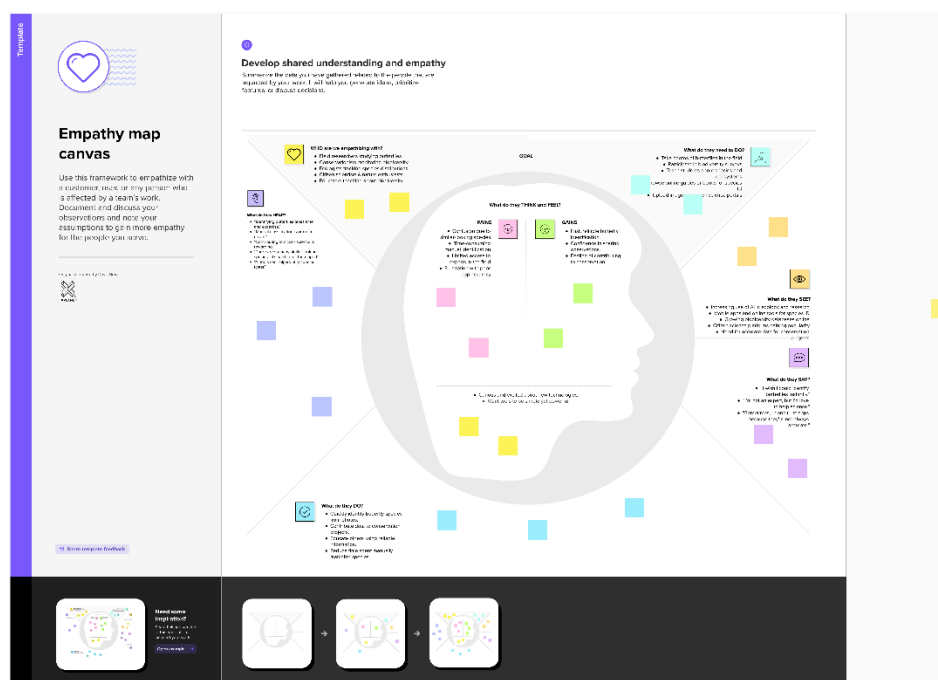


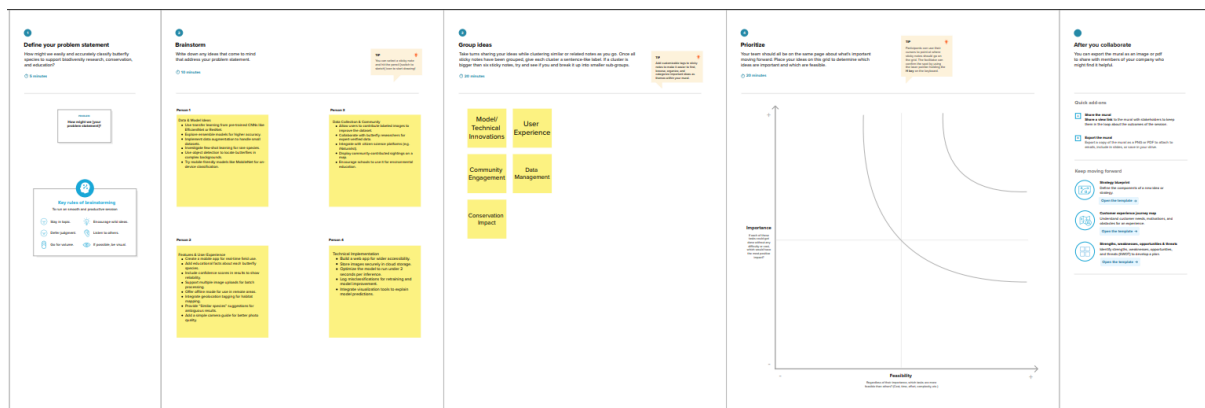
Enchanted Wings: Marvels of Butterfly Species

