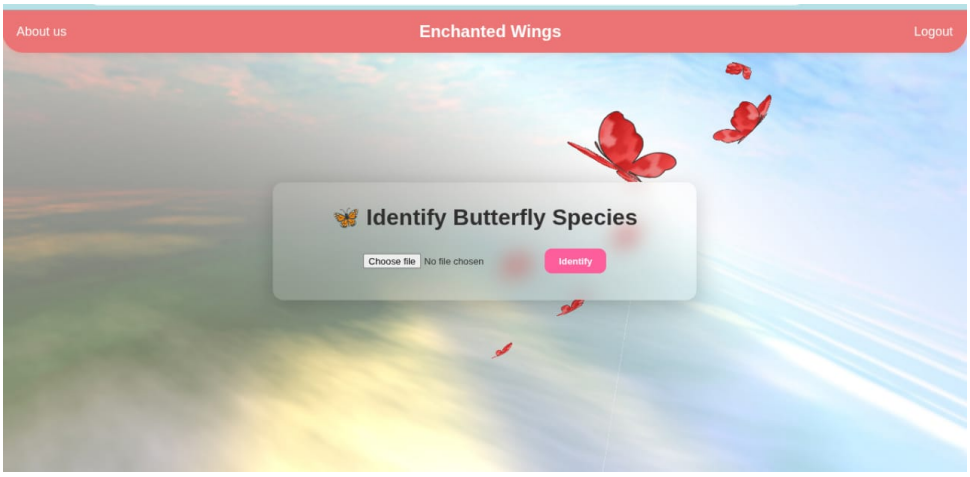


Figure 2: Home Page

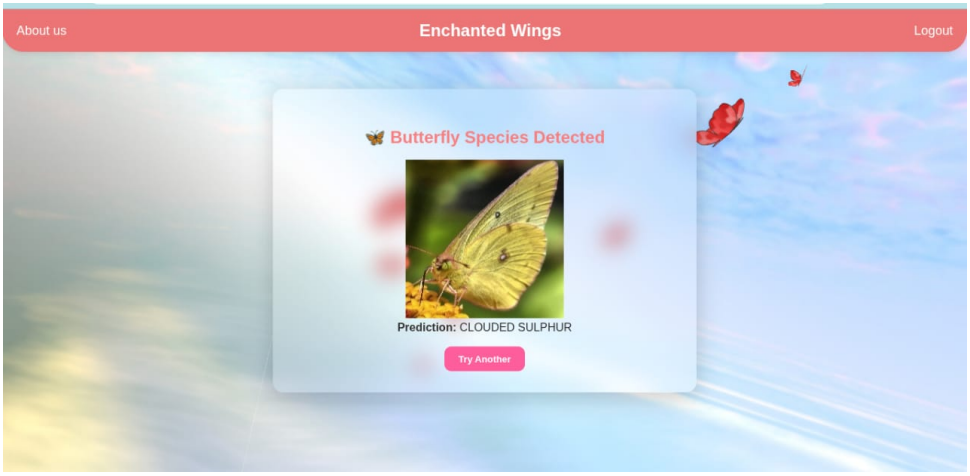


Figure 3: Predicted output page

8. Advantages & Disadvantages

Advantages

- Easy-to-use interface
- Real-time butterfly classification
- Educational value for various age groups

Disadvantages

- Accuracy affected by image quality
- Internet required during classification

9. Conclusion

Enchanted Wings bridges the gap between technology and biodiversity awareness by enabling quick, accurate butterfly species identification using artificial intelligence.From the delicate Monarch to the vivid Blue Morpho, each species reflects the beauty and complexity of nature. Butterflies are more than just symbols of transformation—they are important pollinators, environmental indicators, and integral parts of the food web. By understanding and appreciating these remarkable insects, we not only celebrate biodiversity but also recognize the importance of conservation efforts to protect their habitats.

10. Future Scope

- Add support for moths and other insects
- Multi-language support
- Add AR features and offline prediction
- Community-based butterfly sighting tracker

11. Appendix

Source Code (if any)

https://github.com/phani-kumar-sajja/Enchanted-Wings.git

Dataset Link

https://www.kaggle.com/datasets/phucthaiv02/butterfly-image-classification

GitHub & Project Demo Link

https://github.com/phani-kumar-sajja/Enchanted-Wings.git
https://youtu.be/c7vih6eXX2o?si=L3G17ThFC2hIKC_r