

```
C:\Users\she\PycharmProjects\math5836_ass3_1116\venv\Scripts\python.exe           -X
pycache_prefix=C:\Users\she\AppData\Local\JetBrains\PyCharm2024.2\cpython-cache
"C:/Program Files/JetBrains/PyCharm 2023.3.4/plugins/python-
ce/helpers/pydev/pydevd.py" --multiprocess --qt-support=auto --client 127.0.0.1 --port
12564 --file C:\Users\she\PycharmProjects\math5836_ass3_1116\model.py
Connected to pydev debugger (build 242.23726.102)
2024-11-17 02:11:42.780114: I tensorflow/core/util/port.cc:153] oneDNN custom
operations are on. You may see slightly different numerical results due to floating-point
round-off errors from different computation orders. To turn them off, set the environment
variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-11-17 02:11:49.350747: I tensorflow/core/util/port.cc:153] oneDNN custom
operations are on. You may see slightly different numerical results due to floating-point
round-off errors from different computation orders. To turn them off, set the environment
variable `TF_ENABLE_ONEDNN_OPTS=0`.
Without Null
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Without Null
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training_decision_tree
training_decision_tree: post-pruning
training_random_forest:n_estimators=2
training_random_forest:n_estimators=3
training_random_forest:n_estimators=5
training_random_forest:n_estimators=7
training_random_forest:n_estimators=11
training_random_forest:n_estimators=13
training_random_forest:n_estimators=20
training_random_forest:n_estimators=30
training_random_forest:n_estimators=50
training_random_forest:n_estimators=70
training_random_forest:n_estimators=90
training_random_forest:n_estimators=120
training_random_forest:n_estimators=150
training_random_forest:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
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training_gradient_boost:n_estimators=20
training_gradient_boost:n_estimators=30
training_gradient_boost:n_estimators=50
training_gradient_boost:n_estimators=70
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training_gradient_boost:n_estimators=150
training_gradient_boost:n_estimators=200
training_xg_boost:n_estimators=2
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training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
Without Null
2024-11-17 02:13:26.058207: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-critical operations.
To enable the following instructions: AVX2 AVX_VNNI FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.

Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.1912 - loss: 1.4213 - val_accuracy: 0.3108 - val_loss: 1.2666

Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4167 - loss: 1.2604 - val_accuracy: 0.4821 - val_loss: 1.1877

Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4459 - loss: 1.2000 - val_accuracy: 0.5458 - val_loss: 1.1438

Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4654 - loss: 1.1686 - val_accuracy: 0.5219 - val_loss: 1.1175

Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4585 - loss: 1.1493 - val_accuracy: 0.5139 - val_loss: 1.0997

Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4662 - loss: 1.1350 - val_accuracy: 0.5139 - val_loss: 1.0868

Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4647 - loss: 1.1130 - val_accuracy: 0.5100 - val_loss: 1.0763

Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4484 - loss: 1.1182 - val_accuracy: 0.5139 - val_loss: 1.0667

Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4515 - loss: 1.1094 - val_accuracy: 0.5139 - val_loss: 1.0582

Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4677 - loss: 1.0823 - val_accuracy: 0.5179 - val_loss: 1.0501

Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4858 - loss: 1.0549 - val_accuracy: 0.5179 - val_loss: 1.0427

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4665 - loss:
1.0619 - val_accuracy: 0.5538 - val_loss: 1.0355

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5243 - loss:
1.0393 - val_accuracy: 0.5578 - val_loss: 1.0287

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5385 - loss:
1.0571 - val_accuracy: 0.5578 - val_loss: 1.0219

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5510 - loss:
1.0462 - val_accuracy: 0.5777 - val_loss: 1.0160

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5507 - loss:
1.0289 - val_accuracy: 0.5857 - val_loss: 1.0103

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5772 - loss:
1.0192 - val_accuracy: 0.5896 - val_loss: 1.0054

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5782 - loss:
1.0177 - val_accuracy: 0.6016 - val_loss: 1.0003

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5852 - loss:
1.0143 - val_accuracy: 0.6056 - val_loss: 0.9960

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5840 - loss:
1.0015 - val_accuracy: 0.6016 - val_loss: 0.9909

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5772 - loss:
1.0117 - val_accuracy: 0.6056 - val_loss: 0.9866

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9916 - val_accuracy: 0.6016 - val_loss: 0.9824

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5795 - loss:
1.0039 - val_accuracy: 0.6135 - val_loss: 0.9785

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5737 - loss:
1.0048 - val_accuracy: 0.6096 - val_loss: 0.9745

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5888 - loss:
1.0036 - val_accuracy: 0.6175 - val_loss: 0.9711

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.6106 - loss:

0.9669 - val_accuracy: 0.6096 - val_loss: 0.9682
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5817 - loss:
0.9991 - val_accuracy: 0.6175 - val_loss: 0.9656
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5829 - loss:
0.9941 - val_accuracy: 0.6135 - val_loss: 0.9628
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5918 - loss:
0.9685 - val_accuracy: 0.6096 - val_loss: 0.9612
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5947 - loss:
0.9793 - val_accuracy: 0.6175 - val_loss: 0.9581
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9658 - val_accuracy: 0.6175 - val_loss: 0.9551
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5808 - loss:
0.9921 - val_accuracy: 0.6175 - val_loss: 0.9524
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5862 - loss:
0.9880 - val_accuracy: 0.6175 - val_loss: 0.9501
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6050 - loss:
0.9730 - val_accuracy: 0.6175 - val_loss: 0.9478
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5833 - loss:
0.9769 - val_accuracy: 0.6175 - val_loss: 0.9453
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5832 - loss:
0.9967 - val_accuracy: 0.6175 - val_loss: 0.9441
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.6080 - loss:
0.9563 - val_accuracy: 0.6175 - val_loss: 0.9424
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6101 - loss:
0.9667 - val_accuracy: 0.6135 - val_loss: 0.9407
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5837 - loss:
0.9632 - val_accuracy: 0.6135 - val_loss: 0.9386
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9571 - val_accuracy: 0.6255 - val_loss: 0.9378
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6108 - loss:
0.9471 - val_accuracy: 0.6175 - val_loss: 0.9355
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6086 - loss:
0.9464 - val_accuracy: 0.6255 - val_loss: 0.9349
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6027 - loss:
0.9522 - val_accuracy: 0.6215 - val_loss: 0.9332
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5998 - loss:
0.9724 - val_accuracy: 0.6175 - val_loss: 0.9311
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5770 - loss:
0.9757 - val_accuracy: 0.6255 - val_loss: 0.9299
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6009 - loss:
0.9522 - val_accuracy: 0.6335 - val_loss: 0.9290
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6128 - loss:
0.9349 - val_accuracy: 0.6255 - val_loss: 0.9271
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6034 - loss:
0.9462 - val_accuracy: 0.6375 - val_loss: 0.9271
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5827 - loss:
0.9593 - val_accuracy: 0.6215 - val_loss: 0.9249
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6137 - loss:
0.9433 - val_accuracy: 0.6335 - val_loss: 0.9255
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6127 - loss:
0.9346 - val_accuracy: 0.6215 - val_loss: 0.9258
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6056 - loss:
0.9412 - val_accuracy: 0.6215 - val_loss: 0.9223
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6063 - loss:
0.9359 - val_accuracy: 0.6255 - val_loss: 0.9223
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5917 - loss:
0.9510 - val_accuracy: 0.6215 - val_loss: 0.9198
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6333 - loss:
0.9151 - val_accuracy: 0.6295 - val_loss: 0.9204

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5868 - loss:
0.9473 - val_accuracy: 0.6215 - val_loss: 0.9178

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5797 - loss:
0.9616 - val_accuracy: 0.6255 - val_loss: 0.9169

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9424 - val_accuracy: 0.6215 - val_loss: 0.9154

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6097 - loss:
0.9217 - val_accuracy: 0.6215 - val_loss: 0.9158

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5927 - loss:
0.9382 - val_accuracy: 0.6335 - val_loss: 0.9161

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6173 - loss:
0.9366 - val_accuracy: 0.6295 - val_loss: 0.9150

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9516 - val_accuracy: 0.6215 - val_loss: 0.9141

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5984 - loss:
0.9324 - val_accuracy: 0.6215 - val_loss: 0.9132

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9236 - val_accuracy: 0.6215 - val_loss: 0.9120

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5913 - loss:
0.9333 - val_accuracy: 0.6295 - val_loss: 0.9109

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5905 - loss:
0.9518 - val_accuracy: 0.6255 - val_loss: 0.9095

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9246 - val_accuracy: 0.6255 - val_loss: 0.9100

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6148 - loss:
0.9095 - val_accuracy: 0.6255 - val_loss: 0.9113

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
0.9326 - val_accuracy: 0.6335 - val_loss: 0.9112

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6178 - loss:

0.9137 - val_accuracy: 0.6255 - val_loss: 0.9094
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6092 - loss:
0.9275 - val_accuracy: 0.6295 - val_loss: 0.9071
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.9303 - val_accuracy: 0.6215 - val_loss: 0.9068
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9217 - val_accuracy: 0.6295 - val_loss: 0.9075
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6037 - loss:
0.9221 - val_accuracy: 0.6175 - val_loss: 0.9086
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6143 - loss:
0.9214 - val_accuracy: 0.6295 - val_loss: 0.9077
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.9202 - val_accuracy: 0.6375 - val_loss: 0.9068
training_neural_network: Adam, l2=0, dropout=0
79/79 ————— 0s 2ms/step
53/53 ————— 0s 957us/step
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2556 - loss:
1.4007 - val_accuracy: 0.5060 - val_loss: 1.3133
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4859 - loss:
1.2980 - val_accuracy: 0.5020 - val_loss: 1.2386
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4702 - loss:
1.2494 - val_accuracy: 0.5060 - val_loss: 1.2081
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4619 - loss:
1.2334 - val_accuracy: 0.5060 - val_loss: 1.1914
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4479 - loss:
1.2272 - val_accuracy: 0.5060 - val_loss: 1.1801
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4730 - loss:
1.1937 - val_accuracy: 0.5060 - val_loss: 1.1719
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4706 - loss:
1.1967 - val_accuracy: 0.5060 - val_loss: 1.1645
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4871 - loss:
1.1666 - val_accuracy: 0.5060 - val_loss: 1.1578
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4720 - loss:
1.1664 - val_accuracy: 0.5060 - val_loss: 1.1512
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4648 - loss:
1.1611 - val_accuracy: 0.5060 - val_loss: 1.1442
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4852 - loss:
1.1566 - val_accuracy: 0.5060 - val_loss: 1.1377
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4659 - loss:
1.1571 - val_accuracy: 0.5060 - val_loss: 1.1301
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4701 - loss:
1.1327 - val_accuracy: 0.5060 - val_loss: 1.1225
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4635 - loss:
1.1202 - val_accuracy: 0.5060 - val_loss: 1.1145
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4854 - loss:
1.1002 - val_accuracy: 0.5060 - val_loss: 1.1074
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4791 - loss:
1.1072 - val_accuracy: 0.5060 - val_loss: 1.0993
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4679 - loss:
1.1113 - val_accuracy: 0.5179 - val_loss: 1.0909
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5292 - loss:
1.0848 - val_accuracy: 0.5737 - val_loss: 1.0829
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5438 - loss:
1.1059 - val_accuracy: 0.5817 - val_loss: 1.0745
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5661 - loss:
1.0856 - val_accuracy: 0.5737 - val_loss: 1.0663
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5693 - loss:
1.0761 - val_accuracy: 0.5817 - val_loss: 1.0579
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5469 - loss:
1.0657 - val_accuracy: 0.5538 - val_loss: 1.0507

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5691 - loss:
1.0550 - val_accuracy: 0.5498 - val_loss: 1.0437

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5747 - loss:
1.0358 - val_accuracy: 0.5618 - val_loss: 1.0367

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5736 - loss:
1.0303 - val_accuracy: 0.5618 - val_loss: 1.0303

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5666 - loss:
1.0389 - val_accuracy: 0.5657 - val_loss: 1.0235

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5663 - loss:
1.0186 - val_accuracy: 0.5697 - val_loss: 1.0171

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5630 - loss:
1.0335 - val_accuracy: 0.5817 - val_loss: 1.0107

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9810 - val_accuracy: 0.5777 - val_loss: 1.0051

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9984 - val_accuracy: 0.5737 - val_loss: 0.9999

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5815 - loss:
1.0043 - val_accuracy: 0.5657 - val_loss: 0.9944

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5622 - loss:
1.0161 - val_accuracy: 0.5817 - val_loss: 0.9879

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5800 - loss:
0.9982 - val_accuracy: 0.5857 - val_loss: 0.9831

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5812 - loss:
1.0005 - val_accuracy: 0.5936 - val_loss: 0.9785

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5722 - loss:
0.9824 - val_accuracy: 0.6016 - val_loss: 0.9730

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5764 - loss:
0.9876 - val_accuracy: 0.6135 - val_loss: 0.9674

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5811 - loss:

0.9915 - val_accuracy: 0.6096 - val_loss: 0.9624
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5852 - loss:
0.9660 - val_accuracy: 0.6096 - val_loss: 0.9589
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5758 - loss:
0.9677 - val_accuracy: 0.6135 - val_loss: 0.9538
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5712 - loss:
0.9969 - val_accuracy: 0.6056 - val_loss: 0.9489
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9600 - val_accuracy: 0.6135 - val_loss: 0.9459
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5941 - loss:
0.9499 - val_accuracy: 0.6175 - val_loss: 0.9434
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9458 - val_accuracy: 0.6096 - val_loss: 0.9389
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9579 - val_accuracy: 0.6215 - val_loss: 0.9360
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5969 - loss:
0.9562 - val_accuracy: 0.6255 - val_loss: 0.9317
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5939 - loss:
0.9459 - val_accuracy: 0.6135 - val_loss: 0.9295
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5913 - loss:
0.9438 - val_accuracy: 0.6175 - val_loss: 0.9272
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5940 - loss:
0.9465 - val_accuracy: 0.6135 - val_loss: 0.9247
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6104 - loss:
0.9209 - val_accuracy: 0.6335 - val_loss: 0.9227
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6022 - loss:
0.9329 - val_accuracy: 0.6175 - val_loss: 0.9193
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5911 - loss:
0.9543 - val_accuracy: 0.6215 - val_loss: 0.9176
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5973 - loss:
0.9328 - val_accuracy: 0.6215 - val_loss: 0.9165
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5959 - loss:
0.9402 - val_accuracy: 0.6215 - val_loss: 0.9142
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5982 - loss:
0.9350 - val_accuracy: 0.6375 - val_loss: 0.9126
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6136 - loss:
0.9135 - val_accuracy: 0.6375 - val_loss: 0.9121
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5976 - loss:
0.9354 - val_accuracy: 0.6335 - val_loss: 0.9111
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5915 - loss:
0.9196 - val_accuracy: 0.6375 - val_loss: 0.9090
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6027 - loss:
0.9296 - val_accuracy: 0.6255 - val_loss: 0.9059
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5868 - loss:
0.9431 - val_accuracy: 0.6375 - val_loss: 0.9060
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6151 - loss:
0.9300 - val_accuracy: 0.6335 - val_loss: 0.9050
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5906 - loss:
0.9314 - val_accuracy: 0.6335 - val_loss: 0.9039
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9255 - val_accuracy: 0.6255 - val_loss: 0.9022
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6229 - loss:
0.8926 - val_accuracy: 0.6135 - val_loss: 0.9044
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5917 - loss:
0.9299 - val_accuracy: 0.6335 - val_loss: 0.9026
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5906 - loss:
0.9171 - val_accuracy: 0.6335 - val_loss: 0.8995
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5906 - loss:
0.9206 - val_accuracy: 0.6335 - val_loss: 0.9013

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9210 - val_accuracy: 0.6295 - val_loss: 0.8982

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6102 - loss:
0.9101 - val_accuracy: 0.6295 - val_loss: 0.8988

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.9127 - val_accuracy: 0.6255 - val_loss: 0.8970

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.9204 - val_accuracy: 0.6135 - val_loss: 0.8978

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:
0.9116 - val_accuracy: 0.6335 - val_loss: 0.8962

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5909 - loss:
0.9356 - val_accuracy: 0.6335 - val_loss: 0.8960

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9204 - val_accuracy: 0.6295 - val_loss: 0.8945

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6011 - loss:
0.9002 - val_accuracy: 0.6335 - val_loss: 0.8943

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6089 - loss:
0.9150 - val_accuracy: 0.6255 - val_loss: 0.8939

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6134 - loss:
0.8928 - val_accuracy: 0.6255 - val_loss: 0.8926

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6034 - loss:
0.9048 - val_accuracy: 0.6175 - val_loss: 0.8930

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9166 - val_accuracy: 0.6295 - val_loss: 0.8920

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6121 - loss:
0.9013 - val_accuracy: 0.6255 - val_loss: 0.8916

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6082 - loss:
0.9127 - val_accuracy: 0.6135 - val_loss: 0.8918

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5988 - loss:

0.9271 - val_accuracy: 0.6215 - val_loss: 0.8903
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6042 - loss:
0.9024 - val_accuracy: 0.6056 - val_loss: 0.8918
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6140 - loss:
0.8853 - val_accuracy: 0.6016 - val_loss: 0.8909
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5854 - loss:
0.9161 - val_accuracy: 0.6096 - val_loss: 0.8900
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5945 - loss:
0.9076 - val_accuracy: 0.6215 - val_loss: 0.8905
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9285 - val_accuracy: 0.6135 - val_loss: 0.8880
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5980 - loss:
0.9097 - val_accuracy: 0.6135 - val_loss: 0.8887
Epoch 88/90
71/71 ————— 0s 2ms/step - accuracy: 0.5773 - loss:
0.9329 - val_accuracy: 0.6096 - val_loss: 0.8884
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6001 - loss:
0.9147 - val_accuracy: 0.6056 - val_loss: 0.8884
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6069 - loss:
0.8856 - val_accuracy: 0.6135 - val_loss: 0.8875
training_neural_network: Adam, l2=0, dropout=0.0
Epoch 1/90
71/71 ————— 2s 7ms/step - accuracy: 0.4699 - loss:
1.2936 - val_accuracy: 0.5060 - val_loss: 1.2039
Epoch 2/90
71/71 ————— 0s 2ms/step - accuracy: 0.4588 - loss:
1.2308 - val_accuracy: 0.5060 - val_loss: 1.1668
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4499 - loss:
1.2088 - val_accuracy: 0.5060 - val_loss: 1.1455
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4793 - loss:
1.1602 - val_accuracy: 0.5060 - val_loss: 1.1315
Epoch 5/90
71/71 ————— 0s 2ms/step - accuracy: 0.4878 - loss:
1.1524 - val_accuracy: 0.5060 - val_loss: 1.1214

Epoch 6/90
71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4599 - loss:
1.1487 - val_accuracy: 0.5060 - val_loss: 1.1115

Epoch 7/90
71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4759 - loss:
1.1262 - val_accuracy: 0.5060 - val_loss: 1.1032

Epoch 8/90
71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4691 - loss:
1.1135 - val_accuracy: 0.5060 - val_loss: 1.0941

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4657 - loss:
1.1078 - val_accuracy: 0.5060 - val_loss: 1.0856

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4750 - loss:
1.1004 - val_accuracy: 0.5060 - val_loss: 1.0769

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4564 - loss:
1.1025 - val_accuracy: 0.5060 - val_loss: 1.0681

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4674 - loss:
1.1059 - val_accuracy: 0.5100 - val_loss: 1.0612

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4756 - loss:
1.0612 - val_accuracy: 0.5219 - val_loss: 1.0535

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4878 - loss:
1.0676 - val_accuracy: 0.5259 - val_loss: 1.0452

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4781 - loss:
1.0708 - val_accuracy: 0.5299 - val_loss: 1.0372

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4872 - loss:
1.0564 - val_accuracy: 0.5299 - val_loss: 1.0305

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5162 - loss:
1.0625 - val_accuracy: 0.5299 - val_loss: 1.0232

Epoch 18/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5517 - loss:
1.0169 - val_accuracy: 0.5498 - val_loss: 1.0181

Epoch 19/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5560 - loss:
1.0465 - val_accuracy: 0.5538 - val_loss: 1.0115

Epoch 20/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5522 - loss:

1.0268 - val_accuracy: 0.5737 - val_loss: 1.0051
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5642 - loss:
1.0220 - val_accuracy: 0.5817 - val_loss: 1.0000
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5838 - loss:
1.0043 - val_accuracy: 0.5777 - val_loss: 0.9953
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5636 - loss:
1.0201 - val_accuracy: 0.5737 - val_loss: 0.9888
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5581 - loss:
1.0229 - val_accuracy: 0.5737 - val_loss: 0.9836
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5708 - loss:
0.9972 - val_accuracy: 0.5817 - val_loss: 0.9786
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5742 - loss:
1.0006 - val_accuracy: 0.5817 - val_loss: 0.9741
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5766 - loss:
0.9928 - val_accuracy: 0.5817 - val_loss: 0.9702
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5647 - loss:
1.0201 - val_accuracy: 0.5936 - val_loss: 0.9667
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5873 - loss:
0.9753 - val_accuracy: 0.5896 - val_loss: 0.9624
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5797 - loss:
0.9867 - val_accuracy: 0.5896 - val_loss: 0.9582
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5799 - loss:
0.9766 - val_accuracy: 0.6016 - val_loss: 0.9553
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5802 - loss:
0.9868 - val_accuracy: 0.5936 - val_loss: 0.9521
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9647 - val_accuracy: 0.6016 - val_loss: 0.9500
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5968 - loss:
0.9638 - val_accuracy: 0.6135 - val_loss: 0.9506
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5833 - loss:
0.9847 - val_accuracy: 0.6016 - val_loss: 0.9434
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5932 - loss:
0.9625 - val_accuracy: 0.6056 - val_loss: 0.9404
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5904 - loss:
0.9687 - val_accuracy: 0.6175 - val_loss: 0.9390
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6010 - loss:
0.9770 - val_accuracy: 0.6135 - val_loss: 0.9367
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6007 - loss:
0.9397 - val_accuracy: 0.6096 - val_loss: 0.9351
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5886 - loss:
0.9680 - val_accuracy: 0.6056 - val_loss: 0.9310
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5902 - loss:
0.9603 - val_accuracy: 0.6016 - val_loss: 0.9289
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5937 - loss:
0.9636 - val_accuracy: 0.6096 - val_loss: 0.9272
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6006 - loss:
0.9442 - val_accuracy: 0.6175 - val_loss: 0.9261
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9545 - val_accuracy: 0.6135 - val_loss: 0.9229
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6065 - loss:
0.9381 - val_accuracy: 0.6175 - val_loss: 0.9244
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6140 - loss:
0.9420 - val_accuracy: 0.6056 - val_loss: 0.9202
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6005 - loss:
0.9266 - val_accuracy: 0.5976 - val_loss: 0.9239
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6062 - loss:
0.9273 - val_accuracy: 0.6096 - val_loss: 0.9157
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6030 - loss:
0.9481 - val_accuracy: 0.6096 - val_loss: 0.9162

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5776 - loss:
0.9559 - val_accuracy: 0.6135 - val_loss: 0.9139

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5990 - loss:
0.9390 - val_accuracy: 0.6096 - val_loss: 0.9127

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9387 - val_accuracy: 0.6175 - val_loss: 0.9148

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6210 - loss:
0.9291 - val_accuracy: 0.6096 - val_loss: 0.9093

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5953 - loss:
0.9298 - val_accuracy: 0.6096 - val_loss: 0.9088

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9570 - val_accuracy: 0.6135 - val_loss: 0.9067

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5930 - loss:
0.9395 - val_accuracy: 0.6016 - val_loss: 0.9055

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.9258 - val_accuracy: 0.6056 - val_loss: 0.9056

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6038 - loss:
0.9272 - val_accuracy: 0.6175 - val_loss: 0.9048

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6193 - loss:
0.9221 - val_accuracy: 0.6135 - val_loss: 0.9025

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6022 - loss:
0.9462 - val_accuracy: 0.6096 - val_loss: 0.9046

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9268 - val_accuracy: 0.6056 - val_loss: 0.9016

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9245 - val_accuracy: 0.6175 - val_loss: 0.9015

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9355 - val_accuracy: 0.6175 - val_loss: 0.9007

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6140 - loss:

0.9047 - val_accuracy: 0.6175 - val_loss: 0.9005
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9133 - val_accuracy: 0.6096 - val_loss: 0.9036
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.9172 - val_accuracy: 0.6056 - val_loss: 0.9019
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9276 - val_accuracy: 0.6016 - val_loss: 0.8955
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6064 - loss:
0.9178 - val_accuracy: 0.5976 - val_loss: 0.8980
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9075 - val_accuracy: 0.6096 - val_loss: 0.8981
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6197 - loss:
0.8866 - val_accuracy: 0.6135 - val_loss: 0.8971
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5888 - loss:
0.9399 - val_accuracy: 0.6056 - val_loss: 0.8953
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6255 - loss:
0.9020 - val_accuracy: 0.6016 - val_loss: 0.8973
training_neural_network: Adam, l2=0, dropout=0.2
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2706 - loss:
1.3942 - val_accuracy: 0.3745 - val_loss: 1.2971
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4253 - loss:
1.2939 - val_accuracy: 0.5060 - val_loss: 1.2340
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4815 - loss:
1.2342 - val_accuracy: 0.5060 - val_loss: 1.2041
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4708 - loss:
1.2122 - val_accuracy: 0.5060 - val_loss: 1.1885
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4882 - loss:
1.1909 - val_accuracy: 0.5060 - val_loss: 1.1820
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4578 - loss:
1.2095 - val_accuracy: 0.5060 - val_loss: 1.1744

Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4627 - loss:
1.1995 - val_accuracy: 0.5060 - val_loss: 1.1707

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4718 - loss:
1.1754 - val_accuracy: 0.5060 - val_loss: 1.1633

Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4752 - loss:
1.1871 - val_accuracy: 0.5060 - val_loss: 1.1612

Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4676 - loss:
1.1837 - val_accuracy: 0.5060 - val_loss: 1.1561

Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4644 - loss:
1.1764 - val_accuracy: 0.5060 - val_loss: 1.1493

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4713 - loss:
1.1623 - val_accuracy: 0.5060 - val_loss: 1.1449

Epoch 13/90
71/71 ————— 0s 2ms/step - accuracy: 0.4711 - loss:
1.1550 - val_accuracy: 0.5060 - val_loss: 1.1388

Epoch 14/90
71/71 ————— 0s 2ms/step - accuracy: 0.4515 - loss:
1.1711 - val_accuracy: 0.5060 - val_loss: 1.1326

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4693 - loss:
1.1446 - val_accuracy: 0.5299 - val_loss: 1.1268

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4824 - loss:
1.1327 - val_accuracy: 0.5299 - val_loss: 1.1193

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5022 - loss:
1.1323 - val_accuracy: 0.5299 - val_loss: 1.1121

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5182 - loss:
1.1084 - val_accuracy: 0.5299 - val_loss: 1.1051

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5054 - loss:
1.1331 - val_accuracy: 0.5299 - val_loss: 1.0983

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5217 - loss:
1.1087 - val_accuracy: 0.5418 - val_loss: 1.0917

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5243 - loss:

1.0959 - val_accuracy: 0.5418 - val_loss: 1.0814
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5428 - loss:
1.0850 - val_accuracy: 0.5378 - val_loss: 1.0740
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5516 - loss:
1.0837 - val_accuracy: 0.5538 - val_loss: 1.0657
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5481 - loss:
1.0769 - val_accuracy: 0.5618 - val_loss: 1.0561
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5374 - loss:
1.0770 - val_accuracy: 0.5697 - val_loss: 1.0475
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5601 - loss:
1.0663 - val_accuracy: 0.5777 - val_loss: 1.0406
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5563 - loss:
1.0491 - val_accuracy: 0.5737 - val_loss: 1.0303
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5672 - loss:
1.0437 - val_accuracy: 0.5817 - val_loss: 1.0246
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5778 - loss:
1.0145 - val_accuracy: 0.5857 - val_loss: 1.0149
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5583 - loss:
1.0209 - val_accuracy: 0.5817 - val_loss: 1.0075
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
1.0074 - val_accuracy: 0.5896 - val_loss: 1.0019
Epoch 32/90
71/71 ————— 0s 2ms/step - accuracy: 0.5709 - loss:
1.0075 - val_accuracy: 0.5857 - val_loss: 0.9931
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5607 - loss:
1.0051 - val_accuracy: 0.5936 - val_loss: 0.9864
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5793 - loss:
0.9857 - val_accuracy: 0.5976 - val_loss: 0.9797
Epoch 35/90
71/71 ————— 0s 2ms/step - accuracy: 0.5880 - loss:
0.9909 - val_accuracy: 0.5976 - val_loss: 0.9735
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5869 - loss:
0.9814 - val_accuracy: 0.5976 - val_loss: 0.9667
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5796 - loss:
0.9790 - val_accuracy: 0.5976 - val_loss: 0.9614
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5653 - loss:
0.9819 - val_accuracy: 0.5976 - val_loss: 0.9564
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5738 - loss:
0.9622 - val_accuracy: 0.5976 - val_loss: 0.9489
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5711 - loss:
0.9625 - val_accuracy: 0.5976 - val_loss: 0.9465
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5698 - loss:
0.9630 - val_accuracy: 0.5976 - val_loss: 0.9406
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5908 - loss:
0.9463 - val_accuracy: 0.5976 - val_loss: 0.9361
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5866 - loss:
0.9419 - val_accuracy: 0.6056 - val_loss: 0.9333
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5766 - loss:
0.9556 - val_accuracy: 0.6096 - val_loss: 0.9297
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5996 - loss:
0.9420 - val_accuracy: 0.6096 - val_loss: 0.9256
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6042 - loss:
0.9306 - val_accuracy: 0.6096 - val_loss: 0.9225
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9336 - val_accuracy: 0.6135 - val_loss: 0.9234
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5876 - loss:
0.9415 - val_accuracy: 0.6255 - val_loss: 0.9189
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6035 - loss:
0.9381 - val_accuracy: 0.6135 - val_loss: 0.9117
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6052 - loss:
0.9236 - val_accuracy: 0.6135 - val_loss: 0.9091

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6250 - loss:
0.9010 - val_accuracy: 0.6096 - val_loss: 0.9071

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6084 - loss:
0.9189 - val_accuracy: 0.6215 - val_loss: 0.9074

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5805 - loss:
0.9486 - val_accuracy: 0.6056 - val_loss: 0.9024

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5973 - loss:
0.9428 - val_accuracy: 0.6135 - val_loss: 0.9016

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9059 - val_accuracy: 0.6215 - val_loss: 0.9004

Epoch 56/90
71/71 ————— 0s 2ms/step - accuracy: 0.6049 - loss:
0.9086 - val_accuracy: 0.6255 - val_loss: 0.8960

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.9082 - val_accuracy: 0.6175 - val_loss: 0.8961

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5936 - loss:
0.9225 - val_accuracy: 0.6255 - val_loss: 0.8957

Epoch 59/90
71/71 ————— 0s 2ms/step - accuracy: 0.6126 - loss:
0.8986 - val_accuracy: 0.6175 - val_loss: 0.8966

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5917 - loss:
0.9267 - val_accuracy: 0.6096 - val_loss: 0.8955

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9376 - val_accuracy: 0.6215 - val_loss: 0.8908

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5975 - loss:
0.9077 - val_accuracy: 0.6135 - val_loss: 0.8928

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6104 - loss:
0.8999 - val_accuracy: 0.6135 - val_loss: 0.8886

Epoch 64/90
71/71 ————— 0s 2ms/step - accuracy: 0.5877 - loss:
0.9284 - val_accuracy: 0.6215 - val_loss: 0.8875

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5883 - loss:

0.9192 - val_accuracy: 0.6135 - val_loss: 0.8845
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5981 - loss:
0.8871 - val_accuracy: 0.6255 - val_loss: 0.8856
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5951 - loss:
0.9012 - val_accuracy: 0.6255 - val_loss: 0.8841
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9185 - val_accuracy: 0.6096 - val_loss: 0.8842
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6110 - loss:
0.9201 - val_accuracy: 0.6056 - val_loss: 0.8855
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:
0.9030 - val_accuracy: 0.6175 - val_loss: 0.8827
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5900 - loss:
0.9081 - val_accuracy: 0.6255 - val_loss: 0.8833
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.8912 - val_accuracy: 0.6215 - val_loss: 0.8803
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5722 - loss:
0.9222 - val_accuracy: 0.6096 - val_loss: 0.8815
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6108 - loss:
0.8886 - val_accuracy: 0.6215 - val_loss: 0.8799
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6014 - loss:
0.8912 - val_accuracy: 0.6255 - val_loss: 0.8769
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5894 - loss:
0.9280 - val_accuracy: 0.6255 - val_loss: 0.8781
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9026 - val_accuracy: 0.6255 - val_loss: 0.8774
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6070 - loss:
0.9117 - val_accuracy: 0.6295 - val_loss: 0.8793
Epoch 79/90
71/71 ————— 0s 2ms/step - accuracy: 0.6034 - loss:
0.8891 - val_accuracy: 0.6255 - val_loss: 0.8730
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6053 - loss:
0.9076 - val_accuracy: 0.6255 - val_loss: 0.8743
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5919 - loss:
0.8978 - val_accuracy: 0.6175 - val_loss: 0.8738
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6070 - loss:
0.9143 - val_accuracy: 0.6335 - val_loss: 0.8786
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5926 - loss:
0.8790 - val_accuracy: 0.6255 - val_loss: 0.8715
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5916 - loss:
0.9082 - val_accuracy: 0.6255 - val_loss: 0.8748
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5922 - loss:
0.8992 - val_accuracy: 0.6135 - val_loss: 0.8763
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6127 - loss:
0.8875 - val_accuracy: 0.6215 - val_loss: 0.8750
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6047 - loss:
0.8916 - val_accuracy: 0.6056 - val_loss: 0.8720
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6104 - loss:
0.8841 - val_accuracy: 0.5976 - val_loss: 0.8703
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5953 - loss:
0.8898 - val_accuracy: 0.6215 - val_loss: 0.8699
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.8860 - val_accuracy: 0.6255 - val_loss: 0.8702
training_neural_network: Adam, l2=0, dropout=0.4
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.4470 - loss:
1.3683 - val_accuracy: 0.5060 - val_loss: 1.3256
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4607 - loss:
1.3224 - val_accuracy: 0.5060 - val_loss: 1.2854
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4750 - loss:
1.2853 - val_accuracy: 0.5060 - val_loss: 1.2576
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4638 - loss:

1.2706 - val_accuracy: 0.5060 - val_loss: 1.2383
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4614 - loss:
1.2494 - val_accuracy: 0.5060 - val_loss: 1.2245
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4740 - loss:
1.2347 - val_accuracy: 0.5060 - val_loss: 1.2145
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4793 - loss:
1.2212 - val_accuracy: 0.5060 - val_loss: 1.2072
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4682 - loss:
1.2282 - val_accuracy: 0.5060 - val_loss: 1.2015
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4798 - loss:
1.2063 - val_accuracy: 0.5060 - val_loss: 1.1972
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4667 - loss:
1.2082 - val_accuracy: 0.5060 - val_loss: 1.1937
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4792 - loss:
1.2070 - val_accuracy: 0.5060 - val_loss: 1.1906
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4655 - loss:
1.2090 - val_accuracy: 0.5060 - val_loss: 1.1878
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4783 - loss:
1.1960 - val_accuracy: 0.5060 - val_loss: 1.1853
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4823 - loss:
1.1889 - val_accuracy: 0.5060 - val_loss: 1.1831
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4800 - loss:
1.1829 - val_accuracy: 0.5060 - val_loss: 1.1810
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4581 - loss:
1.2036 - val_accuracy: 0.5060 - val_loss: 1.1788
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4564 - loss:
1.1950 - val_accuracy: 0.5060 - val_loss: 1.1767
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4786 - loss:
1.1754 - val_accuracy: 0.5060 - val_loss: 1.1748
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4589 - loss:
1.1903 - val_accuracy: 0.5060 - val_loss: 1.1727
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4622 - loss:
1.1885 - val_accuracy: 0.5060 - val_loss: 1.1705
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4673 - loss:
1.1739 - val_accuracy: 0.5060 - val_loss: 1.1684
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4693 - loss:
1.1761 - val_accuracy: 0.5060 - val_loss: 1.1661
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4598 - loss:
1.1691 - val_accuracy: 0.5060 - val_loss: 1.1637
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4652 - loss:
1.1612 - val_accuracy: 0.5060 - val_loss: 1.1613
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4720 - loss:
1.1655 - val_accuracy: 0.5060 - val_loss: 1.1590
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4671 - loss:
1.1705 - val_accuracy: 0.5060 - val_loss: 1.1560
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4745 - loss:
1.1438 - val_accuracy: 0.5060 - val_loss: 1.1531
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4594 - loss:
1.1610 - val_accuracy: 0.5060 - val_loss: 1.1500
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4672 - loss:
1.1518 - val_accuracy: 0.5060 - val_loss: 1.1467
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4815 - loss:
1.1404 - val_accuracy: 0.5060 - val_loss: 1.1436
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4497 - loss:
1.1696 - val_accuracy: 0.5060 - val_loss: 1.1401
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4677 - loss:
1.1547 - val_accuracy: 0.5060 - val_loss: 1.1364
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4664 - loss:
1.1247 - val_accuracy: 0.5060 - val_loss: 1.1327

Epoch 34/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4687 - loss:
1.1207 - val_accuracy: 0.5139 - val_loss: 1.1284

Epoch 35/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5150 - loss:
1.1225 - val_accuracy: 0.5458 - val_loss: 1.1240

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5498 - loss:
1.1261 - val_accuracy: 0.5578 - val_loss: 1.1196

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5685 - loss:
1.1041 - val_accuracy: 0.5777 - val_loss: 1.1150

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5484 - loss:
1.1383 - val_accuracy: 0.5737 - val_loss: 1.1101

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5677 - loss:
1.0885 - val_accuracy: 0.5737 - val_loss: 1.1049

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5520 - loss:
1.1041 - val_accuracy: 0.5737 - val_loss: 1.0997

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5450 - loss:
1.0993 - val_accuracy: 0.5657 - val_loss: 1.0945

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5782 - loss:
1.0710 - val_accuracy: 0.5538 - val_loss: 1.0896

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5611 - loss:
1.0799 - val_accuracy: 0.5538 - val_loss: 1.0843

Epoch 44/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5621 - loss:
1.0612 - val_accuracy: 0.5538 - val_loss: 1.0789

Epoch 45/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5715 - loss:
1.0637 - val_accuracy: 0.5418 - val_loss: 1.0741

Epoch 46/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5607 - loss:
1.0518 - val_accuracy: 0.5458 - val_loss: 1.0688

Epoch 47/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5416 - loss:
1.0689 - val_accuracy: 0.5538 - val_loss: 1.0631

Epoch 48/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5646 - loss:

1.0578 - val_accuracy: 0.5538 - val_loss: 1.0580
Epoch 49/90
71/71 ————— 0s 2ms/step - accuracy: 0.5573 - loss:
1.0410 - val_accuracy: 0.5538 - val_loss: 1.0530
Epoch 50/90
71/71 ————— 0s 2ms/step - accuracy: 0.5489 - loss:
1.0492 - val_accuracy: 0.5618 - val_loss: 1.0476
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5654 - loss:
1.0331 - val_accuracy: 0.5618 - val_loss: 1.0427
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5711 - loss:
1.0190 - val_accuracy: 0.5657 - val_loss: 1.0376
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5812 - loss:
1.0250 - val_accuracy: 0.5657 - val_loss: 1.0322
Epoch 54/90
71/71 ————— 0s 2ms/step - accuracy: 0.5609 - loss:
1.0200 - val_accuracy: 0.5657 - val_loss: 1.0254
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5850 - loss:
0.9996 - val_accuracy: 0.5657 - val_loss: 1.0175
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5523 - loss:
1.0023 - val_accuracy: 0.5737 - val_loss: 1.0077
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5713 - loss:
0.9911 - val_accuracy: 0.5817 - val_loss: 0.9994
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5639 - loss:
0.9788 - val_accuracy: 0.5817 - val_loss: 0.9917
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5605 - loss:
0.9964 - val_accuracy: 0.5857 - val_loss: 0.9846
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5710 - loss:
0.9583 - val_accuracy: 0.5817 - val_loss: 0.9790
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5625 - loss:
0.9817 - val_accuracy: 0.5817 - val_loss: 0.9734
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5551 - loss:
0.9777 - val_accuracy: 0.5817 - val_loss: 0.9689
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5775 - loss:
0.9524 - val_accuracy: 0.5896 - val_loss: 0.9627
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5715 - loss:
0.9731 - val_accuracy: 0.5936 - val_loss: 0.9579
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5630 - loss:
0.9760 - val_accuracy: 0.5896 - val_loss: 0.9544
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5736 - loss:
0.9587 - val_accuracy: 0.5896 - val_loss: 0.9504
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5777 - loss:
0.9461 - val_accuracy: 0.5896 - val_loss: 0.9467
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5845 - loss:
0.9537 - val_accuracy: 0.5976 - val_loss: 0.9426
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5888 - loss:
0.9401 - val_accuracy: 0.5896 - val_loss: 0.9394
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5894 - loss:
0.9284 - val_accuracy: 0.5936 - val_loss: 0.9369
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5825 - loss:
0.9432 - val_accuracy: 0.5857 - val_loss: 0.9343
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5726 - loss:
0.9444 - val_accuracy: 0.5936 - val_loss: 0.9325
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5847 - loss:
0.9335 - val_accuracy: 0.6056 - val_loss: 0.9284
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5846 - loss:
0.9406 - val_accuracy: 0.6016 - val_loss: 0.9272
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6002 - loss:
0.9306 - val_accuracy: 0.5936 - val_loss: 0.9253
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6118 - loss:
0.9203 - val_accuracy: 0.5936 - val_loss: 0.9234
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5942 - loss:
0.9327 - val_accuracy: 0.5936 - val_loss: 0.9218

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5939 - loss:
0.9432 - val_accuracy: 0.5936 - val_loss: 0.9206

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9254 - val_accuracy: 0.5896 - val_loss: 0.9189

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5848 - loss:
0.9227 - val_accuracy: 0.5896 - val_loss: 0.9175

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5731 - loss:
0.9404 - val_accuracy: 0.5976 - val_loss: 0.9166

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5945 - loss:
0.9290 - val_accuracy: 0.5896 - val_loss: 0.9154

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5780 - loss:
0.9529 - val_accuracy: 0.5896 - val_loss: 0.9142

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9066 - val_accuracy: 0.5896 - val_loss: 0.9132

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6130 - loss:
0.8968 - val_accuracy: 0.5976 - val_loss: 0.9135

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6023 - loss:
0.9134 - val_accuracy: 0.5936 - val_loss: 0.9124

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9285 - val_accuracy: 0.5936 - val_loss: 0.9114

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5899 - loss:
0.9424 - val_accuracy: 0.5936 - val_loss: 0.9103

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5859 - loss:
0.9395 - val_accuracy: 0.5936 - val_loss: 0.9094

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6011 - loss:
0.9289 - val_accuracy: 0.5936 - val_loss: 0.9083
training_neural_network: Adam, l2=0, dropout=0.6000000000000001

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3627 - loss:
1.3420 - val_accuracy: 0.5060 - val_loss: 1.2160

Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4856 - loss:
1.2007 - val_accuracy: 0.5060 - val_loss: 1.1704
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4734 - loss:
1.1735 - val_accuracy: 0.5020 - val_loss: 1.1511
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4635 - loss:
1.1676 - val_accuracy: 0.5020 - val_loss: 1.1382
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4905 - loss:
1.1244 - val_accuracy: 0.5100 - val_loss: 1.1307
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4761 - loss:
1.1283 - val_accuracy: 0.5100 - val_loss: 1.1206
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4764 - loss:
1.1308 - val_accuracy: 0.5100 - val_loss: 1.1126
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4782 - loss:
1.1231 - val_accuracy: 0.5100 - val_loss: 1.1023
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4804 - loss:
1.1082 - val_accuracy: 0.5100 - val_loss: 1.0947
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4689 - loss:
1.1164 - val_accuracy: 0.5100 - val_loss: 1.0841
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4698 - loss:
1.1085 - val_accuracy: 0.5139 - val_loss: 1.0749
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4758 - loss:
1.0847 - val_accuracy: 0.5100 - val_loss: 1.0661
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4725 - loss:
1.0969 - val_accuracy: 0.5259 - val_loss: 1.0573
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4857 - loss:
1.0750 - val_accuracy: 0.5299 - val_loss: 1.0485
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5054 - loss:
1.0472 - val_accuracy: 0.5458 - val_loss: 1.0422
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5337 - loss:
1.0278 - val_accuracy: 0.5538 - val_loss: 1.0329

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5389 - loss:
1.0414 - val_accuracy: 0.5498 - val_loss: 1.0253

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5584 - loss:
1.0341 - val_accuracy: 0.5538 - val_loss: 1.0163

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5678 - loss:
1.0142 - val_accuracy: 0.5618 - val_loss: 1.0075

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5961 - loss:
0.9917 - val_accuracy: 0.5737 - val_loss: 1.0069

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5732 - loss:
1.0236 - val_accuracy: 0.5857 - val_loss: 0.9943

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9902 - val_accuracy: 0.6056 - val_loss: 0.9894

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9893 - val_accuracy: 0.5817 - val_loss: 0.9858

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5964 - loss:
0.9866 - val_accuracy: 0.6056 - val_loss: 0.9740

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9879 - val_accuracy: 0.6056 - val_loss: 0.9681

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5950 - loss:
0.9909 - val_accuracy: 0.6135 - val_loss: 0.9619

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.6034 - loss:
0.9756 - val_accuracy: 0.6175 - val_loss: 0.9564

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9731 - val_accuracy: 0.6135 - val_loss: 0.9528

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9737 - val_accuracy: 0.6215 - val_loss: 0.9505

Epoch 30/90
71/71 ————— 0s 2ms/step - accuracy: 0.6039 - loss:
0.9557 - val_accuracy: 0.6135 - val_loss: 0.9423

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.6059 - loss:

0.9440 - val_accuracy: 0.6096 - val_loss: 0.9397
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9534 - val_accuracy: 0.6215 - val_loss: 0.9380
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.6077 - loss:
0.9537 - val_accuracy: 0.6175 - val_loss: 0.9314
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6180 - loss:
0.9224 - val_accuracy: 0.6175 - val_loss: 0.9275
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5974 - loss:
0.9560 - val_accuracy: 0.6255 - val_loss: 0.9247
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.6081 - loss:
0.9437 - val_accuracy: 0.6096 - val_loss: 0.9206
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.6086 - loss:
0.9380 - val_accuracy: 0.6295 - val_loss: 0.9187
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6071 - loss:
0.9402 - val_accuracy: 0.6255 - val_loss: 0.9148
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6117 - loss:
0.9303 - val_accuracy: 0.6295 - val_loss: 0.9153
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6125 - loss:
0.9478 - val_accuracy: 0.6255 - val_loss: 0.9096
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6291 - loss:
0.9085 - val_accuracy: 0.6295 - val_loss: 0.9102
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9280 - val_accuracy: 0.6215 - val_loss: 0.9023
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6125 - loss:
0.9057 - val_accuracy: 0.6096 - val_loss: 0.9027
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.6201 - loss:
0.9119 - val_accuracy: 0.6135 - val_loss: 0.9033
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5996 - loss:
0.9234 - val_accuracy: 0.6255 - val_loss: 0.8981
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6178 - loss:
0.9182 - val_accuracy: 0.6175 - val_loss: 0.8961
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6221 - loss:
0.9026 - val_accuracy: 0.6335 - val_loss: 0.8936
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6199 - loss:
0.9205 - val_accuracy: 0.6335 - val_loss: 0.8926
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6044 - loss:
0.9232 - val_accuracy: 0.6135 - val_loss: 0.8927
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5979 - loss:
0.9105 - val_accuracy: 0.6335 - val_loss: 0.8911
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.6200 - loss:
0.9015 - val_accuracy: 0.6295 - val_loss: 0.8875
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6129 - loss:
0.9175 - val_accuracy: 0.6255 - val_loss: 0.8863
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6227 - loss:
0.8838 - val_accuracy: 0.6255 - val_loss: 0.8846
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6108 - loss:
0.9050 - val_accuracy: 0.6255 - val_loss: 0.8827
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6130 - loss:
0.8927 - val_accuracy: 0.6215 - val_loss: 0.8816
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6016 - loss:
0.8982 - val_accuracy: 0.6215 - val_loss: 0.8790
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9052 - val_accuracy: 0.6215 - val_loss: 0.8765
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6103 - loss:
0.9084 - val_accuracy: 0.6335 - val_loss: 0.8762
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6057 - loss:
0.8995 - val_accuracy: 0.6175 - val_loss: 0.8739
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6234 - loss:
0.8966 - val_accuracy: 0.6295 - val_loss: 0.8737

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6025 - loss:
0.9024 - val_accuracy: 0.6295 - val_loss: 0.8716

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6116 - loss:
0.8989 - val_accuracy: 0.6295 - val_loss: 0.8699

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6026 - loss:
0.9008 - val_accuracy: 0.6295 - val_loss: 0.8693

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6387 - loss:
0.8778 - val_accuracy: 0.6135 - val_loss: 0.8661

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6115 - loss:
0.8789 - val_accuracy: 0.6215 - val_loss: 0.8665

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6118 - loss:
0.8841 - val_accuracy: 0.6335 - val_loss: 0.8666

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6203 - loss:
0.8714 - val_accuracy: 0.6215 - val_loss: 0.8614

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6137 - loss:
0.8965 - val_accuracy: 0.6056 - val_loss: 0.8667

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6226 - loss:
0.8785 - val_accuracy: 0.6295 - val_loss: 0.8607

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6172 - loss:
0.8780 - val_accuracy: 0.6255 - val_loss: 0.8607

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6161 - loss:
0.8719 - val_accuracy: 0.6175 - val_loss: 0.8588

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6259 - loss:
0.8641 - val_accuracy: 0.6175 - val_loss: 0.8596

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6210 - loss:
0.8766 - val_accuracy: 0.6056 - val_loss: 0.8626

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6080 - loss:
0.8673 - val_accuracy: 0.6255 - val_loss: 0.8557

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6018 - loss:

0.8871 - val_accuracy: 0.6255 - val_loss: 0.8539
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.8523 - val_accuracy: 0.6375 - val_loss: 0.8528
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6094 - loss:
0.8726 - val_accuracy: 0.6215 - val_loss: 0.8513
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6210 - loss:
0.8465 - val_accuracy: 0.6175 - val_loss: 0.8515
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6102 - loss:
0.8686 - val_accuracy: 0.6175 - val_loss: 0.8503
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6110 - loss:
0.8599 - val_accuracy: 0.6295 - val_loss: 0.8480
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6211 - loss:
0.8502 - val_accuracy: 0.6335 - val_loss: 0.8455
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5935 - loss:
0.8916 - val_accuracy: 0.6215 - val_loss: 0.8474
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6065 - loss:
0.8817 - val_accuracy: 0.5896 - val_loss: 0.8545
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.8816 - val_accuracy: 0.6335 - val_loss: 0.8423
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6130 - loss:
0.8739 - val_accuracy: 0.6335 - val_loss: 0.8407
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6025 - loss:
0.8770 - val_accuracy: 0.6096 - val_loss: 0.8444
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.8792 - val_accuracy: 0.6175 - val_loss: 0.8399
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6147 - loss:
0.8509 - val_accuracy: 0.6096 - val_loss: 0.8433
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.8561 - val_accuracy: 0.6335 - val_loss: 0.8372
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6294 - loss:
0.8486 - val_accuracy: 0.6135 - val_loss: 0.8369
training_neural_network: Adam, l2=0, dropout=0.8

79/79 ━━━━━━━━━━ 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 1ms/step

79/79 ━━━━━━━━━━ 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 1ms/step

79/79 ━━━━━━━━━━ 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 969us/step

79/79 ━━━━━━━━━━ 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 956us/step

79/79 ━━━━━━━━━━ 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 1ms/step

Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.1846 - loss:
1.5592 - val_accuracy: 0.3466 - val_loss: 1.3688

Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4222 - loss:
1.3395 - val_accuracy: 0.5060 - val_loss: 1.2949

Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4510 - loss:
1.2991 - val_accuracy: 0.5060 - val_loss: 1.2620

Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4569 - loss:
1.2655 - val_accuracy: 0.5060 - val_loss: 1.2386

Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4607 - loss:
1.2460 - val_accuracy: 0.5060 - val_loss: 1.2215

Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4565 - loss:
1.2349 - val_accuracy: 0.5060 - val_loss: 1.2090

Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4634 - loss:
1.2162 - val_accuracy: 0.5060 - val_loss: 1.1992

Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4773 - loss:
1.2009 - val_accuracy: 0.5060 - val_loss: 1.1912

Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4532 - loss:
1.2205 - val_accuracy: 0.5060 - val_loss: 1.1846

Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4851 - loss:
1.1848 - val_accuracy: 0.5060 - val_loss: 1.1789

Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4758 - loss:
1.1822 - val_accuracy: 0.5060 - val_loss: 1.1736
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4518 - loss:
1.1971 - val_accuracy: 0.5060 - val_loss: 1.1685
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4635 - loss:
1.1831 - val_accuracy: 0.5060 - val_loss: 1.1636
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4682 - loss:
1.1779 - val_accuracy: 0.5060 - val_loss: 1.1581
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4624 - loss:
1.1769 - val_accuracy: 0.5060 - val_loss: 1.1528
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4861 - loss:
1.1484 - val_accuracy: 0.5060 - val_loss: 1.1471
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4535 - loss:
1.1641 - val_accuracy: 0.5060 - val_loss: 1.1413
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4479 - loss:
1.1658 - val_accuracy: 0.5060 - val_loss: 1.1350
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4849 - loss:
1.1357 - val_accuracy: 0.5060 - val_loss: 1.1279
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4695 - loss:
1.1345 - val_accuracy: 0.5060 - val_loss: 1.1200
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4529 - loss:
1.1366 - val_accuracy: 0.5060 - val_loss: 1.1120
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4497 - loss:
1.1304 - val_accuracy: 0.5060 - val_loss: 1.1042
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4764 - loss:
1.1017 - val_accuracy: 0.5060 - val_loss: 1.0955
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4707 - loss:
1.0981 - val_accuracy: 0.5060 - val_loss: 1.0869
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4607 - loss:
1.0885 - val_accuracy: 0.5060 - val_loss: 1.0778

Epoch 26/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4713 - loss:
1.0792 - val_accuracy: 0.5060 - val_loss: 1.0685

Epoch 27/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4768 - loss:
1.0673 - val_accuracy: 0.5060 - val_loss: 1.0592

Epoch 28/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4833 - loss:
1.0638 - val_accuracy: 0.5339 - val_loss: 1.0502

Epoch 29/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5313 - loss:
1.0570 - val_accuracy: 0.5578 - val_loss: 1.0408

Epoch 30/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5550 - loss:
1.0392 - val_accuracy: 0.5737 - val_loss: 1.0320

Epoch 31/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5695 - loss:
1.0422 - val_accuracy: 0.5737 - val_loss: 1.0225

Epoch 32/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5634 - loss:
1.0138 - val_accuracy: 0.5976 - val_loss: 1.0136

Epoch 33/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5755 - loss:
1.0023 - val_accuracy: 0.5896 - val_loss: 1.0049

Epoch 34/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5579 - loss:
1.0129 - val_accuracy: 0.5936 - val_loss: 0.9970

Epoch 35/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5610 - loss:
1.0066 - val_accuracy: 0.5857 - val_loss: 0.9894

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5595 - loss:
0.9972 - val_accuracy: 0.5976 - val_loss: 0.9806

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5530 - loss:
1.0008 - val_accuracy: 0.5936 - val_loss: 0.9734

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5742 - loss:
0.9901 - val_accuracy: 0.6056 - val_loss: 0.9659

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6026 - loss:
0.9604 - val_accuracy: 0.5976 - val_loss: 0.9603

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5878 - loss:

0.9637 - val_accuracy: 0.6016 - val_loss: 0.9540
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5801 - loss:
0.9591 - val_accuracy: 0.5936 - val_loss: 0.9490
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5899 - loss:
0.9589 - val_accuracy: 0.6135 - val_loss: 0.9433
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9535 - val_accuracy: 0.6056 - val_loss: 0.9385
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5783 - loss:
0.9508 - val_accuracy: 0.6135 - val_loss: 0.9336
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9543 - val_accuracy: 0.6135 - val_loss: 0.9299
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9357 - val_accuracy: 0.6175 - val_loss: 0.9257
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6097 - loss:
0.9329 - val_accuracy: 0.6135 - val_loss: 0.9227
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6055 - loss:
0.9201 - val_accuracy: 0.6175 - val_loss: 0.9200
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6000 - loss:
0.9331 - val_accuracy: 0.6135 - val_loss: 0.9168
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9307 - val_accuracy: 0.6096 - val_loss: 0.9146
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6069 - loss:
0.9134 - val_accuracy: 0.6096 - val_loss: 0.9124
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9212 - val_accuracy: 0.6215 - val_loss: 0.9111
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5914 - loss:
0.9163 - val_accuracy: 0.6135 - val_loss: 0.9099
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5945 - loss:
0.9247 - val_accuracy: 0.6096 - val_loss: 0.9067
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5957 - loss:
0.9173 - val_accuracy: 0.6175 - val_loss: 0.9066
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5869 - loss:
0.9369 - val_accuracy: 0.6096 - val_loss: 0.9045
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5996 - loss:
0.9145 - val_accuracy: 0.6135 - val_loss: 0.9025
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6003 - loss:
0.9112 - val_accuracy: 0.6255 - val_loss: 0.9013
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5932 - loss:
0.9193 - val_accuracy: 0.6255 - val_loss: 0.9007
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6088 - loss:
0.9025 - val_accuracy: 0.6255 - val_loss: 0.9003
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6116 - loss:
0.9284 - val_accuracy: 0.6295 - val_loss: 0.8985
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5857 - loss:
0.9331 - val_accuracy: 0.6335 - val_loss: 0.8975
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5986 - loss:
0.9189 - val_accuracy: 0.6335 - val_loss: 0.8961
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6029 - loss:
0.9374 - val_accuracy: 0.6175 - val_loss: 0.8963
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6074 - loss:
0.8969 - val_accuracy: 0.6215 - val_loss: 0.8951
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5989 - loss:
0.9114 - val_accuracy: 0.6215 - val_loss: 0.8944
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6161 - loss:
0.9120 - val_accuracy: 0.6335 - val_loss: 0.8932
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6153 - loss:
0.8978 - val_accuracy: 0.6255 - val_loss: 0.8926
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6124 - loss:
0.9013 - val_accuracy: 0.6375 - val_loss: 0.8917

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.9090 - val_accuracy: 0.6295 - val_loss: 0.8913

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6101 - loss:
0.9101 - val_accuracy: 0.6135 - val_loss: 0.8920

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6269 - loss:
0.8876 - val_accuracy: 0.6056 - val_loss: 0.8907

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5916 - loss:
0.9201 - val_accuracy: 0.6056 - val_loss: 0.8894

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6064 - loss:
0.8894 - val_accuracy: 0.6135 - val_loss: 0.8893

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5898 - loss:
0.9135 - val_accuracy: 0.6056 - val_loss: 0.8887

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.8947 - val_accuracy: 0.6056 - val_loss: 0.8879

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5977 - loss:
0.9035 - val_accuracy: 0.6096 - val_loss: 0.8882

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5885 - loss:
0.9161 - val_accuracy: 0.6056 - val_loss: 0.8881

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5915 - loss:
0.9080 - val_accuracy: 0.6135 - val_loss: 0.8862

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5932 - loss:
0.9036 - val_accuracy: 0.6135 - val_loss: 0.8865

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6080 - loss:
0.9053 - val_accuracy: 0.6135 - val_loss: 0.8867

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9266 - val_accuracy: 0.6056 - val_loss: 0.8858

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5968 - loss:
0.9107 - val_accuracy: 0.6135 - val_loss: 0.8843

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5924 - loss:

0.9190 - val_accuracy: 0.6135 - val_loss: 0.8843
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5956 - loss:
0.9180 - val_accuracy: 0.6056 - val_loss: 0.8845
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6084 - loss:
0.8846 - val_accuracy: 0.6135 - val_loss: 0.8839
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5968 - loss:
0.9040 - val_accuracy: 0.6096 - val_loss: 0.8823
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9159 - val_accuracy: 0.6056 - val_loss: 0.8825
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5928 - loss:
0.9010 - val_accuracy: 0.6096 - val_loss: 0.8818
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6024 - loss:
0.9106 - val_accuracy: 0.6175 - val_loss: 0.8834
training_neural_network: Adam, l2=0.0, dropout=0
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3651 - loss:
1.2872 - val_accuracy: 0.5060 - val_loss: 1.2035
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4751 - loss:
1.2081 - val_accuracy: 0.5060 - val_loss: 1.1808
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4792 - loss:
1.1956 - val_accuracy: 0.5060 - val_loss: 1.1741
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4715 - loss:
1.1978 - val_accuracy: 0.5060 - val_loss: 1.1686
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4708 - loss:
1.1758 - val_accuracy: 0.5060 - val_loss: 1.1653
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4598 - loss:
1.1987 - val_accuracy: 0.5060 - val_loss: 1.1600
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4802 - loss:
1.1652 - val_accuracy: 0.5060 - val_loss: 1.1565
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4793 - loss:
1.1492 - val_accuracy: 0.5060 - val_loss: 1.1512

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4532 - loss:
1.1717 - val_accuracy: 0.5060 - val_loss: 1.1454

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4717 - loss:
1.1479 - val_accuracy: 0.5139 - val_loss: 1.1397

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4757 - loss:
1.1425 - val_accuracy: 0.5219 - val_loss: 1.1342

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4858 - loss:
1.1405 - val_accuracy: 0.5299 - val_loss: 1.1275

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4817 - loss:
1.1398 - val_accuracy: 0.5378 - val_loss: 1.1200

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4941 - loss:
1.1344 - val_accuracy: 0.5378 - val_loss: 1.1097

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5089 - loss:
1.1138 - val_accuracy: 0.5378 - val_loss: 1.0917

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5148 - loss:
1.1048 - val_accuracy: 0.5418 - val_loss: 1.0762

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5484 - loss:
1.0840 - val_accuracy: 0.5458 - val_loss: 1.0650

Epoch 18/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5444 - loss:
1.0559 - val_accuracy: 0.5657 - val_loss: 1.0553

Epoch 19/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5819 - loss:
1.0234 - val_accuracy: 0.5657 - val_loss: 1.0465

Epoch 20/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5483 - loss:
1.0516 - val_accuracy: 0.5657 - val_loss: 1.0362

Epoch 21/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5733 - loss:
1.0187 - val_accuracy: 0.5737 - val_loss: 1.0283

Epoch 22/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5914 - loss:
0.9932 - val_accuracy: 0.5817 - val_loss: 1.0192

Epoch 23/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5710 - loss:

1.0162 - val_accuracy: 0.5896 - val_loss: 1.0118
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5602 - loss:
1.0216 - val_accuracy: 0.5936 - val_loss: 1.0036
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5775 - loss:
1.0049 - val_accuracy: 0.6016 - val_loss: 0.9976
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5846 - loss:
0.9967 - val_accuracy: 0.6016 - val_loss: 0.9909
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5860 - loss:
0.9955 - val_accuracy: 0.6175 - val_loss: 0.9850
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9852 - val_accuracy: 0.6096 - val_loss: 0.9792
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5898 - loss:
0.9966 - val_accuracy: 0.6056 - val_loss: 0.9735
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5810 - loss:
0.9845 - val_accuracy: 0.6016 - val_loss: 0.9682
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5908 - loss:
0.9736 - val_accuracy: 0.6135 - val_loss: 0.9637
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5815 - loss:
0.9689 - val_accuracy: 0.6096 - val_loss: 0.9594
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9762 - val_accuracy: 0.6056 - val_loss: 0.9550
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9564 - val_accuracy: 0.6135 - val_loss: 0.9508
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.6061 - loss:
0.9609 - val_accuracy: 0.6255 - val_loss: 0.9491
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5963 - loss:
0.9513 - val_accuracy: 0.6056 - val_loss: 0.9440
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9366 - val_accuracy: 0.6096 - val_loss: 0.9408
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5886 - loss:
0.9455 - val_accuracy: 0.6096 - val_loss: 0.9372
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6045 - loss:
0.9512 - val_accuracy: 0.6255 - val_loss: 0.9365
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5920 - loss:
0.9557 - val_accuracy: 0.6215 - val_loss: 0.9324
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9358 - val_accuracy: 0.6096 - val_loss: 0.9319
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9574 - val_accuracy: 0.6215 - val_loss: 0.9280
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6052 - loss:
0.9295 - val_accuracy: 0.6056 - val_loss: 0.9292
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6072 - loss:
0.9334 - val_accuracy: 0.6215 - val_loss: 0.9226
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5852 - loss:
0.9692 - val_accuracy: 0.6175 - val_loss: 0.9210
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5931 - loss:
0.9317 - val_accuracy: 0.6215 - val_loss: 0.9187
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6025 - loss:
0.9418 - val_accuracy: 0.6135 - val_loss: 0.9181
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6070 - loss:
0.9262 - val_accuracy: 0.6096 - val_loss: 0.9169
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9240 - val_accuracy: 0.6135 - val_loss: 0.9153
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5877 - loss:
0.9285 - val_accuracy: 0.6175 - val_loss: 0.9123
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6128 - loss:
0.9119 - val_accuracy: 0.6135 - val_loss: 0.9106
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5971 - loss:
0.9279 - val_accuracy: 0.6135 - val_loss: 0.9106

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6178 - loss:
0.9209 - val_accuracy: 0.6135 - val_loss: 0.9094

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5935 - loss:
0.9399 - val_accuracy: 0.6135 - val_loss: 0.9066

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9297 - val_accuracy: 0.6056 - val_loss: 0.9066

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6113 - loss:
0.9042 - val_accuracy: 0.6175 - val_loss: 0.9046

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5957 - loss:
0.9254 - val_accuracy: 0.6096 - val_loss: 0.9041

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6129 - loss:
0.9151 - val_accuracy: 0.6215 - val_loss: 0.9027

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6006 - loss:
0.9015 - val_accuracy: 0.6135 - val_loss: 0.8998

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5931 - loss:
0.9199 - val_accuracy: 0.6175 - val_loss: 0.8992

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6167 - loss:
0.9013 - val_accuracy: 0.6135 - val_loss: 0.9011

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5986 - loss:
0.9136 - val_accuracy: 0.6056 - val_loss: 0.8976

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9160 - val_accuracy: 0.6096 - val_loss: 0.8952

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6168 - loss:
0.8872 - val_accuracy: 0.6135 - val_loss: 0.8978

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6048 - loss:
0.9044 - val_accuracy: 0.6096 - val_loss: 0.8941

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6192 - loss:
0.8966 - val_accuracy: 0.6175 - val_loss: 0.8940

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:

0.9328 - val_accuracy: 0.6096 - val_loss: 0.8936
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9195 - val_accuracy: 0.6096 - val_loss: 0.8915
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5930 - loss:
0.9228 - val_accuracy: 0.6096 - val_loss: 0.8909
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6135 - loss:
0.9039 - val_accuracy: 0.6135 - val_loss: 0.8912
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
0.9298 - val_accuracy: 0.6175 - val_loss: 0.8883
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6002 - loss:
0.9146 - val_accuracy: 0.6056 - val_loss: 0.8890
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5975 - loss:
0.9063 - val_accuracy: 0.6016 - val_loss: 0.8888
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.8993 - val_accuracy: 0.6175 - val_loss: 0.8889
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6059 - loss:
0.8856 - val_accuracy: 0.6175 - val_loss: 0.8871
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9079 - val_accuracy: 0.6096 - val_loss: 0.8853
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.9099 - val_accuracy: 0.6056 - val_loss: 0.8850
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5863 - loss:
0.9435 - val_accuracy: 0.6056 - val_loss: 0.8851
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5980 - loss:
0.9201 - val_accuracy: 0.6056 - val_loss: 0.8824
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6157 - loss:
0.8870 - val_accuracy: 0.5936 - val_loss: 0.8824
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6103 - loss:
0.8824 - val_accuracy: 0.6135 - val_loss: 0.8812
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6059 - loss:
0.9166 - val_accuracy: 0.6056 - val_loss: 0.8799
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6048 - loss:
0.8837 - val_accuracy: 0.6096 - val_loss: 0.8791
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6171 - loss:
0.8701 - val_accuracy: 0.6255 - val_loss: 0.8821
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6173 - loss:
0.8816 - val_accuracy: 0.6016 - val_loss: 0.8791
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5928 - loss:
0.9172 - val_accuracy: 0.5976 - val_loss: 0.8755
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6003 - loss:
0.8788 - val_accuracy: 0.6135 - val_loss: 0.8782
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6217 - loss:
0.8708 - val_accuracy: 0.6016 - val_loss: 0.8744
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5956 - loss:
0.9215 - val_accuracy: 0.6255 - val_loss: 0.8792
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5966 - loss:
0.9105 - val_accuracy: 0.6096 - val_loss: 0.8739
training_neural_network: Adam, l2=1e-05, dropout=0
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.4583 - loss:
1.3516 - val_accuracy: 0.5060 - val_loss: 1.2733
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4717 - loss:
1.2726 - val_accuracy: 0.5060 - val_loss: 1.2181
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4861 - loss:
1.2214 - val_accuracy: 0.5060 - val_loss: 1.1865
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4631 - loss:
1.2168 - val_accuracy: 0.5060 - val_loss: 1.1692
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4495 - loss:
1.2115 - val_accuracy: 0.5060 - val_loss: 1.1588
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4730 - loss:

1.1835 - val_accuracy: 0.5060 - val_loss: 1.1525
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4644 - loss:
1.1709 - val_accuracy: 0.5060 - val_loss: 1.1470
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4604 - loss:
1.1711 - val_accuracy: 0.5060 - val_loss: 1.1421
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4803 - loss:
1.1388 - val_accuracy: 0.5100 - val_loss: 1.1373
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4767 - loss:
1.1402 - val_accuracy: 0.5139 - val_loss: 1.1319
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4656 - loss:
1.1572 - val_accuracy: 0.5179 - val_loss: 1.1258
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4695 - loss:
1.1311 - val_accuracy: 0.5179 - val_loss: 1.1192
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4783 - loss:
1.1306 - val_accuracy: 0.5139 - val_loss: 1.1126
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4776 - loss:
1.1282 - val_accuracy: 0.5179 - val_loss: 1.1055
Epoch 15/90
71/71 ————— 0s 2ms/step - accuracy: 0.4787 - loss:
1.1057 - val_accuracy: 0.5219 - val_loss: 1.0985
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4688 - loss:
1.1240 - val_accuracy: 0.5259 - val_loss: 1.0901
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4913 - loss:
1.0878 - val_accuracy: 0.5458 - val_loss: 1.0836
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5024 - loss:
1.0734 - val_accuracy: 0.5538 - val_loss: 1.0769
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5096 - loss:
1.0821 - val_accuracy: 0.5578 - val_loss: 1.0694
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5171 - loss:
1.0874 - val_accuracy: 0.5578 - val_loss: 1.0617
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5293 - loss:
1.0642 - val_accuracy: 0.5657 - val_loss: 1.0551
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5470 - loss:
1.0668 - val_accuracy: 0.5657 - val_loss: 1.0476
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5445 - loss:
1.0743 - val_accuracy: 0.5578 - val_loss: 1.0407
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5587 - loss:
1.0554 - val_accuracy: 0.5737 - val_loss: 1.0336
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5582 - loss:
1.0410 - val_accuracy: 0.5817 - val_loss: 1.0276
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5703 - loss:
1.0262 - val_accuracy: 0.5857 - val_loss: 1.0220
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5666 - loss:
1.0116 - val_accuracy: 0.6096 - val_loss: 1.0164
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5897 - loss:
1.0092 - val_accuracy: 0.6215 - val_loss: 1.0118
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5841 - loss:
1.0166 - val_accuracy: 0.6056 - val_loss: 1.0047
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5808 - loss:
1.0260 - val_accuracy: 0.6096 - val_loss: 1.0004
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6080 - loss:
0.9856 - val_accuracy: 0.6056 - val_loss: 0.9965
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5742 - loss:
1.0135 - val_accuracy: 0.6135 - val_loss: 0.9905
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6006 - loss:
0.9821 - val_accuracy: 0.6175 - val_loss: 0.9872
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5813 - loss:
0.9958 - val_accuracy: 0.6255 - val_loss: 0.9823
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5891 - loss:
1.0045 - val_accuracy: 0.6135 - val_loss: 0.9778

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5945 - loss:
0.9801 - val_accuracy: 0.6175 - val_loss: 0.9755

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5878 - loss:
0.9886 - val_accuracy: 0.6215 - val_loss: 0.9719

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5998 - loss:
0.9865 - val_accuracy: 0.6335 - val_loss: 0.9671

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.9869 - val_accuracy: 0.6295 - val_loss: 0.9639

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5873 - loss:
0.9861 - val_accuracy: 0.6255 - val_loss: 0.9610

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6052 - loss:
0.9507 - val_accuracy: 0.6295 - val_loss: 0.9593

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6069 - loss:
0.9671 - val_accuracy: 0.6335 - val_loss: 0.9553

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5840 - loss:
0.9787 - val_accuracy: 0.6255 - val_loss: 0.9533

Epoch 44/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6044 - loss:
0.9655 - val_accuracy: 0.6335 - val_loss: 0.9498

Epoch 45/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9623 - val_accuracy: 0.6335 - val_loss: 0.9477

Epoch 46/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6098 - loss:
0.9437 - val_accuracy: 0.6335 - val_loss: 0.9467

Epoch 47/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5819 - loss:
0.9811 - val_accuracy: 0.6295 - val_loss: 0.9442

Epoch 48/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5936 - loss:
0.9605 - val_accuracy: 0.6375 - val_loss: 0.9421

Epoch 49/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5865 - loss:
0.9662 - val_accuracy: 0.6375 - val_loss: 0.9397

Epoch 50/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6041 - loss:

0.9569 - val_accuracy: 0.6375 - val_loss: 0.9375
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5826 - loss:
0.9638 - val_accuracy: 0.6295 - val_loss: 0.9352
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9414 - val_accuracy: 0.6335 - val_loss: 0.9326
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6087 - loss:
0.9403 - val_accuracy: 0.6335 - val_loss: 0.9332
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9720 - val_accuracy: 0.6375 - val_loss: 0.9300
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9527 - val_accuracy: 0.6375 - val_loss: 0.9288
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5961 - loss:
0.9421 - val_accuracy: 0.6295 - val_loss: 0.9285
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5824 - loss:
0.9625 - val_accuracy: 0.6375 - val_loss: 0.9248
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6082 - loss:
0.9323 - val_accuracy: 0.6255 - val_loss: 0.9262
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6194 - loss:
0.9318 - val_accuracy: 0.6096 - val_loss: 0.9268
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6099 - loss:
0.9459 - val_accuracy: 0.6295 - val_loss: 0.9214
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5866 - loss:
0.9565 - val_accuracy: 0.6375 - val_loss: 0.9206
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6132 - loss:
0.9419 - val_accuracy: 0.6375 - val_loss: 0.9191
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5842 - loss:
0.9555 - val_accuracy: 0.6295 - val_loss: 0.9180
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5989 - loss:
0.9417 - val_accuracy: 0.6375 - val_loss: 0.9168
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6011 - loss:
0.9278 - val_accuracy: 0.6335 - val_loss: 0.9157
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6026 - loss:
0.9256 - val_accuracy: 0.6295 - val_loss: 0.9133
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9422 - val_accuracy: 0.6375 - val_loss: 0.9122
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6027 - loss:
0.9303 - val_accuracy: 0.6255 - val_loss: 0.9132
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5960 - loss:
0.9285 - val_accuracy: 0.6414 - val_loss: 0.9110
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6007 - loss:
0.9249 - val_accuracy: 0.6414 - val_loss: 0.9088
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
0.9353 - val_accuracy: 0.6295 - val_loss: 0.9087
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6133 - loss:
0.9090 - val_accuracy: 0.6375 - val_loss: 0.9099
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6166 - loss:
0.9120 - val_accuracy: 0.6335 - val_loss: 0.9085
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6065 - loss:
0.9177 - val_accuracy: 0.6335 - val_loss: 0.9065
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6125 - loss:
0.9262 - val_accuracy: 0.6414 - val_loss: 0.9059
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6158 - loss:
0.9201 - val_accuracy: 0.6414 - val_loss: 0.9028
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6177 - loss:
0.9104 - val_accuracy: 0.6414 - val_loss: 0.9029
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6153 - loss:
0.9040 - val_accuracy: 0.6375 - val_loss: 0.9001
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5961 - loss:
0.9079 - val_accuracy: 0.6175 - val_loss: 0.9031

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6153 - loss:
0.9139 - val_accuracy: 0.6414 - val_loss: 0.8992

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5975 - loss:
0.9148 - val_accuracy: 0.6414 - val_loss: 0.8996

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.8902 - val_accuracy: 0.6255 - val_loss: 0.8986

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5981 - loss:
0.9158 - val_accuracy: 0.6056 - val_loss: 0.9003

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9164 - val_accuracy: 0.6335 - val_loss: 0.8963

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5864 - loss:
0.9380 - val_accuracy: 0.6255 - val_loss: 0.8952

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6131 - loss:
0.9125 - val_accuracy: 0.6295 - val_loss: 0.8929

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5912 - loss:
0.9291 - val_accuracy: 0.6375 - val_loss: 0.8935

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.9247 - val_accuracy: 0.6414 - val_loss: 0.8926

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6058 - loss:
0.9096 - val_accuracy: 0.6255 - val_loss: 0.8930

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5977 - loss:
0.9311 - val_accuracy: 0.6175 - val_loss: 0.8932
training_neural_network: Adam, l2=3.1622776601683795e-05, dropout=0

Epoch 1/90
71/71 ————— 1s 5ms/step - accuracy: 0.2504 - loss:
1.3490 - val_accuracy: 0.5219 - val_loss: 1.3116

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4606 - loss:
1.2983 - val_accuracy: 0.5060 - val_loss: 1.2693

Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4848 - loss:
1.2537 - val_accuracy: 0.5060 - val_loss: 1.2410

Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4710 - loss:
1.2340 - val_accuracy: 0.5060 - val_loss: 1.2222
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4772 - loss:
1.2113 - val_accuracy: 0.5060 - val_loss: 1.2099
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4660 - loss:
1.2147 - val_accuracy: 0.5060 - val_loss: 1.2019
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4788 - loss:
1.1936 - val_accuracy: 0.5060 - val_loss: 1.1966
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4782 - loss:
1.2025 - val_accuracy: 0.5060 - val_loss: 1.1930
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4824 - loss:
1.1909 - val_accuracy: 0.5060 - val_loss: 1.1906
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4788 - loss:
1.1868 - val_accuracy: 0.5060 - val_loss: 1.1890
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4842 - loss:
1.1879 - val_accuracy: 0.5060 - val_loss: 1.1876
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4659 - loss:
1.2030 - val_accuracy: 0.5060 - val_loss: 1.1865
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4712 - loss:
1.1887 - val_accuracy: 0.5060 - val_loss: 1.1855
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4764 - loss:
1.1852 - val_accuracy: 0.5060 - val_loss: 1.1846
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4674 - loss:
1.2023 - val_accuracy: 0.5060 - val_loss: 1.1839
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4895 - loss:
1.1681 - val_accuracy: 0.5060 - val_loss: 1.1832
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4626 - loss:
1.1856 - val_accuracy: 0.5060 - val_loss: 1.1823
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4661 - loss:
1.1948 - val_accuracy: 0.5060 - val_loss: 1.1816

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4579 - loss:
1.1954 - val_accuracy: 0.5060 - val_loss: 1.1808

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4660 - loss:
1.1967 - val_accuracy: 0.5060 - val_loss: 1.1801

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4534 - loss:
1.1951 - val_accuracy: 0.5060 - val_loss: 1.1791

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4623 - loss:
1.1907 - val_accuracy: 0.5060 - val_loss: 1.1780

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.4861 - loss:
1.1804 - val_accuracy: 0.5060 - val_loss: 1.1771

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4698 - loss:
1.1796 - val_accuracy: 0.5060 - val_loss: 1.1762

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.4755 - loss:
1.1781 - val_accuracy: 0.5060 - val_loss: 1.1753

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.4528 - loss:
1.1969 - val_accuracy: 0.5060 - val_loss: 1.1741

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.4678 - loss:
1.1660 - val_accuracy: 0.5060 - val_loss: 1.1729

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.4609 - loss:
1.1930 - val_accuracy: 0.5060 - val_loss: 1.1717

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.4725 - loss:
1.1762 - val_accuracy: 0.5060 - val_loss: 1.1705

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.4787 - loss:
1.1691 - val_accuracy: 0.5060 - val_loss: 1.1691

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.4836 - loss:
1.1692 - val_accuracy: 0.5060 - val_loss: 1.1679

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.4750 - loss:
1.1695 - val_accuracy: 0.5060 - val_loss: 1.1663

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.4625 - loss:

1.1650 - val_accuracy: 0.5060 - val_loss: 1.1646
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.4421 - loss:
1.1970 - val_accuracy: 0.5060 - val_loss: 1.1626
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.4879 - loss:
1.1505 - val_accuracy: 0.5060 - val_loss: 1.1604
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.4483 - loss:
1.1761 - val_accuracy: 0.5060 - val_loss: 1.1574
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.4744 - loss:
1.1648 - val_accuracy: 0.5060 - val_loss: 1.1536
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.4576 - loss:
1.1581 - val_accuracy: 0.5060 - val_loss: 1.1487
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.4724 - loss:
1.1422 - val_accuracy: 0.5060 - val_loss: 1.1423
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.4573 - loss:
1.1614 - val_accuracy: 0.5020 - val_loss: 1.1343
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.4668 - loss:
1.1363 - val_accuracy: 0.5060 - val_loss: 1.1252
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.4717 - loss:
1.1318 - val_accuracy: 0.5060 - val_loss: 1.1162
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.4701 - loss:
1.1259 - val_accuracy: 0.5060 - val_loss: 1.1063
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.4697 - loss:
1.1051 - val_accuracy: 0.5020 - val_loss: 1.0963
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.4685 - loss:
1.1014 - val_accuracy: 0.5020 - val_loss: 1.0853
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.4801 - loss:
1.0874 - val_accuracy: 0.5020 - val_loss: 1.0750
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.4769 - loss:
1.0760 - val_accuracy: 0.5020 - val_loss: 1.0636
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4828 - loss:
1.0668 - val_accuracy: 0.5020 - val_loss: 1.0525
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4928 - loss:
1.0516 - val_accuracy: 0.5060 - val_loss: 1.0413
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4731 - loss:
1.0367 - val_accuracy: 0.5139 - val_loss: 1.0303
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4628 - loss:
1.0531 - val_accuracy: 0.5179 - val_loss: 1.0191
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4843 - loss:
1.0277 - val_accuracy: 0.5219 - val_loss: 1.0096
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4927 - loss:
1.0176 - val_accuracy: 0.5538 - val_loss: 0.9993
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5738 - loss:
1.0032 - val_accuracy: 0.5697 - val_loss: 0.9898
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5698 - loss:
1.0073 - val_accuracy: 0.5777 - val_loss: 0.9810
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5725 - loss:
0.9933 - val_accuracy: 0.5896 - val_loss: 0.9727
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5845 - loss:
0.9811 - val_accuracy: 0.5936 - val_loss: 0.9647
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5777 - loss:
0.9780 - val_accuracy: 0.5936 - val_loss: 0.9576
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6182 - loss:
0.9571 - val_accuracy: 0.6016 - val_loss: 0.9511
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6042 - loss:
0.9675 - val_accuracy: 0.5976 - val_loss: 0.9446
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6010 - loss:
0.9513 - val_accuracy: 0.6056 - val_loss: 0.9382
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5905 - loss:
0.9570 - val_accuracy: 0.6135 - val_loss: 0.9344

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9461 - val_accuracy: 0.6255 - val_loss: 0.9300

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6037 - loss:
0.9379 - val_accuracy: 0.6135 - val_loss: 0.9242

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5850 - loss:
0.9376 - val_accuracy: 0.6135 - val_loss: 0.9193

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5923 - loss:
0.9359 - val_accuracy: 0.6175 - val_loss: 0.9156

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9166 - val_accuracy: 0.6135 - val_loss: 0.9126

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5990 - loss:
0.9265 - val_accuracy: 0.6215 - val_loss: 0.9102

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5826 - loss:
0.9444 - val_accuracy: 0.6175 - val_loss: 0.9066

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6186 - loss:
0.9200 - val_accuracy: 0.6056 - val_loss: 0.9058

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5981 - loss:
0.9107 - val_accuracy: 0.6175 - val_loss: 0.9021

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.9096 - val_accuracy: 0.6215 - val_loss: 0.9004

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.9053 - val_accuracy: 0.6175 - val_loss: 0.8968

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9114 - val_accuracy: 0.6056 - val_loss: 0.8939

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9183 - val_accuracy: 0.6135 - val_loss: 0.8927

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6123 - loss:
0.9074 - val_accuracy: 0.6056 - val_loss: 0.8925

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6109 - loss:

0.9146 - val_accuracy: 0.6135 - val_loss: 0.8930
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6164 - loss:
0.8900 - val_accuracy: 0.6175 - val_loss: 0.8879
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:
0.9070 - val_accuracy: 0.6215 - val_loss: 0.8878
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6226 - loss:
0.8953 - val_accuracy: 0.6016 - val_loss: 0.8856
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6017 - loss:
0.8969 - val_accuracy: 0.6175 - val_loss: 0.8868
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9043 - val_accuracy: 0.6096 - val_loss: 0.8841
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5943 - loss:
0.9028 - val_accuracy: 0.6096 - val_loss: 0.8825
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6104 - loss:
0.8853 - val_accuracy: 0.6135 - val_loss: 0.8815
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6123 - loss:
0.9070 - val_accuracy: 0.6096 - val_loss: 0.8798
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6073 - loss:
0.8936 - val_accuracy: 0.6215 - val_loss: 0.8791
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.8854 - val_accuracy: 0.6175 - val_loss: 0.8791
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5952 - loss:
0.9023 - val_accuracy: 0.6295 - val_loss: 0.8789
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5987 - loss:
0.8978 - val_accuracy: 0.6175 - val_loss: 0.8780
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6081 - loss:
0.8989 - val_accuracy: 0.6175 - val_loss: 0.8747
training_neural_network: Adam, l2=0.0001, dropout=0
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.4147 - loss:
1.2824 - val_accuracy: 0.5060 - val_loss: 1.2374

Epoch 2/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4750 - loss:
1.2239 - val_accuracy: 0.5060 - val_loss: 1.2095

Epoch 3/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4907 - loss:
1.2002 - val_accuracy: 0.5060 - val_loss: 1.1977

Epoch 4/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4740 - loss:
1.2098 - val_accuracy: 0.5060 - val_loss: 1.1901

Epoch 5/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4637 - loss:
1.1973 - val_accuracy: 0.5060 - val_loss: 1.1850

Epoch 6/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4782 - loss:
1.1734 - val_accuracy: 0.5060 - val_loss: 1.1808

Epoch 7/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4736 - loss:
1.1929 - val_accuracy: 0.5060 - val_loss: 1.1770

Epoch 8/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4613 - loss:
1.2016 - val_accuracy: 0.5060 - val_loss: 1.1731

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4835 - loss:
1.1578 - val_accuracy: 0.5060 - val_loss: 1.1698

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4705 - loss:
1.1731 - val_accuracy: 0.5060 - val_loss: 1.1658

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4754 - loss:
1.1665 - val_accuracy: 0.5060 - val_loss: 1.1621

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4620 - loss:
1.1685 - val_accuracy: 0.5060 - val_loss: 1.1575

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4673 - loss:
1.1718 - val_accuracy: 0.5060 - val_loss: 1.1530

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4641 - loss:
1.1668 - val_accuracy: 0.5060 - val_loss: 1.1483

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4739 - loss:
1.1540 - val_accuracy: 0.5060 - val_loss: 1.1436

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4773 - loss:

1.1340 - val_accuracy: 0.5060 - val_loss: 1.1387
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4584 - loss:
1.1380 - val_accuracy: 0.5060 - val_loss: 1.1329
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4651 - loss:
1.1376 - val_accuracy: 0.5060 - val_loss: 1.1278
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4563 - loss:
1.1402 - val_accuracy: 0.5139 - val_loss: 1.1219
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4645 - loss:
1.1297 - val_accuracy: 0.5219 - val_loss: 1.1157
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4765 - loss:
1.1135 - val_accuracy: 0.5299 - val_loss: 1.1101
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4838 - loss:
1.1181 - val_accuracy: 0.5299 - val_loss: 1.1037
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.4902 - loss:
1.1016 - val_accuracy: 0.5339 - val_loss: 1.0973
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4973 - loss:
1.1168 - val_accuracy: 0.5299 - val_loss: 1.0913
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5212 - loss:
1.0937 - val_accuracy: 0.5299 - val_loss: 1.0850
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5181 - loss:
1.0833 - val_accuracy: 0.5378 - val_loss: 1.0792
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5481 - loss:
1.0757 - val_accuracy: 0.5418 - val_loss: 1.0726
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5171 - loss:
1.0662 - val_accuracy: 0.5418 - val_loss: 1.0661
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5362 - loss:
1.0740 - val_accuracy: 0.5498 - val_loss: 1.0600
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5468 - loss:
1.0840 - val_accuracy: 0.5618 - val_loss: 1.0541
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5496 - loss:
1.0507 - val_accuracy: 0.5697 - val_loss: 1.0479
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5638 - loss:
1.0512 - val_accuracy: 0.5697 - val_loss: 1.0424
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5566 - loss:
1.0437 - val_accuracy: 0.5817 - val_loss: 1.0367
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5506 - loss:
1.0593 - val_accuracy: 0.5817 - val_loss: 1.0308
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5624 - loss:
1.0339 - val_accuracy: 0.5976 - val_loss: 1.0259
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5694 - loss:
1.0268 - val_accuracy: 0.6016 - val_loss: 1.0206
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5660 - loss:
1.0182 - val_accuracy: 0.6056 - val_loss: 1.0160
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5798 - loss:
