Node Classification using Graph Convolutional Networks

This node classification task uses CORA dataset from https://linqs.soe.ucsc.edu/data
The dataset consists of **2708** nodes which correspond to scientific publications.
The nodes are classified into **7** categories indicating the topics of each document.
The edges indicate whether a document is cited by the other or vice versa.
Each node has **1433** features which is described by a 0/1-valued vector, indicating the bag-of-words from the dictionary.

This is an undirected graph problem

In [ ]:
```
#importing dependencies

import numpy as np
import os
import networkx as nx
from keras.utils import to_categorical
from sklearn.preprocessing import LabelEncoder
from sklearn.utils import shuffle
from sklearn.metrics import classification_report

from spektral.layers import GraphConv

from tensorflow.keras.models import Model
from tensorflow.keras.layers import Input, Dropout, Dense
from tensorflow.keras import Sequential
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import TensorBoard, EarlyStopping
import tensorflow as tf
from tensorflow.keras.regularizers import l2

from collections import Counter
from sklearn.manifold import TSNE
import matplotlib.pyplot as plt
```

Data Loading and Preprocessing

We are going to use the edges connecting the (from file **cora.cites**).
The nodes are loaded from file **cora.content**.

In [ ]:
```
#Loading the data

all_data = []
all_edges = []

for root,dirs,files in os.walk('./cora'):
    for file in files:
        if '.content' in file:
            with open(os.path.join(root,file),'r') as f:
                all_data.extend(f.read().splitlines())
        elif 'cites' in file:
            with open(os.path.join(root,file),'r') as f:
                all_edges.extend(f.read().splitlines())


#Shuffle the data because the raw data is ordered based on the label
random_state = 77
all_data = shuffle(all_data,random_state=random_state)
```

In **cora.content** file:
The **first** element indicates the **node name**

The **second** until the last second elements indicate the **node features**
The **last** element indicates the **label of that particular node**

In **cora.cites** file:
Each line indicates the tuple of connected nodes

Parsing the data

In [ ]:
```
#parse the data
labels = []
nodes = []
X = []

for i,data in enumerate(all_data):
    elements = data.split('\t')
    labels.append(elements[-1])
    X.append(elements[1:-1])
    nodes.append(elements[0])

X = np.array(X,dtype=int)
N = X.shape[0] #the number of nodes
F = X.shape[1] #the size of node features
print('X shape: ', X.shape)


#parse the edge
edge_list=[]
for edge in all_edges:
    e = edge.split('\t')
    edge_list.append((e[0],e[1]))

print('\nNumber of nodes (N): ', N)
print('\nNumber of features (F) of each node: ', F)
print('\nCategories: ', set(labels))

num_classes = len(set(labels))
print('\nNumber of classes: ', num_classes)
```

```
X shape:  (2708, 1433)

Number of nodes (N):  2708

Number of features (F) of each node:  1433

Categories:  {'Theory', 'Probabilistic_Methods', 'Reinforcement_Learning', 'Neural_Networks', 'Case_Based',
'Rule_Learning', 'Genetic_Algorithms'}

Number of classes:  7
```

Select examples for training, validation, and test then set the mask

In [ ]:
```
def limit_data(labels,limit=20,val_num=500,test_num=1000):
    '''
    Get the index of train, validation, and test data
    '''
    label_counter = dict((l, 0) for l in labels)
    train_idx = []

    for i in range(len(labels)):
        label = labels[i]
        if label_counter[label]<limit:
            #add the example to the training data
            train_idx.append(i)
            label_counter[label]+=1

        #exit the loop once we found 20 examples for each class
        if all(count == limit for count in label_counter.values()):
            break
```

```
    #get the indices that do not go to traning data
    rest_idx = [x for x in range(len(labels)) if x not in train_idx]
    #get the first val_num
    val_idx = rest_idx[:val_num]
    test_idx = rest_idx[val_num:(val_num+test_num)]
    return train_idx, val_idx,test_idx


train_idx,val_idx,test_idx = limit_data(labels)
```

In [ ]:
```
#set the mask
train_mask = np.zeros((N,),dtype=bool)
train_mask[train_idx] = True

val_mask = np.zeros((N,),dtype=bool)
val_mask[val_idx] = True

test_mask = np.zeros((N,),dtype=bool)
test_mask[test_idx] = True
```

Show Data Distribution

In [ ]:
```
print("All Data Distribution: \n{}".format(Counter(labels)))
```

```
All Data Distribution:
Counter({'Neural_Networks': 818, 'Probabilistic_Methods': 426, 'Genetic_Algorithms': 418, 'Theory': 351, 'Cas
e_Based': 298, 'Reinforcement_Learning': 217, 'Rule_Learning': 180})
```

In [ ]:
```
print("Training Data Distribution: \n{}".format(Counter([labels[i] for i in train_idx])))
```

```
Training Data Distribution:
Counter({'Reinforcement_Learning': 20, 'Probabilistic_Methods': 20, 'Neural_Networks': 20, 'Case_Based': 20,
'Theory': 20, 'Genetic_Algorithms': 20, 'Rule_Learning': 20})
```

In [ ]:
```
print("Validation Data Distribution: \n{}".format(Counter([labels[i] for i in val_idx])))
```

```
Validation Data Distribution:
Counter({'Neural_Networks': 172, 'Genetic_Algorithms': 78, 'Probabilistic_Methods': 72, 'Theory': 63, 'Case_B
ased': 58, 'Reinforcement_Learning': 35, 'Rule_Learning': 22})
```

Convert the labels to one hot encoding

In [ ]:
```
def encode_label(labels):
    label_encoder = LabelEncoder()
    labels = label_encoder.fit_transform(labels)
    labels = to_categorical(labels)
    return labels, label_encoder.classes_

labels_encoded, classes = encode_label(labels)
```

Build a graph on NetworkX using the obtained nodes and edges list

In [ ]:
```
#build the graph
G = nx.Graph()
G.add_nodes_from(nodes)
G.add_edges_from(edge_list)

#obtain the adjacency matrix (A)
A = nx.adjacency_matrix(G)
print('Graph info: ', nx.info(G))
```

```
Graph info:  Name:
Type: Graph
Number of nodes: 2708
Number of edges: 5278
Average degree:   3.8981
```

Building and Training Graph Convolutional Networks

In [ ]:
```
# Parameters
channels = 16           # Number of channels in the first layer
dropout = 0.5           # Dropout rate for the features
l2_reg = 5e-4           # L2 regularization rate
learning_rate = 1e-2    # Learning rate
epochs = 1000            # Number of training epochs
es_patience = 500        # Patience for early stopping

# Preprocessing operations
A = GraphConv.preprocess(A).astype('f4')

# Model definition
X_in = Input(shape=(F, ))
fltr_in = Input((N, ), sparse=True)

dropout_1 = Dropout(dropout)(X_in)
graph_conv_1 = GraphConv(channels,
                         activation='relu',
                         kernel_regularizer=l2(l2_reg),
                         use_bias=False)([dropout_1, fltr_in])

dropout_2 = Dropout(dropout)(graph_conv_1)
graph_conv_2 = GraphConv(num_classes,
                         activation='softmax',
                         use_bias=False)([dropout_2, fltr_in])

# Build model
model = Model(inputs=[X_in, fltr_in], outputs=graph_conv_2)
optimizer = Adam(lr=learning_rate)
model.compile(optimizer=optimizer,
              loss='categorical_crossentropy',
              weighted_metrics=['acc'])
model.summary()

tbCallBack_GCN = tf.keras.callbacks.TensorBoard(
    log_dir='./Tensorboard_GCN_cora',
)
callback_GCN = [tbCallBack_GCN]
```

```
Model: "model"
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_1 (InputLayer)            [(None, 1433)]       0
__________________________________________________________________________________________________
dropout (Dropout)               (None, 1433)         0           input_1[0][0]
__________________________________________________________________________________________________
input_2 (InputLayer)            [(None, 2708)]       0
__________________________________________________________________________________________________
graph_conv (GraphConv)          (None, 16)           22928       dropout[0][0]
                                                                 input_2[0][0]
__________________________________________________________________________________________________
dropout_1 (Dropout)             (None, 16)           0           graph_conv[0][0]
__________________________________________________________________________________________________
graph_conv_1 (GraphConv)        (None, 7)            112         dropout_1[0][0]
                                                                 input_2[0][0]
==================================================================================================
Total params: 23,040
Trainable params: 23,040
Non-trainable params: 0
__________________________________________________________________________________________________
```

