In [ ]:

```
# MOUNT THE DRIVE
from google.colab import drive
drive.mount("/content/drive")
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call driv
e.mount("/content/drive", force_remount=True).
```

IMPORTING LIBRARIES

In [ ]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

IMPORT OS MODULE: **To interact with the underlying operating system**

In [ ]:

```
import os
# os module in python provides functions for creating and removing a folder,
# fetching its content,changing and identifying the current dir etc
```

In [ ]:

```
from skimage.io import imread
# skikit-image is an open source python package used for image processing
# imread function to read images to a form usable in python program
```

In [ ]:

```
from skimage.transform import resize
```

In [ ]:

```
os.listdir("/content/drive/MyDrive/MASK_SVM")
```

Out[ ]:

```
['MASKS_OFF', 'MASKS_ON']
```

In [ ]:

```
len(os.listdir("/content/drive/MyDrive/MASK_SVM/MASKS_OFF"))
```

Out[ ]:

```
144
```

In [ ]:

```
len(os.listdir("/content/drive/MyDrive/MASK_SVM/MASKS_ON"))
```

Out[ ]:

```
180
```

In [ ]:

```
# ASSIGN A VARIABLE FOR EACH PATH
on_path=os.path.join("/content/drive/MyDrive/MASK_SVM","MASKS_ON")
off_path=os.path.join("/content/drive/MyDrive/MASK_SVM","MASKS_OFF")
```

In [ ]:

```
# DISPLAY CONTENT IN BOTH PATHS
for i in os.listdir(on_path):
  print(i)
```

```
with_mask_111.jpg
with_mask_185.jpg
with_mask_182.jpg
with_mask_189.jpg
with_mask_174.jpg
with_mask_113.jpg
with_mask_62.jpg
with_mask_57.jpg
with_mask_127.jpg
with_mask_9.jpg
with_mask_149.jpg
with_mask_65.jpg
with_mask_115.jpg
with_mask_28.jpg
with_mask_261.jpg
with_mask_186.jpg
with_mask_257.jpg
with_mask_119.jpg
with_mask_169.jpg
with_mask_137.jpg
with_mask_259.jpg
with_mask_208.jpg
with_mask_203.jpg
with_mask_94.jpg
with_mask_5.jpg
with_mask_228.jpg
with_mask_41.jpg
with_mask_102.jpg
with_mask_253.jpg
with_mask_206.jpg
with_mask_61.jpg
with_mask_114.jpg
with_mask_129.jpg
with_mask_76.jpg
with_mask_30.jpg
with_mask_170.jpg
with_mask_172.jpg
with_mask_135.jpg
with_mask_12.jpg
with_mask_82.jpg
with_mask_80.jpg
with_mask_222.jpg
with_mask_42.jpg
with_mask_27.jpg
with_mask_84.jpg
with_mask_146.jpg
with_mask_225.jpg
with_mask_25.jpg
with_mask_245.jpg
with_mask_118.jpg
with_mask_43.jpg
with_mask_136.jpg
with_mask_109.jpg
with_mask_204.jpg
with_mask_150.jpg
with_mask_60.jpg
with_mask_116.jpg
with_mask_153.jpg
with_mask_1.jpg
with_mask_66.jpg
with_mask_75.jpg
with_mask_96.jpg
with_mask_255.jpg
with_mask_20.jpg
with_mask_64.jpg
with_mask_130.jpg
with_mask_210.jpg
```

```
with_mask_236.jpg
with_mask_45.jpg
with_mask_165.jpg
with_mask_164.jpg
with_mask_241.jpg
with_mask_171.jpg
with_mask_48.jpg
with_mask_263.jpg
with_mask_202.jpg
with_mask_221.jpg
with_mask_58.jpg
with_mask_209.jpg
with_mask_83.jpg
with_mask_63.jpg
with_mask_227.jpg
with_mask_205.jpg
with_mask_97.jpg
with_mask_242.jpg
with_mask_91.jpg
with_mask_239.jpg
with_mask_238.jpg
with_mask_156.jpg
with_mask_74.jpg
with_mask_39.jpg
with_mask_147.jpg
with_mask_260.jpg
with_mask_79.jpg
with_mask_235.jpg
with_mask_22.jpg
with_mask_168.jpg
with_mask_101.jpg
with_mask_21.jpg
with_mask_99.jpg
with_mask_133.jpg
with_mask_132.jpg
with_mask_73.jpg
with_mask_188.jpg
with_mask_246.jpg
with_mask_192.jpg
with_mask_155.jpg
with_mask_145.jpg
with_mask_240.jpg
with_mask_223.jpg
with_mask_262.jpg
with_mask_218.jpg
with_mask_8.jpg
with_mask_224.jpg
with_mask_258.jpg
with_mask_55.jpg
with_mask_199.jpg
with_mask_183.jpg
with_mask_200.jpg
with_mask_184.jpg
with_mask_163.jpg
with_mask_40.jpg
with_mask_93.jpg
with_mask_117.jpg
with_mask_166.jpg
with_mask_19.jpg
with_mask_110.jpg
with_mask_181.jpg
with_mask_138.jpg
with_mask_3.jpg
with_mask_187.jpg
with_mask_7.jpg
with_mask_152.jpg
with_mask_11.jpg
```

```
with_mask_173.jpg
with_mask_81.jpg
with_mask_264.jpg
with_mask_154.jpg
with_mask_219.jpg
with_mask_95.jpg
with_mask_2.jpg
with_mask_56.jpg
with_mask_24.jpg
with_mask_47.jpg
with_mask_167.jpg
with_mask_44.jpg
with_mask_134.jpg
with_mask_29.jpg
with_mask_148.jpg
with_mask_226.jpg
with_mask_237.jpg
with_mask_256.jpg
with_mask_4.jpg
with_mask_26.jpg
with_mask_6.jpg
with_mask_112.jpg
with_mask_77.jpg
with_mask_38.jpg
with_mask_220.jpg
with_mask_37.jpg
with_mask_23.jpg
with_mask_98.jpg
with_mask_254.jpg
with_mask_244.jpg
with_mask_207.jpg
with_mask_201.jpg
with_mask_243.jpg
with_mask_46.jpg
with_mask_120.jpg
with_mask_92.jpg
with_mask_10.jpg
with_mask_151.jpg
with_mask_190.jpg
with_mask_59.jpg
with_mask_217.jpg
with_mask_100.jpg
with_mask_78.jpg
with_mask_128.jpg
with_mask_191.jpg
with_mask_131.jpg
```