1.0134 - val_accuracy: 0.6096 - val_loss: 1.0106
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5763 - loss:
1.0116 - val_accuracy: 0.6016 - val_loss: 1.0054
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5723 - loss:
1.0296 - val_accuracy: 0.6056 - val_loss: 1.0009
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
1.0116 - val_accuracy: 0.6135 - val_loss: 0.9974
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5862 - loss:
1.0199 - val_accuracy: 0.6056 - val_loss: 0.9935
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5997 - loss:
0.9946 - val_accuracy: 0.6175 - val_loss: 0.9890
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5831 - loss:
1.0042 - val_accuracy: 0.6096 - val_loss: 0.9843
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5855 - loss:
1.0122 - val_accuracy: 0.6175 - val_loss: 0.9810

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5703 - loss:
1.0125 - val_accuracy: 0.6135 - val_loss: 0.9781

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6029 - loss:
0.9964 - val_accuracy: 0.6175 - val_loss: 0.9754

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5924 - loss:
0.9987 - val_accuracy: 0.6175 - val_loss: 0.9714

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5861 - loss:
0.9845 - val_accuracy: 0.6175 - val_loss: 0.9681

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9778 - val_accuracy: 0.6215 - val_loss: 0.9669

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5996 - loss:
0.9738 - val_accuracy: 0.6215 - val_loss: 0.9638

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6034 - loss:
0.9623 - val_accuracy: 0.6175 - val_loss: 0.9601

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6270 - loss:
0.9486 - val_accuracy: 0.6135 - val_loss: 0.9569

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.9670 - val_accuracy: 0.6175 - val_loss: 0.9536

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9654 - val_accuracy: 0.6175 - val_loss: 0.9510

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6092 - loss:
0.9471 - val_accuracy: 0.6175 - val_loss: 0.9487

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5989 - loss:
0.9640 - val_accuracy: 0.6175 - val_loss: 0.9471

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6078 - loss:
0.9552 - val_accuracy: 0.6295 - val_loss: 0.9466

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5989 - loss:
0.9537 - val_accuracy: 0.6255 - val_loss: 0.9443

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5865 - loss:

0.9678 - val_accuracy: 0.6135 - val_loss: 0.9411
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5917 - loss:
0.9686 - val_accuracy: 0.6215 - val_loss: 0.9388
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6022 - loss:
0.9514 - val_accuracy: 0.6175 - val_loss: 0.9375
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.9447 - val_accuracy: 0.6135 - val_loss: 0.9349
Epoch 64/90
71/71 ————— 0s 2ms/step - accuracy: 0.6001 - loss:
0.9713 - val_accuracy: 0.6135 - val_loss: 0.9327
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.9335 - val_accuracy: 0.6175 - val_loss: 0.9311
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6099 - loss:
0.9393 - val_accuracy: 0.6175 - val_loss: 0.9302
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5913 - loss:
0.9512 - val_accuracy: 0.6215 - val_loss: 0.9280
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5859 - loss:
0.9645 - val_accuracy: 0.6215 - val_loss: 0.9273
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5987 - loss:
0.9345 - val_accuracy: 0.6255 - val_loss: 0.9262
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9388 - val_accuracy: 0.6255 - val_loss: 0.9254
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6062 - loss:
0.9272 - val_accuracy: 0.6215 - val_loss: 0.9239
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6039 - loss:
0.9310 - val_accuracy: 0.6215 - val_loss: 0.9215
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5887 - loss:
0.9664 - val_accuracy: 0.6175 - val_loss: 0.9204
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6275 - loss:
0.9187 - val_accuracy: 0.6215 - val_loss: 0.9194
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6064 - loss:
0.9428 - val_accuracy: 0.6215 - val_loss: 0.9167
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5867 - loss:
0.9628 - val_accuracy: 0.6255 - val_loss: 0.9157
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5953 - loss:
0.9422 - val_accuracy: 0.6215 - val_loss: 0.9137
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5914 - loss:
0.9446 - val_accuracy: 0.6295 - val_loss: 0.9134
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6159 - loss:
0.9381 - val_accuracy: 0.6096 - val_loss: 0.9143
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6066 - loss:
0.9339 - val_accuracy: 0.6175 - val_loss: 0.9113
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6139 - loss:
0.9329 - val_accuracy: 0.6135 - val_loss: 0.9109
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6029 - loss:
0.9479 - val_accuracy: 0.6215 - val_loss: 0.9092
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6047 - loss:
0.9268 - val_accuracy: 0.6255 - val_loss: 0.9087
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6036 - loss:
0.9414 - val_accuracy: 0.6215 - val_loss: 0.9069
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5894 - loss:
0.9484 - val_accuracy: 0.6175 - val_loss: 0.9065
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6008 - loss:
0.9211 - val_accuracy: 0.6215 - val_loss: 0.9049
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6106 - loss:
0.9147 - val_accuracy: 0.6215 - val_loss: 0.9041
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6149 - loss:
0.9075 - val_accuracy: 0.6056 - val_loss: 0.9059
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:
0.9294 - val_accuracy: 0.6255 - val_loss: 0.9038

Epoch 90/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6111 - loss:
0.9243 - val_accuracy: 0.6215 - val_loss: 0.9010
training_neural_network: Adam, l2=0.00031622776601683794, dropout=0

Epoch 1/90
71/71 ━━━━━━━━ 2s 6ms/step - accuracy: 0.3545 - loss:
1.3290 - val_accuracy: 0.4781 - val_loss: 1.2546

Epoch 2/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4513 - loss:
1.2440 - val_accuracy: 0.5060 - val_loss: 1.2098

Epoch 3/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4566 - loss:
1.2220 - val_accuracy: 0.5060 - val_loss: 1.1880

Epoch 4/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4667 - loss:
1.2084 - val_accuracy: 0.5060 - val_loss: 1.1773

Epoch 5/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4594 - loss:
1.2095 - val_accuracy: 0.5060 - val_loss: 1.1713

Epoch 6/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4580 - loss:
1.1986 - val_accuracy: 0.5060 - val_loss: 1.1675

Epoch 7/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4583 - loss:
1.1826 - val_accuracy: 0.5060 - val_loss: 1.1647

Epoch 8/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4784 - loss:
1.1746 - val_accuracy: 0.5060 - val_loss: 1.1622

Epoch 9/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4719 - loss:
1.1733 - val_accuracy: 0.5060 - val_loss: 1.1599

Epoch 10/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4605 - loss:
1.1751 - val_accuracy: 0.5060 - val_loss: 1.1577

Epoch 11/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4681 - loss:
1.1750 - val_accuracy: 0.5060 - val_loss: 1.1553

Epoch 12/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4704 - loss:
1.1662 - val_accuracy: 0.5060 - val_loss: 1.1532

Epoch 13/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4644 - loss:
1.1639 - val_accuracy: 0.5060 - val_loss: 1.1508

Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4582 - loss:
1.1941 - val_accuracy: 0.5060 - val_loss: 1.1481
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4661 - loss:
1.1532 - val_accuracy: 0.5060 - val_loss: 1.1428
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4900 - loss:
1.1279 - val_accuracy: 0.5060 - val_loss: 1.1371
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4555 - loss:
1.1567 - val_accuracy: 0.5060 - val_loss: 1.1307
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4752 - loss:
1.1201 - val_accuracy: 0.5060 - val_loss: 1.1256
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4764 - loss:
1.1371 - val_accuracy: 0.5060 - val_loss: 1.1197
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4925 - loss:
1.1013 - val_accuracy: 0.5060 - val_loss: 1.1140
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4681 - loss:
1.1173 - val_accuracy: 0.5060 - val_loss: 1.1079
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4688 - loss:
1.1007 - val_accuracy: 0.5060 - val_loss: 1.1016
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4659 - loss:
1.0992 - val_accuracy: 0.5060 - val_loss: 1.0948
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4765 - loss:
1.0924 - val_accuracy: 0.5060 - val_loss: 1.0884
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4664 - loss:
1.0983 - val_accuracy: 0.5060 - val_loss: 1.0819
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4928 - loss:
1.0855 - val_accuracy: 0.5339 - val_loss: 1.0759
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5264 - loss:
1.0769 - val_accuracy: 0.5378 - val_loss: 1.0696
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5333 - loss:
1.0835 - val_accuracy: 0.5418 - val_loss: 1.0635

Epoch 29/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5415 - loss:
1.0749 - val_accuracy: 0.5458 - val_loss: 1.0575

Epoch 30/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5520 - loss:
1.0472 - val_accuracy: 0.5697 - val_loss: 1.0520

Epoch 31/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5533 - loss:
1.0534 - val_accuracy: 0.5737 - val_loss: 1.0460

Epoch 32/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5657 - loss:
1.0391 - val_accuracy: 0.5657 - val_loss: 1.0407

Epoch 33/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5636 - loss:
1.0448 - val_accuracy: 0.5697 - val_loss: 1.0350

Epoch 34/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5569 - loss:
1.0390 - val_accuracy: 0.5737 - val_loss: 1.0298

Epoch 35/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5714 - loss:
1.0410 - val_accuracy: 0.5777 - val_loss: 1.0247

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5620 - loss:
1.0458 - val_accuracy: 0.5817 - val_loss: 1.0193

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5719 - loss:
1.0265 - val_accuracy: 0.5936 - val_loss: 1.0149

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5773 - loss:
1.0392 - val_accuracy: 0.5857 - val_loss: 1.0101

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5715 - loss:
1.0118 - val_accuracy: 0.6056 - val_loss: 1.0051

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5774 - loss:
1.0113 - val_accuracy: 0.5976 - val_loss: 1.0010

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5850 - loss:
1.0269 - val_accuracy: 0.5896 - val_loss: 0.9972

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5791 - loss:
1.0147 - val_accuracy: 0.6016 - val_loss: 0.9925

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5848 - loss:

0.9891 - val_accuracy: 0.5976 - val_loss: 0.9886
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5950 - loss:
0.9848 - val_accuracy: 0.6056 - val_loss: 0.9855
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5969 - loss:
0.9998 - val_accuracy: 0.5976 - val_loss: 0.9804
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5682 - loss:
1.0051 - val_accuracy: 0.6056 - val_loss: 0.9768
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9917 - val_accuracy: 0.6016 - val_loss: 0.9738
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5992 - loss:
0.9787 - val_accuracy: 0.6056 - val_loss: 0.9708
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9783 - val_accuracy: 0.6056 - val_loss: 0.9678
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9692 - val_accuracy: 0.6096 - val_loss: 0.9645
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6005 - loss:
0.9826 - val_accuracy: 0.6135 - val_loss: 0.9611
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9777 - val_accuracy: 0.6096 - val_loss: 0.9586
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6095 - loss:
0.9596 - val_accuracy: 0.6135 - val_loss: 0.9547
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5907 - loss:
0.9732 - val_accuracy: 0.6096 - val_loss: 0.9523
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5886 - loss:
0.9925 - val_accuracy: 0.6096 - val_loss: 0.9493
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5976 - loss:
0.9787 - val_accuracy: 0.6096 - val_loss: 0.9463
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6171 - loss:
0.9386 - val_accuracy: 0.6096 - val_loss: 0.9442
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5913 - loss:
0.9794 - val_accuracy: 0.6135 - val_loss: 0.9414
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5980 - loss:
0.9790 - val_accuracy: 0.6096 - val_loss: 0.9398
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5971 - loss:
0.9611 - val_accuracy: 0.6056 - val_loss: 0.9373
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6006 - loss:
0.9467 - val_accuracy: 0.6135 - val_loss: 0.9369
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5841 - loss:
0.9689 - val_accuracy: 0.6096 - val_loss: 0.9347
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6015 - loss:
0.9469 - val_accuracy: 0.6096 - val_loss: 0.9326
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6090 - loss:
0.9512 - val_accuracy: 0.6135 - val_loss: 0.9309
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5947 - loss:
0.9652 - val_accuracy: 0.6135 - val_loss: 0.9290
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6135 - loss:
0.9324 - val_accuracy: 0.6175 - val_loss: 0.9280
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6198 - loss:
0.9436 - val_accuracy: 0.6135 - val_loss: 0.9278
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5993 - loss:
0.9515 - val_accuracy: 0.6096 - val_loss: 0.9261
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9442 - val_accuracy: 0.6135 - val_loss: 0.9234
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6152 - loss:
0.9356 - val_accuracy: 0.6096 - val_loss: 0.9236
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6049 - loss:
0.9648 - val_accuracy: 0.6175 - val_loss: 0.9207
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6112 - loss:
0.9266 - val_accuracy: 0.6056 - val_loss: 0.9194

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5985 - loss:
0.9445 - val_accuracy: 0.6096 - val_loss: 0.9182

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6146 - loss:
0.9310 - val_accuracy: 0.6056 - val_loss: 0.9169

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6070 - loss:
0.9311 - val_accuracy: 0.6096 - val_loss: 0.9159

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6077 - loss:
0.9431 - val_accuracy: 0.6135 - val_loss: 0.9157

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9375 - val_accuracy: 0.6135 - val_loss: 0.9139

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6055 - loss:
0.9130 - val_accuracy: 0.6215 - val_loss: 0.9130

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9295 - val_accuracy: 0.6135 - val_loss: 0.9130

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:
0.9103 - val_accuracy: 0.6096 - val_loss: 0.9117

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
0.9168 - val_accuracy: 0.6135 - val_loss: 0.9107

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6156 - loss:
0.9280 - val_accuracy: 0.6096 - val_loss: 0.9093

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6040 - loss:
0.9329 - val_accuracy: 0.6096 - val_loss: 0.9087

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9298 - val_accuracy: 0.6135 - val_loss: 0.9075

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5902 - loss:
0.9345 - val_accuracy: 0.6135 - val_loss: 0.9076

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6091 - loss:
0.9184 - val_accuracy: 0.6135 - val_loss: 0.9068

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5891 - loss:

0.9461 - val_accuracy: 0.6135 - val_loss: 0.9054
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6159 - loss:
0.8981 - val_accuracy: 0.6215 - val_loss: 0.9051
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6137 - loss:
0.9164 - val_accuracy: 0.6255 - val_loss: 0.9058
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5901 - loss:
0.9380 - val_accuracy: 0.6215 - val_loss: 0.9035
training_neural_network: Adam, l2=0.001, dropout=0
79/79 ————— 0s 2ms/step
53/53 ————— 0s 956us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 869us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 998us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 969us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 956us/step
Epoch 1/90
71/71 ————— 1s 6ms/step - accuracy: 0.1807 - loss:
1.4557 - val_accuracy: 0.3267 - val_loss: 1.3633
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.3413 - loss:
1.3499 - val_accuracy: 0.5060 - val_loss: 1.2998
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4732 - loss:
1.3016 - val_accuracy: 0.5060 - val_loss: 1.2616
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4601 - loss:
1.2715 - val_accuracy: 0.5060 - val_loss: 1.2316
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4615 - loss:
1.2463 - val_accuracy: 0.5060 - val_loss: 1.2114
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4628 - loss:
1.2343 - val_accuracy: 0.5060 - val_loss: 1.1969
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4820 - loss:
1.2060 - val_accuracy: 0.5060 - val_loss: 1.1853

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4710 - loss:
1.1987 - val_accuracy: 0.5060 - val_loss: 1.1756

Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4560 - loss:
1.2015 - val_accuracy: 0.5060 - val_loss: 1.1670

Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4788 - loss:
1.1728 - val_accuracy: 0.5060 - val_loss: 1.1588

Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4648 - loss:
1.1758 - val_accuracy: 0.5020 - val_loss: 1.1512

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4680 - loss:
1.1665 - val_accuracy: 0.5020 - val_loss: 1.1436

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4581 - loss:
1.1669 - val_accuracy: 0.5060 - val_loss: 1.1360

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4749 - loss:
1.1572 - val_accuracy: 0.5020 - val_loss: 1.1285

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4788 - loss:
1.1455 - val_accuracy: 0.4940 - val_loss: 1.1208

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4810 - loss:
1.1434 - val_accuracy: 0.4940 - val_loss: 1.1130

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4692 - loss:
1.1262 - val_accuracy: 0.4940 - val_loss: 1.1050

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4883 - loss:
1.1100 - val_accuracy: 0.4861 - val_loss: 1.0969

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4956 - loss:
1.1073 - val_accuracy: 0.4940 - val_loss: 1.0886

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4841 - loss:
1.1040 - val_accuracy: 0.4940 - val_loss: 1.0801

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4819 - loss:
1.1030 - val_accuracy: 0.4980 - val_loss: 1.0719

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4746 - loss:

1.1001 - val_accuracy: 0.4940 - val_loss: 1.0635
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5056 - loss:
1.0617 - val_accuracy: 0.4980 - val_loss: 1.0557
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4911 - loss:
1.0608 - val_accuracy: 0.4900 - val_loss: 1.0479
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.4775 - loss:
1.0679 - val_accuracy: 0.4980 - val_loss: 1.0403
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.4897 - loss:
1.0643 - val_accuracy: 0.4940 - val_loss: 1.0334
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.4789 - loss:
1.0497 - val_accuracy: 0.5020 - val_loss: 1.0267
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5092 - loss:
1.0362 - val_accuracy: 0.4980 - val_loss: 1.0204
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.4814 - loss:
1.0271 - val_accuracy: 0.5060 - val_loss: 1.0143
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.4861 - loss:
1.0391 - val_accuracy: 0.5020 - val_loss: 1.0082
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5134 - loss:
1.0156 - val_accuracy: 0.4980 - val_loss: 1.0032
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.4841 - loss:
1.0147 - val_accuracy: 0.5060 - val_loss: 0.9975
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.4981 - loss:
1.0034 - val_accuracy: 0.4980 - val_loss: 0.9929
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5077 - loss:
1.0048 - val_accuracy: 0.5020 - val_loss: 0.9885
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5217 - loss:
1.0022 - val_accuracy: 0.5618 - val_loss: 0.9841
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9959 - val_accuracy: 0.5817 - val_loss: 0.9800
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5704 - loss:
0.9988 - val_accuracy: 0.5777 - val_loss: 0.9755
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5893 - loss:
0.9909 - val_accuracy: 0.5777 - val_loss: 0.9729
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5801 - loss:
0.9876 - val_accuracy: 0.5777 - val_loss: 0.9707
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6041 - loss:
0.9826 - val_accuracy: 0.5618 - val_loss: 0.9695
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6053 - loss:
0.9701 - val_accuracy: 0.5817 - val_loss: 0.9631
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5996 - loss:
0.9733 - val_accuracy: 0.5817 - val_loss: 0.9601
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5863 - loss:
0.9910 - val_accuracy: 0.5817 - val_loss: 0.9574
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5869 - loss:
0.9779 - val_accuracy: 0.5697 - val_loss: 0.9551
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5883 - loss:
0.9762 - val_accuracy: 0.5857 - val_loss: 0.9517
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6051 - loss:
0.9551 - val_accuracy: 0.5737 - val_loss: 0.9509
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6016 - loss:
0.9731 - val_accuracy: 0.5896 - val_loss: 0.9475
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:
0.9626 - val_accuracy: 0.5777 - val_loss: 0.9461
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6070 - loss:
0.9627 - val_accuracy: 0.5737 - val_loss: 0.9435
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5930 - loss:
0.9516 - val_accuracy: 0.5896 - val_loss: 0.9403
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6185 - loss:
0.9359 - val_accuracy: 0.5896 - val_loss: 0.9381

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6023 - loss:
0.9452 - val_accuracy: 0.5976 - val_loss: 0.9371

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9389 - val_accuracy: 0.5936 - val_loss: 0.9362

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6107 - loss:
0.9470 - val_accuracy: 0.5857 - val_loss: 0.9329

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6217 - loss:
0.9183 - val_accuracy: 0.5936 - val_loss: 0.9308

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6024 - loss:
0.9207 - val_accuracy: 0.5936 - val_loss: 0.9279

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6180 - loss:
0.9386 - val_accuracy: 0.5936 - val_loss: 0.9238

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6110 - loss:
0.9369 - val_accuracy: 0.5936 - val_loss: 0.9238

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6040 - loss:
0.9386 - val_accuracy: 0.5976 - val_loss: 0.9182

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5962 - loss:
0.9573 - val_accuracy: 0.6016 - val_loss: 0.9188

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6113 - loss:
0.9257 - val_accuracy: 0.5976 - val_loss: 0.9158

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9270 - val_accuracy: 0.6056 - val_loss: 0.9169

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6136 - loss:
0.9161 - val_accuracy: 0.6056 - val_loss: 0.9134

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6087 - loss:
0.9153 - val_accuracy: 0.6056 - val_loss: 0.9120

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6109 - loss:
0.9276 - val_accuracy: 0.6056 - val_loss: 0.9113

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6114 - loss:

0.9261 - val_accuracy: 0.6096 - val_loss: 0.9077
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5934 - loss:
0.9510 - val_accuracy: 0.6135 - val_loss: 0.9074
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6163 - loss:
0.9064 - val_accuracy: 0.6096 - val_loss: 0.9052
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6148 - loss:
0.9168 - val_accuracy: 0.6135 - val_loss: 0.9038
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6166 - loss:
0.9157 - val_accuracy: 0.6175 - val_loss: 0.9037
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5911 - loss:
0.9294 - val_accuracy: 0.6135 - val_loss: 0.9051
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9184 - val_accuracy: 0.6255 - val_loss: 0.9021
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6133 - loss:
0.9153 - val_accuracy: 0.6056 - val_loss: 0.8996
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6213 - loss:
0.8986 - val_accuracy: 0.6175 - val_loss: 0.8979
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5926 - loss:
0.9458 - val_accuracy: 0.6135 - val_loss: 0.9042
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6231 - loss:
0.9100 - val_accuracy: 0.6135 - val_loss: 0.8994
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6116 - loss:
0.9232 - val_accuracy: 0.6175 - val_loss: 0.8968
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5866 - loss:
0.9379 - val_accuracy: 0.6056 - val_loss: 0.8931
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9090 - val_accuracy: 0.6135 - val_loss: 0.8927
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
0.9287 - val_accuracy: 0.6255 - val_loss: 0.8941
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6023 - loss:
0.9051 - val_accuracy: 0.6135 - val_loss: 0.8944
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6023 - loss:
0.9099 - val_accuracy: 0.6175 - val_loss: 0.8934
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6005 - loss:
0.9119 - val_accuracy: 0.6255 - val_loss: 0.8901
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.9146 - val_accuracy: 0.6215 - val_loss: 0.8907
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6027 - loss:
0.9125 - val_accuracy: 0.6135 - val_loss: 0.8931
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6142 - loss:
0.9189 - val_accuracy: 0.6215 - val_loss: 0.8887
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6073 - loss:
0.8995 - val_accuracy: 0.6295 - val_loss: 0.8880
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6184 - loss:
0.8953 - val_accuracy: 0.6255 - val_loss: 0.8884
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6054 - loss:
0.8932 - val_accuracy: 0.6215 - val_loss: 0.8850
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6048 - loss:
0.9023 - val_accuracy: 0.6175 - val_loss: 0.8869
training_neural_network: Adam, l2=1e-05, dropout=0.1
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.3505 - loss:
1.3393 - val_accuracy: 0.5060 - val_loss: 1.2330
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4818 - loss:
1.2312 - val_accuracy: 0.5060 - val_loss: 1.1873
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4595 - loss:
1.2088 - val_accuracy: 0.5060 - val_loss: 1.1704
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4719 - loss:
1.1914 - val_accuracy: 0.5060 - val_loss: 1.1632
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4702 - loss:

1.1768 - val_accuracy: 0.5060 - val_loss: 1.1592
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4469 - loss:
1.1955 - val_accuracy: 0.5060 - val_loss: 1.1560
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4685 - loss:
1.1779 - val_accuracy: 0.5060 - val_loss: 1.1533
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4477 - loss:
1.1876 - val_accuracy: 0.5060 - val_loss: 1.1508
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4575 - loss:
1.1775 - val_accuracy: 0.5060 - val_loss: 1.1483
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4734 - loss:
1.1484 - val_accuracy: 0.5060 - val_loss: 1.1455
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4843 - loss:
1.1292 - val_accuracy: 0.5060 - val_loss: 1.1427
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4832 - loss:
1.1360 - val_accuracy: 0.5060 - val_loss: 1.1394
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4591 - loss:
1.1612 - val_accuracy: 0.5060 - val_loss: 1.1357
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4817 - loss:
1.1236 - val_accuracy: 0.5060 - val_loss: 1.1321
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4600 - loss:
1.1222 - val_accuracy: 0.5219 - val_loss: 1.1281
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4851 - loss:
1.1296 - val_accuracy: 0.5259 - val_loss: 1.1235
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4847 - loss:
1.1290 - val_accuracy: 0.5299 - val_loss: 1.1193
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4942 - loss:
1.1198 - val_accuracy: 0.5299 - val_loss: 1.1152
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4959 - loss:
1.1200 - val_accuracy: 0.5299 - val_loss: 1.1105
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5168 - loss:
1.1001 - val_accuracy: 0.5339 - val_loss: 1.1062
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5160 - loss:
1.1062 - val_accuracy: 0.5339 - val_loss: 1.1012
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5388 - loss:
1.0971 - val_accuracy: 0.5378 - val_loss: 1.0962
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5572 - loss:
1.1026 - val_accuracy: 0.5618 - val_loss: 1.0915
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5559 - loss:
1.0744 - val_accuracy: 0.5578 - val_loss: 1.0870
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5564 - loss:
1.0899 - val_accuracy: 0.5578 - val_loss: 1.0819
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5627 - loss:
1.0811 - val_accuracy: 0.5697 - val_loss: 1.0777
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5584 - loss:
1.0529 - val_accuracy: 0.5777 - val_loss: 1.0735
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5771 - loss:
1.0598 - val_accuracy: 0.5737 - val_loss: 1.0687
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5747 - loss:
1.0533 - val_accuracy: 0.5857 - val_loss: 1.0647
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5787 - loss:
1.0579 - val_accuracy: 0.5817 - val_loss: 1.0598
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5649 - loss:
1.0447 - val_accuracy: 0.5857 - val_loss: 1.0559
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5812 - loss:
1.0325 - val_accuracy: 0.5857 - val_loss: 1.0511
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5809 - loss:
1.0210 - val_accuracy: 0.5857 - val_loss: 1.0472
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5555 - loss:
1.0439 - val_accuracy: 0.5857 - val_loss: 1.0426

Epoch 35/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5738 - loss:
1.0439 - val_accuracy: 0.5857 - val_loss: 1.0383

Epoch 36/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5365 - loss:
1.0564 - val_accuracy: 0.5896 - val_loss: 1.0339

Epoch 37/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5579 - loss:
1.0211 - val_accuracy: 0.5936 - val_loss: 1.0301

Epoch 38/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5632 - loss:
1.0365 - val_accuracy: 0.5976 - val_loss: 1.0259

Epoch 39/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5715 - loss:
1.0381 - val_accuracy: 0.6016 - val_loss: 1.0223

Epoch 40/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5539 - loss:
1.0470 - val_accuracy: 0.6016 - val_loss: 1.0185

Epoch 41/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5637 - loss:
1.0136 - val_accuracy: 0.6016 - val_loss: 1.0146

Epoch 42/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5798 - loss:
1.0020 - val_accuracy: 0.6135 - val_loss: 1.0112

Epoch 43/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5796 - loss:
1.0121 - val_accuracy: 0.6056 - val_loss: 1.0078

Epoch 44/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5803 - loss:
1.0077 - val_accuracy: 0.6096 - val_loss: 1.0040

Epoch 45/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5904 - loss:
1.0095 - val_accuracy: 0.6096 - val_loss: 1.0007

Epoch 46/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5728 - loss:
0.9982 - val_accuracy: 0.6016 - val_loss: 0.9971

Epoch 47/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5780 - loss:
0.9918 - val_accuracy: 0.6135 - val_loss: 0.9937

Epoch 48/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5734 - loss:
1.0019 - val_accuracy: 0.6096 - val_loss: 0.9905

Epoch 49/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5798 - loss:

1.0045 - val_accuracy: 0.6096 - val_loss: 0.9876
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5934 - loss:
0.9948 - val_accuracy: 0.6056 - val_loss: 0.9845
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6010 - loss:
0.9728 - val_accuracy: 0.6096 - val_loss: 0.9819
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9790 - val_accuracy: 0.6096 - val_loss: 0.9789
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5911 - loss:
1.0024 - val_accuracy: 0.6096 - val_loss: 0.9759
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5727 - loss:
0.9897 - val_accuracy: 0.6016 - val_loss: 0.9734
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5972 - loss:
0.9677 - val_accuracy: 0.6096 - val_loss: 0.9705
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.9611 - val_accuracy: 0.6135 - val_loss: 0.9679
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5984 - loss:
0.9768 - val_accuracy: 0.5976 - val_loss: 0.9654
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6026 - loss:
0.9683 - val_accuracy: 0.6175 - val_loss: 0.9632
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9542 - val_accuracy: 0.6255 - val_loss: 0.9610
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6133 - loss:
0.9598 - val_accuracy: 0.6175 - val_loss: 0.9583
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5969 - loss:
0.9638 - val_accuracy: 0.6295 - val_loss: 0.9564
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5972 - loss:
0.9674 - val_accuracy: 0.6255 - val_loss: 0.9538
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9549 - val_accuracy: 0.6215 - val_loss: 0.9522
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5951 - loss:
0.9590 - val_accuracy: 0.6215 - val_loss: 0.9502
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5856 - loss:
0.9707 - val_accuracy: 0.6135 - val_loss: 0.9480
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6047 - loss:
0.9477 - val_accuracy: 0.6215 - val_loss: 0.9464
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6020 - loss:
0.9607 - val_accuracy: 0.6215 - val_loss: 0.9444
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5850 - loss:
0.9579 - val_accuracy: 0.6215 - val_loss: 0.9431
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5987 - loss:
0.9648 - val_accuracy: 0.6255 - val_loss: 0.9421
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5947 - loss:
0.9470 - val_accuracy: 0.6255 - val_loss: 0.9401
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6122 - loss:
0.9502 - val_accuracy: 0.6295 - val_loss: 0.9393
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5880 - loss:
0.9333 - val_accuracy: 0.6255 - val_loss: 0.9379
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6044 - loss:
0.9314 - val_accuracy: 0.6295 - val_loss: 0.9358
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6110 - loss:
0.9363 - val_accuracy: 0.6255 - val_loss: 0.9348
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6087 - loss:
0.9213 - val_accuracy: 0.6255 - val_loss: 0.9340
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5975 - loss:
0.9398 - val_accuracy: 0.6255 - val_loss: 0.9327
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9520 - val_accuracy: 0.6255 - val_loss: 0.9309
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5906 - loss:
0.9665 - val_accuracy: 0.6215 - val_loss: 0.9298

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6041 - loss:
0.9369 - val_accuracy: 0.6215 - val_loss: 0.9286

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5909 - loss:
0.9588 - val_accuracy: 0.6255 - val_loss: 0.9278

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5913 - loss:
0.9533 - val_accuracy: 0.6295 - val_loss: 0.9272

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6073 - loss:
0.9375 - val_accuracy: 0.6096 - val_loss: 0.9262

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9217 - val_accuracy: 0.6255 - val_loss: 0.9251

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5945 - loss:
0.9711 - val_accuracy: 0.6295 - val_loss: 0.9232

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9341 - val_accuracy: 0.6335 - val_loss: 0.9237

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5962 - loss:
0.9328 - val_accuracy: 0.6255 - val_loss: 0.9223

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6222 - loss:
0.9137 - val_accuracy: 0.6215 - val_loss: 0.9214

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5903 - loss:
0.9435 - val_accuracy: 0.6096 - val_loss: 0.9210

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5883 - loss:
0.9442 - val_accuracy: 0.6295 - val_loss: 0.9194

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6000 - loss:
0.9320 - val_accuracy: 0.6375 - val_loss: 0.9194
training_neural_network: Adam, l2=1e-05, dropout=0.4

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.1985 - loss:
1.4036 - val_accuracy: 0.3944 - val_loss: 1.3340

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4390 - loss:
1.3181 - val_accuracy: 0.5060 - val_loss: 1.2764

Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4563 - loss:
1.2794 - val_accuracy: 0.5060 - val_loss: 1.2377
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4733 - loss:
1.2354 - val_accuracy: 0.5060 - val_loss: 1.2109
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4677 - loss:
1.2188 - val_accuracy: 0.5060 - val_loss: 1.1911
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4752 - loss:
1.2023 - val_accuracy: 0.5060 - val_loss: 1.1747
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4537 - loss:
1.1936 - val_accuracy: 0.5060 - val_loss: 1.1600
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4626 - loss:
1.1736 - val_accuracy: 0.5060 - val_loss: 1.1462
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4718 - loss:
1.1584 - val_accuracy: 0.5060 - val_loss: 1.1335
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4844 - loss:
1.1291 - val_accuracy: 0.5060 - val_loss: 1.1211
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4767 - loss:
1.1306 - val_accuracy: 0.5060 - val_loss: 1.1091
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4759 - loss:
1.1178 - val_accuracy: 0.5060 - val_loss: 1.0967
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4637 - loss:
1.1120 - val_accuracy: 0.5060 - val_loss: 1.0845
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4673 - loss:
1.0972 - val_accuracy: 0.5060 - val_loss: 1.0722
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4825 - loss:
1.0793 - val_accuracy: 0.5060 - val_loss: 1.0599
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4741 - loss:
1.0690 - val_accuracy: 0.5060 - val_loss: 1.0473
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4691 - loss:
1.0658 - val_accuracy: 0.5139 - val_loss: 1.0353

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5108 - loss:
1.0605 - val_accuracy: 0.5458 - val_loss: 1.0233

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5441 - loss:
1.0339 - val_accuracy: 0.5697 - val_loss: 1.0122

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5588 - loss:
1.0298 - val_accuracy: 0.5777 - val_loss: 1.0014

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5469 - loss:
1.0243 - val_accuracy: 0.5857 - val_loss: 0.9904

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5628 - loss:
1.0057 - val_accuracy: 0.5896 - val_loss: 0.9805

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5661 - loss:
0.9890 - val_accuracy: 0.5976 - val_loss: 0.9715

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5738 - loss:
0.9925 - val_accuracy: 0.6096 - val_loss: 0.9638

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5830 - loss:
0.9756 - val_accuracy: 0.6135 - val_loss: 0.9572

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5886 - loss:
0.9722 - val_accuracy: 0.6096 - val_loss: 0.9510

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5819 - loss:
0.9717 - val_accuracy: 0.6135 - val_loss: 0.9457

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5946 - loss:
0.9642 - val_accuracy: 0.6096 - val_loss: 0.9403

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.6042 - loss:
0.9578 - val_accuracy: 0.6215 - val_loss: 0.9355

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9529 - val_accuracy: 0.6295 - val_loss: 0.9325

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.6231 - loss:
0.9370 - val_accuracy: 0.6295 - val_loss: 0.9279

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5726 - loss:

0.9723 - val_accuracy: 0.6215 - val_loss: 0.9254
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5901 - loss:
0.9596 - val_accuracy: 0.6255 - val_loss: 0.9216
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6062 - loss:
0.9325 - val_accuracy: 0.6255 - val_loss: 0.9185
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5890 - loss:
0.9546 - val_accuracy: 0.6295 - val_loss: 0.9165
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.9402 - val_accuracy: 0.6335 - val_loss: 0.9127
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9372 - val_accuracy: 0.6255 - val_loss: 0.9107
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5971 - loss:
0.9437 - val_accuracy: 0.6175 - val_loss: 0.9118
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6037 - loss:
0.9448 - val_accuracy: 0.6375 - val_loss: 0.9052
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6087 - loss:
0.9314 - val_accuracy: 0.6335 - val_loss: 0.9051
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9387 - val_accuracy: 0.6414 - val_loss: 0.9024
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5896 - loss:
0.9257 - val_accuracy: 0.6255 - val_loss: 0.9019
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:
0.9399 - val_accuracy: 0.6135 - val_loss: 0.9006
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5957 - loss:
0.9126 - val_accuracy: 0.6255 - val_loss: 0.9023
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6103 - loss:
0.8871 - val_accuracy: 0.6215 - val_loss: 0.9003
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5861 - loss:
0.9279 - val_accuracy: 0.6175 - val_loss: 0.8974
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6014 - loss:
0.9063 - val_accuracy: 0.6175 - val_loss: 0.8959
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5954 - loss:
0.9151 - val_accuracy: 0.6295 - val_loss: 0.8978
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6037 - loss:
0.9112 - val_accuracy: 0.6096 - val_loss: 0.8946
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5804 - loss:
0.9441 - val_accuracy: 0.6255 - val_loss: 0.8942
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9381 - val_accuracy: 0.6295 - val_loss: 0.8945
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6140 - loss:
0.8895 - val_accuracy: 0.6175 - val_loss: 0.8920
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6206 - loss:
0.8853 - val_accuracy: 0.6215 - val_loss: 0.8905
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6056 - loss:
0.9128 - val_accuracy: 0.6215 - val_loss: 0.8915
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5873 - loss:
0.9102 - val_accuracy: 0.6135 - val_loss: 0.8908
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5846 - loss:
0.9345 - val_accuracy: 0.6096 - val_loss: 0.8902
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5990 - loss:
0.9140 - val_accuracy: 0.6135 - val_loss: 0.8905
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6093 - loss:
0.8931 - val_accuracy: 0.6135 - val_loss: 0.8904
training_neural_network: Adam, l2=1e-05, dropout=0.7000000000000001
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.2321 - loss:
1.3870 - val_accuracy: 0.3865 - val_loss: 1.3410
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4006 - loss:

1.3305 - val_accuracy: 0.5020 - val_loss: 1.2936
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4629 - loss:
1.2900 - val_accuracy: 0.5060 - val_loss: 1.2575
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4609 - loss:
1.2634 - val_accuracy: 0.5060 - val_loss: 1.2310
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4751 - loss:
1.2307 - val_accuracy: 0.5060 - val_loss: 1.2103
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4777 - loss:
1.2083 - val_accuracy: 0.5060 - val_loss: 1.1930
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4682 - loss:
1.1960 - val_accuracy: 0.5060 - val_loss: 1.1777
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4752 - loss:
1.1838 - val_accuracy: 0.5060 - val_loss: 1.1642
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4504 - loss:
1.1803 - val_accuracy: 0.5060 - val_loss: 1.1516
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4645 - loss:
1.1712 - val_accuracy: 0.5060 - val_loss: 1.1398
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4663 - loss:
1.1553 - val_accuracy: 0.5060 - val_loss: 1.1284
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4644 - loss:
1.1287 - val_accuracy: 0.5060 - val_loss: 1.1172
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4737 - loss:
1.1200 - val_accuracy: 0.5060 - val_loss: 1.1063
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4626 - loss:
1.1189 - val_accuracy: 0.5060 - val_loss: 1.0946
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4605 - loss:
1.1036 - val_accuracy: 0.5060 - val_loss: 1.0830
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4503 - loss:
1.1062 - val_accuracy: 0.5060 - val_loss: 1.0708
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4665 - loss:
1.0862 - val_accuracy: 0.5299 - val_loss: 1.0591
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5030 - loss:
1.0686 - val_accuracy: 0.5339 - val_loss: 1.0479
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5499 - loss:
1.0391 - val_accuracy: 0.5498 - val_loss: 1.0376
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5602 - loss:
1.0384 - val_accuracy: 0.5737 - val_loss: 1.0263
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5714 - loss:
1.0118 - val_accuracy: 0.5896 - val_loss: 1.0167
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5886 - loss:
1.0077 - val_accuracy: 0.5857 - val_loss: 1.0073
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
1.0084 - val_accuracy: 0.5896 - val_loss: 0.9983
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9937 - val_accuracy: 0.6016 - val_loss: 0.9909
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5928 - loss:
0.9906 - val_accuracy: 0.6016 - val_loss: 0.9830
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5898 - loss:
0.9903 - val_accuracy: 0.6096 - val_loss: 0.9764
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5907 - loss:
0.9837 - val_accuracy: 0.6096 - val_loss: 0.9712
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6120 - loss:
0.9634 - val_accuracy: 0.6056 - val_loss: 0.9655
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5952 - loss:
0.9647 - val_accuracy: 0.6096 - val_loss: 0.9598
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5958 - loss:
0.9876 - val_accuracy: 0.6135 - val_loss: 0.9550
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9640 - val_accuracy: 0.6096 - val_loss: 0.9501

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5957 - loss:
0.9590 - val_accuracy: 0.6135 - val_loss: 0.9462

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5905 - loss:
0.9510 - val_accuracy: 0.6135 - val_loss: 0.9420

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6030 - loss:
0.9417 - val_accuracy: 0.6056 - val_loss: 0.9390

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5822 - loss:
0.9695 - val_accuracy: 0.5976 - val_loss: 0.9366

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9480 - val_accuracy: 0.6135 - val_loss: 0.9334

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.6148 - loss:
0.9108 - val_accuracy: 0.6096 - val_loss: 0.9302

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6133 - loss:
0.9215 - val_accuracy: 0.6056 - val_loss: 0.9272

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5904 - loss:
0.9464 - val_accuracy: 0.6135 - val_loss: 0.9256

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.9319 - val_accuracy: 0.6056 - val_loss: 0.9221

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6057 - loss:
0.9214 - val_accuracy: 0.5976 - val_loss: 0.9206

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9364 - val_accuracy: 0.5976 - val_loss: 0.9192

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5858 - loss:
0.9446 - val_accuracy: 0.5976 - val_loss: 0.9168

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.6109 - loss:
0.9297 - val_accuracy: 0.6016 - val_loss: 0.9160

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5855 - loss:
0.9421 - val_accuracy: 0.6056 - val_loss: 0.9136

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6240 - loss:

0.8978 - val_accuracy: 0.6135 - val_loss: 0.9132
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5890 - loss:
0.9293 - val_accuracy: 0.6135 - val_loss: 0.9113
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9165 - val_accuracy: 0.6135 - val_loss: 0.9099
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9180 - val_accuracy: 0.6096 - val_loss: 0.9091
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6111 - loss:
0.9288 - val_accuracy: 0.6056 - val_loss: 0.9089
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5926 - loss:
0.9174 - val_accuracy: 0.6135 - val_loss: 0.9068
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6097 - loss:
0.9111 - val_accuracy: 0.6056 - val_loss: 0.9054
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
0.9284 - val_accuracy: 0.6135 - val_loss: 0.9031
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6107 - loss:
0.9150 - val_accuracy: 0.6215 - val_loss: 0.9031
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6188 - loss:
0.9048 - val_accuracy: 0.6056 - val_loss: 0.9013
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6184 - loss:
0.8934 - val_accuracy: 0.6175 - val_loss: 0.8995
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9372 - val_accuracy: 0.6135 - val_loss: 0.8997
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9050 - val_accuracy: 0.6135 - val_loss: 0.8993
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6278 - loss:
0.8860 - val_accuracy: 0.6175 - val_loss: 0.8972
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9418 - val_accuracy: 0.6175 - val_loss: 0.8956
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5931 - loss:
0.9115 - val_accuracy: 0.6096 - val_loss: 0.8945
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5961 - loss:
0.9233 - val_accuracy: 0.6135 - val_loss: 0.8943
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6116 - loss:
0.9021 - val_accuracy: 0.6175 - val_loss: 0.8936
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6200 - loss:
0.8902 - val_accuracy: 0.6135 - val_loss: 0.8946
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5951 - loss:
0.9182 - val_accuracy: 0.6215 - val_loss: 0.8918
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5976 - loss:
0.9072 - val_accuracy: 0.6175 - val_loss: 0.8940
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6222 - loss:
0.9057 - val_accuracy: 0.6016 - val_loss: 0.8900
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6012 - loss:
0.9051 - val_accuracy: 0.6175 - val_loss: 0.8910
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6176 - loss:
0.8990 - val_accuracy: 0.6056 - val_loss: 0.8921
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6066 - loss:
0.9112 - val_accuracy: 0.6175 - val_loss: 0.8900
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5880 - loss:
0.9217 - val_accuracy: 0.6175 - val_loss: 0.8892
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6017 - loss:
0.8928 - val_accuracy: 0.6175 - val_loss: 0.8877
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5996 - loss:
0.8964 - val_accuracy: 0.6096 - val_loss: 0.8885
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9155 - val_accuracy: 0.6135 - val_loss: 0.8892
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6042 - loss:
0.9089 - val_accuracy: 0.6175 - val_loss: 0.8876

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5864 - loss:
0.9237 - val_accuracy: 0.6096 - val_loss: 0.8859

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5927 - loss:
0.9091 - val_accuracy: 0.6096 - val_loss: 0.8856

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6124 - loss:
0.8926 - val_accuracy: 0.6175 - val_loss: 0.8853

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.8933 - val_accuracy: 0.6056 - val_loss: 0.8857

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6118 - loss:
0.9026 - val_accuracy: 0.6175 - val_loss: 0.8857

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5895 - loss:
0.9142 - val_accuracy: 0.6175 - val_loss: 0.8830

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5976 - loss:
0.9121 - val_accuracy: 0.6175 - val_loss: 0.8845

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6102 - loss:
0.8841 - val_accuracy: 0.6135 - val_loss: 0.8831

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6020 - loss:
0.8957 - val_accuracy: 0.6175 - val_loss: 0.8838

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6038 - loss:
0.9165 - val_accuracy: 0.6135 - val_loss: 0.8797

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6160 - loss:
0.8953 - val_accuracy: 0.6175 - val_loss: 0.8797

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5935 - loss:
0.9126 - val_accuracy: 0.6215 - val_loss: 0.8794

Epoch 88/90
71/71 ————— 0s 2ms/step - accuracy: 0.6098 - loss:
0.8897 - val_accuracy: 0.6295 - val_loss: 0.8777

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5894 - loss:
0.9177 - val_accuracy: 0.6175 - val_loss: 0.8783

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6157 - loss:

0.8853 - val_accuracy: 0.6175 - val_loss: 0.8764
training_neural_network: Adam, l2=0.0001, dropout=0.1
Epoch 1/90
71/71 ━━━━━━━━━━━━━━━━ 2s 8ms/step - accuracy: 0.4309 - loss:
1.3326 - val_accuracy: 0.5060 - val_loss: 1.2568
Epoch 2/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4765 - loss:
1.2498 - val_accuracy: 0.5060 - val_loss: 1.1901
Epoch 3/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4748 - loss:
1.1981 - val_accuracy: 0.5060 - val_loss: 1.1528
Epoch 4/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4601 - loss:
1.1838 - val_accuracy: 0.5060 - val_loss: 1.1270
Epoch 5/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4768 - loss:
1.1305 - val_accuracy: 0.5060 - val_loss: 1.1080
Epoch 6/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4747 - loss:
1.1239 - val_accuracy: 0.5060 - val_loss: 1.0919
Epoch 7/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4817 - loss:
1.0937 - val_accuracy: 0.5060 - val_loss: 1.0791
Epoch 8/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4581 - loss:
1.1072 - val_accuracy: 0.5060 - val_loss: 1.0676
Epoch 9/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4624 - loss:
1.0686 - val_accuracy: 0.5020 - val_loss: 1.0582
Epoch 10/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4750 - loss:
1.0829 - val_accuracy: 0.5100 - val_loss: 1.0494
Epoch 11/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4740 - loss:
1.0509 - val_accuracy: 0.5100 - val_loss: 1.0417
Epoch 12/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4819 - loss:
1.0421 - val_accuracy: 0.5100 - val_loss: 1.0354
Epoch 13/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4873 - loss:
1.0519 - val_accuracy: 0.5139 - val_loss: 1.0277
Epoch 14/90
71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4983 - loss:
1.0555 - val_accuracy: 0.5339 - val_loss: 1.0211

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5195 - loss:
1.0395 - val_accuracy: 0.5458 - val_loss: 1.0151

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5544 - loss:
1.0270 - val_accuracy: 0.5498 - val_loss: 1.0085

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5564 - loss:
1.0386 - val_accuracy: 0.5618 - val_loss: 1.0017

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5625 - loss:
1.0207 - val_accuracy: 0.5737 - val_loss: 0.9961

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5848 - loss:
1.0099 - val_accuracy: 0.5857 - val_loss: 0.9935

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5721 - loss:
1.0019 - val_accuracy: 0.5777 - val_loss: 0.9854

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5810 - loss:
1.0090 - val_accuracy: 0.6016 - val_loss: 0.9811

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5824 - loss:
0.9987 - val_accuracy: 0.6096 - val_loss: 0.9786

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.6095 - loss:
0.9658 - val_accuracy: 0.5976 - val_loss: 0.9717

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5924 - loss:
0.9869 - val_accuracy: 0.6056 - val_loss: 0.9679

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9701 - val_accuracy: 0.6096 - val_loss: 0.9634

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5936 - loss:
0.9836 - val_accuracy: 0.6016 - val_loss: 0.9591

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.6041 - loss:
0.9652 - val_accuracy: 0.6016 - val_loss: 0.9583

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.6009 - loss:
0.9547 - val_accuracy: 0.6056 - val_loss: 0.9511

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:

0.9504 - val_accuracy: 0.6215 - val_loss: 0.9476
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9619 - val_accuracy: 0.6175 - val_loss: 0.9447
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.6032 - loss:
0.9615 - val_accuracy: 0.6135 - val_loss: 0.9408
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.6099 - loss:
0.9516 - val_accuracy: 0.6175 - val_loss: 0.9386
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.6026 - loss:
0.9576 - val_accuracy: 0.6175 - val_loss: 0.9357
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6166 - loss:
0.9417 - val_accuracy: 0.6096 - val_loss: 0.9344
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5983 - loss:
0.9707 - val_accuracy: 0.6175 - val_loss: 0.9301
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5901 - loss:
0.9403 - val_accuracy: 0.6175 - val_loss: 0.9277
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9482 - val_accuracy: 0.6215 - val_loss: 0.9255
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9333 - val_accuracy: 0.6016 - val_loss: 0.9242
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6272 - loss:
0.9050 - val_accuracy: 0.6056 - val_loss: 0.9217
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9538 - val_accuracy: 0.6096 - val_loss: 0.9207
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5980 - loss:
0.9265 - val_accuracy: 0.6215 - val_loss: 0.9174
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6082 - loss:
0.9263 - val_accuracy: 0.6135 - val_loss: 0.9169
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6040 - loss:
0.9366 - val_accuracy: 0.6016 - val_loss: 0.9152
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6096 - loss:
0.9336 - val_accuracy: 0.6135 - val_loss: 0.9118
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6054 - loss:
0.9419 - val_accuracy: 0.6215 - val_loss: 0.9084
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6016 - loss:
0.9354 - val_accuracy: 0.6135 - val_loss: 0.9076
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6023 - loss:
0.9309 - val_accuracy: 0.6255 - val_loss: 0.9071
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5972 - loss:
0.9206 - val_accuracy: 0.6255 - val_loss: 0.9058
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6139 - loss:
0.9070 - val_accuracy: 0.5976 - val_loss: 0.9135
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5954 - loss:
0.9257 - val_accuracy: 0.6016 - val_loss: 0.9110
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5993 - loss:
0.9215 - val_accuracy: 0.6056 - val_loss: 0.9031
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6122 - loss:
0.9015 - val_accuracy: 0.6016 - val_loss: 0.9018
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6127 - loss:
0.9092 - val_accuracy: 0.6056 - val_loss: 0.9006
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6139 - loss:
0.9239 - val_accuracy: 0.6016 - val_loss: 0.8988
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6085 - loss:
0.9260 - val_accuracy: 0.6056 - val_loss: 0.8981
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6106 - loss:
0.9094 - val_accuracy: 0.6056 - val_loss: 0.8954
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5945 - loss:
0.9337 - val_accuracy: 0.6255 - val_loss: 0.8931
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6094 - loss:
0.9054 - val_accuracy: 0.6215 - val_loss: 0.8935

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5917 - loss:
0.9372 - val_accuracy: 0.6016 - val_loss: 0.8921

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6211 - loss:
0.9092 - val_accuracy: 0.6096 - val_loss: 0.8913

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6070 - loss:
0.8934 - val_accuracy: 0.6255 - val_loss: 0.8882

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5957 - loss:
0.9445 - val_accuracy: 0.6215 - val_loss: 0.8867

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6080 - loss:
0.8947 - val_accuracy: 0.6056 - val_loss: 0.8875

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5919 - loss:
0.9118 - val_accuracy: 0.6215 - val_loss: 0.8853

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6088 - loss:
0.9065 - val_accuracy: 0.6175 - val_loss: 0.8920

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.9120 - val_accuracy: 0.6215 - val_loss: 0.8842

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5935 - loss:
0.9246 - val_accuracy: 0.6215 - val_loss: 0.8837

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6138 - loss:
0.8912 - val_accuracy: 0.6295 - val_loss: 0.8821

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.8941 - val_accuracy: 0.6175 - val_loss: 0.8819

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6088 - loss:
0.9027 - val_accuracy: 0.6175 - val_loss: 0.8807

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6134 - loss:
0.8860 - val_accuracy: 0.5896 - val_loss: 0.8822

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6244 - loss:
0.8871 - val_accuracy: 0.6056 - val_loss: 0.8813

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6099 - loss:

0.9062 - val_accuracy: 0.6215 - val_loss: 0.8774
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.9022 - val_accuracy: 0.6135 - val_loss: 0.8786
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.9074 - val_accuracy: 0.5976 - val_loss: 0.8770
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6000 - loss:
0.8942 - val_accuracy: 0.6255 - val_loss: 0.8760
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9012 - val_accuracy: 0.5936 - val_loss: 0.8769
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5929 - loss:
0.9293 - val_accuracy: 0.5976 - val_loss: 0.8763
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6123 - loss:
0.8812 - val_accuracy: 0.6016 - val_loss: 0.8757
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5981 - loss:
0.9054 - val_accuracy: 0.6175 - val_loss: 0.8746
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5946 - loss:
0.8985 - val_accuracy: 0.6096 - val_loss: 0.8693
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.8883 - val_accuracy: 0.6215 - val_loss: 0.8669
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6163 - loss:
0.8877 - val_accuracy: 0.6135 - val_loss: 0.8661
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6056 - loss:
0.9087 - val_accuracy: 0.6175 - val_loss: 0.8635
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6132 - loss:
0.8898 - val_accuracy: 0.6096 - val_loss: 0.8641
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6101 - loss:
0.8849 - val_accuracy: 0.6215 - val_loss: 0.8610
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.8974 - val_accuracy: 0.6215 - val_loss: 0.8604
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6181 - loss:
0.8724 - val_accuracy: 0.6096 - val_loss: 0.8624
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6218 - loss:
0.8761 - val_accuracy: 0.6096 - val_loss: 0.8629
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6083 - loss:
0.8898 - val_accuracy: 0.6175 - val_loss: 0.8586
training_neural_network: Adam, l2=0.0001, dropout=0.4
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.1990 - loss:
1.4357 - val_accuracy: 0.4223 - val_loss: 1.3425
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4629 - loss:
1.3249 - val_accuracy: 0.5060 - val_loss: 1.2926
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4653 - loss:
1.2905 - val_accuracy: 0.5060 - val_loss: 1.2604
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4699 - loss:
1.2604 - val_accuracy: 0.5060 - val_loss: 1.2378
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4606 - loss:
1.2457 - val_accuracy: 0.5060 - val_loss: 1.2209
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4685 - loss:
1.2339 - val_accuracy: 0.5060 - val_loss: 1.2085
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4366 - loss:
1.2419 - val_accuracy: 0.5060 - val_loss: 1.1990
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4613 - loss:
1.2176 - val_accuracy: 0.5060 - val_loss: 1.1919
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4786 - loss:
1.1965 - val_accuracy: 0.5060 - val_loss: 1.1852
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4588 - loss:
1.2066 - val_accuracy: 0.5060 - val_loss: 1.1792
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4707 - loss:
1.1872 - val_accuracy: 0.5060 - val_loss: 1.1742
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4563 - loss:

1.2023 - val_accuracy: 0.5060 - val_loss: 1.1695
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4647 - loss:
1.1955 - val_accuracy: 0.5060 - val_loss: 1.1651
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4613 - loss:
1.1759 - val_accuracy: 0.5060 - val_loss: 1.1598
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4705 - loss:
1.1664 - val_accuracy: 0.5060 - val_loss: 1.1554
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4703 - loss:
1.1678 - val_accuracy: 0.5060 - val_loss: 1.1504
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4776 - loss:
1.1570 - val_accuracy: 0.5060 - val_loss: 1.1451
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4702 - loss:
1.1516 - val_accuracy: 0.5060 - val_loss: 1.1400
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4768 - loss:
1.1356 - val_accuracy: 0.5060 - val_loss: 1.1344
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4625 - loss:
1.1341 - val_accuracy: 0.5060 - val_loss: 1.1287
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4559 - loss:
1.1480 - val_accuracy: 0.5060 - val_loss: 1.1226
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4652 - loss:
1.1349 - val_accuracy: 0.5060 - val_loss: 1.1160
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.4690 - loss:
1.1240 - val_accuracy: 0.5060 - val_loss: 1.1097
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4864 - loss:
1.0959 - val_accuracy: 0.5060 - val_loss: 1.1034
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.4837 - loss:
1.0902 - val_accuracy: 0.5020 - val_loss: 1.0973
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.4838 - loss:
1.1056 - val_accuracy: 0.5299 - val_loss: 1.0907
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5462 - loss:
1.0767 - val_accuracy: 0.5618 - val_loss: 1.0837
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5693 - loss:
1.0813 - val_accuracy: 0.5777 - val_loss: 1.0763
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5527 - loss:
1.0697 - val_accuracy: 0.5737 - val_loss: 1.0700
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5709 - loss:
1.0550 - val_accuracy: 0.5697 - val_loss: 1.0631
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5614 - loss:
1.0742 - val_accuracy: 0.5657 - val_loss: 1.0570
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5580 - loss:
1.0618 - val_accuracy: 0.5657 - val_loss: 1.0507
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5647 - loss:
1.0340 - val_accuracy: 0.5458 - val_loss: 1.0449
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5681 - loss:
1.0370 - val_accuracy: 0.5538 - val_loss: 1.0388
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5495 - loss:
1.0445 - val_accuracy: 0.5657 - val_loss: 1.0322
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5656 - loss:
1.0309 - val_accuracy: 0.5618 - val_loss: 1.0265
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5759 - loss:
1.0069 - val_accuracy: 0.5697 - val_loss: 1.0202
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5591 - loss:
1.0301 - val_accuracy: 0.5657 - val_loss: 1.0151
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5698 - loss:
1.0097 - val_accuracy: 0.5657 - val_loss: 1.0111
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5569 - loss:
1.0098 - val_accuracy: 0.5657 - val_loss: 1.0048
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5747 - loss:
0.9912 - val_accuracy: 0.5777 - val_loss: 1.0006

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5750 - loss:
1.0049 - val_accuracy: 0.5737 - val_loss: 0.9957

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5654 - loss:
1.0087 - val_accuracy: 0.5697 - val_loss: 0.9919

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5843 - loss:
0.9852 - val_accuracy: 0.5777 - val_loss: 0.9886

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5631 - loss:
0.9990 - val_accuracy: 0.5737 - val_loss: 0.9836

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5682 - loss:
0.9728 - val_accuracy: 0.5857 - val_loss: 0.9795

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5782 - loss:
0.9826 - val_accuracy: 0.5896 - val_loss: 0.9754

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5918 - loss:
0.9594 - val_accuracy: 0.5737 - val_loss: 0.9733

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5844 - loss:
0.9644 - val_accuracy: 0.5737 - val_loss: 0.9707

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5686 - loss:
0.9712 - val_accuracy: 0.5896 - val_loss: 0.9663

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5802 - loss:
0.9536 - val_accuracy: 0.5896 - val_loss: 0.9641

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5473 - loss:
0.9900 - val_accuracy: 0.5777 - val_loss: 0.9627

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5859 - loss:
0.9429 - val_accuracy: 0.5936 - val_loss: 0.9585

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5686 - loss:
0.9613 - val_accuracy: 0.5896 - val_loss: 0.9565

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5641 - loss:
0.9757 - val_accuracy: 0.5976 - val_loss: 0.9536

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5763 - loss:

0.9623 - val_accuracy: 0.5976 - val_loss: 0.9511
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9401 - val_accuracy: 0.5976 - val_loss: 0.9491
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5919 - loss:
0.9526 - val_accuracy: 0.5936 - val_loss: 0.9483
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5842 - loss:
0.9506 - val_accuracy: 0.5896 - val_loss: 0.9474
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5523 - loss:
0.9766 - val_accuracy: 0.5976 - val_loss: 0.9433
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5800 - loss:
0.9320 - val_accuracy: 0.5936 - val_loss: 0.9412
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5941 - loss:
0.9178 - val_accuracy: 0.5896 - val_loss: 0.9392
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5846 - loss:
0.9483 - val_accuracy: 0.5936 - val_loss: 0.9383
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5776 - loss:
0.9661 - val_accuracy: 0.5976 - val_loss: 0.9373
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5746 - loss:
0.9527 - val_accuracy: 0.5936 - val_loss: 0.9348
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5876 - loss:
0.9321 - val_accuracy: 0.5936 - val_loss: 0.9337
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5731 - loss:
0.9378 - val_accuracy: 0.5936 - val_loss: 0.9328
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5807 - loss:
0.9410 - val_accuracy: 0.5976 - val_loss: 0.9323
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5799 - loss:
0.9324 - val_accuracy: 0.5936 - val_loss: 0.9301
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5834 - loss:
0.9232 - val_accuracy: 0.5936 - val_loss: 0.9291
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5611 - loss:
0.9580 - val_accuracy: 0.5936 - val_loss: 0.9284
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5693 - loss:
0.9390 - val_accuracy: 0.5976 - val_loss: 0.9287
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5734 - loss:
0.9401 - val_accuracy: 0.5976 - val_loss: 0.9293
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5992 - loss:
0.9109 - val_accuracy: 0.5936 - val_loss: 0.9259
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5639 - loss:
0.9468 - val_accuracy: 0.5976 - val_loss: 0.9276
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5828 - loss:
0.9115 - val_accuracy: 0.5936 - val_loss: 0.9226
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5641 - loss:
0.9507 - val_accuracy: 0.5936 - val_loss: 0.9241
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5705 - loss:
0.9547 - val_accuracy: 0.5936 - val_loss: 0.9220
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5854 - loss:
0.9083 - val_accuracy: 0.5936 - val_loss: 0.9208
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5586 - loss:
0.9480 - val_accuracy: 0.5976 - val_loss: 0.9209
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5932 - loss:
0.9112 - val_accuracy: 0.5936 - val_loss: 0.9190
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5569 - loss:
0.9189 - val_accuracy: 0.5936 - val_loss: 0.9201
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5693 - loss:
0.9417 - val_accuracy: 0.5936 - val_loss: 0.9184
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5630 - loss:
0.9463 - val_accuracy: 0.5976 - val_loss: 0.9183
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5913 - loss:
0.9061 - val_accuracy: 0.5976 - val_loss: 0.9176

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5630 - loss:
0.9364 - val_accuracy: 0.5936 - val_loss: 0.9167

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5708 - loss:
0.9246 - val_accuracy: 0.5936 - val_loss: 0.9152

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5634 - loss:
0.9579 - val_accuracy: 0.5936 - val_loss: 0.9165

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
0.9069 - val_accuracy: 0.5936 - val_loss: 0.9160

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5696 - loss:
0.9395 - val_accuracy: 0.5976 - val_loss: 0.9145
training_neural_network: Adam, l2=0.0001, dropout=0.7000000000000001

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3060 - loss:
1.3379 - val_accuracy: 0.4582 - val_loss: 1.2865

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4420 - loss:
1.2648 - val_accuracy: 0.4821 - val_loss: 1.2165

Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4834 - loss:
1.2145 - val_accuracy: 0.5060 - val_loss: 1.1759

Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4864 - loss:
1.1845 - val_accuracy: 0.5219 - val_loss: 1.1502

Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4719 - loss:
1.1691 - val_accuracy: 0.5219 - val_loss: 1.1320

Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4721 - loss:
1.1520 - val_accuracy: 0.5219 - val_loss: 1.1178

Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4819 - loss:
1.1261 - val_accuracy: 0.5299 - val_loss: 1.1053

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4960 - loss:
1.1104 - val_accuracy: 0.5339 - val_loss: 1.0938

Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4888 - loss:
1.1064 - val_accuracy: 0.5299 - val_loss: 1.0821

Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5040 - loss:
1.0933 - val_accuracy: 0.5299 - val_loss: 1.0710
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4784 - loss:
1.0980 - val_accuracy: 0.5259 - val_loss: 1.0596
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5039 - loss:
1.0601 - val_accuracy: 0.5219 - val_loss: 1.0487
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4827 - loss:
1.0609 - val_accuracy: 0.5259 - val_loss: 1.0376
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4779 - loss:
1.0628 - val_accuracy: 0.5259 - val_loss: 1.0265
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4866 - loss:
1.0532 - val_accuracy: 0.5259 - val_loss: 1.0167
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4848 - loss:
1.0260 - val_accuracy: 0.5259 - val_loss: 1.0075
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4802 - loss:
1.0236 - val_accuracy: 0.5299 - val_loss: 0.9973
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4936 - loss:
1.0033 - val_accuracy: 0.5299 - val_loss: 0.9893
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5035 - loss:
0.9910 - val_accuracy: 0.5697 - val_loss: 0.9805
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5665 - loss:
0.9908 - val_accuracy: 0.5817 - val_loss: 0.9718
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5703 - loss:
0.9783 - val_accuracy: 0.5936 - val_loss: 0.9645
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5925 - loss:
0.9623 - val_accuracy: 0.6096 - val_loss: 0.9592
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5909 - loss:
0.9595 - val_accuracy: 0.6135 - val_loss: 0.9525
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5916 - loss:
0.9652 - val_accuracy: 0.6056 - val_loss: 0.9465

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5998 - loss:
0.9543 - val_accuracy: 0.6175 - val_loss: 0.9407

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5863 - loss:
0.9695 - val_accuracy: 0.6255 - val_loss: 0.9345

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5985 - loss:
0.9393 - val_accuracy: 0.6295 - val_loss: 0.9300

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5888 - loss:
0.9595 - val_accuracy: 0.6295 - val_loss: 0.9268

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.6089 - loss:
0.9385 - val_accuracy: 0.6295 - val_loss: 0.9220

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.6122 - loss:
0.9280 - val_accuracy: 0.6056 - val_loss: 0.9207

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5971 - loss:
0.9411 - val_accuracy: 0.6255 - val_loss: 0.9161

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5883 - loss:
0.9411 - val_accuracy: 0.6335 - val_loss: 0.9119

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5971 - loss:
0.9348 - val_accuracy: 0.6255 - val_loss: 0.9083

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9184 - val_accuracy: 0.6375 - val_loss: 0.9084

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9508 - val_accuracy: 0.6295 - val_loss: 0.9045

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.6074 - loss:
0.9151 - val_accuracy: 0.6335 - val_loss: 0.9023

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5961 - loss:
0.9231 - val_accuracy: 0.6295 - val_loss: 0.8989

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9250 - val_accuracy: 0.6295 - val_loss: 0.8969

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6118 - loss:

0.9069 - val_accuracy: 0.6175 - val_loss: 0.8958
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6097 - loss:
0.9250 - val_accuracy: 0.6255 - val_loss: 0.8943
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6105 - loss:
0.9185 - val_accuracy: 0.6295 - val_loss: 0.8914
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:
0.9233 - val_accuracy: 0.6255 - val_loss: 0.8921
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6049 - loss:
0.9183 - val_accuracy: 0.6135 - val_loss: 0.8899
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9219 - val_accuracy: 0.6335 - val_loss: 0.8883
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.9131 - val_accuracy: 0.6295 - val_loss: 0.8867
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5867 - loss:
0.9253 - val_accuracy: 0.6335 - val_loss: 0.8854
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6172 - loss:
0.8946 - val_accuracy: 0.6335 - val_loss: 0.8845
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9124 - val_accuracy: 0.6215 - val_loss: 0.8837
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6162 - loss:
0.8929 - val_accuracy: 0.6335 - val_loss: 0.8816
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6068 - loss:
0.8979 - val_accuracy: 0.6335 - val_loss: 0.8810
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5943 - loss:
0.9163 - val_accuracy: 0.6375 - val_loss: 0.8805
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6211 - loss:
0.8844 - val_accuracy: 0.6255 - val_loss: 0.8804
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6117 - loss:
0.8983 - val_accuracy: 0.6135 - val_loss: 0.8824
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5881 - loss:
0.9163 - val_accuracy: 0.6056 - val_loss: 0.8799
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5934 - loss:
0.9128 - val_accuracy: 0.6295 - val_loss: 0.8761
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6016 - loss:
0.8940 - val_accuracy: 0.6135 - val_loss: 0.8764
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6138 - loss:
0.8869 - val_accuracy: 0.6096 - val_loss: 0.8788
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5992 - loss:
0.8843 - val_accuracy: 0.6335 - val_loss: 0.8742
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5989 - loss:
0.8914 - val_accuracy: 0.6135 - val_loss: 0.8730
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9019 - val_accuracy: 0.6215 - val_loss: 0.8765
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5922 - loss:
0.9066 - val_accuracy: 0.6255 - val_loss: 0.8741
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6177 - loss:
0.8721 - val_accuracy: 0.6215 - val_loss: 0.8743
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5909 - loss:
0.9186 - val_accuracy: 0.6295 - val_loss: 0.8713
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5843 - loss:
0.9206 - val_accuracy: 0.6215 - val_loss: 0.8696
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6187 - loss:
0.8759 - val_accuracy: 0.6096 - val_loss: 0.8712
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6057 - loss:
0.8834 - val_accuracy: 0.6295 - val_loss: 0.8686
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6098 - loss:
0.9033 - val_accuracy: 0.6255 - val_loss: 0.8694
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6124 - loss:
0.8840 - val_accuracy: 0.6135 - val_loss: 0.8688

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6065 - loss:
0.8829 - val_accuracy: 0.6096 - val_loss: 0.8686

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6098 - loss:
0.9003 - val_accuracy: 0.6335 - val_loss: 0.8688

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.8910 - val_accuracy: 0.6096 - val_loss: 0.8653

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6005 - loss:
0.8811 - val_accuracy: 0.6135 - val_loss: 0.8652

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5881 - loss:
0.9202 - val_accuracy: 0.6215 - val_loss: 0.8654

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6180 - loss:
0.8962 - val_accuracy: 0.6096 - val_loss: 0.8649

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5919 - loss:
0.8956 - val_accuracy: 0.6135 - val_loss: 0.8629

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6301 - loss:
0.8377 - val_accuracy: 0.6175 - val_loss: 0.8635

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6135 - loss:
0.8805 - val_accuracy: 0.6135 - val_loss: 0.8602

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6093 - loss:
0.8878 - val_accuracy: 0.6335 - val_loss: 0.8635

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6032 - loss:
0.8842 - val_accuracy: 0.6175 - val_loss: 0.8612

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6113 - loss:
0.8658 - val_accuracy: 0.6255 - val_loss: 0.8585

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6107 - loss:
0.8753 - val_accuracy: 0.6255 - val_loss: 0.8584

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6225 - loss:
0.8771 - val_accuracy: 0.6175 - val_loss: 0.8572

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6313 - loss:

0.8471 - val_accuracy: 0.6215 - val_loss: 0.8572
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5811 - loss:
0.9178 - val_accuracy: 0.6175 - val_loss: 0.8549
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6162 - loss:
0.8808 - val_accuracy: 0.6335 - val_loss: 0.8545
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.8635 - val_accuracy: 0.6255 - val_loss: 0.8537
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.8712 - val_accuracy: 0.6215 - val_loss: 0.8525
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.8936 - val_accuracy: 0.6175 - val_loss: 0.8522
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6149 - loss:
0.8645 - val_accuracy: 0.6255 - val_loss: 0.8505
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6049 - loss:
0.8872 - val_accuracy: 0.6175 - val_loss: 0.8527
training_neural_network: Adam, l2=0.001, dropout=0.1
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.1012 - loss:
1.5329 - val_accuracy: 0.2829 - val_loss: 1.3586
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.3980 - loss:
1.3437 - val_accuracy: 0.5060 - val_loss: 1.2968
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4692 - loss:
1.2962 - val_accuracy: 0.5060 - val_loss: 1.2625
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4624 - loss:
1.2705 - val_accuracy: 0.5060 - val_loss: 1.2407
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4590 - loss:
1.2568 - val_accuracy: 0.5060 - val_loss: 1.2261
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4508 - loss:
1.2508 - val_accuracy: 0.5060 - val_loss: 1.2167
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4785 - loss:
1.2299 - val_accuracy: 0.5060 - val_loss: 1.2104

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4761 - loss:
1.2212 - val_accuracy: 0.5060 - val_loss: 1.2055

Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4614 - loss:
1.2362 - val_accuracy: 0.5060 - val_loss: 1.2018

Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4757 - loss:
1.2175 - val_accuracy: 0.5060 - val_loss: 1.1991

Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4723 - loss:
1.2151 - val_accuracy: 0.5060 - val_loss: 1.1971

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4504 - loss:
1.2182 - val_accuracy: 0.5060 - val_loss: 1.1954

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4694 - loss:
1.2145 - val_accuracy: 0.5060 - val_loss: 1.1941

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4808 - loss:
1.1913 - val_accuracy: 0.5060 - val_loss: 1.1933

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4710 - loss:
1.2021 - val_accuracy: 0.5060 - val_loss: 1.1925

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4594 - loss:
1.2237 - val_accuracy: 0.5060 - val_loss: 1.1916

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4884 - loss:
1.2040 - val_accuracy: 0.5060 - val_loss: 1.1911

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4741 - loss:
1.2018 - val_accuracy: 0.5060 - val_loss: 1.1906

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4625 - loss:
1.2065 - val_accuracy: 0.5060 - val_loss: 1.1903

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4726 - loss:
1.2101 - val_accuracy: 0.5060 - val_loss: 1.1898

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4775 - loss:
1.1936 - val_accuracy: 0.5060 - val_loss: 1.1894

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4847 - loss:

1.1963 - val_accuracy: 0.5060 - val_loss: 1.1890
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.4651 - loss:
1.2029 - val_accuracy: 0.5060 - val_loss: 1.1886
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4771 - loss:
1.1965 - val_accuracy: 0.5060 - val_loss: 1.1883
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.4755 - loss:
1.1885 - val_accuracy: 0.5060 - val_loss: 1.1878
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.4630 - loss:
1.2092 - val_accuracy: 0.5060 - val_loss: 1.1872
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.4781 - loss:
1.1925 - val_accuracy: 0.5060 - val_loss: 1.1862
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.4831 - loss:
1.1910 - val_accuracy: 0.5060 - val_loss: 1.1849
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.4604 - loss:
1.2076 - val_accuracy: 0.5060 - val_loss: 1.1831
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.4617 - loss:
1.2083 - val_accuracy: 0.5060 - val_loss: 1.1812
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.4824 - loss:
1.1859 - val_accuracy: 0.5060 - val_loss: 1.1792
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.4646 - loss:
1.1976 - val_accuracy: 0.5060 - val_loss: 1.1768
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.4575 - loss:
1.2017 - val_accuracy: 0.5060 - val_loss: 1.1739
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.4870 - loss:
1.1806 - val_accuracy: 0.5060 - val_loss: 1.1707
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.4856 - loss:
1.1782 - val_accuracy: 0.5060 - val_loss: 1.1668
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.4728 - loss:
1.1846 - val_accuracy: 0.5100 - val_loss: 1.1622
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4777 - loss:
1.1722 - val_accuracy: 0.5100 - val_loss: 1.1568
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4736 - loss:
1.1749 - val_accuracy: 0.5139 - val_loss: 1.1505
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4824 - loss:
1.1629 - val_accuracy: 0.5219 - val_loss: 1.1435
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4714 - loss:
1.1609 - val_accuracy: 0.5179 - val_loss: 1.1356
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4875 - loss:
1.1455 - val_accuracy: 0.5139 - val_loss: 1.1271
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4856 - loss:
1.1397 - val_accuracy: 0.5139 - val_loss: 1.1181
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4817 - loss:
1.1405 - val_accuracy: 0.5179 - val_loss: 1.1082
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4849 - loss:
1.1325 - val_accuracy: 0.5219 - val_loss: 1.0982
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4843 - loss:
1.1260 - val_accuracy: 0.5259 - val_loss: 1.0880
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5115 - loss:
1.0983 - val_accuracy: 0.5378 - val_loss: 1.0778
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4779 - loss:
1.1084 - val_accuracy: 0.5339 - val_loss: 1.0677
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4881 - loss:
1.1007 - val_accuracy: 0.5418 - val_loss: 1.0577
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4863 - loss:
1.0884 - val_accuracy: 0.5339 - val_loss: 1.0481
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4706 - loss:
1.0879 - val_accuracy: 0.5339 - val_loss: 1.0389
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4963 - loss:
1.0614 - val_accuracy: 0.5339 - val_loss: 1.0305

Epoch 52/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4744 - loss:
1.0622 - val_accuracy: 0.5299 - val_loss: 1.0223

Epoch 53/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4959 - loss:
1.0410 - val_accuracy: 0.5339 - val_loss: 1.0145

Epoch 54/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4979 - loss:
1.0357 - val_accuracy: 0.5339 - val_loss: 1.0074

Epoch 55/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4846 - loss:
1.0384 - val_accuracy: 0.5259 - val_loss: 1.0010

Epoch 56/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4743 - loss:
1.0405 - val_accuracy: 0.5299 - val_loss: 0.9943

Epoch 57/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4911 - loss:
1.0217 - val_accuracy: 0.5339 - val_loss: 0.9885

Epoch 58/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4937 - loss:
1.0168 - val_accuracy: 0.5339 - val_loss: 0.9828

Epoch 59/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4924 - loss:
1.0166 - val_accuracy: 0.5418 - val_loss: 0.9775

Epoch 60/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5074 - loss:
1.0061 - val_accuracy: 0.5936 - val_loss: 0.9729

Epoch 61/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5915 - loss:
0.9924 - val_accuracy: 0.6056 - val_loss: 0.9683

Epoch 62/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5792 - loss:
0.9829 - val_accuracy: 0.5976 - val_loss: 0.9641

Epoch 63/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5798 - loss:
0.9994 - val_accuracy: 0.5936 - val_loss: 0.9598

Epoch 64/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5662 - loss:
0.9943 - val_accuracy: 0.6175 - val_loss: 0.9564

Epoch 65/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6078 - loss:
0.9610 - val_accuracy: 0.6255 - val_loss: 0.9533

Epoch 66/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5970 - loss:

0.9855 - val_accuracy: 0.6175 - val_loss: 0.9497
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6028 - loss:
0.9599 - val_accuracy: 0.6175 - val_loss: 0.9472
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5779 - loss:
0.9730 - val_accuracy: 0.6135 - val_loss: 0.9447
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5883 - loss:
0.9798 - val_accuracy: 0.6135 - val_loss: 0.9413
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6005 - loss:
0.9595 - val_accuracy: 0.6255 - val_loss: 0.9391
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9674 - val_accuracy: 0.6255 - val_loss: 0.9359
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5793 - loss:
0.9850 - val_accuracy: 0.6215 - val_loss: 0.9333
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6004 - loss:
0.9724 - val_accuracy: 0.6295 - val_loss: 0.9310
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6006 - loss:
0.9625 - val_accuracy: 0.6215 - val_loss: 0.9290
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5930 - loss:
0.9559 - val_accuracy: 0.6175 - val_loss: 0.9276
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5960 - loss:
0.9481 - val_accuracy: 0.6215 - val_loss: 0.9251
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9483 - val_accuracy: 0.6215 - val_loss: 0.9233
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5964 - loss:
0.9470 - val_accuracy: 0.6175 - val_loss: 0.9211
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6211 - loss:
0.9426 - val_accuracy: 0.6255 - val_loss: 0.9183
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6018 - loss:
0.9430 - val_accuracy: 0.6255 - val_loss: 0.9177
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6048 - loss:
0.9289 - val_accuracy: 0.6335 - val_loss: 0.9160
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6046 - loss:
0.9355 - val_accuracy: 0.6215 - val_loss: 0.9143
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9343 - val_accuracy: 0.6215 - val_loss: 0.9131
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5951 - loss:
0.9353 - val_accuracy: 0.6255 - val_loss: 0.9111
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6089 - loss:
0.9286 - val_accuracy: 0.6375 - val_loss: 0.9108
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5958 - loss:
0.9292 - val_accuracy: 0.6295 - val_loss: 0.9101
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6072 - loss:
0.9349 - val_accuracy: 0.6255 - val_loss: 0.9086
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5934 - loss:
0.9476 - val_accuracy: 0.6175 - val_loss: 0.9093
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6074 - loss:
0.9099 - val_accuracy: 0.6215 - val_loss: 0.9081
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5937 - loss:
0.9259 - val_accuracy: 0.6215 - val_loss: 0.9057
training_neural_network: Adam, l2=0.001, dropout=0.4
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.3953 - loss:
1.3386 - val_accuracy: 0.5060 - val_loss: 1.2456
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4718 - loss:
1.2343 - val_accuracy: 0.5060 - val_loss: 1.1935
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4748 - loss:
1.1950 - val_accuracy: 0.5060 - val_loss: 1.1667
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4719 - loss:
1.1732 - val_accuracy: 0.5060 - val_loss: 1.1491
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4526 - loss:

1.1743 - val_accuracy: 0.5060 - val_loss: 1.1389
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4647 - loss:
1.1553 - val_accuracy: 0.5060 - val_loss: 1.1304
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4669 - loss:
1.1380 - val_accuracy: 0.5060 - val_loss: 1.1214
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4705 - loss:
1.1320 - val_accuracy: 0.5020 - val_loss: 1.1134
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4771 - loss:
1.1097 - val_accuracy: 0.5020 - val_loss: 1.1044
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4729 - loss:
1.1180 - val_accuracy: 0.5020 - val_loss: 1.0959
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4771 - loss:
1.1176 - val_accuracy: 0.5100 - val_loss: 1.0875
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4789 - loss:
1.1015 - val_accuracy: 0.5060 - val_loss: 1.0792
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5018 - loss:
1.0655 - val_accuracy: 0.5060 - val_loss: 1.0711
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4883 - loss:
1.0740 - val_accuracy: 0.5139 - val_loss: 1.0629
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4859 - loss:
1.0779 - val_accuracy: 0.5219 - val_loss: 1.0539
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4811 - loss:
1.0795 - val_accuracy: 0.5339 - val_loss: 1.0450
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5064 - loss:
1.0446 - val_accuracy: 0.5299 - val_loss: 1.0389
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5167 - loss:
1.0499 - val_accuracy: 0.5299 - val_loss: 1.0318
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5471 - loss:
1.0296 - val_accuracy: 0.5299 - val_loss: 1.0232
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5555 - loss:
1.0304 - val_accuracy: 0.5538 - val_loss: 1.0166
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5752 - loss:
1.0284 - val_accuracy: 0.5618 - val_loss: 1.0101
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5663 - loss:
1.0192 - val_accuracy: 0.5737 - val_loss: 1.0040
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5676 - loss:
1.0149 - val_accuracy: 0.5857 - val_loss: 0.9988
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5813 - loss:
1.0080 - val_accuracy: 0.5697 - val_loss: 0.9950
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5762 - loss:
1.0161 - val_accuracy: 0.5896 - val_loss: 0.9892
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5799 - loss:
1.0096 - val_accuracy: 0.5896 - val_loss: 0.9841
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9852 - val_accuracy: 0.5936 - val_loss: 0.9797
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5959 - loss:
0.9739 - val_accuracy: 0.5936 - val_loss: 0.9739
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5905 - loss:
0.9906 - val_accuracy: 0.5936 - val_loss: 0.9693
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5881 - loss:
1.0008 - val_accuracy: 0.5936 - val_loss: 0.9653
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5845 - loss:
0.9950 - val_accuracy: 0.5976 - val_loss: 0.9617
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.9634 - val_accuracy: 0.6056 - val_loss: 0.9593
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6000 - loss:
0.9623 - val_accuracy: 0.6016 - val_loss: 0.9562
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6124 - loss:
0.9650 - val_accuracy: 0.6096 - val_loss: 0.9533

Epoch 35/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6109 - loss:
0.9454 - val_accuracy: 0.6175 - val_loss: 0.9485

Epoch 36/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5982 - loss:
0.9620 - val_accuracy: 0.6056 - val_loss: 0.9466

Epoch 37/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6013 - loss:
0.9614 - val_accuracy: 0.6056 - val_loss: 0.9428

Epoch 38/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5981 - loss:
0.9502 - val_accuracy: 0.6056 - val_loss: 0.9411

Epoch 39/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5920 - loss:
0.9568 - val_accuracy: 0.6215 - val_loss: 0.9391

Epoch 40/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
0.9458 - val_accuracy: 0.6135 - val_loss: 0.9351

Epoch 41/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5795 - loss:
0.9779 - val_accuracy: 0.6215 - val_loss: 0.9336

Epoch 42/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6153 - loss:
0.9481 - val_accuracy: 0.6135 - val_loss: 0.9310

Epoch 43/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6007 - loss:
0.9520 - val_accuracy: 0.6255 - val_loss: 0.9301

Epoch 44/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6069 - loss:
0.9600 - val_accuracy: 0.6215 - val_loss: 0.9270

Epoch 45/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5960 - loss:
0.9391 - val_accuracy: 0.6016 - val_loss: 0.9284

Epoch 46/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6061 - loss:
0.9429 - val_accuracy: 0.6215 - val_loss: 0.9247

Epoch 47/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5961 - loss:
0.9417 - val_accuracy: 0.6175 - val_loss: 0.9207

Epoch 48/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6126 - loss:
0.9319 - val_accuracy: 0.6175 - val_loss: 0.9225

Epoch 49/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5977 - loss:

0.9211 - val_accuracy: 0.6175 - val_loss: 0.9207
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5973 - loss:
0.9581 - val_accuracy: 0.6175 - val_loss: 0.9199
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9424 - val_accuracy: 0.6096 - val_loss: 0.9223
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6086 - loss:
0.9385 - val_accuracy: 0.6096 - val_loss: 0.9172
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6113 - loss:
0.9273 - val_accuracy: 0.6135 - val_loss: 0.9147
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5956 - loss:
0.9531 - val_accuracy: 0.6255 - val_loss: 0.9139
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9240 - val_accuracy: 0.6096 - val_loss: 0.9130
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5989 - loss:
0.9282 - val_accuracy: 0.6016 - val_loss: 0.9168
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6094 - loss:
0.9279 - val_accuracy: 0.6135 - val_loss: 0.9119
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.9092 - val_accuracy: 0.6096 - val_loss: 0.9120
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5915 - loss:
0.9198 - val_accuracy: 0.6175 - val_loss: 0.9096
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9272 - val_accuracy: 0.6096 - val_loss: 0.9114
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5853 - loss:
0.9350 - val_accuracy: 0.6135 - val_loss: 0.9076
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.9262 - val_accuracy: 0.6135 - val_loss: 0.9083
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5888 - loss:
0.9448 - val_accuracy: 0.6295 - val_loss: 0.9093
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5864 - loss:
0.9395 - val_accuracy: 0.6295 - val_loss: 0.9046
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6026 - loss:
0.9092 - val_accuracy: 0.6335 - val_loss: 0.9030
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6004 - loss:
0.9103 - val_accuracy: 0.6335 - val_loss: 0.9032
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6147 - loss:
0.8968 - val_accuracy: 0.6255 - val_loss: 0.9098
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6002 - loss:
0.9257 - val_accuracy: 0.6255 - val_loss: 0.9014
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6256 - loss:
0.8895 - val_accuracy: 0.6096 - val_loss: 0.9044
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5967 - loss:
0.9215 - val_accuracy: 0.6255 - val_loss: 0.8999
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6137 - loss:
0.9059 - val_accuracy: 0.6335 - val_loss: 0.9023
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6108 - loss:
0.8956 - val_accuracy: 0.6096 - val_loss: 0.8987
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6114 - loss:
0.9324 - val_accuracy: 0.6175 - val_loss: 0.9065
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6000 - loss:
0.9139 - val_accuracy: 0.6255 - val_loss: 0.9006
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6023 - loss:
0.9066 - val_accuracy: 0.6096 - val_loss: 0.8990
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6081 - loss:
0.8914 - val_accuracy: 0.6255 - val_loss: 0.8976
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9116 - val_accuracy: 0.6255 - val_loss: 0.9001
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5917 - loss:
0.9287 - val_accuracy: 0.6255 - val_loss: 0.8954

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6135 - loss:
0.9148 - val_accuracy: 0.6175 - val_loss: 0.8959

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5979 - loss:
0.9161 - val_accuracy: 0.6096 - val_loss: 0.8995

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6161 - loss:
0.8997 - val_accuracy: 0.6135 - val_loss: 0.8972

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9195 - val_accuracy: 0.6295 - val_loss: 0.8942

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5987 - loss:
0.9141 - val_accuracy: 0.6135 - val_loss: 0.8948

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6078 - loss:
0.8915 - val_accuracy: 0.6295 - val_loss: 0.8927

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.8812 - val_accuracy: 0.6096 - val_loss: 0.8953

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6137 - loss:
0.8995 - val_accuracy: 0.6175 - val_loss: 0.8988

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5802 - loss:
0.9121 - val_accuracy: 0.6135 - val_loss: 0.8941

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9161 - val_accuracy: 0.6135 - val_loss: 0.8899

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6029 - loss:
0.9147 - val_accuracy: 0.6096 - val_loss: 0.8900

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.8955 - val_accuracy: 0.6096 - val_loss: 0.8902
training_neural_network: Adam, l2=0.001, dropout=0.7000000000000001

79/79 ————— 0s 2ms/step

53/53 ————— 0s 987us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 864us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 998us/step

79/79 ————— 0s 2ms/step

53/53 ━━━━━━━━━━ 0s 908us/step
79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 987us/step
79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 1ms/step
79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 966us/step