In [ ]:
```
# Train model
validation_data = ([X, A], labels_encoded, val_mask)
model.fit([X, A],
          labels_encoded,
          sample_weight=train_mask,
          epochs=epochs,
```

```
        batch_size=N,
        validation_data=validation_data,
        shuffle=False,
        callbacks=[
            EarlyStopping(patience=es_patience,  restore_best_weights=True),
            tbCallBack_GCN
        ])
```

```
Epoch 1/1000
1/1 [==============================] - 0s 389ms/step - loss: 0.1169 - acc: 0.1643 - val_loss: 0.3691 - val_ac
c: 0.1620
Epoch 2/1000
1/1 [==============================] - ETA: 0s - loss: 0.1093 - acc: 0.3286WARNING:tensorflow:Method (on_trai
n_batch_end) is slow compared to the batch update (0.185408). Check your callbacks.
1/1 [==============================] - 0s 186ms/step - loss: 0.1093 - acc: 0.3286 - val_loss: 0.3598 - val_ac
c: 0.2860
Epoch 3/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.1031 - acc: 0.4071 - val_loss: 0.3503 - val_ac
c: 0.3980
Epoch 4/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0977 - acc: 0.5500 - val_loss: 0.3417 - val_ac
c: 0.4240
Epoch 5/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0922 - acc: 0.6571 - val_loss: 0.3344 - val_ac
c: 0.4620
Epoch 6/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0883 - acc: 0.6643 - val_loss: 0.3284 - val_ac
c: 0.4700
Epoch 7/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0847 - acc: 0.7214 - val_loss: 0.3224 - val_ac
c: 0.4920
Epoch 8/1000
1/1 [==============================] - 0s 252ms/step - loss: 0.0818 - acc: 0.7000 - val_loss: 0.3153 - val_ac
c: 0.5120
Epoch 9/1000
1/1 [==============================] - 0s 269ms/step - loss: 0.0799 - acc: 0.7357 - val_loss: 0.3074 - val_ac
c: 0.5480
Epoch 10/1000
1/1 [==============================] - 0s 242ms/step - loss: 0.0759 - acc: 0.8214 - val_loss: 0.2993 - val_ac
c: 0.5800
Epoch 11/1000
1/1 [==============================] - 0s 258ms/step - loss: 0.0757 - acc: 0.8286 - val_loss: 0.2917 - val_ac
c: 0.6180
Epoch 12/1000
1/1 [==============================] - 0s 254ms/step - loss: 0.0705 - acc: 0.9000 - val_loss: 0.2846 - val_ac
c: 0.6400
Epoch 13/1000
1/1 [==============================] - 0s 246ms/step - loss: 0.0728 - acc: 0.8643 - val_loss: 0.2780 - val_ac
c: 0.6640
Epoch 14/1000
1/1 [==============================] - 0s 254ms/step - loss: 0.0695 - acc: 0.9071 - val_loss: 0.2714 - val_ac
c: 0.6760
Epoch 15/1000
1/1 [==============================] - 0s 281ms/step - loss: 0.0684 - acc: 0.8857 - val_loss: 0.2651 - val_ac
c: 0.6880
Epoch 16/1000
1/1 [==============================] - 0s 291ms/step - loss: 0.0662 - acc: 0.8786 - val_loss: 0.2592 - val_ac
c: 0.7020
Epoch 17/1000
1/1 [==============================] - 0s 291ms/step - loss: 0.0650 - acc: 0.9000 - val_loss: 0.2532 - val_ac
c: 0.7100
Epoch 18/1000
1/1 [==============================] - 0s 240ms/step - loss: 0.0621 - acc: 0.8929 - val_loss: 0.2473 - val_ac
c: 0.7320
Epoch 19/1000
1/1 [==============================] - 0s 237ms/step - loss: 0.0622 - acc: 0.8929 - val_loss: 0.2415 - val_ac
c: 0.7420
Epoch 20/1000
1/1 [==============================] - 0s 248ms/step - loss: 0.0609 - acc: 0.8929 - val_loss: 0.2364 - val_ac
c: 0.7500
Epoch 21/1000
1/1 [==============================] - 0s 233ms/step - loss: 0.0583 - acc: 0.9429 - val_loss: 0.2313 - val_ac
c: 0.7500
Epoch 22/1000
1/1 [==============================] - 0s 243ms/step - loss: 0.0593 - acc: 0.9000 - val_loss: 0.2262 - val_ac
c: 0.7620
Epoch 23/1000
1/1 [==============================] - 0s 283ms/step - loss: 0.0543 - acc: 0.9357 - val_loss: 0.2212 - val_ac
c: 0.7680
```

```
Epoch 24/1000
1/1 [==============================] - 0s 293ms/step - loss: 0.0604 - acc: 0.9000 - val_loss: 0.2171 - val_ac
c: 0.7740
Epoch 25/1000
1/1 [==============================] - 0s 248ms/step - loss: 0.0531 - acc: 0.9571 - val_loss: 0.2139 - val_ac
c: 0.7740
Epoch 26/1000
1/1 [==============================] - 0s 235ms/step - loss: 0.0535 - acc: 0.9357 - val_loss: 0.2111 - val_ac
c: 0.7740
Epoch 27/1000
1/1 [==============================] - 0s 229ms/step - loss: 0.0557 - acc: 0.9000 - val_loss: 0.2089 - val_ac
c: 0.7740
Epoch 28/1000
1/1 [==============================] - 0s 232ms/step - loss: 0.0515 - acc: 0.9357 - val_loss: 0.2069 - val_ac
c: 0.7700
Epoch 29/1000
1/1 [==============================] - 0s 230ms/step - loss: 0.0503 - acc: 0.9071 - val_loss: 0.2052 - val_ac
c: 0.7720
Epoch 30/1000
1/1 [==============================] - 0s 246ms/step - loss: 0.0514 - acc: 0.9357 - val_loss: 0.2034 - val_ac
c: 0.7720
Epoch 31/1000
1/1 [==============================] - 0s 232ms/step - loss: 0.0503 - acc: 0.9286 - val_loss: 0.2008 - val_ac
c: 0.7720
Epoch 32/1000
1/1 [==============================] - 0s 238ms/step - loss: 0.0494 - acc: 0.9357 - val_loss: 0.1979 - val_ac
c: 0.7780
Epoch 33/1000
1/1 [==============================] - 0s 237ms/step - loss: 0.0493 - acc: 0.9143 - val_loss: 0.1949 - val_ac
c: 0.7800
Epoch 34/1000
1/1 [==============================] - 0s 208ms/step - loss: 0.0461 - acc: 0.9571 - val_loss: 0.1923 - val_ac
c: 0.7780
Epoch 35/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0451 - acc: 0.9429 - val_loss: 0.1903 - val_ac
c: 0.7840
Epoch 36/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0452 - acc: 0.9500 - val_loss: 0.1876 - val_ac
c: 0.7880
Epoch 37/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0464 - acc: 0.9571 - val_loss: 0.1856 - val_ac
c: 0.7880
Epoch 38/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0469 - acc: 0.9357 - val_loss: 0.1837 - val_ac
c: 0.7940
Epoch 39/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0466 - acc: 0.9286 - val_loss: 0.1827 - val_ac
c: 0.7980
Epoch 40/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0485 - acc: 0.9000 - val_loss: 0.1824 - val_ac
c: 0.7880
Epoch 41/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0427 - acc: 0.9643 - val_loss: 0.1821 - val_ac
c: 0.7880
Epoch 42/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0432 - acc: 0.9571 - val_loss: 0.1817 - val_ac
c: 0.7820
Epoch 43/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0439 - acc: 0.9000 - val_loss: 0.1800 - val_ac
c: 0.7880
Epoch 44/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0426 - acc: 0.9571 - val_loss: 0.1782 - val_ac
c: 0.7880
Epoch 45/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0434 - acc: 0.9071 - val_loss: 0.1766 - val_ac
c: 0.7820
Epoch 46/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0440 - acc: 0.9286 - val_loss: 0.1766 - val_ac
c: 0.7860
Epoch 47/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0397 - acc: 0.9786 - val_loss: 0.1765 - val_ac
```

```
c: 0.7800
Epoch 48/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0436 - acc: 0.9071 - val_loss: 0.1763 - val_ac
c: 0.7780
Epoch 49/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0414 - acc: 0.9286 - val_loss: 0.1761 - val_ac
c: 0.7760
Epoch 50/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0406 - acc: 0.9286 - val_loss: 0.1753 - val_ac
c: 0.7780
Epoch 51/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0400 - acc: 0.9929 - val_loss: 0.1746 - val_ac
c: 0.7760
Epoch 52/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0396 - acc: 0.9357 - val_loss: 0.1730 - val_ac
c: 0.7860
Epoch 53/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0420 - acc: 0.9286 - val_loss: 0.1706 - val_ac
c: 0.7940
Epoch 54/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0402 - acc: 0.9500 - val_loss: 0.1684 - val_ac
c: 0.7860
Epoch 55/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0387 - acc: 0.9571 - val_loss: 0.1667 - val_ac
c: 0.7860
Epoch 56/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0383 - acc: 0.9429 - val_loss: 0.1656 - val_ac
c: 0.7860
Epoch 57/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0387 - acc: 0.9571 - val_loss: 0.1656 - val_ac
c: 0.7900
Epoch 58/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0417 - acc: 0.9286 - val_loss: 0.1662 - val_ac
c: 0.7920
Epoch 59/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0382 - acc: 0.9429 - val_loss: 0.1677 - val_ac
c: 0.7900
Epoch 60/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0379 - acc: 0.9429 - val_loss: 0.1690 - val_ac
c: 0.7860
Epoch 61/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0375 - acc: 0.9643 - val_loss: 0.1699 - val_ac
c: 0.7800
Epoch 62/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0376 - acc: 0.9571 - val_loss: 0.1708 - val_ac
c: 0.7780
Epoch 63/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0368 - acc: 0.9786 - val_loss: 0.1708 - val_ac
c: 0.7800
Epoch 64/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0394 - acc: 0.9500 - val_loss: 0.1697 - val_ac
c: 0.7780
Epoch 65/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0358 - acc: 0.9643 - val_loss: 0.1676 - val_ac
c: 0.7820
Epoch 66/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0360 - acc: 0.9500 - val_loss: 0.1662 - val_ac
c: 0.7840
Epoch 67/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0364 - acc: 0.9500 - val_loss: 0.1646 - val_ac
c: 0.7840
Epoch 68/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0379 - acc: 0.9500 - val_loss: 0.1629 - val_ac
c: 0.7860
Epoch 69/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0361 - acc: 0.9500 - val_loss: 0.1613 - val_ac
c: 0.7840
Epoch 70/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0328 - acc: 0.9643 - val_loss: 0.1593 - val_ac
c: 0.7860
Epoch 71/1000
```

```
1/1 [==============================] - 0s 181ms/step - loss: 0.0359 - acc: 0.9571 - val_loss: 0.1589 - val_ac
c: 0.7820
Epoch 72/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0360 - acc: 0.9429 - val_loss: 0.1592 - val_ac
c: 0.7800
Epoch 73/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0328 - acc: 0.9857 - val_loss: 0.1595 - val_ac
c: 0.7860
Epoch 74/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0359 - acc: 0.9357 - val_loss: 0.1600 - val_ac
c: 0.7860
Epoch 75/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0339 - acc: 0.9429 - val_loss: 0.1620 - val_ac
c: 0.7840
Epoch 76/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0352 - acc: 0.9714 - val_loss: 0.1638 - val_ac
c: 0.7840
Epoch 77/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0337 - acc: 0.9429 - val_loss: 0.1650 - val_ac
c: 0.7820
Epoch 78/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0329 - acc: 0.9786 - val_loss: 0.1643 - val_ac
c: 0.7820
Epoch 79/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0336 - acc: 0.9429 - val_loss: 0.1625 - val_ac
c: 0.7860
Epoch 80/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0325 - acc: 0.9500 - val_loss: 0.1595 - val_ac
c: 0.7800
Epoch 81/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0324 - acc: 0.9643 - val_loss: 0.1572 - val_ac
c: 0.7840
Epoch 82/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0328 - acc: 0.9643 - val_loss: 0.1559 - val_ac
c: 0.7880
Epoch 83/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0333 - acc: 0.9714 - val_loss: 0.1553 - val_ac
c: 0.7860
Epoch 84/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0356 - acc: 0.9357 - val_loss: 0.1548 - val_ac
c: 0.7860
Epoch 85/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0315 - acc: 0.9500 - val_loss: 0.1545 - val_ac
c: 0.7840
Epoch 86/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0310 - acc: 0.9643 - val_loss: 0.1539 - val_ac
c: 0.7800
Epoch 87/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0324 - acc: 0.9571 - val_loss: 0.1543 - val_ac
c: 0.7800
Epoch 88/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0296 - acc: 0.9857 - val_loss: 0.1558 - val_ac
c: 0.7740
Epoch 89/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0322 - acc: 0.9500 - val_loss: 0.1580 - val_ac
c: 0.7740
Epoch 90/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0337 - acc: 0.9571 - val_loss: 0.1603 - val_ac
c: 0.7660
Epoch 91/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0311 - acc: 0.9786 - val_loss: 0.1623 - val_ac
c: 0.7600
Epoch 92/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0316 - acc: 0.9571 - val_loss: 0.1631 - val_ac
c: 0.7600
Epoch 93/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0288 - acc: 0.9643 - val_loss: 0.1631 - val_ac
c: 0.7720
Epoch 94/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0317 - acc: 0.9857 - val_loss: 0.1617 - val_ac
c: 0.7780
```

