INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

RAPPORT FOODO

(Food Image Categorization)

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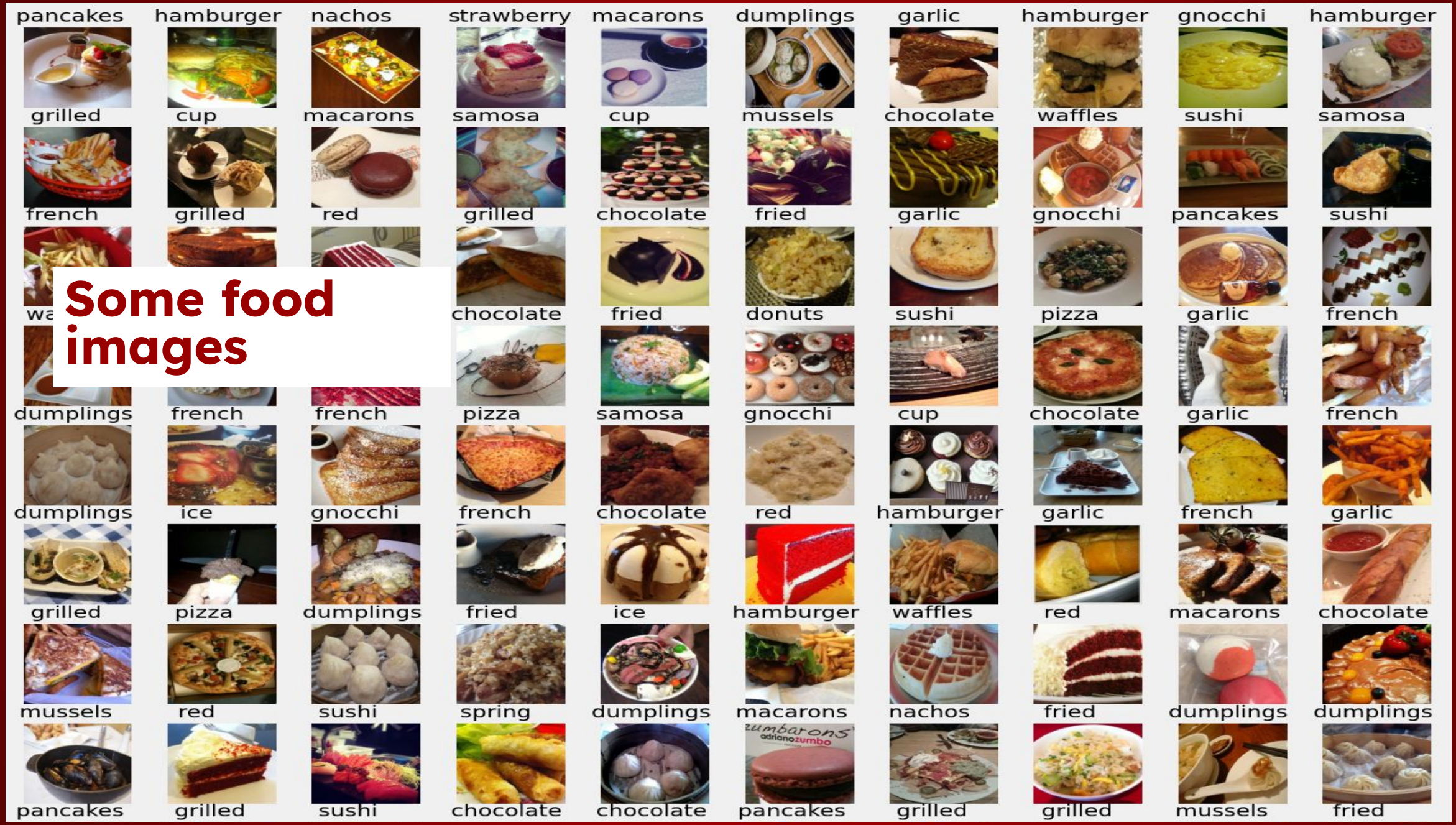
Introduction

- Creation of different types of food proves to be a major part of our world since ages.
- Recent research on food trends show that eating habits of people have changed around the world. Thus, to be modern and updated, one must constantly develop new recipes or products, new processes and new ways.
- This gives rise to a plethora of food dishes that look really appetising but the names of those dishes are not known to the general public.

Data Exploration

Let’s start with knowing the different food classes name

```
array(['chocolate ', 'cup       ', 'donuts    ', 'dumplings ',
       'french    ', 'fried     ', 'garlic    ', 'gnocchi   ',
       'grilled   ', 'hamburger ', 'hot       ', 'ice       ',
       'macarons  ', 'mussels   ', 'nachos    ', 'pancakes  ',
       'pizza     ', 'red       ', 'samosa    ', 'spring    ',
       'strawberry', 'sushi     ', 'waffles   '], dtype='<U10')
```



Some food images

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Train & Test Split on dataset

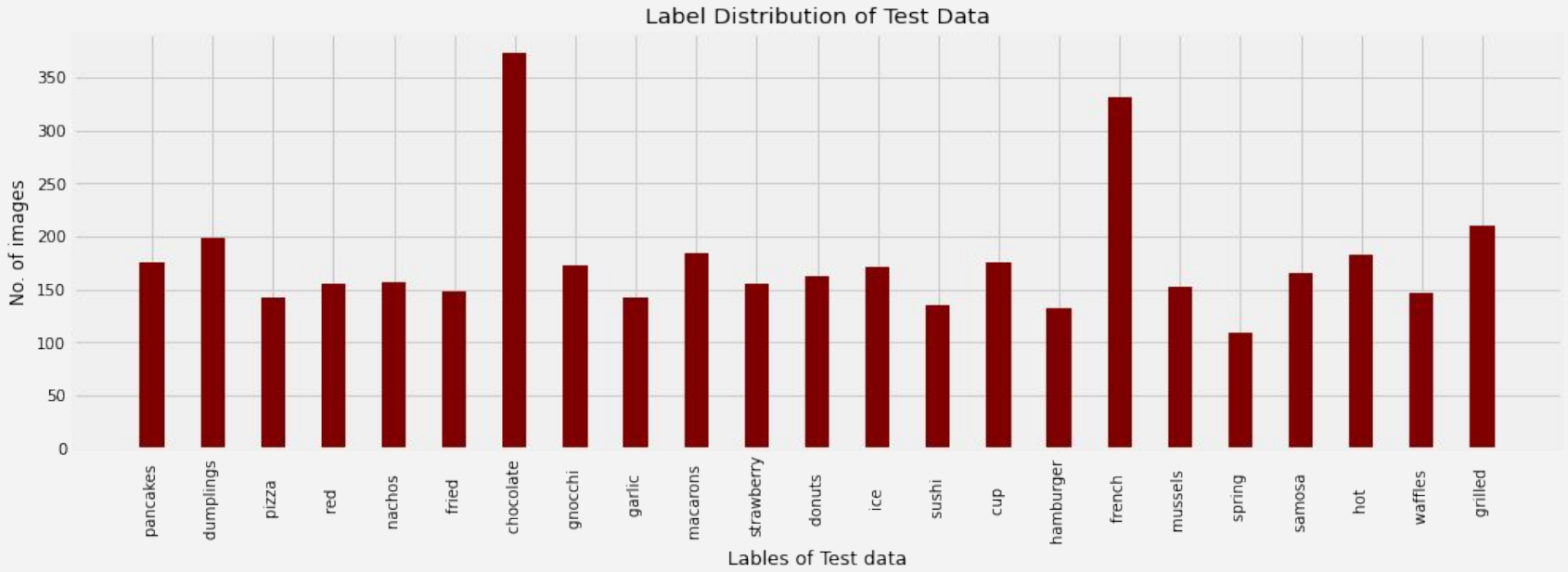
For train set:

```
{'chocolate ': 1433,
 'cup       ': 765,
 'donuts    ': 574,
 'dumplings ': 794,
 'french    ': 1409,
 'fried     ': 612,
 'garlic    ': 611,
 'gnocchi   ': 801,
 'grilled   ': 780,
 'hamburger ': 520,
 'hot       ': 703,
 'ice       ': 692,
 'macarons  ': 777,
 'mussels   ': 581,
 'nachos    ': 615,
 'pancakes  ': 666,
 'pizza     ': 546,
 'red       ': 620,
 'samosa    ': 618,
 'spring    ': 437,
 'strawberry': 598,
 'sushi     ': 528,
 'waffles   ': 631}
```