79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 966us/step
79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 988us/step

Epoch 1/90
71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.2737 - loss:
1.4036 - val_accuracy: 0.4502 - val_loss: 1.3304

Epoch 2/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4503 - loss:
1.3055 - val_accuracy: 0.5060 - val_loss: 1.2640

Epoch 3/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4649 - loss:
1.2603 - val_accuracy: 0.5060 - val_loss: 1.2300

Epoch 4/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4615 - loss:
1.2402 - val_accuracy: 0.5060 - val_loss: 1.2107

Epoch 5/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4797 - loss:
1.2104 - val_accuracy: 0.5060 - val_loss: 1.1990

Epoch 6/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4688 - loss:
1.2092 - val_accuracy: 0.5060 - val_loss: 1.1900

Epoch 7/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4618 - loss:
1.2035 - val_accuracy: 0.5060 - val_loss: 1.1832

Epoch 8/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4568 - loss:
1.2034 - val_accuracy: 0.5060 - val_loss: 1.1778

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4642 - loss:
1.1903 - val_accuracy: 0.5060 - val_loss: 1.1728

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4670 - loss:
1.1860 - val_accuracy: 0.5060 - val_loss: 1.1681

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4800 - loss:
1.1639 - val_accuracy: 0.5060 - val_loss: 1.1632

Epoch 12/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4605 - loss:
1.1678 - val_accuracy: 0.5060 - val_loss: 1.1568

Epoch 13/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4652 - loss:
1.1659 - val_accuracy: 0.5060 - val_loss: 1.1517

Epoch 14/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4775 - loss:
1.1570 - val_accuracy: 0.5060 - val_loss: 1.1469

Epoch 15/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4609 - loss:
1.1560 - val_accuracy: 0.5060 - val_loss: 1.1409

Epoch 16/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4805 - loss:
1.1274 - val_accuracy: 0.5060 - val_loss: 1.1347

Epoch 17/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4557 - loss:
1.1466 - val_accuracy: 0.5060 - val_loss: 1.1276

Epoch 18/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4651 - loss:
1.1319 - val_accuracy: 0.5020 - val_loss: 1.1206

Epoch 19/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5120 - loss:
1.1127 - val_accuracy: 0.5339 - val_loss: 1.1132

Epoch 20/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5394 - loss:
1.1103 - val_accuracy: 0.5339 - val_loss: 1.1054

Epoch 21/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5411 - loss:
1.1081 - val_accuracy: 0.5538 - val_loss: 1.0974

Epoch 22/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5529 - loss:
1.0846 - val_accuracy: 0.5697 - val_loss: 1.0898

Epoch 23/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5586 - loss:
1.0706 - val_accuracy: 0.5697 - val_loss: 1.0817

Epoch 24/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5534 - loss:
1.0575 - val_accuracy: 0.5777 - val_loss: 1.0742

Epoch 25/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5801 - loss:
1.0456 - val_accuracy: 0.5896 - val_loss: 1.0661

Epoch 26/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5656 - loss:

1.0632 - val_accuracy: 0.5896 - val_loss: 1.0585
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5612 - loss:
1.0527 - val_accuracy: 0.5896 - val_loss: 1.0507
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5605 - loss:
1.0404 - val_accuracy: 0.5936 - val_loss: 1.0433
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5679 - loss:
1.0307 - val_accuracy: 0.5976 - val_loss: 1.0361
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5858 - loss:
0.9981 - val_accuracy: 0.5817 - val_loss: 1.0304
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5720 - loss:
1.0282 - val_accuracy: 0.5857 - val_loss: 1.0236
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5610 - loss:
1.0127 - val_accuracy: 0.5857 - val_loss: 1.0170
Epoch 33/90
71/71 ————— 0s 2ms/step - accuracy: 0.5876 - loss:
0.9930 - val_accuracy: 0.5857 - val_loss: 1.0113
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5789 - loss:
1.0025 - val_accuracy: 0.5817 - val_loss: 1.0064
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5533 - loss:
1.0308 - val_accuracy: 0.5817 - val_loss: 1.0009
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5740 - loss:
0.9918 - val_accuracy: 0.5697 - val_loss: 0.9976
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5582 - loss:
0.9974 - val_accuracy: 0.5817 - val_loss: 0.9910
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5729 - loss:
0.9770 - val_accuracy: 0.5896 - val_loss: 0.9861
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5924 - loss:
0.9585 - val_accuracy: 0.5817 - val_loss: 0.9830
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5657 - loss:
0.9892 - val_accuracy: 0.5857 - val_loss: 0.9786
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5811 - loss:
0.9565 - val_accuracy: 0.5896 - val_loss: 0.9750
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5584 - loss:
0.9827 - val_accuracy: 0.5857 - val_loss: 0.9721
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5696 - loss:
0.9855 - val_accuracy: 0.5857 - val_loss: 0.9688
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5622 - loss:
0.9810 - val_accuracy: 0.5936 - val_loss: 0.9648
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5799 - loss:
0.9521 - val_accuracy: 0.5896 - val_loss: 0.9621
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5828 - loss:
0.9549 - val_accuracy: 0.5896 - val_loss: 0.9590
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5874 - loss:
0.9576 - val_accuracy: 0.5896 - val_loss: 0.9563
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5722 - loss:
0.9717 - val_accuracy: 0.5976 - val_loss: 0.9529
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5811 - loss:
0.9407 - val_accuracy: 0.5976 - val_loss: 0.9508
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5786 - loss:
0.9266 - val_accuracy: 0.5976 - val_loss: 0.9480
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5537 - loss:
0.9572 - val_accuracy: 0.5976 - val_loss: 0.9448
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5857 - loss:
0.9253 - val_accuracy: 0.5976 - val_loss: 0.9438
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5908 - loss:
0.9348 - val_accuracy: 0.5896 - val_loss: 0.9422
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5878 - loss:
0.9205 - val_accuracy: 0.5697 - val_loss: 0.9406
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
0.9313 - val_accuracy: 0.5657 - val_loss: 0.9383

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5820 - loss:
0.9310 - val_accuracy: 0.5817 - val_loss: 0.9359

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5907 - loss:
0.9504 - val_accuracy: 0.5817 - val_loss: 0.9340

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5894 - loss:
0.9409 - val_accuracy: 0.5896 - val_loss: 0.9331

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5902 - loss:
0.9051 - val_accuracy: 0.5896 - val_loss: 0.9298

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5799 - loss:
0.9537 - val_accuracy: 0.5896 - val_loss: 0.9286

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5867 - loss:
0.9279 - val_accuracy: 0.5936 - val_loss: 0.9271

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5879 - loss:
0.9383 - val_accuracy: 0.6016 - val_loss: 0.9260

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6038 - loss:
0.9050 - val_accuracy: 0.6096 - val_loss: 0.9247

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5828 - loss:
0.9242 - val_accuracy: 0.6135 - val_loss: 0.9238

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6119 - loss:
0.9174 - val_accuracy: 0.6056 - val_loss: 0.9226

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5946 - loss:
0.9377 - val_accuracy: 0.6096 - val_loss: 0.9206

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.9170 - val_accuracy: 0.6096 - val_loss: 0.9191

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6069 - loss:
0.9174 - val_accuracy: 0.6016 - val_loss: 0.9187

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6000 - loss:
0.9257 - val_accuracy: 0.6096 - val_loss: 0.9181

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:

0.9179 - val_accuracy: 0.6056 - val_loss: 0.9174
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6084 - loss:
0.8891 - val_accuracy: 0.6096 - val_loss: 0.9164
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5781 - loss:
0.9473 - val_accuracy: 0.6135 - val_loss: 0.9148
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9232 - val_accuracy: 0.6096 - val_loss: 0.9152
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5962 - loss:
0.9341 - val_accuracy: 0.6056 - val_loss: 0.9128
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5939 - loss:
0.9319 - val_accuracy: 0.6096 - val_loss: 0.9131
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5972 - loss:
0.9264 - val_accuracy: 0.6056 - val_loss: 0.9110
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5987 - loss:
0.9109 - val_accuracy: 0.6056 - val_loss: 0.9101
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
0.9366 - val_accuracy: 0.6135 - val_loss: 0.9087
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5977 - loss:
0.9376 - val_accuracy: 0.6096 - val_loss: 0.9097
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5896 - loss:
0.9231 - val_accuracy: 0.6056 - val_loss: 0.9085
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5800 - loss:
0.9458 - val_accuracy: 0.6135 - val_loss: 0.9084
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9220 - val_accuracy: 0.6056 - val_loss: 0.9056
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5941 - loss:
0.9214 - val_accuracy: 0.6056 - val_loss: 0.9052
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6062 - loss:
0.8976 - val_accuracy: 0.6056 - val_loss: 0.9048
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6076 - loss:
0.8942 - val_accuracy: 0.6096 - val_loss: 0.9039
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5678 - loss:
0.9441 - val_accuracy: 0.6135 - val_loss: 0.9029
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.9111 - val_accuracy: 0.6135 - val_loss: 0.9033
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5802 - loss:
0.9465 - val_accuracy: 0.6096 - val_loss: 0.9018
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5889 - loss:
0.9077 - val_accuracy: 0.6056 - val_loss: 0.9018
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6131 - loss:
0.9070 - val_accuracy: 0.6096 - val_loss: 0.9008
training_neural_network: SGD, l2=0, dropout=0

79/79 ━━━━━━━━━━ 0s 2ms/step
53/53 ━━━━━━━━━━ 0s 961us/step

Epoch 1/90

71/71 ━━━━━━━━━━ 1s 5ms/step - accuracy: 0.2406 - loss:
1.4475 - val_accuracy: 0.5339 - val_loss: 1.3275
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4635 - loss:
1.3193 - val_accuracy: 0.5179 - val_loss: 1.2801
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4638 - loss:
1.2776 - val_accuracy: 0.5060 - val_loss: 1.2491
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4688 - loss:
1.2539 - val_accuracy: 0.5060 - val_loss: 1.2267
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4658 - loss:
1.2294 - val_accuracy: 0.5060 - val_loss: 1.2100
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4682 - loss:
1.2173 - val_accuracy: 0.5060 - val_loss: 1.1970
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4590 - loss:
1.2118 - val_accuracy: 0.5060 - val_loss: 1.1863
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4771 - loss:
1.1967 - val_accuracy: 0.5060 - val_loss: 1.1778

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4795 - loss:
1.1851 - val_accuracy: 0.5060 - val_loss: 1.1701

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4978 - loss:
1.1609 - val_accuracy: 0.5100 - val_loss: 1.1620

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4748 - loss:
1.1736 - val_accuracy: 0.5179 - val_loss: 1.1540

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4599 - loss:
1.1683 - val_accuracy: 0.5179 - val_loss: 1.1462

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4678 - loss:
1.1586 - val_accuracy: 0.5179 - val_loss: 1.1384

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4712 - loss:
1.1531 - val_accuracy: 0.5219 - val_loss: 1.1307

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4731 - loss:
1.1410 - val_accuracy: 0.5179 - val_loss: 1.1225

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4781 - loss:
1.1251 - val_accuracy: 0.5139 - val_loss: 1.1144

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4847 - loss:
1.1235 - val_accuracy: 0.5259 - val_loss: 1.1062

Epoch 18/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4899 - loss:
1.1069 - val_accuracy: 0.5259 - val_loss: 1.0973

Epoch 19/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4827 - loss:
1.1003 - val_accuracy: 0.5339 - val_loss: 1.0884

Epoch 20/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4997 - loss:
1.0907 - val_accuracy: 0.5378 - val_loss: 1.0795

Epoch 21/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4891 - loss:
1.0943 - val_accuracy: 0.5339 - val_loss: 1.0709

Epoch 22/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4842 - loss:
1.0769 - val_accuracy: 0.5259 - val_loss: 1.0616

Epoch 23/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5027 - loss:

1.0686 - val_accuracy: 0.5418 - val_loss: 1.0525
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5450 - loss:
1.0714 - val_accuracy: 0.5737 - val_loss: 1.0437
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5613 - loss:
1.0525 - val_accuracy: 0.5936 - val_loss: 1.0346
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5686 - loss:
1.0392 - val_accuracy: 0.5857 - val_loss: 1.0261
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5771 - loss:
1.0297 - val_accuracy: 0.5777 - val_loss: 1.0178
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5832 - loss:
1.0308 - val_accuracy: 0.6016 - val_loss: 1.0103
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
1.0048 - val_accuracy: 0.6016 - val_loss: 1.0027
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5916 - loss:
0.9895 - val_accuracy: 0.5936 - val_loss: 0.9962
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5717 - loss:
1.0141 - val_accuracy: 0.5976 - val_loss: 0.9887
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5790 - loss:
1.0003 - val_accuracy: 0.5896 - val_loss: 0.9831
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5904 - loss:
0.9920 - val_accuracy: 0.5896 - val_loss: 0.9774
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9713 - val_accuracy: 0.5936 - val_loss: 0.9712
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
1.0052 - val_accuracy: 0.5936 - val_loss: 0.9660
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5943 - loss:
0.9713 - val_accuracy: 0.5976 - val_loss: 0.9611
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5799 - loss:
0.9667 - val_accuracy: 0.5976 - val_loss: 0.9563
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6024 - loss:
0.9536 - val_accuracy: 0.5896 - val_loss: 0.9527
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5930 - loss:
0.9699 - val_accuracy: 0.6056 - val_loss: 0.9477
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5830 - loss:
0.9621 - val_accuracy: 0.6016 - val_loss: 0.9447
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5872 - loss:
0.9494 - val_accuracy: 0.6096 - val_loss: 0.9397
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5839 - loss:
0.9466 - val_accuracy: 0.6175 - val_loss: 0.9366
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6046 - loss:
0.9391 - val_accuracy: 0.6135 - val_loss: 0.9338
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5889 - loss:
0.9346 - val_accuracy: 0.6135 - val_loss: 0.9313
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6050 - loss:
0.9267 - val_accuracy: 0.6135 - val_loss: 0.9283
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5859 - loss:
0.9508 - val_accuracy: 0.6175 - val_loss: 0.9262
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5931 - loss:
0.9425 - val_accuracy: 0.6175 - val_loss: 0.9242
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5935 - loss:
0.9282 - val_accuracy: 0.6135 - val_loss: 0.9218
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5885 - loss:
0.9282 - val_accuracy: 0.6175 - val_loss: 0.9219
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5862 - loss:
0.9292 - val_accuracy: 0.6215 - val_loss: 0.9190
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9288 - val_accuracy: 0.6215 - val_loss: 0.9172
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5792 - loss:
0.9392 - val_accuracy: 0.6255 - val_loss: 0.9162

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9332 - val_accuracy: 0.6295 - val_loss: 0.9137

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6056 - loss:
0.9270 - val_accuracy: 0.6215 - val_loss: 0.9147

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5987 - loss:
0.9411 - val_accuracy: 0.6135 - val_loss: 0.9125

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5912 - loss:
0.9299 - val_accuracy: 0.6215 - val_loss: 0.9111

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5903 - loss:
0.9424 - val_accuracy: 0.6215 - val_loss: 0.9100

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6005 - loss:
0.9343 - val_accuracy: 0.6295 - val_loss: 0.9095

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9170 - val_accuracy: 0.6255 - val_loss: 0.9094

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6047 - loss:
0.9222 - val_accuracy: 0.6295 - val_loss: 0.9082

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9256 - val_accuracy: 0.6215 - val_loss: 0.9064

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6038 - loss:
0.9233 - val_accuracy: 0.6215 - val_loss: 0.9059

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9206 - val_accuracy: 0.6335 - val_loss: 0.9051

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9395 - val_accuracy: 0.6335 - val_loss: 0.9042

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6021 - loss:
0.9120 - val_accuracy: 0.6255 - val_loss: 0.9042

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6068 - loss:
0.9079 - val_accuracy: 0.6175 - val_loss: 0.9046

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5999 - loss:

0.9167 - val_accuracy: 0.6215 - val_loss: 0.9026
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9176 - val_accuracy: 0.6215 - val_loss: 0.9023
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6056 - loss:
0.9203 - val_accuracy: 0.6175 - val_loss: 0.9032
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6122 - loss:
0.8904 - val_accuracy: 0.6175 - val_loss: 0.9014
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5875 - loss:
0.9329 - val_accuracy: 0.6135 - val_loss: 0.9006
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.8925 - val_accuracy: 0.6335 - val_loss: 0.9026
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5960 - loss:
0.9404 - val_accuracy: 0.6175 - val_loss: 0.8999
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5902 - loss:
0.9485 - val_accuracy: 0.6175 - val_loss: 0.9000
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5871 - loss:
0.9331 - val_accuracy: 0.6175 - val_loss: 0.8997
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9240 - val_accuracy: 0.6175 - val_loss: 0.8993
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5865 - loss:
0.9373 - val_accuracy: 0.6175 - val_loss: 0.8987
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5892 - loss:
0.9141 - val_accuracy: 0.6335 - val_loss: 0.8988
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9085 - val_accuracy: 0.6135 - val_loss: 0.8982
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5936 - loss:
0.9455 - val_accuracy: 0.6135 - val_loss: 0.8978
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6127 - loss:
0.9071 - val_accuracy: 0.6175 - val_loss: 0.8976
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5990 - loss:
0.9190 - val_accuracy: 0.6096 - val_loss: 0.8971
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5970 - loss:
0.9144 - val_accuracy: 0.6215 - val_loss: 0.8971
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5856 - loss:
0.9434 - val_accuracy: 0.6175 - val_loss: 0.8970
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5944 - loss:
0.9203 - val_accuracy: 0.6255 - val_loss: 0.8968
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5901 - loss:
0.9075 - val_accuracy: 0.6215 - val_loss: 0.8964
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9137 - val_accuracy: 0.6335 - val_loss: 0.8976
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5815 - loss:
0.9303 - val_accuracy: 0.6335 - val_loss: 0.8972
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5773 - loss:
0.9337 - val_accuracy: 0.6135 - val_loss: 0.8954
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5932 - loss:
0.9196 - val_accuracy: 0.6335 - val_loss: 0.8955
training_neural_network: SGD, l2=0, dropout=0.0
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.3924 - loss:
1.3341 - val_accuracy: 0.5139 - val_loss: 1.2784
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4716 - loss:
1.2749 - val_accuracy: 0.5060 - val_loss: 1.2392
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4579 - loss:
1.2585 - val_accuracy: 0.5060 - val_loss: 1.2118
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4656 - loss:
1.2315 - val_accuracy: 0.5060 - val_loss: 1.1950
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4541 - loss:
1.2172 - val_accuracy: 0.5060 - val_loss: 1.1839
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4655 - loss:

1.2012 - val_accuracy: 0.5060 - val_loss: 1.1759
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4706 - loss:
1.1950 - val_accuracy: 0.5060 - val_loss: 1.1695
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4437 - loss:
1.2074 - val_accuracy: 0.5060 - val_loss: 1.1635
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4909 - loss:
1.1532 - val_accuracy: 0.5060 - val_loss: 1.1598
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4718 - loss:
1.1762 - val_accuracy: 0.5060 - val_loss: 1.1550
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4692 - loss:
1.1514 - val_accuracy: 0.5060 - val_loss: 1.1513
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4721 - loss:
1.1407 - val_accuracy: 0.5060 - val_loss: 1.1476
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4504 - loss:
1.1708 - val_accuracy: 0.5060 - val_loss: 1.1430
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4457 - loss:
1.1575 - val_accuracy: 0.5060 - val_loss: 1.1390
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4764 - loss:
1.1288 - val_accuracy: 0.5060 - val_loss: 1.1357
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4696 - loss:
1.1341 - val_accuracy: 0.5060 - val_loss: 1.1311
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4912 - loss:
1.1298 - val_accuracy: 0.5219 - val_loss: 1.1269
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4752 - loss:
1.1449 - val_accuracy: 0.5299 - val_loss: 1.1221
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4889 - loss:
1.1378 - val_accuracy: 0.5339 - val_loss: 1.1170
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5100 - loss:
1.0970 - val_accuracy: 0.5299 - val_loss: 1.1119
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5221 - loss:
1.1177 - val_accuracy: 0.5339 - val_loss: 1.1067
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5389 - loss:
1.0856 - val_accuracy: 0.5299 - val_loss: 1.1020
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5340 - loss:
1.0893 - val_accuracy: 0.5458 - val_loss: 1.0971
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5551 - loss:
1.0951 - val_accuracy: 0.5538 - val_loss: 1.0922
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5572 - loss:
1.0798 - val_accuracy: 0.5578 - val_loss: 1.0866
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5629 - loss:
1.0822 - val_accuracy: 0.5538 - val_loss: 1.0808
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5612 - loss:
1.0793 - val_accuracy: 0.5777 - val_loss: 1.0778
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5655 - loss:
1.0751 - val_accuracy: 0.5618 - val_loss: 1.0718
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5588 - loss:
1.0481 - val_accuracy: 0.5697 - val_loss: 1.0673
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5549 - loss:
1.0798 - val_accuracy: 0.5618 - val_loss: 1.0617
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5657 - loss:
1.0575 - val_accuracy: 0.5697 - val_loss: 1.0570
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5579 - loss:
1.0463 - val_accuracy: 0.5737 - val_loss: 1.0527
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5647 - loss:
1.0564 - val_accuracy: 0.5777 - val_loss: 1.0484
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5708 - loss:
1.0343 - val_accuracy: 0.5896 - val_loss: 1.0445
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5688 - loss:
1.0379 - val_accuracy: 0.5737 - val_loss: 1.0394

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5753 - loss:
1.0515 - val_accuracy: 0.5857 - val_loss: 1.0359

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5649 - loss:
1.0458 - val_accuracy: 0.5737 - val_loss: 1.0310

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5634 - loss:
1.0355 - val_accuracy: 0.5737 - val_loss: 1.0264

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5594 - loss:
1.0342 - val_accuracy: 0.5896 - val_loss: 1.0228

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5661 - loss:
1.0220 - val_accuracy: 0.5896 - val_loss: 1.0190

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5808 - loss:
1.0163 - val_accuracy: 0.5857 - val_loss: 1.0151

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5697 - loss:
1.0002 - val_accuracy: 0.5896 - val_loss: 1.0122

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5649 - loss:
1.0198 - val_accuracy: 0.5896 - val_loss: 1.0073

Epoch 44/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5597 - loss:
1.0062 - val_accuracy: 0.5817 - val_loss: 1.0034

Epoch 45/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5644 - loss:
1.0053 - val_accuracy: 0.5817 - val_loss: 0.9997

Epoch 46/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5819 - loss:
0.9906 - val_accuracy: 0.5817 - val_loss: 0.9961

Epoch 47/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5622 - loss:
1.0045 - val_accuracy: 0.5817 - val_loss: 0.9930

Epoch 48/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5772 - loss:
0.9849 - val_accuracy: 0.5896 - val_loss: 0.9895

Epoch 49/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5688 - loss:
1.0054 - val_accuracy: 0.5817 - val_loss: 0.9856

Epoch 50/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5757 - loss:

1.0022 - val_accuracy: 0.5857 - val_loss: 0.9839
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5801 - loss:
0.9951 - val_accuracy: 0.5857 - val_loss: 0.9809
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5866 - loss:
0.9828 - val_accuracy: 0.5936 - val_loss: 0.9788
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5803 - loss:
0.9805 - val_accuracy: 0.6016 - val_loss: 0.9760
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5873 - loss:
0.9795 - val_accuracy: 0.5896 - val_loss: 0.9717
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5776 - loss:
0.9797 - val_accuracy: 0.6016 - val_loss: 0.9689
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5773 - loss:
0.9922 - val_accuracy: 0.6016 - val_loss: 0.9663
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5986 - loss:
0.9643 - val_accuracy: 0.6016 - val_loss: 0.9635
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5752 - loss:
0.9841 - val_accuracy: 0.6016 - val_loss: 0.9604
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5928 - loss:
0.9760 - val_accuracy: 0.6056 - val_loss: 0.9585
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:
0.9700 - val_accuracy: 0.6016 - val_loss: 0.9577
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6059 - loss:
0.9607 - val_accuracy: 0.5936 - val_loss: 0.9555
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5792 - loss:
0.9791 - val_accuracy: 0.5976 - val_loss: 0.9520
Epoch 63/90
71/71 ————— 0s 2ms/step - accuracy: 0.5996 - loss:
0.9607 - val_accuracy: 0.5976 - val_loss: 0.9493
Epoch 64/90
71/71 ————— 0s 2ms/step - accuracy: 0.5993 - loss:
0.9541 - val_accuracy: 0.5976 - val_loss: 0.9479
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6044 - loss:
0.9481 - val_accuracy: 0.6016 - val_loss: 0.9449
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5955 - loss:
0.9743 - val_accuracy: 0.6016 - val_loss: 0.9440
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5821 - loss:
0.9571 - val_accuracy: 0.6016 - val_loss: 0.9418
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6099 - loss:
0.9318 - val_accuracy: 0.6016 - val_loss: 0.9392
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5882 - loss:
0.9798 - val_accuracy: 0.6056 - val_loss: 0.9394
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5995 - loss:
0.9491 - val_accuracy: 0.6175 - val_loss: 0.9411
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9520 - val_accuracy: 0.6016 - val_loss: 0.9361
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6032 - loss:
0.9454 - val_accuracy: 0.5976 - val_loss: 0.9346
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6072 - loss:
0.9432 - val_accuracy: 0.5976 - val_loss: 0.9317
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5896 - loss:
0.9756 - val_accuracy: 0.6016 - val_loss: 0.9293
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6110 - loss:
0.9396 - val_accuracy: 0.6016 - val_loss: 0.9304
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6084 - loss:
0.9274 - val_accuracy: 0.5976 - val_loss: 0.9278
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6270 - loss:
0.9387 - val_accuracy: 0.5936 - val_loss: 0.9264
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6127 - loss:
0.9362 - val_accuracy: 0.6056 - val_loss: 0.9292
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6157 - loss:
0.9300 - val_accuracy: 0.6016 - val_loss: 0.9229

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6063 - loss:
0.9432 - val_accuracy: 0.6016 - val_loss: 0.9224

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6085 - loss:
0.9389 - val_accuracy: 0.5976 - val_loss: 0.9199

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6073 - loss:
0.9413 - val_accuracy: 0.6056 - val_loss: 0.9182

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6155 - loss:
0.9160 - val_accuracy: 0.5976 - val_loss: 0.9197

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6163 - loss:
0.9184 - val_accuracy: 0.6096 - val_loss: 0.9191

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6014 - loss:
0.9509 - val_accuracy: 0.5857 - val_loss: 0.9162

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6070 - loss:
0.9271 - val_accuracy: 0.6056 - val_loss: 0.9135

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9535 - val_accuracy: 0.5976 - val_loss: 0.9130

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9527 - val_accuracy: 0.5936 - val_loss: 0.9123

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5976 - loss:
0.9425 - val_accuracy: 0.5817 - val_loss: 0.9108

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6098 - loss:
0.9206 - val_accuracy: 0.6016 - val_loss: 0.9102
training_neural_network: SGD, l2=0, dropout=0.2

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2384 - loss:
1.3908 - val_accuracy: 0.5060 - val_loss: 1.3261

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4653 - loss:
1.3214 - val_accuracy: 0.5060 - val_loss: 1.2793

Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4602 - loss:
1.2885 - val_accuracy: 0.5060 - val_loss: 1.2483

Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4741 - loss:
1.2563 - val_accuracy: 0.5060 - val_loss: 1.2279
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4735 - loss:
1.2424 - val_accuracy: 0.5060 - val_loss: 1.2138
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4583 - loss:
1.2354 - val_accuracy: 0.5060 - val_loss: 1.2030
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4761 - loss:
1.2185 - val_accuracy: 0.5060 - val_loss: 1.1953
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4789 - loss:
1.2016 - val_accuracy: 0.5060 - val_loss: 1.1890
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4810 - loss:
1.1997 - val_accuracy: 0.5060 - val_loss: 1.1839
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4759 - loss:
1.2010 - val_accuracy: 0.5060 - val_loss: 1.1797
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4801 - loss:
1.1942 - val_accuracy: 0.5060 - val_loss: 1.1760
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4854 - loss:
1.1849 - val_accuracy: 0.5060 - val_loss: 1.1728
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4854 - loss:
1.1801 - val_accuracy: 0.5060 - val_loss: 1.1697
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4630 - loss:
1.1950 - val_accuracy: 0.5060 - val_loss: 1.1664
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4622 - loss:
1.1974 - val_accuracy: 0.5060 - val_loss: 1.1635
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4581 - loss:
1.1875 - val_accuracy: 0.5060 - val_loss: 1.1603
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4840 - loss:
1.1657 - val_accuracy: 0.5060 - val_loss: 1.1575
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4642 - loss:
1.1915 - val_accuracy: 0.5060 - val_loss: 1.1540

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4687 - loss:
1.1737 - val_accuracy: 0.5060 - val_loss: 1.1506

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4610 - loss:
1.1671 - val_accuracy: 0.5060 - val_loss: 1.1472

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.4556 - loss:
1.1793 - val_accuracy: 0.5060 - val_loss: 1.1434

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.4815 - loss:
1.1563 - val_accuracy: 0.5060 - val_loss: 1.1397

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.4855 - loss:
1.1378 - val_accuracy: 0.5060 - val_loss: 1.1359

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.4738 - loss:
1.1543 - val_accuracy: 0.5060 - val_loss: 1.1316

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.4660 - loss:
1.1373 - val_accuracy: 0.5060 - val_loss: 1.1270

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.4822 - loss:
1.1327 - val_accuracy: 0.5060 - val_loss: 1.1225

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5012 - loss:
1.1105 - val_accuracy: 0.5060 - val_loss: 1.1175

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.4693 - loss:
1.1471 - val_accuracy: 0.5060 - val_loss: 1.1124

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.4418 - loss:
1.1395 - val_accuracy: 0.5060 - val_loss: 1.1077

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.4652 - loss:
1.1202 - val_accuracy: 0.5060 - val_loss: 1.1033

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.4745 - loss:
1.1024 - val_accuracy: 0.5060 - val_loss: 1.0991

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.4586 - loss:
1.1299 - val_accuracy: 0.5060 - val_loss: 1.0947

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.4767 - loss:

1.0961 - val_accuracy: 0.5060 - val_loss: 1.0901
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.4845 - loss:
1.0850 - val_accuracy: 0.5219 - val_loss: 1.0855
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5120 - loss:
1.0904 - val_accuracy: 0.5219 - val_loss: 1.0796
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5383 - loss:
1.0983 - val_accuracy: 0.5339 - val_loss: 1.0748
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5543 - loss:
1.0800 - val_accuracy: 0.5418 - val_loss: 1.0698
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5323 - loss:
1.0733 - val_accuracy: 0.5378 - val_loss: 1.0650
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5512 - loss:
1.0555 - val_accuracy: 0.5418 - val_loss: 1.0595
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5397 - loss:
1.0736 - val_accuracy: 0.5418 - val_loss: 1.0548
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5242 - loss:
1.0714 - val_accuracy: 0.5418 - val_loss: 1.0496
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5168 - loss:
1.0520 - val_accuracy: 0.5339 - val_loss: 1.0448
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5759 - loss:
1.0233 - val_accuracy: 0.5498 - val_loss: 1.0388
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5463 - loss:
1.0470 - val_accuracy: 0.5418 - val_loss: 1.0343
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5580 - loss:
1.0213 - val_accuracy: 0.5418 - val_loss: 1.0297
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5621 - loss:
1.0015 - val_accuracy: 0.5418 - val_loss: 1.0251
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5525 - loss:
1.0210 - val_accuracy: 0.5418 - val_loss: 1.0205
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5390 - loss:
1.0462 - val_accuracy: 0.5378 - val_loss: 1.0164
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5599 - loss:
1.0094 - val_accuracy: 0.5458 - val_loss: 1.0108
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5640 - loss:
1.0215 - val_accuracy: 0.5458 - val_loss: 1.0058
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5517 - loss:
1.0281 - val_accuracy: 0.5458 - val_loss: 1.0014
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5424 - loss:
1.0169 - val_accuracy: 0.5458 - val_loss: 0.9983
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5505 - loss:
0.9881 - val_accuracy: 0.5578 - val_loss: 0.9921
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5396 - loss:
1.0144 - val_accuracy: 0.5578 - val_loss: 0.9880
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5618 - loss:
0.9902 - val_accuracy: 0.5618 - val_loss: 0.9833
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5374 - loss:
0.9891 - val_accuracy: 0.5657 - val_loss: 0.9797
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5486 - loss:
0.9883 - val_accuracy: 0.5737 - val_loss: 0.9754
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5729 - loss:
0.9691 - val_accuracy: 0.5697 - val_loss: 0.9722
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5759 - loss:
0.9628 - val_accuracy: 0.5737 - val_loss: 0.9690
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5700 - loss:
0.9654 - val_accuracy: 0.5817 - val_loss: 0.9648
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5733 - loss:
0.9639 - val_accuracy: 0.5817 - val_loss: 0.9616
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5510 - loss:
0.9941 - val_accuracy: 0.5777 - val_loss: 0.9590

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5913 - loss:
0.9527 - val_accuracy: 0.5817 - val_loss: 0.9558

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5766 - loss:
0.9452 - val_accuracy: 0.5737 - val_loss: 0.9537

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5773 - loss:
0.9493 - val_accuracy: 0.5777 - val_loss: 0.9499

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5715 - loss:
0.9806 - val_accuracy: 0.5817 - val_loss: 0.9487

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5737 - loss:
0.9583 - val_accuracy: 0.5817 - val_loss: 0.9456

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5734 - loss:
0.9604 - val_accuracy: 0.5976 - val_loss: 0.9410

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5828 - loss:
0.9412 - val_accuracy: 0.5857 - val_loss: 0.9411

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5686 - loss:
0.9584 - val_accuracy: 0.5936 - val_loss: 0.9375

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5680 - loss:
0.9539 - val_accuracy: 0.5976 - val_loss: 0.9352

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
0.9568 - val_accuracy: 0.5817 - val_loss: 0.9371

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5782 - loss:
0.9471 - val_accuracy: 0.5976 - val_loss: 0.9324

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5785 - loss:
0.9251 - val_accuracy: 0.5936 - val_loss: 0.9311

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5904 - loss:
0.9292 - val_accuracy: 0.5936 - val_loss: 0.9299

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5669 - loss:
0.9476 - val_accuracy: 0.5976 - val_loss: 0.9269

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5919 - loss:

0.9112 - val_accuracy: 0.5976 - val_loss: 0.9259
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5718 - loss:
0.9431 - val_accuracy: 0.5976 - val_loss: 0.9242
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5669 - loss:
0.9654 - val_accuracy: 0.5936 - val_loss: 0.9231
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5560 - loss:
0.9564 - val_accuracy: 0.5976 - val_loss: 0.9223
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5760 - loss:
0.9326 - val_accuracy: 0.5936 - val_loss: 0.9207
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5657 - loss:
0.9467 - val_accuracy: 0.5976 - val_loss: 0.9212
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5737 - loss:
0.9348 - val_accuracy: 0.5976 - val_loss: 0.9185
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5917 - loss:
0.9328 - val_accuracy: 0.5976 - val_loss: 0.9175
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5727 - loss:
0.9300 - val_accuracy: 0.5976 - val_loss: 0.9173
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5807 - loss:
0.9191 - val_accuracy: 0.5976 - val_loss: 0.9166
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5671 - loss:
0.9413 - val_accuracy: 0.5976 - val_loss: 0.9155
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5735 - loss:
0.9435 - val_accuracy: 0.5976 - val_loss: 0.9163
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5743 - loss:
0.9350 - val_accuracy: 0.5976 - val_loss: 0.9147
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5835 - loss:
0.9348 - val_accuracy: 0.5976 - val_loss: 0.9145
training_neural_network: SGD, l2=0, dropout=0.4
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3930 - loss:
1.3587 - val_accuracy: 0.5060 - val_loss: 1.3077

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4740 - loss:
1.3028 - val_accuracy: 0.5060 - val_loss: 1.2513

Epoch 3/90
71/71 ————— 0s 2ms/step - accuracy: 0.4573 - loss:
1.2613 - val_accuracy: 0.5060 - val_loss: 1.2132

Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4828 - loss:
1.2184 - val_accuracy: 0.5060 - val_loss: 1.1894

Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4678 - loss:
1.2090 - val_accuracy: 0.5060 - val_loss: 1.1730

Epoch 6/90
71/71 ————— 0s 2ms/step - accuracy: 0.4742 - loss:
1.1855 - val_accuracy: 0.5060 - val_loss: 1.1618

Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4654 - loss:
1.1816 - val_accuracy: 0.5060 - val_loss: 1.1523

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4652 - loss:
1.1787 - val_accuracy: 0.5060 - val_loss: 1.1441

Epoch 9/90
71/71 ————— 0s 2ms/step - accuracy: 0.4637 - loss:
1.1637 - val_accuracy: 0.5060 - val_loss: 1.1361

Epoch 10/90
71/71 ————— 0s 2ms/step - accuracy: 0.4687 - loss:
1.1553 - val_accuracy: 0.5060 - val_loss: 1.1289

Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4751 - loss:
1.1532 - val_accuracy: 0.5060 - val_loss: 1.1217

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4625 - loss:
1.1528 - val_accuracy: 0.5060 - val_loss: 1.1145

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4727 - loss:
1.1322 - val_accuracy: 0.5060 - val_loss: 1.1072

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4632 - loss:
1.1205 - val_accuracy: 0.5060 - val_loss: 1.0999

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4667 - loss:
1.1216 - val_accuracy: 0.5060 - val_loss: 1.0926

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.4729 - loss:

1.0908 - val_accuracy: 0.5060 - val_loss: 1.0852
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.4692 - loss:
1.1065 - val_accuracy: 0.5060 - val_loss: 1.0778
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.4694 - loss:
1.1009 - val_accuracy: 0.5060 - val_loss: 1.0704
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.4725 - loss:
1.0795 - val_accuracy: 0.5219 - val_loss: 1.0629
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.4906 - loss:
1.0683 - val_accuracy: 0.5339 - val_loss: 1.0554
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5291 - loss:
1.0552 - val_accuracy: 0.5339 - val_loss: 1.0487
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5480 - loss:
1.0673 - val_accuracy: 0.5578 - val_loss: 1.0412
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5607 - loss:
1.0410 - val_accuracy: 0.5578 - val_loss: 1.0344
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5634 - loss:
1.0427 - val_accuracy: 0.5697 - val_loss: 1.0284
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5612 - loss:
1.0462 - val_accuracy: 0.5777 - val_loss: 1.0223
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5685 - loss:
1.0444 - val_accuracy: 0.5777 - val_loss: 1.0164
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5699 - loss:
1.0185 - val_accuracy: 0.5737 - val_loss: 1.0110
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5888 - loss:
1.0088 - val_accuracy: 0.5777 - val_loss: 1.0054
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5769 - loss:
1.0168 - val_accuracy: 0.5976 - val_loss: 1.0010
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5822 - loss:
1.0234 - val_accuracy: 0.6016 - val_loss: 0.9956
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9911 - val_accuracy: 0.6016 - val_loss: 0.9916
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:
0.9924 - val_accuracy: 0.6016 - val_loss: 0.9875
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5887 - loss:
0.9874 - val_accuracy: 0.6016 - val_loss: 0.9828
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5948 - loss:
1.0115 - val_accuracy: 0.6016 - val_loss: 0.9780
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9896 - val_accuracy: 0.6096 - val_loss: 0.9744
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5860 - loss:
1.0047 - val_accuracy: 0.6135 - val_loss: 0.9714
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5950 - loss:
0.9619 - val_accuracy: 0.6215 - val_loss: 0.9680
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6094 - loss:
0.9689 - val_accuracy: 0.6215 - val_loss: 0.9646
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6113 - loss:
0.9688 - val_accuracy: 0.6175 - val_loss: 0.9614
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5896 - loss:
0.9814 - val_accuracy: 0.6175 - val_loss: 0.9583
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6068 - loss:
0.9621 - val_accuracy: 0.6295 - val_loss: 0.9556
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9802 - val_accuracy: 0.6255 - val_loss: 0.9529
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5972 - loss:
0.9866 - val_accuracy: 0.6255 - val_loss: 0.9507
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6210 - loss:
0.9609 - val_accuracy: 0.6175 - val_loss: 0.9484
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6065 - loss:
0.9770 - val_accuracy: 0.6295 - val_loss: 0.9472

Epoch 46/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6025 - loss:
0.9538 - val_accuracy: 0.6295 - val_loss: 0.9442

Epoch 47/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5958 - loss:
0.9621 - val_accuracy: 0.6215 - val_loss: 0.9426

Epoch 48/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6075 - loss:
0.9632 - val_accuracy: 0.6215 - val_loss: 0.9402

Epoch 49/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6037 - loss:
0.9644 - val_accuracy: 0.6295 - val_loss: 0.9393

Epoch 50/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5993 - loss:
0.9685 - val_accuracy: 0.6215 - val_loss: 0.9379

Epoch 51/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6109 - loss:
0.9416 - val_accuracy: 0.6335 - val_loss: 0.9362

Epoch 52/90
71/71 ━━━━━━━━ 0s 2ms/step - accuracy: 0.5901 - loss:
0.9713 - val_accuracy: 0.6335 - val_loss: 0.9344

Epoch 53/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5890 - loss:
0.9709 - val_accuracy: 0.6255 - val_loss: 0.9317

Epoch 54/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9559 - val_accuracy: 0.6255 - val_loss: 0.9306

Epoch 55/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6049 - loss:
0.9637 - val_accuracy: 0.6335 - val_loss: 0.9290

Epoch 56/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6063 - loss:
0.9470 - val_accuracy: 0.6335 - val_loss: 0.9279

Epoch 57/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5926 - loss:
0.9469 - val_accuracy: 0.6255 - val_loss: 0.9272

Epoch 58/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5981 - loss:
0.9364 - val_accuracy: 0.6335 - val_loss: 0.9259

Epoch 59/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5806 - loss:
0.9639 - val_accuracy: 0.6255 - val_loss: 0.9236

Epoch 60/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:

0.9453 - val_accuracy: 0.6335 - val_loss: 0.9225
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6095 - loss:
0.9493 - val_accuracy: 0.6335 - val_loss: 0.9220
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6092 - loss:
0.9237 - val_accuracy: 0.6335 - val_loss: 0.9206
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6136 - loss:
0.9296 - val_accuracy: 0.6335 - val_loss: 0.9198
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:
0.9303 - val_accuracy: 0.6295 - val_loss: 0.9189
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6058 - loss:
0.9417 - val_accuracy: 0.6255 - val_loss: 0.9179
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9403 - val_accuracy: 0.6295 - val_loss: 0.9162
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6025 - loss:
0.9325 - val_accuracy: 0.6335 - val_loss: 0.9164
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9239 - val_accuracy: 0.6335 - val_loss: 0.9160
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5878 - loss:
0.9427 - val_accuracy: 0.6175 - val_loss: 0.9166
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6230 - loss:
0.9221 - val_accuracy: 0.6255 - val_loss: 0.9136
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5926 - loss:
0.9373 - val_accuracy: 0.6135 - val_loss: 0.9139
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9547 - val_accuracy: 0.6255 - val_loss: 0.9126
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9384 - val_accuracy: 0.6295 - val_loss: 0.9122
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5862 - loss:
0.9575 - val_accuracy: 0.6135 - val_loss: 0.9122
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5793 - loss:
0.9441 - val_accuracy: 0.6295 - val_loss: 0.9106
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5931 - loss:
0.9462 - val_accuracy: 0.6215 - val_loss: 0.9106
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6038 - loss:
0.9259 - val_accuracy: 0.6135 - val_loss: 0.9099
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6110 - loss:
0.9107 - val_accuracy: 0.6135 - val_loss: 0.9090
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9265 - val_accuracy: 0.6135 - val_loss: 0.9082
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6091 - loss:
0.9258 - val_accuracy: 0.6135 - val_loss: 0.9076
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5987 - loss:
0.9255 - val_accuracy: 0.6335 - val_loss: 0.9066
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5920 - loss:
0.9503 - val_accuracy: 0.6215 - val_loss: 0.9047
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6039 - loss:
0.9289 - val_accuracy: 0.6215 - val_loss: 0.9050
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5968 - loss:
0.9285 - val_accuracy: 0.6295 - val_loss: 0.9049
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6007 - loss:
0.9352 - val_accuracy: 0.6375 - val_loss: 0.9031
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6008 - loss:
0.9290 - val_accuracy: 0.6335 - val_loss: 0.9026
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.9197 - val_accuracy: 0.6135 - val_loss: 0.9033
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6085 - loss:
0.9218 - val_accuracy: 0.6215 - val_loss: 0.9027
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6043 - loss:
0.9097 - val_accuracy: 0.6215 - val_loss: 0.9014

Epoch 90/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:
0.9334 - val_accuracy: 0.6335 - val_loss: 0.9013
training_neural_network: SGD, l2=0, dropout=0.6000000000000001

Epoch 1/90
71/71 ━━━━━━━━ 2s 6ms/step - accuracy: 0.2482 - loss:
1.3712 - val_accuracy: 0.5020 - val_loss: 1.3155

Epoch 2/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4563 - loss:
1.3067 - val_accuracy: 0.5060 - val_loss: 1.2680

Epoch 3/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4921 - loss:
1.2580 - val_accuracy: 0.5060 - val_loss: 1.2336

Epoch 4/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4679 - loss:
1.2389 - val_accuracy: 0.5060 - val_loss: 1.2065

Epoch 5/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4701 - loss:
1.2146 - val_accuracy: 0.5060 - val_loss: 1.1876

Epoch 6/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4792 - loss:
1.1967 - val_accuracy: 0.5060 - val_loss: 1.1741

Epoch 7/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4646 - loss:
1.1979 - val_accuracy: 0.5060 - val_loss: 1.1636

Epoch 8/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4552 - loss:
1.1892 - val_accuracy: 0.5060 - val_loss: 1.1547

Epoch 9/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4587 - loss:
1.1926 - val_accuracy: 0.5060 - val_loss: 1.1463

Epoch 10/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4742 - loss:
1.1754 - val_accuracy: 0.5060 - val_loss: 1.1392

Epoch 11/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4699 - loss:
1.1549 - val_accuracy: 0.5060 - val_loss: 1.1321

Epoch 12/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4561 - loss:
1.1601 - val_accuracy: 0.5060 - val_loss: 1.1259

Epoch 13/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.4772 - loss:
1.1482 - val_accuracy: 0.5060 - val_loss: 1.1199

Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4929 - loss:
1.1229 - val_accuracy: 0.5259 - val_loss: 1.1139
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4725 - loss:
1.1521 - val_accuracy: 0.5219 - val_loss: 1.1076
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4892 - loss:
1.1319 - val_accuracy: 0.5139 - val_loss: 1.1014
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4795 - loss:
1.1443 - val_accuracy: 0.5299 - val_loss: 1.0948
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4621 - loss:
1.1240 - val_accuracy: 0.5339 - val_loss: 1.0878
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4671 - loss:
1.1212 - val_accuracy: 0.5339 - val_loss: 1.0807
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4818 - loss:
1.1074 - val_accuracy: 0.5299 - val_loss: 1.0735
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4753 - loss:
1.0967 - val_accuracy: 0.5299 - val_loss: 1.0661
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4874 - loss:
1.0780 - val_accuracy: 0.5378 - val_loss: 1.0583
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4583 - loss:
1.1011 - val_accuracy: 0.5299 - val_loss: 1.0499
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4844 - loss:
1.0571 - val_accuracy: 0.5299 - val_loss: 1.0423
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4850 - loss:
1.0569 - val_accuracy: 0.5299 - val_loss: 1.0344
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4705 - loss:
1.0676 - val_accuracy: 0.5339 - val_loss: 1.0283
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4782 - loss:
1.0444 - val_accuracy: 0.5299 - val_loss: 1.0196
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4939 - loss:
1.0355 - val_accuracy: 0.5339 - val_loss: 1.0130

Epoch 29/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4795 - loss:
1.0308 - val_accuracy: 0.5339 - val_loss: 1.0045

Epoch 30/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4737 - loss:
1.0387 - val_accuracy: 0.5657 - val_loss: 0.9980

Epoch 31/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5696 - loss:
1.0118 - val_accuracy: 0.5857 - val_loss: 0.9898

Epoch 32/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5648 - loss:
0.9873 - val_accuracy: 0.5857 - val_loss: 0.9821

Epoch 33/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5566 - loss:
1.0096 - val_accuracy: 0.5896 - val_loss: 0.9738

Epoch 34/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5595 - loss:
1.0081 - val_accuracy: 0.6016 - val_loss: 0.9676

Epoch 35/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5824 - loss:
0.9801 - val_accuracy: 0.6056 - val_loss: 0.9596

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5873 - loss:
0.9757 - val_accuracy: 0.6135 - val_loss: 0.9543

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5824 - loss:
0.9761 - val_accuracy: 0.6175 - val_loss: 0.9476

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5924 - loss:
0.9487 - val_accuracy: 0.6135 - val_loss: 0.9439

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5833 - loss:
0.9681 - val_accuracy: 0.6255 - val_loss: 0.9379

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5724 - loss:
0.9746 - val_accuracy: 0.6215 - val_loss: 0.9344

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5839 - loss:
0.9667 - val_accuracy: 0.6215 - val_loss: 0.9297

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5857 - loss:
0.9571 - val_accuracy: 0.6295 - val_loss: 0.9269

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5804 - loss:

0.9472 - val_accuracy: 0.6335 - val_loss: 0.9245
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5807 - loss:
0.9461 - val_accuracy: 0.6335 - val_loss: 0.9208
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5719 - loss:
0.9616 - val_accuracy: 0.6335 - val_loss: 0.9175
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6090 - loss:
0.9259 - val_accuracy: 0.6335 - val_loss: 0.9156
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.9270 - val_accuracy: 0.6255 - val_loss: 0.9145
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6103 - loss:
0.9209 - val_accuracy: 0.6255 - val_loss: 0.9093
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9130 - val_accuracy: 0.6295 - val_loss: 0.9087
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5881 - loss:
0.9465 - val_accuracy: 0.6295 - val_loss: 0.9065
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5826 - loss:
0.9285 - val_accuracy: 0.6255 - val_loss: 0.9039
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9328 - val_accuracy: 0.6215 - val_loss: 0.9026
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5940 - loss:
0.9327 - val_accuracy: 0.6096 - val_loss: 0.9031
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6007 - loss:
0.9210 - val_accuracy: 0.6255 - val_loss: 0.8987
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5792 - loss:
0.9535 - val_accuracy: 0.6295 - val_loss: 0.8987
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
0.9229 - val_accuracy: 0.6215 - val_loss: 0.8958
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6103 - loss:
0.9282 - val_accuracy: 0.6096 - val_loss: 0.8970
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6098 - loss:
0.9044 - val_accuracy: 0.6255 - val_loss: 0.8950
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6213 - loss:
0.8943 - val_accuracy: 0.6215 - val_loss: 0.8946
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5925 - loss:
0.9342 - val_accuracy: 0.6215 - val_loss: 0.8919
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5996 - loss:
0.9150 - val_accuracy: 0.6215 - val_loss: 0.8893
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6074 - loss:
0.9026 - val_accuracy: 0.6215 - val_loss: 0.8882
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5914 - loss:
0.9096 - val_accuracy: 0.6255 - val_loss: 0.8882
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6211 - loss:
0.8909 - val_accuracy: 0.6215 - val_loss: 0.8857
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9079 - val_accuracy: 0.6016 - val_loss: 0.8868
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5913 - loss:
0.9132 - val_accuracy: 0.6215 - val_loss: 0.8856
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5944 - loss:
0.9077 - val_accuracy: 0.6096 - val_loss: 0.8847
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6022 - loss:
0.9119 - val_accuracy: 0.6135 - val_loss: 0.8837
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5954 - loss:
0.9116 - val_accuracy: 0.6175 - val_loss: 0.8820
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6107 - loss:
0.9021 - val_accuracy: 0.6215 - val_loss: 0.8822
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6046 - loss:
0.9026 - val_accuracy: 0.6016 - val_loss: 0.8829
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6028 - loss:
0.9132 - val_accuracy: 0.6096 - val_loss: 0.8838

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6155 - loss:
0.8928 - val_accuracy: 0.6175 - val_loss: 0.8816

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9015 - val_accuracy: 0.6175 - val_loss: 0.8803

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5931 - loss:
0.9048 - val_accuracy: 0.6175 - val_loss: 0.8814

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5829 - loss:
0.9277 - val_accuracy: 0.5936 - val_loss: 0.8803

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6171 - loss:
0.8943 - val_accuracy: 0.6135 - val_loss: 0.8779

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6068 - loss:
0.8986 - val_accuracy: 0.6056 - val_loss: 0.8798

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6272 - loss:
0.8900 - val_accuracy: 0.5976 - val_loss: 0.8796

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
0.9007 - val_accuracy: 0.6135 - val_loss: 0.8779

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5961 - loss:
0.9048 - val_accuracy: 0.6135 - val_loss: 0.8762

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6148 - loss:
0.8907 - val_accuracy: 0.5936 - val_loss: 0.8757

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5996 - loss:
0.9027 - val_accuracy: 0.6096 - val_loss: 0.8744

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6000 - loss:
0.8976 - val_accuracy: 0.6096 - val_loss: 0.8751

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9044 - val_accuracy: 0.5976 - val_loss: 0.8744

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5996 - loss:
0.8822 - val_accuracy: 0.5896 - val_loss: 0.8741

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5900 - loss:

0.9059 - val_accuracy: 0.6096 - val_loss: 0.8716
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9146 - val_accuracy: 0.6096 - val_loss: 0.8719
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9281 - val_accuracy: 0.5936 - val_loss: 0.8745
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6142 - loss:
0.8751 - val_accuracy: 0.6215 - val_loss: 0.8740
training_neural_network: SGD, l2=0, dropout=0.8
79/79 ————— 0s 2ms/step
53/53 ————— 0s 825us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 973us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 909us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3474 - loss:
1.3203 - val_accuracy: 0.5060 - val_loss: 1.2020
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4632 - loss:
1.2336 - val_accuracy: 0.5060 - val_loss: 1.1599
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4756 - loss:
1.1867 - val_accuracy: 0.5060 - val_loss: 1.1413
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4819 - loss:
1.1617 - val_accuracy: 0.5060 - val_loss: 1.1298
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4797 - loss:
1.1449 - val_accuracy: 0.5219 - val_loss: 1.1212
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4855 - loss:
1.1370 - val_accuracy: 0.5299 - val_loss: 1.1137
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4975 - loss:
1.1360 - val_accuracy: 0.5418 - val_loss: 1.1064
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4883 - loss:

1.1484 - val_accuracy: 0.5418 - val_loss: 1.0995
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4919 - loss:
1.1239 - val_accuracy: 0.5418 - val_loss: 1.0927
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.5171 - loss:
1.1149 - val_accuracy: 0.5418 - val_loss: 1.0862
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.5069 - loss:
1.1117 - val_accuracy: 0.5418 - val_loss: 1.0793
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.5443 - loss:
1.0824 - val_accuracy: 0.5418 - val_loss: 1.0732
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5288 - loss:
1.0880 - val_accuracy: 0.5418 - val_loss: 1.0656
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5451 - loss:
1.0698 - val_accuracy: 0.5418 - val_loss: 1.0588
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5588 - loss:
1.0493 - val_accuracy: 0.5618 - val_loss: 1.0519
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5690 - loss:
1.0423 - val_accuracy: 0.5737 - val_loss: 1.0448
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5687 - loss:
1.0473 - val_accuracy: 0.5737 - val_loss: 1.0383
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5671 - loss:
1.0353 - val_accuracy: 0.5737 - val_loss: 1.0316
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5649 - loss:
1.0377 - val_accuracy: 0.5817 - val_loss: 1.0252
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5637 - loss:
1.0423 - val_accuracy: 0.5817 - val_loss: 1.0192
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5679 - loss:
1.0321 - val_accuracy: 0.5896 - val_loss: 1.0131
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5629 - loss:
1.0151 - val_accuracy: 0.5896 - val_loss: 1.0074
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5834 - loss:
1.0018 - val_accuracy: 0.5936 - val_loss: 1.0019
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5659 - loss:
1.0222 - val_accuracy: 0.5936 - val_loss: 0.9964
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5814 - loss:
0.9853 - val_accuracy: 0.6056 - val_loss: 0.9919
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5746 - loss:
1.0092 - val_accuracy: 0.6096 - val_loss: 0.9866
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5859 - loss:
0.9823 - val_accuracy: 0.6096 - val_loss: 0.9814
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5865 - loss:
0.9732 - val_accuracy: 0.6096 - val_loss: 0.9763
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5876 - loss:
1.0015 - val_accuracy: 0.6056 - val_loss: 0.9713
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6032 - loss:
0.9696 - val_accuracy: 0.6016 - val_loss: 0.9656
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5935 - loss:
0.9783 - val_accuracy: 0.6096 - val_loss: 0.9594
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9600 - val_accuracy: 0.6016 - val_loss: 0.9542
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5908 - loss:
0.9639 - val_accuracy: 0.6056 - val_loss: 0.9500
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5867 - loss:
0.9586 - val_accuracy: 0.6056 - val_loss: 0.9467
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5786 - loss:
0.9689 - val_accuracy: 0.6135 - val_loss: 0.9430
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5971 - loss:
0.9432 - val_accuracy: 0.6135 - val_loss: 0.9402
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9642 - val_accuracy: 0.6016 - val_loss: 0.9363

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:
0.9611 - val_accuracy: 0.6096 - val_loss: 0.9332

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5946 - loss:
0.9367 - val_accuracy: 0.6096 - val_loss: 0.9315

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6051 - loss:
0.9387 - val_accuracy: 0.6215 - val_loss: 0.9298

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9420 - val_accuracy: 0.6096 - val_loss: 0.9279

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6037 - loss:
0.9324 - val_accuracy: 0.6215 - val_loss: 0.9260

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5941 - loss:
0.9506 - val_accuracy: 0.6175 - val_loss: 0.9243

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.6051 - loss:
0.9337 - val_accuracy: 0.6175 - val_loss: 0.9218

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.6023 - loss:
0.9317 - val_accuracy: 0.6135 - val_loss: 0.9205

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6095 - loss:
0.9169 - val_accuracy: 0.6215 - val_loss: 0.9189

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5762 - loss:
0.9552 - val_accuracy: 0.6175 - val_loss: 0.9171

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5786 - loss:
0.9638 - val_accuracy: 0.6175 - val_loss: 0.9163

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6023 - loss:
0.9404 - val_accuracy: 0.6215 - val_loss: 0.9149

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6181 - loss:
0.9195 - val_accuracy: 0.6255 - val_loss: 0.9150

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6057 - loss:
0.9166 - val_accuracy: 0.6255 - val_loss: 0.9135

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6029 - loss:

0.9322 - val_accuracy: 0.6175 - val_loss: 0.9113
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5959 - loss:
0.9231 - val_accuracy: 0.6295 - val_loss: 0.9110
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:
0.9144 - val_accuracy: 0.6175 - val_loss: 0.9089
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5884 - loss:
0.9501 - val_accuracy: 0.6175 - val_loss: 0.9066
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5979 - loss:
0.9435 - val_accuracy: 0.6255 - val_loss: 0.9065
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5867 - loss:
0.9368 - val_accuracy: 0.6135 - val_loss: 0.9053
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.9250 - val_accuracy: 0.6295 - val_loss: 0.9070
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6020 - loss:
0.9426 - val_accuracy: 0.6255 - val_loss: 0.9040
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6195 - loss:
0.8825 - val_accuracy: 0.6135 - val_loss: 0.9037
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9253 - val_accuracy: 0.6175 - val_loss: 0.9027
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5990 - loss:
0.9275 - val_accuracy: 0.6215 - val_loss: 0.9015
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6050 - loss:
0.9235 - val_accuracy: 0.6135 - val_loss: 0.9005
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6079 - loss:
0.9303 - val_accuracy: 0.6175 - val_loss: 0.8998
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.9239 - val_accuracy: 0.6215 - val_loss: 0.8991
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6193 - loss:
0.8970 - val_accuracy: 0.6175 - val_loss: 0.8988
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6149 - loss:
0.9078 - val_accuracy: 0.6255 - val_loss: 0.8988
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5931 - loss:
0.9289 - val_accuracy: 0.6135 - val_loss: 0.8976
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6218 - loss:
0.8938 - val_accuracy: 0.6175 - val_loss: 0.8967
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5861 - loss:
0.9293 - val_accuracy: 0.6175 - val_loss: 0.8963
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9203 - val_accuracy: 0.6175 - val_loss: 0.8957
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6219 - loss:
0.8812 - val_accuracy: 0.6135 - val_loss: 0.8962
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5930 - loss:
0.9203 - val_accuracy: 0.6175 - val_loss: 0.8945
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6050 - loss:
0.9080 - val_accuracy: 0.6175 - val_loss: 0.8929
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5904 - loss:
0.9298 - val_accuracy: 0.6135 - val_loss: 0.8940
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5951 - loss:
0.9244 - val_accuracy: 0.6175 - val_loss: 0.8928
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9136 - val_accuracy: 0.6215 - val_loss: 0.8925
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
0.9115 - val_accuracy: 0.6096 - val_loss: 0.8920
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6025 - loss:
0.9209 - val_accuracy: 0.6135 - val_loss: 0.8910
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6064 - loss:
0.9161 - val_accuracy: 0.6096 - val_loss: 0.8912
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6003 - loss:
0.9122 - val_accuracy: 0.6135 - val_loss: 0.8904

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6180 - loss:
0.9001 - val_accuracy: 0.6135 - val_loss: 0.8900

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5858 - loss:
0.9215 - val_accuracy: 0.6175 - val_loss: 0.8895

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9307 - val_accuracy: 0.6175 - val_loss: 0.8904

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6151 - loss:
0.8958 - val_accuracy: 0.6175 - val_loss: 0.8904

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9080 - val_accuracy: 0.6215 - val_loss: 0.8869

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6009 - loss:
0.8961 - val_accuracy: 0.6175 - val_loss: 0.8863

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9126 - val_accuracy: 0.6175 - val_loss: 0.8861

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6028 - loss:
0.9301 - val_accuracy: 0.6175 - val_loss: 0.8870

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5986 - loss:
0.9068 - val_accuracy: 0.6215 - val_loss: 0.8850
training_neural_network: SGD, l2=0.0, dropout=0

Epoch 1/90
71/71 ————— 2s 8ms/step - accuracy: 0.3173 - loss:
1.3812 - val_accuracy: 0.5060 - val_loss: 1.2686

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4514 - loss:
1.2768 - val_accuracy: 0.5060 - val_loss: 1.2041

Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4640 - loss:
1.2267 - val_accuracy: 0.5060 - val_loss: 1.1751

Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4658 - loss:
1.2006 - val_accuracy: 0.5060 - val_loss: 1.1594

Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4609 - loss:
1.1878 - val_accuracy: 0.5060 - val_loss: 1.1487

Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4741 - loss:
1.1609 - val_accuracy: 0.5060 - val_loss: 1.1403
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4671 - loss:
1.1606 - val_accuracy: 0.5060 - val_loss: 1.1322
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4495 - loss:
1.1638 - val_accuracy: 0.5060 - val_loss: 1.1237
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4638 - loss:
1.1490 - val_accuracy: 0.5060 - val_loss: 1.1161
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4613 - loss:
1.1298 - val_accuracy: 0.5060 - val_loss: 1.1082
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4737 - loss:
1.1084 - val_accuracy: 0.5060 - val_loss: 1.1001
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4535 - loss:
1.1180 - val_accuracy: 0.5139 - val_loss: 1.0915
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4894 - loss:
1.1059 - val_accuracy: 0.5299 - val_loss: 1.0824
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4886 - loss:
1.0683 - val_accuracy: 0.5378 - val_loss: 1.0733
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5072 - loss:
1.0523 - val_accuracy: 0.5418 - val_loss: 1.0633
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5231 - loss:
1.0452 - val_accuracy: 0.5378 - val_loss: 1.0538
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5268 - loss:
1.0463 - val_accuracy: 0.5418 - val_loss: 1.0440
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5344 - loss:
1.0322 - val_accuracy: 0.5458 - val_loss: 1.0340
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5440 - loss:
1.0265 - val_accuracy: 0.5458 - val_loss: 1.0245
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5662 - loss:
1.0379 - val_accuracy: 0.5777 - val_loss: 1.0157

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5809 - loss:
1.0030 - val_accuracy: 0.5896 - val_loss: 1.0064

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5810 - loss:
0.9816 - val_accuracy: 0.5976 - val_loss: 0.9982

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5894 - loss:
0.9847 - val_accuracy: 0.6096 - val_loss: 0.9899

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.6051 - loss:
0.9673 - val_accuracy: 0.6056 - val_loss: 0.9823

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9724 - val_accuracy: 0.5976 - val_loss: 0.9752

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.6025 - loss:
0.9675 - val_accuracy: 0.6096 - val_loss: 0.9689

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5866 - loss:
0.9822 - val_accuracy: 0.6096 - val_loss: 0.9621

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9694 - val_accuracy: 0.6135 - val_loss: 0.9565

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5935 - loss:
0.9580 - val_accuracy: 0.6135 - val_loss: 0.9521

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.6242 - loss:
0.9235 - val_accuracy: 0.6175 - val_loss: 0.9469

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5975 - loss:
0.9644 - val_accuracy: 0.6255 - val_loss: 0.9423

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9634 - val_accuracy: 0.6175 - val_loss: 0.9374

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9655 - val_accuracy: 0.6295 - val_loss: 0.9342

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6174 - loss:
0.9288 - val_accuracy: 0.6016 - val_loss: 0.9318

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5865 - loss:

0.9443 - val_accuracy: 0.6255 - val_loss: 0.9276
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5951 - loss:
0.9068 - val_accuracy: 0.6175 - val_loss: 0.9239
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5810 - loss:
0.9442 - val_accuracy: 0.6255 - val_loss: 0.9208
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6075 - loss:
0.9216 - val_accuracy: 0.6215 - val_loss: 0.9178
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6092 - loss:
0.9187 - val_accuracy: 0.6255 - val_loss: 0.9160
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6091 - loss:
0.9124 - val_accuracy: 0.6215 - val_loss: 0.9136
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6061 - loss:
0.9238 - val_accuracy: 0.6215 - val_loss: 0.9115
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6109 - loss:
0.9122 - val_accuracy: 0.6215 - val_loss: 0.9099
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9275 - val_accuracy: 0.6255 - val_loss: 0.9096
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.6038 - loss:
0.9250 - val_accuracy: 0.6215 - val_loss: 0.9060
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.6164 - loss:
0.9202 - val_accuracy: 0.6175 - val_loss: 0.9063
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5882 - loss:
0.9333 - val_accuracy: 0.6135 - val_loss: 0.9041
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6115 - loss:
0.9083 - val_accuracy: 0.6175 - val_loss: 0.9037
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6125 - loss:
0.8989 - val_accuracy: 0.6215 - val_loss: 0.9018
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6270 - loss:
0.9019 - val_accuracy: 0.6215 - val_loss: 0.9014
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5965 - loss:
0.9136 - val_accuracy: 0.6375 - val_loss: 0.8989
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6166 - loss:
0.8859 - val_accuracy: 0.6175 - val_loss: 0.8967
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6107 - loss:
0.8888 - val_accuracy: 0.6215 - val_loss: 0.8967
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6034 - loss:
0.9034 - val_accuracy: 0.6255 - val_loss: 0.8945
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5982 - loss:
0.9298 - val_accuracy: 0.6215 - val_loss: 0.8937
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6020 - loss:
0.9413 - val_accuracy: 0.6215 - val_loss: 0.8925
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6158 - loss:
0.8977 - val_accuracy: 0.6255 - val_loss: 0.8921
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9089 - val_accuracy: 0.6255 - val_loss: 0.8922
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5965 - loss:
0.9191 - val_accuracy: 0.6215 - val_loss: 0.8924
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5993 - loss:
0.9195 - val_accuracy: 0.6056 - val_loss: 0.8944
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6060 - loss:
0.9111 - val_accuracy: 0.6295 - val_loss: 0.8883
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6059 - loss:
0.9280 - val_accuracy: 0.6215 - val_loss: 0.8890
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5977 - loss:
0.9112 - val_accuracy: 0.6135 - val_loss: 0.8878
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5953 - loss:
0.9207 - val_accuracy: 0.6175 - val_loss: 0.8882
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6015 - loss:
0.9086 - val_accuracy: 0.6215 - val_loss: 0.8870

Epoch 65/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6050 - loss:
0.9150 - val_accuracy: 0.6215 - val_loss: 0.8854

Epoch 66/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5845 - loss:
0.9219 - val_accuracy: 0.6295 - val_loss: 0.8843

Epoch 67/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6115 - loss:
0.9010 - val_accuracy: 0.6215 - val_loss: 0.8845

Epoch 68/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6136 - loss:
0.8928 - val_accuracy: 0.6175 - val_loss: 0.8841

Epoch 69/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5915 - loss:
0.9074 - val_accuracy: 0.6255 - val_loss: 0.8831

Epoch 70/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5926 - loss:
0.9195 - val_accuracy: 0.6335 - val_loss: 0.8817

Epoch 71/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6115 - loss:
0.9028 - val_accuracy: 0.6255 - val_loss: 0.8814

Epoch 72/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9048 - val_accuracy: 0.6215 - val_loss: 0.8818

Epoch 73/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.5942 - loss:
0.9198 - val_accuracy: 0.6175 - val_loss: 0.8789

Epoch 74/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6025 - loss:
0.9005 - val_accuracy: 0.6135 - val_loss: 0.8781

Epoch 75/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6030 - loss:
0.9117 - val_accuracy: 0.6175 - val_loss: 0.8779

Epoch 76/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6045 - loss:
0.8971 - val_accuracy: 0.6135 - val_loss: 0.8774

Epoch 77/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6164 - loss:
0.9119 - val_accuracy: 0.6135 - val_loss: 0.8781

Epoch 78/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6029 - loss:
0.8984 - val_accuracy: 0.6295 - val_loss: 0.8755

Epoch 79/90
71/71 ━━━━━━━━ 0s 1ms/step - accuracy: 0.6116 - loss:

0.8864 - val_accuracy: 0.6056 - val_loss: 0.8759
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.6127 - loss:
0.9106 - val_accuracy: 0.6135 - val_loss: 0.8735
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6216 - loss:
0.8596 - val_accuracy: 0.6295 - val_loss: 0.8760
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.8880 - val_accuracy: 0.6175 - val_loss: 0.8736
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6106 - loss:
0.8800 - val_accuracy: 0.6175 - val_loss: 0.8722
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6060 - loss:
0.9000 - val_accuracy: 0.6215 - val_loss: 0.8721
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9023 - val_accuracy: 0.6135 - val_loss: 0.8717
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6079 - loss:
0.8966 - val_accuracy: 0.6135 - val_loss: 0.8717
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5990 - loss:
0.9027 - val_accuracy: 0.6255 - val_loss: 0.8718
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.8832 - val_accuracy: 0.6135 - val_loss: 0.8702
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5979 - loss:
0.8939 - val_accuracy: 0.6255 - val_loss: 0.8710
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5974 - loss:
0.8974 - val_accuracy: 0.6175 - val_loss: 0.8686
training_neural_network: SGD, l2=1e-05, dropout=0
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3110 - loss:
1.3265 - val_accuracy: 0.5100 - val_loss: 1.2252
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4716 - loss:
1.2230 - val_accuracy: 0.5139 - val_loss: 1.1689
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4786 - loss:
1.1744 - val_accuracy: 0.5060 - val_loss: 1.1460

Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4741 - loss:
1.1576 - val_accuracy: 0.5060 - val_loss: 1.1338

Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4616 - loss:
1.1580 - val_accuracy: 0.5060 - val_loss: 1.1253

Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4656 - loss:
1.1460 - val_accuracy: 0.5060 - val_loss: 1.1173

Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4608 - loss:
1.1314 - val_accuracy: 0.5060 - val_loss: 1.1098

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4880 - loss:
1.0936 - val_accuracy: 0.5060 - val_loss: 1.1026

Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4730 - loss:
1.1001 - val_accuracy: 0.5060 - val_loss: 1.0942

Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4685 - loss:
1.0988 - val_accuracy: 0.5100 - val_loss: 1.0858

Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4785 - loss:
1.1059 - val_accuracy: 0.5139 - val_loss: 1.0766

Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4528 - loss:
1.1001 - val_accuracy: 0.5378 - val_loss: 1.0679

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4965 - loss:
1.0661 - val_accuracy: 0.5378 - val_loss: 1.0590

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5326 - loss:
1.0602 - val_accuracy: 0.5458 - val_loss: 1.0502

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5422 - loss:
1.0648 - val_accuracy: 0.5697 - val_loss: 1.0418

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5642 - loss:
1.0388 - val_accuracy: 0.5737 - val_loss: 1.0332

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5678 - loss:
1.0452 - val_accuracy: 0.5817 - val_loss: 1.0263

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5549 - loss:

1.0340 - val_accuracy: 0.5936 - val_loss: 1.0196
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5716 - loss:
1.0236 - val_accuracy: 0.5936 - val_loss: 1.0123
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5692 - loss:
1.0281 - val_accuracy: 0.5936 - val_loss: 1.0055
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
1.0080 - val_accuracy: 0.5976 - val_loss: 0.9997
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5724 - loss:
1.0033 - val_accuracy: 0.6016 - val_loss: 0.9940
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5590 - loss:
1.0134 - val_accuracy: 0.6056 - val_loss: 0.9877
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5629 - loss:
0.9958 - val_accuracy: 0.6016 - val_loss: 0.9820
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5828 - loss:
0.9924 - val_accuracy: 0.6056 - val_loss: 0.9769
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5977 - loss:
0.9796 - val_accuracy: 0.6096 - val_loss: 0.9715
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5843 - loss:
0.9889 - val_accuracy: 0.6056 - val_loss: 0.9668
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5793 - loss:
0.9615 - val_accuracy: 0.6135 - val_loss: 0.9616
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5870 - loss:
0.9962 - val_accuracy: 0.6135 - val_loss: 0.9568
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5974 - loss:
0.9683 - val_accuracy: 0.6135 - val_loss: 0.9536
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5823 - loss:
0.9526 - val_accuracy: 0.6295 - val_loss: 0.9486
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9426 - val_accuracy: 0.6295 - val_loss: 0.9450
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5939 - loss:
0.9654 - val_accuracy: 0.6255 - val_loss: 0.9411
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6139 - loss:
0.9267 - val_accuracy: 0.6215 - val_loss: 0.9376
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6001 - loss:
0.9465 - val_accuracy: 0.6255 - val_loss: 0.9345
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6029 - loss:
0.9462 - val_accuracy: 0.6255 - val_loss: 0.9311
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:
0.9575 - val_accuracy: 0.6295 - val_loss: 0.9273
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6042 - loss:
0.9306 - val_accuracy: 0.6295 - val_loss: 0.9250
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6123 - loss:
0.9094 - val_accuracy: 0.6175 - val_loss: 0.9221
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5898 - loss:
0.9516 - val_accuracy: 0.6295 - val_loss: 0.9195
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5848 - loss:
0.9478 - val_accuracy: 0.6255 - val_loss: 0.9176
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5804 - loss:
0.9524 - val_accuracy: 0.6255 - val_loss: 0.9155
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5961 - loss:
0.9308 - val_accuracy: 0.6215 - val_loss: 0.9134
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:
0.9255 - val_accuracy: 0.6096 - val_loss: 0.9119
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6115 - loss:
0.9289 - val_accuracy: 0.6215 - val_loss: 0.9084
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5901 - loss:
0.9338 - val_accuracy: 0.6016 - val_loss: 0.9079
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5729 - loss:
0.9405 - val_accuracy: 0.6215 - val_loss: 0.9045

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9190 - val_accuracy: 0.6096 - val_loss: 0.9034

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5896 - loss:
0.9467 - val_accuracy: 0.6215 - val_loss: 0.9020

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9376 - val_accuracy: 0.6215 - val_loss: 0.9011

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5738 - loss:
0.9478 - val_accuracy: 0.6215 - val_loss: 0.9010

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6084 - loss:
0.9066 - val_accuracy: 0.6135 - val_loss: 0.9005

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6057 - loss:
0.9212 - val_accuracy: 0.6056 - val_loss: 0.8987

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9277 - val_accuracy: 0.6096 - val_loss: 0.8973

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6002 - loss:
0.9135 - val_accuracy: 0.6056 - val_loss: 0.8961

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6002 - loss:
0.9080 - val_accuracy: 0.6016 - val_loss: 0.8942

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9226 - val_accuracy: 0.6096 - val_loss: 0.8938

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5852 - loss:
0.9324 - val_accuracy: 0.6056 - val_loss: 0.8922

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5928 - loss:
0.9225 - val_accuracy: 0.6096 - val_loss: 0.8912

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6040 - loss:
0.9115 - val_accuracy: 0.6096 - val_loss: 0.8910

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9096 - val_accuracy: 0.6056 - val_loss: 0.8919

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:

0.9137 - val_accuracy: 0.6175 - val_loss: 0.8885
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6104 - loss:
0.8891 - val_accuracy: 0.6096 - val_loss: 0.8906
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6104 - loss:
0.9107 - val_accuracy: 0.6056 - val_loss: 0.8886
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5856 - loss:
0.9180 - val_accuracy: 0.6135 - val_loss: 0.8869
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5998 - loss:
0.9191 - val_accuracy: 0.6135 - val_loss: 0.8865
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6162 - loss:
0.8869 - val_accuracy: 0.6096 - val_loss: 0.8868
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6049 - loss:
0.9041 - val_accuracy: 0.6255 - val_loss: 0.8854
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.9095 - val_accuracy: 0.6056 - val_loss: 0.8854
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5900 - loss:
0.9204 - val_accuracy: 0.6175 - val_loss: 0.8838
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6029 - loss:
0.8960 - val_accuracy: 0.6215 - val_loss: 0.8827
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5979 - loss:
0.9028 - val_accuracy: 0.6175 - val_loss: 0.8820
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.8993 - val_accuracy: 0.6175 - val_loss: 0.8817
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6025 - loss:
0.8991 - val_accuracy: 0.6215 - val_loss: 0.8821
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.8982 - val_accuracy: 0.6215 - val_loss: 0.8808
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5784 - loss:
0.9217 - val_accuracy: 0.6215 - val_loss: 0.8802
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.8948 - val_accuracy: 0.6215 - val_loss: 0.8802
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6074 - loss:
0.9099 - val_accuracy: 0.6056 - val_loss: 0.8804
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6087 - loss:
0.8988 - val_accuracy: 0.6056 - val_loss: 0.8798
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5941 - loss:
0.9072 - val_accuracy: 0.6215 - val_loss: 0.8775
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6134 - loss:
0.8879 - val_accuracy: 0.6056 - val_loss: 0.8786
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6129 - loss:
0.8995 - val_accuracy: 0.6175 - val_loss: 0.8773
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6010 - loss:
0.9032 - val_accuracy: 0.6135 - val_loss: 0.8774
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5904 - loss:
0.9090 - val_accuracy: 0.6096 - val_loss: 0.8765
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9093 - val_accuracy: 0.6056 - val_loss: 0.8762
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5941 - loss:
0.9118 - val_accuracy: 0.6135 - val_loss: 0.8766
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6009 - loss:
0.9021 - val_accuracy: 0.6056 - val_loss: 0.8757
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5791 - loss:
0.9242 - val_accuracy: 0.6056 - val_loss: 0.8749
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6006 - loss:
0.9034 - val_accuracy: 0.6175 - val_loss: 0.8736
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5895 - loss:
0.9115 - val_accuracy: 0.6056 - val_loss: 0.8762
training_neural_network: SGD, l2=3.1622776601683795e-05, dropout=0
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.3338 - loss:

1.3612 - val_accuracy: 0.4781 - val_loss: 1.2540
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4227 - loss:
1.2470 - val_accuracy: 0.4940 - val_loss: 1.1857
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4339 - loss:
1.1954 - val_accuracy: 0.5339 - val_loss: 1.1432
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4718 - loss:
1.1626 - val_accuracy: 0.5259 - val_loss: 1.1183
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4759 - loss:
1.1450 - val_accuracy: 0.5259 - val_loss: 1.1035
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4642 - loss:
1.1365 - val_accuracy: 0.5339 - val_loss: 1.0923
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4692 - loss:
1.1101 - val_accuracy: 0.5219 - val_loss: 1.0823
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4683 - loss:
1.0986 - val_accuracy: 0.5339 - val_loss: 1.0735
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4827 - loss:
1.1030 - val_accuracy: 0.5418 - val_loss: 1.0639
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4766 - loss:
1.1004 - val_accuracy: 0.5418 - val_loss: 1.0547
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.5018 - loss:
1.0651 - val_accuracy: 0.5378 - val_loss: 1.0469
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4793 - loss:
1.0734 - val_accuracy: 0.5418 - val_loss: 1.0382
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4729 - loss:
1.0599 - val_accuracy: 0.5378 - val_loss: 1.0297
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4853 - loss:
1.0511 - val_accuracy: 0.5418 - val_loss: 1.0209
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4937 - loss:
1.0377 - val_accuracy: 0.5378 - val_loss: 1.0125
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4921 - loss:
1.0454 - val_accuracy: 0.5618 - val_loss: 1.0042
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5245 - loss:
1.0211 - val_accuracy: 0.5737 - val_loss: 0.9950
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5583 - loss:
1.0273 - val_accuracy: 0.5976 - val_loss: 0.9876
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5756 - loss:
1.0015 - val_accuracy: 0.5936 - val_loss: 0.9801
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5870 - loss:
0.9834 - val_accuracy: 0.6016 - val_loss: 0.9732
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5917 - loss:
0.9837 - val_accuracy: 0.5817 - val_loss: 0.9694
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6130 - loss:
0.9530 - val_accuracy: 0.5857 - val_loss: 0.9622
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6032 - loss:
0.9769 - val_accuracy: 0.5896 - val_loss: 0.9565
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5757 - loss:
0.9723 - val_accuracy: 0.6175 - val_loss: 0.9500
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6049 - loss:
0.9517 - val_accuracy: 0.6135 - val_loss: 0.9448
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5836 - loss:
0.9616 - val_accuracy: 0.6135 - val_loss: 0.9434
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6024 - loss:
0.9415 - val_accuracy: 0.6096 - val_loss: 0.9373
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6122 - loss:
0.9366 - val_accuracy: 0.6215 - val_loss: 0.9322
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5927 - loss:
0.9647 - val_accuracy: 0.6255 - val_loss: 0.9282
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6001 - loss:
0.9454 - val_accuracy: 0.6255 - val_loss: 0.9260

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.6023 - loss:
0.9407 - val_accuracy: 0.6056 - val_loss: 0.9217

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5776 - loss:
0.9599 - val_accuracy: 0.6016 - val_loss: 0.9214

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.6204 - loss:
0.9253 - val_accuracy: 0.6215 - val_loss: 0.9170

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6106 - loss:
0.9338 - val_accuracy: 0.6096 - val_loss: 0.9162

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.9434 - val_accuracy: 0.6096 - val_loss: 0.9133

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.6189 - loss:
0.9255 - val_accuracy: 0.6135 - val_loss: 0.9137

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9432 - val_accuracy: 0.6096 - val_loss: 0.9098

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6067 - loss:
0.9217 - val_accuracy: 0.6215 - val_loss: 0.9097

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9218 - val_accuracy: 0.6135 - val_loss: 0.9112

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5899 - loss:
0.9292 - val_accuracy: 0.6175 - val_loss: 0.9021

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6235 - loss:
0.9020 - val_accuracy: 0.6255 - val_loss: 0.9041

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6031 - loss:
0.9148 - val_accuracy: 0.6175 - val_loss: 0.9026

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6093 - loss:
0.9205 - val_accuracy: 0.6255 - val_loss: 0.9069

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5858 - loss:
0.9239 - val_accuracy: 0.6056 - val_loss: 0.8978

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:

0.9037 - val_accuracy: 0.6056 - val_loss: 0.8970
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9209 - val_accuracy: 0.6016 - val_loss: 0.8953
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5944 - loss:
0.9396 - val_accuracy: 0.6175 - val_loss: 0.8967
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6198 - loss:
0.8978 - val_accuracy: 0.6215 - val_loss: 0.8975
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6193 - loss:
0.9084 - val_accuracy: 0.6016 - val_loss: 0.8933
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9156 - val_accuracy: 0.6255 - val_loss: 0.8941
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6123 - loss:
0.9126 - val_accuracy: 0.6096 - val_loss: 0.8906
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9224 - val_accuracy: 0.6096 - val_loss: 0.8893
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6065 - loss:
0.9109 - val_accuracy: 0.6295 - val_loss: 0.8931
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9136 - val_accuracy: 0.6215 - val_loss: 0.8898
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5974 - loss:
0.9188 - val_accuracy: 0.6295 - val_loss: 0.8921
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6206 - loss:
0.8868 - val_accuracy: 0.6096 - val_loss: 0.8859
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.9037 - val_accuracy: 0.6255 - val_loss: 0.8903
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6189 - loss:
0.9019 - val_accuracy: 0.5976 - val_loss: 0.8842
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6182 - loss:
0.8991 - val_accuracy: 0.6016 - val_loss: 0.8865
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6145 - loss:
0.8980 - val_accuracy: 0.6295 - val_loss: 0.8876
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6273 - loss:
0.8847 - val_accuracy: 0.6056 - val_loss: 0.8843
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6057 - loss:
0.9005 - val_accuracy: 0.5976 - val_loss: 0.8833
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6184 - loss:
0.8921 - val_accuracy: 0.6215 - val_loss: 0.8859
training_neural_network: SGD, l2=0.0001, dropout=0
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.2776 - loss:
1.4058 - val_accuracy: 0.5020 - val_loss: 1.3151
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4776 - loss:
1.3034 - val_accuracy: 0.5060 - val_loss: 1.2567
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4566 - loss:
1.2574 - val_accuracy: 0.5060 - val_loss: 1.2188
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4687 - loss:
1.2181 - val_accuracy: 0.5060 - val_loss: 1.1918
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4778 - loss:
1.1848 - val_accuracy: 0.5060 - val_loss: 1.1719
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4724 - loss:
1.1803 - val_accuracy: 0.5060 - val_loss: 1.1560
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4656 - loss:
1.1598 - val_accuracy: 0.5060 - val_loss: 1.1429
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4810 - loss:
1.1439 - val_accuracy: 0.5060 - val_loss: 1.1326
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4605 - loss:
1.1494 - val_accuracy: 0.5060 - val_loss: 1.1225
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4632 - loss:
1.1346 - val_accuracy: 0.5060 - val_loss: 1.1116
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4729 - loss:

1.1214 - val_accuracy: 0.5060 - val_loss: 1.1006
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4636 - loss:
1.1103 - val_accuracy: 0.5060 - val_loss: 1.0871
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5039 - loss:
1.0763 - val_accuracy: 0.5299 - val_loss: 1.0720
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5200 - loss:
1.0758 - val_accuracy: 0.5618 - val_loss: 1.0600
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5705 - loss:
1.0464 - val_accuracy: 0.5618 - val_loss: 1.0459
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5695 - loss:
1.0370 - val_accuracy: 0.5777 - val_loss: 1.0349
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5742 - loss:
1.0255 - val_accuracy: 0.5657 - val_loss: 1.0233
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5625 - loss:
1.0364 - val_accuracy: 0.5657 - val_loss: 1.0122
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5753 - loss:
1.0074 - val_accuracy: 0.5697 - val_loss: 1.0020
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5612 - loss:
1.0238 - val_accuracy: 0.5697 - val_loss: 0.9922
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5686 - loss:
1.0116 - val_accuracy: 0.5737 - val_loss: 0.9834
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5840 - loss:
1.0008 - val_accuracy: 0.5777 - val_loss: 0.9762
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5737 - loss:
0.9761 - val_accuracy: 0.5817 - val_loss: 0.9686
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5869 - loss:
0.9838 - val_accuracy: 0.5817 - val_loss: 0.9618
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5750 - loss:
0.9911 - val_accuracy: 0.5936 - val_loss: 0.9553
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5825 - loss:
0.9694 - val_accuracy: 0.5618 - val_loss: 0.9511
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9511 - val_accuracy: 0.5777 - val_loss: 0.9465
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5661 - loss:
0.9732 - val_accuracy: 0.5857 - val_loss: 0.9416
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5840 - loss:
0.9663 - val_accuracy: 0.5697 - val_loss: 0.9377
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5990 - loss:
0.9405 - val_accuracy: 0.5777 - val_loss: 0.9330
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5922 - loss:
0.9315 - val_accuracy: 0.5817 - val_loss: 0.9309
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6068 - loss:
0.9338 - val_accuracy: 0.5817 - val_loss: 0.9273
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5997 - loss:
0.9319 - val_accuracy: 0.5857 - val_loss: 0.9241
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5640 - loss:
0.9619 - val_accuracy: 0.5896 - val_loss: 0.9217
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6091 - loss:
0.9394 - val_accuracy: 0.6016 - val_loss: 0.9187
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5918 - loss:
0.9394 - val_accuracy: 0.5817 - val_loss: 0.9162
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.9358 - val_accuracy: 0.5896 - val_loss: 0.9128
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6081 - loss:
0.9148 - val_accuracy: 0.5936 - val_loss: 0.9116
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6166 - loss:
0.9173 - val_accuracy: 0.6056 - val_loss: 0.9119
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.9389 - val_accuracy: 0.5936 - val_loss: 0.9083

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5673 - loss:
0.9543 - val_accuracy: 0.6096 - val_loss: 0.9072

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9264 - val_accuracy: 0.6056 - val_loss: 0.9057

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5901 - loss:
0.9292 - val_accuracy: 0.5976 - val_loss: 0.9038

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9258 - val_accuracy: 0.5936 - val_loss: 0.9018

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.6009 - loss:
0.9142 - val_accuracy: 0.6016 - val_loss: 0.9006

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5969 - loss:
0.9189 - val_accuracy: 0.6016 - val_loss: 0.9019

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5927 - loss:
0.9362 - val_accuracy: 0.6056 - val_loss: 0.8994

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6176 - loss:
0.9078 - val_accuracy: 0.5976 - val_loss: 0.8991

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.8959 - val_accuracy: 0.6016 - val_loss: 0.8960

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6087 - loss:
0.9126 - val_accuracy: 0.6096 - val_loss: 0.8955

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5986 - loss:
0.9065 - val_accuracy: 0.5976 - val_loss: 0.8939

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9129 - val_accuracy: 0.5936 - val_loss: 0.8940