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Epoch 95/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0353 - acc: 0.9214 - val_loss: 0.1584 - val_ac
c: 0.7780
Epoch 96/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0330 - acc: 0.9714 - val_loss: 0.1552 - val_ac
c: 0.7740
Epoch 97/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0293 - acc: 0.9714 - val_loss: 0.1532 - val_ac
c: 0.7720
Epoch 98/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0334 - acc: 0.9429 - val_loss: 0.1521 - val_ac
c: 0.7740
Epoch 99/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0290 - acc: 0.9571 - val_loss: 0.1523 - val_ac
c: 0.7760
Epoch 100/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0323 - acc: 0.9500 - val_loss: 0.1540 - val_ac
c: 0.7740
Epoch 101/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0312 - acc: 0.9786 - val_loss: 0.1556 - val_ac
c: 0.7660
Epoch 102/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0312 - acc: 0.9571 - val_loss: 0.1580 - val_ac
c: 0.7620
Epoch 103/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0313 - acc: 0.9786 - val_loss: 0.1586 - val_ac
c: 0.7680
Epoch 104/1000
1/1 [==============================] - 0s 227ms/step - loss: 0.0297 - acc: 0.9857 - val_loss: 0.1584 - val_ac
c: 0.7640
Epoch 105/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0307 - acc: 0.9643 - val_loss: 0.1582 - val_ac
c: 0.7640
Epoch 106/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0305 - acc: 0.9643 - val_loss: 0.1573 - val_ac
c: 0.7620
Epoch 107/1000
1/1 [==============================] - 0s 244ms/step - loss: 0.0306 - acc: 0.9786 - val_loss: 0.1553 - val_ac
c: 0.7760
Epoch 108/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0287 - acc: 0.9643 - val_loss: 0.1529 - val_ac
c: 0.7820
Epoch 109/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0312 - acc: 0.9571 - val_loss: 0.1507 - val_ac
c: 0.7860
Epoch 110/1000
1/1 [==============================] - 0s 248ms/step - loss: 0.0296 - acc: 0.9500 - val_loss: 0.1492 - val_ac
c: 0.7880
Epoch 111/1000
1/1 [==============================] - 0s 213ms/step - loss: 0.0290 - acc: 0.9571 - val_loss: 0.1493 - val_ac
c: 0.7880
Epoch 112/1000
1/1 [==============================] - 0s 217ms/step - loss: 0.0294 - acc: 0.9571 - val_loss: 0.1494 - val_ac
c: 0.7960
Epoch 113/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0278 - acc: 0.9786 - val_loss: 0.1504 - val_ac
c: 0.7920
Epoch 114/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0295 - acc: 0.9643 - val_loss: 0.1503 - val_ac
c: 0.7800
Epoch 115/1000
1/1 [==============================] - 0s 222ms/step - loss: 0.0288 - acc: 0.9643 - val_loss: 0.1498 - val_ac
c: 0.7780
Epoch 116/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0310 - acc: 0.9714 - val_loss: 0.1484 - val_ac
c: 0.7840
Epoch 117/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0273 - acc: 0.9929 - val_loss: 0.1480 - val_ac
c: 0.7800
Epoch 118/1000
1/1 [==============================] - 0s 234ms/step - loss: 0.0285 - acc: 0.9929 - val_loss: 0.1475 - val_ac
```

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c: 0.7880
Epoch 119/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0302 - acc: 0.9500 - val_loss: 0.1490 - val_ac
c: 0.7800
Epoch 120/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0293 - acc: 0.9714 - val_loss: 0.1507 - val_ac
c: 0.7740
Epoch 121/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0290 - acc: 0.9571 - val_loss: 0.1530 - val_ac
c: 0.7680
Epoch 122/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0311 - acc: 0.9429 - val_loss: 0.1548 - val_ac
c: 0.7700
Epoch 123/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0292 - acc: 0.9571 - val_loss: 0.1563 - val_ac
c: 0.7660
Epoch 124/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0296 - acc: 0.9643 - val_loss: 0.1559 - val_ac
c: 0.7700
Epoch 125/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0277 - acc: 0.9714 - val_loss: 0.1552 - val_ac
c: 0.7660
Epoch 126/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0280 - acc: 0.9714 - val_loss: 0.1543 - val_ac
c: 0.7760
Epoch 127/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0274 - acc: 0.9643 - val_loss: 0.1525 - val_ac
c: 0.7760
Epoch 128/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0292 - acc: 0.9571 - val_loss: 0.1501 - val_ac
c: 0.7760
Epoch 129/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0282 - acc: 0.9714 - val_loss: 0.1492 - val_ac
c: 0.7780
Epoch 130/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0288 - acc: 0.9714 - val_loss: 0.1483 - val_ac
c: 0.7740
Epoch 131/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0265 - acc: 0.9500 - val_loss: 0.1490 - val_ac
c: 0.7660
Epoch 132/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0253 - acc: 0.9786 - val_loss: 0.1509 - val_ac
c: 0.7580
Epoch 133/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0258 - acc: 0.9786 - val_loss: 0.1512 - val_ac
c: 0.7620
Epoch 134/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0279 - acc: 0.9643 - val_loss: 0.1506 - val_ac
c: 0.7660
Epoch 135/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0280 - acc: 0.9857 - val_loss: 0.1496 - val_ac
c: 0.7680
Epoch 136/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0275 - acc: 0.9714 - val_loss: 0.1490 - val_ac
c: 0.7720
Epoch 137/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0289 - acc: 0.9643 - val_loss: 0.1496 - val_ac
c: 0.7820
Epoch 138/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0276 - acc: 0.9643 - val_loss: 0.1489 - val_ac
c: 0.7800
Epoch 139/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0263 - acc: 0.9857 - val_loss: 0.1470 - val_ac
c: 0.7840
Epoch 140/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0255 - acc: 0.9786 - val_loss: 0.1454 - val_ac
c: 0.7840
Epoch 141/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0251 - acc: 0.9857 - val_loss: 0.1446 - val_ac
c: 0.7840
Epoch 142/1000
```

