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/home/ubuntu/.virtualenvs/Exam2/bin/python /home/ubuntu/Project/Code/Train.py
inception_model
Epoch 1/50
125/125 [==============================] - 15s 58ms/step - loss: 1.0429 - accuracy: 0.6636 - val_loss: 0.8555 - val_accuracy: 0.7203
Epoch 2/50
125/125 [==============================] - 4s 36ms/step - loss: 0.6215 - accuracy: 0.7716 - val_loss: 0.8072 - val_accuracy: 0.7223
Epoch 3/50
125/125 [==============================] - 4s 35ms/step - loss: 0.4859 - accuracy: 0.8148 - val_loss: 0.7813 - val_accuracy: 0.7093
Epoch 4/50
125/125 [==============================] - 4s 36ms/step - loss: 0.4056 - accuracy: 0.8468 - val_loss: 0.7118 - val_accuracy: 0.7435
Epoch 5/50
125/125 [==============================] - 4s 36ms/step - loss: 0.2754 - accuracy: 0.8943 - val_loss: 0.8431 - val_accuracy: 0.7304
Epoch 6/50
125/125 [==============================] - 4s 36ms/step - loss: 0.2825 - accuracy: 0.8974 - val_loss: 1.0128 - val_accuracy: 0.7254
Epoch 7/50
125/125 [==============================] - 4s 36ms/step - loss: 0.1929 - accuracy: 0.9298 - val_loss: 1.1441 - val_accuracy: 0.6660
Epoch 8/50
125/125 [==============================] - 4s 36ms/step - loss: 0.1537 - accuracy: 0.9514 - val_loss: 1.2796 - val_accuracy: 0.7243
Epoch 9/50
125/125 [==============================] - 4s 36ms/step - loss: 0.1170 - accuracy: 0.9600 - val_loss: 1.2159 - val_accuracy: 0.7374
Epoch 10/50
125/125 [==============================] - 4s 36ms/
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22 step - loss: 0.0936 - accuracy: 0.9686 - val_loss: 1.
   1975 - val_accuracy: 0.7193
23 Epoch 11/50
24 125/125 [==============================] - 4s 35ms/
   step - loss: 0.0946 - accuracy: 0.9718 - val_loss: 1.
   2369 - val_accuracy: 0.7445
25 Epoch 12/50
26 125/125 [==============================] - 4s 35ms/
   step - loss: 0.0949 - accuracy: 0.9686 - val_loss: 1.
   5084 - val_accuracy: 0.7082
27 Epoch 13/50
28 125/125 [==============================] - 4s 36ms/
   step - loss: 0.1072 - accuracy: 0.9658 - val_loss: 1.
   2867 - val_accuracy: 0.7425
29 Epoch 14/50
30 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0462 - accuracy: 0.9872 - val_loss: 1.
   8143 - val_accuracy: 0.7193
31 Epoch 15/50
32 125/125 [==============================] - 4s 35ms/
   step - loss: 0.0915 - accuracy: 0.9733 - val_loss: 1.
   6118 - val_accuracy: 0.7465
33 Epoch 16/50
34 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0827 - accuracy: 0.9726 - val_loss: 1.
   6416 - val_accuracy: 0.7314
35 Epoch 17/50
36 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0763 - accuracy: 0.9769 - val_loss: 1.
   5657 - val_accuracy: 0.7243
37 Epoch 18/50
38 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0350 - accuracy: 0.9869 - val_loss: 1.
   7784 - val_accuracy: 0.7153
39 Epoch 19/50
40 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0665 - accuracy: 0.9816 - val_loss: 1.
   8851 - val_accuracy: 0.7233
41 Epoch 20/50
42 125/125 [==============================] - 4s 36ms/
   step - loss: 0.0501 - accuracy: 0.9819 - val_loss: 2.
```

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0326 - val_accuracy: 0.7193
Epoch 21/50
125/125 [==============================] - 4s 36ms/
   step - loss: 0.0942 - accuracy: 0.9723 - val_loss: 1.
