| **Project Title** | **Multiclass Fish Image Classification** |
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| **Skills take away From This Project** | **Deep Learning, Python, TensorFlow/Keras, Streamlit, Data Preprocessing, Transfer Learning, Model Evaluation, Visualization, and Model Deployment.** |
| **Domain** | **Image Classification** |

### **Problem Statement:**

This project focuses on classifying fish images into multiple categories using deep learning models. The task involves training a CNN from scratch and leveraging transfer learning with pre-trained models to enhance performance. The project also includes saving models for later use and deploying a Streamlit application to predict fish categories from user-uploaded images.

### **Business Use Cases:**

1. Enhanced Accuracy: Determine the best model architecture for fish image classification.
2. Deployment Ready: Create a user-friendly web application for real-time predictions.
3. Model Comparison: Evaluate and compare metrics across models to select the most suitable approach for the task.

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### **Approach:**

* Data Preprocessing and Augmentation
  + Rescale images to [0, 1] range.
  + Apply data augmentation techniques like rotation, zoom, and flipping to enhance model robustness.
* Model Training
  + Train a CNN model from scratch.
  + Experiment with five pre-trained models (e.g., VGG16, ResNet50, MobileNet, InceptionV3, EfficientNetB0).
  + Fine-tune the pre-trained models on the fish dataset.
  + Save the trained model (max accuracy model ) in .h5 or .pkl format for future use.
* Model Evaluation
  + Compare metrics such as accuracy, precision, recall, F1-score, and confusion matrix across all models.
  + Visualize training history (accuracy and loss) for each model.
* Deployment
  + Build a Streamlit application to:
    - Allow users to upload fish images.
    - Predict and display the fish category.
    - Provide model confidence scores.
* Documentation and Deliverables
  + Provide comprehensive documentation of the approach, code, and evaluation.
  + Create a GitHub repository with a detailed README.

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### **Dataset**

* The dataset consists of images of fish, categorized into folders by species. The dataset is loaded using TensorFlow's ImageDataGenerator for efficient processing.
* Dataset:[Data as Zip file](https://drive.google.com/drive/folders/1iKdOs4slf3XvNWkeSfsszhPRggfJ2qEd?usp=sharing)

### **Project Deliverables**

1. Trained Models: CNN and pre-trained models saved in .h5 or .pkl format.
2. Streamlit Application: Interactive web app for real-time predictions.
3. Python Scripts: For training, evaluation, and deployment.
4. Comparison Report: Metrics and insights from all models.
5. GitHub Repository: Well-documented codebase.

### **Project Guidelines:**

* **Follow coding standards**: Consistent naming conventions, modular code.
* **Data validation**: Ensure all data is accurate and complete.