Lab Assignment 2 - Pretrained Model

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PRACTICAL NO.02: Transfer Learning

1. Transfer Learning Model Development: Fine-tune a pre-trained model on a specific dataset by modifying the top layers and optimizing hyperparameters.

Github Link- https://github.com/nirmalchaturvedi/DL_ASSIGNMENT-2

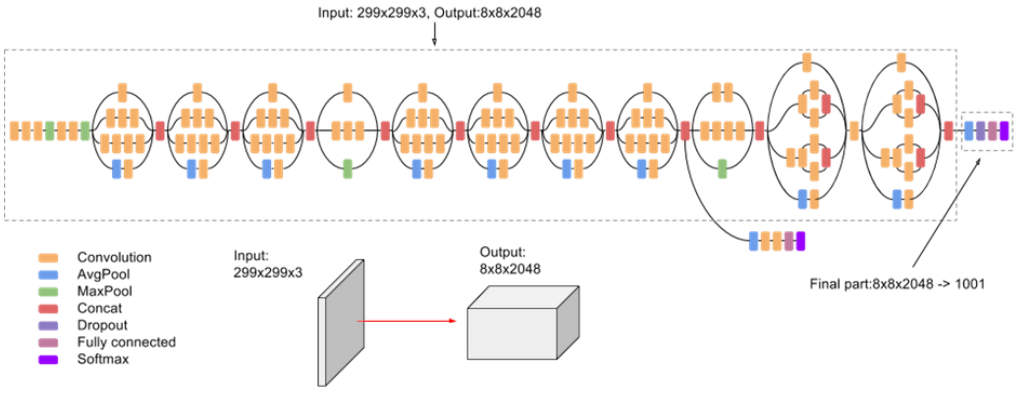
Dataset Used- https://www.kaggle.com/datasets/l33tc0d3r/indian-food-classification

Colab link- https://colab.research.google.com/drive/19t9L2s_BcC1PBIr7g-9m01D40jj01SJ9?usp=sharing

Research Paper- https://drive.google.com/file/d/1c9BXSo-8fdmU1wbqYaDQ0lidyGyfVyL-/view?usp=sharing

Model Used-

InceptionV3

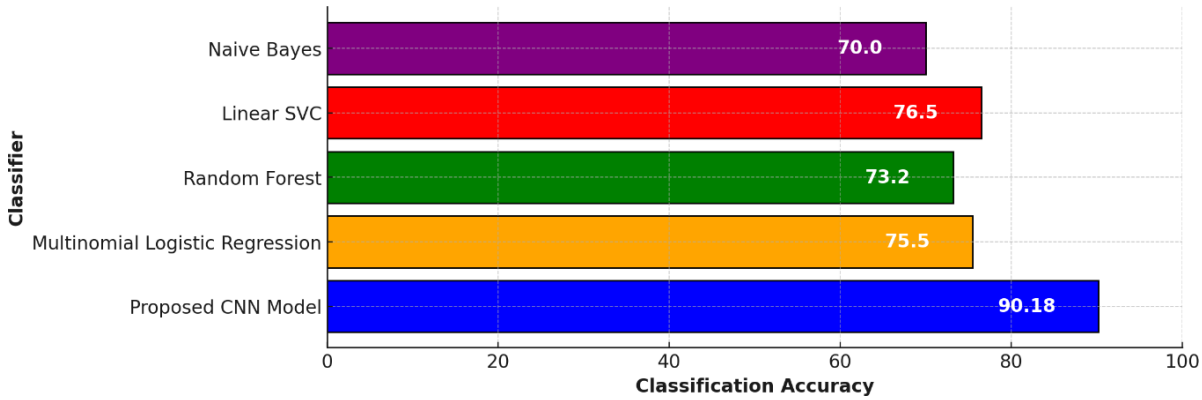


Inception-V3 is a **deep convolutional neural network (CNN)** designed for **image classification**. It was introduced by Google and is an improvement over Inception-V1 and V2.

Key Features:

Efficient Architecture – Uses **Factorized Convolutions** to reduce computation.
Auxiliary Classifiers – Helps in gradient flow and reduces overfitting.
Asymmetric Kernels – Replaces large filters with smaller ones.
Batch Normalization – Speeds up training and stabilizes deep networks.
Pretrained on ImageNet – Achieves **>78% accuracy** on ImageNet.