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6057 - loss:
0.9077 - val_accuracy: 0.6135 - val_loss: 0.8930

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9048 - val_accuracy: 0.6096 - val_loss: 0.8921

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5990 - loss:

0.9111 - val_accuracy: 0.6135 - val_loss: 0.8930
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5939 - loss:
0.9257 - val_accuracy: 0.6056 - val_loss: 0.8896
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6081 - loss:
0.8996 - val_accuracy: 0.6016 - val_loss: 0.8893
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5886 - loss:
0.9065 - val_accuracy: 0.6016 - val_loss: 0.8876
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6084 - loss:
0.8955 - val_accuracy: 0.6016 - val_loss: 0.8870
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9098 - val_accuracy: 0.6016 - val_loss: 0.8864
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5848 - loss:
0.9292 - val_accuracy: 0.6096 - val_loss: 0.8894
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9006 - val_accuracy: 0.6096 - val_loss: 0.8855
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6209 - loss:
0.8860 - val_accuracy: 0.6096 - val_loss: 0.8878
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5938 - loss:
0.9165 - val_accuracy: 0.6016 - val_loss: 0.8835
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6100 - loss:
0.9165 - val_accuracy: 0.6096 - val_loss: 0.8830
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6111 - loss:
0.8899 - val_accuracy: 0.6175 - val_loss: 0.8854
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5877 - loss:
0.9129 - val_accuracy: 0.6056 - val_loss: 0.8815
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.8968 - val_accuracy: 0.6096 - val_loss: 0.8809
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.8965 - val_accuracy: 0.6096 - val_loss: 0.8807
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6028 - loss:
0.9012 - val_accuracy: 0.6056 - val_loss: 0.8800
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6095 - loss:
0.8863 - val_accuracy: 0.6135 - val_loss: 0.8793
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6041 - loss:
0.8986 - val_accuracy: 0.6056 - val_loss: 0.8787
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5906 - loss:
0.8948 - val_accuracy: 0.6295 - val_loss: 0.8801
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6147 - loss:
0.9027 - val_accuracy: 0.6056 - val_loss: 0.8780
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.8923 - val_accuracy: 0.6096 - val_loss: 0.8758
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5986 - loss:
0.9264 - val_accuracy: 0.6056 - val_loss: 0.8752
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5867 - loss:
0.9100 - val_accuracy: 0.6175 - val_loss: 0.8768
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5889 - loss:
0.9152 - val_accuracy: 0.6135 - val_loss: 0.8740
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.8965 - val_accuracy: 0.6096 - val_loss: 0.8725
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6081 - loss:
0.8728 - val_accuracy: 0.6096 - val_loss: 0.8745
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5799 - loss:
0.9225 - val_accuracy: 0.6096 - val_loss: 0.8716
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6143 - loss:
0.8892 - val_accuracy: 0.6056 - val_loss: 0.8739
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6036 - loss:
0.9003 - val_accuracy: 0.6135 - val_loss: 0.8743

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6077 - loss:
0.8845 - val_accuracy: 0.6096 - val_loss: 0.8684

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6332 - loss:
0.8676 - val_accuracy: 0.6175 - val_loss: 0.8732

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6083 - loss:
0.8865 - val_accuracy: 0.6096 - val_loss: 0.8681

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6209 - loss:
0.8672 - val_accuracy: 0.6175 - val_loss: 0.8694

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5804 - loss:
0.9253 - val_accuracy: 0.6215 - val_loss: 0.8675

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5858 - loss:
0.9193 - val_accuracy: 0.6295 - val_loss: 0.8686
training_neural_network: SGD, l2=0.00031622776601683794, dropout=0

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3653 - loss:
1.3550 - val_accuracy: 0.5060 - val_loss: 1.2730

Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4518 - loss:
1.2768 - val_accuracy: 0.5060 - val_loss: 1.2213

Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4601 - loss:
1.2278 - val_accuracy: 0.5060 - val_loss: 1.1936

Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4763 - loss:
1.1975 - val_accuracy: 0.5060 - val_loss: 1.1785

Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4774 - loss:
1.1947 - val_accuracy: 0.5060 - val_loss: 1.1695

Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4734 - loss:
1.1777 - val_accuracy: 0.5060 - val_loss: 1.1626

Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4681 - loss:
1.1878 - val_accuracy: 0.5060 - val_loss: 1.1575

Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4836 - loss:
1.1538 - val_accuracy: 0.5060 - val_loss: 1.1541

Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4785 - loss:
1.1618 - val_accuracy: 0.5060 - val_loss: 1.1501
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4825 - loss:
1.1546 - val_accuracy: 0.5060 - val_loss: 1.1456
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4650 - loss:
1.1584 - val_accuracy: 0.5060 - val_loss: 1.1415
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4549 - loss:
1.1463 - val_accuracy: 0.5060 - val_loss: 1.1366
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4620 - loss:
1.1500 - val_accuracy: 0.5060 - val_loss: 1.1315
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4593 - loss:
1.1561 - val_accuracy: 0.5060 - val_loss: 1.1270
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4638 - loss:
1.1398 - val_accuracy: 0.5060 - val_loss: 1.1214
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4573 - loss:
1.1457 - val_accuracy: 0.5060 - val_loss: 1.1157
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4997 - loss:
1.1221 - val_accuracy: 0.5378 - val_loss: 1.1100
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5302 - loss:
1.1082 - val_accuracy: 0.5458 - val_loss: 1.1045
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5438 - loss:
1.1194 - val_accuracy: 0.5538 - val_loss: 1.0989
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5530 - loss:
1.0928 - val_accuracy: 0.5618 - val_loss: 1.0936
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5452 - loss:
1.1022 - val_accuracy: 0.5697 - val_loss: 1.0878
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5370 - loss:
1.1019 - val_accuracy: 0.5737 - val_loss: 1.0818
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5388 - loss:
1.1047 - val_accuracy: 0.5697 - val_loss: 1.0760

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5627 - loss:
1.0762 - val_accuracy: 0.5618 - val_loss: 1.0704

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5583 - loss:
1.0687 - val_accuracy: 0.5618 - val_loss: 1.0647

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5438 - loss:
1.0689 - val_accuracy: 0.5618 - val_loss: 1.0590

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5597 - loss:
1.0526 - val_accuracy: 0.5618 - val_loss: 1.0533

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5705 - loss:
1.0592 - val_accuracy: 0.5618 - val_loss: 1.0478

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5656 - loss:
1.0524 - val_accuracy: 0.5697 - val_loss: 1.0422

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5563 - loss:
1.0480 - val_accuracy: 0.5697 - val_loss: 1.0368

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5610 - loss:
1.0280 - val_accuracy: 0.5657 - val_loss: 1.0313

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5510 - loss:
1.0402 - val_accuracy: 0.5657 - val_loss: 1.0261

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5564 - loss:
1.0442 - val_accuracy: 0.5777 - val_loss: 1.0206

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5676 - loss:
1.0254 - val_accuracy: 0.5896 - val_loss: 1.0157

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5710 - loss:
1.0237 - val_accuracy: 0.5777 - val_loss: 1.0114

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5672 - loss:
1.0216 - val_accuracy: 0.5857 - val_loss: 1.0065

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5873 - loss:
1.0034 - val_accuracy: 0.5896 - val_loss: 1.0017

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5724 - loss:

1.0067 - val_accuracy: 0.5857 - val_loss: 0.9970
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5685 - loss:
1.0157 - val_accuracy: 0.5936 - val_loss: 0.9926
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5805 - loss:
1.0019 - val_accuracy: 0.5936 - val_loss: 0.9884
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5752 - loss:
0.9995 - val_accuracy: 0.5936 - val_loss: 0.9841
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5605 - loss:
0.9980 - val_accuracy: 0.5896 - val_loss: 0.9808
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5748 - loss:
1.0054 - val_accuracy: 0.5936 - val_loss: 0.9762
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5856 - loss:
0.9739 - val_accuracy: 0.5976 - val_loss: 0.9732
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9805 - val_accuracy: 0.6056 - val_loss: 0.9696
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5905 - loss:
0.9723 - val_accuracy: 0.6175 - val_loss: 0.9662
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5910 - loss:
0.9721 - val_accuracy: 0.6096 - val_loss: 0.9631
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6116 - loss:
0.9563 - val_accuracy: 0.6096 - val_loss: 0.9601
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9788 - val_accuracy: 0.6215 - val_loss: 0.9564
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5876 - loss:
0.9640 - val_accuracy: 0.6215 - val_loss: 0.9535
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9745 - val_accuracy: 0.6135 - val_loss: 0.9512
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5964 - loss:
0.9675 - val_accuracy: 0.6135 - val_loss: 0.9493
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6054 - loss:
0.9586 - val_accuracy: 0.6096 - val_loss: 0.9475
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5992 - loss:
0.9674 - val_accuracy: 0.6135 - val_loss: 0.9449
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9439 - val_accuracy: 0.6175 - val_loss: 0.9414
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5965 - loss:
0.9500 - val_accuracy: 0.6056 - val_loss: 0.9390
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5653 - loss:
0.9672 - val_accuracy: 0.6215 - val_loss: 0.9374
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5971 - loss:
0.9514 - val_accuracy: 0.6295 - val_loss: 0.9361
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5909 - loss:
0.9549 - val_accuracy: 0.6255 - val_loss: 0.9338
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5878 - loss:
0.9387 - val_accuracy: 0.6255 - val_loss: 0.9325
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6102 - loss:
0.9236 - val_accuracy: 0.6255 - val_loss: 0.9305
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9392 - val_accuracy: 0.6175 - val_loss: 0.9298
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5842 - loss:
0.9587 - val_accuracy: 0.6215 - val_loss: 0.9286
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6076 - loss:
0.9366 - val_accuracy: 0.6295 - val_loss: 0.9258
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5928 - loss:
0.9368 - val_accuracy: 0.6255 - val_loss: 0.9248
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5918 - loss:
0.9321 - val_accuracy: 0.6175 - val_loss: 0.9252
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6058 - loss:
0.9238 - val_accuracy: 0.6135 - val_loss: 0.9227

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6042 - loss:
0.9405 - val_accuracy: 0.6215 - val_loss: 0.9215

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5771 - loss:
0.9435 - val_accuracy: 0.6255 - val_loss: 0.9195

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5976 - loss:
0.9490 - val_accuracy: 0.6175 - val_loss: 0.9183

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5921 - loss:
0.9302 - val_accuracy: 0.6295 - val_loss: 0.9172

Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5886 - loss:
0.9397 - val_accuracy: 0.6255 - val_loss: 0.9178

Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5894 - loss:
0.9339 - val_accuracy: 0.6175 - val_loss: 0.9170

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5999 - loss:
0.9355 - val_accuracy: 0.6135 - val_loss: 0.9166

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5951 - loss:
0.9278 - val_accuracy: 0.6056 - val_loss: 0.9150

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6131 - loss:
0.9063 - val_accuracy: 0.6056 - val_loss: 0.9146

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9299 - val_accuracy: 0.6215 - val_loss: 0.9132

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5898 - loss:
0.9426 - val_accuracy: 0.6215 - val_loss: 0.9111

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5934 - loss:
0.9263 - val_accuracy: 0.6215 - val_loss: 0.9112

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5754 - loss:
0.9580 - val_accuracy: 0.6016 - val_loss: 0.9101

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6073 - loss:
0.9123 - val_accuracy: 0.6016 - val_loss: 0.9100

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5806 - loss:

0.9345 - val_accuracy: 0.6056 - val_loss: 0.9080
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9377 - val_accuracy: 0.6135 - val_loss: 0.9071
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.9333 - val_accuracy: 0.6135 - val_loss: 0.9074
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6082 - loss:
0.9313 - val_accuracy: 0.6056 - val_loss: 0.9069
Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6065 - loss:
0.9088 - val_accuracy: 0.6016 - val_loss: 0.9073
Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9185 - val_accuracy: 0.6016 - val_loss: 0.9057
Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9273 - val_accuracy: 0.6096 - val_loss: 0.9057
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5902 - loss:
0.9294 - val_accuracy: 0.6175 - val_loss: 0.9041
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5983 - loss:
0.9264 - val_accuracy: 0.5976 - val_loss: 0.9039
training_neural_network: SGD, l2=0.001, dropout=0
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 943us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 987us/step
79/79 ————— 0s 2ms/step
53/53 ————— 0s 1ms/step
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2006 - loss:
1.5531 - val_accuracy: 0.5060 - val_loss: 1.2983
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4865 - loss:
1.2720 - val_accuracy: 0.5060 - val_loss: 1.2029

Epoch 3/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4569 - loss:
1.2176 - val_accuracy: 0.5060 - val_loss: 1.1711

Epoch 4/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4788 - loss:
1.1662 - val_accuracy: 0.5060 - val_loss: 1.1593

Epoch 5/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4759 - loss:
1.1716 - val_accuracy: 0.5060 - val_loss: 1.1534

Epoch 6/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4749 - loss:
1.1612 - val_accuracy: 0.5060 - val_loss: 1.1465

Epoch 7/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4652 - loss:
1.1674 - val_accuracy: 0.5060 - val_loss: 1.1400

Epoch 8/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4779 - loss:
1.1419 - val_accuracy: 0.5060 - val_loss: 1.1323

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4594 - loss:
1.1519 - val_accuracy: 0.5060 - val_loss: 1.1258

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4767 - loss:
1.1430 - val_accuracy: 0.5060 - val_loss: 1.1193

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4717 - loss:
1.1304 - val_accuracy: 0.5060 - val_loss: 1.1098

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4871 - loss:
1.1084 - val_accuracy: 0.5139 - val_loss: 1.1027

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4662 - loss:
1.1251 - val_accuracy: 0.5299 - val_loss: 1.0937

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5140 - loss:
1.0892 - val_accuracy: 0.5299 - val_loss: 1.0845

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5137 - loss:
1.1147 - val_accuracy: 0.5418 - val_loss: 1.0763

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5388 - loss:
1.0691 - val_accuracy: 0.5378 - val_loss: 1.0673

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5459 - loss:

1.0684 - val_accuracy: 0.5578 - val_loss: 1.0592
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5583 - loss:
1.0633 - val_accuracy: 0.5657 - val_loss: 1.0506
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5579 - loss:
1.0553 - val_accuracy: 0.5657 - val_loss: 1.0428
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5456 - loss:
1.0686 - val_accuracy: 0.5777 - val_loss: 1.0341
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5530 - loss:
1.0479 - val_accuracy: 0.5777 - val_loss: 1.0272
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5555 - loss:
1.0456 - val_accuracy: 0.5777 - val_loss: 1.0193
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5765 - loss:
1.0386 - val_accuracy: 0.5896 - val_loss: 1.0132
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5738 - loss:
1.0156 - val_accuracy: 0.5896 - val_loss: 1.0050
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5633 - loss:
1.0278 - val_accuracy: 0.5896 - val_loss: 0.9981
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5646 - loss:
1.0117 - val_accuracy: 0.5976 - val_loss: 0.9929
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5782 - loss:
0.9915 - val_accuracy: 0.5976 - val_loss: 0.9874
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5690 - loss:
1.0056 - val_accuracy: 0.6056 - val_loss: 0.9824
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5749 - loss:
0.9941 - val_accuracy: 0.6016 - val_loss: 0.9770
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5608 - loss:
1.0039 - val_accuracy: 0.6016 - val_loss: 0.9700
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5705 - loss:
0.9879 - val_accuracy: 0.5976 - val_loss: 0.9643
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5804 - loss:
0.9778 - val_accuracy: 0.6016 - val_loss: 0.9613
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5871 - loss:
0.9678 - val_accuracy: 0.6096 - val_loss: 0.9555
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5828 - loss:
0.9756 - val_accuracy: 0.6096 - val_loss: 0.9530
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5968 - loss:
0.9657 - val_accuracy: 0.6096 - val_loss: 0.9499
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5818 - loss:
0.9555 - val_accuracy: 0.6016 - val_loss: 0.9438
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5915 - loss:
0.9540 - val_accuracy: 0.6135 - val_loss: 0.9394
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5997 - loss:
0.9508 - val_accuracy: 0.6096 - val_loss: 0.9388
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5925 - loss:
0.9409 - val_accuracy: 0.6096 - val_loss: 0.9337
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5863 - loss:
0.9451 - val_accuracy: 0.6096 - val_loss: 0.9314
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5935 - loss:
0.9403 - val_accuracy: 0.6175 - val_loss: 0.9276
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5753 - loss:
0.9565 - val_accuracy: 0.6056 - val_loss: 0.9239
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5816 - loss:
0.9416 - val_accuracy: 0.6175 - val_loss: 0.9226
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6152 - loss:
0.9254 - val_accuracy: 0.6335 - val_loss: 0.9217
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5852 - loss:
0.9387 - val_accuracy: 0.6135 - val_loss: 0.9181
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5847 - loss:
0.9420 - val_accuracy: 0.6255 - val_loss: 0.9179

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9327 - val_accuracy: 0.6255 - val_loss: 0.9149

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9188 - val_accuracy: 0.6255 - val_loss: 0.9113

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6017 - loss:
0.9208 - val_accuracy: 0.6215 - val_loss: 0.9109

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6040 - loss:
0.9200 - val_accuracy: 0.6295 - val_loss: 0.9080

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5963 - loss:
0.9188 - val_accuracy: 0.6215 - val_loss: 0.9102

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6186 - loss:
0.8882 - val_accuracy: 0.6295 - val_loss: 0.9056

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5885 - loss:
0.9310 - val_accuracy: 0.6215 - val_loss: 0.9037

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6057 - loss:
0.8993 - val_accuracy: 0.6135 - val_loss: 0.9032

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5976 - loss:
0.9210 - val_accuracy: 0.6375 - val_loss: 0.8996

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5931 - loss:
0.9171 - val_accuracy: 0.6215 - val_loss: 0.8993

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6158 - loss:
0.9099 - val_accuracy: 0.6215 - val_loss: 0.8983

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6083 - loss:
0.9151 - val_accuracy: 0.6215 - val_loss: 0.8966

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5956 - loss:
0.9042 - val_accuracy: 0.6255 - val_loss: 0.8953

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5956 - loss:
0.9115 - val_accuracy: 0.6375 - val_loss: 0.8932

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6010 - loss:

0.9010 - val_accuracy: 0.6295 - val_loss: 0.8938
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6043 - loss:
0.8955 - val_accuracy: 0.6295 - val_loss: 0.8921
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5843 - loss:
0.9276 - val_accuracy: 0.6335 - val_loss: 0.8889
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:
0.8909 - val_accuracy: 0.6295 - val_loss: 0.8900
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9127 - val_accuracy: 0.6335 - val_loss: 0.8880
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5941 - loss:
0.8997 - val_accuracy: 0.6295 - val_loss: 0.8871
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.8897 - val_accuracy: 0.6135 - val_loss: 0.8878
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9044 - val_accuracy: 0.6255 - val_loss: 0.8852
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9051 - val_accuracy: 0.6175 - val_loss: 0.8851
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.6055 - loss:
0.8877 - val_accuracy: 0.6255 - val_loss: 0.8834
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5861 - loss:
0.9024 - val_accuracy: 0.6335 - val_loss: 0.8807
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5989 - loss:
0.9166 - val_accuracy: 0.6215 - val_loss: 0.8791
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.8936 - val_accuracy: 0.6135 - val_loss: 0.8805
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6106 - loss:
0.9028 - val_accuracy: 0.6255 - val_loss: 0.8755
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6069 - loss:
0.8886 - val_accuracy: 0.6175 - val_loss: 0.8753
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6010 - loss:
0.8930 - val_accuracy: 0.6255 - val_loss: 0.8750
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6043 - loss:
0.8940 - val_accuracy: 0.6096 - val_loss: 0.8733
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6101 - loss:
0.9018 - val_accuracy: 0.6056 - val_loss: 0.8729
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6100 - loss:
0.8776 - val_accuracy: 0.6096 - val_loss: 0.8742
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.8920 - val_accuracy: 0.6215 - val_loss: 0.8734
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6056 - loss:
0.8909 - val_accuracy: 0.6175 - val_loss: 0.8691
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6100 - loss:
0.8929 - val_accuracy: 0.6215 - val_loss: 0.8716
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6089 - loss:
0.8897 - val_accuracy: 0.6295 - val_loss: 0.8681
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6168 - loss:
0.8854 - val_accuracy: 0.6335 - val_loss: 0.8661
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6162 - loss:
0.8885 - val_accuracy: 0.6335 - val_loss: 0.8660
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6132 - loss:
0.8820 - val_accuracy: 0.6295 - val_loss: 0.8630
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6177 - loss:
0.8868 - val_accuracy: 0.6096 - val_loss: 0.8646
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6082 - loss:
0.8775 - val_accuracy: 0.6335 - val_loss: 0.8621
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6087 - loss:
0.9063 - val_accuracy: 0.6335 - val_loss: 0.8605
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6149 - loss:
0.8599 - val_accuracy: 0.6255 - val_loss: 0.8576

training_neural_network: SGD, l2=1e-05, dropout=0.1

Epoch 1/90

71/71 ━━━━━━━━━━━━━━━━ 2s 6ms/step - accuracy: 0.4155 - loss: 1.3450 - val_accuracy: 0.5060 - val_loss: 1.2664

Epoch 2/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4597 - loss: 1.2798 - val_accuracy: 0.5060 - val_loss: 1.2132

Epoch 3/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4567 - loss: 1.2399 - val_accuracy: 0.5060 - val_loss: 1.1796

Epoch 4/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4813 - loss: 1.2000 - val_accuracy: 0.5060 - val_loss: 1.1600

Epoch 5/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4698 - loss: 1.1882 - val_accuracy: 0.5060 - val_loss: 1.1469

Epoch 6/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4771 - loss: 1.1666 - val_accuracy: 0.5060 - val_loss: 1.1379

Epoch 7/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4615 - loss: 1.1768 - val_accuracy: 0.5060 - val_loss: 1.1297

Epoch 8/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4728 - loss: 1.1535 - val_accuracy: 0.5060 - val_loss: 1.1227

Epoch 9/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4855 - loss: 1.1245 - val_accuracy: 0.5060 - val_loss: 1.1166

Epoch 10/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4573 - loss: 1.1446 - val_accuracy: 0.5060 - val_loss: 1.1091

Epoch 11/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4489 - loss: 1.1320 - val_accuracy: 0.5060 - val_loss: 1.1000

Epoch 12/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4744 - loss: 1.1134 - val_accuracy: 0.5219 - val_loss: 1.0933

Epoch 13/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4986 - loss: 1.1010 - val_accuracy: 0.5299 - val_loss: 1.0871

Epoch 14/90

71/71 ━━━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4984 - loss: 1.1123 - val_accuracy: 0.5299 - val_loss: 1.0798

Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5110 - loss:
1.1020 - val_accuracy: 0.5339 - val_loss: 1.0736
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5370 - loss:
1.0728 - val_accuracy: 0.5418 - val_loss: 1.0676
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5347 - loss:
1.0754 - val_accuracy: 0.5498 - val_loss: 1.0610
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5622 - loss:
1.0600 - val_accuracy: 0.5578 - val_loss: 1.0554
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5698 - loss:
1.0665 - val_accuracy: 0.5697 - val_loss: 1.0498
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5523 - loss:
1.0596 - val_accuracy: 0.5697 - val_loss: 1.0443
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5556 - loss:
1.0589 - val_accuracy: 0.5657 - val_loss: 1.0393
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5769 - loss:
1.0392 - val_accuracy: 0.5737 - val_loss: 1.0345
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5674 - loss:
1.0411 - val_accuracy: 0.5857 - val_loss: 1.0293
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5669 - loss:
1.0484 - val_accuracy: 0.5857 - val_loss: 1.0240
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5663 - loss:
1.0373 - val_accuracy: 0.5896 - val_loss: 1.0193
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5785 - loss:
1.0335 - val_accuracy: 0.5896 - val_loss: 1.0149
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5627 - loss:
1.0253 - val_accuracy: 0.5896 - val_loss: 1.0100
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5857 - loss:
1.0046 - val_accuracy: 0.5936 - val_loss: 1.0068
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5539 - loss:
1.0474 - val_accuracy: 0.5936 - val_loss: 1.0019

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5756 - loss:
1.0212 - val_accuracy: 0.5976 - val_loss: 0.9979

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5650 - loss:
1.0115 - val_accuracy: 0.5976 - val_loss: 0.9941

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5876 - loss:
0.9977 - val_accuracy: 0.6016 - val_loss: 0.9899

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5730 - loss:
1.0055 - val_accuracy: 0.6056 - val_loss: 0.9871

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5721 - loss:
1.0004 - val_accuracy: 0.6056 - val_loss: 0.9830

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5887 - loss:
0.9852 - val_accuracy: 0.6096 - val_loss: 0.9796

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5776 - loss:
0.9897 - val_accuracy: 0.6056 - val_loss: 0.9756

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5713 - loss:
0.9936 - val_accuracy: 0.6056 - val_loss: 0.9730

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5892 - loss:
0.9757 - val_accuracy: 0.6056 - val_loss: 0.9700

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5884 - loss:
0.9844 - val_accuracy: 0.6096 - val_loss: 0.9669

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5688 - loss:
0.9934 - val_accuracy: 0.6096 - val_loss: 0.9641

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5804 - loss:
0.9876 - val_accuracy: 0.6135 - val_loss: 0.9621

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5808 - loss:
0.9905 - val_accuracy: 0.6096 - val_loss: 0.9599

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5831 - loss:
0.9842 - val_accuracy: 0.6096 - val_loss: 0.9575

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5917 - loss:

0.9635 - val_accuracy: 0.6096 - val_loss: 0.9559
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5805 - loss:
0.9811 - val_accuracy: 0.6056 - val_loss: 0.9527
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5884 - loss:
0.9713 - val_accuracy: 0.6175 - val_loss: 0.9510
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5774 - loss:
0.9866 - val_accuracy: 0.6056 - val_loss: 0.9486
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5972 - loss:
0.9509 - val_accuracy: 0.6135 - val_loss: 0.9474
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5899 - loss:
0.9606 - val_accuracy: 0.6096 - val_loss: 0.9448
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6019 - loss:
0.9586 - val_accuracy: 0.6096 - val_loss: 0.9428
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9541 - val_accuracy: 0.6175 - val_loss: 0.9428
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5889 - loss:
0.9598 - val_accuracy: 0.6056 - val_loss: 0.9401
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5978 - loss:
0.9553 - val_accuracy: 0.6135 - val_loss: 0.9388
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9524 - val_accuracy: 0.6096 - val_loss: 0.9364
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6106 - loss:
0.9384 - val_accuracy: 0.6175 - val_loss: 0.9355
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9437 - val_accuracy: 0.6175 - val_loss: 0.9334
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9680 - val_accuracy: 0.6135 - val_loss: 0.9310
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5945 - loss:
0.9642 - val_accuracy: 0.6175 - val_loss: 0.9308
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6017 - loss:
0.9669 - val_accuracy: 0.6175 - val_loss: 0.9294
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6036 - loss:
0.9645 - val_accuracy: 0.6215 - val_loss: 0.9274
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6211 - loss:
0.9284 - val_accuracy: 0.6175 - val_loss: 0.9257
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5944 - loss:
0.9435 - val_accuracy: 0.6215 - val_loss: 0.9250
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5879 - loss:
0.9514 - val_accuracy: 0.6096 - val_loss: 0.9224
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5941 - loss:
0.9439 - val_accuracy: 0.6215 - val_loss: 0.9211
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6210 - loss:
0.9251 - val_accuracy: 0.6175 - val_loss: 0.9205
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6082 - loss:
0.9332 - val_accuracy: 0.6295 - val_loss: 0.9200
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5898 - loss:
0.9478 - val_accuracy: 0.6335 - val_loss: 0.9189
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6165 - loss:
0.9291 - val_accuracy: 0.6215 - val_loss: 0.9185
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6053 - loss:
0.9304 - val_accuracy: 0.6175 - val_loss: 0.9164
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6059 - loss:
0.9450 - val_accuracy: 0.6215 - val_loss: 0.9157
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5898 - loss:
0.9638 - val_accuracy: 0.6335 - val_loss: 0.9163
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6211 - loss:
0.9118 - val_accuracy: 0.6255 - val_loss: 0.9141
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6087 - loss:
0.9338 - val_accuracy: 0.6255 - val_loss: 0.9130

Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6061 - loss:
0.9410 - val_accuracy: 0.6295 - val_loss: 0.9128

Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9252 - val_accuracy: 0.6255 - val_loss: 0.9118

Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6008 - loss:
0.9319 - val_accuracy: 0.6135 - val_loss: 0.9117

Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9352 - val_accuracy: 0.6255 - val_loss: 0.9096

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9223 - val_accuracy: 0.6096 - val_loss: 0.9097

Epoch 79/90
71/71 ————— 0s 2ms/step - accuracy: 0.6083 - loss:
0.9337 - val_accuracy: 0.6255 - val_loss: 0.9074

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5857 - loss:
0.9367 - val_accuracy: 0.6255 - val_loss: 0.9073

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9412 - val_accuracy: 0.6175 - val_loss: 0.9083

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:
0.9318 - val_accuracy: 0.6295 - val_loss: 0.9062

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6095 - loss:
0.9159 - val_accuracy: 0.6255 - val_loss: 0.9060

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9168 - val_accuracy: 0.6255 - val_loss: 0.9039

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5821 - loss:
0.9379 - val_accuracy: 0.6255 - val_loss: 0.9030

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6021 - loss:
0.9181 - val_accuracy: 0.6096 - val_loss: 0.9034

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.5943 - loss:
0.9326 - val_accuracy: 0.6135 - val_loss: 0.9048

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.5983 - loss:

0.9154 - val_accuracy: 0.6255 - val_loss: 0.9018
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6083 - loss:
0.9086 - val_accuracy: 0.6215 - val_loss: 0.9037
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.5940 - loss:
0.9221 - val_accuracy: 0.6175 - val_loss: 0.9026
training_neural_network: SGD, l2=1e-05, dropout=0.4
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.3678 - loss:
1.2654 - val_accuracy: 0.5060 - val_loss: 1.1861
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4724 - loss:
1.1948 - val_accuracy: 0.5060 - val_loss: 1.1537
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4687 - loss:
1.1837 - val_accuracy: 0.5060 - val_loss: 1.1402
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4776 - loss:
1.1479 - val_accuracy: 0.5060 - val_loss: 1.1331
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4626 - loss:
1.1498 - val_accuracy: 0.5060 - val_loss: 1.1271
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4644 - loss:
1.1361 - val_accuracy: 0.5060 - val_loss: 1.1211
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4799 - loss:
1.1328 - val_accuracy: 0.5219 - val_loss: 1.1158
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.5037 - loss:
1.1016 - val_accuracy: 0.5299 - val_loss: 1.1108
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.5006 - loss:
1.1280 - val_accuracy: 0.5299 - val_loss: 1.1054
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.5029 - loss:
1.1108 - val_accuracy: 0.5299 - val_loss: 1.1000
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.5335 - loss:
1.0934 - val_accuracy: 0.5299 - val_loss: 1.0946
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.5209 - loss:
1.1144 - val_accuracy: 0.5299 - val_loss: 1.0880

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5255 - loss:
1.0802 - val_accuracy: 0.5418 - val_loss: 1.0824

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5449 - loss:
1.0891 - val_accuracy: 0.5418 - val_loss: 1.0767

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5515 - loss:
1.0719 - val_accuracy: 0.5578 - val_loss: 1.0713

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5667 - loss:
1.0696 - val_accuracy: 0.5657 - val_loss: 1.0665

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5693 - loss:
1.0537 - val_accuracy: 0.5737 - val_loss: 1.0608

Epoch 18/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5649 - loss:
1.0465 - val_accuracy: 0.5777 - val_loss: 1.0553

Epoch 19/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5528 - loss:
1.0713 - val_accuracy: 0.5817 - val_loss: 1.0499

Epoch 20/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5723 - loss:
1.0551 - val_accuracy: 0.5817 - val_loss: 1.0439

Epoch 21/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5608 - loss:
1.0644 - val_accuracy: 0.5857 - val_loss: 1.0388

Epoch 22/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5794 - loss:
1.0406 - val_accuracy: 0.5817 - val_loss: 1.0341

Epoch 23/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5905 - loss:
1.0265 - val_accuracy: 0.5936 - val_loss: 1.0303

Epoch 24/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5611 - loss:
1.0517 - val_accuracy: 0.5857 - val_loss: 1.0246

Epoch 25/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5739 - loss:
1.0301 - val_accuracy: 0.5936 - val_loss: 1.0195

Epoch 26/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5790 - loss:
1.0176 - val_accuracy: 0.5936 - val_loss: 1.0159

Epoch 27/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5822 - loss:

1.0359 - val_accuracy: 0.5976 - val_loss: 1.0111
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5823 - loss:
1.0210 - val_accuracy: 0.6016 - val_loss: 1.0071
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5746 - loss:
1.0216 - val_accuracy: 0.6016 - val_loss: 1.0031
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5713 - loss:
1.0216 - val_accuracy: 0.5936 - val_loss: 0.9987
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5681 - loss:
1.0389 - val_accuracy: 0.6016 - val_loss: 0.9947
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
0.9995 - val_accuracy: 0.5936 - val_loss: 0.9919
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5885 - loss:
0.9935 - val_accuracy: 0.5976 - val_loss: 0.9876
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.6028 - loss:
0.9834 - val_accuracy: 0.6056 - val_loss: 0.9852
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5869 - loss:
0.9922 - val_accuracy: 0.6096 - val_loss: 0.9820
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.6061 - loss:
0.9805 - val_accuracy: 0.6096 - val_loss: 0.9785
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5864 - loss:
0.9920 - val_accuracy: 0.6056 - val_loss: 0.9751
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5930 - loss:
0.9756 - val_accuracy: 0.6096 - val_loss: 0.9735
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9863 - val_accuracy: 0.6096 - val_loss: 0.9704
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5949 - loss:
0.9868 - val_accuracy: 0.6056 - val_loss: 0.9659
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9907 - val_accuracy: 0.6135 - val_loss: 0.9639
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6013 - loss:
0.9913 - val_accuracy: 0.6135 - val_loss: 0.9610
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5946 - loss:
0.9752 - val_accuracy: 0.6135 - val_loss: 0.9588
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6107 - loss:
0.9470 - val_accuracy: 0.6175 - val_loss: 0.9562
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6009 - loss:
0.9585 - val_accuracy: 0.6135 - val_loss: 0.9571
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6036 - loss:
0.9731 - val_accuracy: 0.6135 - val_loss: 0.9532
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6117 - loss:
0.9301 - val_accuracy: 0.6096 - val_loss: 0.9513
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6108 - loss:
0.9494 - val_accuracy: 0.6135 - val_loss: 0.9503
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6018 - loss:
0.9548 - val_accuracy: 0.6096 - val_loss: 0.9464
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6033 - loss:
0.9334 - val_accuracy: 0.6175 - val_loss: 0.9439
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6044 - loss:
0.9497 - val_accuracy: 0.6215 - val_loss: 0.9425
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5933 - loss:
0.9568 - val_accuracy: 0.6215 - val_loss: 0.9415
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6140 - loss:
0.9381 - val_accuracy: 0.6096 - val_loss: 0.9418
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.9446 - val_accuracy: 0.6175 - val_loss: 0.9393
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5913 - loss:
0.9478 - val_accuracy: 0.6215 - val_loss: 0.9371
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5987 - loss:
0.9572 - val_accuracy: 0.6135 - val_loss: 0.9364

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5956 - loss:
0.9444 - val_accuracy: 0.6096 - val_loss: 0.9361

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.6009 - loss:
0.9298 - val_accuracy: 0.6175 - val_loss: 0.9334

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9314 - val_accuracy: 0.6096 - val_loss: 0.9320

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5887 - loss:
0.9508 - val_accuracy: 0.6135 - val_loss: 0.9301

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5829 - loss:
0.9447 - val_accuracy: 0.6096 - val_loss: 0.9288

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6036 - loss:
0.9343 - val_accuracy: 0.6135 - val_loss: 0.9286

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5820 - loss:
0.9704 - val_accuracy: 0.6056 - val_loss: 0.9272

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5943 - loss:
0.9469 - val_accuracy: 0.6135 - val_loss: 0.9250

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.5890 - loss:
0.9521 - val_accuracy: 0.6056 - val_loss: 0.9263

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5886 - loss:
0.9453 - val_accuracy: 0.6096 - val_loss: 0.9254

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9408 - val_accuracy: 0.6135 - val_loss: 0.9246

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6010 - loss:
0.9329 - val_accuracy: 0.6175 - val_loss: 0.9221

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5885 - loss:
0.9659 - val_accuracy: 0.6135 - val_loss: 0.9215

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5984 - loss:
0.9212 - val_accuracy: 0.6175 - val_loss: 0.9211

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6028 - loss:

0.9451 - val_accuracy: 0.6096 - val_loss: 0.9195
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.5905 - loss:
0.9438 - val_accuracy: 0.6175 - val_loss: 0.9205
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5830 - loss:
0.9469 - val_accuracy: 0.6135 - val_loss: 0.9183
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6016 - loss:
0.9413 - val_accuracy: 0.6016 - val_loss: 0.9179
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5994 - loss:
0.9364 - val_accuracy: 0.6096 - val_loss: 0.9179
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.5905 - loss:
0.9458 - val_accuracy: 0.6016 - val_loss: 0.9195
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.5998 - loss:
0.9333 - val_accuracy: 0.6016 - val_loss: 0.9174
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5872 - loss:
0.9409 - val_accuracy: 0.6096 - val_loss: 0.9149
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6218 - loss:
0.9090 - val_accuracy: 0.6135 - val_loss: 0.9148
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9371 - val_accuracy: 0.6135 - val_loss: 0.9175
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6182 - loss:
0.9099 - val_accuracy: 0.6056 - val_loss: 0.9168
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5929 - loss:
0.9396 - val_accuracy: 0.6096 - val_loss: 0.9143
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6017 - loss:
0.9364 - val_accuracy: 0.6056 - val_loss: 0.9147
training_neural_network: SGD, l2=1e-05, dropout=0.7000000000000001
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2632 - loss:
1.3402 - val_accuracy: 0.3347 - val_loss: 1.2618
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4064 - loss:
1.2636 - val_accuracy: 0.5060 - val_loss: 1.1987

Epoch 3/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4678 - loss:
1.2140 - val_accuracy: 0.5060 - val_loss: 1.1678

Epoch 4/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4599 - loss:
1.1991 - val_accuracy: 0.5060 - val_loss: 1.1505

Epoch 5/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4516 - loss:
1.1910 - val_accuracy: 0.5060 - val_loss: 1.1386

Epoch 6/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4641 - loss:
1.1634 - val_accuracy: 0.5060 - val_loss: 1.1304

Epoch 7/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4835 - loss:
1.1426 - val_accuracy: 0.5060 - val_loss: 1.1228

Epoch 8/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4745 - loss:
1.1382 - val_accuracy: 0.5060 - val_loss: 1.1163

Epoch 9/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4697 - loss:
1.1303 - val_accuracy: 0.5060 - val_loss: 1.1088

Epoch 10/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4708 - loss:
1.1308 - val_accuracy: 0.5060 - val_loss: 1.1018

Epoch 11/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4759 - loss:
1.1092 - val_accuracy: 0.5060 - val_loss: 1.0950

Epoch 12/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4653 - loss:
1.1238 - val_accuracy: 0.5100 - val_loss: 1.0873

Epoch 13/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4671 - loss:
1.1075 - val_accuracy: 0.5219 - val_loss: 1.0792

Epoch 14/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4916 - loss:
1.0948 - val_accuracy: 0.5339 - val_loss: 1.0728

Epoch 15/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5095 - loss:
1.0757 - val_accuracy: 0.5339 - val_loss: 1.0657

Epoch 16/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5067 - loss:
1.0994 - val_accuracy: 0.5378 - val_loss: 1.0589

Epoch 17/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5523 - loss:

1.0676 - val_accuracy: 0.5618 - val_loss: 1.0534
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5508 - loss:
1.0701 - val_accuracy: 0.5697 - val_loss: 1.0474
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5521 - loss:
1.0595 - val_accuracy: 0.5697 - val_loss: 1.0408
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5748 - loss:
1.0249 - val_accuracy: 0.5817 - val_loss: 1.0358
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5607 - loss:
1.0471 - val_accuracy: 0.5817 - val_loss: 1.0294
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5579 - loss:
1.0318 - val_accuracy: 0.5936 - val_loss: 1.0258
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5670 - loss:
1.0409 - val_accuracy: 0.5896 - val_loss: 1.0196
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5545 - loss:
1.0556 - val_accuracy: 0.5896 - val_loss: 1.0142
Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5697 - loss:
1.0318 - val_accuracy: 0.5896 - val_loss: 1.0098
Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
1.0056 - val_accuracy: 0.5936 - val_loss: 1.0057
Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5716 - loss:
1.0175 - val_accuracy: 0.5976 - val_loss: 1.0010
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5732 - loss:
1.0093 - val_accuracy: 0.6096 - val_loss: 0.9981
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5868 - loss:
1.0002 - val_accuracy: 0.6056 - val_loss: 0.9928
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5809 - loss:
1.0097 - val_accuracy: 0.6135 - val_loss: 0.9888
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5769 - loss:
1.0039 - val_accuracy: 0.6175 - val_loss: 0.9850
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5836 - loss:
0.9988 - val_accuracy: 0.6096 - val_loss: 0.9811
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5823 - loss:
0.9747 - val_accuracy: 0.6016 - val_loss: 0.9761
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5737 - loss:
0.9847 - val_accuracy: 0.6175 - val_loss: 0.9740
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6041 - loss:
0.9775 - val_accuracy: 0.6096 - val_loss: 0.9706
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5883 - loss:
0.9754 - val_accuracy: 0.6175 - val_loss: 0.9684
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6016 - loss:
0.9665 - val_accuracy: 0.6135 - val_loss: 0.9628
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5928 - loss:
0.9823 - val_accuracy: 0.6135 - val_loss: 0.9598
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5927 - loss:
0.9664 - val_accuracy: 0.6056 - val_loss: 0.9581
Epoch 40/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5945 - loss:
0.9652 - val_accuracy: 0.6175 - val_loss: 0.9541
Epoch 41/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6176 - loss:
0.9432 - val_accuracy: 0.6135 - val_loss: 0.9503
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6076 - loss:
0.9550 - val_accuracy: 0.6215 - val_loss: 0.9486
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6015 - loss:
0.9481 - val_accuracy: 0.6175 - val_loss: 0.9464
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:
0.9543 - val_accuracy: 0.6175 - val_loss: 0.9424
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5914 - loss:
0.9705 - val_accuracy: 0.6175 - val_loss: 0.9401
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6008 - loss:
0.9515 - val_accuracy: 0.6175 - val_loss: 0.9375

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6010 - loss:
0.9469 - val_accuracy: 0.6295 - val_loss: 0.9387

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.5931 - loss:
0.9674 - val_accuracy: 0.6175 - val_loss: 0.9335

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6016 - loss:
0.9487 - val_accuracy: 0.6175 - val_loss: 0.9315

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6054 - loss:
0.9315 - val_accuracy: 0.6335 - val_loss: 0.9314

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.6138 - loss:
0.9244 - val_accuracy: 0.6295 - val_loss: 0.9286

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.6044 - loss:
0.9519 - val_accuracy: 0.6295 - val_loss: 0.9288

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5966 - loss:
0.9422 - val_accuracy: 0.6175 - val_loss: 0.9246

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5942 - loss:
0.9477 - val_accuracy: 0.6135 - val_loss: 0.9205

Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6076 - loss:
0.9383 - val_accuracy: 0.6215 - val_loss: 0.9199

Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.5924 - loss:
0.9396 - val_accuracy: 0.6135 - val_loss: 0.9178

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6158 - loss:
0.9265 - val_accuracy: 0.6215 - val_loss: 0.9158

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9410 - val_accuracy: 0.6135 - val_loss: 0.9147

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5950 - loss:
0.9368 - val_accuracy: 0.6135 - val_loss: 0.9137

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5985 - loss:
0.9277 - val_accuracy: 0.6255 - val_loss: 0.9130

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:

0.9078 - val_accuracy: 0.6175 - val_loss: 0.9109
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5988 - loss:
0.9281 - val_accuracy: 0.6175 - val_loss: 0.9119
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6167 - loss:
0.9173 - val_accuracy: 0.6255 - val_loss: 0.9094
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5995 - loss:
0.9514 - val_accuracy: 0.6215 - val_loss: 0.9084
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6250 - loss:
0.9073 - val_accuracy: 0.6295 - val_loss: 0.9058
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.6050 - loss:
0.9274 - val_accuracy: 0.6135 - val_loss: 0.9029
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9255 - val_accuracy: 0.6215 - val_loss: 0.9055
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.9180 - val_accuracy: 0.6175 - val_loss: 0.9021
Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.6005 - loss:
0.9160 - val_accuracy: 0.6255 - val_loss: 0.9033
Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5811 - loss:
0.9375 - val_accuracy: 0.6215 - val_loss: 0.9002
Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.5901 - loss:
0.9350 - val_accuracy: 0.6175 - val_loss: 0.9002
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6082 - loss:
0.9031 - val_accuracy: 0.6135 - val_loss: 0.9010
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5964 - loss:
0.9189 - val_accuracy: 0.6135 - val_loss: 0.9025
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.6030 - loss:
0.9137 - val_accuracy: 0.6135 - val_loss: 0.8980
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9283 - val_accuracy: 0.6135 - val_loss: 0.8986
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5984 - loss:
0.9137 - val_accuracy: 0.6135 - val_loss: 0.8990
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6045 - loss:
0.9000 - val_accuracy: 0.6135 - val_loss: 0.8933
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5935 - loss:
0.9158 - val_accuracy: 0.6295 - val_loss: 0.8915
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6000 - loss:
0.9078 - val_accuracy: 0.6135 - val_loss: 0.8901
Epoch 80/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6202 - loss:
0.9065 - val_accuracy: 0.6255 - val_loss: 0.8920
Epoch 81/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6066 - loss:
0.9144 - val_accuracy: 0.6135 - val_loss: 0.8903
Epoch 82/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6081 - loss:
0.9071 - val_accuracy: 0.6096 - val_loss: 0.8908
Epoch 83/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6132 - loss:
0.9080 - val_accuracy: 0.6096 - val_loss: 0.8924
Epoch 84/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6251 - loss:
0.8838 - val_accuracy: 0.6135 - val_loss: 0.8863
Epoch 85/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6118 - loss:
0.9185 - val_accuracy: 0.6096 - val_loss: 0.8921
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5893 - loss:
0.9186 - val_accuracy: 0.6096 - val_loss: 0.8880
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6263 - loss:
0.9042 - val_accuracy: 0.6096 - val_loss: 0.8884
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6096 - loss:
0.8917 - val_accuracy: 0.6215 - val_loss: 0.8873
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6026 - loss:
0.8985 - val_accuracy: 0.6175 - val_loss: 0.8833
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5882 - loss:
0.9067 - val_accuracy: 0.6215 - val_loss: 0.8824

training_neural_network: SGD, l2=0.0001, dropout=0.1

Epoch 1/90

71/71 ━━━━━━━━━━━━━━ 2s 6ms/step - accuracy: 0.4186 - loss: 1.3464 - val_accuracy: 0.5060 - val_loss: 1.2662

Epoch 2/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4702 - loss: 1.2745 - val_accuracy: 0.5060 - val_loss: 1.2301

Epoch 3/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4761 - loss: 1.2448 - val_accuracy: 0.5060 - val_loss: 1.2089

Epoch 4/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4774 - loss: 1.2252 - val_accuracy: 0.5060 - val_loss: 1.1939

Epoch 5/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4708 - loss: 1.2103 - val_accuracy: 0.5060 - val_loss: 1.1837

Epoch 6/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4618 - loss: 1.2207 - val_accuracy: 0.5060 - val_loss: 1.1753

Epoch 7/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4822 - loss: 1.1895 - val_accuracy: 0.5060 - val_loss: 1.1693

Epoch 8/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4713 - loss: 1.1868 - val_accuracy: 0.5060 - val_loss: 1.1631

Epoch 9/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4546 - loss: 1.1995 - val_accuracy: 0.5060 - val_loss: 1.1579

Epoch 10/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4722 - loss: 1.1790 - val_accuracy: 0.5060 - val_loss: 1.1539

Epoch 11/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4700 - loss: 1.1712 - val_accuracy: 0.5060 - val_loss: 1.1486

Epoch 12/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4673 - loss: 1.1783 - val_accuracy: 0.5060 - val_loss: 1.1441

Epoch 13/90

71/71 ━━━━━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4548 - loss: 1.1659 - val_accuracy: 0.5060 - val_loss: 1.1384

Epoch 14/90

71/71 ━━━━━━━━━━━━━━ 0s 5ms/step - accuracy: 0.4675 - loss: 1.1510 - val_accuracy: 0.5060 - val_loss: 1.1332

Epoch 15/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4757 - loss:
1.1375 - val_accuracy: 0.5060 - val_loss: 1.1280
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4694 - loss:
1.1459 - val_accuracy: 0.5060 - val_loss: 1.1220
Epoch 17/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4741 - loss:
1.1308 - val_accuracy: 0.5060 - val_loss: 1.1159
Epoch 18/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4848 - loss:
1.1167 - val_accuracy: 0.5060 - val_loss: 1.1098
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4616 - loss:
1.1312 - val_accuracy: 0.5060 - val_loss: 1.1021
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4728 - loss:
1.1200 - val_accuracy: 0.5060 - val_loss: 1.0960
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4797 - loss:
1.1184 - val_accuracy: 0.5060 - val_loss: 1.0896
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4470 - loss:
1.1028 - val_accuracy: 0.5139 - val_loss: 1.0812
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4644 - loss:
1.1017 - val_accuracy: 0.5179 - val_loss: 1.0745
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4697 - loss:
1.0936 - val_accuracy: 0.5259 - val_loss: 1.0660
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4785 - loss:
1.0904 - val_accuracy: 0.5259 - val_loss: 1.0583
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5103 - loss:
1.0679 - val_accuracy: 0.5339 - val_loss: 1.0516
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5244 - loss:
1.0592 - val_accuracy: 0.5339 - val_loss: 1.0451
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5458 - loss:
1.0592 - val_accuracy: 0.5339 - val_loss: 1.0372
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5556 - loss:
1.0398 - val_accuracy: 0.5498 - val_loss: 1.0304

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5573 - loss:
1.0358 - val_accuracy: 0.5737 - val_loss: 1.0229

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5553 - loss:
1.0309 - val_accuracy: 0.5697 - val_loss: 1.0163

Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5759 - loss:
1.0416 - val_accuracy: 0.6056 - val_loss: 1.0123

Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5622 - loss:
1.0226 - val_accuracy: 0.5896 - val_loss: 1.0034

Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5848 - loss:
0.9951 - val_accuracy: 0.6016 - val_loss: 0.9987

Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5915 - loss:
0.9983 - val_accuracy: 0.5976 - val_loss: 0.9919

Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5735 - loss:
1.0179 - val_accuracy: 0.6096 - val_loss: 0.9854

Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5832 - loss:
1.0127 - val_accuracy: 0.6175 - val_loss: 0.9802

Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9917 - val_accuracy: 0.6096 - val_loss: 0.9749

Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.6016 - loss:
0.9881 - val_accuracy: 0.6414 - val_loss: 0.9746

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.6235 - loss:
0.9616 - val_accuracy: 0.6295 - val_loss: 0.9658

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6032 - loss:
0.9916 - val_accuracy: 0.6175 - val_loss: 0.9612

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.5923 - loss:
0.9803 - val_accuracy: 0.6135 - val_loss: 0.9566

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9570 - val_accuracy: 0.6215 - val_loss: 0.9538

Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5996 - loss:

0.9608 - val_accuracy: 0.6414 - val_loss: 0.9504
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5979 - loss:
0.9719 - val_accuracy: 0.6215 - val_loss: 0.9480
Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9640 - val_accuracy: 0.6175 - val_loss: 0.9438
Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.5844 - loss:
0.9736 - val_accuracy: 0.6414 - val_loss: 0.9410
Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6103 - loss:
0.9548 - val_accuracy: 0.6454 - val_loss: 0.9374
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5907 - loss:
0.9500 - val_accuracy: 0.6375 - val_loss: 0.9355
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6072 - loss:
0.9587 - val_accuracy: 0.6375 - val_loss: 0.9316
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5915 - loss:
0.9576 - val_accuracy: 0.6295 - val_loss: 0.9303
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5927 - loss:
0.9532 - val_accuracy: 0.6375 - val_loss: 0.9266
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
0.9415 - val_accuracy: 0.6414 - val_loss: 0.9266
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.5954 - loss:
0.9570 - val_accuracy: 0.6454 - val_loss: 0.9216
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6015 - loss:
0.9454 - val_accuracy: 0.6414 - val_loss: 0.9203
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6099 - loss:
0.9413 - val_accuracy: 0.6295 - val_loss: 0.9165
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5946 - loss:
0.9450 - val_accuracy: 0.6255 - val_loss: 0.9149
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5896 - loss:
0.9528 - val_accuracy: 0.6454 - val_loss: 0.9135
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5943 - loss:
0.9393 - val_accuracy: 0.6255 - val_loss: 0.9117
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6098 - loss:
0.9181 - val_accuracy: 0.6414 - val_loss: 0.9102
Epoch 61/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5750 - loss:
0.9430 - val_accuracy: 0.6454 - val_loss: 0.9084
Epoch 62/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6120 - loss:
0.9048 - val_accuracy: 0.6335 - val_loss: 0.9079
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6086 - loss:
0.9296 - val_accuracy: 0.6215 - val_loss: 0.9033
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5990 - loss:
0.9361 - val_accuracy: 0.6335 - val_loss: 0.9024
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6036 - loss:
0.9354 - val_accuracy: 0.6454 - val_loss: 0.9008
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6258 - loss:
0.9039 - val_accuracy: 0.6414 - val_loss: 0.8998
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6294 - loss:
0.9059 - val_accuracy: 0.6255 - val_loss: 0.8998
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5825 - loss:
0.9335 - val_accuracy: 0.6454 - val_loss: 0.8955
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6005 - loss:
0.9301 - val_accuracy: 0.6215 - val_loss: 0.8966
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6111 - loss:
0.9135 - val_accuracy: 0.6255 - val_loss: 0.8942
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6187 - loss:
0.8989 - val_accuracy: 0.6375 - val_loss: 0.8928
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6228 - loss:
0.9084 - val_accuracy: 0.6135 - val_loss: 0.8941
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6064 - loss:
0.9051 - val_accuracy: 0.6494 - val_loss: 0.8904

Epoch 74/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5967 - loss:
0.9202 - val_accuracy: 0.6335 - val_loss: 0.8888

Epoch 75/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9053 - val_accuracy: 0.6375 - val_loss: 0.8880

Epoch 76/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5922 - loss:
0.9186 - val_accuracy: 0.6375 - val_loss: 0.8850

Epoch 77/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6034 - loss:
0.9050 - val_accuracy: 0.6135 - val_loss: 0.8913

Epoch 78/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5889 - loss:
0.9381 - val_accuracy: 0.6295 - val_loss: 0.8825

Epoch 79/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6054 - loss:
0.9002 - val_accuracy: 0.6454 - val_loss: 0.8809

Epoch 80/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5876 - loss:
0.9248 - val_accuracy: 0.6295 - val_loss: 0.8812

Epoch 81/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6072 - loss:
0.8908 - val_accuracy: 0.6494 - val_loss: 0.8802

Epoch 82/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6097 - loss:
0.9018 - val_accuracy: 0.6494 - val_loss: 0.8783

Epoch 83/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6059 - loss:
0.9043 - val_accuracy: 0.6096 - val_loss: 0.8797

Epoch 84/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6139 - loss:
0.9158 - val_accuracy: 0.6375 - val_loss: 0.8754

Epoch 85/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6153 - loss:
0.8918 - val_accuracy: 0.6414 - val_loss: 0.8737

Epoch 86/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6019 - loss:
0.8912 - val_accuracy: 0.6375 - val_loss: 0.8722

Epoch 87/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5959 - loss:
0.9002 - val_accuracy: 0.6454 - val_loss: 0.8710

Epoch 88/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:

0.9096 - val_accuracy: 0.6454 - val_loss: 0.8689
Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.5831 - loss:
0.9173 - val_accuracy: 0.6414 - val_loss: 0.8682
Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6111 - loss:
0.8962 - val_accuracy: 0.6454 - val_loss: 0.8666
training_neural_network: SGD, l2=0.0001, dropout=0.4
Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2711 - loss:
1.4034 - val_accuracy: 0.4024 - val_loss: 1.2472
Epoch 2/90
71/71 ————— 0s 1ms/step - accuracy: 0.4058 - loss:
1.2322 - val_accuracy: 0.5060 - val_loss: 1.1742
Epoch 3/90
71/71 ————— 0s 1ms/step - accuracy: 0.4620 - loss:
1.1948 - val_accuracy: 0.5060 - val_loss: 1.1491
Epoch 4/90
71/71 ————— 0s 1ms/step - accuracy: 0.4638 - loss:
1.1598 - val_accuracy: 0.5060 - val_loss: 1.1403
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4793 - loss:
1.1406 - val_accuracy: 0.5060 - val_loss: 1.1348
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4675 - loss:
1.1460 - val_accuracy: 0.5060 - val_loss: 1.1278
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4704 - loss:
1.1292 - val_accuracy: 0.5060 - val_loss: 1.1221
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4818 - loss:
1.1354 - val_accuracy: 0.5299 - val_loss: 1.1162
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4804 - loss:
1.1365 - val_accuracy: 0.5299 - val_loss: 1.1086
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.5019 - loss:
1.1133 - val_accuracy: 0.5299 - val_loss: 1.1032
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.5177 - loss:
1.1133 - val_accuracy: 0.5339 - val_loss: 1.0964
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.5363 - loss:
1.1039 - val_accuracy: 0.5339 - val_loss: 1.0904

Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5413 - loss:
1.0911 - val_accuracy: 0.5498 - val_loss: 1.0836

Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5503 - loss:
1.1033 - val_accuracy: 0.5578 - val_loss: 1.0782

Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5542 - loss:
1.0790 - val_accuracy: 0.5657 - val_loss: 1.0715

Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5767 - loss:
1.0629 - val_accuracy: 0.5657 - val_loss: 1.0673

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5633 - loss:
1.0665 - val_accuracy: 0.5697 - val_loss: 1.0602

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5689 - loss:
1.0641 - val_accuracy: 0.5777 - val_loss: 1.0549

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5658 - loss:
1.0654 - val_accuracy: 0.5777 - val_loss: 1.0491

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5766 - loss:
1.0469 - val_accuracy: 0.5857 - val_loss: 1.0458

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5750 - loss:
1.0423 - val_accuracy: 0.5857 - val_loss: 1.0397

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5842 - loss:
1.0431 - val_accuracy: 0.5857 - val_loss: 1.0358

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5671 - loss:
1.0563 - val_accuracy: 0.5857 - val_loss: 1.0294

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5655 - loss:
1.0402 - val_accuracy: 0.5857 - val_loss: 1.0245

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5590 - loss:
1.0355 - val_accuracy: 0.5857 - val_loss: 1.0199

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5758 - loss:
1.0264 - val_accuracy: 0.5896 - val_loss: 1.0163

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5844 - loss:

1.0190 - val_accuracy: 0.5936 - val_loss: 1.0128
Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5698 - loss:
1.0221 - val_accuracy: 0.5896 - val_loss: 1.0084
Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5868 - loss:
1.0004 - val_accuracy: 0.5896 - val_loss: 1.0051
Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5765 - loss:
1.0150 - val_accuracy: 0.5976 - val_loss: 1.0038
Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5906 - loss:
1.0158 - val_accuracy: 0.5976 - val_loss: 1.0011
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5774 - loss:
1.0094 - val_accuracy: 0.5976 - val_loss: 0.9949
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5721 - loss:
1.0164 - val_accuracy: 0.5976 - val_loss: 0.9896
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5726 - loss:
1.0193 - val_accuracy: 0.5976 - val_loss: 0.9873
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5866 - loss:
0.9900 - val_accuracy: 0.5936 - val_loss: 0.9841
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5685 - loss:
1.0006 - val_accuracy: 0.6016 - val_loss: 0.9811
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5847 - loss:
0.9891 - val_accuracy: 0.6016 - val_loss: 0.9775
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.5820 - loss:
0.9814 - val_accuracy: 0.5976 - val_loss: 0.9749
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5749 - loss:
1.0120 - val_accuracy: 0.6016 - val_loss: 0.9723
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5863 - loss:
0.9696 - val_accuracy: 0.6016 - val_loss: 0.9679
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5967 - loss:
0.9662 - val_accuracy: 0.6096 - val_loss: 0.9654
Epoch 42/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9720 - val_accuracy: 0.6016 - val_loss: 0.9644
Epoch 43/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5915 - loss:
0.9900 - val_accuracy: 0.6135 - val_loss: 0.9634
Epoch 44/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6000 - loss:
0.9680 - val_accuracy: 0.6016 - val_loss: 0.9593
Epoch 45/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5954 - loss:
0.9603 - val_accuracy: 0.6135 - val_loss: 0.9575
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5974 - loss:
0.9581 - val_accuracy: 0.6096 - val_loss: 0.9539
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9829 - val_accuracy: 0.6175 - val_loss: 0.9538
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5905 - loss:
0.9701 - val_accuracy: 0.6056 - val_loss: 0.9486
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:
0.9542 - val_accuracy: 0.6175 - val_loss: 0.9529
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6079 - loss:
0.9599 - val_accuracy: 0.6135 - val_loss: 0.9475
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6143 - loss:
0.9499 - val_accuracy: 0.6096 - val_loss: 0.9461
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5944 - loss:
0.9625 - val_accuracy: 0.6016 - val_loss: 0.9410
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5871 - loss:
0.9676 - val_accuracy: 0.6056 - val_loss: 0.9390
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5940 - loss:
0.9619 - val_accuracy: 0.6056 - val_loss: 0.9389
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5938 - loss:
0.9488 - val_accuracy: 0.6175 - val_loss: 0.9371
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5955 - loss:
0.9606 - val_accuracy: 0.6096 - val_loss: 0.9366

Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5961 - loss:
0.9473 - val_accuracy: 0.6056 - val_loss: 0.9342

Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5980 - loss:
0.9375 - val_accuracy: 0.6135 - val_loss: 0.9328

Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5997 - loss:
0.9444 - val_accuracy: 0.6135 - val_loss: 0.9327

Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5948 - loss:
0.9452 - val_accuracy: 0.6056 - val_loss: 0.9282

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6105 - loss:
0.9230 - val_accuracy: 0.6135 - val_loss: 0.9268

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5784 - loss:
0.9809 - val_accuracy: 0.6096 - val_loss: 0.9270

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5972 - loss:
0.9475 - val_accuracy: 0.6135 - val_loss: 0.9250

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5925 - loss:
0.9365 - val_accuracy: 0.6096 - val_loss: 0.9283

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6226 - loss:
0.9210 - val_accuracy: 0.6056 - val_loss: 0.9235

Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5950 - loss:
0.9382 - val_accuracy: 0.6016 - val_loss: 0.9212

Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5958 - loss:
0.9372 - val_accuracy: 0.6135 - val_loss: 0.9214

Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6026 - loss:
0.9455 - val_accuracy: 0.6175 - val_loss: 0.9235

Epoch 69/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9605 - val_accuracy: 0.5936 - val_loss: 0.9291

Epoch 70/90
71/71 ————— 0s 1ms/step - accuracy: 0.5922 - loss:
0.9455 - val_accuracy: 0.6056 - val_loss: 0.9162

Epoch 71/90
71/71 ————— 0s 1ms/step - accuracy: 0.6045 - loss:

0.9328 - val_accuracy: 0.6215 - val_loss: 0.9186
Epoch 72/90
71/71 ————— 0s 1ms/step - accuracy: 0.6126 - loss:
0.9337 - val_accuracy: 0.6135 - val_loss: 0.9150
Epoch 73/90
71/71 ————— 0s 1ms/step - accuracy: 0.5993 - loss:
0.9207 - val_accuracy: 0.6096 - val_loss: 0.9158
Epoch 74/90
71/71 ————— 0s 1ms/step - accuracy: 0.5959 - loss:
0.9285 - val_accuracy: 0.6096 - val_loss: 0.9150
Epoch 75/90
71/71 ————— 0s 1ms/step - accuracy: 0.6035 - loss:
0.9443 - val_accuracy: 0.6175 - val_loss: 0.9140
Epoch 76/90
71/71 ————— 0s 1ms/step - accuracy: 0.6070 - loss:
0.9342 - val_accuracy: 0.6135 - val_loss: 0.9144
Epoch 77/90
71/71 ————— 0s 1ms/step - accuracy: 0.6012 - loss:
0.9390 - val_accuracy: 0.6135 - val_loss: 0.9134
Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.6003 - loss:
0.9152 - val_accuracy: 0.6135 - val_loss: 0.9117
Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.9133 - val_accuracy: 0.6135 - val_loss: 0.9129
Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5831 - loss:
0.9373 - val_accuracy: 0.6175 - val_loss: 0.9112
Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6053 - loss:
0.9182 - val_accuracy: 0.6175 - val_loss: 0.9103
Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5850 - loss:
0.9438 - val_accuracy: 0.6135 - val_loss: 0.9095
Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6024 - loss:
0.9242 - val_accuracy: 0.6096 - val_loss: 0.9114
Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6027 - loss:
0.9139 - val_accuracy: 0.6175 - val_loss: 0.9069
Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.5770 - loss:
0.9423 - val_accuracy: 0.6175 - val_loss: 0.9083
Epoch 86/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6287 - loss:
0.8964 - val_accuracy: 0.6175 - val_loss: 0.9054
Epoch 87/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5886 - loss:
0.9266 - val_accuracy: 0.6175 - val_loss: 0.9067
Epoch 88/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5980 - loss:
0.9311 - val_accuracy: 0.6175 - val_loss: 0.9067
Epoch 89/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6020 - loss:
0.9090 - val_accuracy: 0.6255 - val_loss: 0.9031
Epoch 90/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5961 - loss:
0.9239 - val_accuracy: 0.6135 - val_loss: 0.9047
training_neural_network: SGD, l2=0.0001, dropout=0.7000000000000001
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.2811 - loss:
1.3859 - val_accuracy: 0.4622 - val_loss: 1.2814
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4419 - loss:
1.2712 - val_accuracy: 0.4821 - val_loss: 1.2088
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4685 - loss:
1.2135 - val_accuracy: 0.5179 - val_loss: 1.1748
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4667 - loss:
1.2015 - val_accuracy: 0.5060 - val_loss: 1.1576
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4705 - loss:
1.1816 - val_accuracy: 0.5060 - val_loss: 1.1470
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4710 - loss:
1.1626 - val_accuracy: 0.5060 - val_loss: 1.1397
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4642 - loss:
1.1642 - val_accuracy: 0.5060 - val_loss: 1.1328
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4536 - loss:
1.1586 - val_accuracy: 0.5060 - val_loss: 1.1262
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4664 - loss:
1.1505 - val_accuracy: 0.5060 - val_loss: 1.1184
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4654 - loss:

1.1306 - val_accuracy: 0.5060 - val_loss: 1.1106
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4630 - loss:
1.1361 - val_accuracy: 0.5060 - val_loss: 1.1021
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4654 - loss:
1.1347 - val_accuracy: 0.5060 - val_loss: 1.0932
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.4842 - loss:
1.0916 - val_accuracy: 0.5179 - val_loss: 1.0846
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.4726 - loss:
1.1030 - val_accuracy: 0.5339 - val_loss: 1.0750
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.4957 - loss:
1.0782 - val_accuracy: 0.5498 - val_loss: 1.0661
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5024 - loss:
1.0815 - val_accuracy: 0.5538 - val_loss: 1.0565
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5231 - loss:
1.0597 - val_accuracy: 0.5578 - val_loss: 1.0480
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5534 - loss:
1.0450 - val_accuracy: 0.5578 - val_loss: 1.0390
Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5555 - loss:
1.0480 - val_accuracy: 0.5697 - val_loss: 1.0311
Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5470 - loss:
1.0613 - val_accuracy: 0.5896 - val_loss: 1.0234
Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5794 - loss:
1.0271 - val_accuracy: 0.5817 - val_loss: 1.0155
Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5844 - loss:
1.0157 - val_accuracy: 0.6016 - val_loss: 1.0089
Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5803 - loss:
1.0174 - val_accuracy: 0.6016 - val_loss: 1.0026
Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5897 - loss:
1.0018 - val_accuracy: 0.5976 - val_loss: 0.9950
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5926 - loss:
0.9954 - val_accuracy: 0.5976 - val_loss: 0.9893
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5892 - loss:
0.9746 - val_accuracy: 0.6016 - val_loss: 0.9838
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5833 - loss:
0.9953 - val_accuracy: 0.6056 - val_loss: 0.9792
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5714 - loss:
1.0106 - val_accuracy: 0.6175 - val_loss: 0.9748
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5857 - loss:
0.9921 - val_accuracy: 0.6135 - val_loss: 0.9684
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5987 - loss:
0.9781 - val_accuracy: 0.6096 - val_loss: 0.9655
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9616 - val_accuracy: 0.6135 - val_loss: 0.9610
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5984 - loss:
0.9661 - val_accuracy: 0.6135 - val_loss: 0.9568
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6011 - loss:
0.9525 - val_accuracy: 0.6135 - val_loss: 0.9534
Epoch 34/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5814 - loss:
0.9873 - val_accuracy: 0.6135 - val_loss: 0.9502
Epoch 35/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5837 - loss:
0.9789 - val_accuracy: 0.6175 - val_loss: 0.9474
Epoch 36/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6107 - loss:
0.9450 - val_accuracy: 0.6215 - val_loss: 0.9449
Epoch 37/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6057 - loss:
0.9434 - val_accuracy: 0.6135 - val_loss: 0.9415
Epoch 38/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5990 - loss:
0.9516 - val_accuracy: 0.6255 - val_loss: 0.9387
Epoch 39/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6142 - loss:
0.9289 - val_accuracy: 0.6255 - val_loss: 0.9370

Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5934 - loss:
0.9568 - val_accuracy: 0.6255 - val_loss: 0.9334

Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.5902 - loss:
0.9576 - val_accuracy: 0.6175 - val_loss: 0.9318

Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6213 - loss:
0.9350 - val_accuracy: 0.6295 - val_loss: 0.9296

Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.5953 - loss:
0.9339 - val_accuracy: 0.6175 - val_loss: 0.9266

Epoch 44/90
71/71 ————— 0s 2ms/step - accuracy: 0.5995 - loss:
0.9353 - val_accuracy: 0.6255 - val_loss: 0.9268

Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5834 - loss:
0.9462 - val_accuracy: 0.6135 - val_loss: 0.9239

Epoch 46/90
71/71 ————— 0s 1ms/step - accuracy: 0.5953 - loss:
0.9338 - val_accuracy: 0.6175 - val_loss: 0.9241

Epoch 47/90
71/71 ————— 0s 1ms/step - accuracy: 0.6046 - loss:
0.9556 - val_accuracy: 0.6335 - val_loss: 0.9227

Epoch 48/90
71/71 ————— 0s 1ms/step - accuracy: 0.6014 - loss:
0.9488 - val_accuracy: 0.6335 - val_loss: 0.9200

Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.5879 - loss:
0.9239 - val_accuracy: 0.6215 - val_loss: 0.9191

Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.5955 - loss:
0.9152 - val_accuracy: 0.6295 - val_loss: 0.9190

Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5844 - loss:
0.9398 - val_accuracy: 0.6175 - val_loss: 0.9146

Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5881 - loss:
0.9521 - val_accuracy: 0.6175 - val_loss: 0.9143

Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:
0.9082 - val_accuracy: 0.6175 - val_loss: 0.9160

Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6113 - loss:

0.9177 - val_accuracy: 0.6135 - val_loss: 0.9134
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9179 - val_accuracy: 0.6175 - val_loss: 0.9123
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6033 - loss:
0.9026 - val_accuracy: 0.6096 - val_loss: 0.9142
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.6096 - loss:
0.9194 - val_accuracy: 0.6056 - val_loss: 0.9122
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5992 - loss:
0.9178 - val_accuracy: 0.6215 - val_loss: 0.9107
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5962 - loss:
0.9376 - val_accuracy: 0.6096 - val_loss: 0.9106
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.5863 - loss:
0.9374 - val_accuracy: 0.6096 - val_loss: 0.9099
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5957 - loss:
0.9249 - val_accuracy: 0.6135 - val_loss: 0.9072
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5679 - loss:
0.9491 - val_accuracy: 0.6135 - val_loss: 0.9061
Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.5999 - loss:
0.9284 - val_accuracy: 0.6255 - val_loss: 0.9046
Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.6069 - loss:
0.9176 - val_accuracy: 0.6175 - val_loss: 0.9042
Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6056 - loss:
0.9246 - val_accuracy: 0.6056 - val_loss: 0.9062
Epoch 66/90
71/71 ————— 0s 1ms/step - accuracy: 0.5869 - loss:
0.9280 - val_accuracy: 0.6135 - val_loss: 0.9033
Epoch 67/90
71/71 ————— 0s 1ms/step - accuracy: 0.5853 - loss:
0.9103 - val_accuracy: 0.6096 - val_loss: 0.9016
Epoch 68/90
71/71 ————— 0s 1ms/step - accuracy: 0.6068 - loss:
0.9043 - val_accuracy: 0.6096 - val_loss: 0.9028
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6108 - loss:
0.9068 - val_accuracy: 0.6016 - val_loss: 0.9048
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5903 - loss:
0.9387 - val_accuracy: 0.6096 - val_loss: 0.9013
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5817 - loss:
0.9378 - val_accuracy: 0.6096 - val_loss: 0.9012
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5916 - loss:
0.9287 - val_accuracy: 0.6175 - val_loss: 0.9000
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9142 - val_accuracy: 0.6096 - val_loss: 0.8982
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6000 - loss:
0.9156 - val_accuracy: 0.6096 - val_loss: 0.8967
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6003 - loss:
0.9115 - val_accuracy: 0.6016 - val_loss: 0.8988
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5991 - loss:
0.9079 - val_accuracy: 0.6096 - val_loss: 0.8991
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5996 - loss:
0.9233 - val_accuracy: 0.6096 - val_loss: 0.8984
Epoch 78/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5926 - loss:
0.9161 - val_accuracy: 0.6096 - val_loss: 0.8983
Epoch 79/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5839 - loss:
0.9217 - val_accuracy: 0.6016 - val_loss: 0.8970
training_neural_network: SGD, l2=0.001, dropout=0.1
Epoch 1/90

71/71 ━━━━━━━━━━ 2s 6ms/step - accuracy: 0.3369 - loss:
1.3506 - val_accuracy: 0.5060 - val_loss: 1.2391
Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4813 - loss:
1.2342 - val_accuracy: 0.5060 - val_loss: 1.1947
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4702 - loss:
1.2183 - val_accuracy: 0.5060 - val_loss: 1.1762
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4540 - loss:

1.1993 - val_accuracy: 0.5060 - val_loss: 1.1671
Epoch 5/90
71/71 ————— 0s 1ms/step - accuracy: 0.4714 - loss:
1.1873 - val_accuracy: 0.5060 - val_loss: 1.1609
Epoch 6/90
71/71 ————— 0s 1ms/step - accuracy: 0.4837 - loss:
1.1662 - val_accuracy: 0.5060 - val_loss: 1.1543
Epoch 7/90
71/71 ————— 0s 1ms/step - accuracy: 0.4648 - loss:
1.1770 - val_accuracy: 0.5060 - val_loss: 1.1469
Epoch 8/90
71/71 ————— 0s 1ms/step - accuracy: 0.4802 - loss:
1.1643 - val_accuracy: 0.5060 - val_loss: 1.1395
Epoch 9/90
71/71 ————— 0s 1ms/step - accuracy: 0.4633 - loss:
1.1494 - val_accuracy: 0.5060 - val_loss: 1.1270
Epoch 10/90
71/71 ————— 0s 1ms/step - accuracy: 0.4642 - loss:
1.1524 - val_accuracy: 0.5139 - val_loss: 1.1147
Epoch 11/90
71/71 ————— 0s 1ms/step - accuracy: 0.4502 - loss:
1.1338 - val_accuracy: 0.5259 - val_loss: 1.1031
Epoch 12/90
71/71 ————— 0s 1ms/step - accuracy: 0.4696 - loss:
1.1221 - val_accuracy: 0.5299 - val_loss: 1.0918
Epoch 13/90
71/71 ————— 0s 1ms/step - accuracy: 0.5102 - loss:
1.0691 - val_accuracy: 0.5299 - val_loss: 1.0813
Epoch 14/90
71/71 ————— 0s 1ms/step - accuracy: 0.5218 - loss:
1.0657 - val_accuracy: 0.5418 - val_loss: 1.0714
Epoch 15/90
71/71 ————— 0s 1ms/step - accuracy: 0.5368 - loss:
1.0301 - val_accuracy: 0.5538 - val_loss: 1.0611
Epoch 16/90
71/71 ————— 0s 1ms/step - accuracy: 0.5547 - loss:
1.0709 - val_accuracy: 0.5618 - val_loss: 1.0498
Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5553 - loss:
1.0607 - val_accuracy: 0.5697 - val_loss: 1.0398
Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5730 - loss:
1.0387 - val_accuracy: 0.5896 - val_loss: 1.0310
Epoch 19/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5727 - loss:
1.0162 - val_accuracy: 0.5857 - val_loss: 1.0207
Epoch 20/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5717 - loss:
1.0148 - val_accuracy: 0.5817 - val_loss: 1.0125
Epoch 21/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6018 - loss:
0.9971 - val_accuracy: 0.5777 - val_loss: 1.0048
Epoch 22/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5817 - loss:
0.9996 - val_accuracy: 0.5817 - val_loss: 0.9968
Epoch 23/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5970 - loss:
0.9851 - val_accuracy: 0.5936 - val_loss: 0.9900
Epoch 24/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6031 - loss:
0.9768 - val_accuracy: 0.6016 - val_loss: 0.9830
Epoch 25/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6092 - loss:
0.9566 - val_accuracy: 0.5976 - val_loss: 0.9762
Epoch 26/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5992 - loss:
0.9805 - val_accuracy: 0.6056 - val_loss: 0.9701
Epoch 27/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6043 - loss:
0.9536 - val_accuracy: 0.5976 - val_loss: 0.9642
Epoch 28/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5929 - loss:
0.9805 - val_accuracy: 0.6016 - val_loss: 0.9577
Epoch 29/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6007 - loss:
0.9431 - val_accuracy: 0.6215 - val_loss: 0.9555
Epoch 30/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5898 - loss:
0.9743 - val_accuracy: 0.6016 - val_loss: 0.9485
Epoch 31/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5967 - loss:
0.9545 - val_accuracy: 0.6016 - val_loss: 0.9432
Epoch 32/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6028 - loss:
0.9493 - val_accuracy: 0.6255 - val_loss: 0.9415
Epoch 33/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5984 - loss:
0.9522 - val_accuracy: 0.6056 - val_loss: 0.9357

Epoch 34/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9370 - val_accuracy: 0.6175 - val_loss: 0.9325

Epoch 35/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6067 - loss:
0.9345 - val_accuracy: 0.6295 - val_loss: 0.9300

Epoch 36/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6183 - loss:
0.9313 - val_accuracy: 0.6215 - val_loss: 0.9284

Epoch 37/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6126 - loss:
0.9310 - val_accuracy: 0.6255 - val_loss: 0.9240

Epoch 38/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5919 - loss:
0.9380 - val_accuracy: 0.6255 - val_loss: 0.9231

Epoch 39/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6174 - loss:
0.9092 - val_accuracy: 0.6215 - val_loss: 0.9227

Epoch 40/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5952 - loss:
0.9504 - val_accuracy: 0.6175 - val_loss: 0.9183

Epoch 41/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6067 - loss:
0.9299 - val_accuracy: 0.6175 - val_loss: 0.9141

Epoch 42/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6191 - loss:
0.9110 - val_accuracy: 0.6135 - val_loss: 0.9140

Epoch 43/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6263 - loss:
0.9119 - val_accuracy: 0.6175 - val_loss: 0.9118

Epoch 44/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6048 - loss:
0.9349 - val_accuracy: 0.6175 - val_loss: 0.9092

Epoch 45/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6085 - loss:
0.9216 - val_accuracy: 0.6175 - val_loss: 0.9091

Epoch 46/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6194 - loss:
0.8990 - val_accuracy: 0.6096 - val_loss: 0.9070

Epoch 47/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6137 - loss:
0.9096 - val_accuracy: 0.6175 - val_loss: 0.9036

Epoch 48/90
71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6070 - loss:

0.9313 - val_accuracy: 0.6295 - val_loss: 0.9021
Epoch 49/90
71/71 ————— 0s 1ms/step - accuracy: 0.6064 - loss:
0.9163 - val_accuracy: 0.6295 - val_loss: 0.9004
Epoch 50/90
71/71 ————— 0s 1ms/step - accuracy: 0.6112 - loss:
0.9043 - val_accuracy: 0.6255 - val_loss: 0.8988
Epoch 51/90
71/71 ————— 0s 1ms/step - accuracy: 0.5915 - loss:
0.9212 - val_accuracy: 0.6295 - val_loss: 0.8982
Epoch 52/90
71/71 ————— 0s 1ms/step - accuracy: 0.5869 - loss:
0.9397 - val_accuracy: 0.6255 - val_loss: 0.8971
Epoch 53/90
71/71 ————— 0s 1ms/step - accuracy: 0.5854 - loss:
0.9397 - val_accuracy: 0.6295 - val_loss: 0.8941
Epoch 54/90
71/71 ————— 0s 1ms/step - accuracy: 0.6200 - loss:
0.8905 - val_accuracy: 0.6135 - val_loss: 0.8955
Epoch 55/90
71/71 ————— 0s 1ms/step - accuracy: 0.6230 - loss:
0.8779 - val_accuracy: 0.6096 - val_loss: 0.8937
Epoch 56/90
71/71 ————— 0s 1ms/step - accuracy: 0.6052 - loss:
0.8969 - val_accuracy: 0.6056 - val_loss: 0.8914
Epoch 57/90
71/71 ————— 0s 1ms/step - accuracy: 0.5898 - loss:
0.9059 - val_accuracy: 0.6295 - val_loss: 0.8933
Epoch 58/90
71/71 ————— 0s 1ms/step - accuracy: 0.5831 - loss:
0.9235 - val_accuracy: 0.6255 - val_loss: 0.8893
Epoch 59/90
71/71 ————— 0s 1ms/step - accuracy: 0.5950 - loss:
0.9262 - val_accuracy: 0.6096 - val_loss: 0.8891
Epoch 60/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.8968 - val_accuracy: 0.6135 - val_loss: 0.8880
Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.6120 - loss:
0.8921 - val_accuracy: 0.6295 - val_loss: 0.8867
Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.5965 - loss:
0.9088 - val_accuracy: 0.6175 - val_loss: 0.8859
Epoch 63/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6096 - loss:
0.9043 - val_accuracy: 0.6175 - val_loss: 0.8847
Epoch 64/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6256 - loss:
0.8805 - val_accuracy: 0.6135 - val_loss: 0.8833
Epoch 65/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6030 - loss:
0.8891 - val_accuracy: 0.6135 - val_loss: 0.8834
Epoch 66/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6002 - loss:
0.8818 - val_accuracy: 0.6215 - val_loss: 0.8814
Epoch 67/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6093 - loss:
0.8863 - val_accuracy: 0.6375 - val_loss: 0.8809
Epoch 68/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6039 - loss:
0.8930 - val_accuracy: 0.6096 - val_loss: 0.8813
Epoch 69/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6136 - loss:
0.8968 - val_accuracy: 0.6096 - val_loss: 0.8826
Epoch 70/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6008 - loss:
0.9239 - val_accuracy: 0.6335 - val_loss: 0.8778
Epoch 71/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6020 - loss:
0.9138 - val_accuracy: 0.6135 - val_loss: 0.8773
Epoch 72/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6148 - loss:
0.8991 - val_accuracy: 0.6255 - val_loss: 0.8756
Epoch 73/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6042 - loss:
0.9016 - val_accuracy: 0.6215 - val_loss: 0.8772
Epoch 74/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5981 - loss:
0.9179 - val_accuracy: 0.6175 - val_loss: 0.8772
Epoch 75/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5947 - loss:
0.9070 - val_accuracy: 0.6056 - val_loss: 0.8756
Epoch 76/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5952 - loss:
0.8997 - val_accuracy: 0.6096 - val_loss: 0.8745
Epoch 77/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6232 - loss:
0.8923 - val_accuracy: 0.6096 - val_loss: 0.8741

Epoch 78/90
71/71 ————— 0s 1ms/step - accuracy: 0.5984 - loss:
0.8975 - val_accuracy: 0.6295 - val_loss: 0.8739

Epoch 79/90
71/71 ————— 0s 1ms/step - accuracy: 0.5977 - loss:
0.8935 - val_accuracy: 0.6255 - val_loss: 0.8705

Epoch 80/90
71/71 ————— 0s 1ms/step - accuracy: 0.5933 - loss:
0.9258 - val_accuracy: 0.6096 - val_loss: 0.8699

Epoch 81/90
71/71 ————— 0s 1ms/step - accuracy: 0.6001 - loss:
0.8813 - val_accuracy: 0.6295 - val_loss: 0.8705

Epoch 82/90
71/71 ————— 0s 1ms/step - accuracy: 0.5871 - loss:
0.9076 - val_accuracy: 0.6215 - val_loss: 0.8697

Epoch 83/90
71/71 ————— 0s 1ms/step - accuracy: 0.6151 - loss:
0.8795 - val_accuracy: 0.6175 - val_loss: 0.8727

Epoch 84/90
71/71 ————— 0s 1ms/step - accuracy: 0.6066 - loss:
0.8985 - val_accuracy: 0.6056 - val_loss: 0.8682

Epoch 85/90
71/71 ————— 0s 1ms/step - accuracy: 0.6009 - loss:
0.8854 - val_accuracy: 0.6135 - val_loss: 0.8682

Epoch 86/90
71/71 ————— 0s 1ms/step - accuracy: 0.6181 - loss:
0.8950 - val_accuracy: 0.6175 - val_loss: 0.8654

Epoch 87/90
71/71 ————— 0s 1ms/step - accuracy: 0.6108 - loss:
0.8829 - val_accuracy: 0.6175 - val_loss: 0.8669

Epoch 88/90
71/71 ————— 0s 1ms/step - accuracy: 0.6181 - loss:
0.8737 - val_accuracy: 0.6215 - val_loss: 0.8683

Epoch 89/90
71/71 ————— 0s 1ms/step - accuracy: 0.6210 - loss:
0.8709 - val_accuracy: 0.6215 - val_loss: 0.8637

Epoch 90/90
71/71 ————— 0s 1ms/step - accuracy: 0.6195 - loss:
0.8805 - val_accuracy: 0.6135 - val_loss: 0.8665
training_neural_network: SGD, l2=0.001, dropout=0.4

Epoch 1/90
71/71 ————— 2s 6ms/step - accuracy: 0.2960 - loss:
1.3282 - val_accuracy: 0.4223 - val_loss: 1.2147

Epoch 2/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4535 - loss:
1.2302 - val_accuracy: 0.5060 - val_loss: 1.1540
Epoch 3/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4535 - loss:
1.1960 - val_accuracy: 0.5060 - val_loss: 1.1246
Epoch 4/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4641 - loss:
1.1487 - val_accuracy: 0.5060 - val_loss: 1.1083
Epoch 5/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4603 - loss:
1.1324 - val_accuracy: 0.5060 - val_loss: 1.0969
Epoch 6/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4745 - loss:
1.1161 - val_accuracy: 0.5299 - val_loss: 1.0880
Epoch 7/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4824 - loss:
1.0963 - val_accuracy: 0.5299 - val_loss: 1.0796
Epoch 8/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5060 - loss:
1.0933 - val_accuracy: 0.5339 - val_loss: 1.0727
Epoch 9/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5202 - loss:
1.0946 - val_accuracy: 0.5418 - val_loss: 1.0654
Epoch 10/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5489 - loss:
1.0563 - val_accuracy: 0.5538 - val_loss: 1.0598
Epoch 11/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5558 - loss:
1.0599 - val_accuracy: 0.5538 - val_loss: 1.0516
Epoch 12/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5485 - loss:
1.0466 - val_accuracy: 0.5618 - val_loss: 1.0452
Epoch 13/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5688 - loss:
1.0459 - val_accuracy: 0.5697 - val_loss: 1.0376
Epoch 14/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5494 - loss:
1.0589 - val_accuracy: 0.5697 - val_loss: 1.0300
Epoch 15/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5634 - loss:
1.0307 - val_accuracy: 0.5737 - val_loss: 1.0253
Epoch 16/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5811 - loss:
1.0348 - val_accuracy: 0.5737 - val_loss: 1.0184

Epoch 17/90
71/71 ————— 0s 1ms/step - accuracy: 0.5587 - loss:
1.0340 - val_accuracy: 0.5857 - val_loss: 1.0122

Epoch 18/90
71/71 ————— 0s 1ms/step - accuracy: 0.5718 - loss:
1.0265 - val_accuracy: 0.5817 - val_loss: 1.0064

Epoch 19/90
71/71 ————— 0s 1ms/step - accuracy: 0.5710 - loss:
1.0166 - val_accuracy: 0.5817 - val_loss: 1.0004

Epoch 20/90
71/71 ————— 0s 1ms/step - accuracy: 0.5854 - loss:
0.9775 - val_accuracy: 0.5936 - val_loss: 0.9958

Epoch 21/90
71/71 ————— 0s 1ms/step - accuracy: 0.5720 - loss:
1.0016 - val_accuracy: 0.5857 - val_loss: 0.9893

Epoch 22/90
71/71 ————— 0s 1ms/step - accuracy: 0.5804 - loss:
0.9943 - val_accuracy: 0.5936 - val_loss: 0.9847

Epoch 23/90
71/71 ————— 0s 1ms/step - accuracy: 0.5744 - loss:
0.9954 - val_accuracy: 0.5976 - val_loss: 0.9801

Epoch 24/90
71/71 ————— 0s 1ms/step - accuracy: 0.5788 - loss:
1.0050 - val_accuracy: 0.5936 - val_loss: 0.9744

Epoch 25/90
71/71 ————— 0s 1ms/step - accuracy: 0.5959 - loss:
0.9717 - val_accuracy: 0.5976 - val_loss: 0.9714

Epoch 26/90
71/71 ————— 0s 1ms/step - accuracy: 0.5831 - loss:
0.9781 - val_accuracy: 0.5936 - val_loss: 0.9659

Epoch 27/90
71/71 ————— 0s 1ms/step - accuracy: 0.5854 - loss:
0.9654 - val_accuracy: 0.5936 - val_loss: 0.9624

Epoch 28/90
71/71 ————— 0s 1ms/step - accuracy: 0.5933 - loss:
0.9677 - val_accuracy: 0.5976 - val_loss: 0.9590

Epoch 29/90
71/71 ————— 0s 1ms/step - accuracy: 0.5782 - loss:
0.9777 - val_accuracy: 0.6016 - val_loss: 0.9534

Epoch 30/90
71/71 ————— 0s 1ms/step - accuracy: 0.5856 - loss:
0.9674 - val_accuracy: 0.5976 - val_loss: 0.9491

Epoch 31/90
71/71 ————— 0s 1ms/step - accuracy: 0.5766 - loss:

0.9730 - val_accuracy: 0.5976 - val_loss: 0.9455
Epoch 32/90
71/71 ————— 0s 1ms/step - accuracy: 0.5849 - loss:
0.9453 - val_accuracy: 0.6056 - val_loss: 0.9432
Epoch 33/90
71/71 ————— 0s 1ms/step - accuracy: 0.5992 - loss:
0.9506 - val_accuracy: 0.6056 - val_loss: 0.9400
Epoch 34/90
71/71 ————— 0s 1ms/step - accuracy: 0.5830 - loss:
0.9755 - val_accuracy: 0.6056 - val_loss: 0.9369
Epoch 35/90
71/71 ————— 0s 1ms/step - accuracy: 0.5874 - loss:
0.9608 - val_accuracy: 0.6096 - val_loss: 0.9346
Epoch 36/90
71/71 ————— 0s 1ms/step - accuracy: 0.5867 - loss:
0.9585 - val_accuracy: 0.6016 - val_loss: 0.9312
Epoch 37/90
71/71 ————— 0s 1ms/step - accuracy: 0.5934 - loss:
0.9414 - val_accuracy: 0.6056 - val_loss: 0.9294
Epoch 38/90
71/71 ————— 0s 1ms/step - accuracy: 0.6037 - loss:
0.9333 - val_accuracy: 0.6135 - val_loss: 0.9274
Epoch 39/90
71/71 ————— 0s 1ms/step - accuracy: 0.5970 - loss:
0.9422 - val_accuracy: 0.6175 - val_loss: 0.9259
Epoch 40/90
71/71 ————— 0s 1ms/step - accuracy: 0.5982 - loss:
0.9277 - val_accuracy: 0.6135 - val_loss: 0.9241
Epoch 41/90
71/71 ————— 0s 1ms/step - accuracy: 0.6196 - loss:
0.9089 - val_accuracy: 0.6215 - val_loss: 0.9227
Epoch 42/90
71/71 ————— 0s 1ms/step - accuracy: 0.6213 - loss:
0.9181 - val_accuracy: 0.6096 - val_loss: 0.9206
Epoch 43/90
71/71 ————— 0s 1ms/step - accuracy: 0.6071 - loss:
0.9332 - val_accuracy: 0.6135 - val_loss: 0.9196
Epoch 44/90
71/71 ————— 0s 1ms/step - accuracy: 0.5991 - loss:
0.9365 - val_accuracy: 0.6135 - val_loss: 0.9163
Epoch 45/90
71/71 ————— 0s 1ms/step - accuracy: 0.5937 - loss:
0.9349 - val_accuracy: 0.6255 - val_loss: 0.9164
Epoch 46/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5889 - loss:
0.9656 - val_accuracy: 0.6135 - val_loss: 0.9142
Epoch 47/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5983 - loss:
0.9400 - val_accuracy: 0.6175 - val_loss: 0.9133
Epoch 48/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6054 - loss:
0.9284 - val_accuracy: 0.6255 - val_loss: 0.9120
Epoch 49/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5988 - loss:
0.9304 - val_accuracy: 0.6096 - val_loss: 0.9091
Epoch 50/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5956 - loss:
0.9319 - val_accuracy: 0.6135 - val_loss: 0.9088
Epoch 51/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5874 - loss:
0.9413 - val_accuracy: 0.6135 - val_loss: 0.9081
Epoch 52/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5993 - loss:
0.9452 - val_accuracy: 0.6215 - val_loss: 0.9063
Epoch 53/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5837 - loss:
0.9444 - val_accuracy: 0.6215 - val_loss: 0.9061
Epoch 54/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5894 - loss:
0.9385 - val_accuracy: 0.6135 - val_loss: 0.9070
Epoch 55/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5962 - loss:
0.9313 - val_accuracy: 0.6135 - val_loss: 0.9043
Epoch 56/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5950 - loss:
0.9174 - val_accuracy: 0.6215 - val_loss: 0.9032
Epoch 57/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5968 - loss:
0.9410 - val_accuracy: 0.6175 - val_loss: 0.9023
Epoch 58/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.6117 - loss:
0.9248 - val_accuracy: 0.6215 - val_loss: 0.9027
Epoch 59/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5949 - loss:
0.9149 - val_accuracy: 0.6175 - val_loss: 0.9014
Epoch 60/90

71/71 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.5890 - loss:
0.9443 - val_accuracy: 0.6096 - val_loss: 0.8996

Epoch 61/90
71/71 ————— 0s 1ms/step - accuracy: 0.5927 - loss:
0.9332 - val_accuracy: 0.6135 - val_loss: 0.9005

Epoch 62/90
71/71 ————— 0s 1ms/step - accuracy: 0.6087 - loss:
0.9193 - val_accuracy: 0.6096 - val_loss: 0.9020

Epoch 63/90
71/71 ————— 0s 1ms/step - accuracy: 0.6014 - loss:
0.9090 - val_accuracy: 0.6096 - val_loss: 0.9016

Epoch 64/90
71/71 ————— 0s 1ms/step - accuracy: 0.5986 - loss:
0.8960 - val_accuracy: 0.6175 - val_loss: 0.9025

Epoch 65/90
71/71 ————— 0s 1ms/step - accuracy: 0.6039 - loss:
0.9138 - val_accuracy: 0.6175 - val_loss: 0.9003

training_neural_network: SGD, l2=0.001, dropout=0.7000000000000001

79/79 ————— 0s 2ms/step

53/53 ————— 0s 940us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 894us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 1ms/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 1ms/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 969us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 968us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 1ms/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 890us/step

79/79 ————— 0s 2ms/step

53/53 ————— 0s 963us/step

Without Null

training_decision_tree

training_decision_tree: post-pruning

training_random_forest:n_estimators=2

training_random_forest:n_estimators=3

training_random_forest:n_estimators=5

training_random_forest:n_estimators=7

training_random_forest:n_estimators=11

training_random_forest:n_estimators=13

training_random_forest:n_estimators=20

training_random_forest:n_estimators=30
training_random_forest:n_estimators=50
training_random_forest:n_estimators=70
training_random_forest:n_estimators=90
training_random_forest:n_estimators=120
training_random_forest:n_estimators=150
training_random_forest:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
training_gradient_boost:n_estimators=5
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training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7

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training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
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training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
Without Null
Epoch 1/90
25/25 ━━━━━━━━━━━━━━━━ 1s 15ms/step - accuracy: 0.2331 - loss: 1.1482 - val_accuracy: 0.3708 - val_loss: 1.0993
Epoch 2/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3469 - loss: 1.1371 - val_accuracy: 0.4831 - val_loss: 1.0847
Epoch 3/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3697 - loss: 1.1153 - val_accuracy: 0.4831 - val_loss: 1.0746
Epoch 4/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3899 - loss: 1.1058 - val_accuracy: 0.4944 - val_loss: 1.0673
Epoch 5/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4012 - loss: 1.0921 - val_accuracy: 0.4944 - val_loss: 1.0619
Epoch 6/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3985 - loss: 1.0915 - val_accuracy: 0.4831 - val_loss: 1.0580
Epoch 7/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4406 - loss: 1.0749 - val_accuracy: 0.4719 - val_loss: 1.0554
```

