Task

Kindly download the dataset of Fruits 360 from Kaggle
https://www.kaggle.com/datasets/moltean/fruits
a.Convert all the images which are in the training folder into 1D with labels.
b. Apply Classification models on that dataset and show which one performs best on their best parame
ters.
Then write the deployment code of that model.

In [20]:
```
import os
import numpy as np
import pandas as pd
import cv2
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.svm import SVC
from sklearn.metrics import classification_report ,accuracy_score
import matplotlib.pyplot as plt
from sklearn.ensemble import RandomForestClassifier
```

In [2]:
```
print(os.listdir("../OpenCvDataSet/fruits-360-original-size/fruits-360-original-size/Training"))
```

```
['apple_6', 'apple_braeburn_1', 'apple_crimson_snow_1', 'apple_golden_1', 'apple_golden_2', 'apple_golden_
3', 'apple_granny_smith_1', 'apple_hit_1', 'apple_pink_lady_1', 'apple_red_1', 'apple_red_2', 'apple_red_3',
'apple_red_delicios_1', 'apple_red_yellow_1', 'apple_rotten_1', 'cabbage_white_1', 'carrot_1', 'cucumber_1',
'cucumber_3', 'eggplant_violet_1', 'pear_1', 'pear_3', 'zucchini_1', 'zucchini_dark_1']
```

In [3]:
```
hs = [
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```

In [4]:
```
### This file will
dataset =[]

for i in folder_paths:
    folder_name = os.path.basename(i)
    for file_name in os.listdir(i):
        image_path = os.path.join(i, file_name)

        if os.path.isfile(image_path):  # Only consider files
            # Load the image using OpenCV
            image = cv2.imread(image_path, cv2.IMREAD_GRAYSCALE)

            # If the image was successfully loaded
            if image is not None:
                # Resize the grayscale image to 250X250 pixels
                resized_image = cv2.resize(image, (250, 250))

                # Flatten the image and append each pixel as a separate feature along with the label to the d
                flattened_image = resized_image.flatten().tolist()
                dataset.append(flattened_image + [folder_name])
```

In [5]:
```
## convert the matrix into dataFrame and change last column name into Label