In [ ]:

```
for i in os.listdir(off_path):
  print(i)
```

```
without_mask_117.jpg
without_mask_1.jpg
without_mask_60.jpg
without_mask_135.jpg
without_mask_141.jpg
without_mask_9.jpg
without_mask_115.jpg
without_mask_90.jpg
without_mask_144.jpg
without_mask_29.jpg
without_mask_45.jpg
without_mask_133.jpg
without_mask_66.jpg
without_mask_11.jpg
without_mask_85.jpg
without_mask_70.jpg
without_mask_134.jpg
without_mask_15.jpg
without_mask_97.jpg
without_mask_39.jpg
without_mask_25.jpg
without_mask_48.jpg
without_mask_105.jpg
without_mask_143.jpg
without_mask_51.jpg
without_mask_98.jpg
without_mask_122.jpg
without_mask_89.jpg
without_mask_120.jpg
without_mask_31.jpg
without_mask_114.jpg
without_mask_100.jpg
without_mask_20.jpg
without_mask_132.jpg
without_mask_63.jpg
without_mask_87.jpg
without_mask_67.jpg
without_mask_61.jpg
without_mask_3.jpg
without_mask_13.jpg
without_mask_112.jpg
without_mask_140.jpg
without_mask_116.jpg
without_mask_121.jpg
without_mask_59.jpg
without_mask_142.jpg
without_mask_125.jpg
without_mask_21.jpg
without_mask_35.jpg
without_mask_27.jpg
without_mask_79.jpg
without_mask_127.jpg
without_mask_94.jpg
without_mask_5.jpg
without_mask_55.jpg
without_mask_23.jpg
without_mask_7.jpg
without_mask_44.jpg
without_mask_75.jpg
without_mask_130.jpg
without_mask_69.jpg
without_mask_16.jpg
without_mask_56.jpg
without_mask_36.jpg
without_mask_81.jpg
without_mask_104.jpg
without_mask_57.jpg
```

```
without_mask_8.jpg
without_mask_46.jpg
without_mask_34.jpg
without_mask_49.jpg
without_mask_62.jpg
without_mask_26.jpg
without_mask_19.jpg
without_mask_88.jpg
without_mask_99.jpg
without_mask_54.jpg
without_mask_72.jpg
without_mask_123.jpg
without_mask_137.jpg
without_mask_86.jpg
without_mask_74.jpg
without_mask_14.jpg
without_mask_128.jpg
without_mask_53.jpg
without_mask_109.jpg
without_mask_41.jpg
without_mask_95.jpg
without_mask_118.jpg
without_mask_84.jpg
without_mask_64.jpg
without_mask_30.jpg
without_mask_10.jpg
without_mask_12.jpg
without_mask_65.jpg
without_mask_101.jpg
without_mask_50.jpg
without_mask_2.jpg
without_mask_119.jpg
without_mask_32.jpg
without_mask_40.jpg
without_mask_76.jpg
without_mask_96.jpg
without_mask_111.jpg
without_mask_52.jpg
without_mask_38.jpg
without_mask_18.jpg
without_mask_106.jpg
without_mask_71.jpg
without_mask_138.jpg
without_mask_108.jpg
without_mask_73.jpg
without_mask_77.jpg
without_mask_126.jpg
without_mask_136.jpg
without_mask_131.jpg
without_mask_43.jpg
without_mask_92.jpg
without_mask_102.jpg
without_mask_91.jpg
without_mask_33.jpg
without_mask_83.jpg
without_mask_68.jpg
without_mask_82.jpg
without_mask_28.jpg
without_mask_103.jpg
without_mask_93.jpg
without_mask_42.jpg
without_mask_113.jpg
without_mask_110.jpg
without_mask_107.jpg
without_mask_37.jpg
without_mask_129.jpg
without_mask_47.jpg
```

```
without_mask_80.jpg
without_mask_139.jpg
without_mask_58.jpg
without_mask_124.jpg
without_mask_22.jpg
without_mask_24.jpg
without_mask_17.jpg
without_mask_6.jpg
without_mask_78.jpg
without_mask_4.jpg
```