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4447 - loss:
1.0714 - val_accuracy: 0.4607 - val_loss: 1.0534

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4405 - loss:
1.0733 - val_accuracy: 0.4719 - val_loss: 1.0517

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4127 - loss:
1.0753 - val_accuracy: 0.4719 - val_loss: 1.0504

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4110 - loss:
1.0702 - val_accuracy: 0.4607 - val_loss: 1.0496

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4190 - loss:
1.0665 - val_accuracy: 0.4494 - val_loss: 1.0492

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4172 - loss:
1.0658 - val_accuracy: 0.4607 - val_loss: 1.0487

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4544 - loss:
1.0507 - val_accuracy: 0.4607 - val_loss: 1.0482

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4137 - loss:
1.0681 - val_accuracy: 0.4270 - val_loss: 1.0478

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4226 - loss:
1.0593 - val_accuracy: 0.4270 - val_loss: 1.0475

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4676 - loss:
1.0388 - val_accuracy: 0.4270 - val_loss: 1.0471

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4138 - loss:
1.0675 - val_accuracy: 0.4270 - val_loss: 1.0467

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4261 - loss:
1.0483 - val_accuracy: 0.4270 - val_loss: 1.0463

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4056 - loss:
1.0796 - val_accuracy: 0.4270 - val_loss: 1.0460

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4525 - loss:
1.0551 - val_accuracy: 0.4270 - val_loss: 1.0456

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4422 - loss:

1.0595 - val_accuracy: 0.4270 - val_loss: 1.0453
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4443 - loss:
1.0484 - val_accuracy: 0.4270 - val_loss: 1.0451
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4136 - loss:
1.0615 - val_accuracy: 0.4270 - val_loss: 1.0450
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4190 - loss:
1.0594 - val_accuracy: 0.4270 - val_loss: 1.0448
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4388 - loss:
1.0513 - val_accuracy: 0.4270 - val_loss: 1.0446
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4695 - loss:
1.0414 - val_accuracy: 0.4270 - val_loss: 1.0443
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4287 - loss:
1.0624 - val_accuracy: 0.4270 - val_loss: 1.0441
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4234 - loss:
1.0531 - val_accuracy: 0.4270 - val_loss: 1.0439
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4090 - loss:
1.0669 - val_accuracy: 0.4270 - val_loss: 1.0438
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4299 - loss:
1.0609 - val_accuracy: 0.4270 - val_loss: 1.0436
training_neural_network: Adam, l2=0, dropout=0
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.3527 - loss:
1.1044 - val_accuracy: 0.4270 - val_loss: 1.0883
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3719 - loss:
1.0959 - val_accuracy: 0.4045 - val_loss: 1.0863
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3964 - loss:
1.0874 - val_accuracy: 0.3820 - val_loss: 1.0850
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.3838 - loss:
1.0873 - val_accuracy: 0.3820 - val_loss: 1.0839
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4306 - loss:
1.0799 - val_accuracy: 0.3820 - val_loss: 1.0828
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4301 - loss:
1.0814 - val_accuracy: 0.3820 - val_loss: 1.0816
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4327 - loss:
1.0763 - val_accuracy: 0.3933 - val_loss: 1.0807
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4119 - loss:
1.0751 - val_accuracy: 0.3933 - val_loss: 1.0799
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4508 - loss:
1.0686 - val_accuracy: 0.3820 - val_loss: 1.0790
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4421 - loss:
1.0696 - val_accuracy: 0.3820 - val_loss: 1.0783
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4446 - loss:
1.0652 - val_accuracy: 0.3820 - val_loss: 1.0776
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4215 - loss:
1.0757 - val_accuracy: 0.3820 - val_loss: 1.0770
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4821 - loss:
1.0577 - val_accuracy: 0.3820 - val_loss: 1.0762
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4545 - loss:
1.0620 - val_accuracy: 0.3933 - val_loss: 1.0757
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4310 - loss:
1.0811 - val_accuracy: 0.3933 - val_loss: 1.0751
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4038 - loss:
1.0744 - val_accuracy: 0.3933 - val_loss: 1.0746
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4655 - loss:
1.0560 - val_accuracy: 0.3933 - val_loss: 1.0741
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4472 - loss:
1.0615 - val_accuracy: 0.3933 - val_loss: 1.0734
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4367 - loss:
1.0696 - val_accuracy: 0.3933 - val_loss: 1.0730

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4368 - loss:
1.0642 - val_accuracy: 0.4045 - val_loss: 1.0726

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4217 - loss:
1.0647 - val_accuracy: 0.4045 - val_loss: 1.0723

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4715 - loss:
1.0560 - val_accuracy: 0.4045 - val_loss: 1.0719

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4436 - loss:
1.0663 - val_accuracy: 0.4045 - val_loss: 1.0716

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4181 - loss:
1.0691 - val_accuracy: 0.4045 - val_loss: 1.0714

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4296 - loss:
1.0640 - val_accuracy: 0.4045 - val_loss: 1.0713

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4708 - loss:
1.0511 - val_accuracy: 0.4045 - val_loss: 1.0709

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4498 - loss:
1.0567 - val_accuracy: 0.4045 - val_loss: 1.0707

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4452 - loss:
1.0634 - val_accuracy: 0.3933 - val_loss: 1.0705

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4655 - loss:
1.0534 - val_accuracy: 0.3933 - val_loss: 1.0701

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4435 - loss:
1.0586 - val_accuracy: 0.3933 - val_loss: 1.0700

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4396 - loss:
1.0520 - val_accuracy: 0.3933 - val_loss: 1.0700

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4383 - loss:
1.0661 - val_accuracy: 0.3933 - val_loss: 1.0695

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4191 - loss:
1.0638 - val_accuracy: 0.3933 - val_loss: 1.0695

Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4377 - loss:

1.0610 - val_accuracy: 0.3933 - val_loss: 1.0694
training_neural_network: Adam, l2=0, dropout=0.0
Epoch 1/90
25/25 ━━━━━━━━━━━━━━━━ 1s 14ms/step - accuracy: 0.3618 - loss:
1.1125 - val_accuracy: 0.4157 - val_loss: 1.0932
Epoch 2/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3497 - loss:
1.1097 - val_accuracy: 0.4607 - val_loss: 1.0895
Epoch 3/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3593 - loss:
1.0932 - val_accuracy: 0.4270 - val_loss: 1.0884
Epoch 4/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4225 - loss:
1.0874 - val_accuracy: 0.4157 - val_loss: 1.0877
Epoch 5/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4091 - loss:
1.0817 - val_accuracy: 0.3596 - val_loss: 1.0874
Epoch 6/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4497 - loss:
1.0758 - val_accuracy: 0.3820 - val_loss: 1.0871
Epoch 7/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4301 - loss:
1.0809 - val_accuracy: 0.3933 - val_loss: 1.0869
Epoch 8/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4685 - loss:
1.0640 - val_accuracy: 0.3933 - val_loss: 1.0861
Epoch 9/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4301 - loss:
1.0706 - val_accuracy: 0.3933 - val_loss: 1.0859
Epoch 10/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4400 - loss:
1.0651 - val_accuracy: 0.3933 - val_loss: 1.0853
Epoch 11/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4327 - loss:
1.0662 - val_accuracy: 0.3933 - val_loss: 1.0850
Epoch 12/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4548 - loss:
1.0586 - val_accuracy: 0.3933 - val_loss: 1.0845
Epoch 13/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4329 - loss:
1.0580 - val_accuracy: 0.3933 - val_loss: 1.0845
Epoch 14/90
25/25 ━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4684 - loss:
1.0504 - val_accuracy: 0.3933 - val_loss: 1.0834

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4401 - loss:
1.0550 - val_accuracy: 0.3933 - val_loss: 1.0824

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4537 - loss:
1.0441 - val_accuracy: 0.3820 - val_loss: 1.0820

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4549 - loss:
1.0530 - val_accuracy: 0.3820 - val_loss: 1.0810

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4513 - loss:
1.0482 - val_accuracy: 0.3820 - val_loss: 1.0806

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4487 - loss:
1.0457 - val_accuracy: 0.3820 - val_loss: 1.0801

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4473 - loss:
1.0431 - val_accuracy: 0.3820 - val_loss: 1.0801

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4287 - loss:
1.0519 - val_accuracy: 0.3820 - val_loss: 1.0795

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4723 - loss:
1.0339 - val_accuracy: 0.4045 - val_loss: 1.0787

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4620 - loss:
1.0445 - val_accuracy: 0.4045 - val_loss: 1.0783

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4625 - loss:
1.0376 - val_accuracy: 0.4045 - val_loss: 1.0778

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4467 - loss:
1.0471 - val_accuracy: 0.4045 - val_loss: 1.0778

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4883 - loss:
1.0249 - val_accuracy: 0.4045 - val_loss: 1.0774

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4574 - loss:
1.0329 - val_accuracy: 0.4045 - val_loss: 1.0766

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4818 - loss:
1.0371 - val_accuracy: 0.4045 - val_loss: 1.0768

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4518 - loss:

1.0386 - val_accuracy: 0.4045 - val_loss: 1.0767
Epoch 30/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4770 - loss:
1.0281 - val_accuracy: 0.4045 - val_loss: 1.0766
Epoch 31/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4488 - loss:
1.0328 - val_accuracy: 0.4045 - val_loss: 1.0770
Epoch 32/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4482 - loss:
1.0369 - val_accuracy: 0.4045 - val_loss: 1.0769
training_neural_network: Adam, l2=0, dropout=0.2
Epoch 1/90
25/25 ━━━━━━━━ 1s 15ms/step - accuracy: 0.2947 - loss:
1.1744 - val_accuracy: 0.2584 - val_loss: 1.1155
Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3015 - loss:
1.1367 - val_accuracy: 0.2809 - val_loss: 1.0991
Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3066 - loss:
1.1129 - val_accuracy: 0.2809 - val_loss: 1.0888
Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3418 - loss:
1.1029 - val_accuracy: 0.2921 - val_loss: 1.0823
Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4058 - loss:
1.0839 - val_accuracy: 0.3034 - val_loss: 1.0783
Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4180 - loss:
1.0794 - val_accuracy: 0.3371 - val_loss: 1.0753
Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3724 - loss:
1.0913 - val_accuracy: 0.3933 - val_loss: 1.0729
Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4364 - loss:
1.0688 - val_accuracy: 0.3933 - val_loss: 1.0710
Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4318 - loss:
1.0729 - val_accuracy: 0.3820 - val_loss: 1.0695
Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4389 - loss:
1.0821 - val_accuracy: 0.3820 - val_loss: 1.0683
Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4376 - loss:
1.0600 - val_accuracy: 0.3820 - val_loss: 1.0674

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4041 - loss:
1.0764 - val_accuracy: 0.3708 - val_loss: 1.0665

Epoch 13/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4058 - loss:
1.0827 - val_accuracy: 0.3820 - val_loss: 1.0658

Epoch 14/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4407 - loss:
1.0626 - val_accuracy: 0.3820 - val_loss: 1.0652

Epoch 15/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4359 - loss:
1.0696 - val_accuracy: 0.3820 - val_loss: 1.0647

Epoch 16/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4576 - loss:
1.0620 - val_accuracy: 0.3820 - val_loss: 1.0643

Epoch 17/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4119 - loss:
1.0758 - val_accuracy: 0.3820 - val_loss: 1.0639

Epoch 18/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4210 - loss:
1.0721 - val_accuracy: 0.3820 - val_loss: 1.0635

Epoch 19/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4265 - loss:
1.0690 - val_accuracy: 0.3933 - val_loss: 1.0632

Epoch 20/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4343 - loss:
1.0674 - val_accuracy: 0.3933 - val_loss: 1.0629

Epoch 21/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4237 - loss:
1.0721 - val_accuracy: 0.3933 - val_loss: 1.0627

Epoch 22/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4648 - loss:
1.0494 - val_accuracy: 0.3933 - val_loss: 1.0624

Epoch 23/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4217 - loss:
1.0762 - val_accuracy: 0.3933 - val_loss: 1.0621

Epoch 24/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4368 - loss:
1.0607 - val_accuracy: 0.3933 - val_loss: 1.0619

Epoch 25/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4269 - loss:
1.0748 - val_accuracy: 0.3933 - val_loss: 1.0616

Epoch 26/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4486 - loss:

1.0595 - val_accuracy: 0.3933 - val_loss: 1.0615
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4605 - loss:
1.0558 - val_accuracy: 0.3933 - val_loss: 1.0614
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4267 - loss:
1.0632 - val_accuracy: 0.3933 - val_loss: 1.0612
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4401 - loss:
1.0566 - val_accuracy: 0.3933 - val_loss: 1.0611
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4774 - loss:
1.0464 - val_accuracy: 0.3933 - val_loss: 1.0610
training_neural_network: Adam, l2=0, dropout=0.4
Epoch 1/90
25/25 ————— 2s 22ms/step - accuracy: 0.3393 - loss:
1.1189 - val_accuracy: 0.4157 - val_loss: 1.0987
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3258 - loss:
1.1122 - val_accuracy: 0.4157 - val_loss: 1.0902
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3702 - loss:
1.0920 - val_accuracy: 0.4270 - val_loss: 1.0842
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.3821 - loss:
1.0818 - val_accuracy: 0.4270 - val_loss: 1.0799
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4210 - loss:
1.0687 - val_accuracy: 0.3483 - val_loss: 1.0766
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4015 - loss:
1.0701 - val_accuracy: 0.3371 - val_loss: 1.0740
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4166 - loss:
1.0565 - val_accuracy: 0.3596 - val_loss: 1.0720
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4406 - loss:
1.0537 - val_accuracy: 0.3596 - val_loss: 1.0701
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4067 - loss:
1.0565 - val_accuracy: 0.3483 - val_loss: 1.0684
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4092 - loss:
1.0533 - val_accuracy: 0.3483 - val_loss: 1.0671

Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4411 - loss:
1.0448 - val_accuracy: 0.3371 - val_loss: 1.0660

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4280 - loss:
1.0470 - val_accuracy: 0.3371 - val_loss: 1.0649

Epoch 13/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4184 - loss:
1.0435 - val_accuracy: 0.3483 - val_loss: 1.0642

Epoch 14/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4156 - loss:
1.0531 - val_accuracy: 0.3483 - val_loss: 1.0636

Epoch 15/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4311 - loss:
1.0375 - val_accuracy: 0.3371 - val_loss: 1.0627

Epoch 16/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4296 - loss:
1.0451 - val_accuracy: 0.3371 - val_loss: 1.0619

Epoch 17/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4312 - loss:
1.0555 - val_accuracy: 0.3371 - val_loss: 1.0610

Epoch 18/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4298 - loss:
1.0460 - val_accuracy: 0.3371 - val_loss: 1.0602

Epoch 19/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4493 - loss:
1.0349 - val_accuracy: 0.3371 - val_loss: 1.0592

Epoch 20/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4646 - loss:
1.0274 - val_accuracy: 0.3371 - val_loss: 1.0583

Epoch 21/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4556 - loss:
1.0328 - val_accuracy: 0.3371 - val_loss: 1.0575

Epoch 22/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4518 - loss:
1.0360 - val_accuracy: 0.3483 - val_loss: 1.0567

Epoch 23/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4600 - loss:
1.0203 - val_accuracy: 0.3596 - val_loss: 1.0561

Epoch 24/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4667 - loss:
1.0279 - val_accuracy: 0.3596 - val_loss: 1.0553

Epoch 25/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4498 - loss:

1.0289 - val_accuracy: 0.3596 - val_loss: 1.0546
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4495 - loss:
1.0219 - val_accuracy: 0.3596 - val_loss: 1.0540
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4251 - loss:
1.0232 - val_accuracy: 0.3596 - val_loss: 1.0534
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4740 - loss:
1.0076 - val_accuracy: 0.3708 - val_loss: 1.0528
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4688 - loss:
1.0158 - val_accuracy: 0.3708 - val_loss: 1.0522
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4330 - loss:
1.0340 - val_accuracy: 0.3708 - val_loss: 1.0515
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4414 - loss:
1.0308 - val_accuracy: 0.3708 - val_loss: 1.0509
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4536 - loss:
1.0253 - val_accuracy: 0.3708 - val_loss: 1.0503
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4402 - loss:
1.0335 - val_accuracy: 0.3708 - val_loss: 1.0497
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4279 - loss:
1.0509 - val_accuracy: 0.3820 - val_loss: 1.0492
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4432 - loss:
1.0434 - val_accuracy: 0.3820 - val_loss: 1.0487
Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4675 - loss:
1.0236 - val_accuracy: 0.3820 - val_loss: 1.0481
Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4588 - loss:
1.0213 - val_accuracy: 0.3820 - val_loss: 1.0476
Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4506 - loss:
1.0331 - val_accuracy: 0.3820 - val_loss: 1.0472
Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4620 - loss:
1.0173 - val_accuracy: 0.3820 - val_loss: 1.0466
Epoch 40/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4544 - loss:
1.0134 - val_accuracy: 0.3820 - val_loss: 1.0461
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4620 - loss:
1.0200 - val_accuracy: 0.3820 - val_loss: 1.0457
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4552 - loss:
1.0161 - val_accuracy: 0.3820 - val_loss: 1.0452
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4703 - loss:
1.0189 - val_accuracy: 0.3820 - val_loss: 1.0448
Epoch 44/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4651 - loss:
1.0222 - val_accuracy: 0.3820 - val_loss: 1.0444
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4559 - loss:
1.0286 - val_accuracy: 0.3820 - val_loss: 1.0440
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4756 - loss:
1.0246 - val_accuracy: 0.3820 - val_loss: 1.0435
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4406 - loss:
1.0335 - val_accuracy: 0.3820 - val_loss: 1.0432
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4578 - loss:
1.0126 - val_accuracy: 0.3933 - val_loss: 1.0429
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4522 - loss:
1.0257 - val_accuracy: 0.4045 - val_loss: 1.0426
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4268 - loss:
1.0351 - val_accuracy: 0.4045 - val_loss: 1.0423
Epoch 51/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4623 - loss:
1.0274 - val_accuracy: 0.4045 - val_loss: 1.0419
Epoch 52/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4236 - loss:
1.0351 - val_accuracy: 0.4045 - val_loss: 1.0416
Epoch 53/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4675 - loss:
1.0105 - val_accuracy: 0.4045 - val_loss: 1.0412
Epoch 54/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4678 - loss:
1.0075 - val_accuracy: 0.4045 - val_loss: 1.0408

Epoch 55/90
25/25 ————— 0s 2ms/step - accuracy: 0.4394 - loss:
1.0243 - val_accuracy: 0.4045 - val_loss: 1.0406

Epoch 56/90
25/25 ————— 0s 2ms/step - accuracy: 0.4325 - loss:
1.0322 - val_accuracy: 0.4045 - val_loss: 1.0406

Epoch 57/90
25/25 ————— 0s 2ms/step - accuracy: 0.4642 - loss:
1.0371 - val_accuracy: 0.4045 - val_loss: 1.0403

Epoch 58/90
25/25 ————— 0s 2ms/step - accuracy: 0.4260 - loss:
1.0236 - val_accuracy: 0.4045 - val_loss: 1.0401

Epoch 59/90
25/25 ————— 0s 2ms/step - accuracy: 0.4308 - loss:
1.0343 - val_accuracy: 0.4045 - val_loss: 1.0400

Epoch 60/90
25/25 ————— 0s 2ms/step - accuracy: 0.4744 - loss:
1.0143 - val_accuracy: 0.4045 - val_loss: 1.0395

Epoch 61/90
25/25 ————— 0s 2ms/step - accuracy: 0.4586 - loss:
1.0195 - val_accuracy: 0.3933 - val_loss: 1.0392

Epoch 62/90
25/25 ————— 0s 2ms/step - accuracy: 0.4639 - loss:
1.0232 - val_accuracy: 0.4045 - val_loss: 1.0391

Epoch 63/90
25/25 ————— 0s 2ms/step - accuracy: 0.4637 - loss:
1.0229 - val_accuracy: 0.3933 - val_loss: 1.0388

Epoch 64/90
25/25 ————— 0s 2ms/step - accuracy: 0.4435 - loss:
1.0248 - val_accuracy: 0.3933 - val_loss: 1.0389

Epoch 65/90
25/25 ————— 0s 2ms/step - accuracy: 0.4794 - loss:
1.0187 - val_accuracy: 0.3933 - val_loss: 1.0385

Epoch 66/90
25/25 ————— 0s 2ms/step - accuracy: 0.4522 - loss:
1.0123 - val_accuracy: 0.3933 - val_loss: 1.0383
training_neural_network: Adam, l2=0, dropout=0.6000000000000001

Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.3715 - loss:
1.0813 - val_accuracy: 0.3708 - val_loss: 1.0824

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3945 - loss:
1.0780 - val_accuracy: 0.3933 - val_loss: 1.0728

Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4167 - loss:
1.0614 - val_accuracy: 0.3933 - val_loss: 1.0683
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4193 - loss:
1.0632 - val_accuracy: 0.3933 - val_loss: 1.0657
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4345 - loss:
1.0548 - val_accuracy: 0.3933 - val_loss: 1.0633
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4534 - loss:
1.0417 - val_accuracy: 0.3933 - val_loss: 1.0610
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4440 - loss:
1.0470 - val_accuracy: 0.3933 - val_loss: 1.0594
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4205 - loss:
1.0511 - val_accuracy: 0.3933 - val_loss: 1.0579
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4483 - loss:
1.0396 - val_accuracy: 0.3933 - val_loss: 1.0568
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4340 - loss:
1.0467 - val_accuracy: 0.3933 - val_loss: 1.0559
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4309 - loss:
1.0526 - val_accuracy: 0.3933 - val_loss: 1.0554
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4202 - loss:
1.0525 - val_accuracy: 0.3933 - val_loss: 1.0549
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4433 - loss:
1.0335 - val_accuracy: 0.3933 - val_loss: 1.0541
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4676 - loss:
1.0187 - val_accuracy: 0.3933 - val_loss: 1.0533
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4899 - loss:
1.0098 - val_accuracy: 0.4045 - val_loss: 1.0523
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4743 - loss:
1.0145 - val_accuracy: 0.4045 - val_loss: 1.0520
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4465 - loss:
1.0209 - val_accuracy: 0.4045 - val_loss: 1.0517

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4695 - loss:
1.0143 - val_accuracy: 0.4045 - val_loss: 1.0514

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4402 - loss:
1.0362 - val_accuracy: 0.3933 - val_loss: 1.0517

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4297 - loss:
1.0307 - val_accuracy: 0.3933 - val_loss: 1.0517
training_neural_network: Adam, l2=0, dropout=0.8
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 997us/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.4360 - loss:
1.0803 - val_accuracy: 0.4270 - val_loss: 1.0832

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4352 - loss:
1.0765 - val_accuracy: 0.4382 - val_loss: 1.0792

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4297 - loss:
1.0712 - val_accuracy: 0.4045 - val_loss: 1.0762

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4081 - loss:
1.0667 - val_accuracy: 0.3933 - val_loss: 1.0739

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4199 - loss:
1.0702 - val_accuracy: 0.4045 - val_loss: 1.0723

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4411 - loss:
1.0533 - val_accuracy: 0.4045 - val_loss: 1.0708

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4453 - loss:
1.0571 - val_accuracy: 0.4045 - val_loss: 1.0695

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4289 - loss:
1.0623 - val_accuracy: 0.4045 - val_loss: 1.0684

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.3980 - loss:
1.0814 - val_accuracy: 0.3933 - val_loss: 1.0676

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4235 - loss:
1.0570 - val_accuracy: 0.3933 - val_loss: 1.0669

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4480 - loss:
1.0436 - val_accuracy: 0.3820 - val_loss: 1.0664

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4355 - loss:
1.0520 - val_accuracy: 0.3820 - val_loss: 1.0659

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4573 - loss:
1.0438 - val_accuracy: 0.3820 - val_loss: 1.0652

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4387 - loss:
1.0596 - val_accuracy: 0.3820 - val_loss: 1.0648

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4634 - loss:
1.0416 - val_accuracy: 0.3820 - val_loss: 1.0640

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4202 - loss:
1.0516 - val_accuracy: 0.3820 - val_loss: 1.0636

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4452 - loss:
1.0434 - val_accuracy: 0.4045 - val_loss: 1.0630

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4398 - loss:
1.0480 - val_accuracy: 0.4045 - val_loss: 1.0626

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4443 - loss:
1.0443 - val_accuracy: 0.4045 - val_loss: 1.0621

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4446 - loss:
1.0409 - val_accuracy: 0.4045 - val_loss: 1.0614

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4086 - loss:
1.0465 - val_accuracy: 0.4157 - val_loss: 1.0613

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4399 - loss:
1.0489 - val_accuracy: 0.4157 - val_loss: 1.0608

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4485 - loss:

1.0386 - val_accuracy: 0.4157 - val_loss: 1.0602
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4259 - loss:
1.0525 - val_accuracy: 0.4157 - val_loss: 1.0596
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4337 - loss:
1.0480 - val_accuracy: 0.4270 - val_loss: 1.0590
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4526 - loss:
1.0398 - val_accuracy: 0.4270 - val_loss: 1.0581
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4505 - loss:
1.0454 - val_accuracy: 0.4382 - val_loss: 1.0574
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4631 - loss:
1.0332 - val_accuracy: 0.4270 - val_loss: 1.0569
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4672 - loss:
1.0461 - val_accuracy: 0.4270 - val_loss: 1.0563
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4153 - loss:
1.0604 - val_accuracy: 0.4494 - val_loss: 1.0563
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4546 - loss:
1.0311 - val_accuracy: 0.4719 - val_loss: 1.0559
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4635 - loss:
1.0331 - val_accuracy: 0.4719 - val_loss: 1.0557
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4814 - loss:
1.0315 - val_accuracy: 0.4607 - val_loss: 1.0548
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4338 - loss:
1.0499 - val_accuracy: 0.4607 - val_loss: 1.0547
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4229 - loss:
1.0456 - val_accuracy: 0.4607 - val_loss: 1.0542
Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4241 - loss:
1.0479 - val_accuracy: 0.4607 - val_loss: 1.0544
Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4353 - loss:
1.0458 - val_accuracy: 0.4494 - val_loss: 1.0540
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4392 - loss:
1.0346 - val_accuracy: 0.4382 - val_loss: 1.0534
Epoch 39/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4443 - loss:
1.0393 - val_accuracy: 0.4382 - val_loss: 1.0530
Epoch 40/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4176 - loss:
1.0541 - val_accuracy: 0.4382 - val_loss: 1.0527
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4123 - loss:
1.0513 - val_accuracy: 0.4382 - val_loss: 1.0523
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4158 - loss:
1.0551 - val_accuracy: 0.4382 - val_loss: 1.0516
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4278 - loss:
1.0397 - val_accuracy: 0.4382 - val_loss: 1.0510
Epoch 44/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4610 - loss:
1.0149 - val_accuracy: 0.4382 - val_loss: 1.0505
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4416 - loss:
1.0359 - val_accuracy: 0.4382 - val_loss: 1.0501
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4304 - loss:
1.0402 - val_accuracy: 0.4382 - val_loss: 1.0504
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4587 - loss:
1.0279 - val_accuracy: 0.4382 - val_loss: 1.0494
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4479 - loss:
1.0297 - val_accuracy: 0.4382 - val_loss: 1.0491
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4373 - loss:
1.0350 - val_accuracy: 0.4382 - val_loss: 1.0487
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4243 - loss:
1.0277 - val_accuracy: 0.4382 - val_loss: 1.0485
Epoch 51/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4288 - loss:
1.0537 - val_accuracy: 0.4382 - val_loss: 1.0483
Epoch 52/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4322 - loss:
1.0303 - val_accuracy: 0.4382 - val_loss: 1.0479

Epoch 53/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4696 - loss:
1.0140 - val_accuracy: 0.4382 - val_loss: 1.0468

Epoch 54/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4545 - loss:
1.0341 - val_accuracy: 0.4494 - val_loss: 1.0464

Epoch 55/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4529 - loss:
1.0366 - val_accuracy: 0.4494 - val_loss: 1.0464

Epoch 56/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4238 - loss:
1.0468 - val_accuracy: 0.4494 - val_loss: 1.0464

Epoch 57/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4662 - loss:
1.0112 - val_accuracy: 0.4494 - val_loss: 1.0452

Epoch 58/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4472 - loss:
1.0311 - val_accuracy: 0.4494 - val_loss: 1.0451

Epoch 59/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4334 - loss:
1.0350 - val_accuracy: 0.4494 - val_loss: 1.0453

Epoch 60/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4096 - loss:
1.0373 - val_accuracy: 0.4494 - val_loss: 1.0454

Epoch 61/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4596 - loss:
1.0129 - val_accuracy: 0.4494 - val_loss: 1.0442

Epoch 62/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4504 - loss:
1.0131 - val_accuracy: 0.4494 - val_loss: 1.0440

Epoch 63/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4409 - loss:
1.0135 - val_accuracy: 0.4494 - val_loss: 1.0437

Epoch 64/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4422 - loss:
1.0202 - val_accuracy: 0.4494 - val_loss: 1.0434

Epoch 65/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4605 - loss:
1.0140 - val_accuracy: 0.4494 - val_loss: 1.0433

Epoch 66/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4464 - loss:
1.0256 - val_accuracy: 0.4494 - val_loss: 1.0429

Epoch 67/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4645 - loss:

1.0192 - val_accuracy: 0.4494 - val_loss: 1.0426
Epoch 68/90
25/25 ————— 0s 2ms/step - accuracy: 0.4665 - loss:
1.0204 - val_accuracy: 0.4494 - val_loss: 1.0420
Epoch 69/90
25/25 ————— 0s 2ms/step - accuracy: 0.4649 - loss:
1.0154 - val_accuracy: 0.4494 - val_loss: 1.0420
Epoch 70/90
25/25 ————— 0s 2ms/step - accuracy: 0.4624 - loss:
1.0213 - val_accuracy: 0.4494 - val_loss: 1.0409
Epoch 71/90
25/25 ————— 0s 2ms/step - accuracy: 0.4520 - loss:
1.0236 - val_accuracy: 0.4607 - val_loss: 1.0406
Epoch 72/90
25/25 ————— 0s 2ms/step - accuracy: 0.4091 - loss:
1.0310 - val_accuracy: 0.4607 - val_loss: 1.0409
Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4775 - loss:
1.0229 - val_accuracy: 0.4607 - val_loss: 1.0408
Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4594 - loss:
1.0082 - val_accuracy: 0.4719 - val_loss: 1.0404
Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4698 - loss:
1.0117 - val_accuracy: 0.4719 - val_loss: 1.0401
training_neural_network: Adam, l2=0.0, dropout=0
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.4507 - loss:
1.1073 - val_accuracy: 0.4157 - val_loss: 1.1129
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4377 - loss:
1.0979 - val_accuracy: 0.4045 - val_loss: 1.1043
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4335 - loss:
1.0936 - val_accuracy: 0.4045 - val_loss: 1.0979
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4630 - loss:
1.0726 - val_accuracy: 0.4045 - val_loss: 1.0926
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4715 - loss:
1.0624 - val_accuracy: 0.4045 - val_loss: 1.0884
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4524 - loss:
1.0680 - val_accuracy: 0.4045 - val_loss: 1.0850

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4428 - loss:
1.0693 - val_accuracy: 0.4045 - val_loss: 1.0821

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4483 - loss:
1.0547 - val_accuracy: 0.4045 - val_loss: 1.0796

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4129 - loss:
1.0766 - val_accuracy: 0.4045 - val_loss: 1.0778

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4399 - loss:
1.0591 - val_accuracy: 0.4045 - val_loss: 1.0758

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4520 - loss:
1.0530 - val_accuracy: 0.4045 - val_loss: 1.0741

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4419 - loss:
1.0540 - val_accuracy: 0.4045 - val_loss: 1.0728

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4459 - loss:
1.0539 - val_accuracy: 0.4045 - val_loss: 1.0716

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4469 - loss:
1.0477 - val_accuracy: 0.4045 - val_loss: 1.0705

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4300 - loss:
1.0504 - val_accuracy: 0.4045 - val_loss: 1.0697

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4655 - loss:
1.0395 - val_accuracy: 0.4157 - val_loss: 1.0686

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4219 - loss:
1.0547 - val_accuracy: 0.4157 - val_loss: 1.0678

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4227 - loss:
1.0535 - val_accuracy: 0.4157 - val_loss: 1.0672

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4517 - loss:
1.0467 - val_accuracy: 0.4157 - val_loss: 1.0665

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4666 - loss:
1.0432 - val_accuracy: 0.4270 - val_loss: 1.0657

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4323 - loss:

1.0527 - val_accuracy: 0.4270 - val_loss: 1.0652
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4506 - loss:
1.0397 - val_accuracy: 0.4270 - val_loss: 1.0646
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4302 - loss:
1.0528 - val_accuracy: 0.4270 - val_loss: 1.0641
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4497 - loss:
1.0426 - val_accuracy: 0.4270 - val_loss: 1.0637
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4775 - loss:
1.0274 - val_accuracy: 0.4494 - val_loss: 1.0632
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4397 - loss:
1.0415 - val_accuracy: 0.4494 - val_loss: 1.0629
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4208 - loss:
1.0556 - val_accuracy: 0.4270 - val_loss: 1.0628
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4421 - loss:
1.0497 - val_accuracy: 0.4270 - val_loss: 1.0625
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4309 - loss:
1.0356 - val_accuracy: 0.4270 - val_loss: 1.0623
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4074 - loss:
1.0454 - val_accuracy: 0.4270 - val_loss: 1.0620
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4491 - loss:
1.0400 - val_accuracy: 0.4270 - val_loss: 1.0616
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4123 - loss:
1.0471 - val_accuracy: 0.4270 - val_loss: 1.0614
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4500 - loss:
1.0409 - val_accuracy: 0.4270 - val_loss: 1.0611
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4548 - loss:
1.0278 - val_accuracy: 0.4270 - val_loss: 1.0607
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4354 - loss:
1.0352 - val_accuracy: 0.4270 - val_loss: 1.0604
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4390 - loss:
1.0282 - val_accuracy: 0.4270 - val_loss: 1.0601
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4522 - loss:
1.0381 - val_accuracy: 0.4270 - val_loss: 1.0597
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4749 - loss:
1.0186 - val_accuracy: 0.4382 - val_loss: 1.0593
Epoch 39/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4223 - loss:
1.0418 - val_accuracy: 0.4270 - val_loss: 1.0593
Epoch 40/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4262 - loss:
1.0367 - val_accuracy: 0.4270 - val_loss: 1.0591
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4174 - loss:
1.0463 - val_accuracy: 0.4270 - val_loss: 1.0591
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4476 - loss:
1.0291 - val_accuracy: 0.4270 - val_loss: 1.0588
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4168 - loss:
1.0396 - val_accuracy: 0.4270 - val_loss: 1.0588
training_neural_network: Adam, l2=1e-05, dropout=0
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.2674 - loss:
1.1239 - val_accuracy: 0.3820 - val_loss: 1.0791
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3040 - loss:
1.1113 - val_accuracy: 0.4270 - val_loss: 1.0734
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3654 - loss:
1.0949 - val_accuracy: 0.4494 - val_loss: 1.0692
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4438 - loss:
1.0795 - val_accuracy: 0.4382 - val_loss: 1.0657
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3898 - loss:
1.0882 - val_accuracy: 0.4045 - val_loss: 1.0633
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4068 - loss:
1.0858 - val_accuracy: 0.4157 - val_loss: 1.0615
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4278 - loss:

1.0770 - val_accuracy: 0.4157 - val_loss: 1.0602
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4810 - loss:
1.0634 - val_accuracy: 0.4270 - val_loss: 1.0592
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4625 - loss:
1.0712 - val_accuracy: 0.4382 - val_loss: 1.0580
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4489 - loss:
1.0664 - val_accuracy: 0.4270 - val_loss: 1.0569
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4559 - loss:
1.0689 - val_accuracy: 0.4157 - val_loss: 1.0562
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4702 - loss:
1.0635 - val_accuracy: 0.4045 - val_loss: 1.0558
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4459 - loss:
1.0680 - val_accuracy: 0.4157 - val_loss: 1.0556
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4440 - loss:
1.0643 - val_accuracy: 0.4045 - val_loss: 1.0554
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4831 - loss:
1.0434 - val_accuracy: 0.3933 - val_loss: 1.0552
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4707 - loss:
1.0553 - val_accuracy: 0.3933 - val_loss: 1.0549
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4531 - loss:
1.0579 - val_accuracy: 0.3933 - val_loss: 1.0546
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4434 - loss:
1.0531 - val_accuracy: 0.3820 - val_loss: 1.0546
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4540 - loss:
1.0602 - val_accuracy: 0.3820 - val_loss: 1.0544
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4529 - loss:
1.0560 - val_accuracy: 0.3820 - val_loss: 1.0543
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4348 - loss:
1.0549 - val_accuracy: 0.3820 - val_loss: 1.0542
Epoch 22/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4294 - loss:
1.0657 - val_accuracy: 0.3820 - val_loss: 1.0542
training_neural_network: Adam, l2=3.1622776601683795e-05, dropout=0
Epoch 1/90

25/25 ━━━━━━ 1s 15ms/step - accuracy: 0.3721 - loss:
1.0955 - val_accuracy: 0.4270 - val_loss: 1.0925
Epoch 2/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.3936 - loss:
1.0929 - val_accuracy: 0.4494 - val_loss: 1.0889
Epoch 3/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4072 - loss:
1.0780 - val_accuracy: 0.4607 - val_loss: 1.0856
Epoch 4/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4276 - loss:
1.0696 - val_accuracy: 0.4607 - val_loss: 1.0827
Epoch 5/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.3913 - loss:
1.0686 - val_accuracy: 0.4607 - val_loss: 1.0804
Epoch 6/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4273 - loss:
1.0611 - val_accuracy: 0.4607 - val_loss: 1.0781
Epoch 7/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.3999 - loss:
1.0792 - val_accuracy: 0.4607 - val_loss: 1.0760
Epoch 8/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4070 - loss:
1.0644 - val_accuracy: 0.4607 - val_loss: 1.0744
Epoch 9/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4190 - loss:
1.0614 - val_accuracy: 0.4607 - val_loss: 1.0728
Epoch 10/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4158 - loss:
1.0702 - val_accuracy: 0.4494 - val_loss: 1.0712
Epoch 11/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4198 - loss:
1.0608 - val_accuracy: 0.4382 - val_loss: 1.0703
Epoch 12/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4048 - loss:
1.0717 - val_accuracy: 0.4382 - val_loss: 1.0694
Epoch 13/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.4219 - loss:
1.0528 - val_accuracy: 0.4270 - val_loss: 1.0682
Epoch 14/90

25/25 ━━━━━━ 0s 2ms/step - accuracy: 0.3978 - loss:

1.0626 - val_accuracy: 0.4270 - val_loss: 1.0675
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4063 - loss:
1.0540 - val_accuracy: 0.4270 - val_loss: 1.0666
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4391 - loss:
1.0507 - val_accuracy: 0.4382 - val_loss: 1.0659
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4252 - loss:
1.0429 - val_accuracy: 0.4494 - val_loss: 1.0654
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4227 - loss:
1.0428 - val_accuracy: 0.4494 - val_loss: 1.0649
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4191 - loss:
1.0519 - val_accuracy: 0.4382 - val_loss: 1.0644
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4509 - loss:
1.0404 - val_accuracy: 0.4494 - val_loss: 1.0638
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4337 - loss:
1.0441 - val_accuracy: 0.4382 - val_loss: 1.0634
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4329 - loss:
1.0509 - val_accuracy: 0.4382 - val_loss: 1.0633
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4410 - loss:
1.0436 - val_accuracy: 0.4382 - val_loss: 1.0629
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4422 - loss:
1.0448 - val_accuracy: 0.4494 - val_loss: 1.0625
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4291 - loss:
1.0553 - val_accuracy: 0.4382 - val_loss: 1.0621
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4391 - loss:
1.0383 - val_accuracy: 0.4382 - val_loss: 1.0617
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4295 - loss:
1.0282 - val_accuracy: 0.4382 - val_loss: 1.0614
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4414 - loss:
1.0378 - val_accuracy: 0.4382 - val_loss: 1.0611
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4284 - loss:
1.0437 - val_accuracy: 0.4382 - val_loss: 1.0607
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4142 - loss:
1.0439 - val_accuracy: 0.4382 - val_loss: 1.0602
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4677 - loss:
1.0271 - val_accuracy: 0.4494 - val_loss: 1.0599
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4375 - loss:
1.0282 - val_accuracy: 0.4494 - val_loss: 1.0596
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4383 - loss:
1.0361 - val_accuracy: 0.4382 - val_loss: 1.0593
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4417 - loss:
1.0280 - val_accuracy: 0.4382 - val_loss: 1.0591
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4400 - loss:
1.0261 - val_accuracy: 0.4494 - val_loss: 1.0590
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4272 - loss:
1.0358 - val_accuracy: 0.4494 - val_loss: 1.0587
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4337 - loss:
1.0244 - val_accuracy: 0.4494 - val_loss: 1.0582
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4539 - loss:
1.0235 - val_accuracy: 0.4494 - val_loss: 1.0579
Epoch 39/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4336 - loss:
1.0401 - val_accuracy: 0.4494 - val_loss: 1.0577
Epoch 40/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3994 - loss:
1.0399 - val_accuracy: 0.4494 - val_loss: 1.0578
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4464 - loss:
1.0310 - val_accuracy: 0.4494 - val_loss: 1.0577
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4344 - loss:
1.0326 - val_accuracy: 0.4494 - val_loss: 1.0578
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4248 - loss:
1.0253 - val_accuracy: 0.4494 - val_loss: 1.0578

Epoch 44/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4141 - loss:
1.0364 - val_accuracy: 0.4494 - val_loss: 1.0578
training_neural_network: Adam, l2=0.0001, dropout=0

Epoch 1/90
25/25 ━━━━━━━━ 1s 14ms/step - accuracy: 0.4218 - loss:
1.0907 - val_accuracy: 0.4045 - val_loss: 1.1050

Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4403 - loss:
1.0804 - val_accuracy: 0.4045 - val_loss: 1.0992

Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4298 - loss:
1.0827 - val_accuracy: 0.4045 - val_loss: 1.0946

Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4455 - loss:
1.0783 - val_accuracy: 0.4045 - val_loss: 1.0909

Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4590 - loss:
1.0651 - val_accuracy: 0.3933 - val_loss: 1.0879

Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4526 - loss:
1.0696 - val_accuracy: 0.3933 - val_loss: 1.0854

Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4474 - loss:
1.0675 - val_accuracy: 0.3933 - val_loss: 1.0833

Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4202 - loss:
1.0688 - val_accuracy: 0.3933 - val_loss: 1.0816

Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4445 - loss:
1.0697 - val_accuracy: 0.3933 - val_loss: 1.0803

Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4256 - loss:
1.0774 - val_accuracy: 0.3933 - val_loss: 1.0793

Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4344 - loss:
1.0728 - val_accuracy: 0.3933 - val_loss: 1.0783

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4178 - loss:
1.0728 - val_accuracy: 0.3933 - val_loss: 1.0776

Epoch 13/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4589 - loss:
1.0610 - val_accuracy: 0.3933 - val_loss: 1.0768

Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4279 - loss:
1.0640 - val_accuracy: 0.3933 - val_loss: 1.0761
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4193 - loss:
1.0643 - val_accuracy: 0.3933 - val_loss: 1.0756
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4170 - loss:
1.0726 - val_accuracy: 0.3933 - val_loss: 1.0751
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4405 - loss:
1.0645 - val_accuracy: 0.3933 - val_loss: 1.0747
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4696 - loss:
1.0512 - val_accuracy: 0.3933 - val_loss: 1.0741
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4618 - loss:
1.0504 - val_accuracy: 0.3933 - val_loss: 1.0736
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4257 - loss:
1.0673 - val_accuracy: 0.3933 - val_loss: 1.0733
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4331 - loss:
1.0624 - val_accuracy: 0.3933 - val_loss: 1.0729
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4356 - loss:
1.0620 - val_accuracy: 0.3933 - val_loss: 1.0727
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4296 - loss:
1.0645 - val_accuracy: 0.3933 - val_loss: 1.0724
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4397 - loss:
1.0607 - val_accuracy: 0.3933 - val_loss: 1.0722
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4556 - loss:
1.0465 - val_accuracy: 0.3933 - val_loss: 1.0719
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4719 - loss:
1.0554 - val_accuracy: 0.3933 - val_loss: 1.0715
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4465 - loss:
1.0536 - val_accuracy: 0.3933 - val_loss: 1.0712
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4423 - loss:
1.0590 - val_accuracy: 0.3933 - val_loss: 1.0710

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4486 - loss:
1.0496 - val_accuracy: 0.3933 - val_loss: 1.0706

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4385 - loss:
1.0549 - val_accuracy: 0.3933 - val_loss: 1.0705

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4208 - loss:
1.0610 - val_accuracy: 0.3933 - val_loss: 1.0705

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4576 - loss:
1.0449 - val_accuracy: 0.3933 - val_loss: 1.0702

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4700 - loss:
1.0438 - val_accuracy: 0.3933 - val_loss: 1.0699

Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4105 - loss:
1.0638 - val_accuracy: 0.3933 - val_loss: 1.0699

Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4512 - loss:
1.0430 - val_accuracy: 0.3933 - val_loss: 1.0697

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4591 - loss:
1.0540 - val_accuracy: 0.3933 - val_loss: 1.0695

Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4643 - loss:
1.0371 - val_accuracy: 0.3933 - val_loss: 1.0693
training_neural_network: Adam, l2=0.00031622776601683794, dropout=0

Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.3269 - loss:
1.1243 - val_accuracy: 0.3708 - val_loss: 1.1278

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3821 - loss:
1.1062 - val_accuracy: 0.3596 - val_loss: 1.1143

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4239 - loss:
1.0877 - val_accuracy: 0.3596 - val_loss: 1.1050

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4245 - loss:
1.0765 - val_accuracy: 0.3596 - val_loss: 1.0987

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4042 - loss:
1.0787 - val_accuracy: 0.3596 - val_loss: 1.0940

Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4463 - loss:
1.0576 - val_accuracy: 0.3708 - val_loss: 1.0902
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4294 - loss:
1.0565 - val_accuracy: 0.3708 - val_loss: 1.0873
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4442 - loss:
1.0565 - val_accuracy: 0.3708 - val_loss: 1.0853
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4050 - loss:
1.0682 - val_accuracy: 0.3708 - val_loss: 1.0837
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4609 - loss:
1.0337 - val_accuracy: 0.3708 - val_loss: 1.0824
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4670 - loss:
1.0310 - val_accuracy: 0.3708 - val_loss: 1.0813
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4361 - loss:
1.0417 - val_accuracy: 0.3708 - val_loss: 1.0807
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4726 - loss:
1.0328 - val_accuracy: 0.3596 - val_loss: 1.0799
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4204 - loss:
1.0432 - val_accuracy: 0.3596 - val_loss: 1.0794
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4370 - loss:
1.0448 - val_accuracy: 0.3596 - val_loss: 1.0788
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4192 - loss:
1.0435 - val_accuracy: 0.3596 - val_loss: 1.0785
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4344 - loss:
1.0376 - val_accuracy: 0.3483 - val_loss: 1.0784
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4309 - loss:
1.0425 - val_accuracy: 0.3483 - val_loss: 1.0782
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4438 - loss:
1.0327 - val_accuracy: 0.3483 - val_loss: 1.0780
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4150 - loss:
1.0583 - val_accuracy: 0.3483 - val_loss: 1.0779

```
training_neural_network: Adam, l2=0.001, dropout=0
28/28 ━━━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━━━ 0s 967us/step
28/28 ━━━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━━━ 0s 978us/step
28/28 ━━━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━━━ 0s 1ms/step
Epoch 1/90
25/25 ━━━━━━━━━━ 1s 14ms/step - accuracy: 0.3463 - loss:
1.0863 - val_accuracy: 0.3820 - val_loss: 1.0753
Epoch 2/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3612 - loss:
1.0865 - val_accuracy: 0.3933 - val_loss: 1.0730
Epoch 3/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3725 - loss:
1.0629 - val_accuracy: 0.4045 - val_loss: 1.0712
Epoch 4/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3494 - loss:
1.0699 - val_accuracy: 0.3371 - val_loss: 1.0698
Epoch 5/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3836 - loss:
1.0774 - val_accuracy: 0.3596 - val_loss: 1.0689
Epoch 6/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4154 - loss:
1.0549 - val_accuracy: 0.3596 - val_loss: 1.0683
Epoch 7/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4251 - loss:
1.0558 - val_accuracy: 0.3708 - val_loss: 1.0680
Epoch 8/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4032 - loss:
1.0586 - val_accuracy: 0.3596 - val_loss: 1.0677
Epoch 9/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3978 - loss:
1.0620 - val_accuracy: 0.3483 - val_loss: 1.0676
Epoch 10/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4156 - loss:
1.0482 - val_accuracy: 0.3708 - val_loss: 1.0675
Epoch 11/90
```

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3990 - loss:
1.0550 - val_accuracy: 0.4045 - val_loss: 1.0674
training_neural_network: Adam, l2=1e-05, dropout=0.1
Epoch 1/90

25/25 ━━━━━━━━ 1s 15ms/step - accuracy: 0.3861 - loss:
1.1055 - val_accuracy: 0.4719 - val_loss: 1.0596
Epoch 2/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3854 - loss:
1.0940 - val_accuracy: 0.4494 - val_loss: 1.0602
Epoch 3/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4194 - loss:
1.0727 - val_accuracy: 0.4719 - val_loss: 1.0607
Epoch 4/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4380 - loss:
1.0678 - val_accuracy: 0.5056 - val_loss: 1.0612
Epoch 5/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4177 - loss:
1.0724 - val_accuracy: 0.4270 - val_loss: 1.0618
Epoch 6/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4129 - loss:
1.0700 - val_accuracy: 0.4157 - val_loss: 1.0624
training_neural_network: Adam, l2=1e-05, dropout=0.4
Epoch 1/90

25/25 ━━━━━━━━ 1s 15ms/step - accuracy: 0.4098 - loss:
1.1021 - val_accuracy: 0.3146 - val_loss: 1.1198
Epoch 2/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4483 - loss:
1.0649 - val_accuracy: 0.3146 - val_loss: 1.1010
Epoch 3/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4594 - loss:
1.0522 - val_accuracy: 0.3258 - val_loss: 1.0913
Epoch 4/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4313 - loss:
1.0636 - val_accuracy: 0.3258 - val_loss: 1.0848
Epoch 5/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4247 - loss:
1.0688 - val_accuracy: 0.3258 - val_loss: 1.0816
Epoch 6/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4319 - loss:
1.0564 - val_accuracy: 0.3258 - val_loss: 1.0788
Epoch 7/90

25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4039 - loss:
1.0742 - val_accuracy: 0.3146 - val_loss: 1.0770
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4332 - loss:
1.0545 - val_accuracy: 0.3146 - val_loss: 1.0745
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4285 - loss:
1.0603 - val_accuracy: 0.3146 - val_loss: 1.0727
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4247 - loss:
1.0494 - val_accuracy: 0.3258 - val_loss: 1.0706
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4073 - loss:
1.0578 - val_accuracy: 0.3258 - val_loss: 1.0694
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4355 - loss:
1.0525 - val_accuracy: 0.3258 - val_loss: 1.0679
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4321 - loss:
1.0538 - val_accuracy: 0.3146 - val_loss: 1.0670
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4514 - loss:
1.0295 - val_accuracy: 0.3146 - val_loss: 1.0659
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4352 - loss:
1.0525 - val_accuracy: 0.3146 - val_loss: 1.0656
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4572 - loss:
1.0429 - val_accuracy: 0.3371 - val_loss: 1.0643
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4097 - loss:
1.0602 - val_accuracy: 0.3371 - val_loss: 1.0637
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4153 - loss:
1.0556 - val_accuracy: 0.3483 - val_loss: 1.0630
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4250 - loss:
1.0433 - val_accuracy: 0.3483 - val_loss: 1.0620
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4236 - loss:
1.0477 - val_accuracy: 0.3371 - val_loss: 1.0615
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4288 - loss:
1.0565 - val_accuracy: 0.3371 - val_loss: 1.0610
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4286 - loss:
1.0525 - val_accuracy: 0.3371 - val_loss: 1.0607

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4502 - loss:
1.0419 - val_accuracy: 0.3371 - val_loss: 1.0599

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4458 - loss:
1.0377 - val_accuracy: 0.3371 - val_loss: 1.0594

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4424 - loss:
1.0446 - val_accuracy: 0.3483 - val_loss: 1.0591

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4138 - loss:
1.0475 - val_accuracy: 0.3483 - val_loss: 1.0587

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4585 - loss:
1.0371 - val_accuracy: 0.3483 - val_loss: 1.0579

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4232 - loss:
1.0400 - val_accuracy: 0.3483 - val_loss: 1.0577

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4854 - loss:
1.0192 - val_accuracy: 0.3483 - val_loss: 1.0563

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4658 - loss:
1.0261 - val_accuracy: 0.3596 - val_loss: 1.0553

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4581 - loss:
1.0342 - val_accuracy: 0.3596 - val_loss: 1.0551

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4743 - loss:
1.0279 - val_accuracy: 0.3596 - val_loss: 1.0548

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4626 - loss:
1.0385 - val_accuracy: 0.3708 - val_loss: 1.0546

Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4670 - loss:
1.0262 - val_accuracy: 0.3708 - val_loss: 1.0539

Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4633 - loss:
1.0199 - val_accuracy: 0.3820 - val_loss: 1.0542

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4354 - loss:
1.0393 - val_accuracy: 0.3820 - val_loss: 1.0543

Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4571 - loss:

1.0300 - val_accuracy: 0.4045 - val_loss: 1.0538
Epoch 38/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4381 - loss:
1.0502 - val_accuracy: 0.4157 - val_loss: 1.0539
Epoch 39/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4604 - loss:
1.0413 - val_accuracy: 0.4157 - val_loss: 1.0535
training_neural_network: Adam, l2=1e-05, dropout=0.7000000000000001
Epoch 1/90
25/25 ━━━━━━━━ 1s 14ms/step - accuracy: 0.3157 - loss:
1.1092 - val_accuracy: 0.3820 - val_loss: 1.1074
Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3508 - loss:
1.0971 - val_accuracy: 0.3820 - val_loss: 1.0963
Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3654 - loss:
1.0927 - val_accuracy: 0.3933 - val_loss: 1.0878
Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3962 - loss:
1.0874 - val_accuracy: 0.3596 - val_loss: 1.0810
Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3935 - loss:
1.0808 - val_accuracy: 0.4045 - val_loss: 1.0757
Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4173 - loss:
1.0719 - val_accuracy: 0.4157 - val_loss: 1.0714
Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4368 - loss:
1.0601 - val_accuracy: 0.4157 - val_loss: 1.0677
Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4238 - loss:
1.0666 - val_accuracy: 0.3933 - val_loss: 1.0648
Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4329 - loss:
1.0585 - val_accuracy: 0.3933 - val_loss: 1.0627
Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4180 - loss:
1.0646 - val_accuracy: 0.3933 - val_loss: 1.0607
Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4323 - loss:
1.0654 - val_accuracy: 0.3933 - val_loss: 1.0595
Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4159 - loss:
1.0641 - val_accuracy: 0.3933 - val_loss: 1.0584

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4362 - loss:
1.0628 - val_accuracy: 0.3933 - val_loss: 1.0573

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4515 - loss:
1.0533 - val_accuracy: 0.3933 - val_loss: 1.0564

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4460 - loss:
1.0438 - val_accuracy: 0.3933 - val_loss: 1.0557

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4257 - loss:
1.0602 - val_accuracy: 0.3933 - val_loss: 1.0548

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4328 - loss:
1.0543 - val_accuracy: 0.3933 - val_loss: 1.0541

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4364 - loss:
1.0426 - val_accuracy: 0.3933 - val_loss: 1.0533

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4623 - loss:
1.0380 - val_accuracy: 0.3933 - val_loss: 1.0526

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4660 - loss:
1.0362 - val_accuracy: 0.3933 - val_loss: 1.0522

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4169 - loss:
1.0561 - val_accuracy: 0.3933 - val_loss: 1.0518

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4234 - loss:
1.0557 - val_accuracy: 0.3933 - val_loss: 1.0513

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4166 - loss:
1.0644 - val_accuracy: 0.3933 - val_loss: 1.0506

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4298 - loss:
1.0502 - val_accuracy: 0.3933 - val_loss: 1.0500

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4498 - loss:
1.0330 - val_accuracy: 0.3933 - val_loss: 1.0493

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4568 - loss:
1.0237 - val_accuracy: 0.3933 - val_loss: 1.0486

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4136 - loss:

1.0579 - val_accuracy: 0.3933 - val_loss: 1.0477
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4385 - loss:
1.0420 - val_accuracy: 0.3933 - val_loss: 1.0470
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4302 - loss:
1.0390 - val_accuracy: 0.3933 - val_loss: 1.0461
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4506 - loss:
1.0313 - val_accuracy: 0.3933 - val_loss: 1.0453
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4516 - loss:
1.0347 - val_accuracy: 0.3933 - val_loss: 1.0444
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4605 - loss:
1.0262 - val_accuracy: 0.3933 - val_loss: 1.0434
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4220 - loss:
1.0328 - val_accuracy: 0.3933 - val_loss: 1.0427
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4579 - loss:
1.0344 - val_accuracy: 0.3933 - val_loss: 1.0416
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4199 - loss:
1.0487 - val_accuracy: 0.3933 - val_loss: 1.0407
Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4533 - loss:
1.0292 - val_accuracy: 0.3933 - val_loss: 1.0399
Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4374 - loss:
1.0217 - val_accuracy: 0.3933 - val_loss: 1.0391
Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4293 - loss:
1.0333 - val_accuracy: 0.3933 - val_loss: 1.0382
Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4366 - loss:
1.0317 - val_accuracy: 0.3933 - val_loss: 1.0376
Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4311 - loss:
1.0292 - val_accuracy: 0.3933 - val_loss: 1.0368
Epoch 41/90
25/25 ————— 0s 2ms/step - accuracy: 0.4657 - loss:
1.0330 - val_accuracy: 0.3933 - val_loss: 1.0358
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4349 - loss:
1.0405 - val_accuracy: 0.3820 - val_loss: 1.0353
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4515 - loss:
1.0360 - val_accuracy: 0.3820 - val_loss: 1.0347
Epoch 44/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4610 - loss:
1.0246 - val_accuracy: 0.3820 - val_loss: 1.0337
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4252 - loss:
1.0463 - val_accuracy: 0.3820 - val_loss: 1.0331
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4553 - loss:
1.0177 - val_accuracy: 0.3820 - val_loss: 1.0323
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4494 - loss:
1.0136 - val_accuracy: 0.3820 - val_loss: 1.0316
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4570 - loss:
1.0277 - val_accuracy: 0.3820 - val_loss: 1.0310
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4331 - loss:
1.0223 - val_accuracy: 0.3933 - val_loss: 1.0305
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4302 - loss:
1.0289 - val_accuracy: 0.3933 - val_loss: 1.0300
Epoch 51/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4563 - loss:
1.0250 - val_accuracy: 0.3933 - val_loss: 1.0292
Epoch 52/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4078 - loss:
1.0342 - val_accuracy: 0.3933 - val_loss: 1.0288
Epoch 53/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4640 - loss:
1.0130 - val_accuracy: 0.3933 - val_loss: 1.0280
Epoch 54/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4270 - loss:
1.0343 - val_accuracy: 0.3820 - val_loss: 1.0274
Epoch 55/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4545 - loss:
1.0192 - val_accuracy: 0.3820 - val_loss: 1.0267
Epoch 56/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4526 - loss:
1.0225 - val_accuracy: 0.3820 - val_loss: 1.0260

Epoch 57/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4463 - loss:
1.0256 - val_accuracy: 0.3820 - val_loss: 1.0255

Epoch 58/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4545 - loss:
1.0390 - val_accuracy: 0.3820 - val_loss: 1.0248

Epoch 59/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4289 - loss:
1.0353 - val_accuracy: 0.3820 - val_loss: 1.0244

Epoch 60/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4481 - loss:
1.0228 - val_accuracy: 0.3820 - val_loss: 1.0242

Epoch 61/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4609 - loss:
1.0128 - val_accuracy: 0.3933 - val_loss: 1.0235

Epoch 62/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4730 - loss:
1.0210 - val_accuracy: 0.3820 - val_loss: 1.0226

Epoch 63/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4489 - loss:
1.0204 - val_accuracy: 0.3820 - val_loss: 1.0221

Epoch 64/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4592 - loss:
1.0177 - val_accuracy: 0.3820 - val_loss: 1.0213

Epoch 65/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4725 - loss:
1.0158 - val_accuracy: 0.3820 - val_loss: 1.0209

Epoch 66/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4803 - loss:
1.0108 - val_accuracy: 0.3708 - val_loss: 1.0201

Epoch 67/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4862 - loss:
1.0174 - val_accuracy: 0.3708 - val_loss: 1.0198

Epoch 68/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4877 - loss:
1.0106 - val_accuracy: 0.3708 - val_loss: 1.0192

Epoch 69/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4276 - loss:
1.0449 - val_accuracy: 0.3708 - val_loss: 1.0190

Epoch 70/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4440 - loss:
1.0277 - val_accuracy: 0.3708 - val_loss: 1.0189

Epoch 71/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4756 - loss:

1.0143 - val_accuracy: 0.3483 - val_loss: 1.0183
Epoch 72/90
25/25 ————— 0s 2ms/step - accuracy: 0.4577 - loss:
1.0273 - val_accuracy: 0.3483 - val_loss: 1.0175
Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4530 - loss:
1.0239 - val_accuracy: 0.3483 - val_loss: 1.0167
Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4431 - loss:
1.0161 - val_accuracy: 0.3483 - val_loss: 1.0162
Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4624 - loss:
1.0124 - val_accuracy: 0.3371 - val_loss: 1.0157
Epoch 76/90
25/25 ————— 0s 2ms/step - accuracy: 0.4362 - loss:
1.0213 - val_accuracy: 0.3483 - val_loss: 1.0154
Epoch 77/90
25/25 ————— 0s 2ms/step - accuracy: 0.4614 - loss:
1.0039 - val_accuracy: 0.3371 - val_loss: 1.0148
Epoch 78/90
25/25 ————— 0s 2ms/step - accuracy: 0.4469 - loss:
1.0127 - val_accuracy: 0.3258 - val_loss: 1.0144
Epoch 79/90
25/25 ————— 0s 2ms/step - accuracy: 0.4521 - loss:
1.0108 - val_accuracy: 0.3258 - val_loss: 1.0141
Epoch 80/90
25/25 ————— 0s 2ms/step - accuracy: 0.4657 - loss:
0.9967 - val_accuracy: 0.3483 - val_loss: 1.0130
Epoch 81/90
25/25 ————— 0s 2ms/step - accuracy: 0.4395 - loss:
1.0080 - val_accuracy: 0.3483 - val_loss: 1.0127
Epoch 82/90
25/25 ————— 0s 2ms/step - accuracy: 0.4622 - loss:
1.0255 - val_accuracy: 0.3483 - val_loss: 1.0124
Epoch 83/90
25/25 ————— 0s 2ms/step - accuracy: 0.4741 - loss:
1.0154 - val_accuracy: 0.3483 - val_loss: 1.0116
Epoch 84/90
25/25 ————— 0s 2ms/step - accuracy: 0.4644 - loss:
1.0047 - val_accuracy: 0.3483 - val_loss: 1.0111
Epoch 85/90
25/25 ————— 0s 2ms/step - accuracy: 0.4666 - loss:
1.0183 - val_accuracy: 0.3596 - val_loss: 1.0104
Epoch 86/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4384 - loss:
1.0321 - val_accuracy: 0.3483 - val_loss: 1.0104
Epoch 87/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4761 - loss:
1.0088 - val_accuracy: 0.3596 - val_loss: 1.0101
Epoch 88/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4726 - loss:
1.0063 - val_accuracy: 0.3483 - val_loss: 1.0099
Epoch 89/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4362 - loss:
1.0197 - val_accuracy: 0.3483 - val_loss: 1.0100
Epoch 90/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4558 - loss:
0.9956 - val_accuracy: 0.3483 - val_loss: 1.0096
training_neural_network: Adam, l2=0.0001, dropout=0.1
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 14ms/step - accuracy: 0.4475 - loss:
1.0746 - val_accuracy: 0.3933 - val_loss: 1.0799
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4279 - loss:
1.0864 - val_accuracy: 0.3933 - val_loss: 1.0762
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4506 - loss:
1.0659 - val_accuracy: 0.3933 - val_loss: 1.0729
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4789 - loss:
1.0584 - val_accuracy: 0.3933 - val_loss: 1.0700
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4386 - loss:
1.0759 - val_accuracy: 0.3933 - val_loss: 1.0677
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4176 - loss:
1.0764 - val_accuracy: 0.3933 - val_loss: 1.0656
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4222 - loss:
1.0684 - val_accuracy: 0.3933 - val_loss: 1.0639
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4412 - loss:
1.0622 - val_accuracy: 0.4045 - val_loss: 1.0622
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4857 - loss:
1.0523 - val_accuracy: 0.4045 - val_loss: 1.0607
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4536 - loss:

1.0516 - val_accuracy: 0.4045 - val_loss: 1.0594
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4059 - loss:
1.0686 - val_accuracy: 0.4045 - val_loss: 1.0584
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4565 - loss:
1.0431 - val_accuracy: 0.4157 - val_loss: 1.0572
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:
1.0582 - val_accuracy: 0.4157 - val_loss: 1.0563
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4611 - loss:
1.0444 - val_accuracy: 0.4045 - val_loss: 1.0554
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4523 - loss:
1.0629 - val_accuracy: 0.4045 - val_loss: 1.0545
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4406 - loss:
1.0622 - val_accuracy: 0.4045 - val_loss: 1.0537
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4591 - loss:
1.0585 - val_accuracy: 0.3933 - val_loss: 1.0529
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4354 - loss:
1.0557 - val_accuracy: 0.3933 - val_loss: 1.0524
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4116 - loss:
1.0696 - val_accuracy: 0.3933 - val_loss: 1.0518
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4351 - loss:
1.0386 - val_accuracy: 0.4045 - val_loss: 1.0514
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4531 - loss:
1.0471 - val_accuracy: 0.4045 - val_loss: 1.0509
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4568 - loss:
1.0462 - val_accuracy: 0.4045 - val_loss: 1.0506
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4715 - loss:
1.0305 - val_accuracy: 0.4045 - val_loss: 1.0502
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4435 - loss:
1.0542 - val_accuracy: 0.4045 - val_loss: 1.0498
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4454 - loss:
1.0559 - val_accuracy: 0.4045 - val_loss: 1.0496
Epoch 26/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4524 - loss:
1.0395 - val_accuracy: 0.4045 - val_loss: 1.0493
Epoch 27/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4096 - loss:
1.0597 - val_accuracy: 0.4045 - val_loss: 1.0493
Epoch 28/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4260 - loss:
1.0461 - val_accuracy: 0.4045 - val_loss: 1.0491
Epoch 29/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4536 - loss:
1.0376 - val_accuracy: 0.4045 - val_loss: 1.0489
Epoch 30/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4662 - loss:
1.0291 - val_accuracy: 0.4045 - val_loss: 1.0486
Epoch 31/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4430 - loss:
1.0351 - val_accuracy: 0.4045 - val_loss: 1.0485
Epoch 32/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4206 - loss:
1.0602 - val_accuracy: 0.4045 - val_loss: 1.0486
Epoch 33/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4514 - loss:
1.0328 - val_accuracy: 0.3933 - val_loss: 1.0484
training_neural_network: Adam, l2=0.0001, dropout=0.4
Epoch 1/90
25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.3605 - loss:
1.0913 - val_accuracy: 0.3820 - val_loss: 1.0896
Epoch 2/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4378 - loss:
1.0813 - val_accuracy: 0.4045 - val_loss: 1.0880
Epoch 3/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4044 - loss:
1.0841 - val_accuracy: 0.3933 - val_loss: 1.0867
Epoch 4/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4531 - loss:
1.0715 - val_accuracy: 0.3933 - val_loss: 1.0853
Epoch 5/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4109 - loss:
1.0846 - val_accuracy: 0.3933 - val_loss: 1.0841
Epoch 6/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4309 - loss:

