```
/home/ubuntu/.virtualenvs/Exam2/bin/python /home/ubuntu/Project/Code/Train.py
res_net50
Epoch 1/50
125/125 [==============================] - 18s 93ms/step - loss: 3.1815 - accuracy: 0.2780 - val_loss: 1.5174 - val_accuracy: 0.3581
Epoch 2/50
125/125 [==============================] - 10s 76ms/step - loss: 1.5046 - accuracy: 0.3492 - val_loss: 1.4539 - val_accuracy: 0.3903
Epoch 3/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4239 - accuracy: 0.3945 - val_loss: 1.3669 - val_accuracy: 0.4688
Epoch 4/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4695 - accuracy: 0.3721 - val_loss: 1.2835 - val_accuracy: 0.4759
Epoch 5/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4309 - accuracy: 0.3811 - val_loss: 1.3228 - val_accuracy: 0.4809
Epoch 6/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3660 - accuracy: 0.4226 - val_loss: 1.3148 - val_accuracy: 0.4437
Epoch 7/50
125/125 [==============================] - 9s 76ms/step - loss: 1.3456 - accuracy: 0.4242 - val_loss: 1.1526 - val_accuracy: 0.5523
Epoch 8/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3753 - accuracy: 0.4269 - val_loss: 1.1717 - val_accuracy: 0.5221
Epoch 9/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3241 - accuracy: 0.4335 - val_loss: 1.2741 - val_accuracy: 0.4507
Epoch 10/50
125/125 [==============================] - 9s 76ms/
```

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22 step - loss: 1.3015 - accuracy: 0.4496 - val_loss: 1.
   1679 - val_accuracy: 0.5332
23 Epoch 11/50
24 125/125 [==============================] - 10s 76ms/
   step - loss: 1.3285 - accuracy: 0.4370 - val_loss: 1.
   1419 - val_accuracy: 0.5362
25 Epoch 12/50
26 125/125 [==============================] - 9s 76ms/
   step - loss: 1.3239 - accuracy: 0.4438 - val_loss: 1.
   1375 - val_accuracy: 0.5483
27 Epoch 13/50
28 125/125 [==============================] - 9s 76ms/
   step - loss: 1.3233 - accuracy: 0.4423 - val_loss: 1.
   1373 - val_accuracy: 0.5382
29 Epoch 14/50
30 125/125 [==============================] - 10s 76ms/
   step - loss: 1.3023 - accuracy: 0.4561 - val_loss: 1.
   2694 - val_accuracy: 0.4930
31 Epoch 15/50
32 125/125 [==============================] - 10s 76ms/
   step - loss: 1.3056 - accuracy: 0.4468 - val_loss: 1.
   1329 - val_accuracy: 0.5402
33 Epoch 16/50
34 125/125 [==============================] - 10s 76ms/
   step - loss: 1.2834 - accuracy: 0.4586 - val_loss: 1.
   1155 - val_accuracy: 0.5523
35 Epoch 17/50
36 125/125 [==============================] - 10s 76ms/
   step - loss: 1.3918 - accuracy: 0.4096 - val_loss: 1.
   3908 - val_accuracy: 0.3994
37 Epoch 18/50
38 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4678 - accuracy: 0.3590 - val_loss: 1.
   3224 - val_accuracy: 0.4517
39 Epoch 19/50
40 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4397 - accuracy: 0.3751 - val_loss: 1.
   3028 - val_accuracy: 0.4457
41 Epoch 20/50
42 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4557 - accuracy: 0.3743 - val_loss: 1.
```