Result and output-



10 Epoches-

Accuracy- 78.54%

```
Epoch 10/10
157/157 ━━━━━━━━━━━━━━━━━━━━ 256s 2s/step - accuracy: 0.7854 - loss: 0.7365 - val_accuracy: 0.8803 - val_loss: 0.4263
<keras.src.callbacks.history.History at 0x7c28d8d94a10>
```

15 Epoches-

Accuracy- 81.87%

```
Epoch 15/15
157/157 ━━━━━━━━━━━━━━━━━━━━ 212s 1s/step - accuracy: 0.8187 - loss: 0.6250 - val_accuracy: 0.8916 - val_loss: 0.3734
<keras.src.callbacks.history.History at 0x7c295730c650>
```

20 Epoches-

Accuracy- 83.92%

```
Epoch 20/25
157/157 ━━━━━━━━━━━━━━━━━━━━ 219s 1s/step - accuracy: 0.8392 - loss: 0.5354 - val_accuracy: 0.9036 - val_loss: 0.3194
```

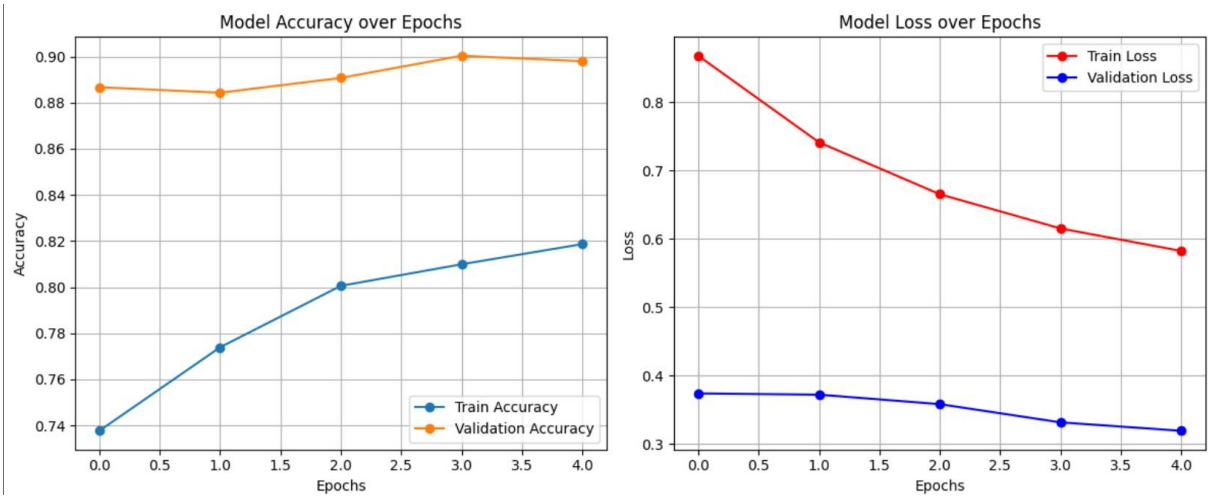
25 Epoches-

Accuarcy- 85.34 %

```
Epoch 25/25
157/157 ━━━━━━━━━━━━━━━━━━━━ 226s 1s/step - accuracy: 0.8534 - loss: 0.4865 - val_accuracy: 0.8948 - val_loss: 0.3528
<keras.src.callbacks.history.History at 0x7f3de11268d0>
```