1.0717 - val_accuracy: 0.3933 - val_loss: 1.0829
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.3961 - loss:
1.0839 - val_accuracy: 0.3933 - val_loss: 1.0817
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4430 - loss:
1.0655 - val_accuracy: 0.3933 - val_loss: 1.0807
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4544 - loss:
1.0656 - val_accuracy: 0.3933 - val_loss: 1.0796
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4346 - loss:
1.0601 - val_accuracy: 0.3933 - val_loss: 1.0786
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4142 - loss:
1.0629 - val_accuracy: 0.3933 - val_loss: 1.0778
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4555 - loss:
1.0531 - val_accuracy: 0.3933 - val_loss: 1.0768
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4216 - loss:
1.0702 - val_accuracy: 0.3933 - val_loss: 1.0759
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4357 - loss:
1.0599 - val_accuracy: 0.3933 - val_loss: 1.0749
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4332 - loss:
1.0623 - val_accuracy: 0.3933 - val_loss: 1.0739
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4326 - loss:
1.0609 - val_accuracy: 0.3933 - val_loss: 1.0730
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4123 - loss:
1.0627 - val_accuracy: 0.3933 - val_loss: 1.0721
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4206 - loss:
1.0578 - val_accuracy: 0.3933 - val_loss: 1.0713
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4642 - loss:
1.0426 - val_accuracy: 0.3933 - val_loss: 1.0704
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4539 - loss:
1.0535 - val_accuracy: 0.3933 - val_loss: 1.0696
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4308 - loss:
1.0505 - val_accuracy: 0.3933 - val_loss: 1.0689
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4057 - loss:
1.0666 - val_accuracy: 0.3933 - val_loss: 1.0683
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4290 - loss:
1.0452 - val_accuracy: 0.3933 - val_loss: 1.0677
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4173 - loss:
1.0558 - val_accuracy: 0.3933 - val_loss: 1.0671
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4468 - loss:
1.0447 - val_accuracy: 0.3933 - val_loss: 1.0666
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4343 - loss:
1.0506 - val_accuracy: 0.3933 - val_loss: 1.0661
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4392 - loss:
1.0494 - val_accuracy: 0.3933 - val_loss: 1.0658
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4179 - loss:
1.0597 - val_accuracy: 0.3933 - val_loss: 1.0655
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4306 - loss:
1.0500 - val_accuracy: 0.3933 - val_loss: 1.0653
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4366 - loss:
1.0374 - val_accuracy: 0.3933 - val_loss: 1.0650
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4533 - loss:
1.0437 - val_accuracy: 0.3933 - val_loss: 1.0647
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4428 - loss:
1.0453 - val_accuracy: 0.3933 - val_loss: 1.0644
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4228 - loss:
1.0533 - val_accuracy: 0.3933 - val_loss: 1.0642
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4354 - loss:
1.0395 - val_accuracy: 0.3933 - val_loss: 1.0639
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4407 - loss:
1.0398 - val_accuracy: 0.3933 - val_loss: 1.0635

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4110 - loss:
1.0583 - val_accuracy: 0.3933 - val_loss: 1.0634

Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4337 - loss:
1.0485 - val_accuracy: 0.3933 - val_loss: 1.0630

Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4338 - loss:
1.0397 - val_accuracy: 0.3933 - val_loss: 1.0628

Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4741 - loss:
1.0266 - val_accuracy: 0.3933 - val_loss: 1.0624

Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4357 - loss:
1.0395 - val_accuracy: 0.3933 - val_loss: 1.0621

Epoch 41/90
25/25 ————— 0s 2ms/step - accuracy: 0.4379 - loss:
1.0370 - val_accuracy: 0.3933 - val_loss: 1.0619

Epoch 42/90
25/25 ————— 0s 2ms/step - accuracy: 0.4007 - loss:
1.0460 - val_accuracy: 0.3933 - val_loss: 1.0620

Epoch 43/90
25/25 ————— 0s 2ms/step - accuracy: 0.4381 - loss:
1.0357 - val_accuracy: 0.3820 - val_loss: 1.0620

Epoch 44/90
25/25 ————— 0s 2ms/step - accuracy: 0.4263 - loss:
1.0436 - val_accuracy: 0.3820 - val_loss: 1.0619
training_neural_network: Adam, l2=0.0001, dropout=0.7000000000000001

Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.4454 - loss:
1.1329 - val_accuracy: 0.3933 - val_loss: 1.1372

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4329 - loss:
1.1058 - val_accuracy: 0.3933 - val_loss: 1.1090

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4467 - loss:
1.0543 - val_accuracy: 0.3933 - val_loss: 1.0951

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4655 - loss:
1.0477 - val_accuracy: 0.3933 - val_loss: 1.0864

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4248 - loss:
1.0589 - val_accuracy: 0.3933 - val_loss: 1.0814

Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4504 - loss:
1.0437 - val_accuracy: 0.3933 - val_loss: 1.0778
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4271 - loss:
1.0672 - val_accuracy: 0.3933 - val_loss: 1.0752
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4391 - loss:
1.0445 - val_accuracy: 0.3933 - val_loss: 1.0732
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4465 - loss:
1.0406 - val_accuracy: 0.3933 - val_loss: 1.0709
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4310 - loss:
1.0382 - val_accuracy: 0.3933 - val_loss: 1.0694
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4340 - loss:
1.0553 - val_accuracy: 0.3933 - val_loss: 1.0681
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4564 - loss:
1.0409 - val_accuracy: 0.3933 - val_loss: 1.0674
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4551 - loss:
1.0391 - val_accuracy: 0.3933 - val_loss: 1.0676
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4140 - loss:
1.0548 - val_accuracy: 0.3820 - val_loss: 1.0676
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4297 - loss:
1.0278 - val_accuracy: 0.3820 - val_loss: 1.0679
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4492 - loss:
1.0239 - val_accuracy: 0.3820 - val_loss: 1.0679
training_neural_network: Adam, l2=0.001, dropout=0.1
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.4011 - loss:
1.1484 - val_accuracy: 0.3820 - val_loss: 1.1147
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4073 - loss:
1.1386 - val_accuracy: 0.4270 - val_loss: 1.1017
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3864 - loss:
1.1437 - val_accuracy: 0.4157 - val_loss: 1.0936
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4310 - loss:

1.1184 - val_accuracy: 0.4382 - val_loss: 1.0877
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4348 - loss:
1.1170 - val_accuracy: 0.4607 - val_loss: 1.0832
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4335 - loss:
1.1057 - val_accuracy: 0.4719 - val_loss: 1.0798
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4434 - loss:
1.0886 - val_accuracy: 0.4607 - val_loss: 1.0766
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4151 - loss:
1.0950 - val_accuracy: 0.4719 - val_loss: 1.0739
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4264 - loss:
1.1036 - val_accuracy: 0.4494 - val_loss: 1.0716
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4387 - loss:
1.1000 - val_accuracy: 0.4270 - val_loss: 1.0694
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4341 - loss:
1.0839 - val_accuracy: 0.4270 - val_loss: 1.0673
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4547 - loss:
1.0721 - val_accuracy: 0.4270 - val_loss: 1.0654
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4403 - loss:
1.0726 - val_accuracy: 0.4270 - val_loss: 1.0637
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4496 - loss:
1.0809 - val_accuracy: 0.4270 - val_loss: 1.0618
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4373 - loss:
1.0722 - val_accuracy: 0.4270 - val_loss: 1.0603
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4378 - loss:
1.0829 - val_accuracy: 0.4270 - val_loss: 1.0589
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4313 - loss:
1.0771 - val_accuracy: 0.4382 - val_loss: 1.0574
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4098 - loss:
1.0847 - val_accuracy: 0.4270 - val_loss: 1.0561
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4815 - loss:
1.0628 - val_accuracy: 0.4270 - val_loss: 1.0546
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4193 - loss:
1.0766 - val_accuracy: 0.4270 - val_loss: 1.0535
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4642 - loss:
1.0596 - val_accuracy: 0.4270 - val_loss: 1.0523
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4500 - loss:
1.0621 - val_accuracy: 0.4270 - val_loss: 1.0511
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4530 - loss:
1.0608 - val_accuracy: 0.4270 - val_loss: 1.0500
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4574 - loss:
1.0623 - val_accuracy: 0.4157 - val_loss: 1.0491
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4592 - loss:
1.0637 - val_accuracy: 0.4157 - val_loss: 1.0482
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4338 - loss:
1.0714 - val_accuracy: 0.4157 - val_loss: 1.0473
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4320 - loss:
1.0716 - val_accuracy: 0.4157 - val_loss: 1.0463
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4654 - loss:
1.0565 - val_accuracy: 0.4157 - val_loss: 1.0451
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4680 - loss:
1.0507 - val_accuracy: 0.4157 - val_loss: 1.0440
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4303 - loss:
1.0698 - val_accuracy: 0.4157 - val_loss: 1.0431
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4516 - loss:
1.0685 - val_accuracy: 0.4494 - val_loss: 1.0417
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4474 - loss:
1.0643 - val_accuracy: 0.4494 - val_loss: 1.0406
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4648 - loss:
1.0596 - val_accuracy: 0.4494 - val_loss: 1.0395

Epoch 34/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4848 - loss:
1.0346 - val_accuracy: 0.4494 - val_loss: 1.0385

Epoch 35/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4650 - loss:
1.0493 - val_accuracy: 0.4494 - val_loss: 1.0376

Epoch 36/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4550 - loss:
1.0577 - val_accuracy: 0.4494 - val_loss: 1.0368

Epoch 37/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4550 - loss:
1.0534 - val_accuracy: 0.4494 - val_loss: 1.0360

Epoch 38/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4768 - loss:
1.0348 - val_accuracy: 0.4494 - val_loss: 1.0351

Epoch 39/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4347 - loss:
1.0548 - val_accuracy: 0.4494 - val_loss: 1.0342

Epoch 40/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4839 - loss:
1.0408 - val_accuracy: 0.4494 - val_loss: 1.0334

Epoch 41/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4721 - loss:
1.0425 - val_accuracy: 0.4494 - val_loss: 1.0326

Epoch 42/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4474 - loss:
1.0555 - val_accuracy: 0.4494 - val_loss: 1.0320

Epoch 43/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4537 - loss:
1.0444 - val_accuracy: 0.4494 - val_loss: 1.0313

Epoch 44/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4701 - loss:
1.0350 - val_accuracy: 0.4494 - val_loss: 1.0306

Epoch 45/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4279 - loss:
1.0524 - val_accuracy: 0.4494 - val_loss: 1.0301

Epoch 46/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4477 - loss:
1.0514 - val_accuracy: 0.4494 - val_loss: 1.0295

Epoch 47/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4334 - loss:
1.0533 - val_accuracy: 0.4494 - val_loss: 1.0289

Epoch 48/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4572 - loss:

1.0438 - val_accuracy: 0.4494 - val_loss: 1.0281
Epoch 49/90
25/25 ————— 0s 2ms/step - accuracy: 0.4437 - loss:
1.0435 - val_accuracy: 0.4494 - val_loss: 1.0276
Epoch 50/90
25/25 ————— 0s 2ms/step - accuracy: 0.4598 - loss:
1.0453 - val_accuracy: 0.4607 - val_loss: 1.0268
Epoch 51/90
25/25 ————— 0s 2ms/step - accuracy: 0.4473 - loss:
1.0476 - val_accuracy: 0.4607 - val_loss: 1.0263
Epoch 52/90
25/25 ————— 0s 2ms/step - accuracy: 0.4558 - loss:
1.0398 - val_accuracy: 0.4607 - val_loss: 1.0257
Epoch 53/90
25/25 ————— 0s 2ms/step - accuracy: 0.4773 - loss:
1.0299 - val_accuracy: 0.4719 - val_loss: 1.0251
Epoch 54/90
25/25 ————— 0s 2ms/step - accuracy: 0.4598 - loss:
1.0326 - val_accuracy: 0.4719 - val_loss: 1.0245
Epoch 55/90
25/25 ————— 0s 2ms/step - accuracy: 0.4377 - loss:
1.0428 - val_accuracy: 0.4719 - val_loss: 1.0246
Epoch 56/90
25/25 ————— 0s 2ms/step - accuracy: 0.4572 - loss:
1.0363 - val_accuracy: 0.4719 - val_loss: 1.0241
Epoch 57/90
25/25 ————— 0s 2ms/step - accuracy: 0.4372 - loss:
1.0482 - val_accuracy: 0.4719 - val_loss: 1.0237
Epoch 58/90
25/25 ————— 0s 2ms/step - accuracy: 0.4532 - loss:
1.0408 - val_accuracy: 0.4831 - val_loss: 1.0233
Epoch 59/90
25/25 ————— 0s 2ms/step - accuracy: 0.4254 - loss:
1.0454 - val_accuracy: 0.4831 - val_loss: 1.0231
Epoch 60/90
25/25 ————— 0s 2ms/step - accuracy: 0.4703 - loss:
1.0266 - val_accuracy: 0.4831 - val_loss: 1.0227
Epoch 61/90
25/25 ————— 0s 2ms/step - accuracy: 0.4348 - loss:
1.0509 - val_accuracy: 0.4719 - val_loss: 1.0224
Epoch 62/90
25/25 ————— 0s 2ms/step - accuracy: 0.4322 - loss:
1.0371 - val_accuracy: 0.4719 - val_loss: 1.0222
Epoch 63/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4675 - loss:
1.0343 - val_accuracy: 0.4607 - val_loss: 1.0218
Epoch 64/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4351 - loss:
1.0350 - val_accuracy: 0.4719 - val_loss: 1.0212
Epoch 65/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4591 - loss:
1.0271 - val_accuracy: 0.4719 - val_loss: 1.0211
Epoch 66/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4442 - loss:
1.0386 - val_accuracy: 0.4719 - val_loss: 1.0213
Epoch 67/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4539 - loss:
1.0350 - val_accuracy: 0.4719 - val_loss: 1.0207
Epoch 68/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4451 - loss:
1.0366 - val_accuracy: 0.4719 - val_loss: 1.0203
Epoch 69/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4672 - loss:
1.0198 - val_accuracy: 0.4719 - val_loss: 1.0198
Epoch 70/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4655 - loss:
1.0274 - val_accuracy: 0.4719 - val_loss: 1.0199
Epoch 71/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4463 - loss:
1.0370 - val_accuracy: 0.4719 - val_loss: 1.0198
Epoch 72/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4612 - loss:
1.0289 - val_accuracy: 0.4831 - val_loss: 1.0200
Epoch 73/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4635 - loss:
1.0202 - val_accuracy: 0.4831 - val_loss: 1.0199
Epoch 74/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4451 - loss:
1.0364 - val_accuracy: 0.4831 - val_loss: 1.0198
training_neural_network: Adam, l2=0.001, dropout=0.4
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.2242 - loss:
1.1416 - val_accuracy: 0.2472 - val_loss: 1.1296
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.2615 - loss:
1.1163 - val_accuracy: 0.3258 - val_loss: 1.1144
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3590 - loss:

1.0982 - val_accuracy: 0.3483 - val_loss: 1.1038
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.3500 - loss:
1.0983 - val_accuracy: 0.3820 - val_loss: 1.0962
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.3984 - loss:
1.0833 - val_accuracy: 0.4045 - val_loss: 1.0905
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4095 - loss:
1.0852 - val_accuracy: 0.4045 - val_loss: 1.0861
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4129 - loss:
1.0766 - val_accuracy: 0.3820 - val_loss: 1.0825
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4144 - loss:
1.0740 - val_accuracy: 0.3820 - val_loss: 1.0798
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4296 - loss:
1.0622 - val_accuracy: 0.3820 - val_loss: 1.0776
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4323 - loss:
1.0673 - val_accuracy: 0.3820 - val_loss: 1.0757
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4432 - loss:
1.0598 - val_accuracy: 0.3820 - val_loss: 1.0740
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4243 - loss:
1.0699 - val_accuracy: 0.3708 - val_loss: 1.0725
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4433 - loss:
1.0615 - val_accuracy: 0.3708 - val_loss: 1.0711
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4401 - loss:
1.0581 - val_accuracy: 0.3820 - val_loss: 1.0699
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4377 - loss:
1.0569 - val_accuracy: 0.3820 - val_loss: 1.0689
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4415 - loss:
1.0543 - val_accuracy: 0.3820 - val_loss: 1.0682
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4436 - loss:
1.0546 - val_accuracy: 0.3820 - val_loss: 1.0675
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4300 - loss:
1.0554 - val_accuracy: 0.3820 - val_loss: 1.0670
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4462 - loss:
1.0535 - val_accuracy: 0.3820 - val_loss: 1.0666
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4479 - loss:
1.0445 - val_accuracy: 0.3820 - val_loss: 1.0661
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4458 - loss:
1.0442 - val_accuracy: 0.3820 - val_loss: 1.0656
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4383 - loss:
1.0556 - val_accuracy: 0.3820 - val_loss: 1.0653
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4491 - loss:
1.0558 - val_accuracy: 0.3820 - val_loss: 1.0650
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4344 - loss:
1.0507 - val_accuracy: 0.3820 - val_loss: 1.0647
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4334 - loss:
1.0535 - val_accuracy: 0.3820 - val_loss: 1.0644
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4475 - loss:
1.0428 - val_accuracy: 0.3820 - val_loss: 1.0641
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4547 - loss:
1.0326 - val_accuracy: 0.3820 - val_loss: 1.0638
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4369 - loss:
1.0477 - val_accuracy: 0.3820 - val_loss: 1.0635
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4515 - loss:
1.0399 - val_accuracy: 0.3820 - val_loss: 1.0632
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4514 - loss:
1.0416 - val_accuracy: 0.3820 - val_loss: 1.0630
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4367 - loss:
1.0463 - val_accuracy: 0.3820 - val_loss: 1.0626
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4129 - loss:
1.0515 - val_accuracy: 0.3820 - val_loss: 1.0623

Epoch 33/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4646 - loss:
1.0353 - val_accuracy: 0.3820 - val_loss: 1.0619

Epoch 34/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4722 - loss:
1.0371 - val_accuracy: 0.3820 - val_loss: 1.0616

Epoch 35/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4582 - loss:
1.0318 - val_accuracy: 0.3820 - val_loss: 1.0613

Epoch 36/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4321 - loss:
1.0501 - val_accuracy: 0.3820 - val_loss: 1.0610

Epoch 37/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4310 - loss:
1.0450 - val_accuracy: 0.3820 - val_loss: 1.0608

Epoch 38/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4390 - loss:
1.0441 - val_accuracy: 0.3820 - val_loss: 1.0606

Epoch 39/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4231 - loss:
1.0444 - val_accuracy: 0.3820 - val_loss: 1.0605

Epoch 40/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4570 - loss:
1.0427 - val_accuracy: 0.3820 - val_loss: 1.0603

Epoch 41/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4420 - loss:
1.0412 - val_accuracy: 0.3820 - val_loss: 1.0602

Epoch 42/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4433 - loss:
1.0380 - val_accuracy: 0.3820 - val_loss: 1.0601

Epoch 43/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4636 - loss:
1.0372 - val_accuracy: 0.3820 - val_loss: 1.0599

Epoch 44/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4531 - loss:
1.0337 - val_accuracy: 0.3820 - val_loss: 1.0596

training_neural_network: Adam, l2=0.001, dropout=0.7000000000000001

28/28 ━━━━━━━━ 0s 3ms/step

19/19 ━━━━━━━━ 0s 1ms/step

28/28 ━━━━━━━━ 0s 3ms/step

19/19 ━━━━━━━━ 0s 982us/step

28/28 ━━━━━━━━ 0s 3ms/step

19/19 ━━━━━━━━ 0s 1ms/step

28/28 ━━━━━━━━ 0s 3ms/step

19/19 ━━━━━━━━ 0s 1ms/step
28/28 ━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━ 0s 919us/step
28/28 ━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━ 0s 1ms/step
28/28 ━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━ 0s 884us/step
28/28 ━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━ 0s 1ms/step
28/28 ━━━━━━━━ 0s 3ms/step
19/19 ━━━━━━━━ 0s 1ms/step
Epoch 1/90
25/25 ━━━━━━━━ 1s 15ms/step - accuracy: 0.3389 - loss:
1.0922 - val_accuracy: 0.4270 - val_loss: 1.0914
Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3528 - loss:
1.0800 - val_accuracy: 0.4607 - val_loss: 1.0887
Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3896 - loss:
1.0742 - val_accuracy: 0.4607 - val_loss: 1.0866
Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4136 - loss:
1.0691 - val_accuracy: 0.4382 - val_loss: 1.0852
Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4140 - loss:
1.0622 - val_accuracy: 0.4382 - val_loss: 1.0844
Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3992 - loss:
1.0652 - val_accuracy: 0.4157 - val_loss: 1.0838
Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4133 - loss:
1.0618 - val_accuracy: 0.4045 - val_loss: 1.0834
Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4315 - loss:
1.0616 - val_accuracy: 0.4045 - val_loss: 1.0832
Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4106 - loss:
1.0633 - val_accuracy: 0.4045 - val_loss: 1.0829
Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4327 - loss:
1.0540 - val_accuracy: 0.3933 - val_loss: 1.0828
Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4372 - loss:
1.0470 - val_accuracy: 0.3933 - val_loss: 1.0828

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4637 - loss:
1.0471 - val_accuracy: 0.3933 - val_loss: 1.0828

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4406 - loss:
1.0462 - val_accuracy: 0.3933 - val_loss: 1.0830

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4567 - loss:
1.0392 - val_accuracy: 0.3933 - val_loss: 1.0830

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4433 - loss:
1.0487 - val_accuracy: 0.3933 - val_loss: 1.0831

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4103 - loss:
1.0695 - val_accuracy: 0.3933 - val_loss: 1.0833
training_neural_network: SGD, l2=0, dropout=0
28/28 ————— 0s 3ms/step
19/19 ————— 0s 995us/step

Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.4050 - loss:
1.0915 - val_accuracy: 0.3820 - val_loss: 1.0834

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4148 - loss:
1.0899 - val_accuracy: 0.3708 - val_loss: 1.0785

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4605 - loss:
1.0773 - val_accuracy: 0.3708 - val_loss: 1.0739

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4604 - loss:
1.0746 - val_accuracy: 0.3933 - val_loss: 1.0698

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4295 - loss:
1.0777 - val_accuracy: 0.3933 - val_loss: 1.0662

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4111 - loss:
1.0802 - val_accuracy: 0.3933 - val_loss: 1.0627

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4410 - loss:
1.0678 - val_accuracy: 0.3933 - val_loss: 1.0596

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4398 - loss:
1.0641 - val_accuracy: 0.3933 - val_loss: 1.0564

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4601 - loss:

1.0516 - val_accuracy: 0.3933 - val_loss: 1.0528
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4592 - loss:
1.0518 - val_accuracy: 0.3933 - val_loss: 1.0499
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4438 - loss:
1.0522 - val_accuracy: 0.3933 - val_loss: 1.0474
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4296 - loss:
1.0611 - val_accuracy: 0.3933 - val_loss: 1.0456
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4610 - loss:
1.0400 - val_accuracy: 0.3933 - val_loss: 1.0441
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4158 - loss:
1.0597 - val_accuracy: 0.3933 - val_loss: 1.0430
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4636 - loss:
1.0330 - val_accuracy: 0.3933 - val_loss: 1.0421
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4456 - loss:
1.0504 - val_accuracy: 0.3933 - val_loss: 1.0413
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4219 - loss:
1.0443 - val_accuracy: 0.3933 - val_loss: 1.0407
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4687 - loss:
1.0275 - val_accuracy: 0.3933 - val_loss: 1.0400
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4135 - loss:
1.0550 - val_accuracy: 0.3933 - val_loss: 1.0394
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4209 - loss:
1.0552 - val_accuracy: 0.3933 - val_loss: 1.0388
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4507 - loss:
1.0449 - val_accuracy: 0.3933 - val_loss: 1.0380
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4341 - loss:
1.0341 - val_accuracy: 0.3933 - val_loss: 1.0372
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4430 - loss:
1.0317 - val_accuracy: 0.3933 - val_loss: 1.0366
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4490 - loss:
1.0392 - val_accuracy: 0.3933 - val_loss: 1.0359
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4312 - loss:
1.0535 - val_accuracy: 0.3933 - val_loss: 1.0354
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4360 - loss:
1.0509 - val_accuracy: 0.3933 - val_loss: 1.0350
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4353 - loss:
1.0336 - val_accuracy: 0.3933 - val_loss: 1.0345
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4473 - loss:
1.0487 - val_accuracy: 0.3933 - val_loss: 1.0341
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4204 - loss:
1.0422 - val_accuracy: 0.3933 - val_loss: 1.0339
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4297 - loss:
1.0344 - val_accuracy: 0.3933 - val_loss: 1.0335
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4181 - loss:
1.0480 - val_accuracy: 0.3933 - val_loss: 1.0333
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4304 - loss:
1.0383 - val_accuracy: 0.3933 - val_loss: 1.0330
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4511 - loss:
1.0343 - val_accuracy: 0.3933 - val_loss: 1.0327
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4093 - loss:
1.0524 - val_accuracy: 0.3933 - val_loss: 1.0326
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4529 - loss:
1.0321 - val_accuracy: 0.3933 - val_loss: 1.0323
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4374 - loss:
1.0331 - val_accuracy: 0.3933 - val_loss: 1.0323
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4394 - loss:
1.0399 - val_accuracy: 0.3933 - val_loss: 1.0320
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4453 - loss:
1.0168 - val_accuracy: 0.3933 - val_loss: 1.0318

Epoch 39/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4488 - loss:
1.0169 - val_accuracy: 0.3933 - val_loss: 1.0316

Epoch 40/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4227 - loss:
1.0461 - val_accuracy: 0.3933 - val_loss: 1.0316
training_neural_network: SGD, l2=0, dropout=0.0

Epoch 1/90
25/25 ━━━━━━━━ 1s 14ms/step - accuracy: 0.4614 - loss:
1.0584 - val_accuracy: 0.3820 - val_loss: 1.0930

Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4284 - loss:
1.0724 - val_accuracy: 0.3820 - val_loss: 1.0830

Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4480 - loss:
1.0539 - val_accuracy: 0.3820 - val_loss: 1.0763

Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4376 - loss:
1.0620 - val_accuracy: 0.3708 - val_loss: 1.0712

Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4481 - loss:
1.0491 - val_accuracy: 0.3820 - val_loss: 1.0673

Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4576 - loss:
1.0387 - val_accuracy: 0.3933 - val_loss: 1.0635

Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4574 - loss:
1.0439 - val_accuracy: 0.3933 - val_loss: 1.0604

Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4415 - loss:
1.0380 - val_accuracy: 0.3933 - val_loss: 1.0575

Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4517 - loss:
1.0312 - val_accuracy: 0.3820 - val_loss: 1.0556

Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4573 - loss:
1.0317 - val_accuracy: 0.3820 - val_loss: 1.0537

Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4357 - loss:
1.0457 - val_accuracy: 0.3820 - val_loss: 1.0519

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4420 - loss:
1.0414 - val_accuracy: 0.3820 - val_loss: 1.0505

Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4267 - loss:
1.0507 - val_accuracy: 0.3820 - val_loss: 1.0495
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4203 - loss:
1.0496 - val_accuracy: 0.3820 - val_loss: 1.0483
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4193 - loss:
1.0600 - val_accuracy: 0.3933 - val_loss: 1.0476
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4323 - loss:
1.0474 - val_accuracy: 0.3933 - val_loss: 1.0468
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4495 - loss:
1.0292 - val_accuracy: 0.3933 - val_loss: 1.0458
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4362 - loss:
1.0452 - val_accuracy: 0.3933 - val_loss: 1.0453
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4605 - loss:
1.0379 - val_accuracy: 0.4045 - val_loss: 1.0441
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4560 - loss:
1.0289 - val_accuracy: 0.4045 - val_loss: 1.0435
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4499 - loss:
1.0433 - val_accuracy: 0.4045 - val_loss: 1.0431
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4335 - loss:
1.0445 - val_accuracy: 0.4045 - val_loss: 1.0425
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4544 - loss:
1.0292 - val_accuracy: 0.4045 - val_loss: 1.0419
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4624 - loss:
1.0177 - val_accuracy: 0.4045 - val_loss: 1.0415
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4227 - loss:
1.0418 - val_accuracy: 0.4045 - val_loss: 1.0414
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4642 - loss:
1.0217 - val_accuracy: 0.4045 - val_loss: 1.0413
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4470 - loss:
1.0306 - val_accuracy: 0.3933 - val_loss: 1.0412

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4610 - loss:
1.0252 - val_accuracy: 0.4045 - val_loss: 1.0407

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4700 - loss:
1.0312 - val_accuracy: 0.4045 - val_loss: 1.0398

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4623 - loss:
1.0337 - val_accuracy: 0.4045 - val_loss: 1.0399

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4372 - loss:
1.0242 - val_accuracy: 0.4045 - val_loss: 1.0396

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4562 - loss:
1.0314 - val_accuracy: 0.4045 - val_loss: 1.0392

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4421 - loss:
1.0123 - val_accuracy: 0.3933 - val_loss: 1.0389

Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4457 - loss:
1.0235 - val_accuracy: 0.3933 - val_loss: 1.0388

Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4318 - loss:
1.0266 - val_accuracy: 0.3933 - val_loss: 1.0387

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4601 - loss:
1.0331 - val_accuracy: 0.3933 - val_loss: 1.0387
training_neural_network: SGD, l2=0, dropout=0.2

Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.3113 - loss:
1.1185 - val_accuracy: 0.3483 - val_loss: 1.0992

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3626 - loss:
1.1041 - val_accuracy: 0.3820 - val_loss: 1.0908

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3811 - loss:
1.0980 - val_accuracy: 0.4157 - val_loss: 1.0850

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4058 - loss:
1.0789 - val_accuracy: 0.4270 - val_loss: 1.0812

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4416 - loss:
1.0712 - val_accuracy: 0.4270 - val_loss: 1.0786

Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4616 - loss:
1.0657 - val_accuracy: 0.4045 - val_loss: 1.0765
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3984 - loss:
1.0689 - val_accuracy: 0.4382 - val_loss: 1.0752
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4381 - loss:
1.0645 - val_accuracy: 0.4382 - val_loss: 1.0743
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4284 - loss:
1.0685 - val_accuracy: 0.4382 - val_loss: 1.0738
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4190 - loss:
1.0643 - val_accuracy: 0.4270 - val_loss: 1.0736
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4434 - loss:
1.0523 - val_accuracy: 0.4157 - val_loss: 1.0735
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4364 - loss:
1.0523 - val_accuracy: 0.4270 - val_loss: 1.0733
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4131 - loss:
1.0471 - val_accuracy: 0.4270 - val_loss: 1.0732
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4403 - loss:
1.0393 - val_accuracy: 0.4270 - val_loss: 1.0731
training_neural_network: SGD, l2=0, dropout=0.4
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 14ms/step - accuracy: 0.3436 - loss:
1.2082 - val_accuracy: 0.4157 - val_loss: 1.1381
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3273 - loss:
1.1663 - val_accuracy: 0.4494 - val_loss: 1.1217
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3726 - loss:
1.1082 - val_accuracy: 0.4494 - val_loss: 1.1132
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3778 - loss:
1.1089 - val_accuracy: 0.4494 - val_loss: 1.1082
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4025 - loss:
1.0905 - val_accuracy: 0.4607 - val_loss: 1.1046
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4313 - loss:

1.0846 - val_accuracy: 0.3933 - val_loss: 1.1019
Epoch 7/90
25/25 ————— 0s 1ms/step - accuracy: 0.4372 - loss:
1.0758 - val_accuracy: 0.4494 - val_loss: 1.0999
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4062 - loss:
1.0872 - val_accuracy: 0.4270 - val_loss: 1.0982
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4009 - loss:
1.0966 - val_accuracy: 0.4270 - val_loss: 1.0967
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4177 - loss:
1.0840 - val_accuracy: 0.4270 - val_loss: 1.0953
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4362 - loss:
1.0885 - val_accuracy: 0.4045 - val_loss: 1.0941
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4521 - loss:
1.0657 - val_accuracy: 0.4157 - val_loss: 1.0926
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4292 - loss:
1.0746 - val_accuracy: 0.4494 - val_loss: 1.0915
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4475 - loss:
1.0548 - val_accuracy: 0.4494 - val_loss: 1.0904
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4563 - loss:
1.0572 - val_accuracy: 0.4382 - val_loss: 1.0893
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4853 - loss:
1.0582 - val_accuracy: 0.4270 - val_loss: 1.0882
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4792 - loss:
1.0582 - val_accuracy: 0.4270 - val_loss: 1.0871
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4824 - loss:
1.0533 - val_accuracy: 0.4270 - val_loss: 1.0860
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4730 - loss:
1.0500 - val_accuracy: 0.4157 - val_loss: 1.0851
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4578 - loss:
1.0766 - val_accuracy: 0.4157 - val_loss: 1.0846
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5017 - loss:
1.0534 - val_accuracy: 0.4157 - val_loss: 1.0838
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4762 - loss:
1.0515 - val_accuracy: 0.4157 - val_loss: 1.0834
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4503 - loss:
1.0626 - val_accuracy: 0.4157 - val_loss: 1.0831
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4638 - loss:
1.0436 - val_accuracy: 0.4157 - val_loss: 1.0825
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4514 - loss:
1.0616 - val_accuracy: 0.4157 - val_loss: 1.0820
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4891 - loss:
1.0364 - val_accuracy: 0.4157 - val_loss: 1.0813
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4720 - loss:
1.0418 - val_accuracy: 0.4157 - val_loss: 1.0808
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4563 - loss:
1.0481 - val_accuracy: 0.4157 - val_loss: 1.0806
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4523 - loss:
1.0496 - val_accuracy: 0.4157 - val_loss: 1.0800
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4394 - loss:
1.0487 - val_accuracy: 0.4157 - val_loss: 1.0796
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4518 - loss:
1.0497 - val_accuracy: 0.4157 - val_loss: 1.0792
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4785 - loss:
1.0445 - val_accuracy: 0.4157 - val_loss: 1.0788
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4752 - loss:
1.0445 - val_accuracy: 0.4157 - val_loss: 1.0785
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4843 - loss:
1.0390 - val_accuracy: 0.4157 - val_loss: 1.0781
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4546 - loss:
1.0493 - val_accuracy: 0.4157 - val_loss: 1.0778

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4550 - loss:
1.0504 - val_accuracy: 0.4157 - val_loss: 1.0775

Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4491 - loss:
1.0634 - val_accuracy: 0.4157 - val_loss: 1.0775

Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4547 - loss:
1.0459 - val_accuracy: 0.4157 - val_loss: 1.0775
training_neural_network: SGD, l2=0, dropout=0.6000000000000001

Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.4135 - loss:
1.1447 - val_accuracy: 0.3596 - val_loss: 1.1628

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4104 - loss:
1.0984 - val_accuracy: 0.3596 - val_loss: 1.1321

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3961 - loss:
1.0976 - val_accuracy: 0.3596 - val_loss: 1.1124

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.3867 - loss:
1.0947 - val_accuracy: 0.3483 - val_loss: 1.0989

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.3993 - loss:
1.0785 - val_accuracy: 0.3708 - val_loss: 1.0933

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4225 - loss:
1.0546 - val_accuracy: 0.3708 - val_loss: 1.0862

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.3939 - loss:
1.0777 - val_accuracy: 0.3596 - val_loss: 1.0819

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4102 - loss:
1.0580 - val_accuracy: 0.3596 - val_loss: 1.0787

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.3939 - loss:
1.0686 - val_accuracy: 0.3708 - val_loss: 1.0737

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:
1.0439 - val_accuracy: 0.3596 - val_loss: 1.0718

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4162 - loss:
1.0614 - val_accuracy: 0.3708 - val_loss: 1.0697

Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4113 - loss:
1.0624 - val_accuracy: 0.3708 - val_loss: 1.0680
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4116 - loss:
1.0554 - val_accuracy: 0.3596 - val_loss: 1.0665
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4366 - loss:
1.0420 - val_accuracy: 0.3483 - val_loss: 1.0653
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4407 - loss:
1.0578 - val_accuracy: 0.3596 - val_loss: 1.0627
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4307 - loss:
1.0469 - val_accuracy: 0.3596 - val_loss: 1.0615
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4350 - loss:
1.0454 - val_accuracy: 0.3596 - val_loss: 1.0608
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4446 - loss:
1.0583 - val_accuracy: 0.3483 - val_loss: 1.0606
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4405 - loss:
1.0372 - val_accuracy: 0.3708 - val_loss: 1.0597
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4347 - loss:
1.0410 - val_accuracy: 0.3708 - val_loss: 1.0587
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4281 - loss:
1.0401 - val_accuracy: 0.3820 - val_loss: 1.0574
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4335 - loss:
1.0323 - val_accuracy: 0.3708 - val_loss: 1.0569
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4418 - loss:
1.0247 - val_accuracy: 0.3708 - val_loss: 1.0575
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4295 - loss:
1.0350 - val_accuracy: 0.3708 - val_loss: 1.0577
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4395 - loss:
1.0407 - val_accuracy: 0.3708 - val_loss: 1.0561
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4224 - loss:
1.0388 - val_accuracy: 0.3708 - val_loss: 1.0554

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4518 - loss:
1.0170 - val_accuracy: 0.3820 - val_loss: 1.0549

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4420 - loss:
1.0326 - val_accuracy: 0.3708 - val_loss: 1.0536

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4369 - loss:
1.0325 - val_accuracy: 0.4045 - val_loss: 1.0539

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4593 - loss:
1.0312 - val_accuracy: 0.3933 - val_loss: 1.0546

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4413 - loss:
1.0262 - val_accuracy: 0.3933 - val_loss: 1.0536

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4564 - loss:
1.0293 - val_accuracy: 0.4045 - val_loss: 1.0537

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4574 - loss:
1.0332 - val_accuracy: 0.4045 - val_loss: 1.0534
training_neural_network: SGD, l2=0, dropout=0.8
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.2709 - loss:
1.1435 - val_accuracy: 0.2360 - val_loss: 1.1494

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3173 - loss:
1.1141 - val_accuracy: 0.3034 - val_loss: 1.1256

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3575 - loss:
1.0931 - val_accuracy: 0.3258 - val_loss: 1.1131

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4021 - loss:
1.0743 - val_accuracy: 0.3483 - val_loss: 1.1068

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.3931 - loss:
1.0823 - val_accuracy: 0.3371 - val_loss: 1.1025

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.3953 - loss:
1.0716 - val_accuracy: 0.3820 - val_loss: 1.1000

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.3880 - loss:
1.0625 - val_accuracy: 0.3933 - val_loss: 1.0982

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.3974 - loss:
1.0665 - val_accuracy: 0.4045 - val_loss: 1.0966

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.3875 - loss:
1.0644 - val_accuracy: 0.3820 - val_loss: 1.0955

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.3852 - loss:
1.0623 - val_accuracy: 0.3596 - val_loss: 1.0948

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.3889 - loss:
1.0592 - val_accuracy: 0.3596 - val_loss: 1.0946

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.3855 - loss:
1.0644 - val_accuracy: 0.3483 - val_loss: 1.0943

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.3929 - loss:
1.0554 - val_accuracy: 0.3596 - val_loss: 1.0938

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4525 - loss:
1.0432 - val_accuracy: 0.3596 - val_loss: 1.0935

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4300 - loss:
1.0545 - val_accuracy: 0.3820 - val_loss: 1.0934

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4371 - loss:
1.0502 - val_accuracy: 0.3820 - val_loss: 1.0933

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4496 - loss:
1.0498 - val_accuracy: 0.3820 - val_loss: 1.0933

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4255 - loss:
1.0493 - val_accuracy: 0.3933 - val_loss: 1.0936

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4248 - loss:

1.0499 - val_accuracy: 0.3933 - val_loss: 1.0935
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4273 - loss:
1.0571 - val_accuracy: 0.3933 - val_loss: 1.0937
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4479 - loss:
1.0457 - val_accuracy: 0.3820 - val_loss: 1.0941
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4598 - loss:
1.0422 - val_accuracy: 0.3820 - val_loss: 1.0948
training_neural_network: SGD, l2=0.0, dropout=0
Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.4245 - loss:
1.0928 - val_accuracy: 0.3933 - val_loss: 1.0699
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4279 - loss:
1.0846 - val_accuracy: 0.3933 - val_loss: 1.0649
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4393 - loss:
1.0767 - val_accuracy: 0.3933 - val_loss: 1.0610
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4380 - loss:
1.0755 - val_accuracy: 0.3933 - val_loss: 1.0580
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4643 - loss:
1.0615 - val_accuracy: 0.3933 - val_loss: 1.0557
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4463 - loss:
1.0692 - val_accuracy: 0.3933 - val_loss: 1.0537
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4469 - loss:
1.0658 - val_accuracy: 0.3933 - val_loss: 1.0524
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4286 - loss:
1.0723 - val_accuracy: 0.3933 - val_loss: 1.0512
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4687 - loss:
1.0554 - val_accuracy: 0.3933 - val_loss: 1.0501
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4505 - loss:
1.0612 - val_accuracy: 0.3933 - val_loss: 1.0491
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4595 - loss:
1.0585 - val_accuracy: 0.3933 - val_loss: 1.0479

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4590 - loss:
1.0577 - val_accuracy: 0.3933 - val_loss: 1.0473

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4233 - loss:
1.0700 - val_accuracy: 0.3933 - val_loss: 1.0467

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4276 - loss:
1.0608 - val_accuracy: 0.3933 - val_loss: 1.0463

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4670 - loss:
1.0513 - val_accuracy: 0.3933 - val_loss: 1.0460

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4388 - loss:
1.0516 - val_accuracy: 0.3933 - val_loss: 1.0458

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4303 - loss:
1.0564 - val_accuracy: 0.3933 - val_loss: 1.0456

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4298 - loss:
1.0565 - val_accuracy: 0.3933 - val_loss: 1.0453

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4442 - loss:
1.0503 - val_accuracy: 0.3933 - val_loss: 1.0450

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4337 - loss:
1.0561 - val_accuracy: 0.3933 - val_loss: 1.0447

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4109 - loss:
1.0685 - val_accuracy: 0.3933 - val_loss: 1.0445

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4592 - loss:
1.0484 - val_accuracy: 0.3933 - val_loss: 1.0442

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4392 - loss:
1.0461 - val_accuracy: 0.3933 - val_loss: 1.0440

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4414 - loss:
1.0558 - val_accuracy: 0.3933 - val_loss: 1.0438

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4240 - loss:
1.0570 - val_accuracy: 0.3933 - val_loss: 1.0435

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4717 - loss:

1.0315 - val_accuracy: 0.3933 - val_loss: 1.0432
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4631 - loss:
1.0352 - val_accuracy: 0.3933 - val_loss: 1.0430
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4349 - loss:
1.0615 - val_accuracy: 0.3933 - val_loss: 1.0427
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4148 - loss:
1.0561 - val_accuracy: 0.3933 - val_loss: 1.0426
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4396 - loss:
1.0498 - val_accuracy: 0.3933 - val_loss: 1.0423
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4380 - loss:
1.0482 - val_accuracy: 0.3933 - val_loss: 1.0420
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4448 - loss:
1.0515 - val_accuracy: 0.3933 - val_loss: 1.0417
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4840 - loss:
1.0306 - val_accuracy: 0.3933 - val_loss: 1.0413
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4316 - loss:
1.0503 - val_accuracy: 0.3933 - val_loss: 1.0411
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4525 - loss:
1.0506 - val_accuracy: 0.3933 - val_loss: 1.0407
Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4273 - loss:
1.0594 - val_accuracy: 0.3933 - val_loss: 1.0405
Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4375 - loss:
1.0494 - val_accuracy: 0.3933 - val_loss: 1.0402
Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4317 - loss:
1.0469 - val_accuracy: 0.3933 - val_loss: 1.0398
Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4428 - loss:
1.0443 - val_accuracy: 0.3933 - val_loss: 1.0394
Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4474 - loss:
1.0377 - val_accuracy: 0.3933 - val_loss: 1.0390
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4467 - loss:
1.0434 - val_accuracy: 0.3933 - val_loss: 1.0386
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4798 - loss:
1.0261 - val_accuracy: 0.3933 - val_loss: 1.0382
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4442 - loss:
1.0511 - val_accuracy: 0.3933 - val_loss: 1.0378
Epoch 44/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4432 - loss:
1.0334 - val_accuracy: 0.3933 - val_loss: 1.0375
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4346 - loss:
1.0429 - val_accuracy: 0.3933 - val_loss: 1.0371
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4375 - loss:
1.0398 - val_accuracy: 0.3933 - val_loss: 1.0369
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4519 - loss:
1.0381 - val_accuracy: 0.3933 - val_loss: 1.0365
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4288 - loss:
1.0410 - val_accuracy: 0.3933 - val_loss: 1.0362
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4502 - loss:
1.0393 - val_accuracy: 0.3933 - val_loss: 1.0358
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4520 - loss:
1.0496 - val_accuracy: 0.3933 - val_loss: 1.0354
Epoch 51/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4501 - loss:
1.0396 - val_accuracy: 0.3933 - val_loss: 1.0350
Epoch 52/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4618 - loss:
1.0280 - val_accuracy: 0.3933 - val_loss: 1.0346
Epoch 53/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4531 - loss:
1.0363 - val_accuracy: 0.3933 - val_loss: 1.0342
Epoch 54/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4052 - loss:
1.0485 - val_accuracy: 0.3933 - val_loss: 1.0339
Epoch 55/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4159 - loss:
1.0434 - val_accuracy: 0.3933 - val_loss: 1.0335

Epoch 56/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4107 - loss:
1.0559 - val_accuracy: 0.3933 - val_loss: 1.0331

Epoch 57/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4657 - loss:
1.0247 - val_accuracy: 0.3933 - val_loss: 1.0326

Epoch 58/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4575 - loss:
1.0250 - val_accuracy: 0.3933 - val_loss: 1.0321

Epoch 59/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4350 - loss:
1.0449 - val_accuracy: 0.3933 - val_loss: 1.0317

Epoch 60/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4423 - loss:
1.0382 - val_accuracy: 0.3933 - val_loss: 1.0315

Epoch 61/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4060 - loss:
1.0502 - val_accuracy: 0.3933 - val_loss: 1.0312

Epoch 62/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4738 - loss:
1.0210 - val_accuracy: 0.3933 - val_loss: 1.0310

Epoch 63/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4704 - loss:
1.0276 - val_accuracy: 0.3933 - val_loss: 1.0306

Epoch 64/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4422 - loss:
1.0411 - val_accuracy: 0.3933 - val_loss: 1.0304

Epoch 65/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4346 - loss:
1.0455 - val_accuracy: 0.3933 - val_loss: 1.0302

Epoch 66/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4416 - loss:
1.0208 - val_accuracy: 0.3933 - val_loss: 1.0300

Epoch 67/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4465 - loss:
1.0296 - val_accuracy: 0.3933 - val_loss: 1.0298

Epoch 68/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4449 - loss:
1.0421 - val_accuracy: 0.3933 - val_loss: 1.0298

Epoch 69/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4607 - loss:
1.0170 - val_accuracy: 0.3933 - val_loss: 1.0296

Epoch 70/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4406 - loss:

1.0334 - val_accuracy: 0.3933 - val_loss: 1.0295
Epoch 71/90
25/25 ————— 0s 2ms/step - accuracy: 0.4529 - loss:
1.0279 - val_accuracy: 0.3933 - val_loss: 1.0292
Epoch 72/90
25/25 ————— 0s 2ms/step - accuracy: 0.4604 - loss:
1.0312 - val_accuracy: 0.3933 - val_loss: 1.0288
Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4407 - loss:
1.0398 - val_accuracy: 0.3933 - val_loss: 1.0283
Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4603 - loss:
1.0345 - val_accuracy: 0.3820 - val_loss: 1.0281
Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4562 - loss:
1.0422 - val_accuracy: 0.3820 - val_loss: 1.0278
Epoch 76/90
25/25 ————— 0s 2ms/step - accuracy: 0.4316 - loss:
1.0447 - val_accuracy: 0.3820 - val_loss: 1.0276
Epoch 77/90
25/25 ————— 0s 2ms/step - accuracy: 0.4396 - loss:
1.0276 - val_accuracy: 0.3820 - val_loss: 1.0272
Epoch 78/90
25/25 ————— 0s 2ms/step - accuracy: 0.4498 - loss:
1.0264 - val_accuracy: 0.3820 - val_loss: 1.0271
Epoch 79/90
25/25 ————— 0s 2ms/step - accuracy: 0.4456 - loss:
1.0366 - val_accuracy: 0.3820 - val_loss: 1.0269
Epoch 80/90
25/25 ————— 0s 2ms/step - accuracy: 0.4622 - loss:
1.0324 - val_accuracy: 0.3820 - val_loss: 1.0265
Epoch 81/90
25/25 ————— 0s 2ms/step - accuracy: 0.4521 - loss:
1.0303 - val_accuracy: 0.3820 - val_loss: 1.0261
Epoch 82/90
25/25 ————— 0s 2ms/step - accuracy: 0.4365 - loss:
1.0433 - val_accuracy: 0.3820 - val_loss: 1.0257
Epoch 83/90
25/25 ————— 0s 2ms/step - accuracy: 0.4630 - loss:
1.0166 - val_accuracy: 0.3820 - val_loss: 1.0253
Epoch 84/90
25/25 ————— 0s 2ms/step - accuracy: 0.4391 - loss:
1.0206 - val_accuracy: 0.3820 - val_loss: 1.0252
Epoch 85/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4320 - loss:
1.0281 - val_accuracy: 0.3933 - val_loss: 1.0248
Epoch 86/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4522 - loss:
1.0150 - val_accuracy: 0.3933 - val_loss: 1.0245
Epoch 87/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4656 - loss:
1.0048 - val_accuracy: 0.3933 - val_loss: 1.0240
Epoch 88/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4539 - loss:
1.0126 - val_accuracy: 0.3933 - val_loss: 1.0238
Epoch 89/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4562 - loss:
1.0206 - val_accuracy: 0.3933 - val_loss: 1.0233
Epoch 90/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4468 - loss:
1.0186 - val_accuracy: 0.4045 - val_loss: 1.0229
training_neural_network: SGD, l2=1e-05, dropout=0
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.3083 - loss:
1.1870 - val_accuracy: 0.3483 - val_loss: 1.1451
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3611 - loss:
1.1441 - val_accuracy: 0.4270 - val_loss: 1.1201
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3680 - loss:
1.1145 - val_accuracy: 0.4382 - val_loss: 1.1045
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3863 - loss:
1.0986 - val_accuracy: 0.4157 - val_loss: 1.0954
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4143 - loss:
1.0903 - val_accuracy: 0.4382 - val_loss: 1.0899
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4074 - loss:
1.0837 - val_accuracy: 0.4382 - val_loss: 1.0857
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4105 - loss:
1.0837 - val_accuracy: 0.4270 - val_loss: 1.0825
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4386 - loss:
1.0659 - val_accuracy: 0.4382 - val_loss: 1.0796
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4230 - loss:

1.0635 - val_accuracy: 0.4157 - val_loss: 1.0772
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4342 - loss:
1.0768 - val_accuracy: 0.4045 - val_loss: 1.0750
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4320 - loss:
1.0699 - val_accuracy: 0.4157 - val_loss: 1.0731
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4070 - loss:
1.0756 - val_accuracy: 0.4270 - val_loss: 1.0714
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4116 - loss:
1.0689 - val_accuracy: 0.4270 - val_loss: 1.0700
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4276 - loss:
1.0689 - val_accuracy: 0.4270 - val_loss: 1.0686
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4146 - loss:
1.0706 - val_accuracy: 0.4270 - val_loss: 1.0673
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4471 - loss:
1.0437 - val_accuracy: 0.4157 - val_loss: 1.0660
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4435 - loss:
1.0544 - val_accuracy: 0.4157 - val_loss: 1.0649
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.3928 - loss:
1.0752 - val_accuracy: 0.4157 - val_loss: 1.0639
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4176 - loss:
1.0571 - val_accuracy: 0.4157 - val_loss: 1.0631
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4182 - loss:
1.0554 - val_accuracy: 0.4157 - val_loss: 1.0623
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4485 - loss:
1.0448 - val_accuracy: 0.4270 - val_loss: 1.0618
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4126 - loss:
1.0603 - val_accuracy: 0.4157 - val_loss: 1.0612
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4288 - loss:
1.0634 - val_accuracy: 0.4157 - val_loss: 1.0606
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4002 - loss:
1.0623 - val_accuracy: 0.4045 - val_loss: 1.0602
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4337 - loss:
1.0664 - val_accuracy: 0.4157 - val_loss: 1.0598
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4414 - loss:
1.0461 - val_accuracy: 0.4157 - val_loss: 1.0594
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4218 - loss:
1.0532 - val_accuracy: 0.4157 - val_loss: 1.0591
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4251 - loss:
1.0509 - val_accuracy: 0.4157 - val_loss: 1.0588
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4450 - loss:
1.0414 - val_accuracy: 0.4157 - val_loss: 1.0585
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4483 - loss:
1.0496 - val_accuracy: 0.4157 - val_loss: 1.0581
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4316 - loss:
1.0529 - val_accuracy: 0.4157 - val_loss: 1.0579
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4128 - loss:
1.0643 - val_accuracy: 0.4157 - val_loss: 1.0577
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4343 - loss:
1.0562 - val_accuracy: 0.4157 - val_loss: 1.0574
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4593 - loss:
1.0364 - val_accuracy: 0.4157 - val_loss: 1.0573
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4612 - loss:
1.0491 - val_accuracy: 0.4157 - val_loss: 1.0571
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4233 - loss:
1.0615 - val_accuracy: 0.4157 - val_loss: 1.0569
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4139 - loss:
1.0558 - val_accuracy: 0.4157 - val_loss: 1.0568
training_neural_network: SGD, l2=3.1622776601683795e-05, dropout=0
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 14ms/step - accuracy: 0.2813 - loss:

1.1107 - val_accuracy: 0.3371 - val_loss: 1.0945
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4076 - loss:
1.0864 - val_accuracy: 0.4045 - val_loss: 1.0838
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4355 - loss:
1.0751 - val_accuracy: 0.3933 - val_loss: 1.0760
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4306 - loss:
1.0690 - val_accuracy: 0.4270 - val_loss: 1.0706
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4271 - loss:
1.0609 - val_accuracy: 0.4270 - val_loss: 1.0676
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4684 - loss:
1.0473 - val_accuracy: 0.4270 - val_loss: 1.0655
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4612 - loss:
1.0449 - val_accuracy: 0.4270 - val_loss: 1.0639
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4442 - loss:
1.0456 - val_accuracy: 0.4157 - val_loss: 1.0629
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4390 - loss:
1.0560 - val_accuracy: 0.4157 - val_loss: 1.0623
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4190 - loss:
1.0575 - val_accuracy: 0.4157 - val_loss: 1.0621
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4688 - loss:
1.0310 - val_accuracy: 0.4157 - val_loss: 1.0620
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4593 - loss:
1.0393 - val_accuracy: 0.4157 - val_loss: 1.0618
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4603 - loss:
1.0420 - val_accuracy: 0.4157 - val_loss: 1.0612
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4462 - loss:
1.0429 - val_accuracy: 0.4157 - val_loss: 1.0613
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4210 - loss:
1.0519 - val_accuracy: 0.4045 - val_loss: 1.0609
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4642 - loss:
1.0374 - val_accuracy: 0.4045 - val_loss: 1.0605
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4389 - loss:
1.0371 - val_accuracy: 0.4045 - val_loss: 1.0601
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4531 - loss:
1.0356 - val_accuracy: 0.4045 - val_loss: 1.0595
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4523 - loss:
1.0351 - val_accuracy: 0.4045 - val_loss: 1.0590
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4300 - loss:
1.0480 - val_accuracy: 0.4045 - val_loss: 1.0587
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4505 - loss:
1.0366 - val_accuracy: 0.4045 - val_loss: 1.0583
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4441 - loss:
1.0366 - val_accuracy: 0.4045 - val_loss: 1.0581
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4380 - loss:
1.0309 - val_accuracy: 0.3933 - val_loss: 1.0579
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4476 - loss:
1.0361 - val_accuracy: 0.3933 - val_loss: 1.0577
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4779 - loss:
1.0274 - val_accuracy: 0.3933 - val_loss: 1.0570
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4547 - loss:
1.0320 - val_accuracy: 0.3933 - val_loss: 1.0569
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4463 - loss:
1.0413 - val_accuracy: 0.3933 - val_loss: 1.0567
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4284 - loss:
1.0471 - val_accuracy: 0.3933 - val_loss: 1.0569
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4441 - loss:
1.0305 - val_accuracy: 0.3933 - val_loss: 1.0566
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4594 - loss:
1.0131 - val_accuracy: 0.3933 - val_loss: 1.0563

Epoch 31/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4331 - loss:
1.0346 - val_accuracy: 0.3933 - val_loss: 1.0562
training_neural_network: SGD, l2=0.0001, dropout=0

Epoch 1/90
25/25 ━━━━━━━━ 1s 14ms/step - accuracy: 0.4642 - loss:
1.0870 - val_accuracy: 0.3933 - val_loss: 1.1386

Epoch 2/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4369 - loss:
1.0974 - val_accuracy: 0.3933 - val_loss: 1.1230

Epoch 3/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4294 - loss:
1.0730 - val_accuracy: 0.4045 - val_loss: 1.1119

Epoch 4/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4302 - loss:
1.0709 - val_accuracy: 0.3933 - val_loss: 1.1041

Epoch 5/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4097 - loss:
1.0726 - val_accuracy: 0.3820 - val_loss: 1.0989

Epoch 6/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4179 - loss:
1.0641 - val_accuracy: 0.3708 - val_loss: 1.0950

Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4430 - loss:
1.0605 - val_accuracy: 0.3483 - val_loss: 1.0920

Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4287 - loss:
1.0568 - val_accuracy: 0.3483 - val_loss: 1.0895

Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4551 - loss:
1.0288 - val_accuracy: 0.3483 - val_loss: 1.0875

Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4062 - loss:
1.0563 - val_accuracy: 0.3483 - val_loss: 1.0860

Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.3964 - loss:
1.0528 - val_accuracy: 0.3483 - val_loss: 1.0850

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4070 - loss:
1.0616 - val_accuracy: 0.3483 - val_loss: 1.0838

Epoch 13/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4146 - loss:
1.0416 - val_accuracy: 0.3258 - val_loss: 1.0832

Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3933 - loss:
1.0532 - val_accuracy: 0.3146 - val_loss: 1.0827
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3968 - loss:
1.0509 - val_accuracy: 0.3146 - val_loss: 1.0820
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4276 - loss:
1.0419 - val_accuracy: 0.3146 - val_loss: 1.0814
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4030 - loss:
1.0535 - val_accuracy: 0.3146 - val_loss: 1.0811
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4237 - loss:
1.0368 - val_accuracy: 0.3258 - val_loss: 1.0806
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4311 - loss:
1.0286 - val_accuracy: 0.3258 - val_loss: 1.0798
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4213 - loss:
1.0358 - val_accuracy: 0.3258 - val_loss: 1.0795
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3949 - loss:
1.0573 - val_accuracy: 0.3371 - val_loss: 1.0791
Epoch 22/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4276 - loss:
1.0457 - val_accuracy: 0.3371 - val_loss: 1.0788
Epoch 23/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4569 - loss:
1.0427 - val_accuracy: 0.3371 - val_loss: 1.0785
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4497 - loss:
1.0278 - val_accuracy: 0.3371 - val_loss: 1.0782
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4654 - loss:
1.0370 - val_accuracy: 0.3596 - val_loss: 1.0774
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4259 - loss:
1.0432 - val_accuracy: 0.3708 - val_loss: 1.0770
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4074 - loss:
1.0561 - val_accuracy: 0.3708 - val_loss: 1.0763
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4358 - loss:
1.0280 - val_accuracy: 0.3596 - val_loss: 1.0755

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4265 - loss:
1.0380 - val_accuracy: 0.3708 - val_loss: 1.0752

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4453 - loss:
1.0391 - val_accuracy: 0.3708 - val_loss: 1.0742

Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4356 - loss:
1.0401 - val_accuracy: 0.3708 - val_loss: 1.0737

Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4500 - loss:
1.0386 - val_accuracy: 0.3708 - val_loss: 1.0731

Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4469 - loss:
1.0353 - val_accuracy: 0.3708 - val_loss: 1.0726

Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4254 - loss:
1.0417 - val_accuracy: 0.3708 - val_loss: 1.0722

Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4530 - loss:
1.0248 - val_accuracy: 0.3708 - val_loss: 1.0714

Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4433 - loss:
1.0369 - val_accuracy: 0.3483 - val_loss: 1.0710

Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4303 - loss:
1.0438 - val_accuracy: 0.3596 - val_loss: 1.0707

Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4550 - loss:
1.0342 - val_accuracy: 0.3483 - val_loss: 1.0700

Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4246 - loss:
1.0347 - val_accuracy: 0.3708 - val_loss: 1.0694

Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4567 - loss:
1.0172 - val_accuracy: 0.3596 - val_loss: 1.0687

Epoch 41/90
25/25 ————— 0s 2ms/step - accuracy: 0.4511 - loss:
1.0290 - val_accuracy: 0.3708 - val_loss: 1.0682

Epoch 42/90
25/25 ————— 0s 2ms/step - accuracy: 0.4403 - loss:
1.0389 - val_accuracy: 0.3708 - val_loss: 1.0677

Epoch 43/90
25/25 ————— 0s 2ms/step - accuracy: 0.4368 - loss:

1.0290 - val_accuracy: 0.3708 - val_loss: 1.0670
Epoch 44/90
25/25 ————— 0s 2ms/step - accuracy: 0.4570 - loss:
1.0119 - val_accuracy: 0.3708 - val_loss: 1.0656
Epoch 45/90
25/25 ————— 0s 2ms/step - accuracy: 0.4481 - loss:
1.0370 - val_accuracy: 0.3708 - val_loss: 1.0654
Epoch 46/90
25/25 ————— 0s 2ms/step - accuracy: 0.4560 - loss:
1.0143 - val_accuracy: 0.3708 - val_loss: 1.0648
Epoch 47/90
25/25 ————— 0s 2ms/step - accuracy: 0.4546 - loss:
1.0238 - val_accuracy: 0.3708 - val_loss: 1.0646
Epoch 48/90
25/25 ————— 0s 2ms/step - accuracy: 0.4151 - loss:
1.0406 - val_accuracy: 0.3820 - val_loss: 1.0645
Epoch 49/90
25/25 ————— 0s 2ms/step - accuracy: 0.4423 - loss:
1.0294 - val_accuracy: 0.3933 - val_loss: 1.0640
Epoch 50/90
25/25 ————— 0s 2ms/step - accuracy: 0.4572 - loss:
1.0259 - val_accuracy: 0.4045 - val_loss: 1.0631
Epoch 51/90
25/25 ————— 0s 2ms/step - accuracy: 0.4527 - loss:
1.0126 - val_accuracy: 0.4045 - val_loss: 1.0630
Epoch 52/90
25/25 ————— 0s 2ms/step - accuracy: 0.4172 - loss:
1.0392 - val_accuracy: 0.4045 - val_loss: 1.0627
Epoch 53/90
25/25 ————— 0s 2ms/step - accuracy: 0.4580 - loss:
1.0229 - val_accuracy: 0.4045 - val_loss: 1.0615
Epoch 54/90
25/25 ————— 0s 2ms/step - accuracy: 0.4555 - loss:
1.0192 - val_accuracy: 0.4045 - val_loss: 1.0611
Epoch 55/90
25/25 ————— 0s 1ms/step - accuracy: 0.4289 - loss:
1.0213 - val_accuracy: 0.4045 - val_loss: 1.0613
Epoch 56/90
25/25 ————— 0s 2ms/step - accuracy: 0.4420 - loss:
1.0170 - val_accuracy: 0.4045 - val_loss: 1.0607
Epoch 57/90
25/25 ————— 0s 2ms/step - accuracy: 0.4489 - loss:
1.0396 - val_accuracy: 0.4045 - val_loss: 1.0600
Epoch 58/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4327 - loss:
1.0228 - val_accuracy: 0.4045 - val_loss: 1.0593
Epoch 59/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4302 - loss:
1.0445 - val_accuracy: 0.4045 - val_loss: 1.0589
Epoch 60/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4530 - loss:
1.0145 - val_accuracy: 0.4045 - val_loss: 1.0583
Epoch 61/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4098 - loss:
1.0388 - val_accuracy: 0.4045 - val_loss: 1.0583
Epoch 62/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4311 - loss:
1.0353 - val_accuracy: 0.4045 - val_loss: 1.0580
Epoch 63/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4438 - loss:
1.0123 - val_accuracy: 0.4157 - val_loss: 1.0571
Epoch 64/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4383 - loss:
1.0179 - val_accuracy: 0.4045 - val_loss: 1.0567
Epoch 65/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4588 - loss:
1.0060 - val_accuracy: 0.4157 - val_loss: 1.0560
Epoch 66/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4543 - loss:
1.0257 - val_accuracy: 0.4270 - val_loss: 1.0549
Epoch 67/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4526 - loss:
1.0210 - val_accuracy: 0.4270 - val_loss: 1.0546
Epoch 68/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4314 - loss:
1.0275 - val_accuracy: 0.4270 - val_loss: 1.0544
Epoch 69/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4162 - loss:
1.0346 - val_accuracy: 0.4270 - val_loss: 1.0539
Epoch 70/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4219 - loss:
1.0361 - val_accuracy: 0.4270 - val_loss: 1.0534
Epoch 71/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4528 - loss:
1.0025 - val_accuracy: 0.4270 - val_loss: 1.0528
Epoch 72/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4571 - loss:
1.0075 - val_accuracy: 0.4270 - val_loss: 1.0523

Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4731 - loss:
1.0059 - val_accuracy: 0.4157 - val_loss: 1.0516

Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4745 - loss:
1.0084 - val_accuracy: 0.4157 - val_loss: 1.0510

Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4719 - loss:
1.0075 - val_accuracy: 0.4045 - val_loss: 1.0504

Epoch 76/90
25/25 ————— 0s 2ms/step - accuracy: 0.4320 - loss:
1.0232 - val_accuracy: 0.4045 - val_loss: 1.0500

Epoch 77/90
25/25 ————— 0s 2ms/step - accuracy: 0.4512 - loss:
1.0171 - val_accuracy: 0.4045 - val_loss: 1.0492

Epoch 78/90
25/25 ————— 0s 2ms/step - accuracy: 0.4628 - loss:
1.0077 - val_accuracy: 0.4045 - val_loss: 1.0488

Epoch 79/90
25/25 ————— 0s 2ms/step - accuracy: 0.4697 - loss:
1.0055 - val_accuracy: 0.4045 - val_loss: 1.0481

Epoch 80/90
25/25 ————— 0s 2ms/step - accuracy: 0.4576 - loss:
1.0107 - val_accuracy: 0.4045 - val_loss: 1.0477

Epoch 81/90
25/25 ————— 0s 2ms/step - accuracy: 0.4556 - loss:
1.0102 - val_accuracy: 0.4157 - val_loss: 1.0469

Epoch 82/90
25/25 ————— 0s 2ms/step - accuracy: 0.4673 - loss:
0.9967 - val_accuracy: 0.4157 - val_loss: 1.0464

Epoch 83/90
25/25 ————— 0s 2ms/step - accuracy: 0.4705 - loss:
0.9964 - val_accuracy: 0.4157 - val_loss: 1.0460

Epoch 84/90
25/25 ————— 0s 2ms/step - accuracy: 0.4282 - loss:
1.0188 - val_accuracy: 0.4157 - val_loss: 1.0455

Epoch 85/90
25/25 ————— 0s 2ms/step - accuracy: 0.4500 - loss:
1.0166 - val_accuracy: 0.4157 - val_loss: 1.0449

Epoch 86/90
25/25 ————— 0s 2ms/step - accuracy: 0.4473 - loss:
1.0257 - val_accuracy: 0.4157 - val_loss: 1.0442

Epoch 87/90
25/25 ————— 0s 2ms/step - accuracy: 0.4586 - loss:

1.0045 - val_accuracy: 0.4157 - val_loss: 1.0436
Epoch 88/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4644 - loss:
1.0037 - val_accuracy: 0.4270 - val_loss: 1.0428
Epoch 89/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4547 - loss:
1.0010 - val_accuracy: 0.4270 - val_loss: 1.0426
Epoch 90/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4263 - loss:
1.0138 - val_accuracy: 0.4270 - val_loss: 1.0421
training_neural_network: SGD, l2=0.00031622776601683794, dropout=0
Epoch 1/90
25/25 ━━━━━━━━━━ 1s 14ms/step - accuracy: 0.3325 - loss:
1.1156 - val_accuracy: 0.4157 - val_loss: 1.0878
Epoch 2/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3730 - loss:
1.0992 - val_accuracy: 0.4157 - val_loss: 1.0806
Epoch 3/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4140 - loss:
1.0708 - val_accuracy: 0.4382 - val_loss: 1.0763
Epoch 4/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4312 - loss:
1.0685 - val_accuracy: 0.4494 - val_loss: 1.0734
Epoch 5/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4155 - loss:
1.0638 - val_accuracy: 0.4607 - val_loss: 1.0714
Epoch 6/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4337 - loss:
1.0583 - val_accuracy: 0.4382 - val_loss: 1.0703
Epoch 7/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4216 - loss:
1.0507 - val_accuracy: 0.4382 - val_loss: 1.0696
Epoch 8/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4159 - loss:
1.0535 - val_accuracy: 0.4607 - val_loss: 1.0691
Epoch 9/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4347 - loss:
1.0471 - val_accuracy: 0.4607 - val_loss: 1.0685
Epoch 10/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4276 - loss:
1.0538 - val_accuracy: 0.4607 - val_loss: 1.0682
Epoch 11/90
25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4230 - loss:
1.0542 - val_accuracy: 0.4494 - val_loss: 1.0681

25/25 ━━━━━━━━━━━━━━ 1s 14ms/step - accuracy: 0.3486 - loss:
1.1390 - val_accuracy: 0.3933 - val_loss: 1.1255
Epoch 2/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3644 - loss:
1.1255 - val_accuracy: 0.3820 - val_loss: 1.1098
Epoch 3/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3859 - loss:
1.0877 - val_accuracy: 0.3708 - val_loss: 1.1011
Epoch 4/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3722 - loss:
1.0845 - val_accuracy: 0.3708 - val_loss: 1.0960
Epoch 5/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3692 - loss:
1.0731 - val_accuracy: 0.3820 - val_loss: 1.0918
Epoch 6/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3622 - loss:
1.0775 - val_accuracy: 0.3596 - val_loss: 1.0888
Epoch 7/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3995 - loss:
1.0558 - val_accuracy: 0.3596 - val_loss: 1.0865
Epoch 8/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4098 - loss:
1.0597 - val_accuracy: 0.3596 - val_loss: 1.0846
Epoch 9/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3955 - loss:
1.0606 - val_accuracy: 0.3596 - val_loss: 1.0828
Epoch 10/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3892 - loss:
1.0484 - val_accuracy: 0.4045 - val_loss: 1.0810
Epoch 11/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3976 - loss:
1.0698 - val_accuracy: 0.3933 - val_loss: 1.0793
Epoch 12/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3777 - loss:
1.0745 - val_accuracy: 0.4045 - val_loss: 1.0773
Epoch 13/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4012 - loss:
1.0572 - val_accuracy: 0.3933 - val_loss: 1.0753
Epoch 14/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4048 - loss:
1.0677 - val_accuracy: 0.4045 - val_loss: 1.0735
Epoch 15/90
25/25 ━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4351 - loss:
1.0497 - val_accuracy: 0.3933 - val_loss: 1.0716

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4207 - loss:
1.0400 - val_accuracy: 0.3820 - val_loss: 1.0700

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4272 - loss:
1.0513 - val_accuracy: 0.3933 - val_loss: 1.0684

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4160 - loss:
1.0570 - val_accuracy: 0.3933 - val_loss: 1.0670

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.3937 - loss:
1.0567 - val_accuracy: 0.3933 - val_loss: 1.0658

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.3823 - loss:
1.0751 - val_accuracy: 0.3820 - val_loss: 1.0646

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4248 - loss:
1.0305 - val_accuracy: 0.3933 - val_loss: 1.0636

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4534 - loss:
1.0229 - val_accuracy: 0.3820 - val_loss: 1.0626

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4116 - loss:
1.0463 - val_accuracy: 0.3820 - val_loss: 1.0619

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4385 - loss:
1.0404 - val_accuracy: 0.3820 - val_loss: 1.0609

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4390 - loss:
1.0378 - val_accuracy: 0.3820 - val_loss: 1.0603

Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4298 - loss:
1.0447 - val_accuracy: 0.3708 - val_loss: 1.0596

Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4230 - loss:
1.0548 - val_accuracy: 0.3708 - val_loss: 1.0589

Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4593 - loss:
1.0317 - val_accuracy: 0.3708 - val_loss: 1.0581

Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4172 - loss:
1.0311 - val_accuracy: 0.3820 - val_loss: 1.0577

Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4334 - loss:

1.0290 - val_accuracy: 0.4045 - val_loss: 1.0571
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4275 - loss:
1.0349 - val_accuracy: 0.3933 - val_loss: 1.0567
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4339 - loss:
1.0399 - val_accuracy: 0.3820 - val_loss: 1.0564
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4439 - loss:
1.0278 - val_accuracy: 0.3820 - val_loss: 1.0560
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4505 - loss:
1.0350 - val_accuracy: 0.3820 - val_loss: 1.0558
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4322 - loss:
1.0394 - val_accuracy: 0.3820 - val_loss: 1.0557
Epoch 36/90
25/25 ————— 0s 2ms/step - accuracy: 0.4285 - loss:
1.0226 - val_accuracy: 0.3820 - val_loss: 1.0555
Epoch 37/90
25/25 ————— 0s 2ms/step - accuracy: 0.4247 - loss:
1.0531 - val_accuracy: 0.3820 - val_loss: 1.0553
Epoch 38/90
25/25 ————— 0s 2ms/step - accuracy: 0.4177 - loss:
1.0427 - val_accuracy: 0.3933 - val_loss: 1.0550
Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4383 - loss:
1.0373 - val_accuracy: 0.3933 - val_loss: 1.0548
Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4418 - loss:
1.0173 - val_accuracy: 0.3933 - val_loss: 1.0546
Epoch 41/90
25/25 ————— 0s 2ms/step - accuracy: 0.4424 - loss:
1.0398 - val_accuracy: 0.3933 - val_loss: 1.0542
Epoch 42/90
25/25 ————— 0s 2ms/step - accuracy: 0.4308 - loss:
1.0278 - val_accuracy: 0.3933 - val_loss: 1.0541
Epoch 43/90
25/25 ————— 0s 2ms/step - accuracy: 0.4411 - loss:
1.0239 - val_accuracy: 0.3933 - val_loss: 1.0539
Epoch 44/90
25/25 ————— 0s 2ms/step - accuracy: 0.4253 - loss:
1.0347 - val_accuracy: 0.3933 - val_loss: 1.0538
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4497 - loss:
1.0085 - val_accuracy: 0.3933 - val_loss: 1.0533
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4257 - loss:
1.0429 - val_accuracy: 0.3933 - val_loss: 1.0531
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4072 - loss:
1.0549 - val_accuracy: 0.3933 - val_loss: 1.0529
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4388 - loss:
1.0246 - val_accuracy: 0.3820 - val_loss: 1.0527
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4541 - loss:
1.0115 - val_accuracy: 0.3820 - val_loss: 1.0524
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4282 - loss:
1.0315 - val_accuracy: 0.3820 - val_loss: 1.0522
Epoch 51/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4273 - loss:
1.0331 - val_accuracy: 0.3820 - val_loss: 1.0519
Epoch 52/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4357 - loss:
1.0199 - val_accuracy: 0.3933 - val_loss: 1.0517
Epoch 53/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4239 - loss:
1.0170 - val_accuracy: 0.3933 - val_loss: 1.0513
Epoch 54/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4173 - loss:
1.0355 - val_accuracy: 0.3933 - val_loss: 1.0511
Epoch 55/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4258 - loss:
1.0150 - val_accuracy: 0.3820 - val_loss: 1.0511
Epoch 56/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4364 - loss:
1.0273 - val_accuracy: 0.3933 - val_loss: 1.0508
Epoch 57/90

25/25 ━━━━━━━━━━ 0s 1ms/step - accuracy: 0.4372 - loss:
1.0147 - val_accuracy: 0.3933 - val_loss: 1.0504
Epoch 58/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4246 - loss:
1.0300 - val_accuracy: 0.3933 - val_loss: 1.0500
Epoch 59/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4325 - loss:
1.0172 - val_accuracy: 0.3933 - val_loss: 1.0497

Epoch 60/90
25/25 ————— 0s 2ms/step - accuracy: 0.4249 - loss:
1.0273 - val_accuracy: 0.4045 - val_loss: 1.0494

Epoch 61/90
25/25 ————— 0s 2ms/step - accuracy: 0.4233 - loss:
1.0324 - val_accuracy: 0.4045 - val_loss: 1.0491

Epoch 62/90
25/25 ————— 0s 2ms/step - accuracy: 0.4142 - loss:
1.0366 - val_accuracy: 0.4045 - val_loss: 1.0489

Epoch 63/90
25/25 ————— 0s 2ms/step - accuracy: 0.4343 - loss:
1.0294 - val_accuracy: 0.4045 - val_loss: 1.0486

Epoch 64/90
25/25 ————— 0s 2ms/step - accuracy: 0.4507 - loss:
1.0224 - val_accuracy: 0.4045 - val_loss: 1.0484

Epoch 65/90
25/25 ————— 0s 2ms/step - accuracy: 0.4084 - loss:
1.0284 - val_accuracy: 0.4045 - val_loss: 1.0481

Epoch 66/90
25/25 ————— 0s 2ms/step - accuracy: 0.4266 - loss:
1.0211 - val_accuracy: 0.4045 - val_loss: 1.0478

Epoch 67/90
25/25 ————— 0s 2ms/step - accuracy: 0.4430 - loss:
1.0114 - val_accuracy: 0.4045 - val_loss: 1.0475

Epoch 68/90
25/25 ————— 0s 2ms/step - accuracy: 0.4420 - loss:
1.0132 - val_accuracy: 0.4157 - val_loss: 1.0473

Epoch 69/90
25/25 ————— 0s 2ms/step - accuracy: 0.4421 - loss:
1.0030 - val_accuracy: 0.4270 - val_loss: 1.0472

Epoch 70/90
25/25 ————— 0s 2ms/step - accuracy: 0.4478 - loss:
1.0228 - val_accuracy: 0.4270 - val_loss: 1.0469

Epoch 71/90
25/25 ————— 0s 2ms/step - accuracy: 0.4286 - loss:
1.0384 - val_accuracy: 0.4270 - val_loss: 1.0466

Epoch 72/90
25/25 ————— 0s 2ms/step - accuracy: 0.4696 - loss:
0.9939 - val_accuracy: 0.4270 - val_loss: 1.0463

Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4613 - loss:
1.0221 - val_accuracy: 0.4270 - val_loss: 1.0461

Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4439 - loss:

1.0162 - val_accuracy: 0.4270 - val_loss: 1.0459
Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4447 - loss:
1.0144 - val_accuracy: 0.4270 - val_loss: 1.0457
Epoch 76/90
25/25 ————— 0s 2ms/step - accuracy: 0.4443 - loss:
1.0205 - val_accuracy: 0.4270 - val_loss: 1.0455
Epoch 77/90
25/25 ————— 0s 2ms/step - accuracy: 0.4625 - loss:
1.0041 - val_accuracy: 0.4270 - val_loss: 1.0452
Epoch 78/90
25/25 ————— 0s 2ms/step - accuracy: 0.4628 - loss:
1.0257 - val_accuracy: 0.4270 - val_loss: 1.0450
Epoch 79/90
25/25 ————— 0s 2ms/step - accuracy: 0.4550 - loss:
1.0250 - val_accuracy: 0.4270 - val_loss: 1.0450
Epoch 80/90
25/25 ————— 0s 2ms/step - accuracy: 0.4352 - loss:
1.0248 - val_accuracy: 0.4270 - val_loss: 1.0449
Epoch 81/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:
1.0236 - val_accuracy: 0.4270 - val_loss: 1.0447
Epoch 82/90
25/25 ————— 0s 2ms/step - accuracy: 0.4377 - loss:
1.0126 - val_accuracy: 0.4270 - val_loss: 1.0446
training_neural_network: SGD, l2=1e-05, dropout=0.1
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.2385 - loss:
1.1231 - val_accuracy: 0.3820 - val_loss: 1.1105
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3358 - loss:
1.1074 - val_accuracy: 0.4157 - val_loss: 1.1025
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3839 - loss:
1.0950 - val_accuracy: 0.3933 - val_loss: 1.0962
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4298 - loss:
1.0901 - val_accuracy: 0.4045 - val_loss: 1.0911
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4340 - loss:
1.0853 - val_accuracy: 0.3933 - val_loss: 1.0871
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4520 - loss:
1.0776 - val_accuracy: 0.3820 - val_loss: 1.0837

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4331 - loss:
1.0769 - val_accuracy: 0.3820 - val_loss: 1.0811

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4227 - loss:
1.0806 - val_accuracy: 0.3596 - val_loss: 1.0789

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4237 - loss:
1.0717 - val_accuracy: 0.3596 - val_loss: 1.0771

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4679 - loss:
1.0595 - val_accuracy: 0.3483 - val_loss: 1.0756

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4393 - loss:
1.0692 - val_accuracy: 0.3371 - val_loss: 1.0742

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4030 - loss:
1.0775 - val_accuracy: 0.3483 - val_loss: 1.0730

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4586 - loss:
1.0606 - val_accuracy: 0.3483 - val_loss: 1.0718

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4339 - loss:
1.0688 - val_accuracy: 0.3483 - val_loss: 1.0709

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4791 - loss:
1.0538 - val_accuracy: 0.3596 - val_loss: 1.0701

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4354 - loss:
1.0625 - val_accuracy: 0.3596 - val_loss: 1.0695

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4404 - loss:
1.0622 - val_accuracy: 0.3596 - val_loss: 1.0689

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4384 - loss:
1.0617 - val_accuracy: 0.3596 - val_loss: 1.0685

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4538 - loss:
1.0558 - val_accuracy: 0.3596 - val_loss: 1.0680

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.3990 - loss:
1.0684 - val_accuracy: 0.3708 - val_loss: 1.0678

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4527 - loss:

1.0496 - val_accuracy: 0.3596 - val_loss: 1.0676
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4220 - loss:
1.0626 - val_accuracy: 0.3596 - val_loss: 1.0674
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4403 - loss:
1.0562 - val_accuracy: 0.3596 - val_loss: 1.0671
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4126 - loss:
1.0570 - val_accuracy: 0.3596 - val_loss: 1.0670
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4569 - loss:
1.0540 - val_accuracy: 0.3483 - val_loss: 1.0668
training_neural_network: SGD, l2=1e-05, dropout=0.4
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.4422 - loss:
1.1081 - val_accuracy: 0.3596 - val_loss: 1.1658
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4238 - loss:
1.1109 - val_accuracy: 0.3820 - val_loss: 1.1538
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3934 - loss:
1.1002 - val_accuracy: 0.3820 - val_loss: 1.1445
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4031 - loss:
1.0865 - val_accuracy: 0.3596 - val_loss: 1.1365
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.3758 - loss:
1.0941 - val_accuracy: 0.3483 - val_loss: 1.1298
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.3805 - loss:
1.0890 - val_accuracy: 0.3483 - val_loss: 1.1243
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4017 - loss:
1.0762 - val_accuracy: 0.3596 - val_loss: 1.1196
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4254 - loss:
1.0638 - val_accuracy: 0.3596 - val_loss: 1.1151
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.3962 - loss:
1.0762 - val_accuracy: 0.3708 - val_loss: 1.1116
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4142 - loss:
1.0730 - val_accuracy: 0.3708 - val_loss: 1.1082

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4085 - loss:
1.0639 - val_accuracy: 0.3483 - val_loss: 1.1051

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4083 - loss:
1.0744 - val_accuracy: 0.3596 - val_loss: 1.1021

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4348 - loss:
1.0625 - val_accuracy: 0.3933 - val_loss: 1.0993

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4567 - loss:
1.0578 - val_accuracy: 0.3933 - val_loss: 1.0967

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4205 - loss:
1.0672 - val_accuracy: 0.3933 - val_loss: 1.0940

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4344 - loss:
1.0579 - val_accuracy: 0.3933 - val_loss: 1.0918

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4581 - loss:
1.0569 - val_accuracy: 0.3933 - val_loss: 1.0895

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4666 - loss:
1.0502 - val_accuracy: 0.3933 - val_loss: 1.0882

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4433 - loss:
1.0543 - val_accuracy: 0.4045 - val_loss: 1.0869

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4494 - loss:
1.0524 - val_accuracy: 0.4045 - val_loss: 1.0858

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4472 - loss:
1.0582 - val_accuracy: 0.4045 - val_loss: 1.0847

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4489 - loss:
1.0565 - val_accuracy: 0.3933 - val_loss: 1.0839

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4470 - loss:
1.0611 - val_accuracy: 0.3933 - val_loss: 1.0833

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4393 - loss:
1.0596 - val_accuracy: 0.3933 - val_loss: 1.0827

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4510 - loss:

