ENCHANTED WINGS: Marvels of Butterfly Species

# Team Details

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# Overview

"Enchanted Wings" is a deep learning-based web application designed to classify butterfly species from images. The system leverages a TensorFlow Lite model for lightweight inference and provides an intuitive interface for users to upload butterfly images and receive real-time predictions.

# Features

- Homepage with butterfly-themed design and "GET STARTED" button  
- Navigation bar with links: HOME, ABOUT, PREDICT  
- About Page offering information about butterflies and their diversity  
- Predict Page for uploading butterfly images and receiving species classification  
- Responsive Design suitable for various screen sizes

# Technology Stack

- Frontend: HTML, CSS (with inline styling), Bootstrap (optional for future enhancements)  
- Backend: Python with Flask  
- Machine Learning: TensorFlow Lite model (.tflite)  
- Image Processing: OpenCV (for reading and preprocessing images)

# Directory Structure

project/  
├── binary\_dataset/ # Binary classification dataset (butterfly vs non-butterfly)  
├── dataset/ # Multi-class butterfly image dataset  
├── static/ # Static files (images, CSS)  
│ └── butterfly.jpg  
├── templates/ # HTML templates for Flask rendering  
│ ├── about.html  
│ ├── home.html  
│ └── index.html  
├── uploads/ # Directory for storing uploaded images  
├── binary\_butterfly\_model.tflite # TFLite model for binary classification  
├── binary\_class\_indices.npy # Class labels for binary model  
├── butterfly\_model\_best.h5 # Best-trained Keras model (multi-class)  
├── butterfly\_model\_initial.h5 # Initial trained Keras model  
├── butterfly\_model.tflite # Final deployed TFLite model  
├── class\_indices.npy # Label mappings for species  
├── confusion\_matrix.png # Evaluation result image  
├── convert\_tflite.py # Script to convert model to TFLite  
├── data\_preparation.py # Data loading and preprocessing logic  
├── flask\_app.py # Main Flask backend application  
├── model\_configuration.py # Model architecture definition  
├── model\_evaluation.py # Model testing and evaluation  
└── model\_training.py # Model training script

# Web Pages

1. Homepage (home.html): Background, welcome message, description, 'GET STARTED' button.

2. About Page (about.html): Info about butterflies and classification importance.

3. Predict Page (index.html): Image upload form, prediction result and confidence display.

# Deployment Suggestions

- Host using PythonAnywhere, Heroku, or Render  
- Ensure static and template folders are configured  
- Enable file upload limits and validation in production

# Future Enhancements

- Add image augmentation and preprocessing feedback  
- Expand species dataset  
- Add downloadable PDF reports  
- Add user authentication and history

# Credits

- Dataset source: Butterfly-classification dataset  
- Developed by: Katikala Mohana Krishna, K Madhu Kalyan, Kadali Pavan Ramu, Kaila Thanmai  
- Tools: TensorFlow, Flask, OpenCV, HTML/CSS

Enchanted Wings blends biology and AI, offering an engaging tool to explore the marvels of butterfly species.