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Mapping Urban Vulnerability areas
(Crimes, Disasters, etc.) using Open Source Data

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MODEL BUILDING

TASK-2 & 3

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Model Building

MODELS

We carried out modelling using the following models:

- CNN
- Resnet
- InceptionV3
- ElasticNet
- VGG16

MODEL BUILT USING

- VGG16
- K-Means Clustering

IMAGE CLASSIFICATION

With the images we had we decided to concentrate on the following classifications

Disaster $\longrightarrow$ Non Disaster

Violent Crime $\longrightarrow$ Non Violent Crime

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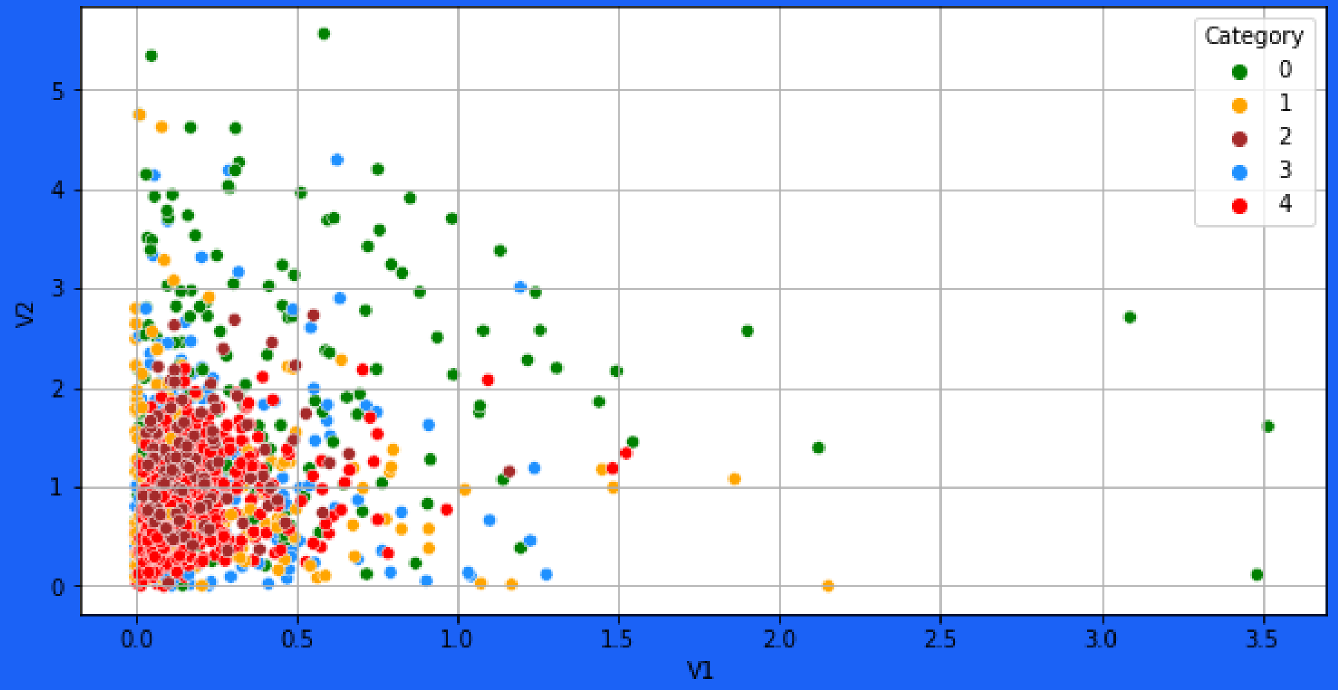
Clustering Images
K-MEANS

We were looking to classify the Data into two categories…’Violent and Non Violent’ with respect to ‘Crime Images’ and ‘Disastrous and ‘Non-Disasterous’ with respect to ‘Disaster Images’.



To do this the KMeans Agglomerative clustering was used. This mapped the unlabelled data into two types of clusters.