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2.3 Brainstorming



REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Stage	Actions	Pain Points	Opportunities
Discover	Learns about the tool	Uncertainty about tool's accuracy	Education and promotion
Capture Image	Takes photo of butterfly	Poor image quality, motion blur	Provide photo guidelines
Classify	Uploads image for classification	Slow processing	Use efficient models
Learn	Reads species info	Limited details	Provide rich, engaging educational content
Contribute	Shares data with researchers	Privacy concerns	Anonymized data collection

3.2 Solution Requirement

Functional Requirements

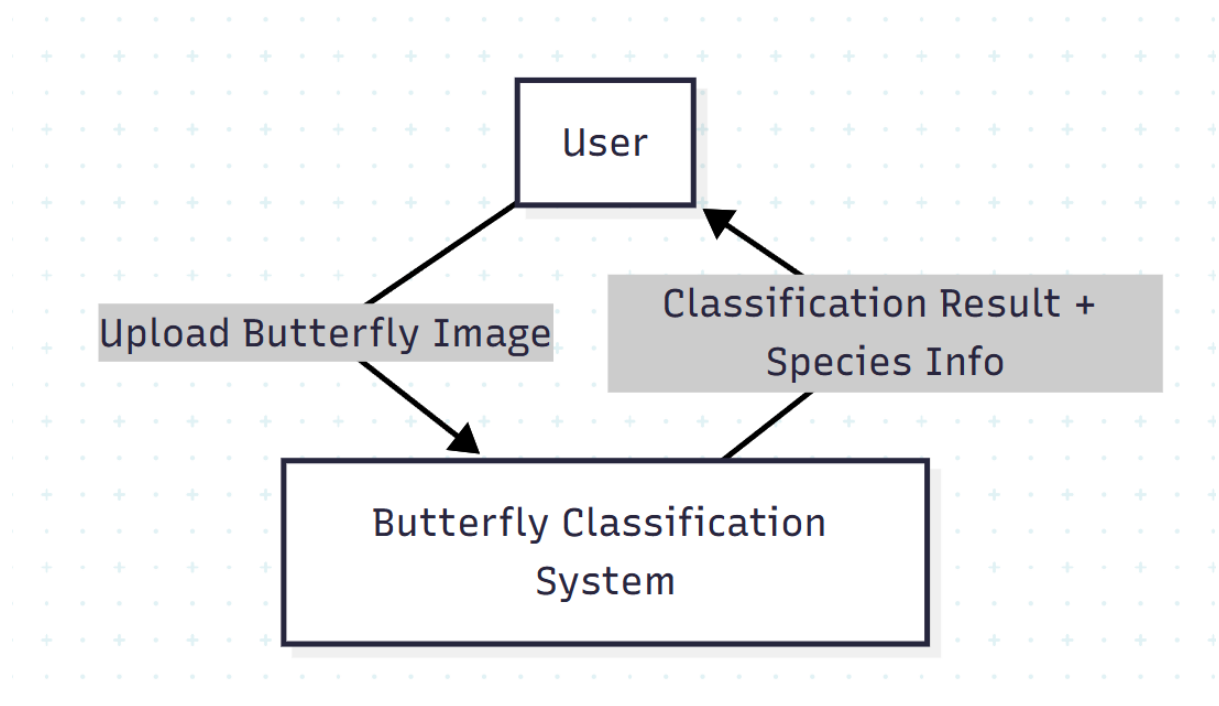
- Accept butterfly images as input.
- Classify images into one of 75 species.
- Display classification results with confidence scores.
- Provide species information and educational content.
- Allow bulk image classification.

