Fish Image Classification

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APPROACH

This project focuses on the classification of fish images into predefined categories using deep learning models.

The primary goal was to develop a model that accurately predicts the fish species based on uploaded images.

Multiple CNN architectures were evaluated (VGG16, MobileNetV2, InceptionV3, Xception, ResNet50)

A **Streamlit** application was built for real-time predictions.

DATA PREPROCESSING

The dataset used in this project contained **many images** across **[4,5] fish species**. Each image was resized to **224×224 pixels**, normalized to a pixel value range of **0–1**, and augmented with random rotations, zooming, and horizontal flips to improve model generalization.

Model & Methodology
 Transfer learning was applied using pre-trained CNN architectures from `tensorflow.keras.applications`. Five models — **VGG16**, **MobileNetV2**, **InceptionV3**, **Xception**, and **ResNet50** — were fine-tuned for the fish classification task. Performance was evaluated using **accuracy**, **precision**, **recall**, **F1-score**, and **confusion matrix** as the primary metrics.

Model Evaluation Results

MODEL	TEST ACCURACY	PRECISION	RECALL	F1-SCORE
VGG16	99%	99%	91%	91%
MOBILENETV2	97%	98%	96%	96%
RESNET50	25%	24%	19%	14%
INCEPTIONV3	99%	99%	91%	92%
XCEPTION	98%	99%	92%	94%

Analysis of Model Evaluation Results

VGG16: High test accuracy (99%) with good precision (99%), but recall is slightly lower (91%), which means it sometimes misses certain fish classes.

MobileNetV2: Slightly lower test accuracy (97%), but well-balanced precision (98%), recall (96%), and F1-score (96%), indicating consistent performance across classes.

ResNet50: Very poor performance (25% accuracy), with extremely low precision, recall, and F1-score. This model failed to classify the fish dataset properly — likely due to mismatch in training or inadequate fine-tuning.

InceptionV3: Excellent accuracy (99%), high precision (99%), and good recall (91%), similar to VGG16.

Xception: Strong performance with 98% accuracy, 99% precision, 92% recall, and the highest F1-score (94%), suggesting it balances precision and recall better than others.

BEST MODEL

Based on the **combined metrics** (accuracy, precision, recall, and F1-score), the **Xception model** appears to be the best choice:

- Very high accuracy (98%)

- Highest F1-score (94%), indicating a good balance between precision and recall

- Robust across most fish classes

Model Accuracy Comparison
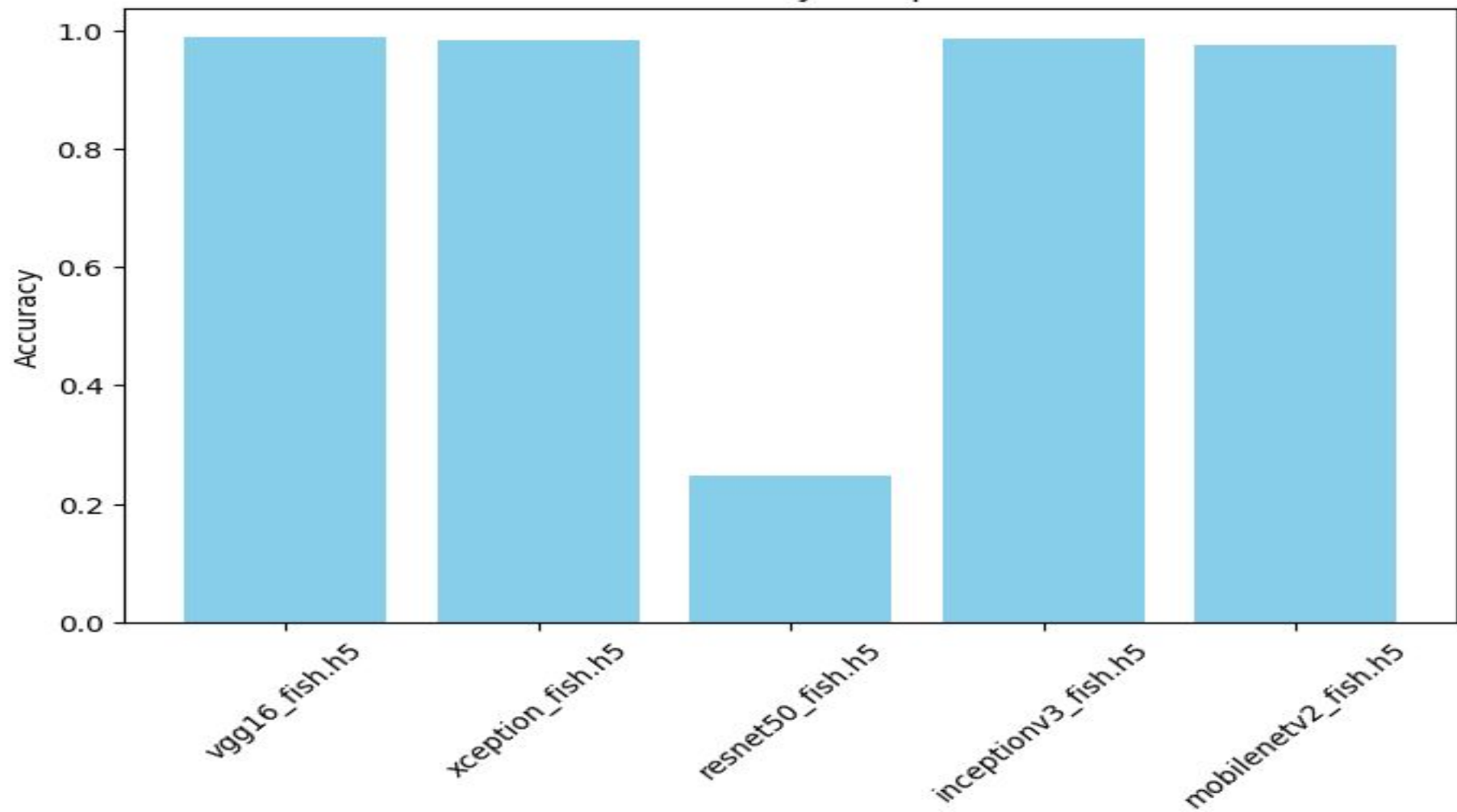
CONCLUSION

- The fish classification task was successfully solved using deep learning transfer learning models.

- While several models achieved high accuracy, **Xception** demonstrated the best overall performance in terms of balanced precision and recall.

- ResNet50 did not perform well, highlighting the importance of careful fine-tuning and dataset compatibility.

- For deployment or further analysis, **Xception** is recommended due to its high F1-score and consistent predictions across classes.