For test set:

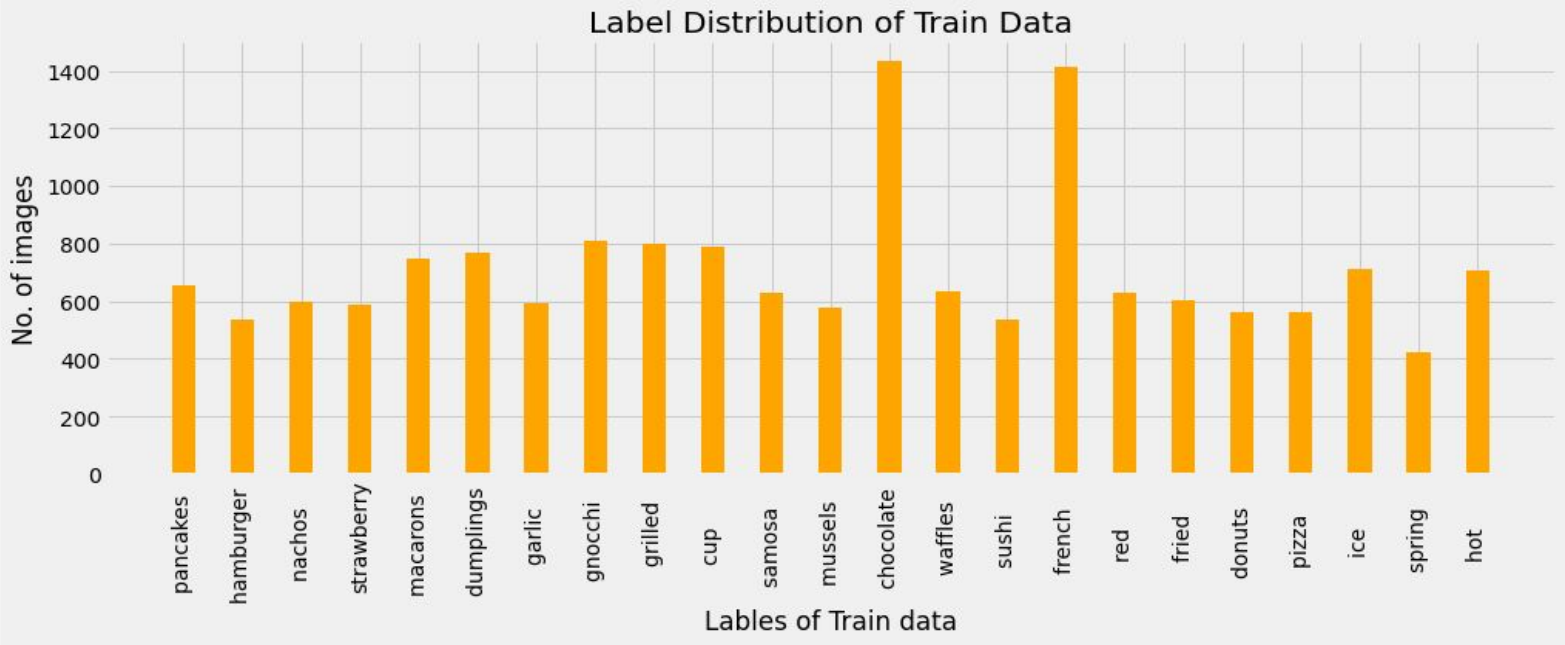
```
{'chocolate ': 362,
 'cup       ': 195,
 'donuts    ': 133,
 'dumplings ': 186,
 'french    ': 366,
 'fried     ': 160,
 'garlic    ': 146,
 'gnocchi   ': 184,
 'grilled   ': 191,
 'hamburger ': 156,
 'hot       ': 195,
 'ice       ': 189,
 'macarons  ': 165,
 'mussels   ': 141,
 'nachos    ': 122,
 'pancakes  ': 159,
 'pizza     ': 158,
 'red       ': 156,
 'samosa    ': 174,
 'spring    ': 105,
 'strawberry': 143,
 'sushi     ': 140,
 'waffles   ': 152}
```