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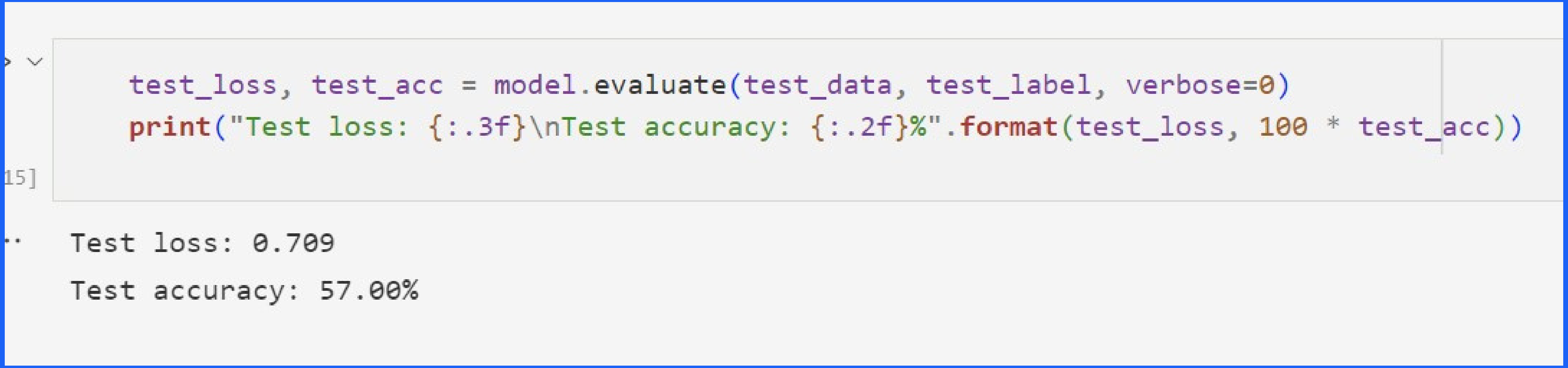
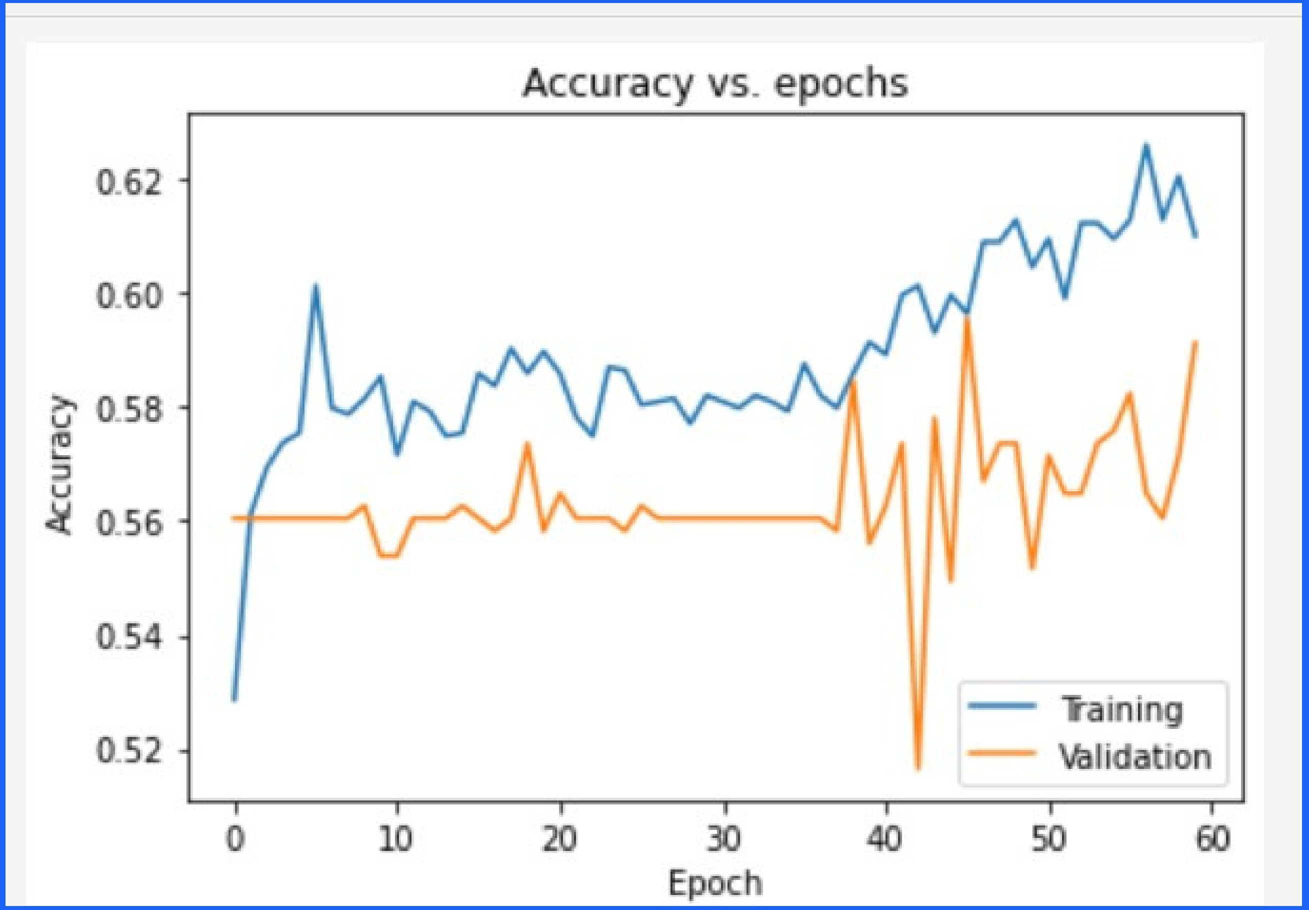
CNN



```
test_loss, test_acc = model.evaluate(test_data, test_label, verbose=0)
print("Test loss: {:.3f}\nTest accuracy: {:.2f}%".format(test_loss, 100 * test_acc))
```

```
Test loss: 0.709
Test accuracy: 57.00%
```