```
42 4247 - val_accuracy: 0.4034
43 Epoch 21/50
44 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4427 - accuracy: 0.3658 - val_loss: 1.
   3398 - val_accuracy: 0.4276
45 Epoch 22/50
46 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4565 - accuracy: 0.3673 - val_loss: 1.
   3963 - val_accuracy: 0.4155
47 Epoch 23/50
48 125/125 [==============================] - 9s 76ms/
   step - loss: 1.4601 - accuracy: 0.3673 - val_loss: 1.
   3540 - val_accuracy: 0.4366
49 Epoch 24/50
50 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4348 - accuracy: 0.3796 - val_loss: 1.
   2842 - val_accuracy: 0.4547
51 Epoch 25/50
52 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4389 - accuracy: 0.3864 - val_loss: 1.
   2927 - val_accuracy: 0.4557
53 Epoch 26/50
54 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4337 - accuracy: 0.3816 - val_loss: 1.
   4400 - val_accuracy: 0.3571
55 Epoch 27/50
56 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4679 - accuracy: 0.3708 - val_loss: 1.
   3040 - val_accuracy: 0.4588
57 Epoch 28/50
58 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4182 - accuracy: 0.3962 - val_loss: 1.
   2728 - val_accuracy: 0.4618
59 Epoch 29/50
60 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4210 - accuracy: 0.3940 - val_loss: 1.
   4190 - val_accuracy: 0.3974
61 Epoch 30/50
62 125/125 [==============================] - 10s 76ms/
   step - loss: 1.4013 - accuracy: 0.3995 - val_loss: 1.
   4539 - val_accuracy: 0.3773
```

```
Epoch 31/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4265 - accuracy: 0.3826 - val_loss: 1.2930 - val_accuracy: 0.4648
Epoch 32/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4028 - accuracy: 0.4131 - val_loss: 1.2674 - val_accuracy: 0.4809
Epoch 33/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3902 - accuracy: 0.4143 - val_loss: 1.2552 - val_accuracy: 0.4688
Epoch 34/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4080 - accuracy: 0.4025 - val_loss: 1.5270 - val_accuracy: 0.3581
Epoch 35/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4013 - accuracy: 0.3927 - val_loss: 1.2735 - val_accuracy: 0.4779
Epoch 36/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4165 - accuracy: 0.3977 - val_loss: 1.3269 - val_accuracy: 0.4638
Epoch 37/50
125/125 [==============================] - 10s 76ms/step - loss: 1.4009 - accuracy: 0.4035 - val_loss: 1.2602 - val_accuracy: 0.4759
Epoch 38/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3760 - accuracy: 0.4101 - val_loss: 1.2359 - val_accuracy: 0.4748
Epoch 39/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3783 - accuracy: 0.4063 - val_loss: 1.3780 - val_accuracy: 0.4024
Epoch 40/50
125/125 [==============================] - 10s 76ms/step - loss: 1.3921 - accuracy: 0.4151 - val_loss: 1.2358 - val_accuracy: 0.4920
Epoch 41/50
```

```
 84 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3675 - accuracy: 0.4138 - val_loss: 1
    .2465 - val_accuracy: 0.4930
 85 Epoch 42/50
 86 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3906 - accuracy: 0.4083 - val_loss: 1
    .5412 - val_accuracy: 0.3370
 87 Epoch 43/50
 88 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3783 - accuracy: 0.4189 - val_loss: 1
    .2064 - val_accuracy: 0.4960
 89 Epoch 44/50
 90 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3923 - accuracy: 0.4164 - val_loss: 1
    .2370 - val_accuracy: 0.5040
 91 Epoch 45/50
 92 125/125 [==============================] - 10s 76ms/
    step - loss: 1.4309 - accuracy: 0.3907 - val_loss: 1
    .4938 - val_accuracy: 0.3400
 93 Epoch 46/50
 94 125/125 [==============================] - 10s 76ms/
    step - loss: 1.4053 - accuracy: 0.4113 - val_loss: 1
    .4025 - val_accuracy: 0.3903
 95 Epoch 47/50
 96 125/125 [==============================] - 10s 76ms/
    step - loss: 1.4323 - accuracy: 0.3804 - val_loss: 1
    .1914 - val_accuracy: 0.5000
 97 Epoch 48/50
 98 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3940 - accuracy: 0.4098 - val_loss: 1
    .2208 - val_accuracy: 0.4899
 99 Epoch 49/50
100 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3777 - accuracy: 0.4113 - val_loss: 1
    .5203 - val_accuracy: 0.3400
101 Epoch 50/50
102 125/125 [==============================] - 10s 76ms/
    step - loss: 1.3788 - accuracy: 0.4108 - val_loss: 1
    .2226 - val_accuracy: 0.4688
103 Model: "res_net50"
104 _________________________________________________
```