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1/1 [==============================] - 0s 186ms/step - loss: 0.0257 - acc: 0.9857 - val_loss: 0.1450 - val_ac
c: 0.7880
Epoch 143/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0281 - acc: 0.9500 - val_loss: 0.1465 - val_ac
c: 0.7800
Epoch 144/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0269 - acc: 0.9643 - val_loss: 0.1490 - val_ac
c: 0.7720
Epoch 145/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0267 - acc: 0.9857 - val_loss: 0.1504 - val_ac
c: 0.7700
Epoch 146/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0264 - acc: 0.9643 - val_loss: 0.1501 - val_ac
c: 0.7680
Epoch 147/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0282 - acc: 0.9714 - val_loss: 0.1484 - val_ac
c: 0.7760
Epoch 148/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0259 - acc: 0.9571 - val_loss: 0.1474 - val_ac
c: 0.7800
Epoch 149/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0271 - acc: 0.9571 - val_loss: 0.1465 - val_ac
c: 0.7860
Epoch 150/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0245 - acc: 0.9786 - val_loss: 0.1460 - val_ac
c: 0.7820
Epoch 151/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0274 - acc: 0.9571 - val_loss: 0.1450 - val_ac
c: 0.7860
Epoch 152/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0259 - acc: 0.9786 - val_loss: 0.1451 - val_ac
c: 0.7860
Epoch 153/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0267 - acc: 0.9500 - val_loss: 0.1456 - val_ac
c: 0.7820
Epoch 154/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0274 - acc: 0.9714 - val_loss: 0.1461 - val_ac
c: 0.7840
Epoch 155/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0270 - acc: 0.9786 - val_loss: 0.1470 - val_ac
c: 0.7840
Epoch 156/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0241 - acc: 0.9857 - val_loss: 0.1484 - val_ac
c: 0.7860
Epoch 157/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0258 - acc: 0.9500 - val_loss: 0.1503 - val_ac
c: 0.7840
Epoch 158/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0246 - acc: 0.9857 - val_loss: 0.1518 - val_ac
c: 0.7780
Epoch 159/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0255 - acc: 0.9857 - val_loss: 0.1513 - val_ac
c: 0.7780
Epoch 160/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0276 - acc: 0.9357 - val_loss: 0.1486 - val_ac
c: 0.7740
Epoch 161/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0247 - acc: 0.9857 - val_loss: 0.1461 - val_ac
c: 0.7800
Epoch 162/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0271 - acc: 0.9714 - val_loss: 0.1459 - val_ac
c: 0.7840
Epoch 163/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0262 - acc: 0.9786 - val_loss: 0.1468 - val_ac
c: 0.7860
Epoch 164/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0238 - acc: 0.9571 - val_loss: 0.1495 - val_ac
c: 0.7920
Epoch 165/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0257 - acc: 0.9857 - val_loss: 0.1510 - val_ac
c: 0.7920
```

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Epoch 166/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0239 - acc: 0.9857 - val_loss: 0.1515 - val_ac
c: 0.7860
Epoch 167/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0265 - acc: 0.9571 - val_loss: 0.1504 - val_ac
c: 0.7840
Epoch 168/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0254 - acc: 0.9714 - val_loss: 0.1479 - val_ac
c: 0.7880
Epoch 169/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0256 - acc: 0.9714 - val_loss: 0.1478 - val_ac
c: 0.7880
Epoch 170/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0253 - acc: 0.9786 - val_loss: 0.1484 - val_ac
c: 0.7840
Epoch 171/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0239 - acc: 0.9571 - val_loss: 0.1486 - val_ac
c: 0.7860
Epoch 172/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0262 - acc: 0.9714 - val_loss: 0.1496 - val_ac
c: 0.7880
Epoch 173/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0240 - acc: 0.9643 - val_loss: 0.1496 - val_ac
c: 0.7840
Epoch 174/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0234 - acc: 0.9643 - val_loss: 0.1493 - val_ac
c: 0.7840
Epoch 175/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0244 - acc: 0.9714 - val_loss: 0.1491 - val_ac
c: 0.7840
Epoch 176/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0255 - acc: 0.9786 - val_loss: 0.1471 - val_ac
c: 0.7880
Epoch 177/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0259 - acc: 0.9643 - val_loss: 0.1443 - val_ac
c: 0.7880
Epoch 178/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0263 - acc: 0.9429 - val_loss: 0.1424 - val_ac
c: 0.7920
Epoch 179/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0237 - acc: 0.9714 - val_loss: 0.1413 - val_ac
c: 0.7880
Epoch 180/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0257 - acc: 0.9714 - val_loss: 0.1417 - val_ac
c: 0.7880
Epoch 181/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0277 - acc: 0.9571 - val_loss: 0.1440 - val_ac
c: 0.7820
Epoch 182/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0224 - acc: 0.9929 - val_loss: 0.1462 - val_ac
c: 0.7780
Epoch 183/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0247 - acc: 0.9857 - val_loss: 0.1482 - val_ac
c: 0.7740
Epoch 184/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0269 - acc: 0.9857 - val_loss: 0.1494 - val_ac
c: 0.7760
Epoch 185/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0237 - acc: 0.9786 - val_loss: 0.1481 - val_ac
c: 0.7760
Epoch 186/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0219 - acc: 0.9929 - val_loss: 0.1451 - val_ac
c: 0.7780
Epoch 187/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0245 - acc: 0.9714 - val_loss: 0.1419 - val_ac
c: 0.7880
Epoch 188/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0228 - acc: 0.9643 - val_loss: 0.1383 - val_ac
c: 0.7880
Epoch 189/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0242 - acc: 0.9786 - val_loss: 0.1369 - val_ac
```