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Other Models Worked On:

- ResNet
- InceptionV3
- VGG16
- ElasticNet

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VGG16

VGG16 is a convolution neural network which has been trained on a subset of the ‘ImageNet’ dataset, a collection of over 14 million images belonging to 22,000 categories.

We use the pre-trained model's architecture to create a new dataset from our input images in this approach.

We pass our images through VGG16's convolution layers, it gives an output of feature stack of the detected visual features.

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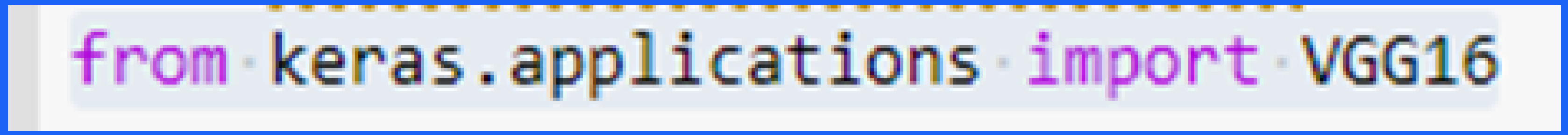
VGG16

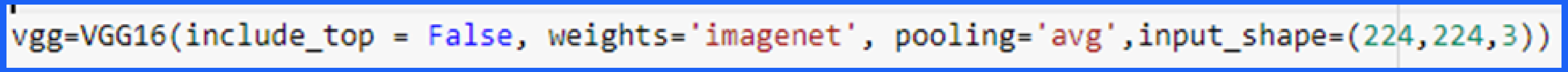
The Implementation Process:

