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/home/ubuntu/.virtualenvs/Exam2/bin/python /home/ubuntu/Project/Code/Train.py
vgg19
Epoch 1/50
125/125 [==============================] - 15s 82ms/step - loss: 1.1167 - accuracy: 0.6418 - val_loss: 0.6518 - val_accuracy: 0.7505
Epoch 2/50
125/125 [==============================] - 9s 70ms/step - loss: 0.6553 - accuracy: 0.7504 - val_loss: 0.7020 - val_accuracy: 0.7414
Epoch 3/50
125/125 [==============================] - 9s 70ms/step - loss: 0.5916 - accuracy: 0.7691 - val_loss: 0.5624 - val_accuracy: 0.7696
Epoch 4/50
125/125 [==============================] - 9s 70ms/step - loss: 0.5591 - accuracy: 0.7766 - val_loss: 0.5791 - val_accuracy: 0.7565
Epoch 5/50
125/125 [==============================] - 9s 70ms/step - loss: 0.5173 - accuracy: 0.7892 - val_loss: 0.5981 - val_accuracy: 0.7495
Epoch 6/50
125/125 [==============================] - 9s 71ms/step - loss: 0.4814 - accuracy: 0.8020 - val_loss: 0.5470 - val_accuracy: 0.7867
Epoch 7/50
125/125 [==============================] - 9s 71ms/step - loss: 0.4717 - accuracy: 0.8156 - val_loss: 0.5837 - val_accuracy: 0.7887
Epoch 8/50
125/125 [==============================] - 9s 71ms/step - loss: 0.4609 - accuracy: 0.8116 - val_loss: 0.6158 - val_accuracy: 0.7586
Epoch 9/50
125/125 [==============================] - 9s 71ms/step - loss: 0.4494 - accuracy: 0.8156 - val_loss: 0.6671 - val_accuracy: 0.7736
Epoch 10/50
125/125 [==============================] - 9s 71ms/
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22 step - loss: 0.4357 - accuracy: 0.8292 - val_loss: 0.
   5344 - val_accuracy: 0.8139
23 Epoch 11/50
24 125/125 [==============================] - 9s 71ms/
   step - loss: 0.4302 - accuracy: 0.8247 - val_loss: 0.
   5192 - val_accuracy: 0.8028
25 Epoch 12/50
26 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3919 - accuracy: 0.8418 - val_loss: 0.
   5734 - val_accuracy: 0.8048
27 Epoch 13/50
28 125/125 [==============================] - 9s 71ms/
   step - loss: 0.4155 - accuracy: 0.8267 - val_loss: 0.
   5843 - val_accuracy: 0.8048
29 Epoch 14/50
30 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3793 - accuracy: 0.8481 - val_loss: 0.
   6089 - val_accuracy: 0.7827
31 Epoch 15/50
32 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3980 - accuracy: 0.8443 - val_loss: 0.
   6326 - val_accuracy: 0.8099
33 Epoch 16/50
34 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3679 - accuracy: 0.8453 - val_loss: 0.
   6297 - val_accuracy: 0.8119
35 Epoch 17/50
36 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3674 - accuracy: 0.8413 - val_loss: 0.
   6275 - val_accuracy: 0.7877
37 Epoch 18/50
38 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3609 - accuracy: 0.8513 - val_loss: 0.
   6097 - val_accuracy: 0.8089
39 Epoch 19/50
40 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3545 - accuracy: 0.8508 - val_loss: 0.
   5941 - val_accuracy: 0.8078
41 Epoch 20/50
42 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3668 - accuracy: 0.8473 - val_loss: 0.
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5776 - val_accuracy: 0.8048
Epoch 21/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3558 - accuracy: 0.8576 - val_loss: 0.
   5871 - val_accuracy: 0.8058
Epoch 22/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3550 - accuracy: 0.8531 - val_loss: 0.
   6109 - val_accuracy: 0.7857
Epoch 23/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3511 - accuracy: 0.8533 - val_loss: 0.
   6440 - val_accuracy: 0.7938
Epoch 24/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3663 - accuracy: 0.8493 - val_loss: 0.
   6543 - val_accuracy: 0.8008
Epoch 25/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3433 - accuracy: 0.8649 - val_loss: 0.
   6244 - val_accuracy: 0.7948
Epoch 26/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3444 - accuracy: 0.8604 - val_loss: 0.
   7039 - val_accuracy: 0.7907
Epoch 27/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3317 - accuracy: 0.8654 - val_loss: 0.
   8283 - val_accuracy: 0.7887
Epoch 28/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3135 - accuracy: 0.8682 - val_loss: 0.
   6106 - val_accuracy: 0.8189
Epoch 29/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3063 - accuracy: 0.8679 - val_loss: 0.
   7103 - val_accuracy: 0.8209
Epoch 30/50
125/125 [==============================] - 9s 71ms/
   step - loss: 0.3345 - accuracy: 0.8564 - val_loss: 0.