1.0540 - val_accuracy: 0.3933 - val_loss: 1.0821
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4415 - loss:
1.0427 - val_accuracy: 0.3933 - val_loss: 1.0816
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4537 - loss:
1.0530 - val_accuracy: 0.3933 - val_loss: 1.0813
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4408 - loss:
1.0512 - val_accuracy: 0.3933 - val_loss: 1.0810
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4610 - loss:
1.0536 - val_accuracy: 0.3933 - val_loss: 1.0806
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4275 - loss:
1.0526 - val_accuracy: 0.3933 - val_loss: 1.0804
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4256 - loss:
1.0584 - val_accuracy: 0.3933 - val_loss: 1.0803
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4445 - loss:
1.0587 - val_accuracy: 0.3933 - val_loss: 1.0802
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4402 - loss:
1.0532 - val_accuracy: 0.3933 - val_loss: 1.0802
training_neural_network: SGD, l2=1e-05, dropout=0.7000000000000001
Epoch 1/90
25/25 ————— 2s 14ms/step - accuracy: 0.4273 - loss:
1.0917 - val_accuracy: 0.3820 - val_loss: 1.1132
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4416 - loss:
1.0800 - val_accuracy: 0.3708 - val_loss: 1.1089
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4582 - loss:
1.0716 - val_accuracy: 0.3596 - val_loss: 1.1055
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4184 - loss:
1.0825 - val_accuracy: 0.3483 - val_loss: 1.1028
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4078 - loss:
1.0893 - val_accuracy: 0.3483 - val_loss: 1.1005
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4749 - loss:
1.0688 - val_accuracy: 0.3483 - val_loss: 1.0980

Epoch 7/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4172 - loss:
1.0824 - val_accuracy: 0.3483 - val_loss: 1.0966

Epoch 8/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4428 - loss:
1.0667 - val_accuracy: 0.3483 - val_loss: 1.0950

Epoch 9/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4165 - loss:
1.0771 - val_accuracy: 0.3483 - val_loss: 1.0939

Epoch 10/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4200 - loss:
1.0818 - val_accuracy: 0.3596 - val_loss: 1.0930

Epoch 11/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4315 - loss:
1.0636 - val_accuracy: 0.3596 - val_loss: 1.0920

Epoch 12/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4171 - loss:
1.0774 - val_accuracy: 0.3708 - val_loss: 1.0911

Epoch 13/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4601 - loss:
1.0557 - val_accuracy: 0.3708 - val_loss: 1.0902

Epoch 14/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4558 - loss:
1.0571 - val_accuracy: 0.3708 - val_loss: 1.0893

Epoch 15/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4555 - loss:
1.0495 - val_accuracy: 0.3708 - val_loss: 1.0886

Epoch 16/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4141 - loss:
1.0687 - val_accuracy: 0.3708 - val_loss: 1.0879

Epoch 17/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4609 - loss:
1.0491 - val_accuracy: 0.3708 - val_loss: 1.0873

Epoch 18/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4388 - loss:
1.0582 - val_accuracy: 0.3708 - val_loss: 1.0866

Epoch 19/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4340 - loss:
1.0672 - val_accuracy: 0.3708 - val_loss: 1.0860

Epoch 20/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4320 - loss:
1.0574 - val_accuracy: 0.3708 - val_loss: 1.0854

Epoch 21/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4678 - loss:

1.0435 - val_accuracy: 0.3708 - val_loss: 1.0848
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4221 - loss:
1.0723 - val_accuracy: 0.3708 - val_loss: 1.0841
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4289 - loss:
1.0563 - val_accuracy: 0.3708 - val_loss: 1.0834
Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4445 - loss:
1.0532 - val_accuracy: 0.3708 - val_loss: 1.0827
Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:
1.0588 - val_accuracy: 0.3708 - val_loss: 1.0823
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4376 - loss:
1.0572 - val_accuracy: 0.3708 - val_loss: 1.0820
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4297 - loss:
1.0576 - val_accuracy: 0.3820 - val_loss: 1.0814
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4241 - loss:
1.0652 - val_accuracy: 0.3820 - val_loss: 1.0809
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4636 - loss:
1.0469 - val_accuracy: 0.3820 - val_loss: 1.0803
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4546 - loss:
1.0385 - val_accuracy: 0.3708 - val_loss: 1.0796
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4470 - loss:
1.0535 - val_accuracy: 0.3708 - val_loss: 1.0789
Epoch 32/90
25/25 ————— 0s 2ms/step - accuracy: 0.4422 - loss:
1.0448 - val_accuracy: 0.3708 - val_loss: 1.0782
Epoch 33/90
25/25 ————— 0s 2ms/step - accuracy: 0.4363 - loss:
1.0442 - val_accuracy: 0.3708 - val_loss: 1.0778
Epoch 34/90
25/25 ————— 0s 2ms/step - accuracy: 0.4702 - loss:
1.0427 - val_accuracy: 0.3820 - val_loss: 1.0770
Epoch 35/90
25/25 ————— 0s 2ms/step - accuracy: 0.4449 - loss:
1.0353 - val_accuracy: 0.3820 - val_loss: 1.0766
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4597 - loss:
1.0346 - val_accuracy: 0.3820 - val_loss: 1.0761
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4611 - loss:
1.0317 - val_accuracy: 0.3820 - val_loss: 1.0756
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4541 - loss:
1.0425 - val_accuracy: 0.3820 - val_loss: 1.0751
Epoch 39/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4386 - loss:
1.0467 - val_accuracy: 0.3820 - val_loss: 1.0748
Epoch 40/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4500 - loss:
1.0456 - val_accuracy: 0.3820 - val_loss: 1.0741
Epoch 41/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4384 - loss:
1.0457 - val_accuracy: 0.3820 - val_loss: 1.0738
Epoch 42/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4647 - loss:
1.0286 - val_accuracy: 0.3820 - val_loss: 1.0731
Epoch 43/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4359 - loss:
1.0357 - val_accuracy: 0.3820 - val_loss: 1.0729
Epoch 44/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4457 - loss:
1.0446 - val_accuracy: 0.3820 - val_loss: 1.0725
Epoch 45/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4418 - loss:
1.0427 - val_accuracy: 0.3820 - val_loss: 1.0720
Epoch 46/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4441 - loss:
1.0500 - val_accuracy: 0.3820 - val_loss: 1.0714
Epoch 47/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4361 - loss:
1.0387 - val_accuracy: 0.3820 - val_loss: 1.0710
Epoch 48/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4388 - loss:
1.0364 - val_accuracy: 0.3708 - val_loss: 1.0708
Epoch 49/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4879 - loss:
1.0161 - val_accuracy: 0.3708 - val_loss: 1.0703
Epoch 50/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4515 - loss:
1.0302 - val_accuracy: 0.3708 - val_loss: 1.0700

Epoch 51/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4634 - loss:
1.0370 - val_accuracy: 0.3708 - val_loss: 1.0696

Epoch 52/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4669 - loss:
1.0316 - val_accuracy: 0.3708 - val_loss: 1.0692

Epoch 53/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4455 - loss:
1.0351 - val_accuracy: 0.3708 - val_loss: 1.0687

Epoch 54/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4716 - loss:
1.0261 - val_accuracy: 0.3708 - val_loss: 1.0683

Epoch 55/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4264 - loss:
1.0540 - val_accuracy: 0.3708 - val_loss: 1.0678

Epoch 56/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4842 - loss:
1.0082 - val_accuracy: 0.3708 - val_loss: 1.0674

Epoch 57/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4529 - loss:
1.0382 - val_accuracy: 0.3708 - val_loss: 1.0672

Epoch 58/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4314 - loss:
1.0488 - val_accuracy: 0.3708 - val_loss: 1.0671

Epoch 59/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4448 - loss:
1.0301 - val_accuracy: 0.3708 - val_loss: 1.0668

Epoch 60/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4790 - loss:
1.0024 - val_accuracy: 0.3596 - val_loss: 1.0663

Epoch 61/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4213 - loss:
1.0403 - val_accuracy: 0.3708 - val_loss: 1.0662

Epoch 62/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4315 - loss:
1.0471 - val_accuracy: 0.3820 - val_loss: 1.0659

Epoch 63/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4613 - loss:
1.0190 - val_accuracy: 0.3820 - val_loss: 1.0654

Epoch 64/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4709 - loss:
1.0261 - val_accuracy: 0.3708 - val_loss: 1.0649

Epoch 65/90
25/25 ━━━━━━━━ 0s 2ms/step - accuracy: 0.4727 - loss:

1.0199 - val_accuracy: 0.3708 - val_loss: 1.0644
Epoch 66/90
25/25 ————— 0s 2ms/step - accuracy: 0.4452 - loss:
1.0335 - val_accuracy: 0.3820 - val_loss: 1.0642
Epoch 67/90
25/25 ————— 0s 2ms/step - accuracy: 0.4510 - loss:
1.0217 - val_accuracy: 0.3708 - val_loss: 1.0640
Epoch 68/90
25/25 ————— 0s 2ms/step - accuracy: 0.4470 - loss:
1.0338 - val_accuracy: 0.3708 - val_loss: 1.0637
Epoch 69/90
25/25 ————— 0s 2ms/step - accuracy: 0.4396 - loss:
1.0270 - val_accuracy: 0.3708 - val_loss: 1.0633
Epoch 70/90
25/25 ————— 0s 2ms/step - accuracy: 0.4332 - loss:
1.0334 - val_accuracy: 0.3708 - val_loss: 1.0632
Epoch 71/90
25/25 ————— 0s 2ms/step - accuracy: 0.4644 - loss:
1.0226 - val_accuracy: 0.3708 - val_loss: 1.0625
Epoch 72/90
25/25 ————— 0s 2ms/step - accuracy: 0.4323 - loss:
1.0367 - val_accuracy: 0.3708 - val_loss: 1.0625
Epoch 73/90
25/25 ————— 0s 2ms/step - accuracy: 0.4427 - loss:
1.0416 - val_accuracy: 0.3708 - val_loss: 1.0623
Epoch 74/90
25/25 ————— 0s 2ms/step - accuracy: 0.4447 - loss:
1.0205 - val_accuracy: 0.3820 - val_loss: 1.0621
Epoch 75/90
25/25 ————— 0s 2ms/step - accuracy: 0.4614 - loss:
1.0264 - val_accuracy: 0.3708 - val_loss: 1.0616
Epoch 76/90
25/25 ————— 0s 2ms/step - accuracy: 0.4321 - loss:
1.0292 - val_accuracy: 0.3708 - val_loss: 1.0614
Epoch 77/90
25/25 ————— 0s 2ms/step - accuracy: 0.4561 - loss:
1.0219 - val_accuracy: 0.3708 - val_loss: 1.0611
Epoch 78/90
25/25 ————— 0s 2ms/step - accuracy: 0.4694 - loss:
1.0087 - val_accuracy: 0.3708 - val_loss: 1.0605
Epoch 79/90
25/25 ————— 0s 2ms/step - accuracy: 0.4664 - loss:
1.0236 - val_accuracy: 0.3708 - val_loss: 1.0605
Epoch 80/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4644 - loss:
1.0211 - val_accuracy: 0.3708 - val_loss: 1.0600
Epoch 81/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4552 - loss:
1.0387 - val_accuracy: 0.3708 - val_loss: 1.0599
Epoch 82/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4509 - loss:
1.0244 - val_accuracy: 0.3708 - val_loss: 1.0597
Epoch 83/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4366 - loss:
1.0329 - val_accuracy: 0.3708 - val_loss: 1.0595
Epoch 84/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4452 - loss:
1.0481 - val_accuracy: 0.3708 - val_loss: 1.0593
Epoch 85/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4535 - loss:
1.0265 - val_accuracy: 0.3708 - val_loss: 1.0591
training_neural_network: SGD, l2=0.0001, dropout=0.1
Epoch 1/90

25/25 ━━━━━━━━━━ 1s 15ms/step - accuracy: 0.2549 - loss:
1.1286 - val_accuracy: 0.3596 - val_loss: 1.1141
Epoch 2/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3426 - loss:
1.1039 - val_accuracy: 0.3483 - val_loss: 1.1021
Epoch 3/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3761 - loss:
1.0891 - val_accuracy: 0.3708 - val_loss: 1.0947
Epoch 4/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4087 - loss:
1.0814 - val_accuracy: 0.3820 - val_loss: 1.0897
Epoch 5/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4068 - loss:
1.0740 - val_accuracy: 0.4157 - val_loss: 1.0862
Epoch 6/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4007 - loss:
1.0735 - val_accuracy: 0.4045 - val_loss: 1.0834
Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4163 - loss:
1.0678 - val_accuracy: 0.4045 - val_loss: 1.0812
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4231 - loss:
1.0638 - val_accuracy: 0.4157 - val_loss: 1.0796
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4288 - loss:

1.0472 - val_accuracy: 0.4157 - val_loss: 1.0782
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4245 - loss:
1.0566 - val_accuracy: 0.4045 - val_loss: 1.0768
Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4176 - loss:
1.0612 - val_accuracy: 0.4045 - val_loss: 1.0756
Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4396 - loss:
1.0496 - val_accuracy: 0.3933 - val_loss: 1.0744
Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4235 - loss:
1.0586 - val_accuracy: 0.3933 - val_loss: 1.0733
Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4338 - loss:
1.0528 - val_accuracy: 0.3933 - val_loss: 1.0725
Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4339 - loss:
1.0469 - val_accuracy: 0.3933 - val_loss: 1.0715
Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4453 - loss:
1.0512 - val_accuracy: 0.3933 - val_loss: 1.0704
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4587 - loss:
1.0382 - val_accuracy: 0.4045 - val_loss: 1.0694
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4345 - loss:
1.0505 - val_accuracy: 0.4045 - val_loss: 1.0684
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4453 - loss:
1.0405 - val_accuracy: 0.4045 - val_loss: 1.0674
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4110 - loss:
1.0620 - val_accuracy: 0.4045 - val_loss: 1.0667
Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4432 - loss:
1.0524 - val_accuracy: 0.4045 - val_loss: 1.0658
Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4360 - loss:
1.0413 - val_accuracy: 0.4045 - val_loss: 1.0652
Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4653 - loss:
1.0307 - val_accuracy: 0.4045 - val_loss: 1.0645
Epoch 24/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4371 - loss:
1.0422 - val_accuracy: 0.4045 - val_loss: 1.0637
Epoch 25/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4399 - loss:
1.0398 - val_accuracy: 0.4045 - val_loss: 1.0631
Epoch 26/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4119 - loss:
1.0567 - val_accuracy: 0.4045 - val_loss: 1.0623
Epoch 27/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4333 - loss:
1.0466 - val_accuracy: 0.4045 - val_loss: 1.0615
Epoch 28/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4693 - loss:
1.0321 - val_accuracy: 0.4045 - val_loss: 1.0605
Epoch 29/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4081 - loss:
1.0508 - val_accuracy: 0.4045 - val_loss: 1.0599
Epoch 30/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4338 - loss:
1.0408 - val_accuracy: 0.4045 - val_loss: 1.0590
Epoch 31/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4730 - loss:
1.0267 - val_accuracy: 0.4157 - val_loss: 1.0576
Epoch 32/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4284 - loss:
1.0462 - val_accuracy: 0.4157 - val_loss: 1.0566
Epoch 33/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4410 - loss:
1.0331 - val_accuracy: 0.4157 - val_loss: 1.0554
Epoch 34/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4261 - loss:
1.0451 - val_accuracy: 0.4045 - val_loss: 1.0542
Epoch 35/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4517 - loss:
1.0262 - val_accuracy: 0.4045 - val_loss: 1.0534
Epoch 36/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4639 - loss:
1.0245 - val_accuracy: 0.4045 - val_loss: 1.0524
Epoch 37/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4666 - loss:
1.0194 - val_accuracy: 0.4045 - val_loss: 1.0513
Epoch 38/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4211 - loss:
1.0297 - val_accuracy: 0.4157 - val_loss: 1.0502

Epoch 39/90
25/25 ————— 0s 2ms/step - accuracy: 0.4496 - loss:
1.0243 - val_accuracy: 0.4270 - val_loss: 1.0488

Epoch 40/90
25/25 ————— 0s 2ms/step - accuracy: 0.4464 - loss:
1.0342 - val_accuracy: 0.4270 - val_loss: 1.0477

Epoch 41/90
25/25 ————— 0s 2ms/step - accuracy: 0.4094 - loss:
1.0483 - val_accuracy: 0.4270 - val_loss: 1.0469

Epoch 42/90
25/25 ————— 0s 2ms/step - accuracy: 0.4699 - loss:
1.0215 - val_accuracy: 0.4157 - val_loss: 1.0456

Epoch 43/90
25/25 ————— 0s 2ms/step - accuracy: 0.4364 - loss:
1.0301 - val_accuracy: 0.4157 - val_loss: 1.0448

Epoch 44/90
25/25 ————— 0s 2ms/step - accuracy: 0.4526 - loss:
1.0412 - val_accuracy: 0.4045 - val_loss: 1.0439

Epoch 45/90
25/25 ————— 0s 2ms/step - accuracy: 0.4675 - loss:
1.0136 - val_accuracy: 0.4045 - val_loss: 1.0432

Epoch 46/90
25/25 ————— 0s 2ms/step - accuracy: 0.4497 - loss:
1.0142 - val_accuracy: 0.4045 - val_loss: 1.0423

Epoch 47/90
25/25 ————— 0s 2ms/step - accuracy: 0.4637 - loss:
1.0189 - val_accuracy: 0.4045 - val_loss: 1.0412

Epoch 48/90
25/25 ————— 0s 2ms/step - accuracy: 0.4606 - loss:
1.0124 - val_accuracy: 0.4045 - val_loss: 1.0403

Epoch 49/90
25/25 ————— 0s 2ms/step - accuracy: 0.4934 - loss:
1.0114 - val_accuracy: 0.3933 - val_loss: 1.0388

Epoch 50/90
25/25 ————— 0s 2ms/step - accuracy: 0.4567 - loss:
1.0250 - val_accuracy: 0.3933 - val_loss: 1.0377

Epoch 51/90
25/25 ————— 0s 2ms/step - accuracy: 0.4551 - loss:
1.0210 - val_accuracy: 0.3933 - val_loss: 1.0371

Epoch 52/90
25/25 ————— 0s 2ms/step - accuracy: 0.4661 - loss:
1.0151 - val_accuracy: 0.3933 - val_loss: 1.0362

Epoch 53/90
25/25 ————— 0s 2ms/step - accuracy: 0.4639 - loss:

1.0178 - val_accuracy: 0.4157 - val_loss: 1.0351
Epoch 54/90
25/25 ————— 0s 2ms/step - accuracy: 0.4874 - loss:
1.0048 - val_accuracy: 0.4157 - val_loss: 1.0344
Epoch 55/90
25/25 ————— 0s 2ms/step - accuracy: 0.4760 - loss:
1.0204 - val_accuracy: 0.3820 - val_loss: 1.0341
Epoch 56/90
25/25 ————— 0s 2ms/step - accuracy: 0.4684 - loss:
1.0110 - val_accuracy: 0.3820 - val_loss: 1.0332
Epoch 57/90
25/25 ————— 0s 2ms/step - accuracy: 0.4666 - loss:
1.0113 - val_accuracy: 0.3820 - val_loss: 1.0325
Epoch 58/90
25/25 ————— 0s 2ms/step - accuracy: 0.4650 - loss:
1.0310 - val_accuracy: 0.3933 - val_loss: 1.0320
Epoch 59/90
25/25 ————— 0s 2ms/step - accuracy: 0.4824 - loss:
0.9927 - val_accuracy: 0.3933 - val_loss: 1.0314
Epoch 60/90
25/25 ————— 0s 2ms/step - accuracy: 0.4556 - loss:
1.0140 - val_accuracy: 0.3820 - val_loss: 1.0310
Epoch 61/90
25/25 ————— 0s 2ms/step - accuracy: 0.4974 - loss:
1.0071 - val_accuracy: 0.3933 - val_loss: 1.0298
Epoch 62/90
25/25 ————— 0s 2ms/step - accuracy: 0.4632 - loss:
1.0012 - val_accuracy: 0.3933 - val_loss: 1.0296
Epoch 63/90
25/25 ————— 0s 2ms/step - accuracy: 0.4637 - loss:
1.0136 - val_accuracy: 0.3820 - val_loss: 1.0292
Epoch 64/90
25/25 ————— 0s 2ms/step - accuracy: 0.5153 - loss:
0.9926 - val_accuracy: 0.3708 - val_loss: 1.0286
Epoch 65/90
25/25 ————— 0s 2ms/step - accuracy: 0.4915 - loss:
1.0109 - val_accuracy: 0.3708 - val_loss: 1.0285
Epoch 66/90
25/25 ————— 0s 2ms/step - accuracy: 0.4736 - loss:
1.0023 - val_accuracy: 0.3708 - val_loss: 1.0274
Epoch 67/90
25/25 ————— 0s 2ms/step - accuracy: 0.4782 - loss:
1.0093 - val_accuracy: 0.3708 - val_loss: 1.0269
Epoch 68/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4740 - loss:
1.0062 - val_accuracy: 0.3596 - val_loss: 1.0263
Epoch 69/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4994 - loss:
0.9941 - val_accuracy: 0.3596 - val_loss: 1.0258
Epoch 70/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5030 - loss:
0.9966 - val_accuracy: 0.3708 - val_loss: 1.0250
Epoch 71/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4745 - loss:
0.9987 - val_accuracy: 0.3596 - val_loss: 1.0253
Epoch 72/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4751 - loss:
1.0209 - val_accuracy: 0.3596 - val_loss: 1.0247
Epoch 73/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5028 - loss:
1.0029 - val_accuracy: 0.3708 - val_loss: 1.0237
Epoch 74/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4416 - loss:
1.0224 - val_accuracy: 0.3708 - val_loss: 1.0242
Epoch 75/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4721 - loss:
0.9942 - val_accuracy: 0.3708 - val_loss: 1.0241
Epoch 76/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4784 - loss:
0.9925 - val_accuracy: 0.3708 - val_loss: 1.0233
Epoch 77/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5028 - loss:
0.9927 - val_accuracy: 0.3596 - val_loss: 1.0225
Epoch 78/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4743 - loss:
1.0076 - val_accuracy: 0.3708 - val_loss: 1.0227
Epoch 79/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5184 - loss:
0.9932 - val_accuracy: 0.3820 - val_loss: 1.0223
Epoch 80/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4832 - loss:
0.9971 - val_accuracy: 0.3820 - val_loss: 1.0222
Epoch 81/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4996 - loss:
0.9897 - val_accuracy: 0.3820 - val_loss: 1.0221
Epoch 82/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4746 - loss:
1.0106 - val_accuracy: 0.3933 - val_loss: 1.0208

Epoch 83/90
25/25 ————— 0s 2ms/step - accuracy: 0.4785 - loss:
1.0012 - val_accuracy: 0.3820 - val_loss: 1.0211

Epoch 84/90
25/25 ————— 0s 2ms/step - accuracy: 0.4591 - loss:
1.0000 - val_accuracy: 0.3933 - val_loss: 1.0215

Epoch 85/90
25/25 ————— 0s 2ms/step - accuracy: 0.4722 - loss:
0.9887 - val_accuracy: 0.4045 - val_loss: 1.0214

Epoch 86/90
25/25 ————— 0s 2ms/step - accuracy: 0.5049 - loss:
0.9767 - val_accuracy: 0.4045 - val_loss: 1.0200

Epoch 87/90
25/25 ————— 0s 2ms/step - accuracy: 0.4800 - loss:
0.9726 - val_accuracy: 0.3933 - val_loss: 1.0198

Epoch 88/90
25/25 ————— 0s 2ms/step - accuracy: 0.4895 - loss:
0.9816 - val_accuracy: 0.3933 - val_loss: 1.0199

Epoch 89/90
25/25 ————— 0s 2ms/step - accuracy: 0.4918 - loss:
0.9855 - val_accuracy: 0.4045 - val_loss: 1.0189

Epoch 90/90
25/25 ————— 0s 2ms/step - accuracy: 0.4903 - loss:
0.9721 - val_accuracy: 0.4045 - val_loss: 1.0189
training_neural_network: SGD, l2=0.0001, dropout=0.4

Epoch 1/90
25/25 ————— 1s 14ms/step - accuracy: 0.3306 - loss:
1.1494 - val_accuracy: 0.3933 - val_loss: 1.1194

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3658 - loss:
1.1192 - val_accuracy: 0.4045 - val_loss: 1.1025

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3864 - loss:
1.0981 - val_accuracy: 0.4045 - val_loss: 1.0906

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.3623 - loss:
1.0938 - val_accuracy: 0.3596 - val_loss: 1.0827

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.3686 - loss:
1.0855 - val_accuracy: 0.3371 - val_loss: 1.0769

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.3905 - loss:
1.0796 - val_accuracy: 0.3933 - val_loss: 1.0726

Epoch 7/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3764 - loss:
1.0756 - val_accuracy: 0.3933 - val_loss: 1.0692
Epoch 8/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3906 - loss:
1.0720 - val_accuracy: 0.4045 - val_loss: 1.0668
Epoch 9/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4390 - loss:
1.0571 - val_accuracy: 0.4157 - val_loss: 1.0650
Epoch 10/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4345 - loss:
1.0649 - val_accuracy: 0.4157 - val_loss: 1.0635
Epoch 11/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4391 - loss:
1.0669 - val_accuracy: 0.4045 - val_loss: 1.0623
Epoch 12/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4298 - loss:
1.0657 - val_accuracy: 0.3933 - val_loss: 1.0613
Epoch 13/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4428 - loss:
1.0574 - val_accuracy: 0.3933 - val_loss: 1.0606
Epoch 14/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4415 - loss:
1.0585 - val_accuracy: 0.4045 - val_loss: 1.0600
Epoch 15/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4396 - loss:
1.0573 - val_accuracy: 0.4045 - val_loss: 1.0594
Epoch 16/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4190 - loss:
1.0644 - val_accuracy: 0.4045 - val_loss: 1.0589
Epoch 17/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4444 - loss:
1.0523 - val_accuracy: 0.4045 - val_loss: 1.0584
Epoch 18/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4390 - loss:
1.0540 - val_accuracy: 0.4045 - val_loss: 1.0581
Epoch 19/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4362 - loss:
1.0644 - val_accuracy: 0.4045 - val_loss: 1.0578
Epoch 20/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4530 - loss:
1.0571 - val_accuracy: 0.4045 - val_loss: 1.0575
Epoch 21/90

25/25 ━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3978 - loss:
1.0734 - val_accuracy: 0.4045 - val_loss: 1.0573

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4621 - loss:
1.0385 - val_accuracy: 0.4045 - val_loss: 1.0571

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4265 - loss:
1.0554 - val_accuracy: 0.4045 - val_loss: 1.0569

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4450 - loss:
1.0523 - val_accuracy: 0.4045 - val_loss: 1.0568
training_neural_network: SGD, l2=0.0001, dropout=0.7000000000000001

Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.2972 - loss:
1.0871 - val_accuracy: 0.4157 - val_loss: 1.0797

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3214 - loss:
1.0928 - val_accuracy: 0.3933 - val_loss: 1.0773

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.3905 - loss:
1.0845 - val_accuracy: 0.4157 - val_loss: 1.0761

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4211 - loss:
1.0722 - val_accuracy: 0.4045 - val_loss: 1.0754

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4286 - loss:
1.0746 - val_accuracy: 0.3820 - val_loss: 1.0743

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4711 - loss:
1.0549 - val_accuracy: 0.4157 - val_loss: 1.0739

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4756 - loss:
1.0507 - val_accuracy: 0.4270 - val_loss: 1.0741

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4517 - loss:
1.0547 - val_accuracy: 0.4045 - val_loss: 1.0736

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4429 - loss:
1.0635 - val_accuracy: 0.4045 - val_loss: 1.0733

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4455 - loss:
1.0538 - val_accuracy: 0.4045 - val_loss: 1.0734
training_neural_network: SGD, l2=0.001, dropout=0.1

Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.4100 - loss:
1.1745 - val_accuracy: 0.3820 - val_loss: 1.1700

Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.3919 - loss:
1.1255 - val_accuracy: 0.3708 - val_loss: 1.1307

Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4145 - loss:
1.0967 - val_accuracy: 0.3258 - val_loss: 1.1084

Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4397 - loss:
1.0808 - val_accuracy: 0.3371 - val_loss: 1.0946

Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4439 - loss:
1.0639 - val_accuracy: 0.3596 - val_loss: 1.0861

Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4515 - loss:
1.0617 - val_accuracy: 0.3596 - val_loss: 1.0806

Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4032 - loss:
1.0735 - val_accuracy: 0.3371 - val_loss: 1.0776

Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4303 - loss:
1.0548 - val_accuracy: 0.3371 - val_loss: 1.0751

Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4496 - loss:
1.0508 - val_accuracy: 0.3483 - val_loss: 1.0734

Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4325 - loss:
1.0530 - val_accuracy: 0.3596 - val_loss: 1.0723

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4356 - loss:
1.0508 - val_accuracy: 0.3596 - val_loss: 1.0712

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4244 - loss:
1.0485 - val_accuracy: 0.3483 - val_loss: 1.0707

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4359 - loss:
1.0529 - val_accuracy: 0.3596 - val_loss: 1.0704

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4539 - loss:
1.0375 - val_accuracy: 0.3596 - val_loss: 1.0703

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4361 - loss:
1.0472 - val_accuracy: 0.3483 - val_loss: 1.0699

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:

1.0340 - val_accuracy: 0.3371 - val_loss: 1.0698
Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4239 - loss:
1.0452 - val_accuracy: 0.3708 - val_loss: 1.0702
Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4314 - loss:
1.0347 - val_accuracy: 0.3483 - val_loss: 1.0701
Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4281 - loss:
1.0394 - val_accuracy: 0.3371 - val_loss: 1.0702
Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4327 - loss:
1.0410 - val_accuracy: 0.3371 - val_loss: 1.0701
training_neural_network: SGD, l2=0.001, dropout=0.4
Epoch 1/90
25/25 ————— 1s 15ms/step - accuracy: 0.3980 - loss:
1.1245 - val_accuracy: 0.4045 - val_loss: 1.1434
Epoch 2/90
25/25 ————— 0s 2ms/step - accuracy: 0.4131 - loss:
1.1013 - val_accuracy: 0.4045 - val_loss: 1.1267
Epoch 3/90
25/25 ————— 0s 2ms/step - accuracy: 0.4090 - loss:
1.0967 - val_accuracy: 0.4157 - val_loss: 1.1155
Epoch 4/90
25/25 ————— 0s 2ms/step - accuracy: 0.4282 - loss:
1.0757 - val_accuracy: 0.4045 - val_loss: 1.1078
Epoch 5/90
25/25 ————— 0s 2ms/step - accuracy: 0.4219 - loss:
1.0782 - val_accuracy: 0.4045 - val_loss: 1.1022
Epoch 6/90
25/25 ————— 0s 2ms/step - accuracy: 0.4265 - loss:
1.0716 - val_accuracy: 0.4045 - val_loss: 1.0982
Epoch 7/90
25/25 ————— 0s 2ms/step - accuracy: 0.4030 - loss:
1.0747 - val_accuracy: 0.4045 - val_loss: 1.0950
Epoch 8/90
25/25 ————— 0s 2ms/step - accuracy: 0.4275 - loss:
1.0646 - val_accuracy: 0.4045 - val_loss: 1.0922
Epoch 9/90
25/25 ————— 0s 2ms/step - accuracy: 0.4355 - loss:
1.0636 - val_accuracy: 0.4045 - val_loss: 1.0899
Epoch 10/90
25/25 ————— 0s 2ms/step - accuracy: 0.4163 - loss:
1.0639 - val_accuracy: 0.4045 - val_loss: 1.0880

Epoch 11/90
25/25 ————— 0s 2ms/step - accuracy: 0.4626 - loss:
1.0510 - val_accuracy: 0.3933 - val_loss: 1.0865

Epoch 12/90
25/25 ————— 0s 2ms/step - accuracy: 0.4494 - loss:
1.0603 - val_accuracy: 0.3933 - val_loss: 1.0852

Epoch 13/90
25/25 ————— 0s 2ms/step - accuracy: 0.4298 - loss:
1.0624 - val_accuracy: 0.3933 - val_loss: 1.0840

Epoch 14/90
25/25 ————— 0s 2ms/step - accuracy: 0.4482 - loss:
1.0572 - val_accuracy: 0.3933 - val_loss: 1.0831

Epoch 15/90
25/25 ————— 0s 2ms/step - accuracy: 0.4585 - loss:
1.0606 - val_accuracy: 0.3933 - val_loss: 1.0824

Epoch 16/90
25/25 ————— 0s 2ms/step - accuracy: 0.4610 - loss:
1.0545 - val_accuracy: 0.3933 - val_loss: 1.0817

Epoch 17/90
25/25 ————— 0s 2ms/step - accuracy: 0.4300 - loss:
1.0716 - val_accuracy: 0.3933 - val_loss: 1.0811

Epoch 18/90
25/25 ————— 0s 2ms/step - accuracy: 0.4526 - loss:
1.0647 - val_accuracy: 0.3933 - val_loss: 1.0806

Epoch 19/90
25/25 ————— 0s 2ms/step - accuracy: 0.4416 - loss:
1.0586 - val_accuracy: 0.3933 - val_loss: 1.0800

Epoch 20/90
25/25 ————— 0s 2ms/step - accuracy: 0.4706 - loss:
1.0438 - val_accuracy: 0.3933 - val_loss: 1.0796

Epoch 21/90
25/25 ————— 0s 2ms/step - accuracy: 0.4313 - loss:
1.0584 - val_accuracy: 0.3933 - val_loss: 1.0795

Epoch 22/90
25/25 ————— 0s 2ms/step - accuracy: 0.4758 - loss:
1.0388 - val_accuracy: 0.3933 - val_loss: 1.0791

Epoch 23/90
25/25 ————— 0s 2ms/step - accuracy: 0.4471 - loss:
1.0598 - val_accuracy: 0.3933 - val_loss: 1.0788

Epoch 24/90
25/25 ————— 0s 2ms/step - accuracy: 0.4696 - loss:
1.0521 - val_accuracy: 0.3933 - val_loss: 1.0787

Epoch 25/90
25/25 ————— 0s 2ms/step - accuracy: 0.4400 - loss:

1.0630 - val_accuracy: 0.3933 - val_loss: 1.0781
Epoch 26/90
25/25 ————— 0s 2ms/step - accuracy: 0.4442 - loss:
1.0632 - val_accuracy: 0.3933 - val_loss: 1.0778
Epoch 27/90
25/25 ————— 0s 2ms/step - accuracy: 0.4452 - loss:
1.0477 - val_accuracy: 0.3933 - val_loss: 1.0778
Epoch 28/90
25/25 ————— 0s 2ms/step - accuracy: 0.4390 - loss:
1.0632 - val_accuracy: 0.3933 - val_loss: 1.0778
Epoch 29/90
25/25 ————— 0s 2ms/step - accuracy: 0.4422 - loss:
1.0610 - val_accuracy: 0.3933 - val_loss: 1.0776
Epoch 30/90
25/25 ————— 0s 2ms/step - accuracy: 0.4590 - loss:
1.0479 - val_accuracy: 0.3933 - val_loss: 1.0775
Epoch 31/90
25/25 ————— 0s 2ms/step - accuracy: 0.4470 - loss:
1.0481 - val_accuracy: 0.3933 - val_loss: 1.0773
training_neural_network: SGD, l2=0.001, dropout=0.7000000000000001
28/28 ————— 0s 3ms/step
19/19 ————— 0s 951us/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 940us/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 984us/step
28/28 ————— 0s 3ms/step
19/19 ————— 0s 1ms/step
With Null
training_decision_tree
training_random_forest:n_estimators=2
training_random_forest:n_estimators=3
training_random_forest:n_estimators=5
training_random_forest:n_estimators=7

training_random_forest:n_estimators=11
training_random_forest:n_estimators=13
training_random_forest:n_estimators=20
training_random_forest:n_estimators=30
training_random_forest:n_estimators=50
training_random_forest:n_estimators=70
training_random_forest:n_estimators=90
training_random_forest:n_estimators=120
training_random_forest:n_estimators=150
training_random_forest:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
training_gradient_boost:n_estimators=5
training_gradient_boost:n_estimators=7
training_gradient_boost:n_estimators=11
training_gradient_boost:n_estimators=13
training_gradient_boost:n_estimators=20
training_gradient_boost:n_estimators=30
training_gradient_boost:n_estimators=50
training_gradient_boost:n_estimators=70
training_gradient_boost:n_estimators=90
training_gradient_boost:n_estimators=120
training_gradient_boost:n_estimators=150
training_gradient_boost:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
training_gradient_boost:n_estimators=5
training_gradient_boost:n_estimators=7
training_gradient_boost:n_estimators=11
training_gradient_boost:n_estimators=13
training_gradient_boost:n_estimators=20
training_gradient_boost:n_estimators=30
training_gradient_boost:n_estimators=50
training_gradient_boost:n_estimators=70
training_gradient_boost:n_estimators=90
training_gradient_boost:n_estimators=120
training_gradient_boost:n_estimators=150
training_gradient_boost:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
training_gradient_boost:n_estimators=5
training_gradient_boost:n_estimators=7
training_gradient_boost:n_estimators=11
training_gradient_boost:n_estimators=13

training_gradient_boost:n_estimators=20
training_gradient_boost:n_estimators=30
training_gradient_boost:n_estimators=50
training_gradient_boost:n_estimators=70
training_gradient_boost:n_estimators=90
training_gradient_boost:n_estimators=120
training_gradient_boost:n_estimators=150
training_gradient_boost:n_estimators=200
training_gradient_boost:n_estimators=2
training_gradient_boost:n_estimators=3
training_gradient_boost:n_estimators=5
training_gradient_boost:n_estimators=7
training_gradient_boost:n_estimators=11
training_gradient_boost:n_estimators=13
training_gradient_boost:n_estimators=20
training_gradient_boost:n_estimators=30
training_gradient_boost:n_estimators=50
training_gradient_boost:n_estimators=70
training_gradient_boost:n_estimators=90
training_gradient_boost:n_estimators=120
training_gradient_boost:n_estimators=150
training_gradient_boost:n_estimators=200
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20

training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2

```
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
training_xg_boost:n_estimators=2
training_xg_boost:n_estimators=3
training_xg_boost:n_estimators=5
training_xg_boost:n_estimators=7
training_xg_boost:n_estimators=11
training_xg_boost:n_estimators=13
training_xg_boost:n_estimators=15
training_xg_boost:n_estimators=17
training_xg_boost:n_estimators=20
training_xg_boost:n_estimators=25
training_xg_boost:n_estimators=30
training_xg_boost:n_estimators=40
training_xg_boost:n_estimators=50
With Null
Epoch 1/90
1099/1099 ━━━━━━━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7159 -
loss: 0.5563 - val_accuracy: 0.8119 - val_loss: 0.4090
Epoch 2/90
1099/1099 ━━━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8213 -
loss: 0.3864 - val_accuracy: 0.8270 - val_loss: 0.3796
Epoch 3/90
1099/1099 ━━━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8295 -
loss: 0.3657 - val_accuracy: 0.8327 - val_loss: 0.3695
Epoch 4/90
1099/1099 ━━━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8389 -
loss: 0.3482 - val_accuracy: 0.8314 - val_loss: 0.3608
Epoch 5/90
1099/1099 ━━━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8374 -
loss: 0.3483 - val_accuracy: 0.8344 - val_loss: 0.3563
Epoch 6/90
1099/1099 ━━━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3428 - val_accuracy: 0.8350 - val_loss: 0.3535
```

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8373 -
loss: 0.3414 - val_accuracy: 0.8350 - val_loss: 0.3512

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3364 - val_accuracy: 0.8355 - val_loss: 0.3501

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8394 -
loss: 0.3418 - val_accuracy: 0.8362 - val_loss: 0.3506

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8407 -
loss: 0.3405 - val_accuracy: 0.8334 - val_loss: 0.3479

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3340 - val_accuracy: 0.8332 - val_loss: 0.3465

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3353 - val_accuracy: 0.8347 - val_loss: 0.3490

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8404 -
loss: 0.3367 - val_accuracy: 0.8388 - val_loss: 0.3465

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3318 - val_accuracy: 0.8337 - val_loss: 0.3442

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8458 -
loss: 0.3290 - val_accuracy: 0.8367 - val_loss: 0.3432

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3273 - val_accuracy: 0.8342 - val_loss: 0.3428

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3291 - val_accuracy: 0.8352 - val_loss: 0.3422

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8476 -
loss: 0.3286 - val_accuracy: 0.8375 - val_loss: 0.3412

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3302 - val_accuracy: 0.8357 - val_loss: 0.3412

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3231 - val_accuracy: 0.8316 - val_loss: 0.3566

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8511 -

loss: 0.3208 - val_accuracy: 0.8393 - val_loss: 0.3427
Epoch 22/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3277 - val_accuracy: 0.8398 - val_loss: 0.3442
Epoch 23/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3268 - val_accuracy: 0.8424 - val_loss: 0.3374
Epoch 24/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3304 - val_accuracy: 0.8367 - val_loss: 0.3402
Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3274 - val_accuracy: 0.8380 - val_loss: 0.3381
Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8497 -
loss: 0.3260 - val_accuracy: 0.8424 - val_loss: 0.3359
Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8533 -
loss: 0.3169 - val_accuracy: 0.8355 - val_loss: 0.3377
Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8510 -
loss: 0.3255 - val_accuracy: 0.8350 - val_loss: 0.3444
Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8525 -
loss: 0.3202 - val_accuracy: 0.8454 - val_loss: 0.3357
Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3253 - val_accuracy: 0.8442 - val_loss: 0.3339
Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3166 - val_accuracy: 0.8447 - val_loss: 0.3339
Epoch 32/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3190 - val_accuracy: 0.8408 - val_loss: 0.3437
Epoch 33/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3177 - val_accuracy: 0.8373 - val_loss: 0.3396
Epoch 34/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3207 - val_accuracy: 0.8437 - val_loss: 0.3326
Epoch 35/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3208 - val_accuracy: 0.8475 - val_loss: 0.3374
Epoch 36/90

1099/1099 ————— 1s 993us/step - accuracy: 0.8508
- loss: 0.3219 - val_accuracy: 0.8465 - val_loss: 0.3332
Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3212 - val_accuracy: 0.8442 - val_loss: 0.3362
Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8556 -
loss: 0.3160 - val_accuracy: 0.8403 - val_loss: 0.3404
Epoch 39/90
1099/1099 ————— 1s 994us/step - accuracy: 0.8535
- loss: 0.3194 - val_accuracy: 0.8344 - val_loss: 0.3445
training_neural_network: Adam, l2=0, dropout=0
1222/1222 ————— 1s 1ms/step
815/815 ————— 1s 959us/step
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7544 -
loss: 0.5171 - val_accuracy: 0.7815 - val_loss: 0.4323
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8047 -
loss: 0.4082 - val_accuracy: 0.8135 - val_loss: 0.3978
Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8245 -
loss: 0.3795 - val_accuracy: 0.8242 - val_loss: 0.3803
Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8280 -
loss: 0.3692 - val_accuracy: 0.8270 - val_loss: 0.3724
Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8334 -
loss: 0.3540 - val_accuracy: 0.8316 - val_loss: 0.3611
Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8364 -
loss: 0.3525 - val_accuracy: 0.8337 - val_loss: 0.3562
Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8416 -
loss: 0.3431 - val_accuracy: 0.8367 - val_loss: 0.3564
Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8415 -
loss: 0.3381 - val_accuracy: 0.8355 - val_loss: 0.3585
Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8436 -
loss: 0.3349 - val_accuracy: 0.8350 - val_loss: 0.3494
Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3337 - val_accuracy: 0.8357 - val_loss: 0.3492

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8412 -
loss: 0.3341 - val_accuracy: 0.8357 - val_loss: 0.3478

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3344 - val_accuracy: 0.8406 - val_loss: 0.3446

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8416 -
loss: 0.3350 - val_accuracy: 0.8367 - val_loss: 0.3508

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8476 -
loss: 0.3314 - val_accuracy: 0.8352 - val_loss: 0.3440

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3288 - val_accuracy: 0.8388 - val_loss: 0.3419

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3321 - val_accuracy: 0.8362 - val_loss: 0.3421

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3295 - val_accuracy: 0.8383 - val_loss: 0.3448

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3327 - val_accuracy: 0.8303 - val_loss: 0.3503

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3286 - val_accuracy: 0.8357 - val_loss: 0.3508

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3279 - val_accuracy: 0.8401 - val_loss: 0.3380

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3260 - val_accuracy: 0.8406 - val_loss: 0.3385

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3215 - val_accuracy: 0.8419 - val_loss: 0.3378

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3270 - val_accuracy: 0.8414 - val_loss: 0.3368

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3236 - val_accuracy: 0.8449 - val_loss: 0.3355

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8534 -

loss: 0.3171 - val_accuracy: 0.8437 - val_loss: 0.3346
Epoch 26/90
1099/1099 ————— 1s 1000us/step - accuracy: 0.8530 - loss: 0.3184 - val_accuracy: 0.8360 - val_loss: 0.3476
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8520 - loss: 0.3150 - val_accuracy: 0.8452 - val_loss: 0.3322
Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8530 - loss: 0.3186 - val_accuracy: 0.8460 - val_loss: 0.3305
Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8548 - loss: 0.3151 - val_accuracy: 0.8442 - val_loss: 0.3301
Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8522 - loss: 0.3201 - val_accuracy: 0.8472 - val_loss: 0.3308
Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8528 - loss: 0.3156 - val_accuracy: 0.8460 - val_loss: 0.3294
Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8549 - loss: 0.3103 - val_accuracy: 0.8419 - val_loss: 0.3377
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8563 - loss: 0.3147 - val_accuracy: 0.8462 - val_loss: 0.3269
Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8561 - loss: 0.3115 - val_accuracy: 0.8475 - val_loss: 0.3266
Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8537 - loss: 0.3134 - val_accuracy: 0.8529 - val_loss: 0.3281
Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8592 - loss: 0.3091 - val_accuracy: 0.8470 - val_loss: 0.3256
Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8536 - loss: 0.3137 - val_accuracy: 0.8467 - val_loss: 0.3276
Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8563 - loss: 0.3134 - val_accuracy: 0.8470 - val_loss: 0.3313
Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8551 - loss: 0.3113 - val_accuracy: 0.8477 - val_loss: 0.3281
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8542 -
loss: 0.3100 - val_accuracy: 0.8513 - val_loss: 0.3234
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8557 -
loss: 0.3099 - val_accuracy: 0.8467 - val_loss: 0.3328
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8601 -
loss: 0.3103 - val_accuracy: 0.8444 - val_loss: 0.3393
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8584 -
loss: 0.3101 - val_accuracy: 0.8503 - val_loss: 0.3225
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8573 -
loss: 0.3076 - val_accuracy: 0.8457 - val_loss: 0.3296
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8564 -
loss: 0.3098 - val_accuracy: 0.8457 - val_loss: 0.3266
training_neural_network: Adam, l2=0, dropout=0.0
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7376 -
loss: 0.5361 - val_accuracy: 0.7950 - val_loss: 0.4254
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8124 -
loss: 0.4030 - val_accuracy: 0.8132 - val_loss: 0.3931
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8276 -
loss: 0.3665 - val_accuracy: 0.8257 - val_loss: 0.3738
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8341 -
loss: 0.3579 - val_accuracy: 0.8283 - val_loss: 0.3659
Epoch 5/90

1099/1099 ━━━━━━━━━━ 2s 1ms/step - accuracy: 0.8348 -
loss: 0.3536 - val_accuracy: 0.8327 - val_loss: 0.3606
Epoch 6/90

1099/1099 ━━━━━━━━━━ 3s 3ms/step - accuracy: 0.8388 -
loss: 0.3427 - val_accuracy: 0.8301 - val_loss: 0.3554
Epoch 7/90

1099/1099 ━━━━━━━━━━ 5s 3ms/step - accuracy: 0.8378 -
loss: 0.3420 - val_accuracy: 0.8365 - val_loss: 0.3584
Epoch 8/90

1099/1099 ━━━━━━━━━━ 3s 3ms/step - accuracy: 0.8415 -
loss: 0.3395 - val_accuracy: 0.8321 - val_loss: 0.3509
Epoch 9/90

1099/1099 ━━━━━━━━━━ 3s 3ms/step - accuracy: 0.8417 -

loss: 0.3402 - val_accuracy: 0.8327 - val_loss: 0.3498
Epoch 10/90
1099/1099 ━━━━━━━━━━ 5s 3ms/step - accuracy: 0.8401 -
loss: 0.3400 - val_accuracy: 0.8344 - val_loss: 0.3480
Epoch 11/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.8405 -
loss: 0.3373 - val_accuracy: 0.8398 - val_loss: 0.3524
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8423 -
loss: 0.3382 - val_accuracy: 0.8329 - val_loss: 0.3485
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3352 - val_accuracy: 0.8334 - val_loss: 0.3452
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3294 - val_accuracy: 0.8378 - val_loss: 0.3469
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8452 -
loss: 0.3302 - val_accuracy: 0.8337 - val_loss: 0.3434
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3351 - val_accuracy: 0.8334 - val_loss: 0.3432
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8446 -
loss: 0.3308 - val_accuracy: 0.8314 - val_loss: 0.3518
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3282 - val_accuracy: 0.8352 - val_loss: 0.3417
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3264 - val_accuracy: 0.8350 - val_loss: 0.3430
Epoch 20/90
1099/1099 ━━━━━━━━━━ 3s 2ms/step - accuracy: 0.8524 -
loss: 0.3249 - val_accuracy: 0.8383 - val_loss: 0.3416
Epoch 21/90
1099/1099 ━━━━━━━━━━ 5s 3ms/step - accuracy: 0.8490 -
loss: 0.3241 - val_accuracy: 0.8334 - val_loss: 0.3470
Epoch 22/90
1099/1099 ━━━━━━━━━━ 3s 3ms/step - accuracy: 0.8471 -
loss: 0.3281 - val_accuracy: 0.8311 - val_loss: 0.3505
Epoch 23/90
1099/1099 ━━━━━━━━━━ 5s 2ms/step - accuracy: 0.8443 -
loss: 0.3323 - val_accuracy: 0.8301 - val_loss: 0.3546
training_neural_network: Adam, l2=0, dropout=0.2

Epoch 1/90
1099/1099 ————— 6s 3ms/step - accuracy: 0.7317 -
loss: 0.5656 - val_accuracy: 0.7802 - val_loss: 0.4479

Epoch 2/90
1099/1099 ————— 3s 3ms/step - accuracy: 0.7990 -
loss: 0.4142 - val_accuracy: 0.8158 - val_loss: 0.4009

Epoch 3/90
1099/1099 ————— 5s 3ms/step - accuracy: 0.8185 -
loss: 0.3890 - val_accuracy: 0.8270 - val_loss: 0.3817

Epoch 4/90
1099/1099 ————— 5s 3ms/step - accuracy: 0.8301 -
loss: 0.3621 - val_accuracy: 0.8296 - val_loss: 0.3699

Epoch 5/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.8325 -
loss: 0.3544 - val_accuracy: 0.8352 - val_loss: 0.3636

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8383 -
loss: 0.3445 - val_accuracy: 0.8337 - val_loss: 0.3589

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8372 -
loss: 0.3442 - val_accuracy: 0.8327 - val_loss: 0.3544

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3386 - val_accuracy: 0.8301 - val_loss: 0.3544

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8378 -
loss: 0.3427 - val_accuracy: 0.8350 - val_loss: 0.3508

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3350 - val_accuracy: 0.8360 - val_loss: 0.3519

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8413 -
loss: 0.3336 - val_accuracy: 0.8293 - val_loss: 0.3524

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8340 -
loss: 0.3447 - val_accuracy: 0.8337 - val_loss: 0.3488

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3321 - val_accuracy: 0.8352 - val_loss: 0.3550

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8405 -
loss: 0.3332 - val_accuracy: 0.8344 - val_loss: 0.3490

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8505 -

loss: 0.3267 - val_accuracy: 0.8347 - val_loss: 0.3458
Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3315 - val_accuracy: 0.8347 - val_loss: 0.3449
Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3340 - val_accuracy: 0.8355 - val_loss: 0.3481
Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3305 - val_accuracy: 0.8375 - val_loss: 0.3452
Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3323 - val_accuracy: 0.8352 - val_loss: 0.3437
Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8428 -
loss: 0.3304 - val_accuracy: 0.8355 - val_loss: 0.3428
Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8424 -
loss: 0.3322 - val_accuracy: 0.8378 - val_loss: 0.3443
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3263 - val_accuracy: 0.8373 - val_loss: 0.3401
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3261 - val_accuracy: 0.8383 - val_loss: 0.3410
Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3260 - val_accuracy: 0.8416 - val_loss: 0.3430
Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3227 - val_accuracy: 0.8403 - val_loss: 0.3391
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8508 -
loss: 0.3237 - val_accuracy: 0.8393 - val_loss: 0.3407
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3240 - val_accuracy: 0.8393 - val_loss: 0.3410
training_neural_network: Adam, l2=0, dropout=0.4
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7204 -
loss: 0.5536 - val_accuracy: 0.8083 - val_loss: 0.4103
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8150 -
loss: 0.3928 - val_accuracy: 0.8196 - val_loss: 0.3827

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8302 -
loss: 0.3687 - val_accuracy: 0.8286 - val_loss: 0.3701

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8361 -
loss: 0.3536 - val_accuracy: 0.8291 - val_loss: 0.3647

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8356 -
loss: 0.3497 - val_accuracy: 0.8319 - val_loss: 0.3575

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8385 -
loss: 0.3453 - val_accuracy: 0.8339 - val_loss: 0.3544

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8424 -
loss: 0.3405 - val_accuracy: 0.8321 - val_loss: 0.3521

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8414 -
loss: 0.3412 - val_accuracy: 0.8293 - val_loss: 0.3546

Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3396 - val_accuracy: 0.8332 - val_loss: 0.3500

Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3410 - val_accuracy: 0.8309 - val_loss: 0.3508

Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8435 -
loss: 0.3360 - val_accuracy: 0.8316 - val_loss: 0.3491

Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3307 - val_accuracy: 0.8311 - val_loss: 0.3461

Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3308 - val_accuracy: 0.8342 - val_loss: 0.3475

Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8452 -
loss: 0.3303 - val_accuracy: 0.8337 - val_loss: 0.3443

Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8465 -
loss: 0.3316 - val_accuracy: 0.8367 - val_loss: 0.3442

Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3275 - val_accuracy: 0.8355 - val_loss: 0.3444

Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -

loss: 0.3278 - val_accuracy: 0.8365 - val_loss: 0.3454
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8450 -
loss: 0.3304 - val_accuracy: 0.8350 - val_loss: 0.3422
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3263 - val_accuracy: 0.8357 - val_loss: 0.3405
Epoch 20/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3241 - val_accuracy: 0.8355 - val_loss: 0.3408
Epoch 21/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8493 -
loss: 0.3243 - val_accuracy: 0.8388 - val_loss: 0.3417
Epoch 22/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3246 - val_accuracy: 0.8373 - val_loss: 0.3399
Epoch 23/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3229 - val_accuracy: 0.8396 - val_loss: 0.3385
Epoch 24/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8513 -
loss: 0.3197 - val_accuracy: 0.8370 - val_loss: 0.3378
Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3224 - val_accuracy: 0.8414 - val_loss: 0.3372
Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3239 - val_accuracy: 0.8388 - val_loss: 0.3372
Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8533 -
loss: 0.3215 - val_accuracy: 0.8408 - val_loss: 0.3350
Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3194 - val_accuracy: 0.8398 - val_loss: 0.3342
Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3199 - val_accuracy: 0.8424 - val_loss: 0.3356
Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3168 - val_accuracy: 0.8444 - val_loss: 0.3356
Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8562 -
loss: 0.3138 - val_accuracy: 0.8406 - val_loss: 0.3414
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3152 - val_accuracy: 0.8426 - val_loss: 0.3310
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8555 -
loss: 0.3135 - val_accuracy: 0.8357 - val_loss: 0.3495
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3179 - val_accuracy: 0.8449 - val_loss: 0.3314
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8521 -
loss: 0.3177 - val_accuracy: 0.8424 - val_loss: 0.3326
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8551 -
loss: 0.3161 - val_accuracy: 0.8421 - val_loss: 0.3285
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8577 -
loss: 0.3104 - val_accuracy: 0.8416 - val_loss: 0.3301
Epoch 38/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8566 -
loss: 0.3153 - val_accuracy: 0.8457 - val_loss: 0.3294
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8552 -
loss: 0.3148 - val_accuracy: 0.8416 - val_loss: 0.3294
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3150 - val_accuracy: 0.8462 - val_loss: 0.3293
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8555 -
loss: 0.3087 - val_accuracy: 0.8437 - val_loss: 0.3262
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3113 - val_accuracy: 0.8414 - val_loss: 0.3273
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3091 - val_accuracy: 0.8431 - val_loss: 0.3296
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8587 -
loss: 0.3078 - val_accuracy: 0.8429 - val_loss: 0.3262
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3141 - val_accuracy: 0.8444 - val_loss: 0.3269
Epoch 46/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8561 -
loss: 0.3100 - val_accuracy: 0.8485 - val_loss: 0.3250

Epoch 47/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8565 -
loss: 0.3074 - val_accuracy: 0.8424 - val_loss: 0.3297

Epoch 48/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8573 -
loss: 0.3039 - val_accuracy: 0.8449 - val_loss: 0.3286

Epoch 49/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8570 -
loss: 0.3086 - val_accuracy: 0.8447 - val_loss: 0.3248

Epoch 50/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8571 -
loss: 0.3102 - val_accuracy: 0.8444 - val_loss: 0.3377

Epoch 51/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3108 - val_accuracy: 0.8457 - val_loss: 0.3281
training_neural_network: Adam, l2=0, dropout=0.6000000000000001

Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7481 -
loss: 0.5273 - val_accuracy: 0.7835 - val_loss: 0.4367

Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8049 -
loss: 0.4111 - val_accuracy: 0.8176 - val_loss: 0.3991

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8201 -
loss: 0.3829 - val_accuracy: 0.8224 - val_loss: 0.3788

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8247 -
loss: 0.3672 - val_accuracy: 0.8280 - val_loss: 0.3675

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8320 -
loss: 0.3575 - val_accuracy: 0.8329 - val_loss: 0.3615

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8373 -
loss: 0.3480 - val_accuracy: 0.8365 - val_loss: 0.3531

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8386 -
loss: 0.3453 - val_accuracy: 0.8365 - val_loss: 0.3504

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8392 -
loss: 0.3403 - val_accuracy: 0.8344 - val_loss: 0.3484

Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3358 - val_accuracy: 0.8319 - val_loss: 0.3469

Epoch 10/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3374 - val_accuracy: 0.8375 - val_loss: 0.3468
Epoch 11/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8458 -
loss: 0.3337 - val_accuracy: 0.8385 - val_loss: 0.3479
Epoch 12/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8406 -
loss: 0.3394 - val_accuracy: 0.8355 - val_loss: 0.3468
Epoch 13/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3326 - val_accuracy: 0.8357 - val_loss: 0.3487
Epoch 14/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3329 - val_accuracy: 0.8380 - val_loss: 0.3473
training_neural_network: Adam, l2=0, dropout=0.8

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 984us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 986us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 989us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 989us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 1ms/step

Epoch 1/90

1099/1099 ————— 3s 1ms/step - accuracy: 0.7586 -
loss: 0.5104 - val_accuracy: 0.7894 - val_loss: 0.4250
Epoch 2/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8054 -
loss: 0.4035 - val_accuracy: 0.8112 - val_loss: 0.3986
Epoch 3/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8192 -
loss: 0.3839 - val_accuracy: 0.8199 - val_loss: 0.3867
Epoch 4/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8278 -
loss: 0.3688 - val_accuracy: 0.8270 - val_loss: 0.3725
Epoch 5/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8314 -
loss: 0.3578 - val_accuracy: 0.8352 - val_loss: 0.3642
Epoch 6/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8354 -
loss: 0.3524 - val_accuracy: 0.8324 - val_loss: 0.3588
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3460 - val_accuracy: 0.8324 - val_loss: 0.3549
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8390 -
loss: 0.3440 - val_accuracy: 0.8337 - val_loss: 0.3548
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8419 -
loss: 0.3376 - val_accuracy: 0.8344 - val_loss: 0.3511
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3429 - val_accuracy: 0.8342 - val_loss: 0.3506
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3338 - val_accuracy: 0.8344 - val_loss: 0.3481
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8428 -
loss: 0.3313 - val_accuracy: 0.8370 - val_loss: 0.3489
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8428 -
loss: 0.3337 - val_accuracy: 0.8352 - val_loss: 0.3475
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8432 -
loss: 0.3320 - val_accuracy: 0.8367 - val_loss: 0.3464
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3302 - val_accuracy: 0.8344 - val_loss: 0.3448
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3323 - val_accuracy: 0.8334 - val_loss: 0.3445
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3325 - val_accuracy: 0.8324 - val_loss: 0.3431
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8465 -
loss: 0.3273 - val_accuracy: 0.8344 - val_loss: 0.3454
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8493 -
loss: 0.3243 - val_accuracy: 0.8373 - val_loss: 0.3415
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3311 - val_accuracy: 0.8378 - val_loss: 0.3398
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3247 - val_accuracy: 0.8373 - val_loss: 0.3400

Epoch 22/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3286 - val_accuracy: 0.8383 - val_loss: 0.3403

Epoch 23/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3271 - val_accuracy: 0.8388 - val_loss: 0.3390

Epoch 24/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8528 -
loss: 0.3219 - val_accuracy: 0.8367 - val_loss: 0.3404

Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3256 - val_accuracy: 0.8375 - val_loss: 0.3395
training_neural_network: Adam, l2=0.0, dropout=0

Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7606 -
loss: 0.5034 - val_accuracy: 0.7994 - val_loss: 0.4201

Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8195 -
loss: 0.3942 - val_accuracy: 0.8199 - val_loss: 0.3902

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8242 -
loss: 0.3748 - val_accuracy: 0.8278 - val_loss: 0.3757

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8312 -
loss: 0.3623 - val_accuracy: 0.8319 - val_loss: 0.3666

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8349 -
loss: 0.3549 - val_accuracy: 0.8357 - val_loss: 0.3624

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8408 -
loss: 0.3492 - val_accuracy: 0.8347 - val_loss: 0.3566

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8386 -
loss: 0.3454 - val_accuracy: 0.8365 - val_loss: 0.3564

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8393 -
loss: 0.3465 - val_accuracy: 0.8375 - val_loss: 0.3522

Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3390 - val_accuracy: 0.8280 - val_loss: 0.3548

Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3351 - val_accuracy: 0.8373 - val_loss: 0.3520

Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3381 - val_accuracy: 0.8390 - val_loss: 0.3517
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3355 - val_accuracy: 0.8327 - val_loss: 0.3467
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8422 -
loss: 0.3381 - val_accuracy: 0.8411 - val_loss: 0.3511
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3333 - val_accuracy: 0.8396 - val_loss: 0.3490
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3314 - val_accuracy: 0.8385 - val_loss: 0.3443
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3329 - val_accuracy: 0.8316 - val_loss: 0.3454
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3269 - val_accuracy: 0.8373 - val_loss: 0.3450
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8515 -
loss: 0.3216 - val_accuracy: 0.8421 - val_loss: 0.3425
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3248 - val_accuracy: 0.8414 - val_loss: 0.3468
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3272 - val_accuracy: 0.8411 - val_loss: 0.3408
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3281 - val_accuracy: 0.8378 - val_loss: 0.3450
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3238 - val_accuracy: 0.8396 - val_loss: 0.3393
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3275 - val_accuracy: 0.8431 - val_loss: 0.3401
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3186 - val_accuracy: 0.8362 - val_loss: 0.3468
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3220 - val_accuracy: 0.8454 - val_loss: 0.3402

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3192 - val_accuracy: 0.8375 - val_loss: 0.3412

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8519 -
loss: 0.3210 - val_accuracy: 0.8460 - val_loss: 0.3357

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3192 - val_accuracy: 0.8457 - val_loss: 0.3366

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8542 -
loss: 0.3174 - val_accuracy: 0.8460 - val_loss: 0.3354

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3195 - val_accuracy: 0.8475 - val_loss: 0.3350

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3155 - val_accuracy: 0.8334 - val_loss: 0.3469

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8537 -
loss: 0.3160 - val_accuracy: 0.8465 - val_loss: 0.3329

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8513 -
loss: 0.3214 - val_accuracy: 0.8462 - val_loss: 0.3332

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3176 - val_accuracy: 0.8488 - val_loss: 0.3322

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8515 -
loss: 0.3178 - val_accuracy: 0.8434 - val_loss: 0.3389

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8496 -
loss: 0.3216 - val_accuracy: 0.8495 - val_loss: 0.3340

Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8549 -
loss: 0.3126 - val_accuracy: 0.8416 - val_loss: 0.3355

training_neural_network: Adam, l2=1e-05, dropout=0

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7334 -
loss: 0.5302 - val_accuracy: 0.8191 - val_loss: 0.4067

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8223 -
loss: 0.3861 - val_accuracy: 0.8229 - val_loss: 0.3822

Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8298 -
loss: 0.3666 - val_accuracy: 0.8293 - val_loss: 0.3689
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8348 -
loss: 0.3509 - val_accuracy: 0.8286 - val_loss: 0.3628
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8411 -
loss: 0.3436 - val_accuracy: 0.8329 - val_loss: 0.3650
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3442 - val_accuracy: 0.8298 - val_loss: 0.3626
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8410 -
loss: 0.3397 - val_accuracy: 0.8306 - val_loss: 0.3539
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3350 - val_accuracy: 0.8316 - val_loss: 0.3517
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3403 - val_accuracy: 0.8319 - val_loss: 0.3521
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3348 - val_accuracy: 0.8321 - val_loss: 0.3497
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8414 -
loss: 0.3363 - val_accuracy: 0.8324 - val_loss: 0.3478
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3342 - val_accuracy: 0.8367 - val_loss: 0.3514
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3367 - val_accuracy: 0.8334 - val_loss: 0.3515
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3319 - val_accuracy: 0.8352 - val_loss: 0.3456
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3283 - val_accuracy: 0.8350 - val_loss: 0.3447
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3277 - val_accuracy: 0.8350 - val_loss: 0.3441
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8439 -
loss: 0.3317 - val_accuracy: 0.8357 - val_loss: 0.3499

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3254 - val_accuracy: 0.8365 - val_loss: 0.3436

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3282 - val_accuracy: 0.8367 - val_loss: 0.3423

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3258 - val_accuracy: 0.8367 - val_loss: 0.3429

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3248 - val_accuracy: 0.8393 - val_loss: 0.3438

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8476 -
loss: 0.3277 - val_accuracy: 0.8390 - val_loss: 0.3385

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3260 - val_accuracy: 0.8390 - val_loss: 0.3388

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3205 - val_accuracy: 0.8347 - val_loss: 0.3478

Epoch 25/90
1099/1099 ————— 3s 3ms/step - accuracy: 0.8471 -
loss: 0.3255 - val_accuracy: 0.8396 - val_loss: 0.3376

Epoch 26/90
1099/1099 ————— 5s 3ms/step - accuracy: 0.8507 -
loss: 0.3224 - val_accuracy: 0.8396 - val_loss: 0.3372

Epoch 27/90
1099/1099 ————— 4s 4ms/step - accuracy: 0.8503 -
loss: 0.3215 - val_accuracy: 0.8416 - val_loss: 0.3361

Epoch 28/90
1099/1099 ————— 4s 3ms/step - accuracy: 0.8522 -
loss: 0.3215 - val_accuracy: 0.8411 - val_loss: 0.3374

Epoch 29/90
1099/1099 ————— 5s 2ms/step - accuracy: 0.8525 -
loss: 0.3185 - val_accuracy: 0.8347 - val_loss: 0.3470

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3220 - val_accuracy: 0.8199 - val_loss: 0.3784

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8513 -
loss: 0.3247 - val_accuracy: 0.8408 - val_loss: 0.3396

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8509 -

loss: 0.3209 - val_accuracy: 0.8411 - val_loss: 0.3335
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8515 -
loss: 0.3198 - val_accuracy: 0.8419 - val_loss: 0.3333
Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3244 - val_accuracy: 0.8442 - val_loss: 0.3337
Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3176 - val_accuracy: 0.8385 - val_loss: 0.3406
Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3177 - val_accuracy: 0.8416 - val_loss: 0.3348
Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3177 - val_accuracy: 0.8470 - val_loss: 0.3357
training_neural_network: Adam, l2=3.1622776601683795e-05, dropout=0
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7647 -
loss: 0.5185 - val_accuracy: 0.7963 - val_loss: 0.4166
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8157 -
loss: 0.3942 - val_accuracy: 0.8250 - val_loss: 0.3826
Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8266 -
loss: 0.3693 - val_accuracy: 0.8270 - val_loss: 0.3694
Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8321 -
loss: 0.3579 - val_accuracy: 0.8306 - val_loss: 0.3612
Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8383 -
loss: 0.3471 - val_accuracy: 0.8324 - val_loss: 0.3586
Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8397 -
loss: 0.3445 - val_accuracy: 0.8355 - val_loss: 0.3531
Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8379 -
loss: 0.3426 - val_accuracy: 0.8334 - val_loss: 0.3514
Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8389 -
loss: 0.3452 - val_accuracy: 0.8337 - val_loss: 0.3498
Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8383 -
loss: 0.3411 - val_accuracy: 0.8339 - val_loss: 0.3494

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3391 - val_accuracy: 0.8291 - val_loss: 0.3538

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8421 -
loss: 0.3374 - val_accuracy: 0.8350 - val_loss: 0.3472

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3339 - val_accuracy: 0.8355 - val_loss: 0.3460

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3340 - val_accuracy: 0.8344 - val_loss: 0.3449

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3304 - val_accuracy: 0.8344 - val_loss: 0.3433

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3262 - val_accuracy: 0.8350 - val_loss: 0.3430

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3288 - val_accuracy: 0.8347 - val_loss: 0.3442

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3329 - val_accuracy: 0.8362 - val_loss: 0.3420

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3287 - val_accuracy: 0.8362 - val_loss: 0.3427

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3291 - val_accuracy: 0.8393 - val_loss: 0.3397

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3325 - val_accuracy: 0.8378 - val_loss: 0.3395

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3299 - val_accuracy: 0.8383 - val_loss: 0.3415

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3274 - val_accuracy: 0.8403 - val_loss: 0.3385

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3287 - val_accuracy: 0.8390 - val_loss: 0.3387

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8488 -

loss: 0.3241 - val_accuracy: 0.8408 - val_loss: 0.3400
Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3267 - val_accuracy: 0.8375 - val_loss: 0.3373
Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3254 - val_accuracy: 0.8360 - val_loss: 0.3457
Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3213 - val_accuracy: 0.8454 - val_loss: 0.3388
Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8536 -
loss: 0.3229 - val_accuracy: 0.8460 - val_loss: 0.3344
Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3181 - val_accuracy: 0.8406 - val_loss: 0.3339
Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8508 -
loss: 0.3196 - val_accuracy: 0.8429 - val_loss: 0.3336
Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3195 - val_accuracy: 0.8373 - val_loss: 0.3383
Epoch 32/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8519 -
loss: 0.3196 - val_accuracy: 0.8437 - val_loss: 0.3333
Epoch 33/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3168 - val_accuracy: 0.8414 - val_loss: 0.3327
Epoch 34/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8536 -
loss: 0.3186 - val_accuracy: 0.8426 - val_loss: 0.3334
Epoch 35/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3191 - val_accuracy: 0.8439 - val_loss: 0.3355
Epoch 36/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3175 - val_accuracy: 0.8460 - val_loss: 0.3315
Epoch 37/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3187 - val_accuracy: 0.8437 - val_loss: 0.3356
Epoch 38/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8564 -
loss: 0.3115 - val_accuracy: 0.8370 - val_loss: 0.3426
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3178 - val_accuracy: 0.8347 - val_loss: 0.3499
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3151 - val_accuracy: 0.8411 - val_loss: 0.3315
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3147 - val_accuracy: 0.8444 - val_loss: 0.3302
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3161 - val_accuracy: 0.8334 - val_loss: 0.3480
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3215 - val_accuracy: 0.8431 - val_loss: 0.3299
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3112 - val_accuracy: 0.8470 - val_loss: 0.3323
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3130 - val_accuracy: 0.8408 - val_loss: 0.3409
Epoch 46/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8558 -
loss: 0.3110 - val_accuracy: 0.8421 - val_loss: 0.3286
Epoch 47/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8554 -
loss: 0.3092 - val_accuracy: 0.8467 - val_loss: 0.3285
Epoch 48/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8559 -
loss: 0.3056 - val_accuracy: 0.8447 - val_loss: 0.3311
Epoch 49/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8548 -
loss: 0.3112 - val_accuracy: 0.8462 - val_loss: 0.3330
Epoch 50/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8562 -
loss: 0.3064 - val_accuracy: 0.8460 - val_loss: 0.3329
Epoch 51/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3163 - val_accuracy: 0.8493 - val_loss: 0.3324
training_neural_network: Adam, l2=0.0001, dropout=0
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7478 -
loss: 0.5222 - val_accuracy: 0.8122 - val_loss: 0.4028
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8228 -

loss: 0.3849 - val_accuracy: 0.8240 - val_loss: 0.3824
Epoch 3/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8270 -
loss: 0.3697 - val_accuracy: 0.8296 - val_loss: 0.3718
Epoch 4/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8357 -
loss: 0.3569 - val_accuracy: 0.8347 - val_loss: 0.3625
Epoch 5/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8364 -
loss: 0.3541 - val_accuracy: 0.8350 - val_loss: 0.3576
Epoch 6/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3454 - val_accuracy: 0.8357 - val_loss: 0.3533
Epoch 7/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8357 -
loss: 0.3497 - val_accuracy: 0.8339 - val_loss: 0.3520
Epoch 8/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3352 - val_accuracy: 0.8334 - val_loss: 0.3506
Epoch 9/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8424 -
loss: 0.3387 - val_accuracy: 0.8327 - val_loss: 0.3492
Epoch 10/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8418 -
loss: 0.3372 - val_accuracy: 0.8342 - val_loss: 0.3477
Epoch 11/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8432 -
loss: 0.3384 - val_accuracy: 0.8339 - val_loss: 0.3466
Epoch 12/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3288 - val_accuracy: 0.8342 - val_loss: 0.3455
Epoch 13/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3311 - val_accuracy: 0.8350 - val_loss: 0.3448
Epoch 14/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3316 - val_accuracy: 0.8383 - val_loss: 0.3481
Epoch 15/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3305 - val_accuracy: 0.8344 - val_loss: 0.3485
Epoch 16/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3279 - val_accuracy: 0.8385 - val_loss: 0.3459
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3312 - val_accuracy: 0.8378 - val_loss: 0.3451
training_neural_network: Adam, l2=0.00031622776601683794, dropout=0
Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7488 -
loss: 0.5461 - val_accuracy: 0.7620 - val_loss: 0.4305
Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8057 -
loss: 0.4054 - val_accuracy: 0.8204 - val_loss: 0.3947
Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8214 -
loss: 0.3846 - val_accuracy: 0.8283 - val_loss: 0.3781
Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8312 -
loss: 0.3674 - val_accuracy: 0.8265 - val_loss: 0.3704
Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8319 -
loss: 0.3592 - val_accuracy: 0.8342 - val_loss: 0.3608
Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8368 -
loss: 0.3506 - val_accuracy: 0.8309 - val_loss: 0.3582
Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8399 -
loss: 0.3451 - val_accuracy: 0.8367 - val_loss: 0.3522
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8388 -
loss: 0.3418 - val_accuracy: 0.8319 - val_loss: 0.3553
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8385 -
loss: 0.3425 - val_accuracy: 0.8352 - val_loss: 0.3485
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8424 -
loss: 0.3398 - val_accuracy: 0.8367 - val_loss: 0.3493
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3318 - val_accuracy: 0.8350 - val_loss: 0.3485
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8417 -
loss: 0.3326 - val_accuracy: 0.8373 - val_loss: 0.3452
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3318 - val_accuracy: 0.8339 - val_loss: 0.3436
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -

loss: 0.3274 - val_accuracy: 0.8378 - val_loss: 0.3440
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8422 -
loss: 0.3334 - val_accuracy: 0.8403 - val_loss: 0.3421
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3258 - val_accuracy: 0.8370 - val_loss: 0.3523
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3293 - val_accuracy: 0.8383 - val_loss: 0.3409
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3260 - val_accuracy: 0.8390 - val_loss: 0.3396
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3255 - val_accuracy: 0.8396 - val_loss: 0.3383
Epoch 20/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8436 -
loss: 0.3304 - val_accuracy: 0.8442 - val_loss: 0.3387
Epoch 21/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3274 - val_accuracy: 0.8393 - val_loss: 0.3381
Epoch 22/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8483 -
loss: 0.3244 - val_accuracy: 0.8426 - val_loss: 0.3370
Epoch 23/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3224 - val_accuracy: 0.8414 - val_loss: 0.3371
Epoch 24/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8483 -
loss: 0.3240 - val_accuracy: 0.8414 - val_loss: 0.3355
Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3171 - val_accuracy: 0.8390 - val_loss: 0.3439
Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3264 - val_accuracy: 0.8403 - val_loss: 0.3335
Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8493 -
loss: 0.3207 - val_accuracy: 0.8431 - val_loss: 0.3331
Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3221 - val_accuracy: 0.8426 - val_loss: 0.3387
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3191 - val_accuracy: 0.8439 - val_loss: 0.3330
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3205 - val_accuracy: 0.8437 - val_loss: 0.3312
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3208 - val_accuracy: 0.8298 - val_loss: 0.3535
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3182 - val_accuracy: 0.8416 - val_loss: 0.3295
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3156 - val_accuracy: 0.8460 - val_loss: 0.3307
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8509 -
loss: 0.3193 - val_accuracy: 0.8465 - val_loss: 0.3306
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3189 - val_accuracy: 0.8431 - val_loss: 0.3284
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8542 -
loss: 0.3141 - val_accuracy: 0.8406 - val_loss: 0.3335
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8515 -
loss: 0.3150 - val_accuracy: 0.8454 - val_loss: 0.3276
Epoch 38/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3161 - val_accuracy: 0.8416 - val_loss: 0.3280
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3160 - val_accuracy: 0.8403 - val_loss: 0.3293
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3134 - val_accuracy: 0.8452 - val_loss: 0.3266
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3139 - val_accuracy: 0.8401 - val_loss: 0.3354
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3174 - val_accuracy: 0.8414 - val_loss: 0.3268
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3185 - val_accuracy: 0.8460 - val_loss: 0.3246

Epoch 44/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8563 -
loss: 0.3103 - val_accuracy: 0.8416 - val_loss: 0.3265

Epoch 45/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8544 -
loss: 0.3147 - val_accuracy: 0.8475 - val_loss: 0.3290

Epoch 46/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3124 - val_accuracy: 0.8467 - val_loss: 0.3313

Epoch 47/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8548 -
loss: 0.3110 - val_accuracy: 0.8393 - val_loss: 0.3360

Epoch 48/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8565 -
loss: 0.3074 - val_accuracy: 0.8460 - val_loss: 0.3304
training_neural_network: Adam, l2=0.001, dropout=0

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 992us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 982us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 976us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 1ms/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 981us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 996us/step

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7545 -
loss: 0.5139 - val_accuracy: 0.7927 - val_loss: 0.4212

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8145 -
loss: 0.3928 - val_accuracy: 0.8214 - val_loss: 0.3865

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8249 -
loss: 0.3669 - val_accuracy: 0.8286 - val_loss: 0.3728

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8314 -
loss: 0.3568 - val_accuracy: 0.8324 - val_loss: 0.3651

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8357 -
loss: 0.3487 - val_accuracy: 0.8329 - val_loss: 0.3589

Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8397 -
loss: 0.3448 - val_accuracy: 0.8316 - val_loss: 0.3551
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8409 -
loss: 0.3410 - val_accuracy: 0.8350 - val_loss: 0.3535
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3348 - val_accuracy: 0.8360 - val_loss: 0.3510
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3347 - val_accuracy: 0.8390 - val_loss: 0.3553
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8446 -
loss: 0.3348 - val_accuracy: 0.8385 - val_loss: 0.3495
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8384 -
loss: 0.3349 - val_accuracy: 0.8355 - val_loss: 0.3475
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3273 - val_accuracy: 0.8388 - val_loss: 0.3537
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3307 - val_accuracy: 0.8360 - val_loss: 0.3450
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8458 -
loss: 0.3285 - val_accuracy: 0.8350 - val_loss: 0.3440
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3314 - val_accuracy: 0.8319 - val_loss: 0.3456
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3292 - val_accuracy: 0.8390 - val_loss: 0.3423
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8493 -
loss: 0.3271 - val_accuracy: 0.8385 - val_loss: 0.3428
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3270 - val_accuracy: 0.8362 - val_loss: 0.3418
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3272 - val_accuracy: 0.8388 - val_loss: 0.3470
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3247 - val_accuracy: 0.8403 - val_loss: 0.3425

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3252 - val_accuracy: 0.8378 - val_loss: 0.3418
training_neural_network: Adam, l2=1e-05, dropout=0.1

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7412 -
loss: 0.5218 - val_accuracy: 0.8060 - val_loss: 0.4151

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8143 -
loss: 0.3952 - val_accuracy: 0.8211 - val_loss: 0.3875

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8233 -
loss: 0.3726 - val_accuracy: 0.8265 - val_loss: 0.3733

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8336 -
loss: 0.3579 - val_accuracy: 0.8311 - val_loss: 0.3668

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8359 -
loss: 0.3520 - val_accuracy: 0.8316 - val_loss: 0.3666

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8410 -
loss: 0.3434 - val_accuracy: 0.8301 - val_loss: 0.3565

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8404 -
loss: 0.3439 - val_accuracy: 0.8296 - val_loss: 0.3621

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8432 -
loss: 0.3384 - val_accuracy: 0.8357 - val_loss: 0.3521

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8397 -
loss: 0.3390 - val_accuracy: 0.8311 - val_loss: 0.3558

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8432 -
loss: 0.3356 - val_accuracy: 0.8316 - val_loss: 0.3510

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3333 - val_accuracy: 0.8339 - val_loss: 0.3545

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8373 -
loss: 0.3402 - val_accuracy: 0.8334 - val_loss: 0.3496

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3360 - val_accuracy: 0.8344 - val_loss: 0.3492

Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3336 - val_accuracy: 0.8339 - val_loss: 0.3457
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3302 - val_accuracy: 0.8393 - val_loss: 0.3447
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3305 - val_accuracy: 0.8406 - val_loss: 0.3468
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3326 - val_accuracy: 0.8378 - val_loss: 0.3463
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3286 - val_accuracy: 0.8367 - val_loss: 0.3429
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3240 - val_accuracy: 0.8378 - val_loss: 0.3414
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3275 - val_accuracy: 0.8396 - val_loss: 0.3448
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3310 - val_accuracy: 0.8378 - val_loss: 0.3413
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3238 - val_accuracy: 0.8263 - val_loss: 0.3613
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8497 -
loss: 0.3232 - val_accuracy: 0.8378 - val_loss: 0.3453
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3271 - val_accuracy: 0.8408 - val_loss: 0.3412
training_neural_network: Adam, l2=1e-05, dropout=0.4

Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7605 -
loss: 0.5066 - val_accuracy: 0.7766 - val_loss: 0.4321
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8076 -
loss: 0.4088 - val_accuracy: 0.8099 - val_loss: 0.4067
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8189 -
loss: 0.3883 - val_accuracy: 0.8191 - val_loss: 0.3913
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8227 -

loss: 0.3721 - val_accuracy: 0.8273 - val_loss: 0.3792
Epoch 5/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8352 -
loss: 0.3599 - val_accuracy: 0.8309 - val_loss: 0.3718
Epoch 6/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8294 -
loss: 0.3606 - val_accuracy: 0.8324 - val_loss: 0.3652
Epoch 7/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8341 -
loss: 0.3494 - val_accuracy: 0.8301 - val_loss: 0.3607
Epoch 8/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3445 - val_accuracy: 0.8357 - val_loss: 0.3583
Epoch 9/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3407 - val_accuracy: 0.8357 - val_loss: 0.3558
Epoch 10/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8396 -
loss: 0.3403 - val_accuracy: 0.8332 - val_loss: 0.3540
Epoch 11/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3367 - val_accuracy: 0.8316 - val_loss: 0.3530
Epoch 12/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8419 -
loss: 0.3352 - val_accuracy: 0.8339 - val_loss: 0.3523
Epoch 13/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8408 -
loss: 0.3358 - val_accuracy: 0.8324 - val_loss: 0.3498
Epoch 14/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3292 - val_accuracy: 0.8360 - val_loss: 0.3502
Epoch 15/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3330 - val_accuracy: 0.8375 - val_loss: 0.3532
Epoch 16/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3264 - val_accuracy: 0.8332 - val_loss: 0.3470
Epoch 17/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3302 - val_accuracy: 0.8365 - val_loss: 0.3495
Epoch 18/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3305 - val_accuracy: 0.8327 - val_loss: 0.3456
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3224 - val_accuracy: 0.8367 - val_loss: 0.3457
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3273 - val_accuracy: 0.8357 - val_loss: 0.3469
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3259 - val_accuracy: 0.8352 - val_loss: 0.3470
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3252 - val_accuracy: 0.8375 - val_loss: 0.3447
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3271 - val_accuracy: 0.8352 - val_loss: 0.3462
training_neural_network: Adam, l2=1e-05, dropout=0.7000000000000001
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7587 -
loss: 0.4990 - val_accuracy: 0.7876 - val_loss: 0.4227
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8082 -
loss: 0.4002 - val_accuracy: 0.8104 - val_loss: 0.3964
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8196 -
loss: 0.3821 - val_accuracy: 0.8191 - val_loss: 0.3814
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8279 -
loss: 0.3634 - val_accuracy: 0.8280 - val_loss: 0.3718
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8324 -
loss: 0.3576 - val_accuracy: 0.8298 - val_loss: 0.3625
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8375 -
loss: 0.3459 - val_accuracy: 0.8301 - val_loss: 0.3600
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8378 -
loss: 0.3462 - val_accuracy: 0.8321 - val_loss: 0.3552
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3412 - val_accuracy: 0.8306 - val_loss: 0.3535
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8395 -
loss: 0.3431 - val_accuracy: 0.8314 - val_loss: 0.3517
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8415 -

loss: 0.3396 - val_accuracy: 0.8339 - val_loss: 0.3524
Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3359 - val_accuracy: 0.8357 - val_loss: 0.3518
Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3314 - val_accuracy: 0.8321 - val_loss: 0.3479
Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3346 - val_accuracy: 0.8332 - val_loss: 0.3491
Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3336 - val_accuracy: 0.8324 - val_loss: 0.3462
Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3302 - val_accuracy: 0.8352 - val_loss: 0.3461
Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3271 - val_accuracy: 0.8350 - val_loss: 0.3476
Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8419 -
loss: 0.3340 - val_accuracy: 0.8352 - val_loss: 0.3446
Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8442 -
loss: 0.3295 - val_accuracy: 0.8367 - val_loss: 0.3486
Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3299 - val_accuracy: 0.8373 - val_loss: 0.3447
Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3276 - val_accuracy: 0.8334 - val_loss: 0.3429
Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3271 - val_accuracy: 0.8352 - val_loss: 0.3419
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3224 - val_accuracy: 0.8375 - val_loss: 0.3409
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8523 -
loss: 0.3209 - val_accuracy: 0.8352 - val_loss: 0.3448
Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3276 - val_accuracy: 0.8370 - val_loss: 0.3412
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8510 -
loss: 0.3231 - val_accuracy: 0.8383 - val_loss: 0.3404
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3316 - val_accuracy: 0.8393 - val_loss: 0.3387
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3202 - val_accuracy: 0.8385 - val_loss: 0.3402
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3171 - val_accuracy: 0.8408 - val_loss: 0.3384
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3222 - val_accuracy: 0.8406 - val_loss: 0.3398
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3184 - val_accuracy: 0.8396 - val_loss: 0.3368
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8553 -
loss: 0.3148 - val_accuracy: 0.8406 - val_loss: 0.3389
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3185 - val_accuracy: 0.8414 - val_loss: 0.3412
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3175 - val_accuracy: 0.8390 - val_loss: 0.3398
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3164 - val_accuracy: 0.8431 - val_loss: 0.3341
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8537 -
loss: 0.3144 - val_accuracy: 0.8431 - val_loss: 0.3346
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8537 -
loss: 0.3134 - val_accuracy: 0.8429 - val_loss: 0.3378
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3177 - val_accuracy: 0.8434 - val_loss: 0.3336
Epoch 38/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3139 - val_accuracy: 0.8421 - val_loss: 0.3335
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8543 -
loss: 0.3180 - val_accuracy: 0.8472 - val_loss: 0.3320