VGG16 has been imported from the keras.applications



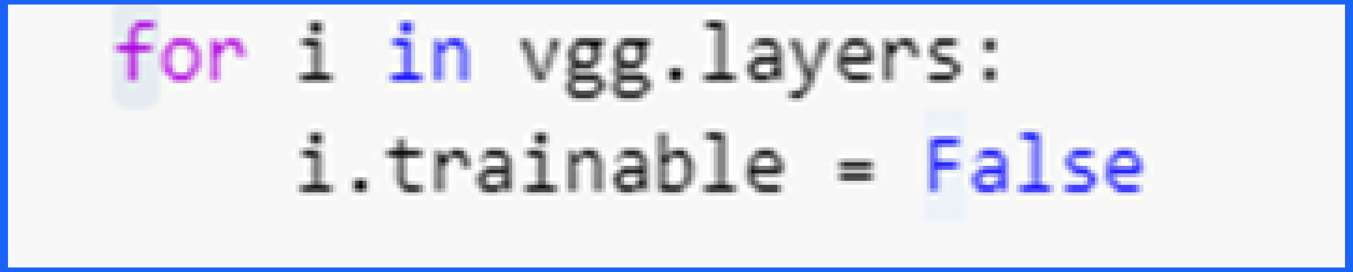
```
from keras.applications import VGG16
```

Bringing in a new top portion for the model with using the weights from ‘Imagenet’



```
vgg=VGG16(include_top = False, weights='imagenet', pooling='avg',input_shape=(224,224,3))
```

The pre-trained convolution layers are freezed



```
for i in vgg.layers:
    i.trainable = False
```

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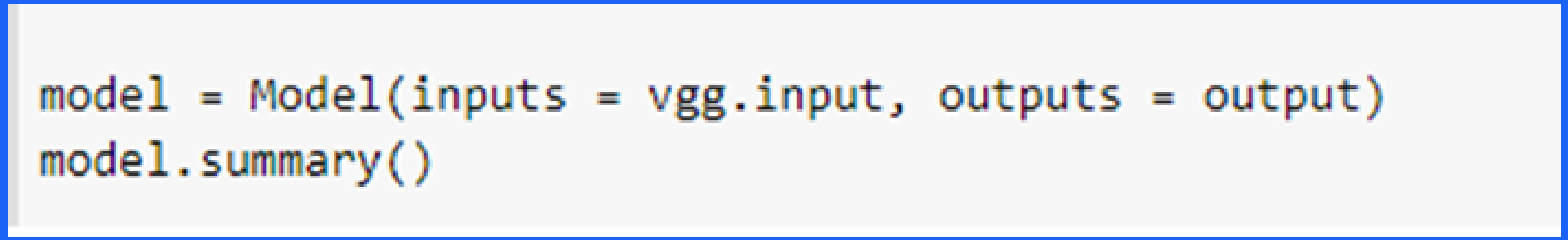
VGG16

The model summary



```
model = Model(inputs = vgg.input, outputs = output)
model.summary()
```

The images have to be first kept in their respective folders with labels for 'Train' and and an unlabelled folder of images was taken for the 'Test' data.

The images in the dataset was processed before using it to classify while passing through the model. We used the 'Image Data Generator' function imported from keras library to do this

After getting the data preprocessed, it was fit into the model to analyze the accuracy and the history is mapped to get the details