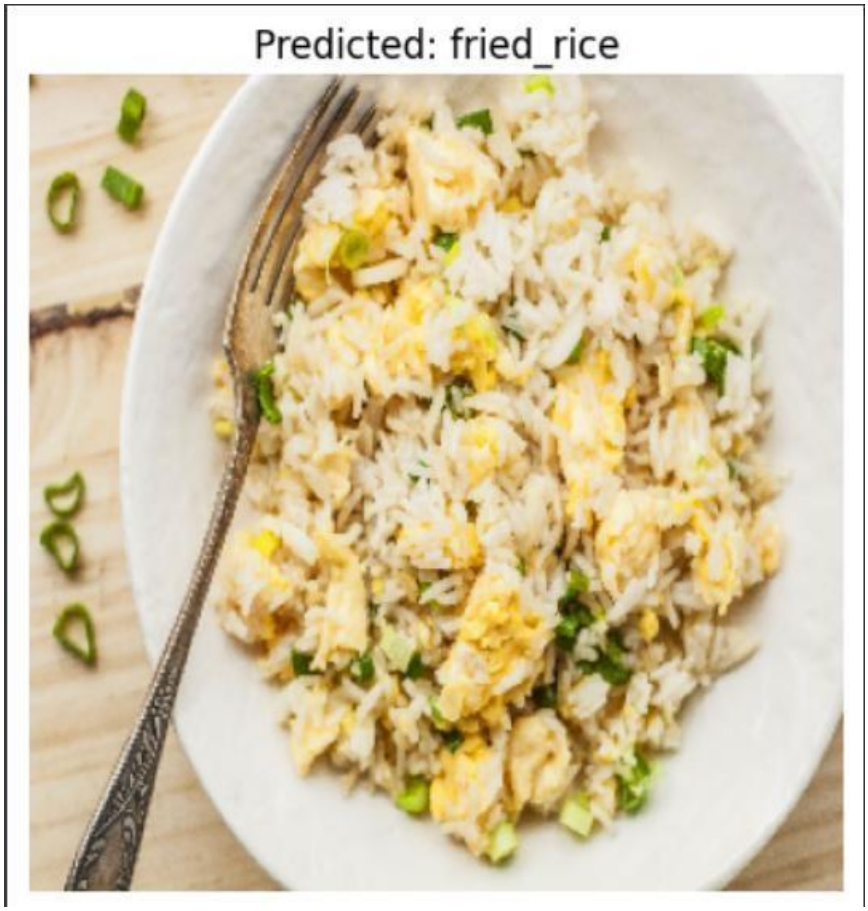
Max Accuarcy- 90.18 %

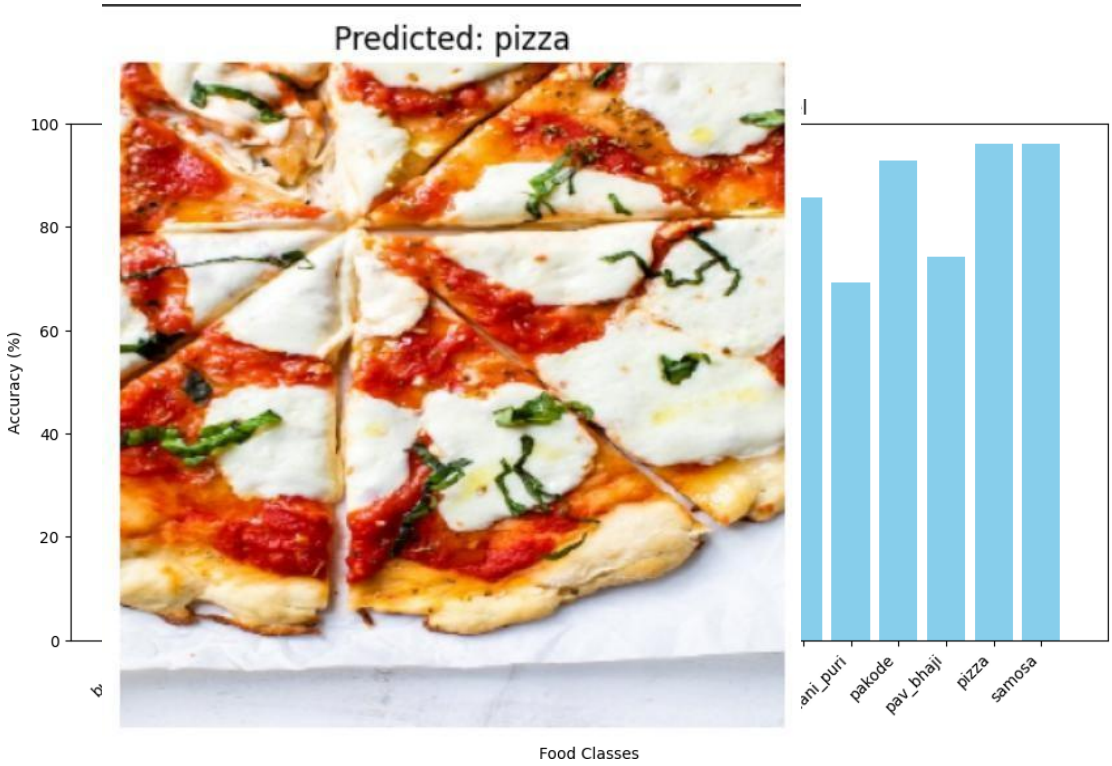
