

Mini Project—5

Multiclass Fish Image Classification

Introduction

We have a dataset with 11 classes(folders) where each file contains images specific to the fish breed. The aim of this project is to predict the fish name and demonstrate the fine tuned pretrained model's performance based on prediction on a Streamlit application.

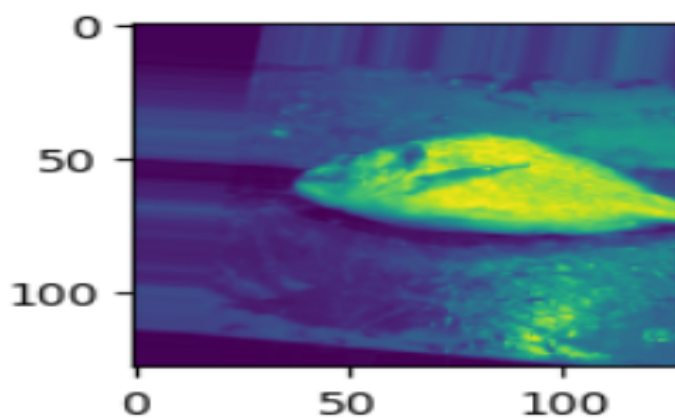
Approach

DATA PREPROCESSING AND AUGMENTATION

I have leveraged the ImageDataGenerator for data augmentation.

- Image augmentation is a technique of applying different transformations to original images. These help incorporate a level of variation in the dataset which allows your model to generalize better on unseen data. Also, the model becomes more robust when it is trained on new, slightly altered images.

animal fish



animal fish

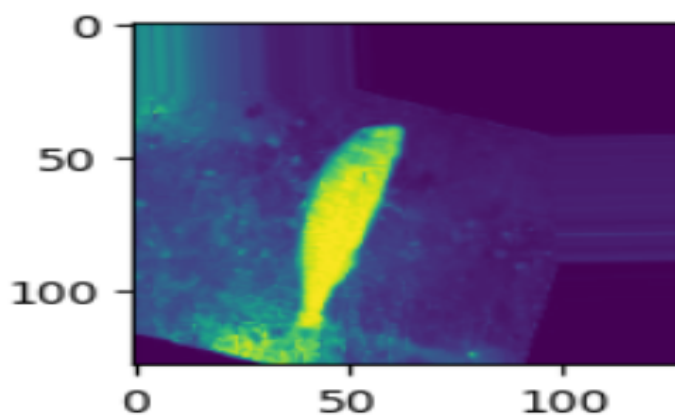


Fig: Glimpse of Fish Images on.

Model Training

I have built a custom CNN model and implemented 5 pretrained models. The models which I implemented are:

- VGG16
- ResNet50
- MobileNet
- InceptionV3
- EfficientNetB0

After training, based on the accuracy of the model I saved the best model in this case VGG 16 which has 94% accuracy as a .h5 format for deployment.

Model	Training Accuracy	Validation Accuracy
CNN	90.5%	94.5%
VGG 16	94.6%	94.3%
ResNet	97.6%	89.9%
MobileNet	98.7%	97.2%
InceptionV3	88.1%	91.3%
EfficientNetB0	98.2%	17.1%