In [ ]:

```
categories=['MASKS_ON','MASKS_OFF']
flatten_data_arr=[]  #input array
target_arr=[]        #output array
datadir="/content/drive/MyDrive/MASK_SVM"   #path which contains all the categories
```

In [ ]:

```
for i in categories:
  print('loading category:',i)
  path=os.path.join(datadir,i)
  for img in os.listdir(path):
    img_read=imread(os.path.join(path,img))
    img_resize=resize(img_read,(150,150,3))
    flatten_data_arr.append(img_resize.flatten())
    target_arr.append(categories.index(i))
  print("load completed for category:",i)
```

```
loading category: MASKS_ON
load completed for category: MASKS_ON
loading category: MASKS_OFF
load completed for category: MASKS_OFF
```

In [ ]:

```
flatten_data=np.array(flatten_data_arr)
flatten_data
```

Out[ ]:

```
array([[0.0489698 , 0.03694976, 0.01785341, ..., 0.47810349, 0.37300886,
        0.26497744],
       [0.096767  , 0.07323759, 0.07323759, ..., 0.06178773, 0.0648595 ,
        0.04780105],
       [0.15724732, 0.17071137, 0.21552183, ..., 0.13541987, 0.13934144,
        0.15502771],
       ...,
       [0.10920436, 0.10528279, 0.12489063, ..., 0.92547712, 0.9411634 ,
        0.9529281 ],
       [0.97647059, 0.98039216, 0.96078431, ..., 0.13341176, 0.08956863,
        0.07411765],
       [0.39402065, 0.23726418, 0.13526797, ..., 0.80749948, 0.71097281,
        0.55298039]])
```

In [ ]:

```
target=np.array(target_arr)
target
```

Out[ ]:

```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1])
```

In [ ]:

```
# CREATE A DATAFRAME USING PANDAS
df=pd.DataFrame(flatten_data)
df['Target']=target   # add a column Target
df
```

Out[ ]:

	0	1	2	3	4	5	6	7	8	9
0	0.048970	0.036950	0.017853	0.049624	0.036971	0.023606	0.048036	0.040530	0.032455	0.053869
1	0.096767	0.073238	0.073238	0.098918	0.075389	0.075389	0.087897	0.064368	0.064368	0.084486
2	0.157247	0.170711	0.215522	0.159029	0.172493	0.217304	0.157136	0.170600	0.215410	0.155243
3	0.766592	0.638254	0.556172	0.741610	0.602220	0.516361	0.717316	0.564863	0.467107	0.700209
4	0.680133	0.631324	0.972080	0.689959	0.642900	0.980154	0.706551	0.659492	0.996289	0.696629
...	...	...	...	...	...	...	...	...	...	...
319	0.411026	0.402562	0.351892	0.414243	0.398850	0.351644	0.421211	0.398205	0.351146	0.418144
320	0.933333	0.933333	0.933333	0.933333	0.933333	0.933333	0.933333	0.933333	0.933333	0.933333
321	0.109204	0.105283	0.124891	0.070449	0.066528	0.086135	0.051505	0.047583	0.067191	0.051602
322	0.976471	0.980392	0.960784	0.983843	0.987765	0.968157	0.968157	0.972078	0.952471	0.968863
323	0.394021	0.237264	0.135268	0.391090	0.244889	0.139374	0.397753	0.253047	0.146969	0.401502

