```
/Users/xl3139/PycharmProjects/Intro_to_ML/venv1/bin/python /Users/xl3139/PycharmProjects/Intro_to_ML/Assignments/Assignment3/Assignment3_Q1.py
2021-11-23 16:40:32.364383: I tensorflow/core/platform/cpu_feature_guard.cc:151] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 75, 75, 16)        448

 max_pooling2d (MaxPooling2D  (None, 37, 37, 16)       0
 )

 conv2d_1 (Conv2D)           (None, 35, 35, 32)        4640

 max_pooling2d_1 (MaxPooling  (None, 17, 17, 32)       0
 2D)

 conv2d_2 (Conv2D)           (None, 15, 15, 64)        18496
```

```
19
20  max_pooling2d_2 (MaxPooling  (None, 7, 7, 64
   )          0
21  2D
   )
22
23  conv2d_3 (Conv2D)           (None, 5, 5, 128
   )          73856
24
25 =================================================
   ==============
26 Total params: 97,440
27 Trainable params: 97,440
28 Non-trainable params: 0
29 _________________________________________________
   ______________
30 None
31 Model: "sequential"
32 _________________________________________________
   ______________
33  Layer (type)                Output Shape
                Param #
34 =================================================
   ==============
35  conv2d (Conv2D)             (None, 75, 75, 16
   )         448
36
37  max_pooling2d (MaxPooling2D  (None, 37, 37, 16
   )        0
38  )
39
40  conv2d_1 (Conv2D)           (None, 35, 35, 32
   )         4640
41
```

```
41
42  max_pooling2d_1 (MaxPooling  (None, 17, 17, 32
   )       0
43  2D
   )

44

45  conv2d_2 (Conv2D)           (None, 15, 15, 64
   )        18496
46

47  max_pooling2d_2 (MaxPooling  (None, 7, 7, 64
   )         0
48  2D
   )

49

50  conv2d_3 (Conv2D)           (None, 5, 5, 128
   )         73856
51

52  flatten (Flatten)           (None, 3200
   )              0
53

54  dense (Dense)               (None, 4
   )                 12804
55

56  dense_1 (Dense)             (None, 5
   )                 25
57

58 =================================================
   ==============
59 Total params: 110,269
60 Trainable params: 110,269
61 Non-trainable params: 0
62 _________________________________________________
```

```
62 _____________
63 None
64 Epoch 1/30
65 113/113 [==============================] - 4s 31ms
   /step - loss: 0.6716 - accuracy: 0.7294 - val_loss
   : 1.7958 - val_accuracy: 0.0733
66 Epoch 2/30
67 113/113 [==============================] - 4s 33ms
   /step - loss: 0.4593 - accuracy: 0.8603 - val_loss
   : 2.6544 - val_accuracy: 0.6400
68 Epoch 3/30
69 113/113 [==============================] - 4s 35ms
   /step - loss: 0.3361 - accuracy: 0.9650 - val_loss
   : 15.1435 - val_accuracy: 0.6644
70 Epoch 4/30
71 113/113 [==============================] - 4s 36ms
   /step - loss: 0.2784 - accuracy: 0.9906 - val_loss
   : 31.8538 - val_accuracy: 0.6644
72 Epoch 5/30
73 113/113 [==============================] - 4s 37ms
   /step - loss: 0.2350 - accuracy: 0.9967 - val_loss
   : 40.5238 - val_accuracy: 0.6667
74 Epoch 6/30
75 113/113 [==============================] - 4s 36ms
   /step - loss: 0.2147 - accuracy: 0.9958 - val_loss
   : 17.5789 - val_accuracy: 0.6667
76 Epoch 7/30
77 113/113 [==============================] - 4s 37ms
   /step - loss: 0.1977 - accuracy: 0.9964 - val_loss
   : 7.6430 - val_accuracy: 0.6667
78 Epoch 8/30
79 113/113 [==============================] - 5s 40ms
   /step - loss: 0.1760 - accuracy: 0.9956 - val_loss
   : 24.3009 - val_accuracy: 0.6644
80 Epoch 9/30
81 113/113 [==============================] - 4s 39ms