MODEL EVALUATION

I have plotted Accuracy and Loss curve for each model as follows

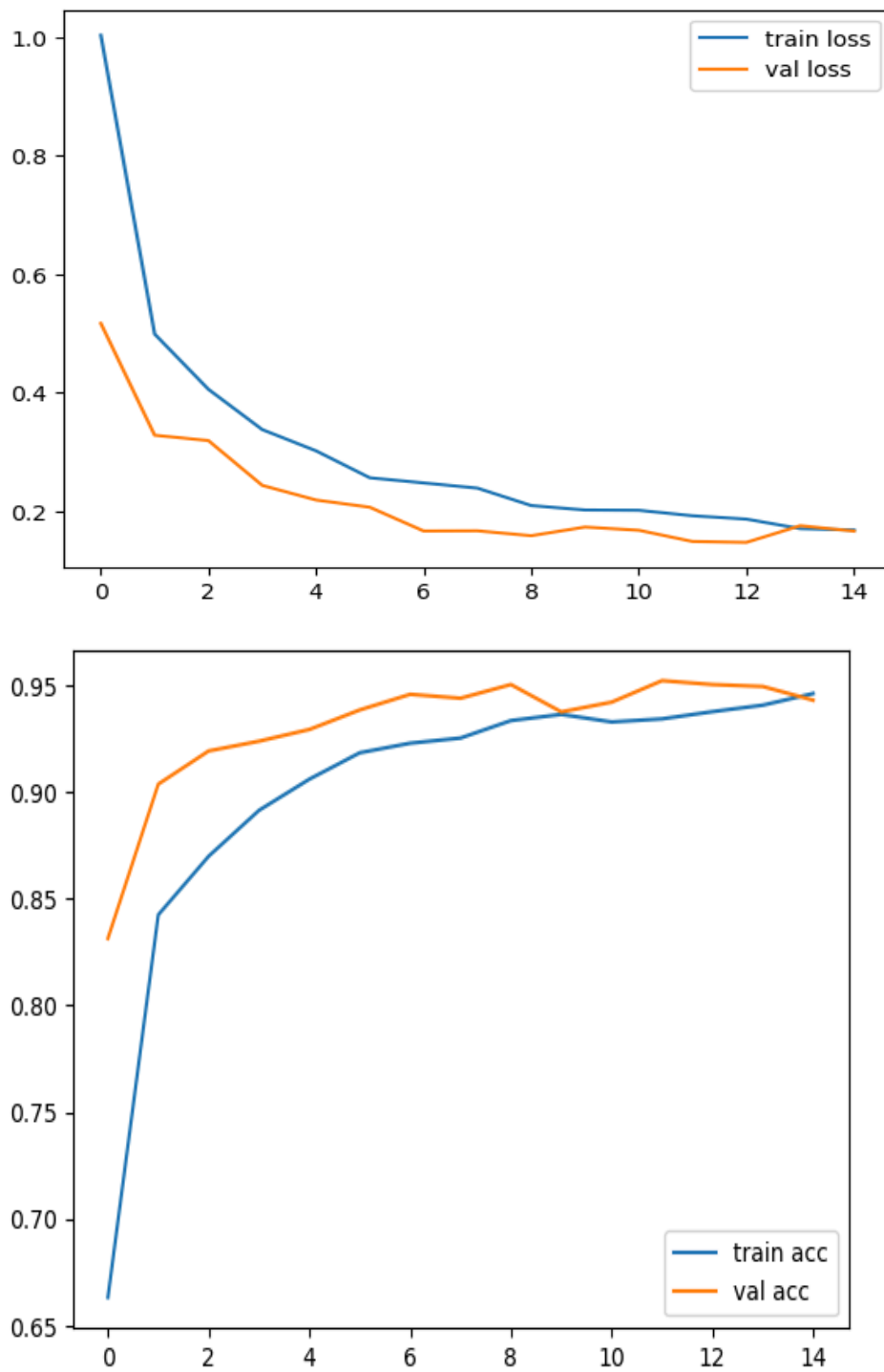
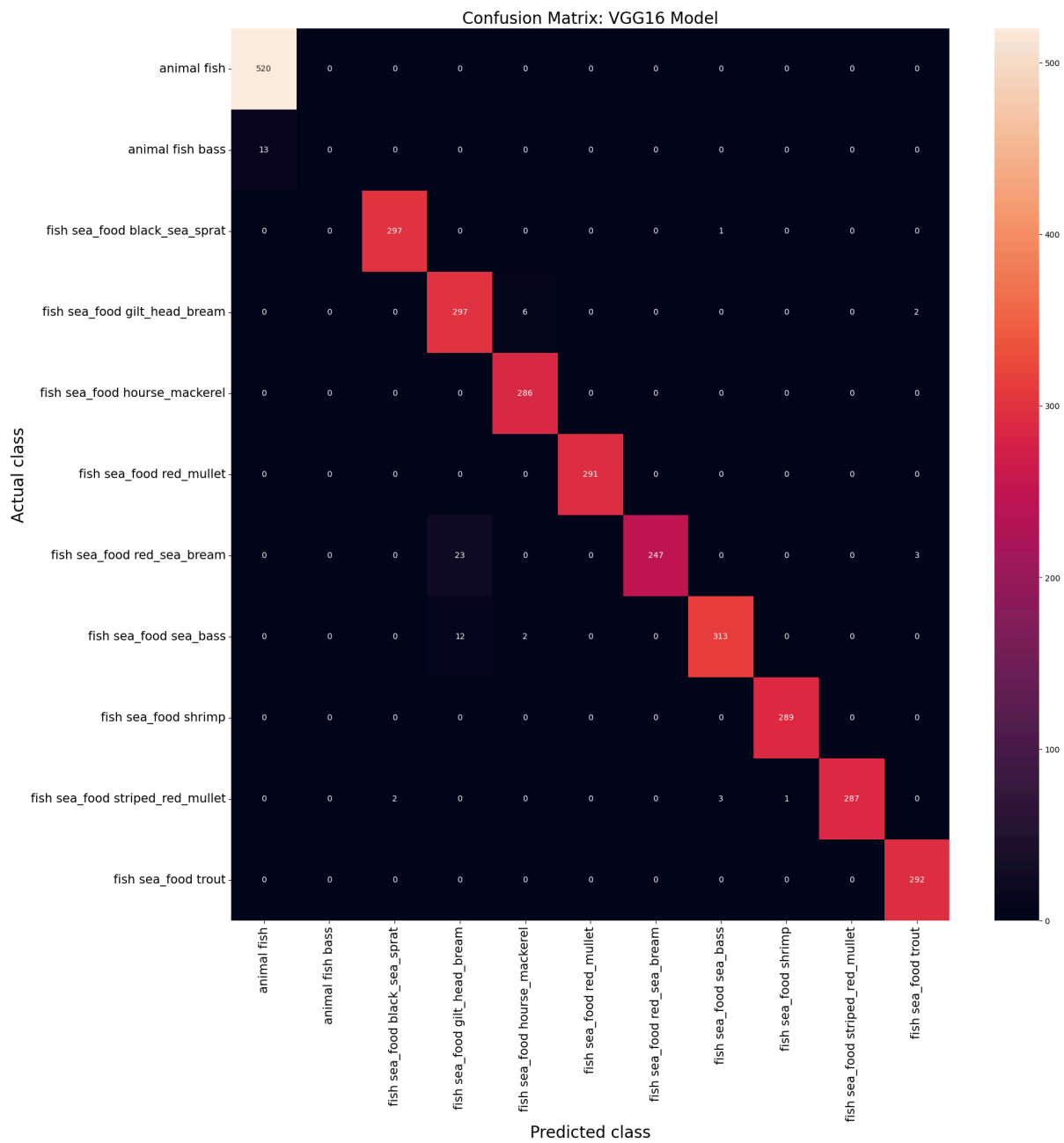
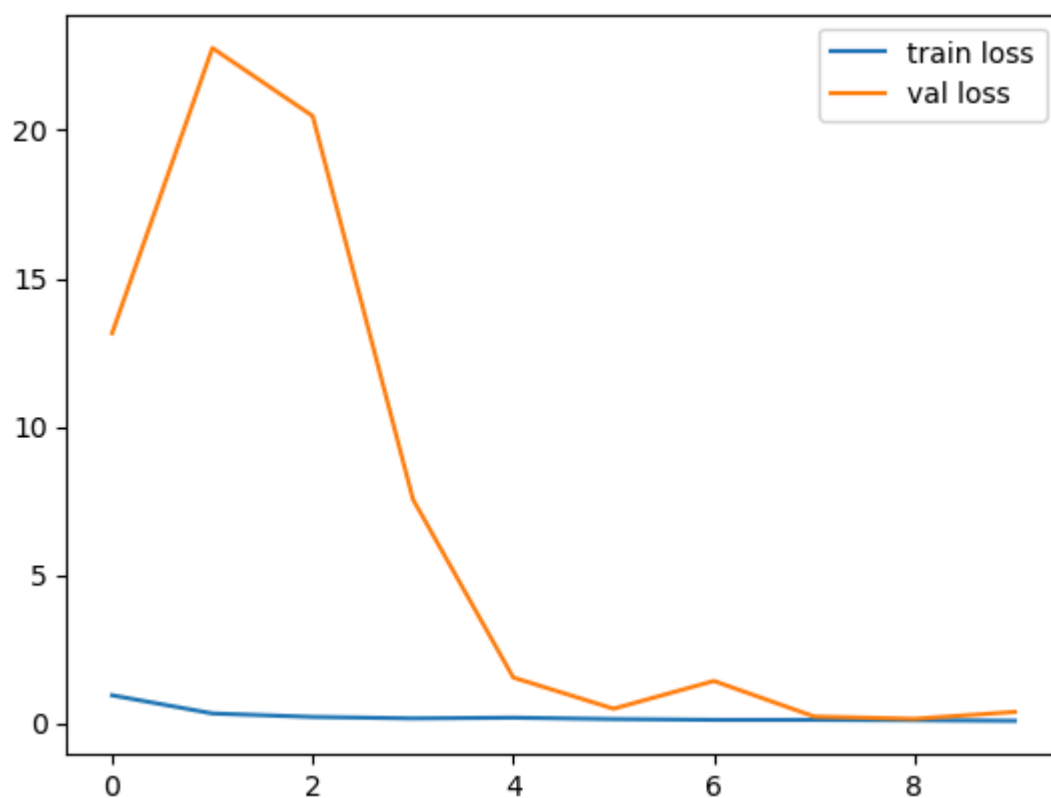