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c: 0.7880
Epoch 190/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0223 - acc: 0.9929 - val_loss: 0.1362 - val_ac
c: 0.7860
Epoch 191/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0243 - acc: 0.9500 - val_loss: 0.1368 - val_ac
c: 0.7860
Epoch 192/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0237 - acc: 0.9643 - val_loss: 0.1379 - val_ac
c: 0.7820
Epoch 193/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0246 - acc: 0.9571 - val_loss: 0.1389 - val_ac
c: 0.7840
Epoch 194/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0226 - acc: 0.9786 - val_loss: 0.1398 - val_ac
c: 0.7800
Epoch 195/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0238 - acc: 0.9857 - val_loss: 0.1420 - val_ac
c: 0.7740
Epoch 196/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0247 - acc: 0.9714 - val_loss: 0.1440 - val_ac
c: 0.7660
Epoch 197/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0228 - acc: 0.9857 - val_loss: 0.1444 - val_ac
c: 0.7660
Epoch 198/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0252 - acc: 0.9500 - val_loss: 0.1445 - val_ac
c: 0.7700
Epoch 199/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0255 - acc: 0.9357 - val_loss: 0.1466 - val_ac
c: 0.7740
Epoch 200/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0229 - acc: 0.9714 - val_loss: 0.1491 - val_ac
c: 0.7660
Epoch 201/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0228 - acc: 0.9857 - val_loss: 0.1506 - val_ac
c: 0.7720
Epoch 202/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0237 - acc: 0.9714 - val_loss: 0.1498 - val_ac
c: 0.7700
Epoch 203/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0248 - acc: 0.9571 - val_loss: 0.1472 - val_ac
c: 0.7700
Epoch 204/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0241 - acc: 0.9714 - val_loss: 0.1444 - val_ac
c: 0.7760
Epoch 205/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0223 - acc: 0.9571 - val_loss: 0.1410 - val_ac
c: 0.7780
Epoch 206/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0232 - acc: 0.9786 - val_loss: 0.1400 - val_ac
c: 0.7880
Epoch 207/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0216 - acc: 0.9786 - val_loss: 0.1394 - val_ac
c: 0.7940
Epoch 208/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0229 - acc: 0.9786 - val_loss: 0.1396 - val_ac
c: 0.7960
Epoch 209/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0228 - acc: 0.9857 - val_loss: 0.1404 - val_ac
c: 0.7920
Epoch 210/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0221 - acc: 0.9929 - val_loss: 0.1422 - val_ac
c: 0.7820
Epoch 211/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0216 - acc: 0.9786 - val_loss: 0.1432 - val_ac
c: 0.7780
Epoch 212/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0220 - acc: 0.9786 - val_loss: 0.1435 - val_ac
c: 0.7680
Epoch 213/1000
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1/1 [==============================] - 0s 179ms/step - loss: 0.0245 - acc: 0.9500 - val_loss: 0.1439 - val_ac
c: 0.7580
Epoch 214/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0244 - acc: 0.9429 - val_loss: 0.1423 - val_ac
c: 0.7580
Epoch 215/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0232 - acc: 0.9571 - val_loss: 0.1400 - val_ac
c: 0.7640
Epoch 216/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0217 - acc: 0.9786 - val_loss: 0.1386 - val_ac
c: 0.7700
Epoch 217/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0246 - acc: 0.9286 - val_loss: 0.1402 - val_ac
c: 0.7660
Epoch 218/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0216 - acc: 0.9786 - val_loss: 0.1408 - val_ac
c: 0.7740
Epoch 219/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0217 - acc: 0.9857 - val_loss: 0.1427 - val_ac
c: 0.7760
Epoch 220/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0232 - acc: 0.9786 - val_loss: 0.1443 - val_ac
c: 0.7800
Epoch 221/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0231 - acc: 0.9571 - val_loss: 0.1452 - val_ac
c: 0.7800
Epoch 222/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0211 - acc: 1.0000 - val_loss: 0.1458 - val_ac
c: 0.7780
Epoch 223/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0242 - acc: 0.9714 - val_loss: 0.1447 - val_ac
c: 0.7740
Epoch 224/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0210 - acc: 0.9857 - val_loss: 0.1429 - val_ac
c: 0.7780
Epoch 225/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0226 - acc: 0.9643 - val_loss: 0.1409 - val_ac
c: 0.7740
Epoch 226/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0213 - acc: 0.9857 - val_loss: 0.1398 - val_ac
c: 0.7740
Epoch 227/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0230 - acc: 0.9786 - val_loss: 0.1393 - val_ac
c: 0.7740
Epoch 228/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0241 - acc: 0.9571 - val_loss: 0.1389 - val_ac
c: 0.7800
Epoch 229/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0193 - acc: 0.9857 - val_loss: 0.1414 - val_ac
c: 0.7720
Epoch 230/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0224 - acc: 0.9786 - val_loss: 0.1428 - val_ac
c: 0.7760
Epoch 231/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0207 - acc: 0.9786 - val_loss: 0.1437 - val_ac
c: 0.7780
Epoch 232/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0231 - acc: 0.9714 - val_loss: 0.1455 - val_ac
c: 0.7660
Epoch 233/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0225 - acc: 0.9714 - val_loss: 0.1474 - val_ac
c: 0.7660
Epoch 234/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0220 - acc: 0.9786 - val_loss: 0.1475 - val_ac
c: 0.7660
Epoch 235/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0199 - acc: 0.9857 - val_loss: 0.1457 - val_ac
c: 0.7720
Epoch 236/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0219 - acc: 0.9786 - val_loss: 0.1415 - val_ac
c: 0.7820
```

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Epoch 237/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0241 - acc: 0.9429 - val_loss: 0.1402 - val_ac
c: 0.7800
Epoch 238/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0220 - acc: 0.9643 - val_loss: 0.1405 - val_ac
c: 0.7840
Epoch 239/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0210 - acc: 0.9857 - val_loss: 0.1415 - val_ac
c: 0.7760
Epoch 240/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0204 - acc: 0.9929 - val_loss: 0.1434 - val_ac
c: 0.7760
Epoch 241/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0217 - acc: 0.9714 - val_loss: 0.1457 - val_ac
c: 0.7760
Epoch 242/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0205 - acc: 0.9786 - val_loss: 0.1455 - val_ac
c: 0.7680
Epoch 243/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0223 - acc: 0.9714 - val_loss: 0.1451 - val_ac
c: 0.7680
Epoch 244/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0222 - acc: 0.9857 - val_loss: 0.1442 - val_ac
c: 0.7680
Epoch 245/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0225 - acc: 0.9429 - val_loss: 0.1452 - val_ac
c: 0.7620
Epoch 246/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0227 - acc: 0.9571 - val_loss: 0.1456 - val_ac
c: 0.7620
Epoch 247/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0223 - acc: 0.9500 - val_loss: 0.1466 - val_ac
c: 0.7640
Epoch 248/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0220 - acc: 0.9786 - val_loss: 0.1489 - val_ac
c: 0.7740
Epoch 249/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0222 - acc: 0.9571 - val_loss: 0.1487 - val_ac
c: 0.7720
Epoch 250/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0198 - acc: 0.9929 - val_loss: 0.1483 - val_ac
c: 0.7660
Epoch 251/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0211 - acc: 0.9786 - val_loss: 0.1446 - val_ac
c: 0.7660
Epoch 252/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0198 - acc: 0.9857 - val_loss: 0.1412 - val_ac
c: 0.7700
Epoch 253/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0215 - acc: 0.9786 - val_loss: 0.1415 - val_ac
c: 0.7720
Epoch 254/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0214 - acc: 0.9643 - val_loss: 0.1431 - val_ac
c: 0.7720
Epoch 255/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0217 - acc: 0.9857 - val_loss: 0.1447 - val_ac
c: 0.7620
Epoch 256/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0203 - acc: 0.9857 - val_loss: 0.1461 - val_ac
c: 0.7560
Epoch 257/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0224 - acc: 0.9500 - val_loss: 0.1462 - val_ac
c: 0.7560
Epoch 258/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0224 - acc: 0.9429 - val_loss: 0.1461 - val_ac
c: 0.7580
Epoch 259/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0206 - acc: 0.9714 - val_loss: 0.1465 - val_ac
c: 0.7640
Epoch 260/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0219 - acc: 0.9714 - val_loss: 0.1432 - val_ac
```