Visualizing the epochs Result-



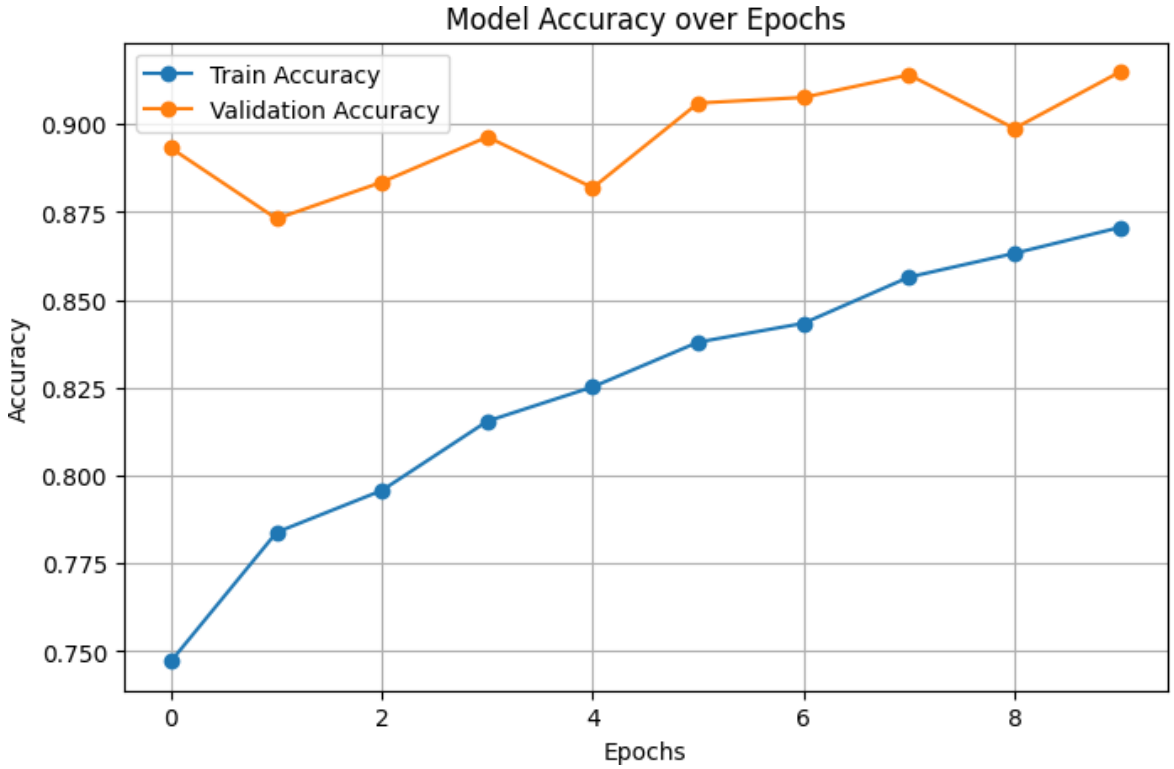
Prediction Result –

1)