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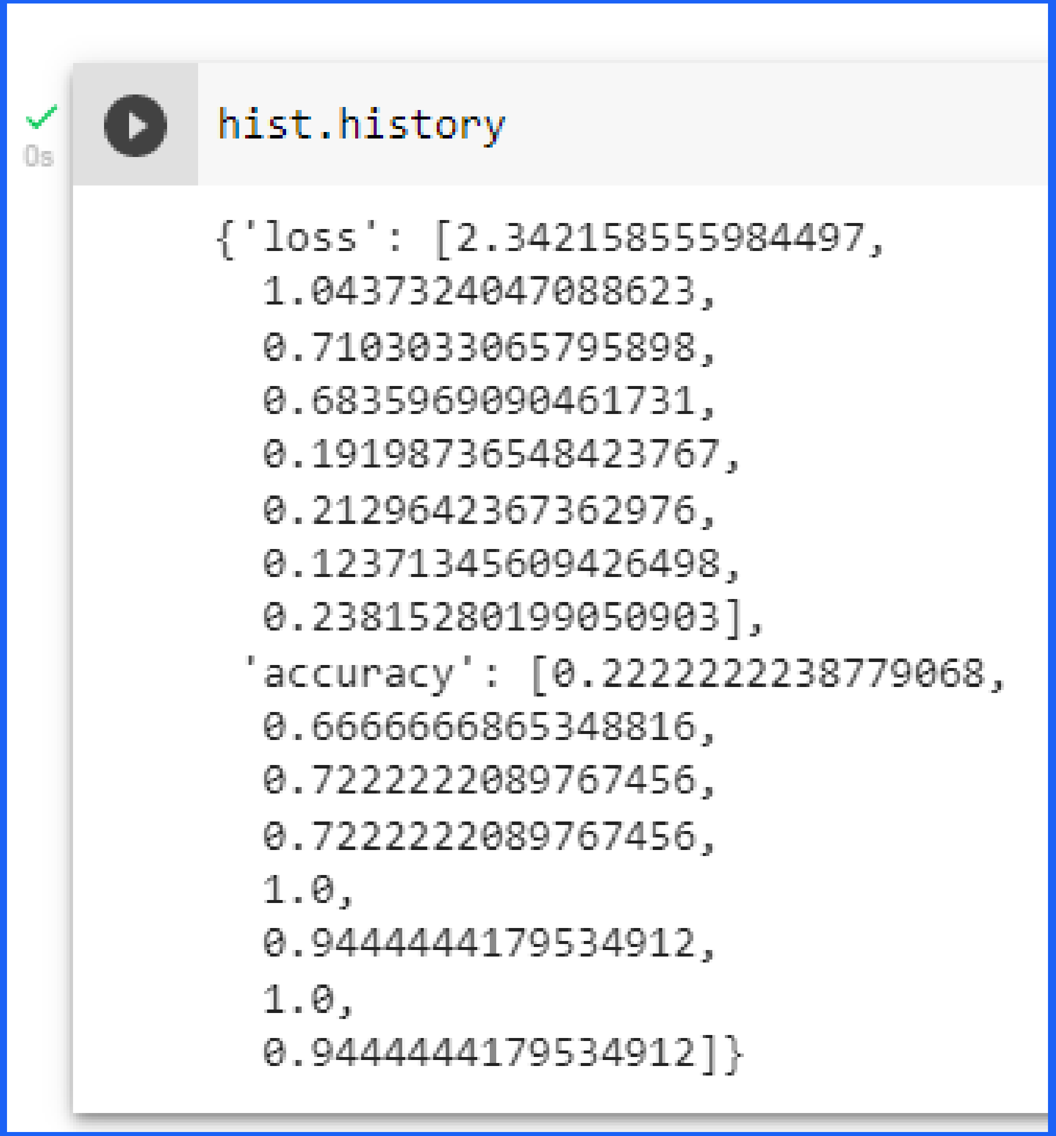
Accuracy VGG16

The vgg16 model gave us a respectable model accuracy

With this the vgg16 model was used on an unlabelled set of images to classify it into two categories based on the type of data entered.
The dataset in this case being a set of 'Crimes Images' and the 'Disaster Images'.



```
hist.history

{'loss': [2.342158555984497,
  1.0437324047088623,
  0.7103033065795898,
  0.6835969090461731,
  0.19198736548423767,
  0.2129642367362976,
  0.12371345609426498,
  0.23815280199050903],
 'accuracy': [0.2222222238779068,
  0.6666666865348816,
  0.7222222089767456,
  0.7222222089767456,
  1.0,
  0.9444444179534912,
  1.0,
  0.9444444179534912]}
```