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c: 0.7840
Epoch 261/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0205 - acc: 0.9857 - val_loss: 0.1384 - val_ac
c: 0.7920
Epoch 262/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0216 - acc: 0.9714 - val_loss: 0.1353 - val_ac
c: 0.7820
Epoch 263/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0193 - acc: 0.9929 - val_loss: 0.1336 - val_ac
c: 0.7780
Epoch 264/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0200 - acc: 0.9857 - val_loss: 0.1332 - val_ac
c: 0.7780
Epoch 265/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0203 - acc: 0.9857 - val_loss: 0.1345 - val_ac
c: 0.7760
Epoch 266/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0214 - acc: 0.9786 - val_loss: 0.1373 - val_ac
c: 0.7780
Epoch 267/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0225 - acc: 0.9357 - val_loss: 0.1406 - val_ac
c: 0.7780
Epoch 268/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0209 - acc: 0.9857 - val_loss: 0.1436 - val_ac
c: 0.7740
Epoch 269/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0200 - acc: 0.9929 - val_loss: 0.1453 - val_ac
c: 0.7680
Epoch 270/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0187 - acc: 0.9929 - val_loss: 0.1436 - val_ac
c: 0.7680
Epoch 271/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0202 - acc: 0.9643 - val_loss: 0.1396 - val_ac
c: 0.7640
Epoch 272/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0203 - acc: 0.9786 - val_loss: 0.1361 - val_ac
c: 0.7660
Epoch 273/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0216 - acc: 0.9714 - val_loss: 0.1344 - val_ac
c: 0.7800
Epoch 274/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0211 - acc: 0.9571 - val_loss: 0.1346 - val_ac
c: 0.7820
Epoch 275/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0196 - acc: 0.9857 - val_loss: 0.1363 - val_ac
c: 0.7820
Epoch 276/1000
1/1 [==============================] - 0s 208ms/step - loss: 0.0217 - acc: 0.9500 - val_loss: 0.1400 - val_ac
c: 0.7740
Epoch 277/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0231 - acc: 0.9429 - val_loss: 0.1441 - val_ac
c: 0.7640
Epoch 278/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0214 - acc: 0.9571 - val_loss: 0.1442 - val_ac
c: 0.7680
Epoch 279/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0192 - acc: 0.9929 - val_loss: 0.1421 - val_ac
c: 0.7720
Epoch 280/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0187 - acc: 0.9929 - val_loss: 0.1389 - val_ac
c: 0.7760
Epoch 281/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0207 - acc: 0.9857 - val_loss: 0.1357 - val_ac
c: 0.7820
Epoch 282/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0196 - acc: 0.9786 - val_loss: 0.1353 - val_ac
c: 0.7800
Epoch 283/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0208 - acc: 0.9857 - val_loss: 0.1353 - val_ac
c: 0.7800
Epoch 284/1000
```

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1/1 [==============================] - 0s 182ms/step - loss: 0.0204 - acc: 0.9714 - val_loss: 0.1352 - val_ac
c: 0.7800
Epoch 285/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0202 - acc: 0.9929 - val_loss: 0.1372 - val_ac
c: 0.7800
Epoch 286/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0201 - acc: 0.9857 - val_loss: 0.1397 - val_ac
c: 0.7800
Epoch 287/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0192 - acc: 0.9643 - val_loss: 0.1427 - val_ac
c: 0.7740
Epoch 288/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0202 - acc: 0.9714 - val_loss: 0.1453 - val_ac
c: 0.7720
Epoch 289/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0212 - acc: 0.9714 - val_loss: 0.1439 - val_ac
c: 0.7720
Epoch 290/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0209 - acc: 0.9786 - val_loss: 0.1409 - val_ac
c: 0.7820
Epoch 291/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0194 - acc: 0.9714 - val_loss: 0.1373 - val_ac
c: 0.7800
Epoch 292/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0219 - acc: 0.9571 - val_loss: 0.1367 - val_ac
c: 0.7780
Epoch 293/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0207 - acc: 0.9857 - val_loss: 0.1367 - val_ac
c: 0.7760
Epoch 294/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0189 - acc: 0.9857 - val_loss: 0.1373 - val_ac
c: 0.7740
Epoch 295/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0211 - acc: 0.9714 - val_loss: 0.1388 - val_ac
c: 0.7680
Epoch 296/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0205 - acc: 0.9786 - val_loss: 0.1397 - val_ac
c: 0.7720
Epoch 297/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0225 - acc: 0.9714 - val_loss: 0.1430 - val_ac
c: 0.7800
Epoch 298/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0186 - acc: 0.9786 - val_loss: 0.1480 - val_ac
c: 0.7780
Epoch 299/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0206 - acc: 0.9714 - val_loss: 0.1504 - val_ac
c: 0.7900
Epoch 300/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0183 - acc: 1.0000 - val_loss: 0.1518 - val_ac
c: 0.7940
Epoch 301/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0214 - acc: 0.9857 - val_loss: 0.1489 - val_ac
c: 0.7920
Epoch 302/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0220 - acc: 0.9643 - val_loss: 0.1431 - val_ac
c: 0.7820
Epoch 303/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0216 - acc: 0.9786 - val_loss: 0.1402 - val_ac
c: 0.7760
Epoch 304/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0215 - acc: 0.9571 - val_loss: 0.1406 - val_ac
c: 0.7780
Epoch 305/1000
1/1 [==============================] - 0s 165ms/step - loss: 0.0197 - acc: 0.9929 - val_loss: 0.1432 - val_ac
c: 0.7700
Epoch 306/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0211 - acc: 0.9786 - val_loss: 0.1455 - val_ac
c: 0.7600
Epoch 307/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0218 - acc: 0.9714 - val_loss: 0.1481 - val_ac
c: 0.7580
```