324 rows × 67501 columns

In [ ]:

```
df.shape  # NUMBER OF COLUMNS=150*150*3+1
```

Out[ ]:

```
(324, 67501)
```

SEPERATING INPUT AND OUTPUT

In [ ]:

```
x=df.iloc[:,:-1]
y=df.iloc[:,-1]
```

SEPERATING TRAIN AND TEST DATA

In [ ]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.20,random_state=42)
```

MODEL CREATION

In [ ]:

```
from sklearn.svm import SVC
model=SVC()
model.fit(x_train,y_train)
y_pred=model.predict(x_test)
```

PERFORMACE EVALUATION

In [ ]:

```
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
mat=confusion_matrix(y_test,y_pred)
mat
```

Out[ ]:

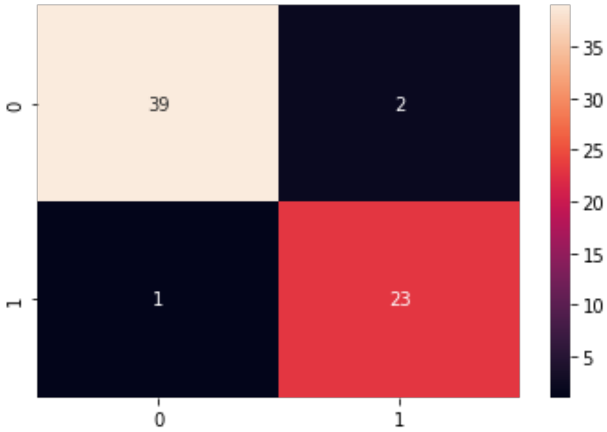
```
array([[39,  2],
       [ 1, 23]])
```

In [ ]:

```
sns.heatmap(mat,annot=True)
```

Out[ ]:

```
<Axes: >
```



```
In [ ]: score=accuracy_score(y_test,y_pred)
        score
```

```
Out[ ]: 0.9538461538461539
```

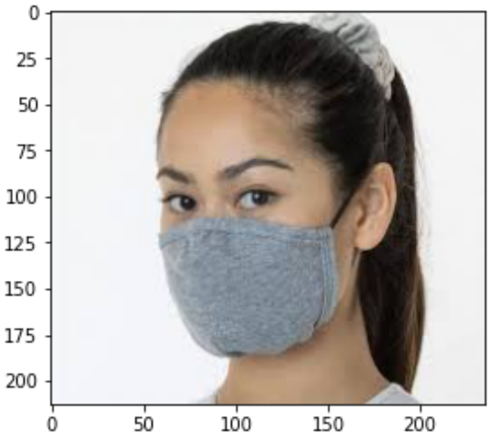
```
In [ ]: report=classification_report(y_test,y_pred)
        print(report)
```

```
              precision    recall  f1-score   support

           0       0.97      0.95      0.96        41
           1       0.92      0.96      0.94        24

    accuracy                           0.95        65
   macro avg       0.95      0.95      0.95        65
weighted avg       0.95      0.95      0.95        65
```

IMPLEMENTATION

```
In [ ]: url=input("Enter URL of the image:")
        img=imread(url)
        plt.imshow(img)
        plt.show()
        img_resize=resize(img,(150,150,3))
        l=[img_resize.flatten()]
        print("THE PREDICTED IMAGE IS:",categories[model.predict(l)[0]])
```

```
Enter URL of the image:/content/drive/MyDrive/with_mask_1797.jpg
```



```
THE PREDICTED IMAGE IS: MASKS_ON
```

In [ ]:

```
url1=input("Enter URL of the image:")
img=imread(url1)
plt.imshow(img)
plt.show()
img_resize=resize(img,(150,150,3))
l=[img_resize.flatten()]
print("THE PREDICTED IMAGE IS:",categories[model.predict(l)[0]])
```

```
Enter URL of the image:/content/drive/MyDrive/without_mask_1695.jpg
```

```
THE PREDICTED IMAGE IS: MASKS_OFF
```

CONCLUSION: SVM model with 95% accuracy is assembled and trained to classify images with or without masks.