Bar Chart



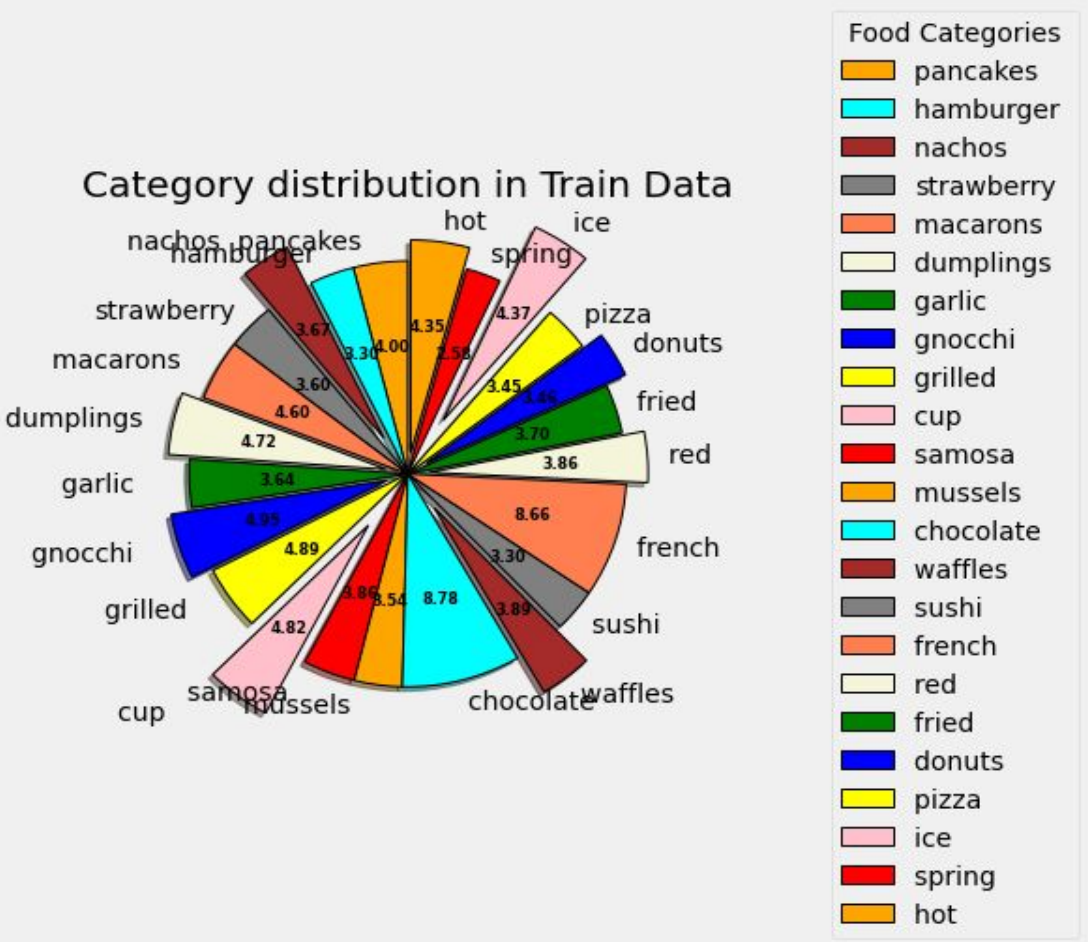
- Train Data

- Test Data

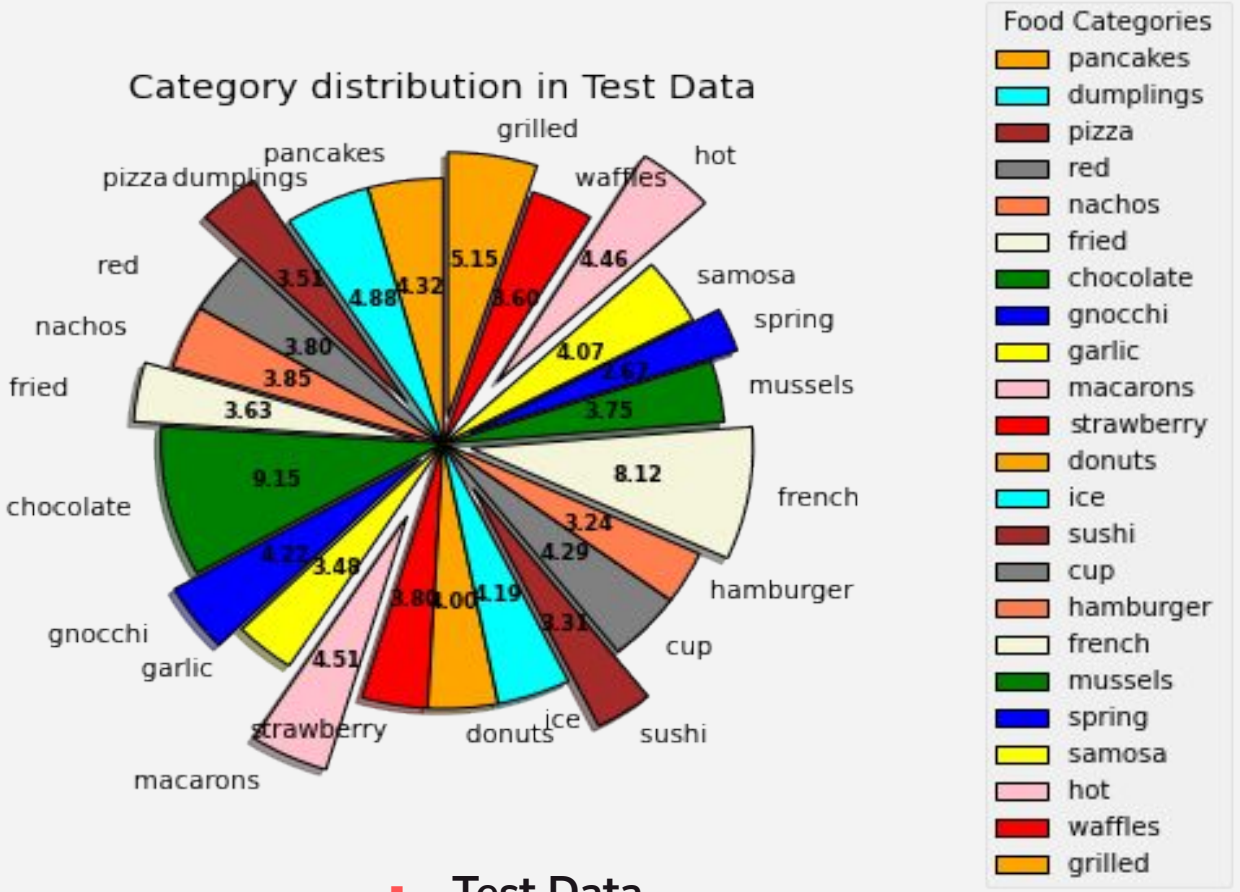


Pie Chart

- Train Data



- Test Data



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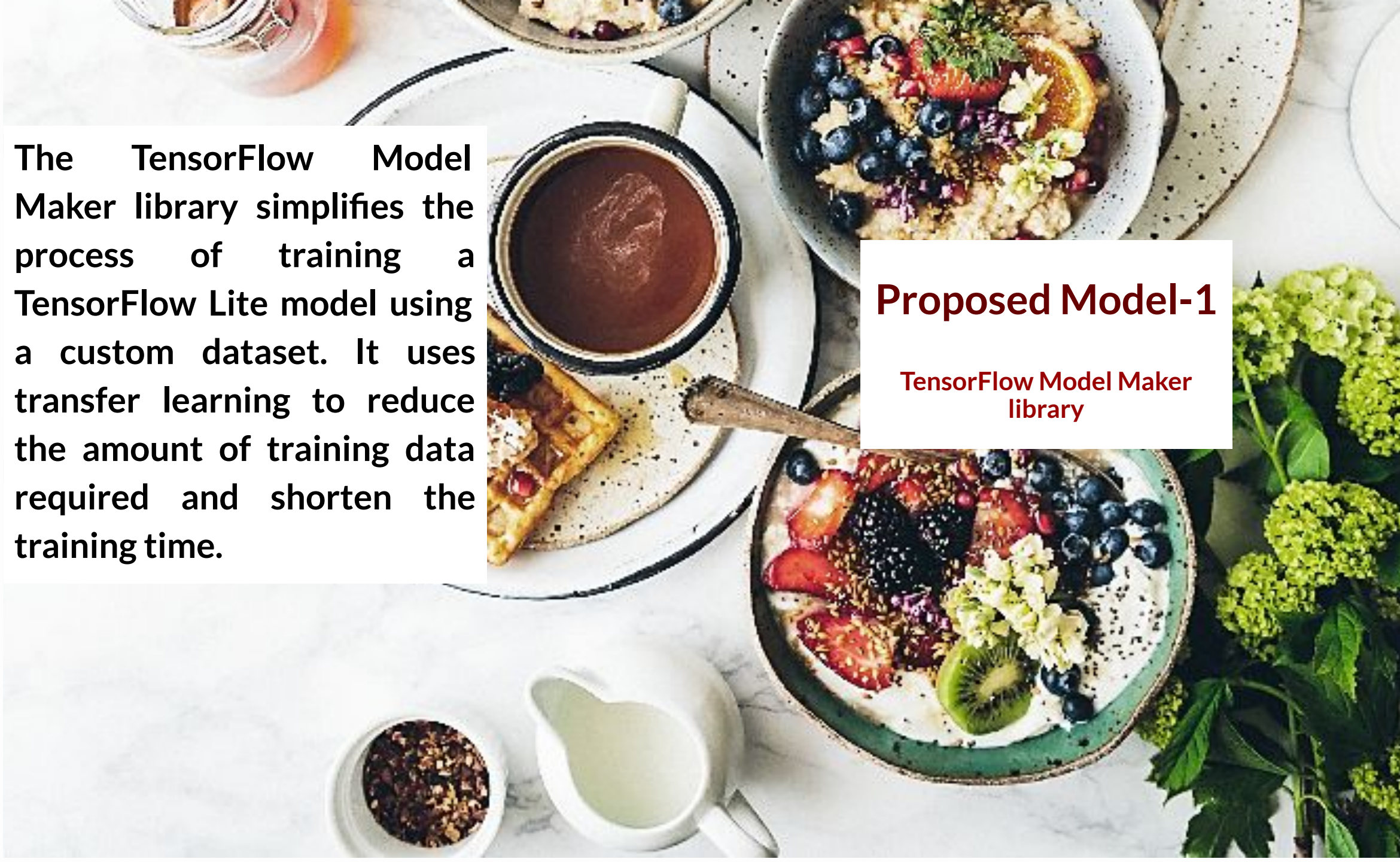


The TensorFlow Model Maker library simplifies the process of training a TensorFlow Lite model using a custom dataset. It uses transfer learning to reduce the amount of training data required and shorten the training time.

Proposed Model-1

TensorFlow Model Maker library

- Inception v3 is a CNN for assisting in image analysis and object detection, and got its start as a module for Googlenet.
- Widely used image recognition model that has been shown to attain greater than 81.93% accuracy on our dataset with least loss rate of .10

Proposed Model-2

Inception v3

Model Maker Training & Evaluation

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 hub_keras_layer_v1v2 (HubKe  (None, 1280)             3413024
 rasLayerV1V2)

 dropout (Dropout)           (None, 1280)              0

 dense (Dense)               (None, 25)                32025

=================================================================
Total params: 3,445,049
Trainable params: 32,025
Non-trainable params: 3,413,024
_________________________________________________________________
None
/usr/local/lib/python3.7/dist-packages/keras/optimizer_v2/gradient_descent.py:102: UserWarning: Tl
tead.
  super(SGD, self).__init__(name, **kwargs)
Epoch 1/5