img_df = pd.DataFrame(data =dataset)
img_df.rename(columns={img_df.iloc[:, -1].name : "label"},inplace=True)
img_df
```

Out[5]:

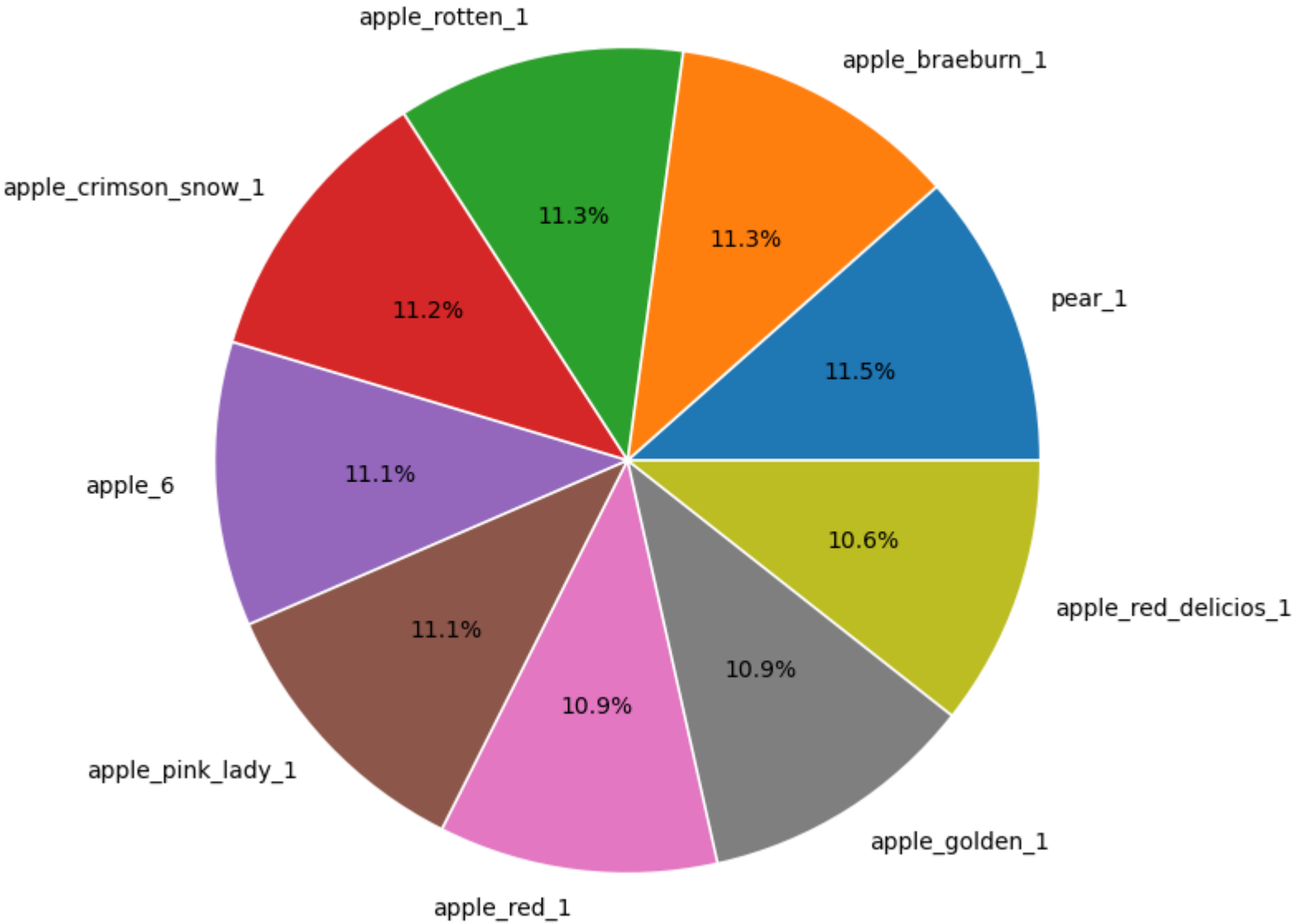
	0	1	2	3	4	5	6	7	8	9	...	62491	62492	62493	62494	62495	62496	62497	62498	62499	label
0	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	apple_6
1	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	apple_6
2	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	apple_6
3	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	apple_6
4	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	apple_6
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2823	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	pear_1
2824	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	pear_1
2825	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	pear_1
2826	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	pear_1
2827	255	255	255	255	255	255	255	255	255	255	...	255	255	255	255	255	255	255	255	255	pear_1

2828 rows × 62501 columns

In [6]:
```
## Count the label value in row
y = img_df.iloc[: , -1]
y.value_counts()
```

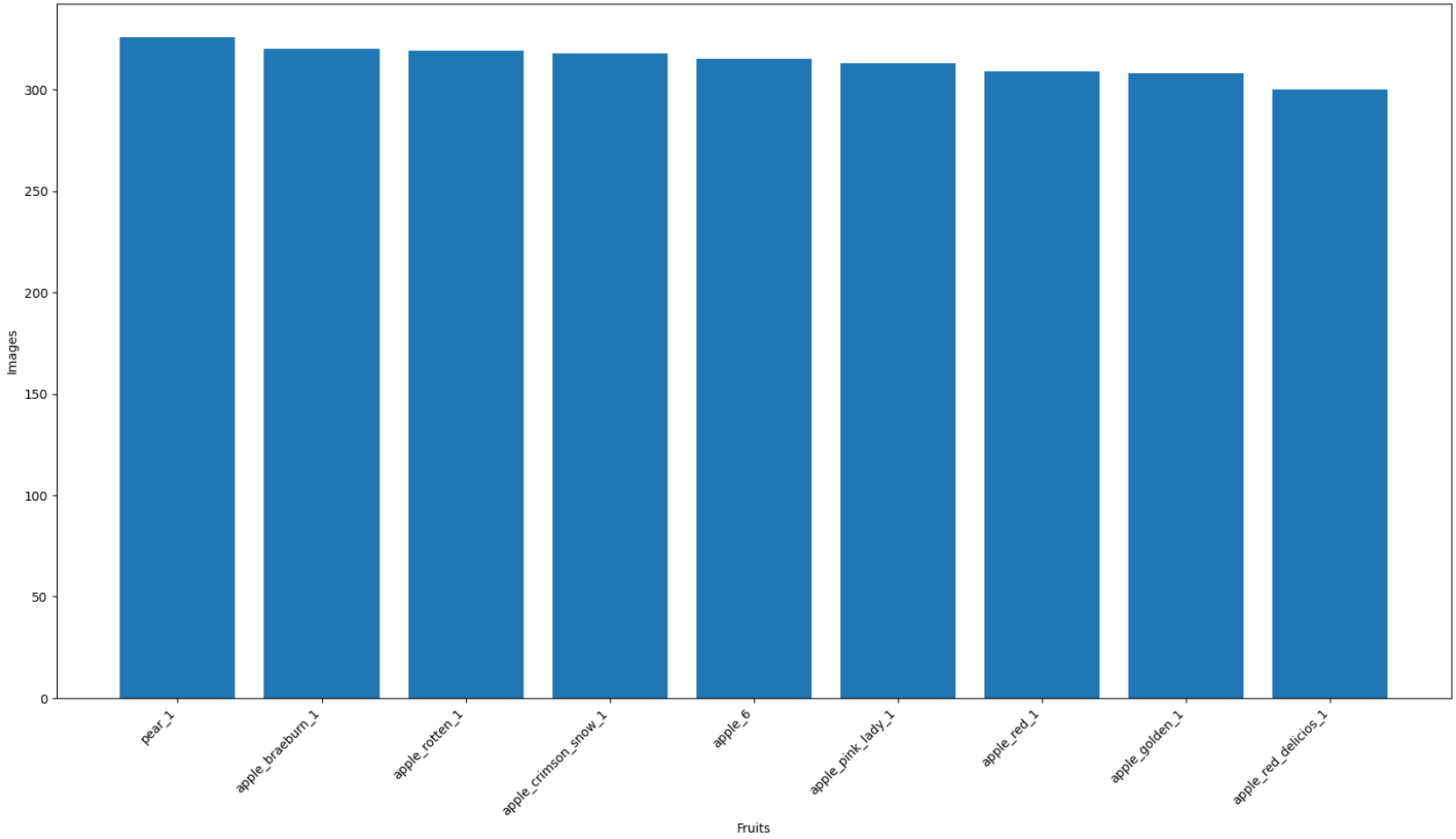
Out[6]:
```
pear_1                  326
apple_braeburn_1        320
apple_rotten_1          319
apple_crimson_snow_1    318
apple_6                 315
apple_pink_lady_1       313
apple_red_1             309
apple_golden_1          308
apple_red_delicios_1    300
Name: label, dtype: int64
```

In [8]:
```
##
plt.figure(figsize=(8,8))
plt.pie(y.value_counts(),labels=y.value_counts().index,autopct='%1.1f%%',explode = [0.01 for i in range(9)]);
```


apple_rotten_1
apple_braeburn_1
apple_crimson_snow_1
11.3%
11.3%
11.2%
pear_1
11.5%
apple_6
11.1%
10.6%
apple_red_delicios_1
11.1%
10.9%
10.9%
apple_pink_lady_1
apple_golden_1
apple_red_1

In [9]:
```
plt.figure(figsize=(20,10))
plt.bar(y.value_counts().index, y.value_counts().values ,)
plt.xticks(rotation=45, ha='right');
plt.xlabel("Fruits")
plt.ylabel("Images")
```

Out[9]: Text(0, 0.5, 'Images')



In [10]:
```
##   Split data into x and Y
x = img_df.drop("label" , axis =1)
y = img_df.iloc[:,-1]
```

In [11]:
```
## scale the Values in Range of 0 to 1 & label encode the value of y
##
x_scaled = x/255
encoder = LabelEncoder()
y_encoded = encoder.fit_transform(y)
encoder.classes_
```

Out[11]:
```
array(['apple_6', 'apple_braeburn_1', 'apple_crimson_snow_1',
       'apple_golden_1', 'apple_pink_lady_1', 'apple_red_1',
       'apple_red_delicios_1', 'apple_rotten_1', 'pear_1'], dtype=object)
```

In [12]:
```
## Train Test split