   /step - loss: 0.1553 - accuracy: 0.9983 - val_loss
   : 41.3518 - val_accuracy: 0.6667
82 Epoch 10/30
83 113/113 [==============================] - 4s 37ms
   /step - loss: 0.1359 - accuracy: 0.9994 - val_loss
```

```
 83 : 37.8685 - val_accuracy: 0.6667
 84 Epoch 11/30
 85 113/113 [==============================] - 4s 37ms
    /step - loss: 0.1214 - accuracy: 0.9994 - val_loss
    : 42.8825 - val_accuracy: 0.6667
 86 Epoch 12/30
 87 113/113 [==============================] - 4s 38ms
    /step - loss: 0.1093 - accuracy: 0.9994 - val_loss
    : 46.0118 - val_accuracy: 0.6667
 88 Epoch 13/30
 89 113/113 [==============================] - 5s 41ms
    /step - loss: 0.0982 - accuracy: 0.9989 - val_loss
    : 42.3844 - val_accuracy: 0.6667
 90 Epoch 14/30
 91 113/113 [==============================] - 4s 40ms
    /step - loss: 0.0914 - accuracy: 0.9981 - val_loss
    : 45.8560 - val_accuracy: 0.6656
 92 Epoch 15/30
 93 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0821 - accuracy: 0.9992 - val_loss
    : 31.1871 - val_accuracy: 0.6667
 94 Epoch 16/30
 95 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0721 - accuracy: 0.9997 - val_loss
    : 43.6379 - val_accuracy: 0.6667
 96 Epoch 17/30
 97 113/113 [==============================] - 4s 39ms
    /step - loss: 0.0652 - accuracy: 0.9997 - val_loss
    : 42.8031 - val_accuracy: 0.6656
 98 Epoch 18/30
 99 113/113 [==============================] - 4s 39ms
    /step - loss: 0.0591 - accuracy: 0.9997 - val_loss
    : 47.5533 - val_accuracy: 0.6656
100 Epoch 19/30
101 113/113 [==============================] - 4s 40ms
    /step - loss: 0.0564 - accuracy: 0.9983 - val_loss
    : 58.9848 - val_accuracy: 0.6667
102 Epoch 20/30
103 113/113 [==============================] - 4s 39ms
    /step - loss: 0.0588 - accuracy: 0.9967 - val_loss
    : 37.8246 - val_accuracy: 0.6589
```

```
104 Epoch 21/30
105 113/113 [==============================] - 4s 39ms
    /step - loss: 0.1304 - accuracy: 0.9839 - val_loss
    : 29.3519 - val_accuracy: 0.6433
106 Epoch 22/30
107 113/113 [==============================] - 5s 41ms
    /step - loss: 0.0502 - accuracy: 0.9969 - val_loss
    : 33.8551 - val_accuracy: 0.6522
108 Epoch 23/30
109 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0787 - accuracy: 0.9908 - val_loss
    : 3.5519 - val_accuracy: 0.6356
110 Epoch 24/30
111 113/113 [==============================] - 4s 38ms
    /step - loss: 0.3916 - accuracy: 0.9256 - val_loss
    : 30.1169 - val_accuracy: 0.6667
112 Epoch 25/30
113 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0526 - accuracy: 0.9958 - val_loss
    : 38.0270 - val_accuracy: 0.6667
114 Epoch 26/30
115 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0362 - accuracy: 0.9992 - val_loss
    : 48.6587 - val_accuracy: 0.6667
116 Epoch 27/30
117 113/113 [==============================] - 4s 39ms
    /step - loss: 0.0326 - accuracy: 0.9997 - val_loss
    : 54.7699 - val_accuracy: 0.6667
118 Epoch 28/30
119 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0295 - accuracy: 0.9997 - val_loss
    : 101.2054 - val_accuracy: 0.6667
120 Epoch 29/30
121 113/113 [==============================] - 4s 38ms
    /step - loss: 0.0302 - accuracy: 0.9992 - val_loss
    : 96.8899 - val_accuracy: 0.6667
122 Epoch 30/30
123 113/113 [==============================] - 4s 40ms
    /step - loss: 0.0260 - accuracy: 0.9994 - val_loss
    : 133.5987 - val_accuracy: 0.6667
124
```

```
125 Process finished with exit code 0
126
```