Non-Functional Requirements

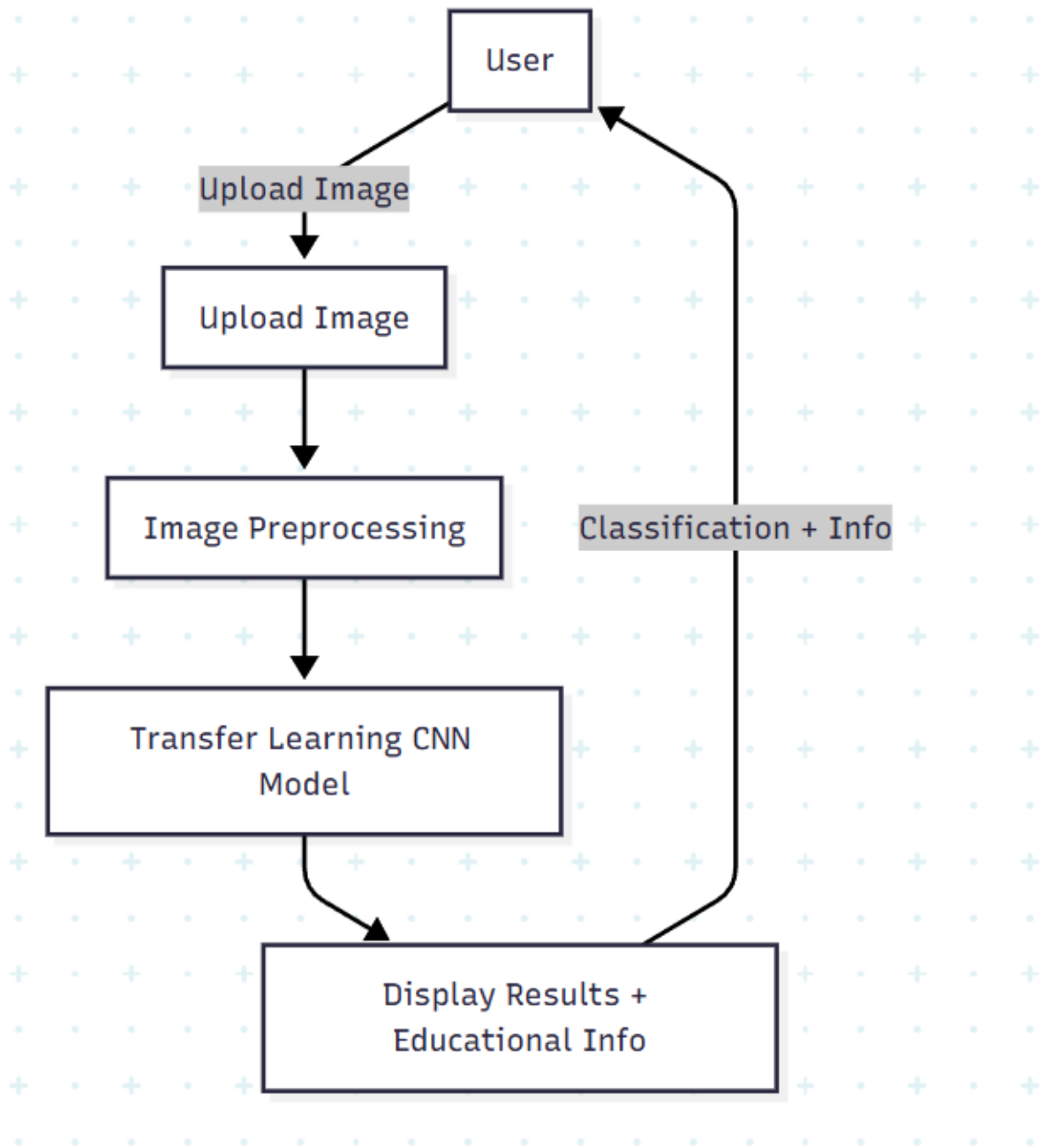
- High classification accuracy (>90%).
- Fast processing time (<2 seconds per image).
- User-friendly interface.
- Scalable architecture for large datasets.
- Mobile-friendly design for field usage.