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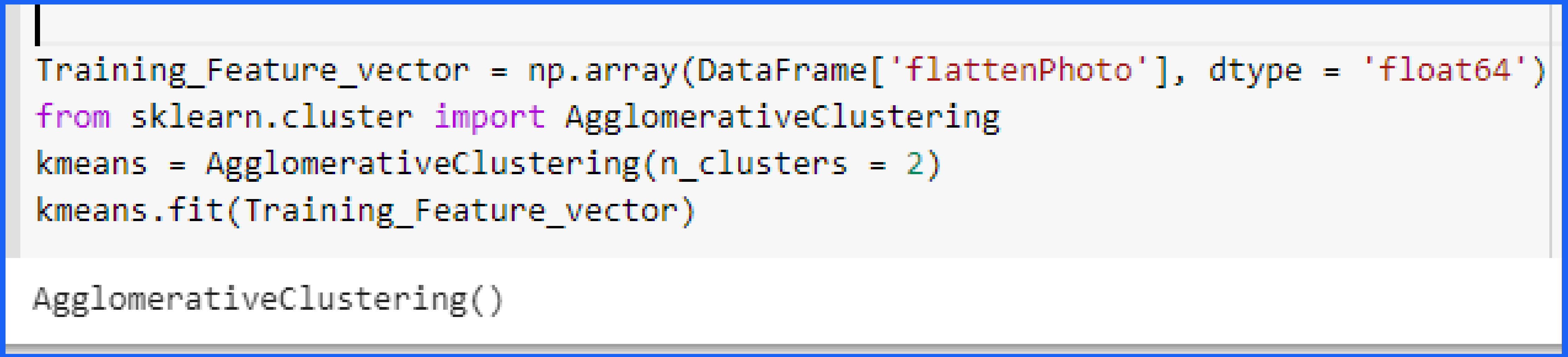
Model built on the KMeans Clustering

The vgg16 model was used for KMeans Agglomerative clustering after feature extraction for the classification of images on the basis of two categories



```
Training_Feature_vector = np.array(DataFrame['flattenPhoto'], dtype = 'float64')
from sklearn.cluster import AgglomerativeClustering
kmeans = AgglomerativeClustering(n_clusters = 2)
kmeans.fit(Training_Feature_vector)
```

```
AgglomerativeClustering()
```

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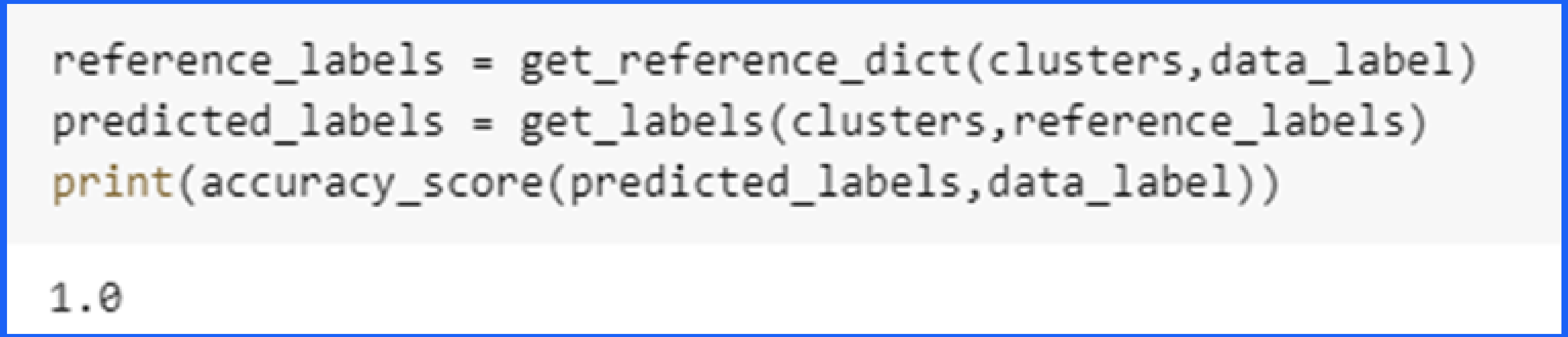
Accuracy
K-MEANS

Here the features were extracted using a function, where the image path with the redefined size of the image was used.



```
reference_labels = get_reference_dict(clusters,data_label)
predicted_labels = get_labels(clusters,reference_labels)
print(accuracy_score(predicted_labels,data_label))
```

```
1.0
```

The KMeans gave a good precision of 1 with respect to the classification.