```
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 resnet50 (Functional)       (None, 4, 4, 2048)        23587712

 flatten (Flatten)           multiple                  0

 dense (Dense)               multiple                  67110912

 dense_1 (Dense)             multiple                  2573544

 dropout_1 (Dropout)         multiple                  0

 dense_2 (Dense)             multiple                  8799

=================================================================
Total params: 93,280,967
Trainable params: 69,693,255
Non-trainable params: 23,587,712
_________________________________________________________________
None
125/125 [==============================] - 6s 45ms/step - loss: 1.2171 - accuracy: 0.4868
CNN for train: [1.2171381711959839, 0.4867924451828003]
```

```
39/39 [==============================] - 2s 53ms/step - loss: 1.2295 - accuracy: 0.4650
CNN for test: [1.2294844388961792, 0.465004026889801]
125/125 [==============================] - 6s 43ms/step
32/32 [==============================] - 1s 43ms/step
39/39 [==============================] - 2s 43ms/step
KNN classification report for validation data:
/usr/local/lib/python3.8/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
/usr/local/lib/python3.8/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
/usr/local/lib/python3.8/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
              precision    recall  f1-score   support

           0       0.37      0.37      0.37       165
           1       0.00      0.00      0.00
```

```
142 22
143            2       0.71      0.67      0.69
    296
144            3       0.39      0.50      0.44
    161
145            4       0.00      0.00      0.00
    27
146            5       0.43      0.91      0.59
    161
147            6       0.00      0.00      0.00
    162
148
149     accuracy                           0.49
    994
150    macro avg       0.27      0.35      0.30
    994
151 weighted avg       0.41      0.49      0.43
    994
152
153 KNN classification report for train data:
154 /usr/local/lib/python3.8/dist-packages/sklearn/
    metrics/_classification.py:1344:
    UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
    predicted samples. Use `zero_division` parameter to
    control this behavior.
155   _warn_prf(average, modifier, msg_start, len(result
    ))
156 /usr/local/lib/python3.8/dist-packages/sklearn/
    metrics/_classification.py:1344:
    UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
    predicted samples. Use `zero_division` parameter to
    control this behavior.
157   _warn_prf(average, modifier, msg_start, len(result
    ))
158 /usr/local/lib/python3.8/dist-packages/sklearn/
    metrics/_classification.py:1344:
    UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
    predicted samples. Use `zero_division` parameter to
```

```
158 control this behavior.
159   _warn_prf(average, modifier, msg_start, len(result
    ))
160               precision    recall  f1-score
    support
161
162            0       0.49      0.52      0.50
    666
163            1       0.00      0.00      0.00
    73
164            2       0.75      0.74      0.75
    1136
165            3       0.53      0.58      0.55
    681
166            4       0.33      0.01      0.02
    130
167            5       0.41      0.88      0.56
    644
168            6       0.38      0.00      0.01
    645
169
170     accuracy                           0.54
    3975
171    macro avg       0.41      0.39      0.34
    3975
172 weighted avg       0.52      0.54      0.49
    3975
173
174 KNN classification report for test data:
175 /usr/local/lib/python3.8/dist-packages/sklearn/
    metrics/_classification.py:1344:
    UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
    predicted samples. Use `zero_division` parameter to
    control this behavior.
176   _warn_prf(average, modifier, msg_start, len(result
    ))
177 /usr/local/lib/python3.8/dist-packages/sklearn/
    metrics/_classification.py:1344:
    UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
```

```
predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
/usr/local/lib/python3.8/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
              precision    recall  f1-score   support

           0       0.35      0.34      0.34       223
           1       0.00      0.00      0.00        26
           2       0.66      0.67      0.67       357
           3       0.30      0.38      0.33       193
           4       0.00      0.00      0.00        31
           5       0.43      0.85      0.57       210
           6       0.00      0.00      0.00       203

    accuracy                           0.46      1243
   macro avg       0.25      0.32      0.27      1243
weighted avg       0.37      0.46      0.40      1243


Process finished with exit code 0

```