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Epoch 308/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0194 - acc: 0.9714 - val_loss: 0.1513 - val_ac
c: 0.7480
Epoch 309/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0204 - acc: 1.0000 - val_loss: 0.1534 - val_ac
c: 0.7500
Epoch 310/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0210 - acc: 0.9714 - val_loss: 0.1541 - val_ac
c: 0.7500
Epoch 311/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0213 - acc: 0.9571 - val_loss: 0.1519 - val_ac
c: 0.7680
Epoch 312/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0194 - acc: 0.9786 - val_loss: 0.1479 - val_ac
c: 0.7760
Epoch 313/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0202 - acc: 0.9643 - val_loss: 0.1428 - val_ac
c: 0.7840
Epoch 314/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0224 - acc: 0.9500 - val_loss: 0.1386 - val_ac
c: 0.7740
Epoch 315/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0217 - acc: 0.9571 - val_loss: 0.1375 - val_ac
c: 0.7780
Epoch 316/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0194 - acc: 0.9714 - val_loss: 0.1388 - val_ac
c: 0.7720
Epoch 317/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0195 - acc: 0.9786 - val_loss: 0.1432 - val_ac
c: 0.7680
Epoch 318/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0199 - acc: 0.9714 - val_loss: 0.1467 - val_ac
c: 0.7620
Epoch 319/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0208 - acc: 0.9786 - val_loss: 0.1493 - val_ac
c: 0.7520
Epoch 320/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0201 - acc: 0.9786 - val_loss: 0.1503 - val_ac
c: 0.7580
Epoch 321/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0207 - acc: 0.9786 - val_loss: 0.1494 - val_ac
c: 0.7620
Epoch 322/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0191 - acc: 0.9929 - val_loss: 0.1478 - val_ac
c: 0.7680
Epoch 323/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0186 - acc: 0.9857 - val_loss: 0.1458 - val_ac
c: 0.7640
Epoch 324/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0202 - acc: 0.9571 - val_loss: 0.1431 - val_ac
c: 0.7640
Epoch 325/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0199 - acc: 0.9786 - val_loss: 0.1394 - val_ac
c: 0.7680
Epoch 326/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0194 - acc: 0.9786 - val_loss: 0.1368 - val_ac
c: 0.7660
Epoch 327/1000
1/1 [==============================] - 0s 166ms/step - loss: 0.0216 - acc: 0.9500 - val_loss: 0.1372 - val_ac
c: 0.7620
Epoch 328/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0195 - acc: 0.9714 - val_loss: 0.1386 - val_ac
c: 0.7620
Epoch 329/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0180 - acc: 0.9857 - val_loss: 0.1399 - val_ac
c: 0.7640
Epoch 330/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0198 - acc: 0.9714 - val_loss: 0.1407 - val_ac
c: 0.7580
Epoch 331/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0182 - acc: 0.9857 - val_loss: 0.1421 - val_ac
```

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c: 0.7660
Epoch 332/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0197 - acc: 0.9643 - val_loss: 0.1450 - val_ac
c: 0.7560
Epoch 333/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0182 - acc: 0.9929 - val_loss: 0.1477 - val_ac
c: 0.7500
Epoch 334/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0216 - acc: 0.9571 - val_loss: 0.1458 - val_ac
c: 0.7480
Epoch 335/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0193 - acc: 0.9786 - val_loss: 0.1430 - val_ac
c: 0.7600
Epoch 336/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0184 - acc: 1.0000 - val_loss: 0.1379 - val_ac
c: 0.7700
Epoch 337/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0206 - acc: 0.9643 - val_loss: 0.1353 - val_ac
c: 0.7720
Epoch 338/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0185 - acc: 0.9857 - val_loss: 0.1333 - val_ac
c: 0.7780
Epoch 339/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0192 - acc: 0.9786 - val_loss: 0.1328 - val_ac
c: 0.7720
Epoch 340/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0184 - acc: 0.9857 - val_loss: 0.1347 - val_ac
c: 0.7680
Epoch 341/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0165 - acc: 0.9929 - val_loss: 0.1368 - val_ac
c: 0.7700
Epoch 342/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0204 - acc: 0.9714 - val_loss: 0.1379 - val_ac
c: 0.7720
Epoch 343/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0218 - acc: 0.9714 - val_loss: 0.1412 - val_ac
c: 0.7680
Epoch 344/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0185 - acc: 0.9786 - val_loss: 0.1464 - val_ac
c: 0.7580
Epoch 345/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0188 - acc: 0.9786 - val_loss: 0.1512 - val_ac
c: 0.7560
Epoch 346/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0183 - acc: 0.9786 - val_loss: 0.1518 - val_ac
c: 0.7540
Epoch 347/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0206 - acc: 0.9714 - val_loss: 0.1478 - val_ac
c: 0.7640
Epoch 348/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0200 - acc: 0.9714 - val_loss: 0.1416 - val_ac
c: 0.7740
Epoch 349/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0195 - acc: 0.9786 - val_loss: 0.1375 - val_ac
c: 0.7780
Epoch 350/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0185 - acc: 1.0000 - val_loss: 0.1361 - val_ac
c: 0.7740
Epoch 351/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0194 - acc: 0.9714 - val_loss: 0.1371 - val_ac
c: 0.7700
Epoch 352/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0190 - acc: 0.9786 - val_loss: 0.1393 - val_ac
c: 0.7680
Epoch 353/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0184 - acc: 0.9857 - val_loss: 0.1433 - val_ac
c: 0.7640
Epoch 354/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0218 - acc: 0.9643 - val_loss: 0.1462 - val_ac
c: 0.7640
Epoch 355/1000
```

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1/1 [==============================] - 0s 176ms/step - loss: 0.0200 - acc: 0.9857 - val_loss: 0.1477 - val_ac
c: 0.7620
Epoch 356/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0205 - acc: 0.9643 - val_loss: 0.1485 - val_ac
c: 0.7660
Epoch 357/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0210 - acc: 0.9786 - val_loss: 0.1526 - val_ac
c: 0.7700
Epoch 358/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0192 - acc: 0.9643 - val_loss: 0.1545 - val_ac
c: 0.7600
Epoch 359/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0194 - acc: 0.9714 - val_loss: 0.1531 - val_ac
c: 0.7640
Epoch 360/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0190 - acc: 0.9929 - val_loss: 0.1497 - val_ac
c: 0.7700
Epoch 361/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0196 - acc: 0.9786 - val_loss: 0.1461 - val_ac
c: 0.7640
Epoch 362/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0197 - acc: 0.9500 - val_loss: 0.1429 - val_ac
c: 0.7660
Epoch 363/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0212 - acc: 0.9714 - val_loss: 0.1393 - val_ac
c: 0.7740
Epoch 364/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0179 - acc: 0.9786 - val_loss: 0.1365 - val_ac
c: 0.7940
Epoch 365/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0192 - acc: 0.9786 - val_loss: 0.1354 - val_ac
c: 0.7900
Epoch 366/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0191 - acc: 0.9929 - val_loss: 0.1349 - val_ac
c: 0.7860
Epoch 367/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0200 - acc: 0.9714 - val_loss: 0.1353 - val_ac
c: 0.7800
Epoch 368/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0187 - acc: 0.9857 - val_loss: 0.1362 - val_ac
c: 0.7740
Epoch 369/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0206 - acc: 0.9786 - val_loss: 0.1414 - val_ac
c: 0.7680
Epoch 370/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0188 - acc: 0.9857 - val_loss: 0.1466 - val_ac
c: 0.7660
Epoch 371/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0198 - acc: 0.9500 - val_loss: 0.1496 - val_ac
c: 0.7600
Epoch 372/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0196 - acc: 0.9857 - val_loss: 0.1506 - val_ac
c: 0.7560
Epoch 373/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0182 - acc: 0.9857 - val_loss: 0.1465 - val_ac
c: 0.7640
Epoch 374/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0176 - acc: 0.9786 - val_loss: 0.1411 - val_ac
c: 0.7580
Epoch 375/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0196 - acc: 0.9643 - val_loss: 0.1384 - val_ac
c: 0.7740
Epoch 376/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0169 - acc: 1.0000 - val_loss: 0.1373 - val_ac
c: 0.7780
Epoch 377/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0197 - acc: 0.9643 - val_loss: 0.1373 - val_ac
c: 0.7740
Epoch 378/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0180 - acc: 0.9714 - val_loss: 0.1359 - val_ac
c: 0.7720
```

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Epoch 379/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0199 - acc: 0.9714 - val_loss: 0.1391 - val_ac
c: 0.7680
Epoch 380/1000
1/1 [==============================] - 0s 224ms/step - loss: 0.0183 - acc: 0.9929 - val_loss: 0.1439 - val_ac
c: 0.7640
Epoch 381/1000
1/1 [==============================] - 0s 213ms/step - loss: 0.0182 - acc: 0.9786 - val_loss: 0.1494 - val_ac
c: 0.7600
Epoch 382/1000
1/1 [==============================] - 0s 229ms/step - loss: 0.0184 - acc: 0.9857 - val_loss: 0.1520 - val_ac
c: 0.7560
Epoch 383/1000
1/1 [==============================] - 0s 214ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1496 - val_ac
c: 0.7580
Epoch 384/1000
1/1 [==============================] - 0s 217ms/step - loss: 0.0199 - acc: 0.9714 - val_loss: 0.1455 - val_ac
c: 0.7660
Epoch 385/1000
1/1 [==============================] - 0s 222ms/step - loss: 0.0209 - acc: 0.9714 - val_loss: 0.1404 - val_ac
c: 0.7780
Epoch 386/1000
1/1 [==============================] - 0s 207ms/step - loss: 0.0196 - acc: 0.9500 - val_loss: 0.1371 - val_ac
c: 0.7840
Epoch 387/1000
1/1 [==============================] - 0s 232ms/step - loss: 0.0186 - acc: 1.0000 - val_loss: 0.1360 - val_ac
c: 0.7880
Epoch 388/1000
1/1 [==============================] - 0s 222ms/step - loss: 0.0161 - acc: 0.9929 - val_loss: 0.1363 - val_ac
c: 0.7960
Epoch 389/1000
1/1 [==============================] - 0s 219ms/step - loss: 0.0189 - acc: 0.9714 - val_loss: 0.1380 - val_ac
c: 0.7860
Epoch 390/1000
1/1 [==============================] - 0s 237ms/step - loss: 0.0187 - acc: 0.9786 - val_loss: 0.1391 - val_ac
c: 0.7860
Epoch 391/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0189 - acc: 0.9714 - val_loss: 0.1392 - val_ac
c: 0.7860
Epoch 392/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0212 - acc: 0.9429 - val_loss: 0.1376 - val_ac
c: 0.7820
Epoch 393/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0176 - acc: 0.9929 - val_loss: 0.1371 - val_ac
c: 0.7780
Epoch 394/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0193 - acc: 0.9714 - val_loss: 0.1390 - val_ac
c: 0.7720
Epoch 395/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0176 - acc: 0.9929 - val_loss: 0.1402 - val_ac
c: 0.7780
Epoch 396/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0190 - acc: 0.9857 - val_loss: 0.1415 - val_ac
c: 0.7800
Epoch 397/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0182 - acc: 0.9857 - val_loss: 0.1435 - val_ac
c: 0.7720
Epoch 398/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0198 - acc: 0.9786 - val_loss: 0.1438 - val_ac
c: 0.7680
Epoch 399/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1421 - val_ac
c: 0.7700
Epoch 400/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0180 - acc: 0.9714 - val_loss: 0.1402 - val_ac
c: 0.7720
Epoch 401/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0180 - acc: 0.9857 - val_loss: 0.1386 - val_ac
c: 0.7740
Epoch 402/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0198 - acc: 0.9857 - val_loss: 0.1371 - val_ac
```