   6744 - val_accuracy: 0.7324
Epoch 22/50
125/125 [==============================] - 4s 36ms/
   step - loss: 0.0662 - accuracy: 0.9824 - val_loss: 1.
   9996 - val_accuracy: 0.6982
Epoch 23/50
125/125 [==============================] - 4s 35ms/
   step - loss: 0.0537 - accuracy: 0.9872 - val_loss: 1.
   5793 - val_accuracy: 0.7384
Epoch 24/50
125/125 [==============================] - 4s 36ms/
   step - loss: 0.0206 - accuracy: 0.9927 - val_loss: 1.
   8256 - val_accuracy: 0.7203
Epoch 25/50
125/125 [==============================] - 4s 35ms/
   step - loss: 0.0298 - accuracy: 0.9894 - val_loss: 1.
   6735 - val_accuracy: 0.7274
Epoch 26/50
125/125 [==============================] - 4s 36ms/
   step - loss: 0.0240 - accuracy: 0.9930 - val_loss: 1.
   8318 - val_accuracy: 0.7354
Epoch 27/50
125/125 [==============================] - 4s 36ms/
   step - loss: 0.0211 - accuracy: 0.9950 - val_loss: 2.
   0636 - val_accuracy: 0.7243
Epoch 28/50
125/125 [==============================] - 4s 35ms/
   step - loss: 0.0782 - accuracy: 0.9771 - val_loss: 1.
   9428 - val_accuracy: 0.7364
Epoch 29/50
125/125 [==============================] - 4s 35ms/
   step - loss: 0.0506 - accuracy: 0.9854 - val_loss: 2.
   1113 - val_accuracy: 0.7364
Epoch 30/50
125/125 [==============================] - 4s 35ms/
   step - loss: 0.0873 - accuracy: 0.9771 - val_loss: 2.
   1205 - val_accuracy: 0.7414
```

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Epoch 31/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0500 - accuracy: 0.9842 - val_loss: 1.8815 - val_accuracy: 0.7294
Epoch 32/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0371 - accuracy: 0.9867 - val_loss: 2.0949 - val_accuracy: 0.7304
Epoch 33/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0684 - accuracy: 0.9819 - val_loss: 1.6646 - val_accuracy: 0.7354
Epoch 34/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0613 - accuracy: 0.9839 - val_loss: 1.7798 - val_accuracy: 0.7233
Epoch 35/50
125/125 [==============================] - 4s 36ms/step - loss: 0.0479 - accuracy: 0.9854 - val_loss: 2.0081 - val_accuracy: 0.7334
Epoch 36/50
125/125 [==============================] - 4s 36ms/step - loss: 0.0315 - accuracy: 0.9919 - val_loss: 2.3785 - val_accuracy: 0.7274
Epoch 37/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0239 - accuracy: 0.9945 - val_loss: 2.6116 - val_accuracy: 0.7284
Epoch 38/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0295 - accuracy: 0.9925 - val_loss: 2.2927 - val_accuracy: 0.7304
Epoch 39/50
125/125 [==============================] - 4s 35ms/step - loss: 0.0230 - accuracy: 0.9937 - val_loss: 2.5502 - val_accuracy: 0.7203
Epoch 40/50
125/125 [==============================] - 4s 36ms/step - loss: 0.0652 - accuracy: 0.9874 - val_loss: 2.4542 - val_accuracy: 0.7314
Epoch 41/50
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 84 125/125 [==============================] - 4s 35ms/
    step - loss: 0.0842 - accuracy: 0.9799 - val_loss: 2
    .2328 - val_accuracy: 0.7093
 85 Epoch 42/50
 86 125/125 [==============================] - 4s 35ms/
    step - loss: 0.0430 - accuracy: 0.9897 - val_loss: 2
    .3283 - val_accuracy: 0.7113
 87 Epoch 43/50
 88 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0156 - accuracy: 0.9940 - val_loss: 2
    .4182 - val_accuracy: 0.7374
 89 Epoch 44/50
 90 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0363 - accuracy: 0.9892 - val_loss: 2
    .4207 - val_accuracy: 0.7093
 91 Epoch 45/50
 92 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0230 - accuracy: 0.9937 - val_loss: 2
    .5987 - val_accuracy: 0.7374
 93 Epoch 46/50
 94 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0216 - accuracy: 0.9937 - val_loss: 2
    .6858 - val_accuracy: 0.7414
 95 Epoch 47/50
 96 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0526 - accuracy: 0.9879 - val_loss: 2
    .5328 - val_accuracy: 0.7364
 97 Epoch 48/50
 98 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0233 - accuracy: 0.9925 - val_loss: 2