Fig:VGG16 Accuracy and Loss curve



CLASSIFICATION REPORT

	precision	recall	f1-score	support
0	0.98	1.00	0.99	520
1	0.00	0.00	0.00	13
2	0.99	1.00	0.99	298
3	0.89	0.97	0.93	305
4	0.97	1.00	0.99	286
5	1.00	1.00	1.00	291
6	1.00	0.90	0.95	273
7	0.99	0.96	0.97	327
8	1.00	1.00	1.00	289
9	1.00	0.98	0.99	293
10	0.98	1.00	0.99	292
accuracy			0.98	3187
macro avg	0.89	0.89	0.89	3187
weighted avg	0.98	0.98	0.98	3187



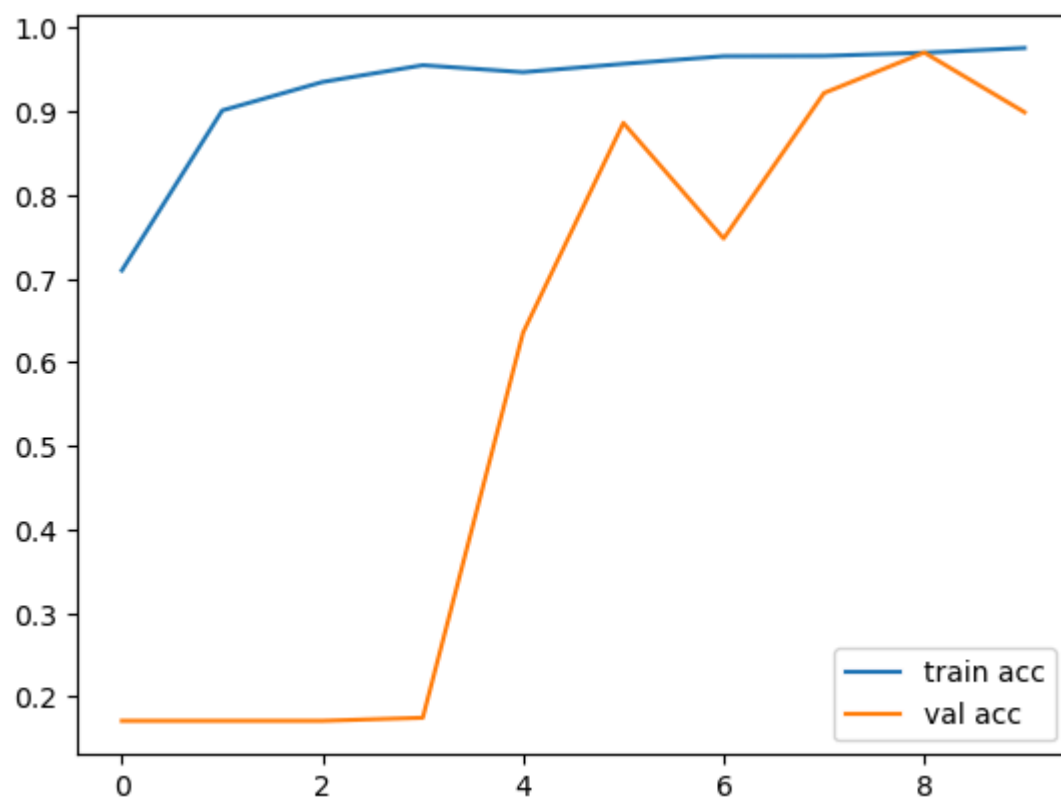
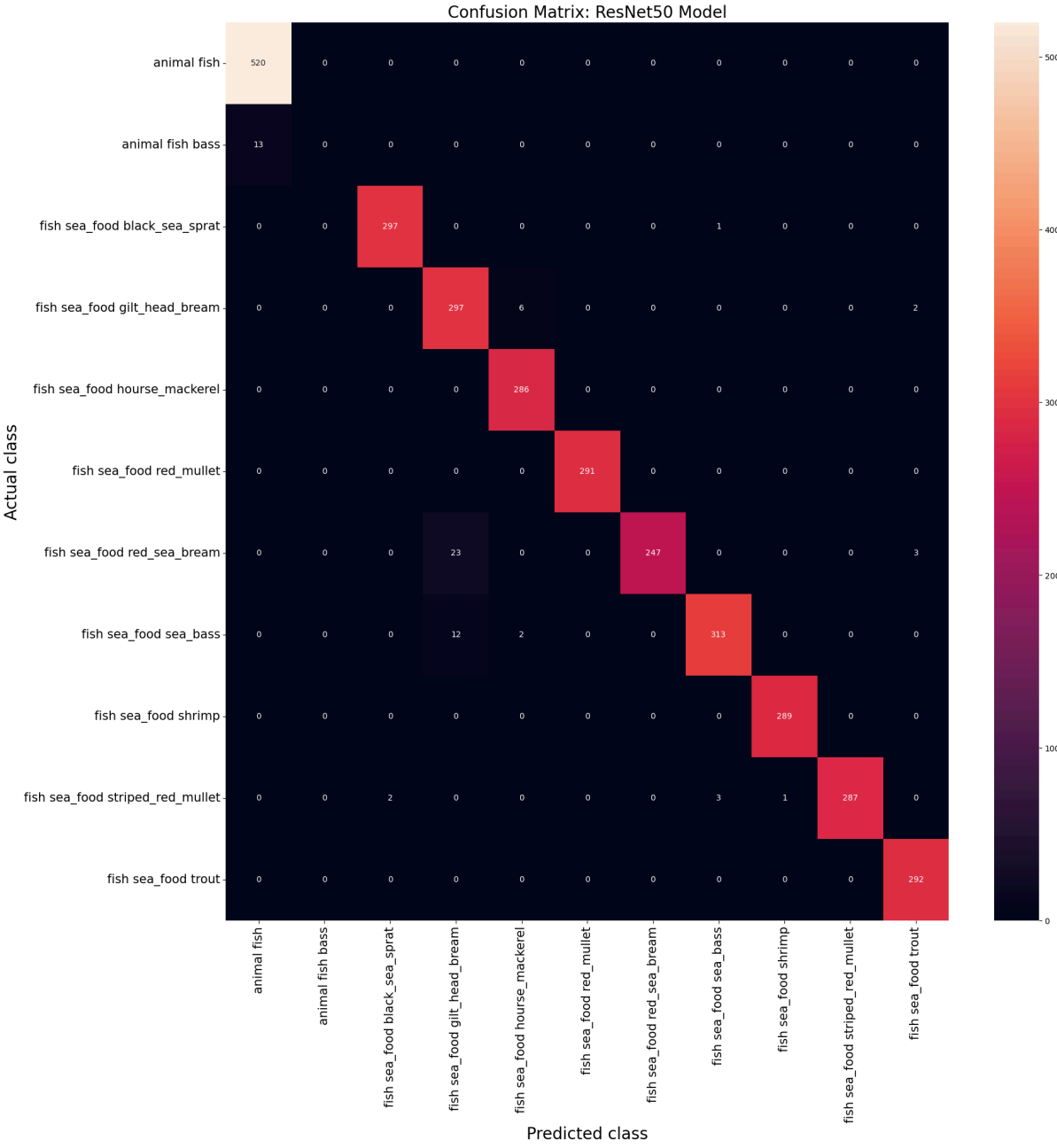
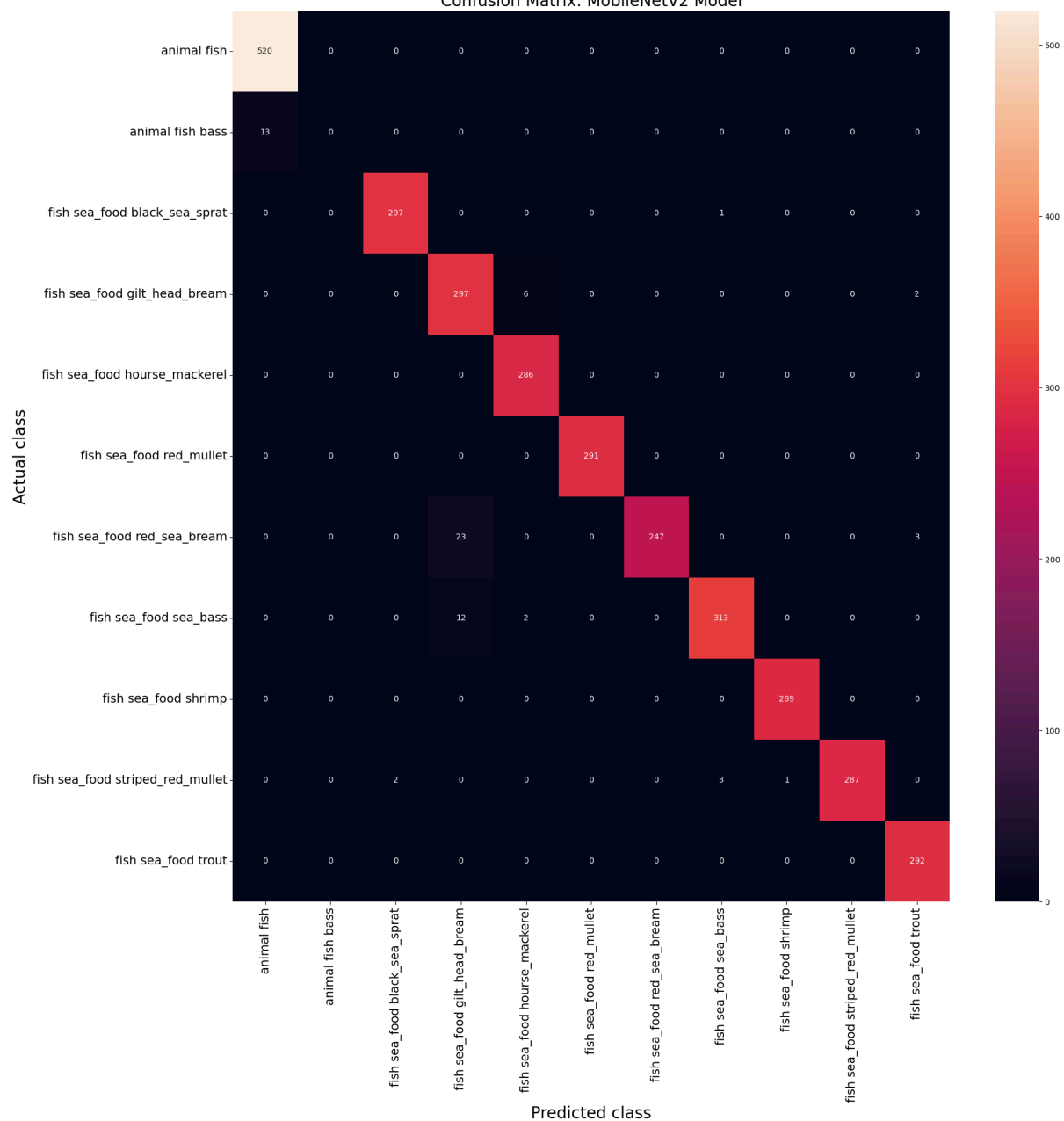