   5905 - val_accuracy: 0.7998
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63 Epoch 31/50
64 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3644 - accuracy: 0.8526 - val_loss: 0
   .6971 - val_accuracy: 0.7988
65 Epoch 32/50
66 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3225 - accuracy: 0.8714 - val_loss: 0
   .7083 - val_accuracy: 0.7988
67 Epoch 33/50
68 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3081 - accuracy: 0.8735 - val_loss: 0
   .6497 - val_accuracy: 0.8219
69 Epoch 34/50
70 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3110 - accuracy: 0.8664 - val_loss: 0
   .6636 - val_accuracy: 0.7897
71 Epoch 35/50
72 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3088 - accuracy: 0.8757 - val_loss: 0
   .7127 - val_accuracy: 0.8068
73 Epoch 36/50
74 125/125 [==============================] - 9s 71ms/
   step - loss: 0.2856 - accuracy: 0.8795 - val_loss: 0
   .6956 - val_accuracy: 0.8089
75 Epoch 37/50
76 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3047 - accuracy: 0.8770 - val_loss: 0
   .6543 - val_accuracy: 0.8199
77 Epoch 38/50
78 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3186 - accuracy: 0.8679 - val_loss: 0
   .8146 - val_accuracy: 0.8159
79 Epoch 39/50
80 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3510 - accuracy: 0.8599 - val_loss: 0
   .6708 - val_accuracy: 0.8149
81 Epoch 40/50
82 125/125 [==============================] - 9s 71ms/
   step - loss: 0.3068 - accuracy: 0.8722 - val_loss: 0
   .6201 - val_accuracy: 0.8129
83 Epoch 41/50
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 84 125/125 [==============================] - 9s 71ms/
    step - loss: 0.3094 - accuracy: 0.8767 - val_loss: 0
    .7260 - val_accuracy: 0.7847
 85 Epoch 42/50
 86 125/125 [==============================] - 9s 71ms/
    step - loss: 0.3106 - accuracy: 0.8725 - val_loss: 0
    .7000 - val_accuracy: 0.8169
 87 Epoch 43/50
 88 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2979 - accuracy: 0.8782 - val_loss: 0
    .6903 - val_accuracy: 0.8038
 89 Epoch 44/50
 90 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2828 - accuracy: 0.8840 - val_loss: 0
    .6795 - val_accuracy: 0.8209
 91 Epoch 45/50
 92 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2815 - accuracy: 0.8838 - val_loss: 0
    .7132 - val_accuracy: 0.8109
 93 Epoch 46/50
 94 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2817 - accuracy: 0.8863 - val_loss: 0
    .6922 - val_accuracy: 0.8058
 95 Epoch 47/50
 96 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2824 - accuracy: 0.8850 - val_loss: 0
    .6908 - val_accuracy: 0.7958
 97 Epoch 48/50
 98 125/125 [==============================] - 9s 71ms/
    step - loss: 0.2954 - accuracy: 0.8792 - val_loss: 0
    .7588 - val_accuracy: 0.8119
 99 Epoch 49/50
100 125/125 [==============================] - 9s 71ms/
    step - loss: 0.3007 - accuracy: 0.8725 - val_loss: 0
    .8177 - val_accuracy: 0.7837
101 Epoch 50/50
102 125/125 [==============================] - 9s 71ms/
    step - loss: 0.3351 - accuracy: 0.8697 - val_loss: 0
    .7746 - val_accuracy: 0.7857
103 Model: "vgg19"
104 _________________________________________________
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104 _________________________________________________________________
105  Layer (type)                 Output Shape              
                Param #   
106 =================================================================
    =============
107  vgg19 (Functional)           (None, 3, 3, 512
    )         20024384  
108 
109  flatten (Flatten)            multiple                  
                    0         
110 
111  dense (Dense)                multiple                  
                    9439232   
112 
113  dense_1 (Dense)              multiple                  
                    2573544   
114 
115  dropout_1 (Dropout)          multiple                  
                    0         
116 
117  dense_2 (Dense)              multiple                  
                    8799      
118 
119 =================================================================
    =============
120 Total params: 32,045,959
121 Trainable params: 12,021,575
122 Non-trainable params: 20,024,384
123 _________________________________________________________________
    _____________
124 None
125 125/125 [==============================] - 7s 54ms/
    step - loss: 0.2796 - accuracy: 0.8843
126 CNN for train: [0.27958276867866516, 0.
    8842767477035522]
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127 39/39 [==============================] - 3s 90ms/
    step - loss: 0.7471 - accuracy: 0.7812
128 CNN for test: [0.7470927238464355, 0.
    7811746001243591]
129 125/125 [==============================] - 7s 53ms/
    step
130 32/32 [==============================] - 2s 53ms/
    step
131 39/39 [==============================] - 2s 53ms/
    step
132 KNN classification report for validation data:
133               precision    recall  f1-score
    support
134
135            0       0.82      0.85      0.84
    165
136            1       0.25      0.09      0.13
    22
137            2       0.98      0.97      0.98
    296
138            3       0.88      0.93      0.91
    161
139            4       0.50      0.33      0.40
    27
140            5       0.60      0.62      0.61
    161
141            6       0.67      0.69      0.68
    162
142
143     accuracy                           0.81
    994
144    macro avg       0.67      0.64      0.65
    994
145 weighted avg       0.80      0.81      0.80
    994
146
147 KNN classification report for train data:
148               precision    recall  f1-score
    support
149
150            0       0.99      0.98      0.98
```

```
150 666
151              1       1.00      0.97      0.99
    73
152              2       1.00      1.00      1.00
    1136
153              3       0.99      1.00      0.99
    681
154              4       0.78      0.41      0.54
    130
155              5       0.78      0.81      0.80
    644
156              6       0.79      0.84      0.82
    645
157
158     accuracy                           0.92
    3975
159    macro avg       0.90      0.86      0.87
    3975
160 weighted avg       0.92      0.92      0.92
    3975
161
162 KNN classification report for test data:
163                precision    recall  f1-score
    support
164
165              0       0.86      0.80      0.83
    223
166              1       0.18      0.08      0.11
    26
167              2       0.96      0.97      0.97
    357
168              3       0.85      0.93      0.89
    193
169              4       0.30      0.26      0.28
    31
170              5       0.59      0.58      0.58
    210
171              6       0.64      0.68      0.66
    203
172
173     accuracy                           0.79
```

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173 1243
174    macro avg       0.63      0.62      0.62
    1243
175 weighted avg       0.78      0.79      0.78
    1243
176
177
178 Process finished with exit code 0
179
```