573/573 [==============================] - 164s 267ms/step - loss: 1.5613 - accuracy: 0.6928
Epoch 2/5
573/573 [==============================] - 155s 271ms/step - loss: 1.2576 - accuracy: 0.7985
Epoch 3/5
573/573 [==============================] - 154s 269ms/step - loss: 1.2076 - accuracy: 0.8189
Epoch 4/5
573/573 [==============================] - 154s 268ms/step - loss: 1.1766 - accuracy: 0.8337
Epoch 5/5
573/573 [==============================] - 154s 269ms/step - loss: 1.1560 - accuracy: 0.8416
```

```
loss,accuracy=model.evaluate(test_data)
```

```
64/64 [==============================] - 38s 274ms/step - loss: 1.1830 - accuracy: 0.8205
```

Inception v3 Training & Evaluation

```
Model: "model_1"
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_2 (InputLayer)            [(None, 192, 192, 3  0           []
                                )]

conv2d_94 (Conv2D)              (None, 95, 95, 32)   864         ['input_2[0][0]']

batch_normalization_94 (BatchN  (None, 95, 95, 32)   96          ['conv2d_94[0][0]']
ormalization)

activation_94 (Activation)      (None, 95, 95, 32)   0           ['batch_normalization_94[0][0]']

conv2d_95 (Conv2D)              (None, 93, 93, 32)   9216        ['activation_94[0][0]']

batch_normalization_95 (BatchN  (None, 93, 93, 32)   96          ['conv2d_95[0][0]']
ormalization)

activation_95 (Activation)      (None, 93, 93, 32)   0           ['batch_normalization_95[0][0]']

conv2d_96 (Conv2D)              (None, 93, 93, 64)   18432       ['activation_95[0][0]']

