Project Report Format

1. **INTRODUCTION**
   1.1 Project Overview

   This project aims to develop a deep learning–based web application to classify butterfly species using image recognition. The model is trained using the VGG16 convolutional neural network and deployed with a Flask-based web interface.

   1.2 Purpose

   The purpose of this system is to assist researchers, enthusiasts, and conservationists in identifying butterfly species accurately using computer vision and machine learning.
2. **IDEATION PHASE**
   2.1 Problem Statement

   Manually identifying butterfly species requires expert knowledge. This project solves the problem by automating the recognition process using a trained AI model.

   2.2Empathy Map Canvas

   - **Who**: Nature photographers, researchers, biology students
   - **Needs**: Quick, accurate identification
   - **Pain Points**: Time-consuming identification, high error rate for non-experts
   - **Gains**: Instant recognition, educational value

   2.3Brainstorming

   - Deep learning model (VGG16, CNN)
   - Web interface (Flask + HTML + Bootstrap)
   - Real-world dataset (Kaggle butterfly dataset)
3. **REQUIREMENT ANALYSIS**
   3.1 Customer Journey map

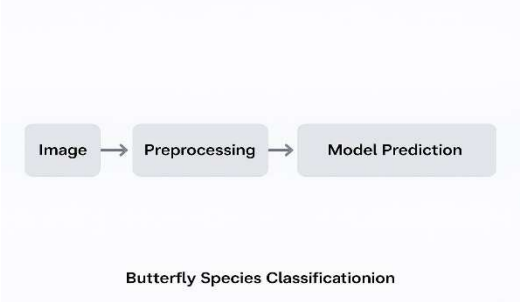
Step	Action	Emotion	Touchpoint
1	Uploads butterfly image	Curious	Web form
2	Waits for prediction	Anxious	Loading screen
3	Views species name	Excited	Result page

   3.2 Solution Requirement

   - Functional: Image upload, prediction, display
   - Non-functional: Fast response, responsive UI, accurate predictions

   3.3 Data Flow Diagram

   Image → Preprocessing → Model Prediction → Result Page



3.4 Technology Stack

- **Frontend**: HTML, CSS, Bootstrap
- **Backend**: Flask (Python)
- **Model**: VGG16 (TensorFlow/Keras)
- **Dataset**: Butterfly Species Dataset (Kaggle)
- **Deployment**: Localhost/Web server

4. PROJECT DESIGN

4.1 Problem Solution Fit

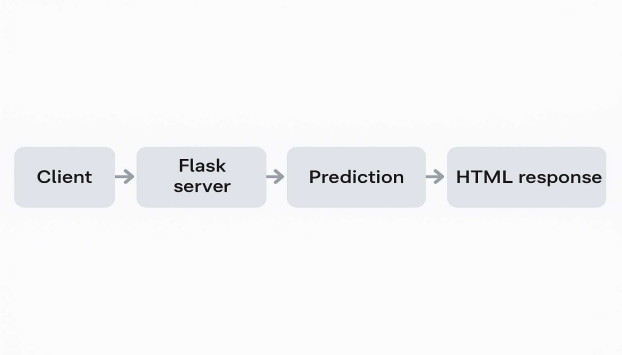
This solution meets the demand for automatic butterfly classification in an accessible, user-friendly way.

4.2 Proposed Solution

Upload a butterfly image → Process with VGG16 model → Show species name with image.

4.3 Solution Architecture

Client → Flask server → Model (VGG16) → Prediction → HTML response



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Week	Task
1	Dataset collection, model selection
2	Model training and testing
3	Flask app development
4	Frontend and UI design
5	Integration and testing
6	Final deployment & report writing

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

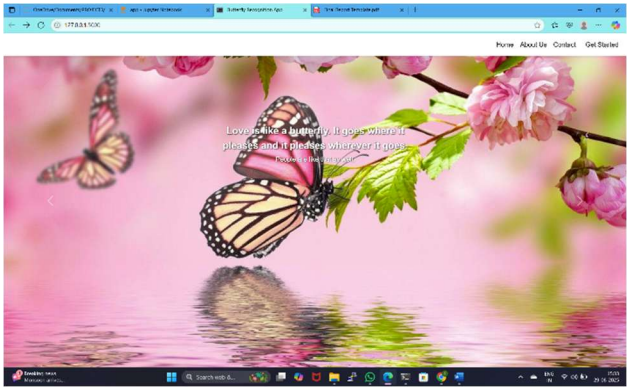
Metric	Result
Training Accuracy	95.32%
Validation Accuracy	91.76%
Fine-Tuned Accuracy	93.45%

Metric	Result
Model Size	~68MB
Prediction Time	<1 second

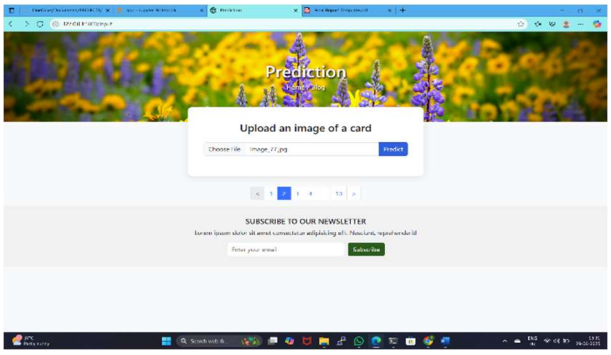
7. RESULTS

7.1 Output Screenshots

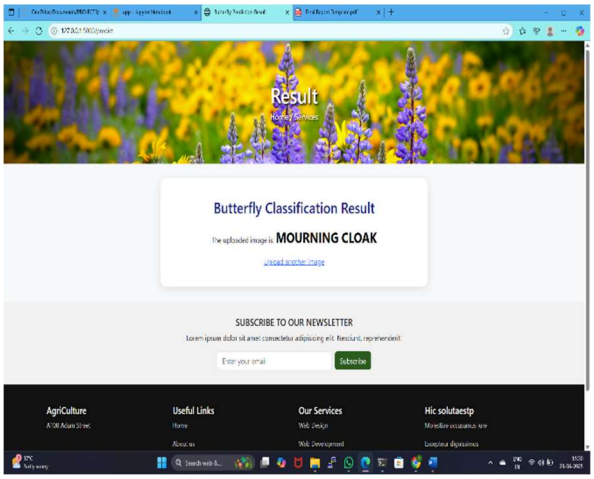
Index.html



Input.html



Output.html



8. ADVANTAGES & DISADVANTAGES

Advantages

- Accurate classification using VGG16
- User-friendly web interface
- Fast predictions

Disadvantages

- Requires internet or local server
- Only classifies known species from dataset
- Slightly large model size for mobile

9. CONCLUSION

This butterfly classification system combines deep learning and web development to deliver a user-friendly tool for real-time species identification. It improves accessibility for non-experts and enhances learning and research.

10. FUTURE SCOPE

- Add more species to the dataset
- Deploy as a mobile app
- Use real-time camera feed for prediction
- Improve accuracy using newer architectures (EfficientNet, MobileNetV3)

11. APPENDIX

Source Code(if any)

Dataset Link

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

GitHub & Project Demo Link

https://github.com/TanderiVishnuPriya/Enchanted-Wings-Marvels-of-Butterfly-Species/tree/main