Fig:ResNet Accuracy and Loss curve

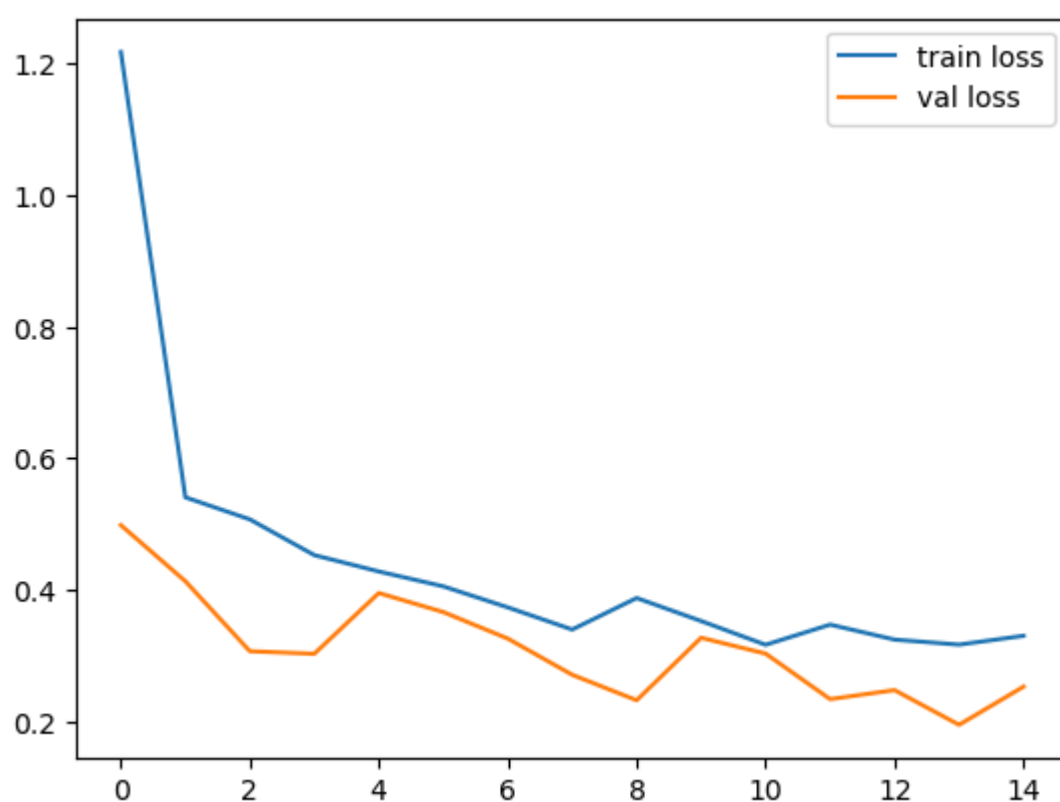


Confusion Matrix: MobileNetV2 Model



CLASSIFICATION REPORT

	precision	recall	f1-score	support
0	0.98	1.00	0.99	520
1	0.00	0.00	0.00	13
2	0.99	1.00	0.99	298
3	0.89	0.97	0.93	305
4	0.97	1.00	0.99	286
5	1.00	1.00	1.00	291
6	1.00	0.90	0.95	273
7	0.99	0.96	0.97	327
8	1.00	1.00	1.00	289
9	1.00	0.98	0.99	293
10	0.98	1.00	0.99	292
accuracy			0.98	3187
macro avg	0.89	0.89	0.89	3187
weighted avg	0.98	0.98	0.98	3187