batch_normalization_96 (BatchN  (None, 93, 93, 64)   192         ['conv2d_96[0][0]']
ormalization)
```

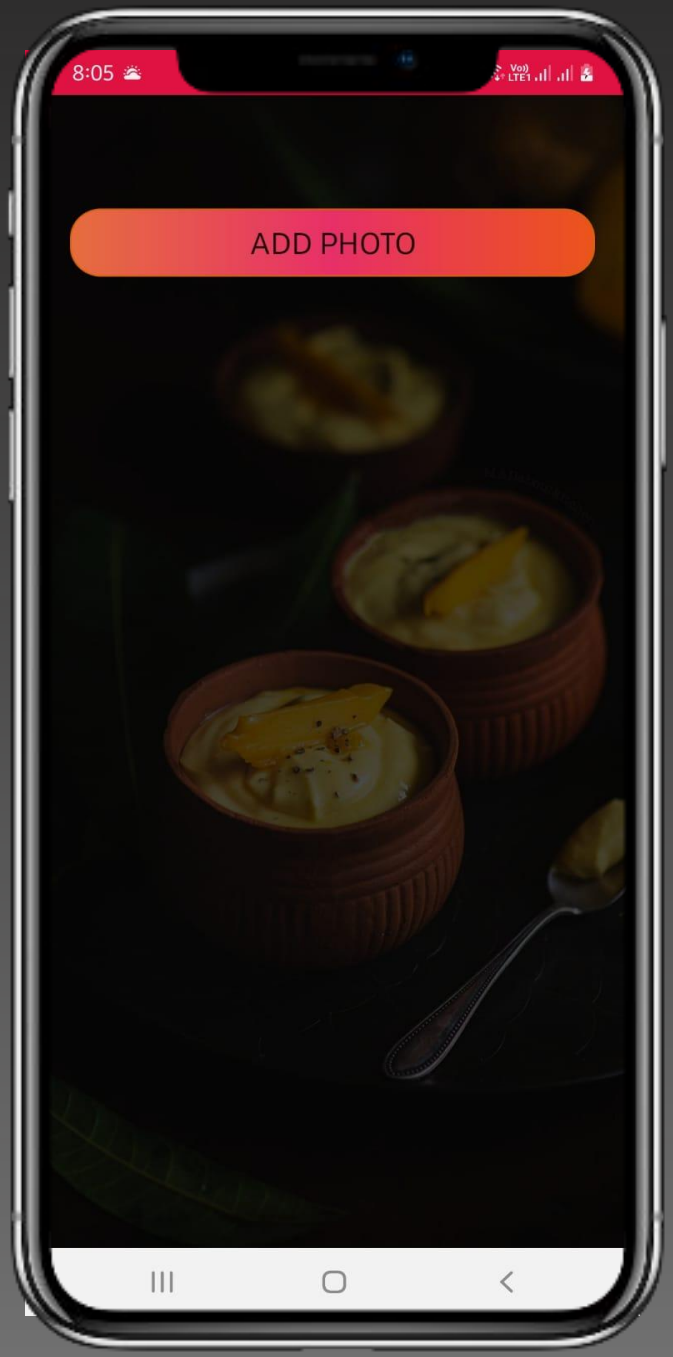
```
Epoch 1/10
510/510 [==============================] - ETA: 0s - loss: 0.0871 - acc: 0.6430WARNING:tensorflow:Can save best model only with
skipping.
510/510 [==============================] - 290s 518ms/step - loss: 0.0871 - acc: 0.6430 - val_loss: 0.0624 - val_acc: 0.7879
Epoch 2/10