3.3 Data Flow Diagram

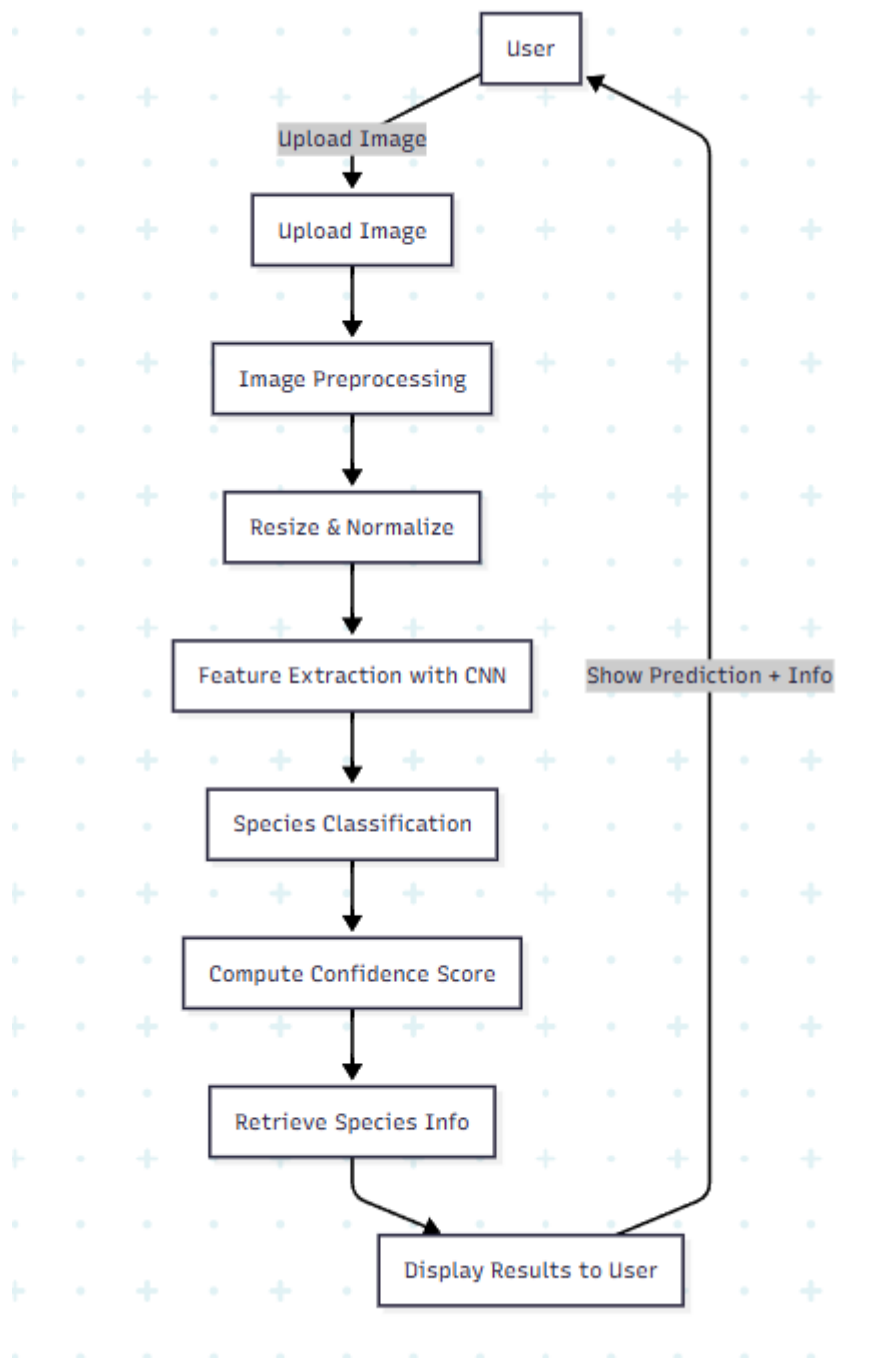
Level 0



Level 1



Level 2



3.4 Technology Stack

- **Programming Language:** Python
- **Libraries/Frameworks:** TensorFlow, Keras, NumPy, OpenCV, Matplotlib
- **Model Architecture:** Pre-trained CNNs (e.g., EfficientNet, ResNet, VGG16)
- **Deployment:** Flask/Django Web App, optional mobile integration
- **Data Storage:** Local file system or cloud storage for images and metadata