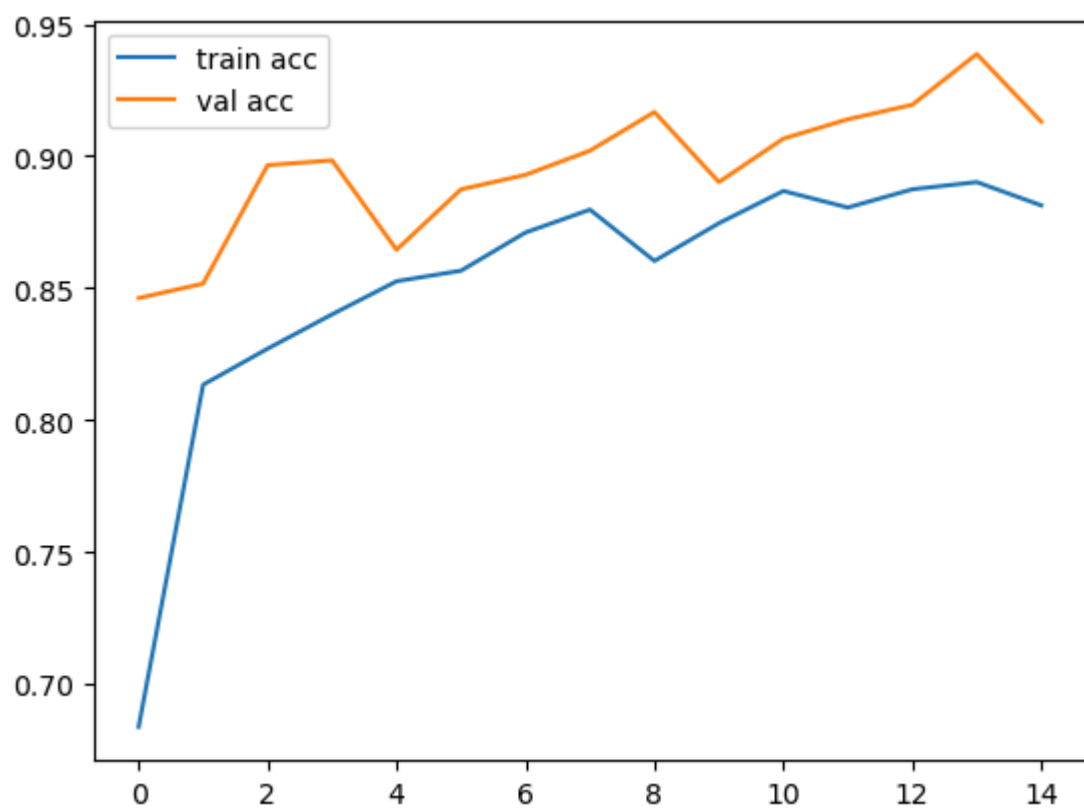
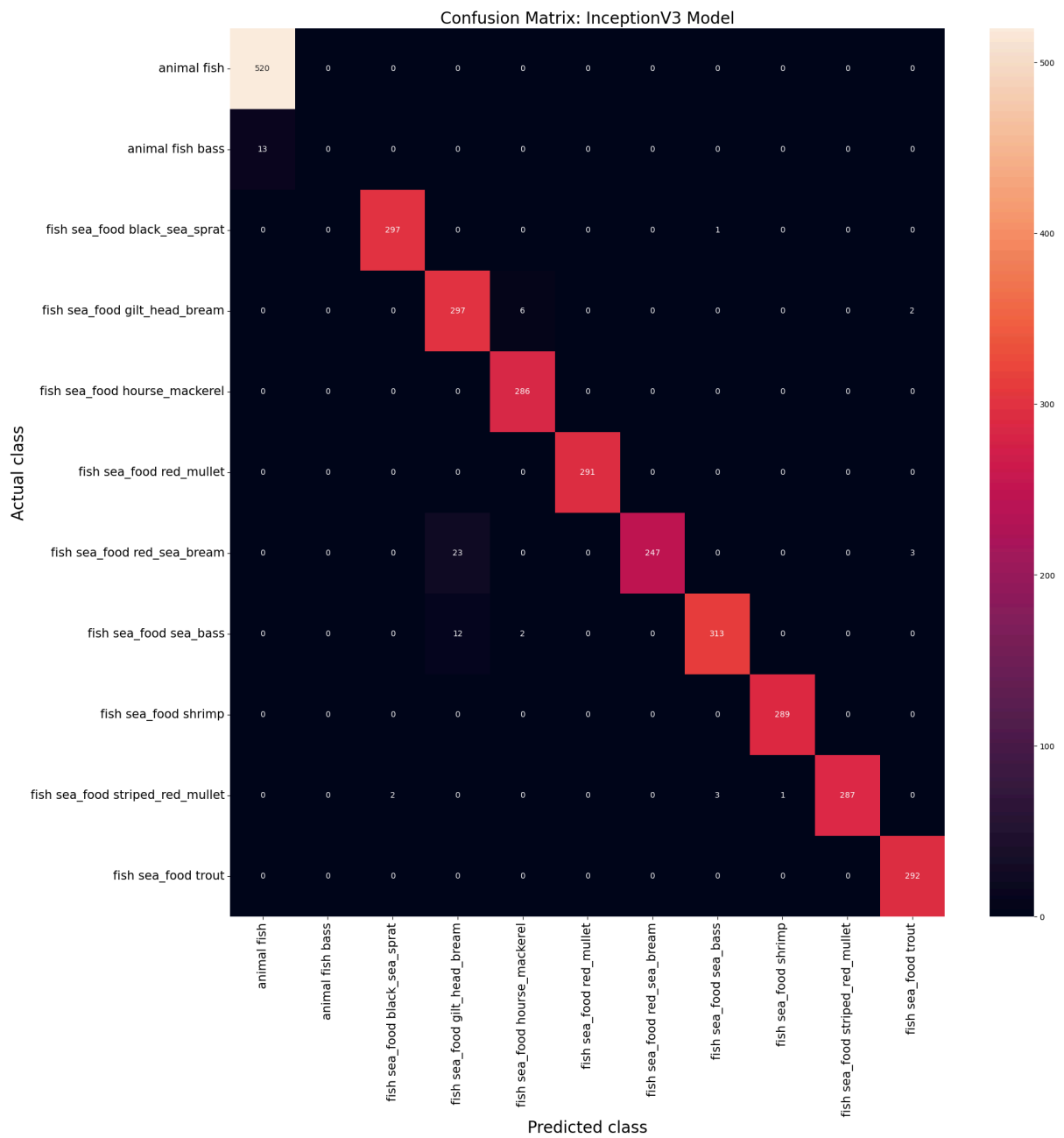