510/510 [==============================] - ETA: 0s - loss: 0.0350 - acc: 0.8673WARNING:tensorflow:Can save best model only with
skipping.
510/510 [==============================] - 258s 506ms/step - loss: 0.0350 - acc: 0.8673 - val_loss: 0.0776 - val_acc: 0.8122
Epoch 3/10
510/510 [==============================] - ETA: 0s - loss: 0.0199 - acc: 0.9300WARNING:tensorflow:Can save best model only with
skipping.
510/510 [==============================] - 257s 505ms/step - loss: 0.0199 - acc: 0.9300 - val_loss: 0.0903 - val_acc: 0.8185
Epoch 4/10
```

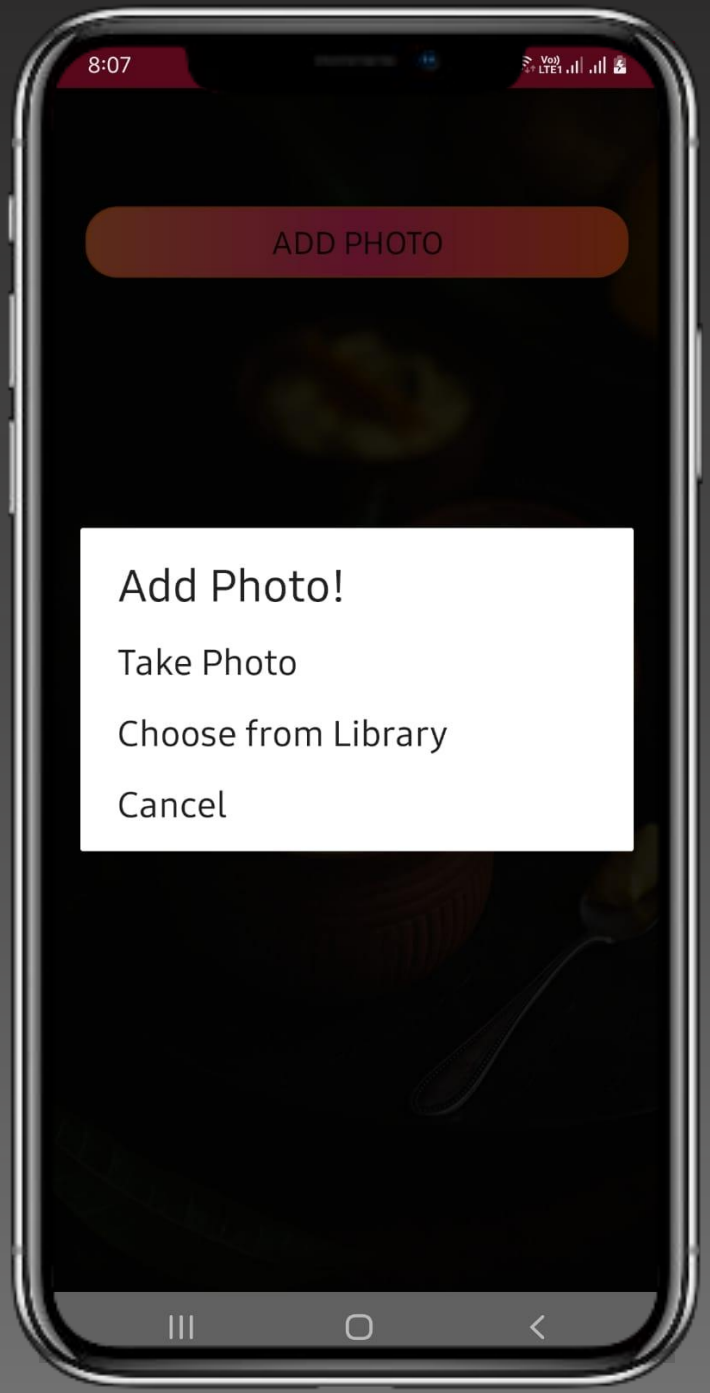
```
INFO:tensorflow:Assets written to: /content/drive/MyDrive/C
16/16 [==============================] - 21s 1s/step - loss
Test loss: 0.10591458529233932
Test accuracy:  0.8192741274833679
```

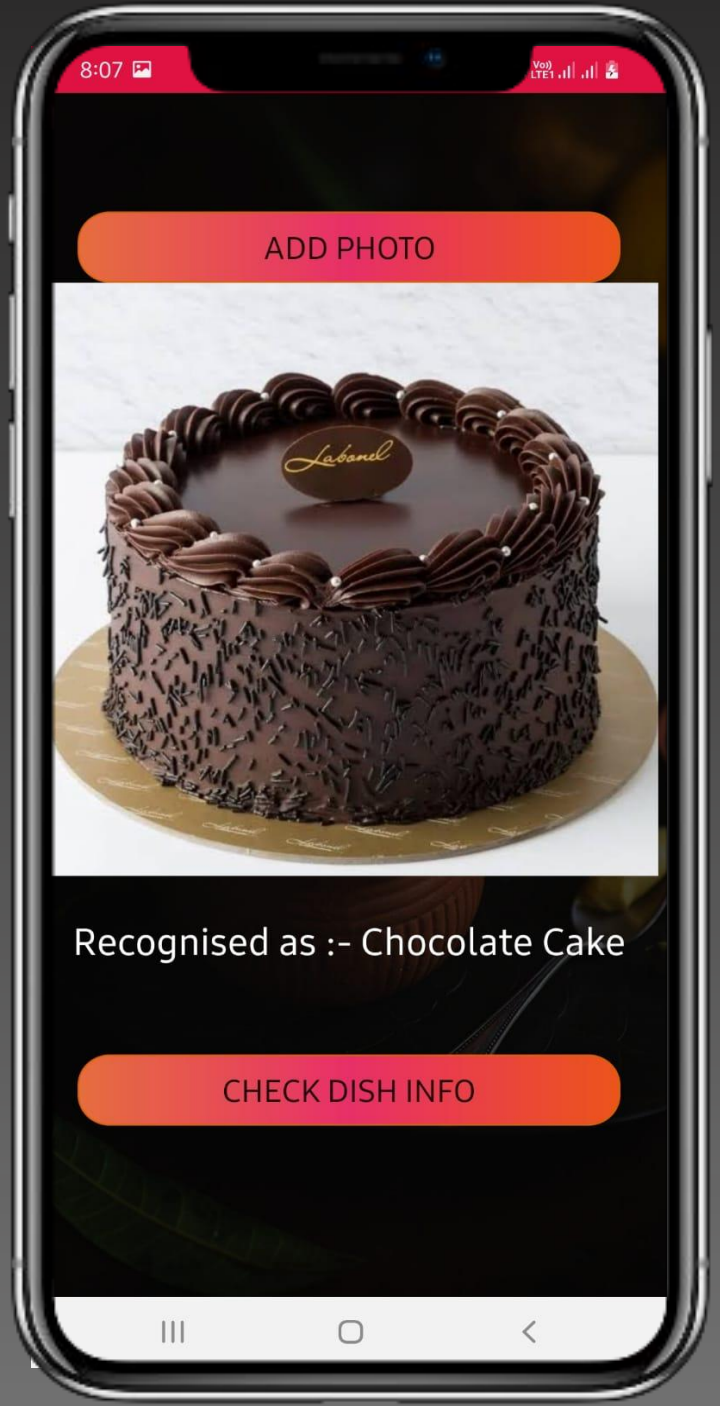
Comparison between models

Model Name	Train Accuracy(in %)	Train Loss	Test Accuracy(in %)	Test Loss
Inception v3	97.77	0.0079	81.93	0.1059
Model Maker	84.16	1.15	82.05	1.18
Resnet50	15.12	2.8152	14.59	2.8491