Performance Evaluation-



Comparing the Result With the research paper-

Comparison & Improvement Strategies for Inception-V3 Food Classification Model

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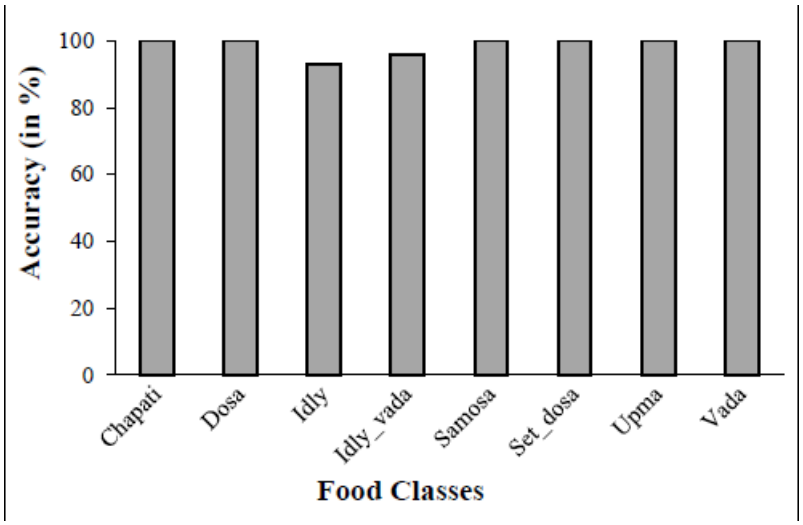
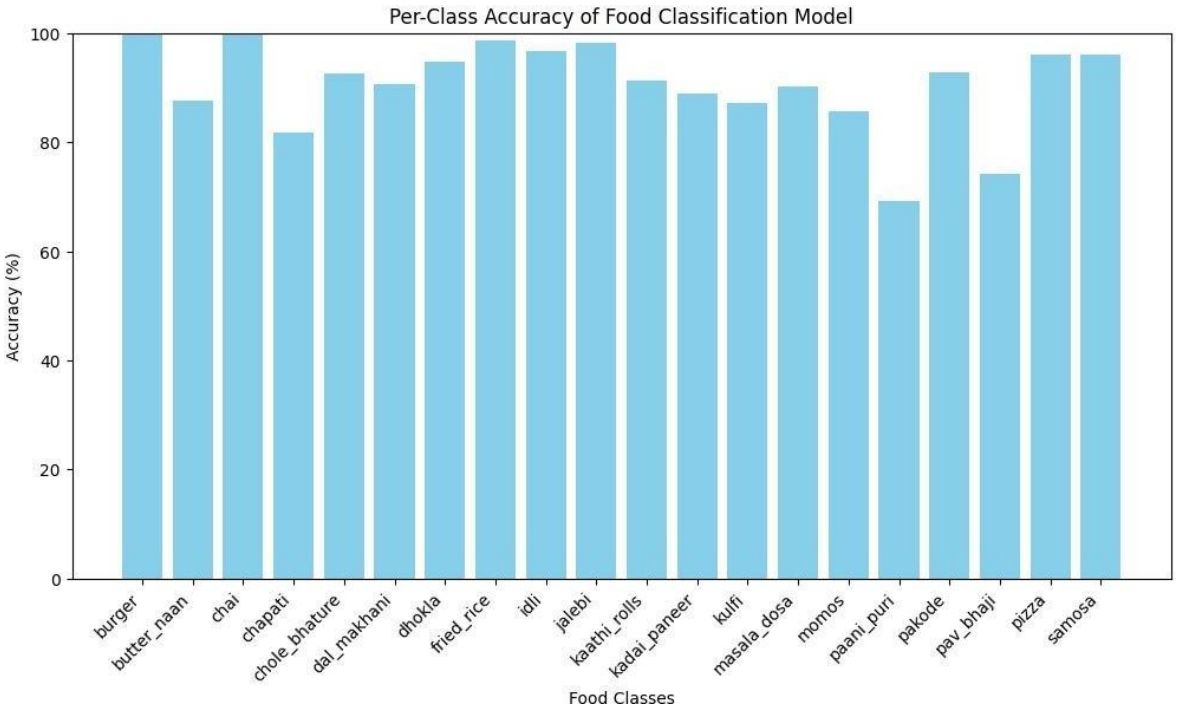
1. Key Differences Between Models

Factor	Our **Model (90.18%)**	**Research Paper Model (95.27%)**
Number of Classes	20	16
Augmentation	Used	Used
Training Steps	fewer epochs	Likely well-trained
Pretrained Weights	Yes	Yes

Reasearch Paper output-



Our Output-


Per-Class Accuracy of Food Classification Model
Accuracy (%)
0
20
40
60
80
100
burger
butter_naan
chai
chapati
chole_bhature
dal_makhani
dhokla
fried_rice
idli
jalebi
kaathi_rolls
kadai_paneer
kulfi
masala_dosa
momos
paani_puri
pakode
pav_bhaji
pizza
samosa
Food Classes