x_train ,x_test ,y_train ,y_test  =  train_test_split(x_scaled , y_encoded ,test_size = 0.2 ,random_state = 4
```

In [21]:
```
## Model selection

clf = RandomForestClassifier()
clf.fit(x_train ,y_train)
```

Out[21]:
```
▾ RandomForestClassifier

RandomForestClassifier()
```

In [22]:
```
##Basic Evalution
print("svc.score",clf.score(x_test ,y_test))
y_preds = clf.predict(x_test)
print("Accuracy_score",accuracy_score(y_test ,y_preds))
```

```
svc.score 1.0
Accuracy_score 1.0
```

In [23]:
```
### Classification Report
print(classification_report(y_test , y_preds))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        63
           1       1.00      1.00      1.00        70
           2       1.00      1.00      1.00        60
           3       1.00      1.00      1.00        54
           4       1.00      1.00      1.00        72
           5       1.00      1.00      1.00        62
           6       1.00      1.00      1.00        52
           7       1.00      1.00      1.00        69
           8       1.00      1.00      1.00        64

    accuracy                           1.00       566
   macro avg       1.00      1.00      1.00       566
weighted avg       1.00      1.00      1.00       566
```

In [47]:
```
### Deployment: Take a picture of a


inputDataSet = []
input_img = cv2.imread("../OpenCvDataSet/fruits-360-original-size/fruits-360-original-size/Test/apple_crimson

resized_input_image = cv2.resize(input_img, (250, 250))
flattened_input_image = resized_input_image.flatten().tolist()
inputDataSet.append(flattened_input_image)
```

In [48]:
```
##Scale the image before converting it into dataFrame

inp = np.array(inputDataSet) / 255
deploy_df = pd.DataFrame(inp)
deploy_df
```

Out[48]:

	0	1	2	3	4	5	6	7	8	9	...	62490	62491	62492	62493	62494	62495	62496	62497	62498	62499
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	...	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

1 rows × 62500 columns

In [43]:
```
##
encoder.classes_
```

Out[43]:
```
array(['apple_6', 'apple_braeburn_1', 'apple_crimson_snow_1',
       'apple_golden_1', 'apple_pink_lady_1', 'apple_red_1',
       'apple_red_delicios_1', 'apple_rotten_1', 'pear_1'], dtype=object)
```

In [45]:
```
## predict the Fruit


labels = {i:label for i,label in enumerate(encoder.classes_)}
y = svc.predict(deploy_df)
print("The Fruit is",labels[y[0]])
```

```
The Fruit is apple_crimson_snow_1
```