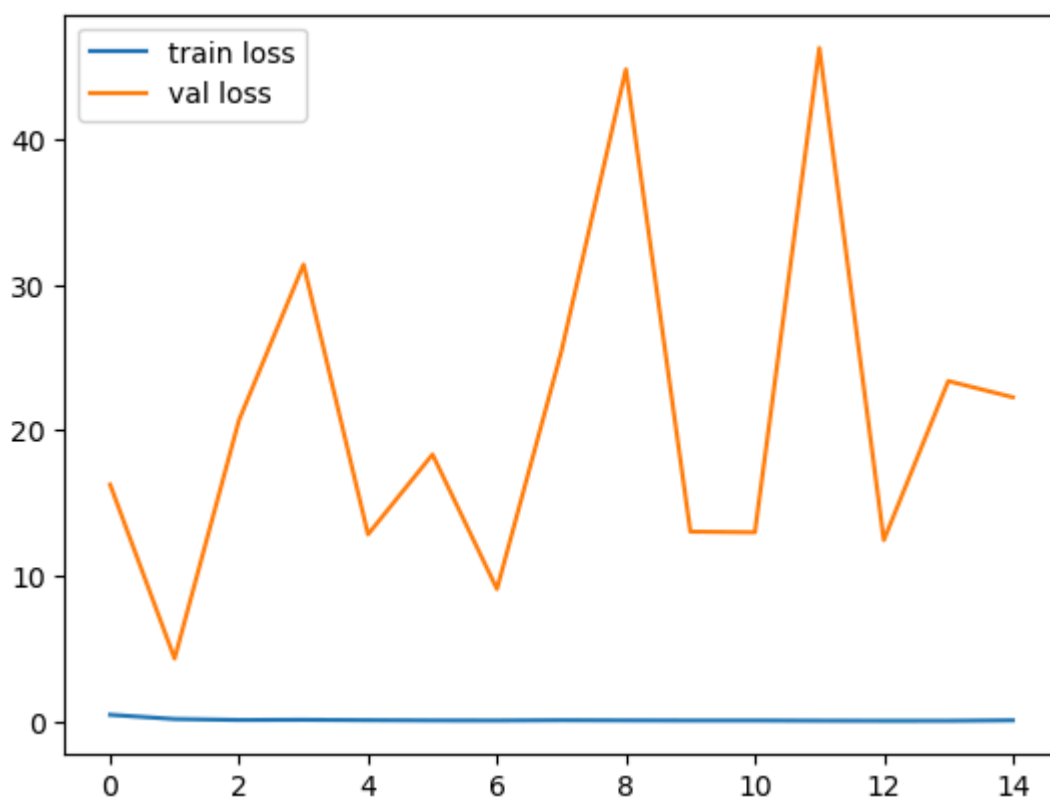
Fig:InceptionV3 Accuracy and Loss curve



CLASSIFICATION REPORT

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	precision	recall	f1-score	support
animal fish	0.98	1.00	0.99	520
animal fish bass	0.00	0.00	0.00	13
fish sea_food black_sea_sprat	0.99	1.00	0.99	298
fish sea_food gilt_head_bream	0.89	0.97	0.93	305
fish sea_food hourse_mackerel	0.97	1.00	0.99	286
fish sea_food red_mullet	1.00	1.00	1.00	291
fish sea_food red_sea_bream	1.00	0.90	0.95	273
fish sea_food sea_bass	0.99	0.96	0.97	327
fish sea_food shrimp	1.00	1.00	1.00	289
fish sea_food striped_red_mullet	1.00	0.98	0.99	293
fish sea_food trout	0.98	1.00	0.99	292
accuracy			0.98	3187
macro avg	0.89	0.89	0.89	3187
weighted avg	0.98	0.98	0.98	3187