PROJECT DESIGN

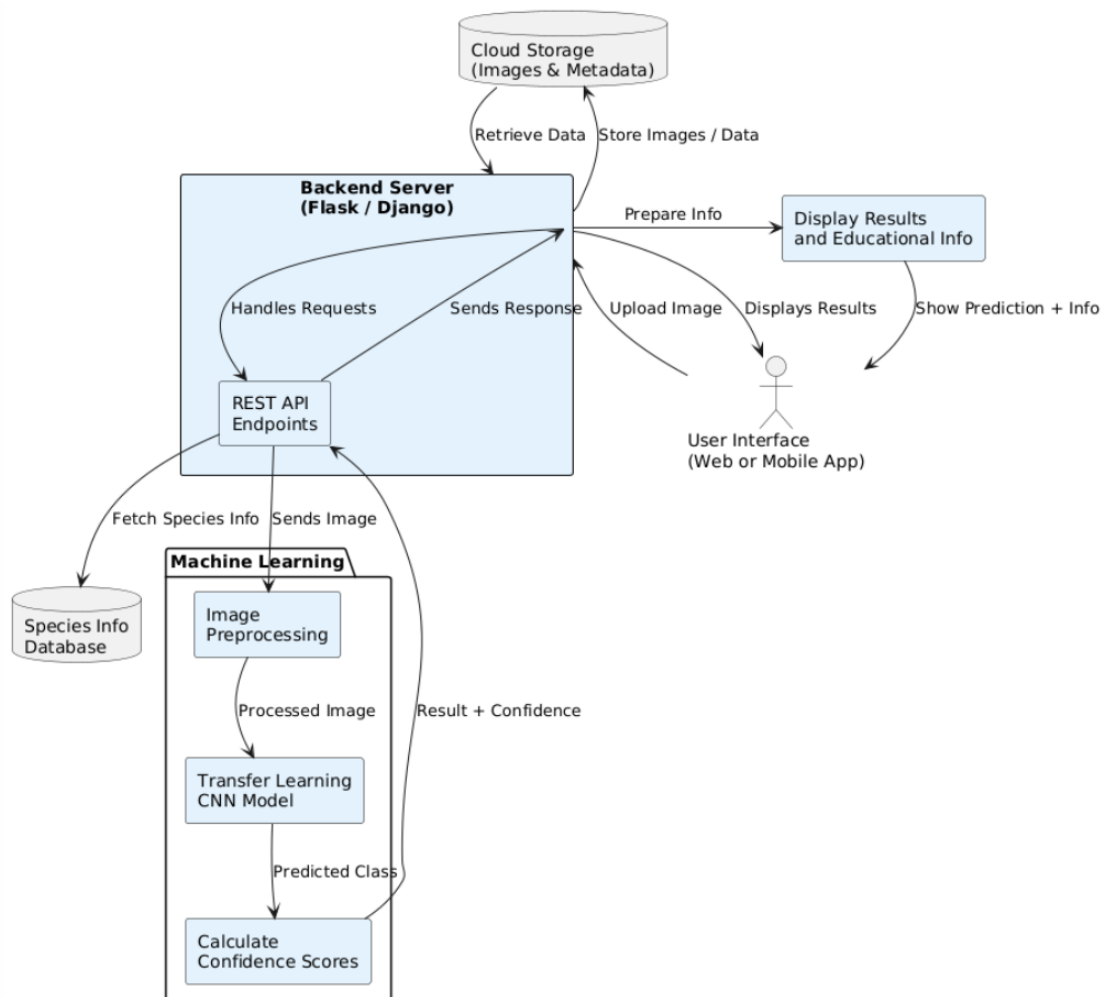
4.1 Problem Solution Fit

The problem of time-consuming manual butterfly identification is addressed through a transfer learning model that automates classification. The solution fits well for researchers, conservationists, and the public by saving time and improving accuracy.