VGG19	96.18	1.7162	63.73	52.7193
VGG16	95.60	2.01	65.57	54.56

OUR APP







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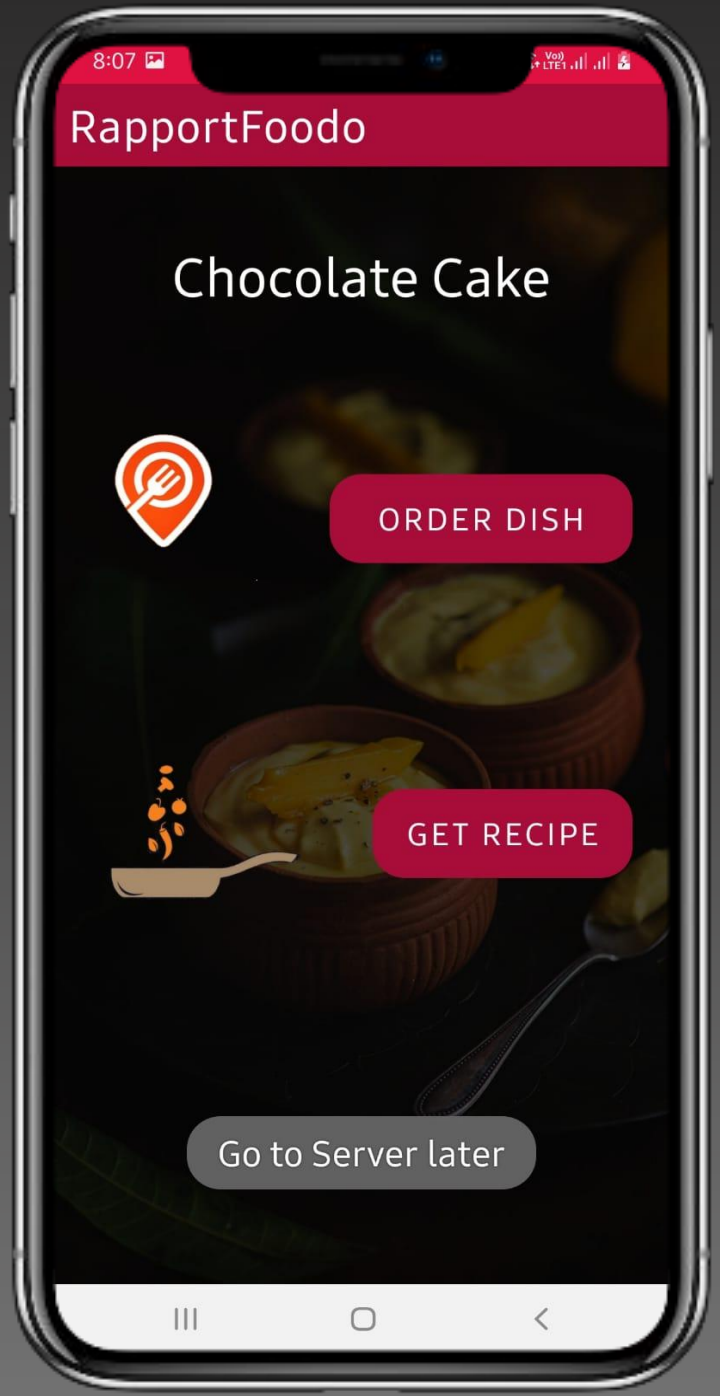

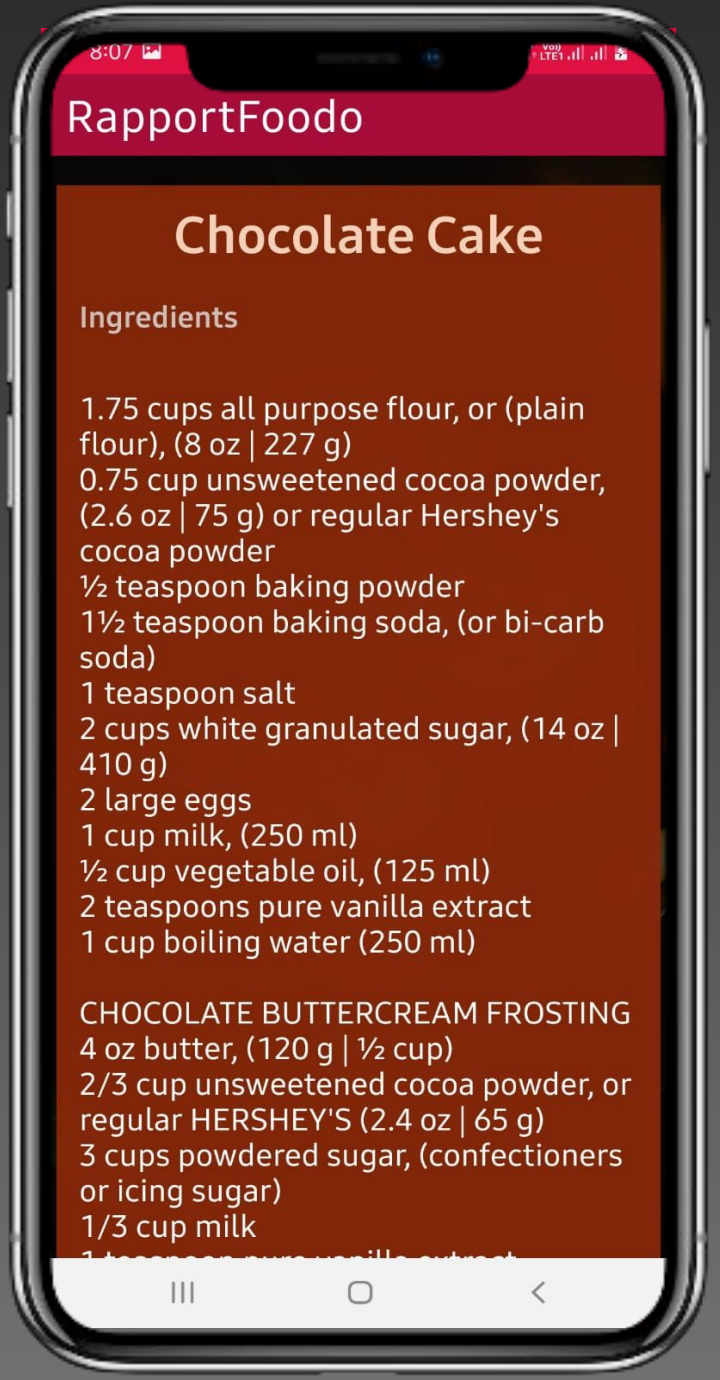

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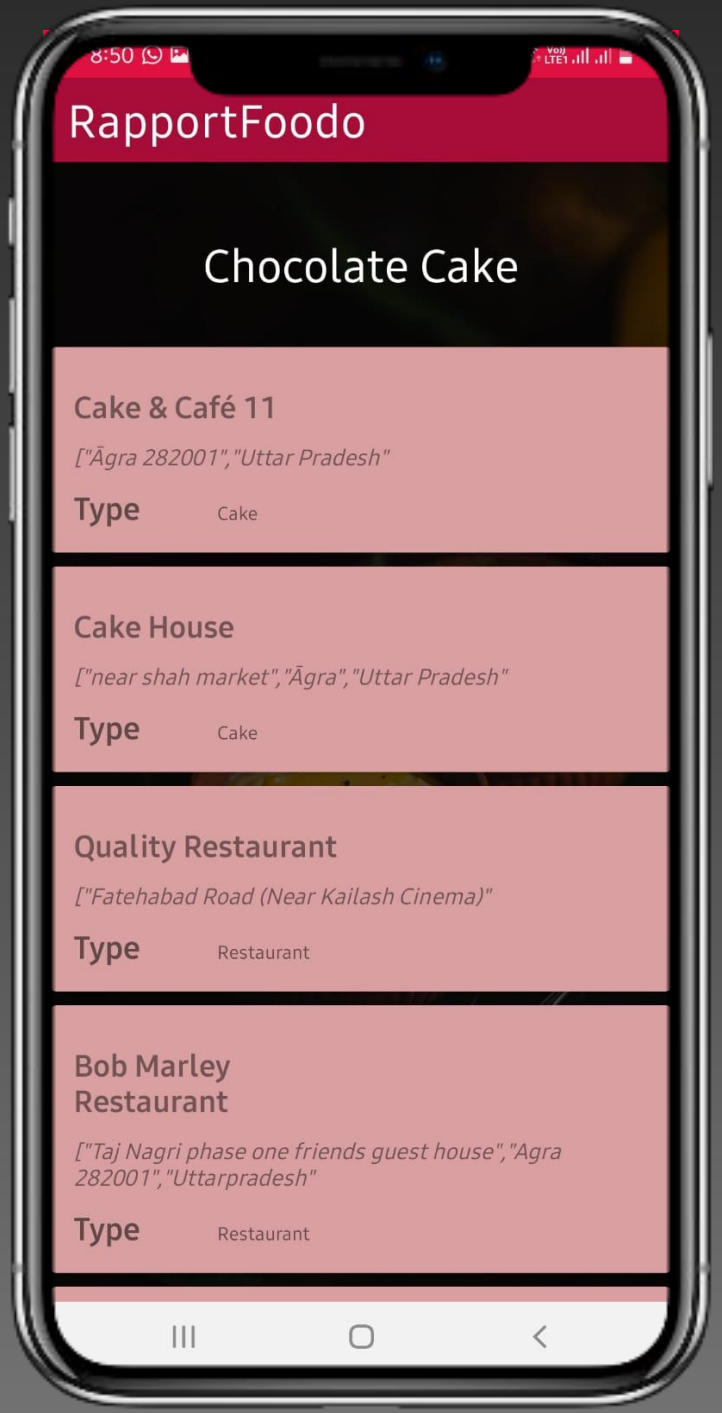

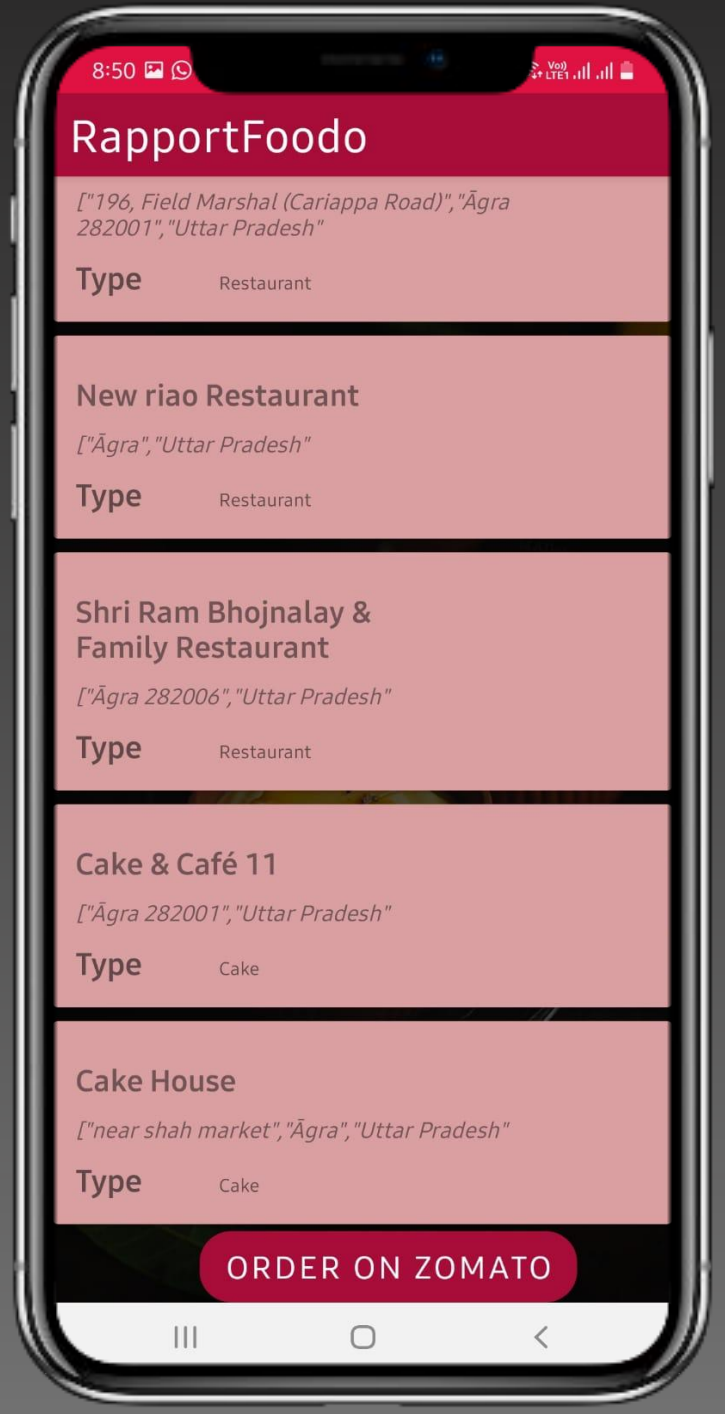

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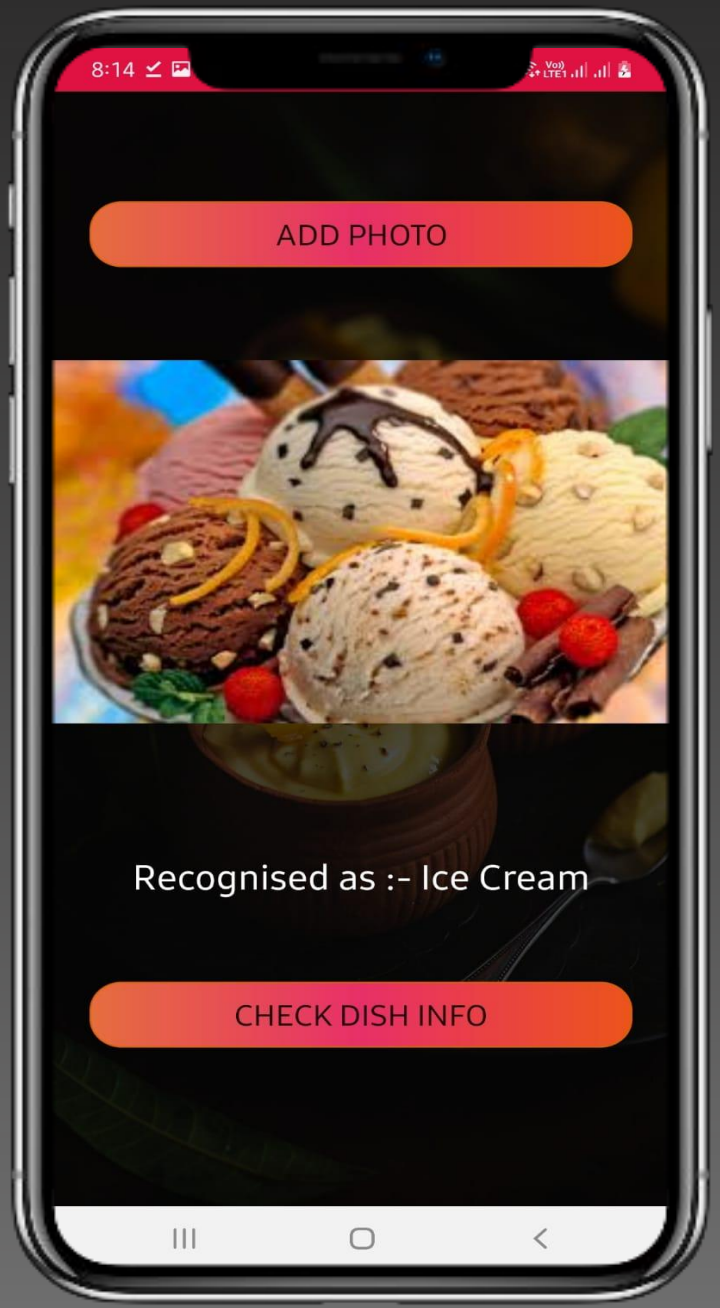

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THANK YOU!!