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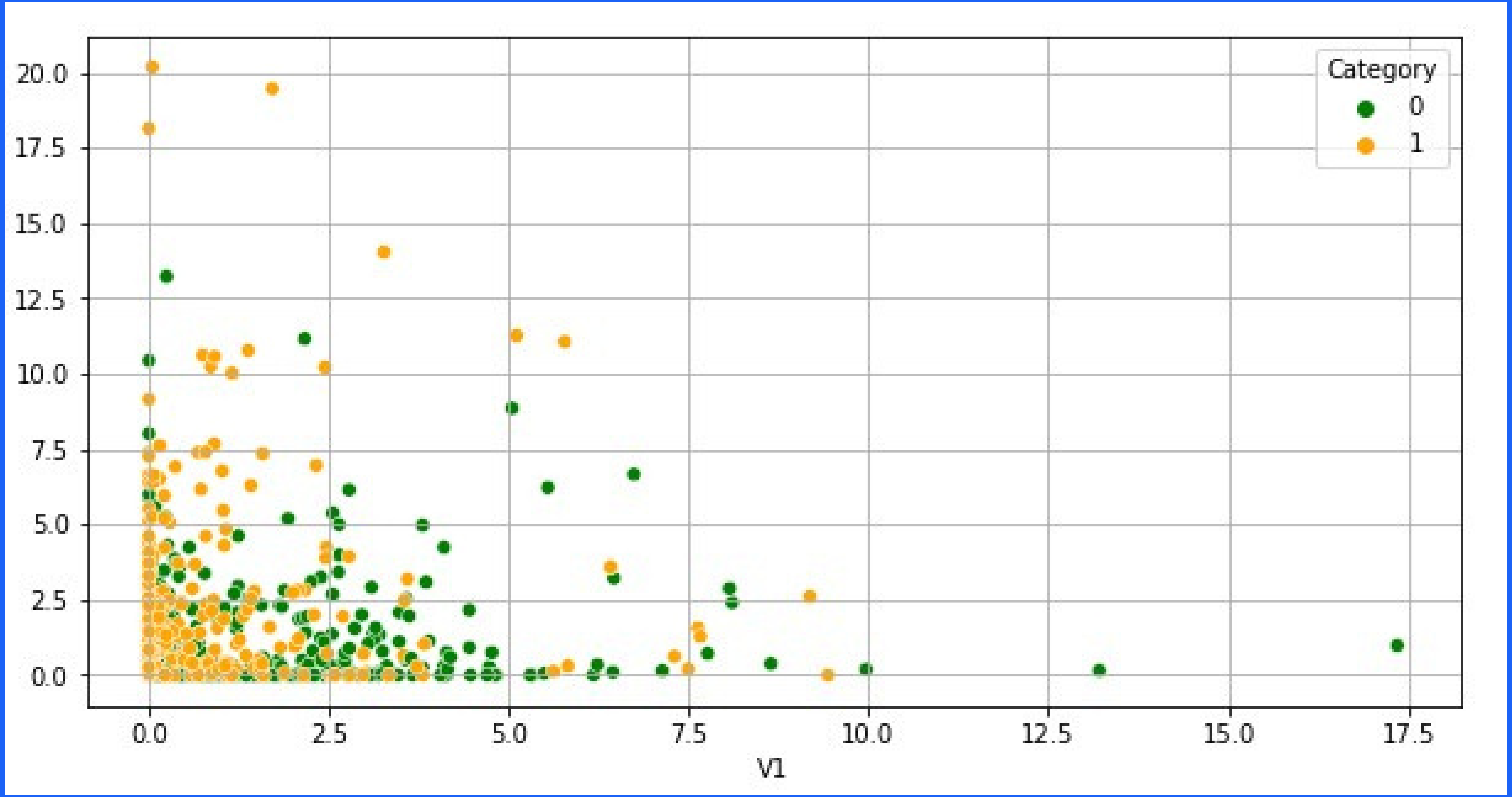
Clustering Images
VGG16



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Questions