    .4489 - val_accuracy: 0.7364
 99 Epoch 49/50
100 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0311 - accuracy: 0.9917 - val_loss: 2
    .4912 - val_accuracy: 0.7334
101 Epoch 50/50
102 125/125 [==============================] - 4s 36ms/
    step - loss: 0.0489 - accuracy: 0.9864 - val_loss: 2
    .6569 - val_accuracy: 0.7445
103 Model: "inception_model"
104 _________________________________________________
```

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104 _________________________________________________________________
105  Layer (type)                 Output Shape              Param #
106 =================================================================
107  inception_v3 (Functional)   (None, 1, 1, 2048)        21802784
108
109  global_average_pooling2d (G  multiple                  0
110  lobalAveragePooling2D)
111
112  dense (Dense)                multiple                  4196352
113
114  dense_1 (Dense)              multiple                  2573544
115
116  dropout_1 (Dropout)          multiple                  0
117
118  dense_2 (Dense)              multiple                  8799
119
120 =================================================================
121 Total params: 28,581,479
122 Trainable params: 6,778,695
123 Non-trainable params: 21,802,784
124 _________________________________________________________________
125 None
126 125/125 [==============================] - 3s 27ms/step - loss: 0.0078 - accuracy: 0.9970
```

```
CNN for train: [0.007814266718924046, 0.
    996981143951416]
39/39 [==============================] - 2s 41ms/
    step - loss: 2.4135 - accuracy: 0.7627
CNN for test: [2.4134533405303955, 0.
    7626709342002869]
125/125 [==============================] - 5s 25ms/
    step
32/32 [==============================] - 1s 25ms/
    step
39/39 [==============================] - 1s 25ms/
    step
KNN classification report for validation data:
              precision    recall  f1-score
    support

           0       0.75      0.84      0.79
    165
           1       0.00      0.00      0.00
    22
           2       0.92      0.95      0.93
    296
           3       0.81      0.81      0.81
    161
           4       0.38      0.19      0.25
    27
           5       0.54      0.39      0.45
    161
           6       0.54      0.72      0.62
    162

    accuracy                           0.74
    994
   macro avg       0.57      0.56      0.55
    994
weighted avg       0.72      0.74      0.72
    994

KNN classification report for train data:
              precision    recall  f1-score
    support
```

```
150
151              0       1.00      1.00      1.00
    666
152              1       1.00      0.97      0.99
    73
153              2       1.00      1.00      1.00
    1136
154              3       1.00      1.00      1.00
    681
155              4       1.00      1.00      1.00
    130
156              5       1.00      1.00      1.00
    644
157              6       0.99      1.00      1.00
    645
158
159     accuracy                           1.00
    3975
160    macro avg       1.00      0.99      1.00
    3975
161 weighted avg       1.00      1.00      1.00
    3975
162
163 KNN classification report for test data:
164                precision    recall  f1-score
    support
165
166              0       0.81      0.86      0.83
    223
167              1       0.43      0.12      0.18
    26
168              2       0.92      0.95      0.93
    357
169              3       0.87      0.88      0.88
    193
170              4       0.25      0.10      0.14
    31
171              5       0.60      0.45      0.52
    210
172              6       0.54      0.71      0.62
    203
```

```
173
174     accuracy                           0.76
    1243
175    macro avg       0.63      0.58      0.58
    1243
176 weighted avg       0.75      0.76      0.75
    1243
177
178
179 Process finished with exit code 0
180
```