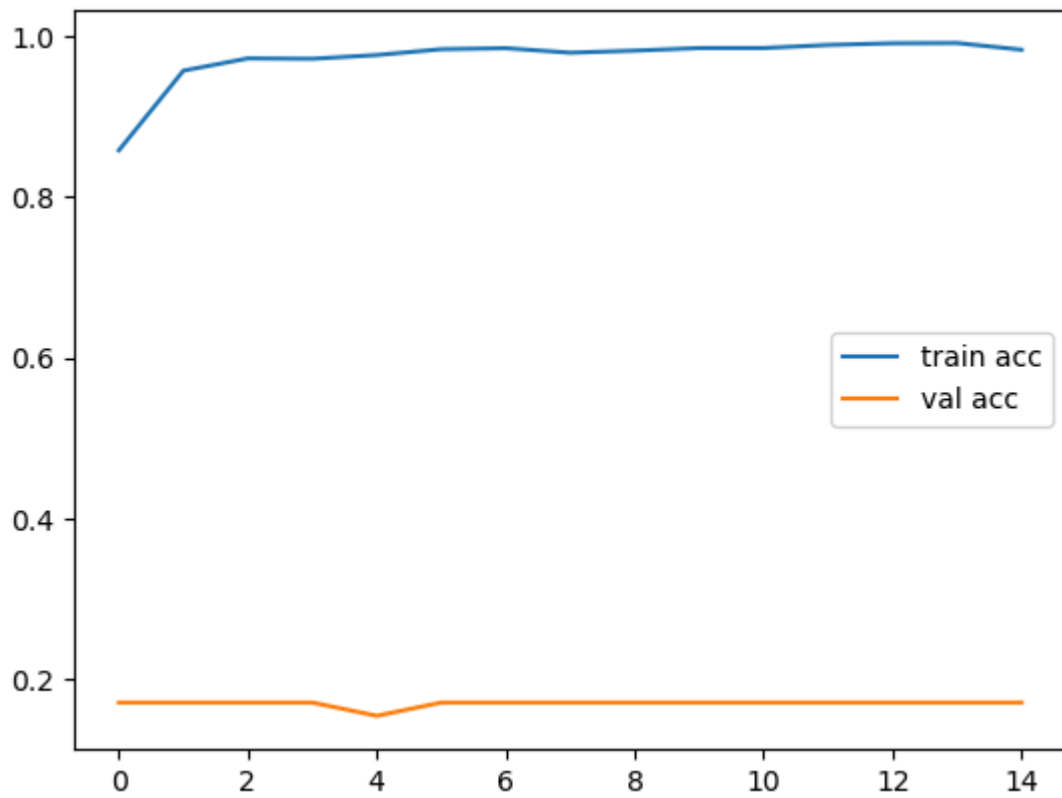
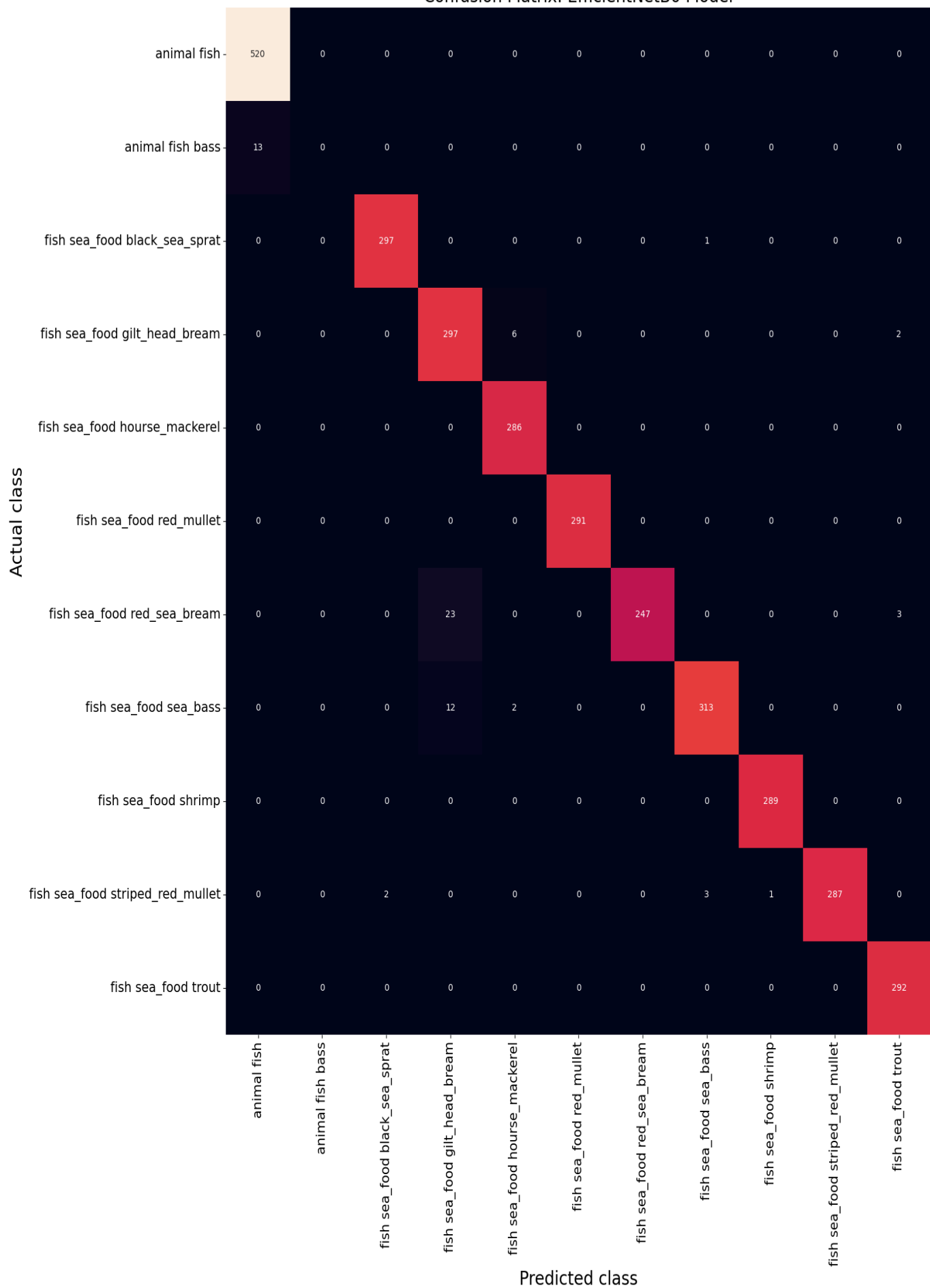


Fig:EfficientNetB0 Accuracy and Loss Curve

Confusion Matrix: EfficientNetB0 Model



CLASSIFICATION REPORT

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	precision	recall	f1-score	support
animal fish	0.98	1.00	0.99	520
animal fish bass	0.00	0.00	0.00	13
fish sea_food black_sea_sprat	0.99	1.00	0.99	298
fish sea_food gilt_head_bream	0.89	0.97	0.93	305
fish sea_food hourse_mackerel	0.97	1.00	0.99	286
fish sea_food red_mullet	1.00	1.00	1.00	291
fish sea_food red_sea_bream	1.00	0.90	0.95	273
fish sea_food sea_bass	0.99	0.96	0.97	327
fish sea_food shrimp	1.00	1.00	1.00	289
fish sea_food striped_red_mullet	1.00	0.98	0.99	293
fish sea_food trout	0.98	1.00	0.99	292
accuracy			0.98	3187
macro avg	0.89	0.89	0.89	3187
weighted avg	0.98	0.98	0.98	3187

DEPLOYMENT

I have considered the VGG16 Model for fine tuning and saved in .h5 format.I have developed the streamlit application which ahs the following functionalities:

- Allow users to upload fish images.
- Predict and display the fish category.
- Provide model confidence scores.