4.2 Proposed Solution

- Leverage pre-trained CNNs for feature extraction.
- Fine-tune the model on butterfly image dataset.
- Develop a web or mobile interface for user interaction.
- Provide educational content alongside classification results.

4.3 Solution Architecture



PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Phase	Duration	Tasks
Data Collection & Cleaning	2 weeks	Gather dataset, clean images, organize folders
Model Development	3 weeks	Implement transfer learning, train and validate model
Interface Development	2 weeks	Create web/mobile UI for image upload & results display
Testing & Optimization	1 week	Test accuracy, optimize model size and speed
Documentation & Deployment	1 week	Write report, deploy app, prepare demo

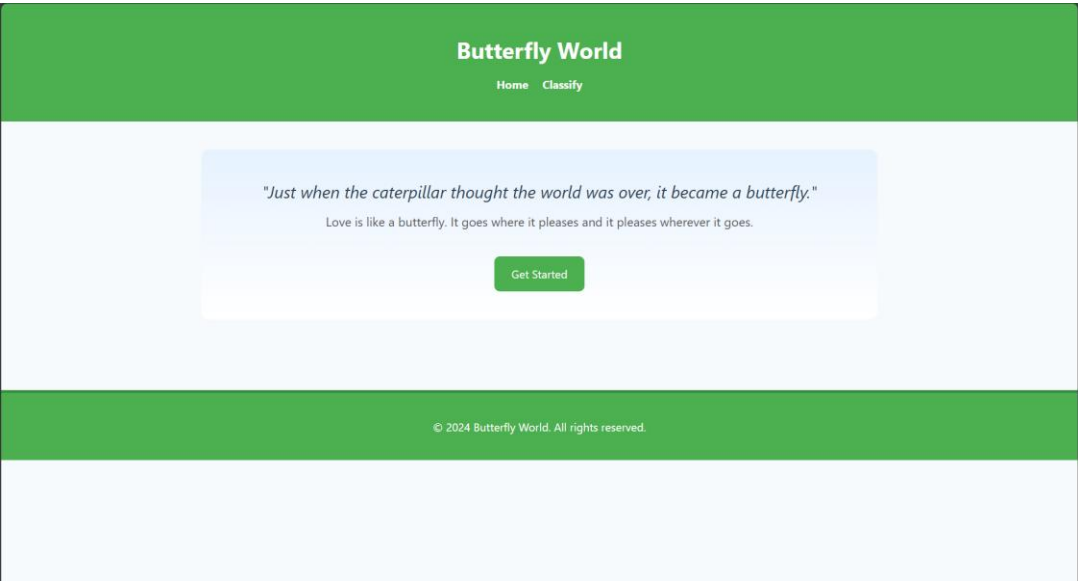
FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- **Accuracy:** Measured on validation and test datasets (~6499 images total).
- **Inference Time:** Evaluated to ensure classification under 2 seconds per image.
- **Stress Testing:** Tested with multiple concurrent image uploads.
- **Edge Cases:** Tested with low-quality and partially visible butterfly images.