Epoch 40/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8574 -
loss: 0.3100 - val_accuracy: 0.8408 - val_loss: 0.3340

Epoch 41/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8545 -
loss: 0.3135 - val_accuracy: 0.8452 - val_loss: 0.3311

Epoch 42/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8553 -
loss: 0.3133 - val_accuracy: 0.8467 - val_loss: 0.3303

Epoch 43/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8575 -
loss: 0.3120 - val_accuracy: 0.8452 - val_loss: 0.3377

Epoch 44/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8575 -
loss: 0.3103 - val_accuracy: 0.8449 - val_loss: 0.3406

Epoch 45/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8567 -
loss: 0.3132 - val_accuracy: 0.8460 - val_loss: 0.3316

Epoch 46/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8581 -
loss: 0.3114 - val_accuracy: 0.8390 - val_loss: 0.3380

Epoch 47/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8581 -
loss: 0.3092 - val_accuracy: 0.8447 - val_loss: 0.3309
training_neural_network: Adam, l2=0.0001, dropout=0.1

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7343 -
loss: 0.5612 - val_accuracy: 0.7472 - val_loss: 0.4640

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.7590 -
loss: 0.4375 - val_accuracy: 0.7932 - val_loss: 0.4232

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8129 -
loss: 0.3972 - val_accuracy: 0.8094 - val_loss: 0.4016

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8190 -
loss: 0.3902 - val_accuracy: 0.8178 - val_loss: 0.3870

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8280 -
loss: 0.3695 - val_accuracy: 0.8252 - val_loss: 0.3770

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8310 -
loss: 0.3644 - val_accuracy: 0.8296 - val_loss: 0.3673

Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8354 -
loss: 0.3532 - val_accuracy: 0.8342 - val_loss: 0.3597
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8406 -
loss: 0.3460 - val_accuracy: 0.8347 - val_loss: 0.3569
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8374 -
loss: 0.3462 - val_accuracy: 0.8327 - val_loss: 0.3523
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 996us/step - accuracy: 0.8439 -
- loss: 0.3397 - val_accuracy: 0.8365 - val_loss: 0.3515
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3401 - val_accuracy: 0.8388 - val_loss: 0.3516
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3369 - val_accuracy: 0.8334 - val_loss: 0.3476
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8439 -
loss: 0.3341 - val_accuracy: 0.8357 - val_loss: 0.3474
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3353 - val_accuracy: 0.8344 - val_loss: 0.3470
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3309 - val_accuracy: 0.8393 - val_loss: 0.3482
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3293 - val_accuracy: 0.8370 - val_loss: 0.3492
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3287 - val_accuracy: 0.8347 - val_loss: 0.3480
training_neural_network: Adam, l2=0.0001, dropout=0.4
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7483 -
loss: 0.5421 - val_accuracy: 0.7700 - val_loss: 0.4334
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8112 -
loss: 0.4057 - val_accuracy: 0.8209 - val_loss: 0.3956
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8240 -
loss: 0.3751 - val_accuracy: 0.8234 - val_loss: 0.3800
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8290 -

loss: 0.3619 - val_accuracy: 0.8309 - val_loss: 0.3697
Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8349 -
loss: 0.3517 - val_accuracy: 0.8337 - val_loss: 0.3620
Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3440 - val_accuracy: 0.8319 - val_loss: 0.3561
Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3391 - val_accuracy: 0.8339 - val_loss: 0.3533
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3392 - val_accuracy: 0.8398 - val_loss: 0.3564
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8417 -
loss: 0.3388 - val_accuracy: 0.8329 - val_loss: 0.3495
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3317 - val_accuracy: 0.8393 - val_loss: 0.3502
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3346 - val_accuracy: 0.8380 - val_loss: 0.3517
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3260 - val_accuracy: 0.8365 - val_loss: 0.3474
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3272 - val_accuracy: 0.8301 - val_loss: 0.3572
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3369 - val_accuracy: 0.8357 - val_loss: 0.3442
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3266 - val_accuracy: 0.8380 - val_loss: 0.3437
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3233 - val_accuracy: 0.8365 - val_loss: 0.3420
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3303 - val_accuracy: 0.8370 - val_loss: 0.3423
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3301 - val_accuracy: 0.8380 - val_loss: 0.3404
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8465 -
loss: 0.3281 - val_accuracy: 0.8388 - val_loss: 0.3397
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3267 - val_accuracy: 0.8403 - val_loss: 0.3402
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3258 - val_accuracy: 0.8406 - val_loss: 0.3401
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8496 -
loss: 0.3235 - val_accuracy: 0.8393 - val_loss: 0.3390
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3205 - val_accuracy: 0.8401 - val_loss: 0.3388
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3221 - val_accuracy: 0.8408 - val_loss: 0.3343
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3200 - val_accuracy: 0.8406 - val_loss: 0.3338
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8543 -
loss: 0.3173 - val_accuracy: 0.8434 - val_loss: 0.3321
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3207 - val_accuracy: 0.8424 - val_loss: 0.3404
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3174 - val_accuracy: 0.8437 - val_loss: 0.3316
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8533 -
loss: 0.3152 - val_accuracy: 0.8449 - val_loss: 0.3308
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8528 -
loss: 0.3151 - val_accuracy: 0.8434 - val_loss: 0.3316
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3127 - val_accuracy: 0.8460 - val_loss: 0.3284
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8556 -
loss: 0.3136 - val_accuracy: 0.8452 - val_loss: 0.3272
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8525 -
loss: 0.3152 - val_accuracy: 0.8475 - val_loss: 0.3287

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3184 - val_accuracy: 0.8419 - val_loss: 0.3331

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3157 - val_accuracy: 0.8465 - val_loss: 0.3276

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3141 - val_accuracy: 0.8465 - val_loss: 0.3245

Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3133 - val_accuracy: 0.8470 - val_loss: 0.3246

Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8540 -
loss: 0.3110 - val_accuracy: 0.8490 - val_loss: 0.3244

Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8589 -
loss: 0.3055 - val_accuracy: 0.8475 - val_loss: 0.3314

Epoch 40/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3133 - val_accuracy: 0.8439 - val_loss: 0.3350

Epoch 41/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8615 -
loss: 0.3013 - val_accuracy: 0.8447 - val_loss: 0.3235
training_neural_network: Adam, l2=0.0001, dropout=0.7000000000000001

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7608 -
loss: 0.5159 - val_accuracy: 0.7922 - val_loss: 0.4266

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8072 -
loss: 0.4025 - val_accuracy: 0.8147 - val_loss: 0.3987

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8150 -
loss: 0.3853 - val_accuracy: 0.8234 - val_loss: 0.3838

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8226 -
loss: 0.3733 - val_accuracy: 0.8316 - val_loss: 0.3715

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8316 -
loss: 0.3568 - val_accuracy: 0.8332 - val_loss: 0.3635

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8340 -
loss: 0.3531 - val_accuracy: 0.8355 - val_loss: 0.3591

Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3398 - val_accuracy: 0.8367 - val_loss: 0.3551
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8395 -
loss: 0.3434 - val_accuracy: 0.8347 - val_loss: 0.3584
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8404 -
loss: 0.3397 - val_accuracy: 0.8357 - val_loss: 0.3558
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8428 -
loss: 0.3346 - val_accuracy: 0.8355 - val_loss: 0.3515
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8413 -
loss: 0.3362 - val_accuracy: 0.8339 - val_loss: 0.3510
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3323 - val_accuracy: 0.8334 - val_loss: 0.3461
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3306 - val_accuracy: 0.8352 - val_loss: 0.3467
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8465 -
loss: 0.3308 - val_accuracy: 0.8339 - val_loss: 0.3452
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3302 - val_accuracy: 0.8378 - val_loss: 0.3478
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3233 - val_accuracy: 0.8352 - val_loss: 0.3451
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3270 - val_accuracy: 0.8357 - val_loss: 0.3443
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3250 - val_accuracy: 0.8380 - val_loss: 0.3414
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3255 - val_accuracy: 0.8375 - val_loss: 0.3409
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3247 - val_accuracy: 0.8370 - val_loss: 0.3389
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8508 -
loss: 0.3212 - val_accuracy: 0.8378 - val_loss: 0.3441

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3255 - val_accuracy: 0.8406 - val_loss: 0.3409

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3232 - val_accuracy: 0.8378 - val_loss: 0.3455

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3254 - val_accuracy: 0.8434 - val_loss: 0.3356

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3217 - val_accuracy: 0.8437 - val_loss: 0.3367

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3204 - val_accuracy: 0.8416 - val_loss: 0.3346

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3194 - val_accuracy: 0.8437 - val_loss: 0.3329

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3173 - val_accuracy: 0.8401 - val_loss: 0.3315

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3147 - val_accuracy: 0.8444 - val_loss: 0.3340

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8536 -
loss: 0.3161 - val_accuracy: 0.8444 - val_loss: 0.3335

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3112 - val_accuracy: 0.8452 - val_loss: 0.3326

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8552 -
loss: 0.3106 - val_accuracy: 0.8403 - val_loss: 0.3289

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8553 -
loss: 0.3147 - val_accuracy: 0.8449 - val_loss: 0.3287

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8565 -
loss: 0.3109 - val_accuracy: 0.8480 - val_loss: 0.3279

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8559 -
loss: 0.3106 - val_accuracy: 0.8442 - val_loss: 0.3332

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8597 -

loss: 0.3080 - val_accuracy: 0.8373 - val_loss: 0.3409
Epoch 37/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8532 -
loss: 0.3114 - val_accuracy: 0.8495 - val_loss: 0.3297
training_neural_network: Adam, l2=0.001, dropout=0.1
Epoch 1/90
1099/1099 ━━━━━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7593 -
loss: 0.5389 - val_accuracy: 0.8025 - val_loss: 0.4226
Epoch 2/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8148 -
loss: 0.4003 - val_accuracy: 0.8229 - val_loss: 0.3846
Epoch 3/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8283 -
loss: 0.3697 - val_accuracy: 0.8268 - val_loss: 0.3714
Epoch 4/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8328 -
loss: 0.3602 - val_accuracy: 0.8298 - val_loss: 0.3638
Epoch 5/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8363 -
loss: 0.3514 - val_accuracy: 0.8342 - val_loss: 0.3588
Epoch 6/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8396 -
loss: 0.3442 - val_accuracy: 0.8314 - val_loss: 0.3574
Epoch 7/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3442 - val_accuracy: 0.8342 - val_loss: 0.3538
Epoch 8/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8393 -
loss: 0.3398 - val_accuracy: 0.8332 - val_loss: 0.3580
Epoch 9/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8415 -
loss: 0.3406 - val_accuracy: 0.8306 - val_loss: 0.3518
Epoch 10/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8406 -
loss: 0.3388 - val_accuracy: 0.8298 - val_loss: 0.3501
Epoch 11/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8416 -
loss: 0.3400 - val_accuracy: 0.8291 - val_loss: 0.3490
Epoch 12/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8412 -
loss: 0.3364 - val_accuracy: 0.8327 - val_loss: 0.3485
Epoch 13/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8398 -
loss: 0.3402 - val_accuracy: 0.8327 - val_loss: 0.3467

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3336 - val_accuracy: 0.8298 - val_loss: 0.3462

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3310 - val_accuracy: 0.8337 - val_loss: 0.3455

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3337 - val_accuracy: 0.8327 - val_loss: 0.3444

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3322 - val_accuracy: 0.8334 - val_loss: 0.3437

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3303 - val_accuracy: 0.8319 - val_loss: 0.3433

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8483 -
loss: 0.3259 - val_accuracy: 0.8357 - val_loss: 0.3434

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3269 - val_accuracy: 0.8350 - val_loss: 0.3426

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3216 - val_accuracy: 0.8352 - val_loss: 0.3408

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3278 - val_accuracy: 0.8355 - val_loss: 0.3402

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3204 - val_accuracy: 0.8362 - val_loss: 0.3398

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3264 - val_accuracy: 0.8344 - val_loss: 0.3515

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3257 - val_accuracy: 0.8396 - val_loss: 0.3375

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3259 - val_accuracy: 0.8424 - val_loss: 0.3381

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3289 - val_accuracy: 0.8350 - val_loss: 0.3440

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8528 -

loss: 0.3207 - val_accuracy: 0.8416 - val_loss: 0.3361
Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8545 -
loss: 0.3188 - val_accuracy: 0.8411 - val_loss: 0.3390
Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3238 - val_accuracy: 0.8416 - val_loss: 0.3343
Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3213 - val_accuracy: 0.8406 - val_loss: 0.3440
Epoch 32/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8544 -
loss: 0.3168 - val_accuracy: 0.8334 - val_loss: 0.3498
Epoch 33/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8548 -
loss: 0.3146 - val_accuracy: 0.8434 - val_loss: 0.3349
Epoch 34/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3227 - val_accuracy: 0.8444 - val_loss: 0.3342
Epoch 35/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3155 - val_accuracy: 0.8439 - val_loss: 0.3326
Epoch 36/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3163 - val_accuracy: 0.8470 - val_loss: 0.3350
Epoch 37/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3220 - val_accuracy: 0.8449 - val_loss: 0.3323
Epoch 38/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8545 -
loss: 0.3152 - val_accuracy: 0.8465 - val_loss: 0.3375
Epoch 39/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8559 -
loss: 0.3108 - val_accuracy: 0.8460 - val_loss: 0.3344
Epoch 40/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8554 -
loss: 0.3147 - val_accuracy: 0.8465 - val_loss: 0.3304
Epoch 41/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3178 - val_accuracy: 0.8424 - val_loss: 0.3314
Epoch 42/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3144 - val_accuracy: 0.8273 - val_loss: 0.3667
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8536 -
loss: 0.3132 - val_accuracy: 0.8265 - val_loss: 0.3649
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8574 -
loss: 0.3126 - val_accuracy: 0.8447 - val_loss: 0.3317
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3179 - val_accuracy: 0.8447 - val_loss: 0.3321
training_neural_network: Adam, l2=0.001, dropout=0.4
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7584 -
loss: 0.5117 - val_accuracy: 0.7966 - val_loss: 0.4252
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8136 -
loss: 0.3978 - val_accuracy: 0.8245 - val_loss: 0.3885
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8246 -
loss: 0.3761 - val_accuracy: 0.8278 - val_loss: 0.3743
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8304 -
loss: 0.3593 - val_accuracy: 0.8327 - val_loss: 0.3662
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8338 -
loss: 0.3522 - val_accuracy: 0.8321 - val_loss: 0.3616
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8388 -
loss: 0.3457 - val_accuracy: 0.8309 - val_loss: 0.3574
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8394 -
loss: 0.3426 - val_accuracy: 0.8327 - val_loss: 0.3543
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8401 -
loss: 0.3407 - val_accuracy: 0.8352 - val_loss: 0.3531
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8417 -
loss: 0.3413 - val_accuracy: 0.8347 - val_loss: 0.3544
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8419 -
loss: 0.3362 - val_accuracy: 0.8334 - val_loss: 0.3505
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8409 -
loss: 0.3367 - val_accuracy: 0.8319 - val_loss: 0.3491
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8423 -

loss: 0.3335 - val_accuracy: 0.8319 - val_loss: 0.3491
Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3307 - val_accuracy: 0.8339 - val_loss: 0.3475
Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3281 - val_accuracy: 0.8357 - val_loss: 0.3474
Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8390 -
loss: 0.3394 - val_accuracy: 0.8360 - val_loss: 0.3484
Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3303 - val_accuracy: 0.8347 - val_loss: 0.3454
Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3277 - val_accuracy: 0.8357 - val_loss: 0.3445
Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3299 - val_accuracy: 0.8365 - val_loss: 0.3467
Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3306 - val_accuracy: 0.8360 - val_loss: 0.3423
Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3289 - val_accuracy: 0.8365 - val_loss: 0.3419
Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3248 - val_accuracy: 0.8355 - val_loss: 0.3422
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3247 - val_accuracy: 0.8383 - val_loss: 0.3394
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3217 - val_accuracy: 0.8378 - val_loss: 0.3393
Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3203 - val_accuracy: 0.8411 - val_loss: 0.3407
Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3249 - val_accuracy: 0.8396 - val_loss: 0.3400
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3207 - val_accuracy: 0.8408 - val_loss: 0.3401
Epoch 27/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3238 - val_accuracy: 0.8385 - val_loss: 0.3421
training_neural_network: Adam, l2=0.001, dropout=0.7000000000000001

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 980us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 980us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 975us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 980us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 981us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 963us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 976us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 979us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 977us/step

Epoch 1/90

1099/1099 ————— 3s 1ms/step - accuracy: 0.7749 -
loss: 0.4707 - val_accuracy: 0.8214 - val_loss: 0.3949

Epoch 2/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8234 -
loss: 0.3752 - val_accuracy: 0.8286 - val_loss: 0.3733

Epoch 3/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8300 -
loss: 0.3613 - val_accuracy: 0.8339 - val_loss: 0.3633

Epoch 4/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8395 -
loss: 0.3509 - val_accuracy: 0.8357 - val_loss: 0.3547

Epoch 5/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8390 -
loss: 0.3416 - val_accuracy: 0.8365 - val_loss: 0.3528

Epoch 6/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3403 - val_accuracy: 0.8319 - val_loss: 0.3499

Epoch 7/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8458 -
loss: 0.3374 - val_accuracy: 0.8355 - val_loss: 0.3482

Epoch 8/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8405 -

loss: 0.3394 - val_accuracy: 0.8337 - val_loss: 0.3495
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3323 - val_accuracy: 0.8367 - val_loss: 0.3478
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3329 - val_accuracy: 0.8378 - val_loss: 0.3457
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3318 - val_accuracy: 0.8365 - val_loss: 0.3433
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8413 -
loss: 0.3339 - val_accuracy: 0.8370 - val_loss: 0.3431
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3287 - val_accuracy: 0.8324 - val_loss: 0.3544
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3321 - val_accuracy: 0.8373 - val_loss: 0.3464
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3291 - val_accuracy: 0.8380 - val_loss: 0.3425
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3274 - val_accuracy: 0.8401 - val_loss: 0.3409
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3324 - val_accuracy: 0.8419 - val_loss: 0.3401
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8521 -
loss: 0.3202 - val_accuracy: 0.8411 - val_loss: 0.3420
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3256 - val_accuracy: 0.8403 - val_loss: 0.3381
Epoch 20/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3274 - val_accuracy: 0.8419 - val_loss: 0.3397
Epoch 21/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3274 - val_accuracy: 0.8390 - val_loss: 0.3497
Epoch 22/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3262 - val_accuracy: 0.8388 - val_loss: 0.3361
Epoch 23/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3260 - val_accuracy: 0.8398 - val_loss: 0.3423
Epoch 24/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3246 - val_accuracy: 0.8393 - val_loss: 0.3389
Epoch 25/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3226 - val_accuracy: 0.8365 - val_loss: 0.3458
Epoch 26/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3233 - val_accuracy: 0.8434 - val_loss: 0.3386
Epoch 27/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3215 - val_accuracy: 0.8444 - val_loss: 0.3394
training_neural_network: SGD, l2=0, dropout=0

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 1ms/step

Epoch 1/90

1099/1099 ————— 3s 1ms/step - accuracy: 0.7445 -
loss: 0.5399 - val_accuracy: 0.7968 - val_loss: 0.4321
Epoch 2/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8106 -
loss: 0.4042 - val_accuracy: 0.8137 - val_loss: 0.3919
Epoch 3/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8203 -
loss: 0.3767 - val_accuracy: 0.8265 - val_loss: 0.3734
Epoch 4/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8323 -
loss: 0.3570 - val_accuracy: 0.8334 - val_loss: 0.3634
Epoch 5/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8379 -
loss: 0.3507 - val_accuracy: 0.8362 - val_loss: 0.3578
Epoch 6/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3440 - val_accuracy: 0.8324 - val_loss: 0.3528
Epoch 7/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8398 -
loss: 0.3437 - val_accuracy: 0.8375 - val_loss: 0.3530
Epoch 8/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3356 - val_accuracy: 0.8347 - val_loss: 0.3497
Epoch 9/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8412 -
loss: 0.3410 - val_accuracy: 0.8309 - val_loss: 0.3555

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3319 - val_accuracy: 0.8370 - val_loss: 0.3479

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3380 - val_accuracy: 0.8344 - val_loss: 0.3451

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3341 - val_accuracy: 0.8373 - val_loss: 0.3472

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3344 - val_accuracy: 0.8360 - val_loss: 0.3457

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3308 - val_accuracy: 0.8362 - val_loss: 0.3487

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3308 - val_accuracy: 0.8360 - val_loss: 0.3414

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8496 -
loss: 0.3294 - val_accuracy: 0.8342 - val_loss: 0.3467

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3243 - val_accuracy: 0.8375 - val_loss: 0.3396

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8476 -
loss: 0.3244 - val_accuracy: 0.8362 - val_loss: 0.3395

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3292 - val_accuracy: 0.8398 - val_loss: 0.3396

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3285 - val_accuracy: 0.8393 - val_loss: 0.3374

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3281 - val_accuracy: 0.8403 - val_loss: 0.3411

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3232 - val_accuracy: 0.8383 - val_loss: 0.3353

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3217 - val_accuracy: 0.8383 - val_loss: 0.3405

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -

loss: 0.3252 - val_accuracy: 0.8393 - val_loss: 0.3357
Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3247 - val_accuracy: 0.8406 - val_loss: 0.3370
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8538 -
loss: 0.3168 - val_accuracy: 0.8408 - val_loss: 0.3341
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8538 -
loss: 0.3160 - val_accuracy: 0.8388 - val_loss: 0.3352
Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3205 - val_accuracy: 0.8419 - val_loss: 0.3348
Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3214 - val_accuracy: 0.8411 - val_loss: 0.3332
Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3182 - val_accuracy: 0.8424 - val_loss: 0.3325
Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3177 - val_accuracy: 0.8411 - val_loss: 0.3306
Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3196 - val_accuracy: 0.8411 - val_loss: 0.3346
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8559 -
loss: 0.3112 - val_accuracy: 0.8439 - val_loss: 0.3307
Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3175 - val_accuracy: 0.8344 - val_loss: 0.3491
Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8553 -
loss: 0.3135 - val_accuracy: 0.8408 - val_loss: 0.3298
Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8510 -
loss: 0.3187 - val_accuracy: 0.8429 - val_loss: 0.3306
training_neural_network: SGD, l2=0, dropout=0.0
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7334 -
loss: 0.5263 - val_accuracy: 0.7756 - val_loss: 0.4286
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8018 -
loss: 0.4075 - val_accuracy: 0.8137 - val_loss: 0.3917

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8231 -
loss: 0.3758 - val_accuracy: 0.8227 - val_loss: 0.3768

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8259 -
loss: 0.3629 - val_accuracy: 0.8324 - val_loss: 0.3678

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8350 -
loss: 0.3534 - val_accuracy: 0.8337 - val_loss: 0.3613

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8387 -
loss: 0.3459 - val_accuracy: 0.8362 - val_loss: 0.3563

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8374 -
loss: 0.3457 - val_accuracy: 0.8355 - val_loss: 0.3521

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8420 -
loss: 0.3356 - val_accuracy: 0.8342 - val_loss: 0.3514

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8420 -
loss: 0.3334 - val_accuracy: 0.8344 - val_loss: 0.3490

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8385 -
loss: 0.3395 - val_accuracy: 0.8350 - val_loss: 0.3480

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8421 -
loss: 0.3324 - val_accuracy: 0.8357 - val_loss: 0.3466

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3289 - val_accuracy: 0.8332 - val_loss: 0.3457

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3309 - val_accuracy: 0.8360 - val_loss: 0.3449

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3344 - val_accuracy: 0.8337 - val_loss: 0.3487

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8446 -
loss: 0.3327 - val_accuracy: 0.8367 - val_loss: 0.3538

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3337 - val_accuracy: 0.8357 - val_loss: 0.3428

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8459 -

loss: 0.3265 - val_accuracy: 0.8380 - val_loss: 0.3477
Epoch 18/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3266 - val_accuracy: 0.8324 - val_loss: 0.3407
Epoch 19/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3277 - val_accuracy: 0.8370 - val_loss: 0.3497
Epoch 20/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3225 - val_accuracy: 0.8393 - val_loss: 0.3409
Epoch 21/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3278 - val_accuracy: 0.8378 - val_loss: 0.3389
Epoch 22/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3245 - val_accuracy: 0.8383 - val_loss: 0.3388
Epoch 23/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3240 - val_accuracy: 0.8396 - val_loss: 0.3382
Epoch 24/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3237 - val_accuracy: 0.8398 - val_loss: 0.3378
Epoch 25/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3202 - val_accuracy: 0.8375 - val_loss: 0.3377
Epoch 26/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3231 - val_accuracy: 0.8370 - val_loss: 0.3360
Epoch 27/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3218 - val_accuracy: 0.8357 - val_loss: 0.3495
Epoch 28/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3230 - val_accuracy: 0.8365 - val_loss: 0.3372
Epoch 29/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3214 - val_accuracy: 0.8447 - val_loss: 0.3352
Epoch 30/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3223 - val_accuracy: 0.8429 - val_loss: 0.3343
Epoch 31/90
1099/1099 ━━━━━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3218 - val_accuracy: 0.8385 - val_loss: 0.3337
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3173 - val_accuracy: 0.8414 - val_loss: 0.3328
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8497 -
loss: 0.3226 - val_accuracy: 0.8444 - val_loss: 0.3341
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3165 - val_accuracy: 0.8393 - val_loss: 0.3334
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8532 -
loss: 0.3192 - val_accuracy: 0.8419 - val_loss: 0.3327
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8521 -
loss: 0.3183 - val_accuracy: 0.8447 - val_loss: 0.3340
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8540 -
loss: 0.3156 - val_accuracy: 0.8406 - val_loss: 0.3325
training_neural_network: SGD, l2=0, dropout=0.2
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7391 -
loss: 0.5612 - val_accuracy: 0.7474 - val_loss: 0.4557
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.7617 -
loss: 0.4284 - val_accuracy: 0.7973 - val_loss: 0.4137
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8111 -
loss: 0.3908 - val_accuracy: 0.8214 - val_loss: 0.3874
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8254 -
loss: 0.3762 - val_accuracy: 0.8268 - val_loss: 0.3744
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8298 -
loss: 0.3630 - val_accuracy: 0.8298 - val_loss: 0.3690
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8342 -
loss: 0.3545 - val_accuracy: 0.8339 - val_loss: 0.3608
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8368 -
loss: 0.3466 - val_accuracy: 0.8329 - val_loss: 0.3591
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8420 -
loss: 0.3413 - val_accuracy: 0.8337 - val_loss: 0.3550
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8382 -

loss: 0.3446 - val_accuracy: 0.8327 - val_loss: 0.3527
Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3375 - val_accuracy: 0.8337 - val_loss: 0.3521
Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3408 - val_accuracy: 0.8321 - val_loss: 0.3498
Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3400 - val_accuracy: 0.8365 - val_loss: 0.3529
Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3318 - val_accuracy: 0.8321 - val_loss: 0.3492
Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3362 - val_accuracy: 0.8355 - val_loss: 0.3476
Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8435 -
loss: 0.3348 - val_accuracy: 0.8327 - val_loss: 0.3469
Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8390 -
loss: 0.3393 - val_accuracy: 0.8357 - val_loss: 0.3471
Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3364 - val_accuracy: 0.8332 - val_loss: 0.3449
Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8509 -
loss: 0.3222 - val_accuracy: 0.8347 - val_loss: 0.3463
Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3276 - val_accuracy: 0.8352 - val_loss: 0.3439
Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3266 - val_accuracy: 0.8375 - val_loss: 0.3457
Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3275 - val_accuracy: 0.8360 - val_loss: 0.3427
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3231 - val_accuracy: 0.8357 - val_loss: 0.3414
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3265 - val_accuracy: 0.8390 - val_loss: 0.3408
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3276 - val_accuracy: 0.8360 - val_loss: 0.3455
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3219 - val_accuracy: 0.8403 - val_loss: 0.3400
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3248 - val_accuracy: 0.8342 - val_loss: 0.3458
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3215 - val_accuracy: 0.8396 - val_loss: 0.3382
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3251 - val_accuracy: 0.8380 - val_loss: 0.3388
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3163 - val_accuracy: 0.8398 - val_loss: 0.3429
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8509 -
loss: 0.3209 - val_accuracy: 0.8401 - val_loss: 0.3380
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3219 - val_accuracy: 0.8385 - val_loss: 0.3437
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3189 - val_accuracy: 0.8434 - val_loss: 0.3385
training_neural_network: SGD, l2=0, dropout=0.4
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7542 -
loss: 0.5093 - val_accuracy: 0.7894 - val_loss: 0.4227
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8149 -
loss: 0.3993 - val_accuracy: 0.8224 - val_loss: 0.3864
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8265 -
loss: 0.3714 - val_accuracy: 0.8314 - val_loss: 0.3682
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8363 -
loss: 0.3531 - val_accuracy: 0.8329 - val_loss: 0.3600
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3453 - val_accuracy: 0.8327 - val_loss: 0.3552
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -

loss: 0.3351 - val_accuracy: 0.8319 - val_loss: 0.3509
Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3320 - val_accuracy: 0.8367 - val_loss: 0.3546
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3368 - val_accuracy: 0.8362 - val_loss: 0.3488
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8410 -
loss: 0.3396 - val_accuracy: 0.8357 - val_loss: 0.3496
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3339 - val_accuracy: 0.8344 - val_loss: 0.3450
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3300 - val_accuracy: 0.8324 - val_loss: 0.3517
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3317 - val_accuracy: 0.8350 - val_loss: 0.3424
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3295 - val_accuracy: 0.8406 - val_loss: 0.3463
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3246 - val_accuracy: 0.8396 - val_loss: 0.3438
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3310 - val_accuracy: 0.8401 - val_loss: 0.3415
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3288 - val_accuracy: 0.8414 - val_loss: 0.3420
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3252 - val_accuracy: 0.8347 - val_loss: 0.3390
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8465 -
loss: 0.3283 - val_accuracy: 0.8380 - val_loss: 0.3382
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3209 - val_accuracy: 0.8380 - val_loss: 0.3370
Epoch 20/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3294 - val_accuracy: 0.8393 - val_loss: 0.3364
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3242 - val_accuracy: 0.8396 - val_loss: 0.3360
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8483 -
loss: 0.3274 - val_accuracy: 0.8396 - val_loss: 0.3352
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8532 -
loss: 0.3187 - val_accuracy: 0.8393 - val_loss: 0.3343
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3229 - val_accuracy: 0.8416 - val_loss: 0.3376
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3214 - val_accuracy: 0.8444 - val_loss: 0.3342
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8549 -
loss: 0.3179 - val_accuracy: 0.8411 - val_loss: 0.3380
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8540 -
loss: 0.3198 - val_accuracy: 0.8419 - val_loss: 0.3328
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3220 - val_accuracy: 0.8393 - val_loss: 0.3410
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3191 - val_accuracy: 0.8339 - val_loss: 0.3463
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3179 - val_accuracy: 0.8460 - val_loss: 0.3296
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8538 -
loss: 0.3136 - val_accuracy: 0.8426 - val_loss: 0.3364
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3186 - val_accuracy: 0.8437 - val_loss: 0.3410
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3190 - val_accuracy: 0.8449 - val_loss: 0.3324
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3226 - val_accuracy: 0.8434 - val_loss: 0.3338
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8555 -
loss: 0.3138 - val_accuracy: 0.8454 - val_loss: 0.3291

training_neural_network: SGD, l2=0, dropout=0.6000000000000001
Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7625 -
loss: 0.4871 - val_accuracy: 0.8124 - val_loss: 0.4012
Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8221 -
loss: 0.3851 - val_accuracy: 0.8242 - val_loss: 0.3788
Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8275 -
loss: 0.3657 - val_accuracy: 0.8311 - val_loss: 0.3666
Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8320 -
loss: 0.3582 - val_accuracy: 0.8334 - val_loss: 0.3595
Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8409 -
loss: 0.3435 - val_accuracy: 0.8352 - val_loss: 0.3566
Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8396 -
loss: 0.3399 - val_accuracy: 0.8347 - val_loss: 0.3527
Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8397 -
loss: 0.3446 - val_accuracy: 0.8344 - val_loss: 0.3510
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8413 -
loss: 0.3415 - val_accuracy: 0.8337 - val_loss: 0.3537
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8422 -
loss: 0.3357 - val_accuracy: 0.8332 - val_loss: 0.3485
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3260 - val_accuracy: 0.8327 - val_loss: 0.3471
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3320 - val_accuracy: 0.8355 - val_loss: 0.3459
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3329 - val_accuracy: 0.8337 - val_loss: 0.3447
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8414 -
loss: 0.3369 - val_accuracy: 0.8362 - val_loss: 0.3455
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3293 - val_accuracy: 0.8344 - val_loss: 0.3433
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3235 - val_accuracy: 0.8355 - val_loss: 0.3415
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3278 - val_accuracy: 0.8365 - val_loss: 0.3458
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3310 - val_accuracy: 0.8283 - val_loss: 0.3596
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3293 - val_accuracy: 0.8360 - val_loss: 0.3396
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3241 - val_accuracy: 0.8388 - val_loss: 0.3449
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3225 - val_accuracy: 0.8403 - val_loss: 0.3398
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8483 -
loss: 0.3271 - val_accuracy: 0.8367 - val_loss: 0.3401
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3210 - val_accuracy: 0.8396 - val_loss: 0.3434
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3237 - val_accuracy: 0.8421 - val_loss: 0.3386
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3215 - val_accuracy: 0.8393 - val_loss: 0.3360
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3235 - val_accuracy: 0.8383 - val_loss: 0.3426
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8509 -
loss: 0.3209 - val_accuracy: 0.8380 - val_loss: 0.3453
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3205 - val_accuracy: 0.8403 - val_loss: 0.3373
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8545 -
loss: 0.3160 - val_accuracy: 0.8424 - val_loss: 0.3348
Epoch 29/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3194 - val_accuracy: 0.8416 - val_loss: 0.3344

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3157 - val_accuracy: 0.8362 - val_loss: 0.3476

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3206 - val_accuracy: 0.8403 - val_loss: 0.3340

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8496 -
loss: 0.3256 - val_accuracy: 0.8431 - val_loss: 0.3334

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3166 - val_accuracy: 0.8444 - val_loss: 0.3346

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3181 - val_accuracy: 0.8447 - val_loss: 0.3326

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8604 -
loss: 0.3102 - val_accuracy: 0.8447 - val_loss: 0.3317

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3129 - val_accuracy: 0.8357 - val_loss: 0.3494

Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8497 -
loss: 0.3172 - val_accuracy: 0.8470 - val_loss: 0.3346

Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3177 - val_accuracy: 0.8426 - val_loss: 0.3364

Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3170 - val_accuracy: 0.8429 - val_loss: 0.3403

Epoch 40/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8552 -
loss: 0.3116 - val_accuracy: 0.8393 - val_loss: 0.3336
training_neural_network: SGD, l2=0, dropout=0.8

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 979us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 978us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 967us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 983us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 988us/step

Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7578 -
loss: 0.5423 - val_accuracy: 0.7485 - val_loss: 0.4434

Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.7888 -
loss: 0.4164 - val_accuracy: 0.8206 - val_loss: 0.4013

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8226 -
loss: 0.3800 - val_accuracy: 0.8252 - val_loss: 0.3840

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8281 -
loss: 0.3677 - val_accuracy: 0.8298 - val_loss: 0.3734

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8364 -
loss: 0.3541 - val_accuracy: 0.8319 - val_loss: 0.3650

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8285 -
loss: 0.3605 - val_accuracy: 0.8342 - val_loss: 0.3646

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8369 -
loss: 0.3470 - val_accuracy: 0.8316 - val_loss: 0.3555

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8379 -
loss: 0.3435 - val_accuracy: 0.8319 - val_loss: 0.3526

Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8389 -
loss: 0.3451 - val_accuracy: 0.8337 - val_loss: 0.3509

Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3408 - val_accuracy: 0.8339 - val_loss: 0.3488

Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8423 -
loss: 0.3356 - val_accuracy: 0.8319 - val_loss: 0.3575

Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3300 - val_accuracy: 0.8339 - val_loss: 0.3468

Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3329 - val_accuracy: 0.8342 - val_loss: 0.3534

Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8441 -
loss: 0.3318 - val_accuracy: 0.8337 - val_loss: 0.3456

Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -

loss: 0.3266 - val_accuracy: 0.8347 - val_loss: 0.3506
Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3348 - val_accuracy: 0.8347 - val_loss: 0.3462
Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3295 - val_accuracy: 0.8350 - val_loss: 0.3467
Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3322 - val_accuracy: 0.8367 - val_loss: 0.3415
Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8451 -
loss: 0.3293 - val_accuracy: 0.8367 - val_loss: 0.3495
Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3219 - val_accuracy: 0.8370 - val_loss: 0.3416
Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3277 - val_accuracy: 0.8316 - val_loss: 0.3481
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3251 - val_accuracy: 0.8370 - val_loss: 0.3395
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3239 - val_accuracy: 0.8383 - val_loss: 0.3398
Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8511 -
loss: 0.3231 - val_accuracy: 0.8396 - val_loss: 0.3386
Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8467 -
loss: 0.3273 - val_accuracy: 0.8337 - val_loss: 0.3506
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3231 - val_accuracy: 0.8396 - val_loss: 0.3400
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3239 - val_accuracy: 0.8414 - val_loss: 0.3357
Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8536 -
loss: 0.3140 - val_accuracy: 0.8375 - val_loss: 0.3351
Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3227 - val_accuracy: 0.8362 - val_loss: 0.3457
Epoch 30/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3218 - val_accuracy: 0.8383 - val_loss: 0.3376
Epoch 31/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3164 - val_accuracy: 0.8411 - val_loss: 0.3343
Epoch 32/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3161 - val_accuracy: 0.8388 - val_loss: 0.3355
Epoch 33/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8509 -
loss: 0.3195 - val_accuracy: 0.8408 - val_loss: 0.3349
Epoch 34/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3164 - val_accuracy: 0.8431 - val_loss: 0.3362
Epoch 35/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3193 - val_accuracy: 0.8416 - val_loss: 0.3331
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3179 - val_accuracy: 0.8416 - val_loss: 0.3361
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3196 - val_accuracy: 0.8447 - val_loss: 0.3368
Epoch 38/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3155 - val_accuracy: 0.8388 - val_loss: 0.3372
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3136 - val_accuracy: 0.8421 - val_loss: 0.3375
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8543 -
loss: 0.3135 - val_accuracy: 0.8421 - val_loss: 0.3303
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3187 - val_accuracy: 0.8390 - val_loss: 0.3443
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8533 -
loss: 0.3123 - val_accuracy: 0.8419 - val_loss: 0.3338
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3104 - val_accuracy: 0.8378 - val_loss: 0.3412
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8572 -
loss: 0.3110 - val_accuracy: 0.8419 - val_loss: 0.3310

Epoch 45/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8561 -
loss: 0.3071 - val_accuracy: 0.8419 - val_loss: 0.3314
training_neural_network: SGD, l2=0.0, dropout=0

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7599 -
loss: 0.5554 - val_accuracy: 0.7474 - val_loss: 0.4445

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.7877 -
loss: 0.4157 - val_accuracy: 0.8193 - val_loss: 0.3967

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8260 -
loss: 0.3786 - val_accuracy: 0.8265 - val_loss: 0.3778

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8273 -
loss: 0.3653 - val_accuracy: 0.8337 - val_loss: 0.3663

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8352 -
loss: 0.3547 - val_accuracy: 0.8375 - val_loss: 0.3588

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8398 -
loss: 0.3455 - val_accuracy: 0.8388 - val_loss: 0.3553

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8401 -
loss: 0.3444 - val_accuracy: 0.8419 - val_loss: 0.3540

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8428 -
loss: 0.3378 - val_accuracy: 0.8339 - val_loss: 0.3498

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8398 -
loss: 0.3420 - val_accuracy: 0.8380 - val_loss: 0.3540

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3361 - val_accuracy: 0.8332 - val_loss: 0.3470

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3319 - val_accuracy: 0.8357 - val_loss: 0.3473

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3354 - val_accuracy: 0.8344 - val_loss: 0.3484

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8415 -
loss: 0.3366 - val_accuracy: 0.8365 - val_loss: 0.3443

Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3358 - val_accuracy: 0.8380 - val_loss: 0.3502
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3303 - val_accuracy: 0.8367 - val_loss: 0.3435
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3296 - val_accuracy: 0.8373 - val_loss: 0.3419
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3260 - val_accuracy: 0.8398 - val_loss: 0.3434
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3354 - val_accuracy: 0.8396 - val_loss: 0.3431
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3275 - val_accuracy: 0.8393 - val_loss: 0.3418
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8458 -
loss: 0.3297 - val_accuracy: 0.8383 - val_loss: 0.3393
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3266 - val_accuracy: 0.8390 - val_loss: 0.3392
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3282 - val_accuracy: 0.8388 - val_loss: 0.3409
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3284 - val_accuracy: 0.8411 - val_loss: 0.3380
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3311 - val_accuracy: 0.8388 - val_loss: 0.3414
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3272 - val_accuracy: 0.8401 - val_loss: 0.3373
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3247 - val_accuracy: 0.8434 - val_loss: 0.3390
Epoch 27/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3293 - val_accuracy: 0.8385 - val_loss: 0.3369
Epoch 28/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8513 -
loss: 0.3185 - val_accuracy: 0.8332 - val_loss: 0.3498

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8495 -
loss: 0.3260 - val_accuracy: 0.8431 - val_loss: 0.3361

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3190 - val_accuracy: 0.8416 - val_loss: 0.3350

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8493 -
loss: 0.3228 - val_accuracy: 0.8431 - val_loss: 0.3367

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3249 - val_accuracy: 0.8408 - val_loss: 0.3360

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3212 - val_accuracy: 0.8431 - val_loss: 0.3344

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3164 - val_accuracy: 0.8306 - val_loss: 0.3555

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3211 - val_accuracy: 0.8385 - val_loss: 0.3402
training_neural_network: SGD, l2=1e-05, dropout=0

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7359 -
loss: 0.5373 - val_accuracy: 0.8048 - val_loss: 0.4177

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8169 -
loss: 0.3914 - val_accuracy: 0.8183 - val_loss: 0.3827

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8263 -
loss: 0.3686 - val_accuracy: 0.8278 - val_loss: 0.3684

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8311 -
loss: 0.3581 - val_accuracy: 0.8319 - val_loss: 0.3613

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8349 -
loss: 0.3504 - val_accuracy: 0.8280 - val_loss: 0.3600

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8400 -
loss: 0.3414 - val_accuracy: 0.8321 - val_loss: 0.3511

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8397 -
loss: 0.3423 - val_accuracy: 0.8303 - val_loss: 0.3492

Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8423 -
loss: 0.3405 - val_accuracy: 0.8316 - val_loss: 0.3476
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3349 - val_accuracy: 0.8339 - val_loss: 0.3480
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3367 - val_accuracy: 0.8342 - val_loss: 0.3526
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3342 - val_accuracy: 0.8360 - val_loss: 0.3447
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3306 - val_accuracy: 0.8339 - val_loss: 0.3443
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3334 - val_accuracy: 0.8344 - val_loss: 0.3448
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8423 -
loss: 0.3320 - val_accuracy: 0.8362 - val_loss: 0.3423
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3323 - val_accuracy: 0.8370 - val_loss: 0.3420
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3271 - val_accuracy: 0.8357 - val_loss: 0.3456
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3274 - val_accuracy: 0.8365 - val_loss: 0.3455
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8510 -
loss: 0.3241 - val_accuracy: 0.8390 - val_loss: 0.3405
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8523 -
loss: 0.3206 - val_accuracy: 0.8383 - val_loss: 0.3391
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3292 - val_accuracy: 0.8370 - val_loss: 0.3396
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3248 - val_accuracy: 0.8393 - val_loss: 0.3430
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3192 - val_accuracy: 0.8401 - val_loss: 0.3407

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3205 - val_accuracy: 0.8431 - val_loss: 0.3355

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3169 - val_accuracy: 0.8421 - val_loss: 0.3353

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3192 - val_accuracy: 0.8408 - val_loss: 0.3370

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3227 - val_accuracy: 0.8437 - val_loss: 0.3326

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3158 - val_accuracy: 0.8273 - val_loss: 0.3560

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3195 - val_accuracy: 0.8431 - val_loss: 0.3330

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3177 - val_accuracy: 0.8442 - val_loss: 0.3311

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8554 -
loss: 0.3148 - val_accuracy: 0.8444 - val_loss: 0.3295

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8568 -
loss: 0.3144 - val_accuracy: 0.8416 - val_loss: 0.3323

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3181 - val_accuracy: 0.8495 - val_loss: 0.3313

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8538 -
loss: 0.3154 - val_accuracy: 0.8421 - val_loss: 0.3288

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8570 -
loss: 0.3102 - val_accuracy: 0.8419 - val_loss: 0.3332

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8557 -
loss: 0.3165 - val_accuracy: 0.8465 - val_loss: 0.3375

training_neural_network: SGD, l2=3.1622776601683795e-05, dropout=0

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7558 -
loss: 0.5390 - val_accuracy: 0.7802 - val_loss: 0.4329

Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.7974 -
loss: 0.4086 - val_accuracy: 0.8145 - val_loss: 0.3972
Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8224 -
loss: 0.3768 - val_accuracy: 0.8222 - val_loss: 0.3792
Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8340 -
loss: 0.3581 - val_accuracy: 0.8283 - val_loss: 0.3673
Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8358 -
loss: 0.3506 - val_accuracy: 0.8316 - val_loss: 0.3595
Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3454 - val_accuracy: 0.8342 - val_loss: 0.3599
Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8366 -
loss: 0.3446 - val_accuracy: 0.8327 - val_loss: 0.3533
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8410 -
loss: 0.3414 - val_accuracy: 0.8337 - val_loss: 0.3530
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3346 - val_accuracy: 0.8314 - val_loss: 0.3487
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3334 - val_accuracy: 0.8311 - val_loss: 0.3484
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8411 -
loss: 0.3387 - val_accuracy: 0.8296 - val_loss: 0.3468
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3364 - val_accuracy: 0.8347 - val_loss: 0.3465
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8398 -
loss: 0.3403 - val_accuracy: 0.8380 - val_loss: 0.3476
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3290 - val_accuracy: 0.8360 - val_loss: 0.3444
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3337 - val_accuracy: 0.8332 - val_loss: 0.3424
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3331 - val_accuracy: 0.8357 - val_loss: 0.3430

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3315 - val_accuracy: 0.8339 - val_loss: 0.3419

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8450 -
loss: 0.3268 - val_accuracy: 0.8370 - val_loss: 0.3405

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3238 - val_accuracy: 0.8383 - val_loss: 0.3422

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3281 - val_accuracy: 0.8370 - val_loss: 0.3381

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3286 - val_accuracy: 0.8373 - val_loss: 0.3446

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3279 - val_accuracy: 0.8373 - val_loss: 0.3378

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3246 - val_accuracy: 0.8365 - val_loss: 0.3373

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3182 - val_accuracy: 0.8401 - val_loss: 0.3367

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3248 - val_accuracy: 0.8383 - val_loss: 0.3382

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3239 - val_accuracy: 0.8421 - val_loss: 0.3360

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3225 - val_accuracy: 0.8352 - val_loss: 0.3426

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3267 - val_accuracy: 0.8398 - val_loss: 0.3338

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3176 - val_accuracy: 0.8414 - val_loss: 0.3387

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3204 - val_accuracy: 0.8401 - val_loss: 0.3333

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8541 -

loss: 0.3155 - val_accuracy: 0.8245 - val_loss: 0.3632
Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3197 - val_accuracy: 0.8301 - val_loss: 0.3589
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3145 - val_accuracy: 0.8403 - val_loss: 0.3365
training_neural_network: SGD, l2=0.0001, dropout=0
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7503 -
loss: 0.5781 - val_accuracy: 0.7474 - val_loss: 0.4760
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.7780 -
loss: 0.4361 - val_accuracy: 0.8127 - val_loss: 0.4007
Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8221 -
loss: 0.3815 - val_accuracy: 0.8273 - val_loss: 0.3776
Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8289 -
loss: 0.3661 - val_accuracy: 0.8337 - val_loss: 0.3663
Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8342 -
loss: 0.3545 - val_accuracy: 0.8347 - val_loss: 0.3596
Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8377 -
loss: 0.3488 - val_accuracy: 0.8355 - val_loss: 0.3559
Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3394 - val_accuracy: 0.8350 - val_loss: 0.3541
Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8432 -
loss: 0.3397 - val_accuracy: 0.8352 - val_loss: 0.3508
Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3382 - val_accuracy: 0.8393 - val_loss: 0.3504
Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3340 - val_accuracy: 0.8357 - val_loss: 0.3474
Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8454 -
loss: 0.3322 - val_accuracy: 0.8350 - val_loss: 0.3462
Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8391 -
loss: 0.3387 - val_accuracy: 0.8347 - val_loss: 0.3458

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3324 - val_accuracy: 0.8355 - val_loss: 0.3513

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3345 - val_accuracy: 0.8342 - val_loss: 0.3440

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3331 - val_accuracy: 0.8378 - val_loss: 0.3421

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8442 -
loss: 0.3322 - val_accuracy: 0.8360 - val_loss: 0.3417

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8452 -
loss: 0.3304 - val_accuracy: 0.8367 - val_loss: 0.3405

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3266 - val_accuracy: 0.8390 - val_loss: 0.3410

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8479 -
loss: 0.3281 - val_accuracy: 0.8396 - val_loss: 0.3396

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3251 - val_accuracy: 0.8383 - val_loss: 0.3434

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8497 -
loss: 0.3206 - val_accuracy: 0.8373 - val_loss: 0.3377

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3208 - val_accuracy: 0.8414 - val_loss: 0.3373

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3261 - val_accuracy: 0.8393 - val_loss: 0.3424

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3232 - val_accuracy: 0.8429 - val_loss: 0.3375

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3191 - val_accuracy: 0.8411 - val_loss: 0.3370

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3183 - val_accuracy: 0.8390 - val_loss: 0.3354

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8510 -

loss: 0.3233 - val_accuracy: 0.8401 - val_loss: 0.3342
Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3250 - val_accuracy: 0.8329 - val_loss: 0.3508
Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3221 - val_accuracy: 0.8439 - val_loss: 0.3335
Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3180 - val_accuracy: 0.8442 - val_loss: 0.3331
Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8530 -
loss: 0.3167 - val_accuracy: 0.8434 - val_loss: 0.3372
Epoch 32/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3238 - val_accuracy: 0.8460 - val_loss: 0.3335
Epoch 33/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8522 -
loss: 0.3160 - val_accuracy: 0.8426 - val_loss: 0.3374
Epoch 34/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3169 - val_accuracy: 0.8437 - val_loss: 0.3364
Epoch 35/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8574 -
loss: 0.3137 - val_accuracy: 0.8426 - val_loss: 0.3360
training_neural_network: SGD, l2=0.00031622776601683794, dropout=0
Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7664 -
loss: 0.4805 - val_accuracy: 0.8119 - val_loss: 0.4051
Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8156 -
loss: 0.3900 - val_accuracy: 0.8183 - val_loss: 0.3807
Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8240 -
loss: 0.3700 - val_accuracy: 0.8301 - val_loss: 0.3682
Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8283 -
loss: 0.3612 - val_accuracy: 0.8298 - val_loss: 0.3636
Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8365 -
loss: 0.3513 - val_accuracy: 0.8350 - val_loss: 0.3562
Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8385 -
loss: 0.3485 - val_accuracy: 0.8342 - val_loss: 0.3557

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8412 -
loss: 0.3397 - val_accuracy: 0.8337 - val_loss: 0.3519

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8404 -
loss: 0.3395 - val_accuracy: 0.8306 - val_loss: 0.3501

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3344 - val_accuracy: 0.8329 - val_loss: 0.3496

Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3321 - val_accuracy: 0.8324 - val_loss: 0.3478

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3349 - val_accuracy: 0.8309 - val_loss: 0.3472

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8436 -
loss: 0.3299 - val_accuracy: 0.8327 - val_loss: 0.3482

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3287 - val_accuracy: 0.8334 - val_loss: 0.3443

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8436 -
loss: 0.3317 - val_accuracy: 0.8365 - val_loss: 0.3459

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8450 -
loss: 0.3298 - val_accuracy: 0.8365 - val_loss: 0.3420

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3278 - val_accuracy: 0.8344 - val_loss: 0.3447

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3300 - val_accuracy: 0.8360 - val_loss: 0.3458

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3223 - val_accuracy: 0.8357 - val_loss: 0.3403

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3324 - val_accuracy: 0.8398 - val_loss: 0.3446

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8477 -
loss: 0.3250 - val_accuracy: 0.8365 - val_loss: 0.3392

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8503 -

loss: 0.3262 - val_accuracy: 0.8406 - val_loss: 0.3421
Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3250 - val_accuracy: 0.8396 - val_loss: 0.3372
Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8482 -
loss: 0.3290 - val_accuracy: 0.8393 - val_loss: 0.3427
Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3239 - val_accuracy: 0.8419 - val_loss: 0.3340
Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3225 - val_accuracy: 0.8429 - val_loss: 0.3354
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8544 -
loss: 0.3199 - val_accuracy: 0.8442 - val_loss: 0.3368
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8538 -
loss: 0.3143 - val_accuracy: 0.8444 - val_loss: 0.3346
Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3181 - val_accuracy: 0.8421 - val_loss: 0.3319
Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8519 -
loss: 0.3187 - val_accuracy: 0.8403 - val_loss: 0.3314
Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8540 -
loss: 0.3172 - val_accuracy: 0.8457 - val_loss: 0.3326
Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3167 - val_accuracy: 0.8460 - val_loss: 0.3308
Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8559 -
loss: 0.3115 - val_accuracy: 0.8431 - val_loss: 0.3310
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8558 -
loss: 0.3159 - val_accuracy: 0.8460 - val_loss: 0.3315
Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8540 -
loss: 0.3201 - val_accuracy: 0.8495 - val_loss: 0.3329
Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8553 -
loss: 0.3170 - val_accuracy: 0.8490 - val_loss: 0.3262
Epoch 36/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8537 -
loss: 0.3153 - val_accuracy: 0.8485 - val_loss: 0.3283
Epoch 37/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3143 - val_accuracy: 0.8475 - val_loss: 0.3274
Epoch 38/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8566 -
loss: 0.3062 - val_accuracy: 0.8437 - val_loss: 0.3278
Epoch 39/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8573 -
loss: 0.3088 - val_accuracy: 0.8495 - val_loss: 0.3298
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8592 -
loss: 0.3046 - val_accuracy: 0.8526 - val_loss: 0.3246
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8550 -
loss: 0.3141 - val_accuracy: 0.8501 - val_loss: 0.3262
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3120 - val_accuracy: 0.8513 - val_loss: 0.3246
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8548 -
loss: 0.3135 - val_accuracy: 0.8465 - val_loss: 0.3376
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8562 -
loss: 0.3141 - val_accuracy: 0.8352 - val_loss: 0.3403
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8594 -
loss: 0.3056 - val_accuracy: 0.8534 - val_loss: 0.3230
Epoch 46/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8581 -
loss: 0.3096 - val_accuracy: 0.8513 - val_loss: 0.3230
Epoch 47/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8571 -
loss: 0.3075 - val_accuracy: 0.8465 - val_loss: 0.3291
Epoch 48/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8569 -
loss: 0.3084 - val_accuracy: 0.8362 - val_loss: 0.3407
Epoch 49/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8592 -
loss: 0.3036 - val_accuracy: 0.8531 - val_loss: 0.3231
Epoch 50/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8554 -
loss: 0.3097 - val_accuracy: 0.8449 - val_loss: 0.3343

training_neural_network: SGD, l2=0.001, dropout=0

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 966us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 988us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 992us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 970us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 984us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 974us/step

Epoch 1/90

1099/1099 ————— 3s 1ms/step - accuracy: 0.7569 -
loss: 0.5127 - val_accuracy: 0.7618 - val_loss: 0.4297

Epoch 2/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8020 -
loss: 0.4093 - val_accuracy: 0.8193 - val_loss: 0.3954

Epoch 3/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8226 -
loss: 0.3782 - val_accuracy: 0.8278 - val_loss: 0.3776

Epoch 4/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8301 -
loss: 0.3661 - val_accuracy: 0.8327 - val_loss: 0.3666

Epoch 5/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8363 -
loss: 0.3522 - val_accuracy: 0.8355 - val_loss: 0.3606

Epoch 6/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8354 -
loss: 0.3502 - val_accuracy: 0.8347 - val_loss: 0.3549

Epoch 7/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8396 -
loss: 0.3446 - val_accuracy: 0.8339 - val_loss: 0.3526

Epoch 8/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8415 -
loss: 0.3410 - val_accuracy: 0.8360 - val_loss: 0.3506

Epoch 9/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8442 -
loss: 0.3358 - val_accuracy: 0.8321 - val_loss: 0.3515

Epoch 10/90

1099/1099 ————— 1s 1000us/step - accuracy:
0.8435 - loss: 0.3349 - val_accuracy: 0.8350 - val_loss: 0.3483

Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3359 - val_accuracy: 0.8355 - val_loss: 0.3467
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3345 - val_accuracy: 0.8332 - val_loss: 0.3473
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3355 - val_accuracy: 0.8306 - val_loss: 0.3546
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3311 - val_accuracy: 0.8367 - val_loss: 0.3443
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8421 -
loss: 0.3377 - val_accuracy: 0.8380 - val_loss: 0.3427
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3325 - val_accuracy: 0.8398 - val_loss: 0.3417
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3305 - val_accuracy: 0.8408 - val_loss: 0.3420
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8466 -
loss: 0.3277 - val_accuracy: 0.8355 - val_loss: 0.3481
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8435 -
loss: 0.3316 - val_accuracy: 0.8408 - val_loss: 0.3407
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3294 - val_accuracy: 0.8365 - val_loss: 0.3462
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3255 - val_accuracy: 0.8388 - val_loss: 0.3403
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8504 -
loss: 0.3236 - val_accuracy: 0.8419 - val_loss: 0.3388
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3241 - val_accuracy: 0.8388 - val_loss: 0.3389
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8498 -
loss: 0.3205 - val_accuracy: 0.8408 - val_loss: 0.3384
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3253 - val_accuracy: 0.8385 - val_loss: 0.3371

Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3243 - val_accuracy: 0.8408 - val_loss: 0.3356

Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8503 -
loss: 0.3201 - val_accuracy: 0.8411 - val_loss: 0.3349

Epoch 28/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3229 - val_accuracy: 0.8419 - val_loss: 0.3379

Epoch 29/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3256 - val_accuracy: 0.8390 - val_loss: 0.3380

Epoch 30/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8492 -
loss: 0.3228 - val_accuracy: 0.8378 - val_loss: 0.3472

Epoch 31/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3250 - val_accuracy: 0.8421 - val_loss: 0.3378
training_neural_network: SGD, l2=1e-05, dropout=0.1

Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7586 -
loss: 0.5282 - val_accuracy: 0.7474 - val_loss: 0.4336

Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.7833 -
loss: 0.4066 - val_accuracy: 0.8191 - val_loss: 0.3950

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8210 -
loss: 0.3765 - val_accuracy: 0.8303 - val_loss: 0.3748

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8292 -
loss: 0.3625 - val_accuracy: 0.8344 - val_loss: 0.3638

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8335 -
loss: 0.3538 - val_accuracy: 0.8347 - val_loss: 0.3589

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3482 - val_accuracy: 0.8367 - val_loss: 0.3551

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8380 -
loss: 0.3458 - val_accuracy: 0.8332 - val_loss: 0.3521

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8439 -
loss: 0.3378 - val_accuracy: 0.8316 - val_loss: 0.3509

Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8430 -
loss: 0.3382 - val_accuracy: 0.8362 - val_loss: 0.3512
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3334 - val_accuracy: 0.8319 - val_loss: 0.3582
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3371 - val_accuracy: 0.8316 - val_loss: 0.3466
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3407 - val_accuracy: 0.8327 - val_loss: 0.3461
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8440 -
loss: 0.3327 - val_accuracy: 0.8321 - val_loss: 0.3528
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3312 - val_accuracy: 0.8383 - val_loss: 0.3463
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8425 -
loss: 0.3335 - val_accuracy: 0.8362 - val_loss: 0.3446
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3267 - val_accuracy: 0.8319 - val_loss: 0.3494
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3253 - val_accuracy: 0.8342 - val_loss: 0.3421
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3286 - val_accuracy: 0.8380 - val_loss: 0.3418
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3285 - val_accuracy: 0.8388 - val_loss: 0.3422
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8488 -
loss: 0.3236 - val_accuracy: 0.8388 - val_loss: 0.3419
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3311 - val_accuracy: 0.8375 - val_loss: 0.3382
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3280 - val_accuracy: 0.8365 - val_loss: 0.3406
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3274 - val_accuracy: 0.8362 - val_loss: 0.3405

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8514 -
loss: 0.3223 - val_accuracy: 0.8367 - val_loss: 0.3376

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3261 - val_accuracy: 0.8380 - val_loss: 0.3371

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3224 - val_accuracy: 0.8401 - val_loss: 0.3358

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3228 - val_accuracy: 0.8339 - val_loss: 0.3454

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3199 - val_accuracy: 0.8329 - val_loss: 0.3492

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3188 - val_accuracy: 0.8347 - val_loss: 0.3357

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3216 - val_accuracy: 0.8414 - val_loss: 0.3343

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3208 - val_accuracy: 0.8416 - val_loss: 0.3334

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3201 - val_accuracy: 0.8355 - val_loss: 0.3363

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3254 - val_accuracy: 0.8380 - val_loss: 0.3341

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3211 - val_accuracy: 0.8314 - val_loss: 0.3447

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3223 - val_accuracy: 0.8414 - val_loss: 0.3333
training_neural_network: SGD, l2=1e-05, dropout=0.4

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7247 -
loss: 0.5457 - val_accuracy: 0.8012 - val_loss: 0.4259

Epoch 2/90
1099/1099 ————— 2s 1ms/step - accuracy: 0.8143 -
loss: 0.4006 - val_accuracy: 0.8183 - val_loss: 0.3935

Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8216 -
loss: 0.3787 - val_accuracy: 0.8296 - val_loss: 0.3753
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8279 -
loss: 0.3613 - val_accuracy: 0.8321 - val_loss: 0.3656
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8319 -
loss: 0.3551 - val_accuracy: 0.8334 - val_loss: 0.3655
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8374 -
loss: 0.3502 - val_accuracy: 0.8339 - val_loss: 0.3582
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8387 -
loss: 0.3460 - val_accuracy: 0.8298 - val_loss: 0.3565
Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8394 -
loss: 0.3409 - val_accuracy: 0.8316 - val_loss: 0.3526
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8380 -
loss: 0.3463 - val_accuracy: 0.8316 - val_loss: 0.3506
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3332 - val_accuracy: 0.8360 - val_loss: 0.3526
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8420 -
loss: 0.3373 - val_accuracy: 0.8324 - val_loss: 0.3477
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3383 - val_accuracy: 0.8334 - val_loss: 0.3467
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8429 -
loss: 0.3339 - val_accuracy: 0.8306 - val_loss: 0.3464
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3295 - val_accuracy: 0.8329 - val_loss: 0.3466
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8445 -
loss: 0.3316 - val_accuracy: 0.8344 - val_loss: 0.3500
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3308 - val_accuracy: 0.8375 - val_loss: 0.3440
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8407 -
loss: 0.3369 - val_accuracy: 0.8352 - val_loss: 0.3423

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8481 -
loss: 0.3276 - val_accuracy: 0.8342 - val_loss: 0.3441

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3251 - val_accuracy: 0.8383 - val_loss: 0.3408

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8475 -
loss: 0.3286 - val_accuracy: 0.8370 - val_loss: 0.3469

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3281 - val_accuracy: 0.8370 - val_loss: 0.3416

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8516 -
loss: 0.3240 - val_accuracy: 0.8437 - val_loss: 0.3402

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3237 - val_accuracy: 0.8360 - val_loss: 0.3433

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3233 - val_accuracy: 0.8416 - val_loss: 0.3421
training_neural_network: SGD, l2=1e-05, dropout=0.7000000000000001

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7383 -
loss: 0.5156 - val_accuracy: 0.7996 - val_loss: 0.4304

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8121 -
loss: 0.4045 - val_accuracy: 0.8127 - val_loss: 0.3950

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8246 -
loss: 0.3733 - val_accuracy: 0.8250 - val_loss: 0.3783

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8300 -
loss: 0.3666 - val_accuracy: 0.8278 - val_loss: 0.3688

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8328 -
loss: 0.3553 - val_accuracy: 0.8327 - val_loss: 0.3610

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8329 -
loss: 0.3501 - val_accuracy: 0.8334 - val_loss: 0.3588

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8402 -
loss: 0.3440 - val_accuracy: 0.8309 - val_loss: 0.3543

Epoch 8/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8382 -
loss: 0.3445 - val_accuracy: 0.8314 - val_loss: 0.3528
Epoch 9/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8381 -
loss: 0.3398 - val_accuracy: 0.8311 - val_loss: 0.3564
Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8424 -
loss: 0.3354 - val_accuracy: 0.8327 - val_loss: 0.3505
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3346 - val_accuracy: 0.8283 - val_loss: 0.3570
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8421 -
loss: 0.3403 - val_accuracy: 0.8352 - val_loss: 0.3514
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8437 -
loss: 0.3354 - val_accuracy: 0.8357 - val_loss: 0.3535
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8436 -
loss: 0.3362 - val_accuracy: 0.8370 - val_loss: 0.3485
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3270 - val_accuracy: 0.8342 - val_loss: 0.3452
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8463 -
loss: 0.3309 - val_accuracy: 0.8339 - val_loss: 0.3483
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8426 -
loss: 0.3337 - val_accuracy: 0.8352 - val_loss: 0.3452
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3254 - val_accuracy: 0.8383 - val_loss: 0.3477
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3257 - val_accuracy: 0.8375 - val_loss: 0.3428
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3252 - val_accuracy: 0.8393 - val_loss: 0.3409
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3246 - val_accuracy: 0.8375 - val_loss: 0.3409
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3288 - val_accuracy: 0.8367 - val_loss: 0.3396

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8485 -
loss: 0.3253 - val_accuracy: 0.8362 - val_loss: 0.3467

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3239 - val_accuracy: 0.8408 - val_loss: 0.3397

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3198 - val_accuracy: 0.8393 - val_loss: 0.3369

Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3211 - val_accuracy: 0.8408 - val_loss: 0.3362

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3231 - val_accuracy: 0.8419 - val_loss: 0.3371

Epoch 28/90
1099/1099 ————— 1s 1000us/step - accuracy:
0.8522 - loss: 0.3170 - val_accuracy: 0.8408 - val_loss: 0.3353

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3233 - val_accuracy: 0.8403 - val_loss: 0.3352

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3192 - val_accuracy: 0.8396 - val_loss: 0.3334

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3200 - val_accuracy: 0.8416 - val_loss: 0.3334

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8512 -
loss: 0.3173 - val_accuracy: 0.8421 - val_loss: 0.3338

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8563 -
loss: 0.3160 - val_accuracy: 0.8480 - val_loss: 0.3330

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3185 - val_accuracy: 0.8424 - val_loss: 0.3311

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8510 -
loss: 0.3163 - val_accuracy: 0.8431 - val_loss: 0.3297

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8532 -
loss: 0.3182 - val_accuracy: 0.8421 - val_loss: 0.3370

Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8558 -

loss: 0.3112 - val_accuracy: 0.8437 - val_loss: 0.3310
Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3181 - val_accuracy: 0.8488 - val_loss: 0.3298
Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8523 -
loss: 0.3150 - val_accuracy: 0.8462 - val_loss: 0.3364
Epoch 40/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8525 -
loss: 0.3150 - val_accuracy: 0.8472 - val_loss: 0.3334
training_neural_network: SGD, l2=0.0001, dropout=0.1
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7432 -
loss: 0.5299 - val_accuracy: 0.8147 - val_loss: 0.4147
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8184 -
loss: 0.3975 - val_accuracy: 0.8219 - val_loss: 0.3867
Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8207 -
loss: 0.3770 - val_accuracy: 0.8301 - val_loss: 0.3743
Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8313 -
loss: 0.3592 - val_accuracy: 0.8324 - val_loss: 0.3649
Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8358 -
loss: 0.3527 - val_accuracy: 0.8339 - val_loss: 0.3586
Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8407 -
loss: 0.3448 - val_accuracy: 0.8352 - val_loss: 0.3546
Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8399 -
loss: 0.3437 - val_accuracy: 0.8344 - val_loss: 0.3545
Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8452 -
loss: 0.3356 - val_accuracy: 0.8347 - val_loss: 0.3563
Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3322 - val_accuracy: 0.8344 - val_loss: 0.3481
Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3341 - val_accuracy: 0.8352 - val_loss: 0.3551
Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3355 - val_accuracy: 0.8329 - val_loss: 0.3456

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8474 -
loss: 0.3299 - val_accuracy: 0.8350 - val_loss: 0.3453

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3344 - val_accuracy: 0.8342 - val_loss: 0.3450

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8433 -
loss: 0.3332 - val_accuracy: 0.8360 - val_loss: 0.3468

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3301 - val_accuracy: 0.8337 - val_loss: 0.3494

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8461 -
loss: 0.3303 - val_accuracy: 0.8311 - val_loss: 0.3480
training_neural_network: SGD, l2=0.0001, dropout=0.4

Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7328 -
loss: 0.5146 - val_accuracy: 0.8129 - val_loss: 0.4049

Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8203 -
loss: 0.3834 - val_accuracy: 0.8240 - val_loss: 0.3804

Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8255 -
loss: 0.3667 - val_accuracy: 0.8278 - val_loss: 0.3687

Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8344 -
loss: 0.3531 - val_accuracy: 0.8306 - val_loss: 0.3642

Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8376 -
loss: 0.3456 - val_accuracy: 0.8329 - val_loss: 0.3558

Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8338 -
loss: 0.3488 - val_accuracy: 0.8314 - val_loss: 0.3531

Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8383 -
loss: 0.3395 - val_accuracy: 0.8301 - val_loss: 0.3514

Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8421 -
loss: 0.3359 - val_accuracy: 0.8303 - val_loss: 0.3493

Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8416 -
loss: 0.3346 - val_accuracy: 0.8301 - val_loss: 0.3478

Epoch 10/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8411 -
loss: 0.3369 - val_accuracy: 0.8352 - val_loss: 0.3492
Epoch 11/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3315 - val_accuracy: 0.8367 - val_loss: 0.3490
Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3330 - val_accuracy: 0.8332 - val_loss: 0.3445
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8447 -
loss: 0.3296 - val_accuracy: 0.8327 - val_loss: 0.3438
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3362 - val_accuracy: 0.8329 - val_loss: 0.3442
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8471 -
loss: 0.3313 - val_accuracy: 0.8350 - val_loss: 0.3427
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8443 -
loss: 0.3317 - val_accuracy: 0.8316 - val_loss: 0.3414
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3345 - val_accuracy: 0.8332 - val_loss: 0.3415
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3266 - val_accuracy: 0.8334 - val_loss: 0.3404
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3229 - val_accuracy: 0.8362 - val_loss: 0.3452
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3256 - val_accuracy: 0.8324 - val_loss: 0.3393
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8434 -
loss: 0.3318 - val_accuracy: 0.8375 - val_loss: 0.3461
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8499 -
loss: 0.3246 - val_accuracy: 0.8367 - val_loss: 0.3373
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8487 -
loss: 0.3269 - val_accuracy: 0.8350 - val_loss: 0.3377
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3221 - val_accuracy: 0.8327 - val_loss: 0.3368

Epoch 25/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3207 - val_accuracy: 0.8342 - val_loss: 0.3474

Epoch 26/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3250 - val_accuracy: 0.8406 - val_loss: 0.3396

Epoch 27/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3229 - val_accuracy: 0.8365 - val_loss: 0.3393
training_neural_network: SGD, l2=0.0001, dropout=0.7000000000000001

Epoch 1/90
1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7348 -
loss: 0.5489 - val_accuracy: 0.7643 - val_loss: 0.4391

Epoch 2/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.7977 -
loss: 0.4110 - val_accuracy: 0.8081 - val_loss: 0.4020

Epoch 3/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8138 -
loss: 0.3851 - val_accuracy: 0.8211 - val_loss: 0.3810

Epoch 4/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8256 -
loss: 0.3689 - val_accuracy: 0.8296 - val_loss: 0.3697

Epoch 5/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8341 -
loss: 0.3532 - val_accuracy: 0.8327 - val_loss: 0.3608

Epoch 6/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8363 -
loss: 0.3539 - val_accuracy: 0.8339 - val_loss: 0.3555

Epoch 7/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8382 -
loss: 0.3440 - val_accuracy: 0.8367 - val_loss: 0.3543

Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8383 -
loss: 0.3416 - val_accuracy: 0.8355 - val_loss: 0.3516

Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3349 - val_accuracy: 0.8355 - val_loss: 0.3555

Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3339 - val_accuracy: 0.8329 - val_loss: 0.3490

Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8417 -
loss: 0.3354 - val_accuracy: 0.8329 - val_loss: 0.3484

Epoch 12/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8457 -
loss: 0.3322 - val_accuracy: 0.8375 - val_loss: 0.3492
Epoch 13/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3348 - val_accuracy: 0.8360 - val_loss: 0.3458
Epoch 14/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8455 -
loss: 0.3354 - val_accuracy: 0.8352 - val_loss: 0.3438
Epoch 15/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3304 - val_accuracy: 0.8365 - val_loss: 0.3469
Epoch 16/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8505 -
loss: 0.3238 - val_accuracy: 0.8367 - val_loss: 0.3442
Epoch 17/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8459 -
loss: 0.3281 - val_accuracy: 0.8347 - val_loss: 0.3430
Epoch 18/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8452 -
loss: 0.3282 - val_accuracy: 0.8357 - val_loss: 0.3435
Epoch 19/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8470 -
loss: 0.3266 - val_accuracy: 0.8334 - val_loss: 0.3407
Epoch 20/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8469 -
loss: 0.3250 - val_accuracy: 0.8398 - val_loss: 0.3458
Epoch 21/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8468 -
loss: 0.3268 - val_accuracy: 0.8342 - val_loss: 0.3528
Epoch 22/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3225 - val_accuracy: 0.8408 - val_loss: 0.3401
Epoch 23/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3175 - val_accuracy: 0.8367 - val_loss: 0.3422
Epoch 24/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8494 -
loss: 0.3229 - val_accuracy: 0.8385 - val_loss: 0.3361
Epoch 25/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3236 - val_accuracy: 0.8385 - val_loss: 0.3406
Epoch 26/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8508 -
loss: 0.3213 - val_accuracy: 0.8398 - val_loss: 0.3352

Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8523 -
loss: 0.3210 - val_accuracy: 0.8380 - val_loss: 0.3323

Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8535 -
loss: 0.3179 - val_accuracy: 0.8406 - val_loss: 0.3324

Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3232 - val_accuracy: 0.8434 - val_loss: 0.3350

Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8501 -
loss: 0.3209 - val_accuracy: 0.8431 - val_loss: 0.3316

Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8537 -
loss: 0.3164 - val_accuracy: 0.8416 - val_loss: 0.3310

Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3191 - val_accuracy: 0.8398 - val_loss: 0.3381

Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8543 -
loss: 0.3144 - val_accuracy: 0.8390 - val_loss: 0.3306

Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8531 -
loss: 0.3178 - val_accuracy: 0.8442 - val_loss: 0.3351

Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3122 - val_accuracy: 0.8416 - val_loss: 0.3295

Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8558 -
loss: 0.3151 - val_accuracy: 0.8434 - val_loss: 0.3323

Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8588 -
loss: 0.3080 - val_accuracy: 0.8431 - val_loss: 0.3277

Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3140 - val_accuracy: 0.8424 - val_loss: 0.3288

Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8520 -
loss: 0.3148 - val_accuracy: 0.8429 - val_loss: 0.3279

Epoch 40/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8562 -
loss: 0.3128 - val_accuracy: 0.8426 - val_loss: 0.3262

Epoch 41/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8532 -

loss: 0.3157 - val_accuracy: 0.8485 - val_loss: 0.3307
Epoch 42/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8579 -
loss: 0.3080 - val_accuracy: 0.8457 - val_loss: 0.3271
Epoch 43/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8554 -
loss: 0.3162 - val_accuracy: 0.8424 - val_loss: 0.3322
Epoch 44/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8534 -
loss: 0.3127 - val_accuracy: 0.8429 - val_loss: 0.3257
Epoch 45/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8546 -
loss: 0.3094 - val_accuracy: 0.8467 - val_loss: 0.3333
training_neural_network: SGD, l2=0.001, dropout=0.1
Epoch 1/90
1099/1099 ————— 3s 1ms/step - accuracy: 0.7263 -
loss: 0.5637 - val_accuracy: 0.7646 - val_loss: 0.4489
Epoch 2/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8006 -
loss: 0.4244 - val_accuracy: 0.8096 - val_loss: 0.4038
Epoch 3/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8182 -
loss: 0.3855 - val_accuracy: 0.8209 - val_loss: 0.3833
Epoch 4/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8275 -
loss: 0.3658 - val_accuracy: 0.8270 - val_loss: 0.3730
Epoch 5/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8365 -
loss: 0.3543 - val_accuracy: 0.8329 - val_loss: 0.3637
Epoch 6/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8393 -
loss: 0.3471 - val_accuracy: 0.8350 - val_loss: 0.3593
Epoch 7/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8380 -
loss: 0.3472 - val_accuracy: 0.8370 - val_loss: 0.3598
Epoch 8/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8403 -
loss: 0.3389 - val_accuracy: 0.8360 - val_loss: 0.3522
Epoch 9/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8411 -
loss: 0.3386 - val_accuracy: 0.8355 - val_loss: 0.3499
Epoch 10/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8414 -
loss: 0.3383 - val_accuracy: 0.8350 - val_loss: 0.3501

Epoch 11/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3314 - val_accuracy: 0.8357 - val_loss: 0.3487

Epoch 12/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3261 - val_accuracy: 0.8329 - val_loss: 0.3458

Epoch 13/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8476 -
loss: 0.3299 - val_accuracy: 0.8332 - val_loss: 0.3452

Epoch 14/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8478 -
loss: 0.3273 - val_accuracy: 0.8332 - val_loss: 0.3430

Epoch 15/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3252 - val_accuracy: 0.8378 - val_loss: 0.3415

Epoch 16/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8462 -
loss: 0.3289 - val_accuracy: 0.8367 - val_loss: 0.3418

Epoch 17/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3314 - val_accuracy: 0.8393 - val_loss: 0.3420

Epoch 18/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3278 - val_accuracy: 0.8390 - val_loss: 0.3388

Epoch 19/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3276 - val_accuracy: 0.8390 - val_loss: 0.3411

Epoch 20/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8490 -
loss: 0.3222 - val_accuracy: 0.8416 - val_loss: 0.3369

Epoch 21/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3231 - val_accuracy: 0.8437 - val_loss: 0.3362

Epoch 22/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8517 -
loss: 0.3239 - val_accuracy: 0.8398 - val_loss: 0.3383

Epoch 23/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3229 - val_accuracy: 0.8449 - val_loss: 0.3351

Epoch 24/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3202 - val_accuracy: 0.8442 - val_loss: 0.3374

Epoch 25/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8553 -

loss: 0.3137 - val_accuracy: 0.8380 - val_loss: 0.3360
Epoch 26/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8507 -
loss: 0.3203 - val_accuracy: 0.8437 - val_loss: 0.3319
Epoch 27/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8529 -
loss: 0.3163 - val_accuracy: 0.8421 - val_loss: 0.3331
Epoch 28/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8543 -
loss: 0.3160 - val_accuracy: 0.8454 - val_loss: 0.3350
Epoch 29/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3190 - val_accuracy: 0.8475 - val_loss: 0.3304
Epoch 30/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8549 -
loss: 0.3125 - val_accuracy: 0.8483 - val_loss: 0.3301
Epoch 31/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8527 -
loss: 0.3190 - val_accuracy: 0.8488 - val_loss: 0.3335
Epoch 32/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8547 -
loss: 0.3110 - val_accuracy: 0.8406 - val_loss: 0.3380
Epoch 33/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8539 -
loss: 0.3150 - val_accuracy: 0.8462 - val_loss: 0.3367
Epoch 34/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8518 -
loss: 0.3157 - val_accuracy: 0.8518 - val_loss: 0.3281
Epoch 35/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8576 -
loss: 0.3103 - val_accuracy: 0.8513 - val_loss: 0.3289
Epoch 36/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8560 -
loss: 0.3141 - val_accuracy: 0.8472 - val_loss: 0.3308
Epoch 37/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8566 -
loss: 0.3115 - val_accuracy: 0.8460 - val_loss: 0.3257
Epoch 38/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8568 -
loss: 0.3098 - val_accuracy: 0.8498 - val_loss: 0.3261
Epoch 39/90
1099/1099 ————— 1s 1ms/step - accuracy: 0.8562 -
loss: 0.3112 - val_accuracy: 0.8344 - val_loss: 0.3502
Epoch 40/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8549 -
loss: 0.3130 - val_accuracy: 0.8421 - val_loss: 0.3271
Epoch 41/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8567 -
loss: 0.3128 - val_accuracy: 0.8470 - val_loss: 0.3317
Epoch 42/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8575 -
loss: 0.3117 - val_accuracy: 0.8513 - val_loss: 0.3239
Epoch 43/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8526 -
loss: 0.3126 - val_accuracy: 0.8460 - val_loss: 0.3341
Epoch 44/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8561 -
loss: 0.3102 - val_accuracy: 0.8462 - val_loss: 0.3296
Epoch 45/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8525 -
loss: 0.3168 - val_accuracy: 0.8488 - val_loss: 0.3274
Epoch 46/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8561 -
loss: 0.3108 - val_accuracy: 0.8462 - val_loss: 0.3272
Epoch 47/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8560 -
loss: 0.3094 - val_accuracy: 0.8465 - val_loss: 0.3317
training_neural_network: SGD, l2=0.001, dropout=0.4
Epoch 1/90

1099/1099 ━━━━━━━━━━ 3s 1ms/step - accuracy: 0.7473 -
loss: 0.5282 - val_accuracy: 0.7815 - val_loss: 0.4251
Epoch 2/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8087 -
loss: 0.4022 - val_accuracy: 0.8168 - val_loss: 0.3915
Epoch 3/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8275 -
loss: 0.3708 - val_accuracy: 0.8280 - val_loss: 0.3721
Epoch 4/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8332 -
loss: 0.3573 - val_accuracy: 0.8324 - val_loss: 0.3625
Epoch 5/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8354 -
loss: 0.3515 - val_accuracy: 0.8339 - val_loss: 0.3575
Epoch 6/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8390 -
loss: 0.3421 - val_accuracy: 0.8347 - val_loss: 0.3542
Epoch 7/90

1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8430 -

loss: 0.3403 - val_accuracy: 0.8365 - val_loss: 0.3522
Epoch 8/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8372 -
loss: 0.3412 - val_accuracy: 0.8342 - val_loss: 0.3502
Epoch 9/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8394 -
loss: 0.3426 - val_accuracy: 0.8347 - val_loss: 0.3514
Epoch 10/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8438 -
loss: 0.3394 - val_accuracy: 0.8324 - val_loss: 0.3482
Epoch 11/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8464 -
loss: 0.3296 - val_accuracy: 0.8321 - val_loss: 0.3468
Epoch 12/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8431 -
loss: 0.3336 - val_accuracy: 0.8373 - val_loss: 0.3469
Epoch 13/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8449 -
loss: 0.3340 - val_accuracy: 0.8360 - val_loss: 0.3454
Epoch 14/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8444 -
loss: 0.3296 - val_accuracy: 0.8350 - val_loss: 0.3443
Epoch 15/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8472 -
loss: 0.3302 - val_accuracy: 0.8367 - val_loss: 0.3472
Epoch 16/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8456 -
loss: 0.3287 - val_accuracy: 0.8388 - val_loss: 0.3469
Epoch 17/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8427 -
loss: 0.3328 - val_accuracy: 0.8403 - val_loss: 0.3443
Epoch 18/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8448 -
loss: 0.3291 - val_accuracy: 0.8383 - val_loss: 0.3415
Epoch 19/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8484 -
loss: 0.3261 - val_accuracy: 0.8319 - val_loss: 0.3516
Epoch 20/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3263 - val_accuracy: 0.8378 - val_loss: 0.3405
Epoch 21/90
1099/1099 ━━━━━━━━━━ 1s 1ms/step - accuracy: 0.8486 -
loss: 0.3269 - val_accuracy: 0.8406 - val_loss: 0.3395
Epoch 22/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8500 -
loss: 0.3231 - val_accuracy: 0.8403 - val_loss: 0.3379
Epoch 23/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8489 -
loss: 0.3224 - val_accuracy: 0.8414 - val_loss: 0.3373
Epoch 24/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8453 -
loss: 0.3284 - val_accuracy: 0.8393 - val_loss: 0.3429
Epoch 25/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8473 -
loss: 0.3258 - val_accuracy: 0.8454 - val_loss: 0.3365
Epoch 26/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8460 -
loss: 0.3294 - val_accuracy: 0.8429 - val_loss: 0.3375
Epoch 27/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8524 -
loss: 0.3175 - val_accuracy: 0.8426 - val_loss: 0.3345
Epoch 28/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8506 -
loss: 0.3196 - val_accuracy: 0.8444 - val_loss: 0.3356
Epoch 29/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8502 -
loss: 0.3217 - val_accuracy: 0.8401 - val_loss: 0.3347
Epoch 30/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8480 -
loss: 0.3222 - val_accuracy: 0.8470 - val_loss: 0.3338
Epoch 31/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8491 -
loss: 0.3213 - val_accuracy: 0.8431 - val_loss: 0.3342
Epoch 32/90

1099/1099 ————— 1s 1ms/step - accuracy: 0.8519 -
loss: 0.3205 - val_accuracy: 0.8414 - val_loss: 0.3366
training_neural_network: SGD, l2=0.001, dropout=0.7000000000000001

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 982us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 997us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 993us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 981us/step

1222/1222 ————— 1s 1ms/step

815/815 ————— 1s 993us/step

1222/1222 ————— 1s 1ms/step

815/815	1s 983us/step
1222/1222	1s 1ms/step
815/815	1s 970us/step
1222/1222	1s 1ms/step
815/815	1s 988us/step
1222/1222	1s 1ms/step
815/815	1s 984us/step

Process finished with exit code 0