RESULTS

7.1 Output Screenshots



Butterfly World

[Home](#) [Classify](#)

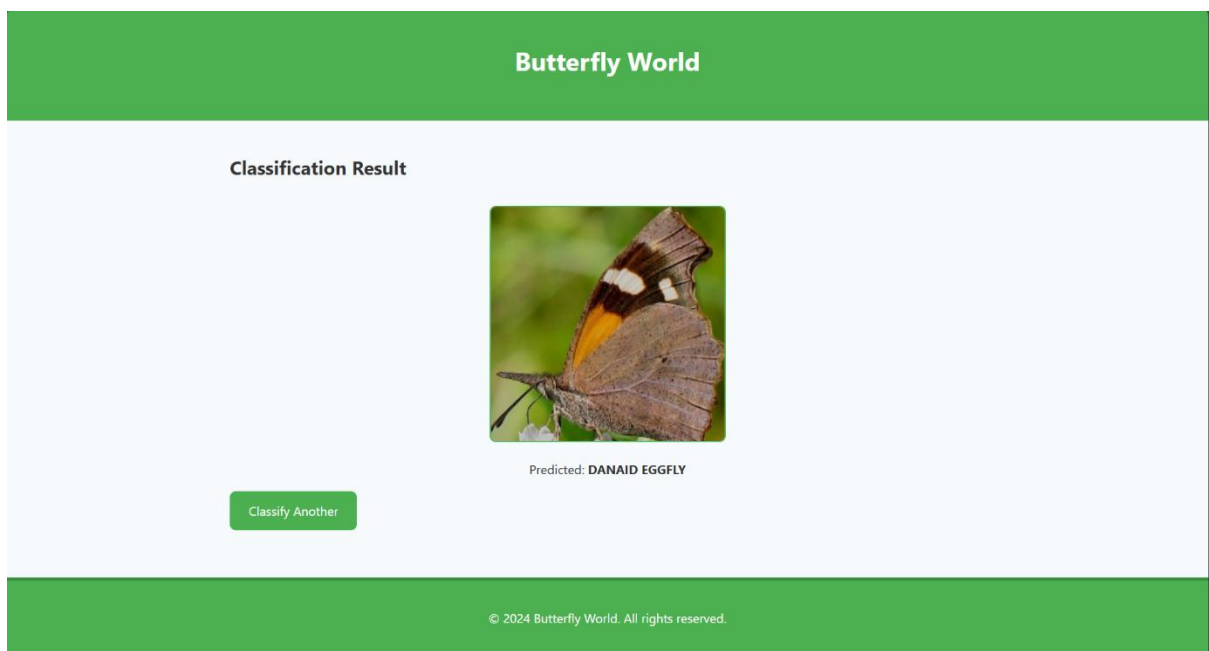
Upload a Butterfly Image

Choose File2.jpg

No file chosen

Classify

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8. ADVANTAGES & DISADVANTAGES

Advantages

- Accelerates butterfly identification
- Supports biodiversity and ecological research
- Educational tool for public engagement
- Easy to integrate into field research workflows
- Leverages powerful transfer learning architectures

Disadvantages

- Dependent on image quality
- Might misclassify visually similar species
- Requires periodic model updates with new data

CONCLUSION

Enchanted Wings: Marvels of Butterfly Species demonstrates how modern AI techniques like transfer learning can significantly contribute to biodiversity research and conservation. The project achieves high accuracy in classifying butterfly species and provides a valuable tool for researchers, educators, and citizen scientists. Future enhancements could include mobile app deployment, more species, and real-time identification capabilities.

FUTURE SCOPE

- Expand dataset to cover more butterfly species worldwide.
- Develop a dedicated mobile app for offline usage.
- Integrate geolocation tagging for habitat mapping.
- Enhance model robustness against poor image quality.
- Incorporate explainable AI to show how predictions are made.

APPENDIX

- **Source Code (if any):** [GitHub Repository Link] (provide your repo link here)
- **Dataset Link:** [Dataset Source] (e.g. Kaggle or custom dataset link)
- **GitHub & Project Demo Link:**
 - GitHub: [Your GitHub link]
 - Demo Video: [Demo link if available]