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c: 0.7720
Epoch 403/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0179 - acc: 0.9786 - val_loss: 0.1362 - val_ac
c: 0.7780
Epoch 404/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0182 - acc: 0.9786 - val_loss: 0.1370 - val_ac
c: 0.7760
Epoch 405/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0174 - acc: 0.9929 - val_loss: 0.1362 - val_ac
c: 0.7860
Epoch 406/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0180 - acc: 0.9786 - val_loss: 0.1373 - val_ac
c: 0.7860
Epoch 407/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0185 - acc: 0.9857 - val_loss: 0.1373 - val_ac
c: 0.7820
Epoch 408/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0162 - acc: 0.9929 - val_loss: 0.1356 - val_ac
c: 0.7800
Epoch 409/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0186 - acc: 0.9714 - val_loss: 0.1349 - val_ac
c: 0.7680
Epoch 410/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0169 - acc: 0.9929 - val_loss: 0.1381 - val_ac
c: 0.7600
Epoch 411/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0195 - acc: 0.9643 - val_loss: 0.1409 - val_ac
c: 0.7520
Epoch 412/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0177 - acc: 0.9714 - val_loss: 0.1390 - val_ac
c: 0.7580
Epoch 413/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0208 - acc: 0.9429 - val_loss: 0.1362 - val_ac
c: 0.7660
Epoch 414/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0178 - acc: 0.9857 - val_loss: 0.1349 - val_ac
c: 0.7700
Epoch 415/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0196 - acc: 0.9643 - val_loss: 0.1350 - val_ac
c: 0.7740
Epoch 416/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0196 - acc: 0.9857 - val_loss: 0.1367 - val_ac
c: 0.7840
Epoch 417/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0175 - acc: 0.9929 - val_loss: 0.1385 - val_ac
c: 0.7880
Epoch 418/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0188 - acc: 0.9857 - val_loss: 0.1391 - val_ac
c: 0.7900
Epoch 419/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0185 - acc: 0.9786 - val_loss: 0.1387 - val_ac
c: 0.7820
Epoch 420/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0172 - acc: 0.9857 - val_loss: 0.1379 - val_ac
c: 0.7800
Epoch 421/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0186 - acc: 0.9857 - val_loss: 0.1372 - val_ac
c: 0.7840
Epoch 422/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0184 - acc: 0.9714 - val_loss: 0.1367 - val_ac
c: 0.7860
Epoch 423/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0187 - acc: 0.9857 - val_loss: 0.1361 - val_ac
c: 0.7780
Epoch 424/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0205 - acc: 0.9714 - val_loss: 0.1364 - val_ac
c: 0.7720
Epoch 425/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0191 - acc: 0.9714 - val_loss: 0.1370 - val_ac
c: 0.7680
Epoch 426/1000
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1/1 [==============================] - 0s 187ms/step - loss: 0.0187 - acc: 0.9786 - val_loss: 0.1399 - val_ac
c: 0.7720
Epoch 427/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1411 - val_ac
c: 0.7780
Epoch 428/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0209 - acc: 0.9714 - val_loss: 0.1428 - val_ac
c: 0.7760
Epoch 429/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0201 - acc: 0.9714 - val_loss: 0.1445 - val_ac
c: 0.7740
Epoch 430/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0191 - acc: 0.9786 - val_loss: 0.1441 - val_ac
c: 0.7640
Epoch 431/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0175 - acc: 0.9857 - val_loss: 0.1452 - val_ac
c: 0.7680
Epoch 432/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0203 - acc: 0.9357 - val_loss: 0.1448 - val_ac
c: 0.7720
Epoch 433/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0191 - acc: 0.9500 - val_loss: 0.1435 - val_ac
c: 0.7720
Epoch 434/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1430 - val_ac
c: 0.7700
Epoch 435/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0185 - acc: 0.9643 - val_loss: 0.1428 - val_ac
c: 0.7620
Epoch 436/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0182 - acc: 0.9714 - val_loss: 0.1443 - val_ac
c: 0.7540
Epoch 437/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0195 - acc: 0.9571 - val_loss: 0.1427 - val_ac
c: 0.7580
Epoch 438/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1392 - val_ac
c: 0.7640
Epoch 439/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0179 - acc: 0.9714 - val_loss: 0.1379 - val_ac
c: 0.7680
Epoch 440/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0187 - acc: 0.9714 - val_loss: 0.1404 - val_ac
c: 0.7720
Epoch 441/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0175 - acc: 0.9786 - val_loss: 0.1425 - val_ac
c: 0.7660
Epoch 442/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0187 - acc: 0.9857 - val_loss: 0.1424 - val_ac
c: 0.7660
Epoch 443/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0171 - acc: 0.9929 - val_loss: 0.1386 - val_ac
c: 0.7800
Epoch 444/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0185 - acc: 0.9786 - val_loss: 0.1385 - val_ac
c: 0.7780
Epoch 445/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0191 - acc: 0.9786 - val_loss: 0.1402 - val_ac
c: 0.7880
Epoch 446/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0177 - acc: 0.9929 - val_loss: 0.1428 - val_ac
c: 0.7840
Epoch 447/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0167 - acc: 0.9786 - val_loss: 0.1464 - val_ac
c: 0.7760
Epoch 448/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0179 - acc: 0.9857 - val_loss: 0.1496 - val_ac
c: 0.7680
Epoch 449/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0194 - acc: 0.9429 - val_loss: 0.1497 - val_ac
c: 0.7600
```

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Epoch 450/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0176 - acc: 0.9857 - val_loss: 0.1467 - val_ac
c: 0.7620
Epoch 451/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0192 - acc: 0.9643 - val_loss: 0.1433 - val_ac
c: 0.7640
Epoch 452/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0182 - acc: 0.9786 - val_loss: 0.1408 - val_ac
c: 0.7680
Epoch 453/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1409 - val_ac
c: 0.7740
Epoch 454/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0178 - acc: 1.0000 - val_loss: 0.1422 - val_ac
c: 0.7800
Epoch 455/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0179 - acc: 0.9857 - val_loss: 0.1439 - val_ac
c: 0.7740
Epoch 456/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0176 - acc: 0.9857 - val_loss: 0.1440 - val_ac
c: 0.7660
Epoch 457/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0190 - acc: 0.9786 - val_loss: 0.1439 - val_ac
c: 0.7660
Epoch 458/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0202 - acc: 0.9643 - val_loss: 0.1451 - val_ac
c: 0.7660
Epoch 459/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0175 - acc: 0.9643 - val_loss: 0.1482 - val_ac
c: 0.7680
Epoch 460/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0164 - acc: 0.9786 - val_loss: 0.1495 - val_ac
c: 0.7600
Epoch 461/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0152 - acc: 1.0000 - val_loss: 0.1478 - val_ac
c: 0.7620
Epoch 462/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1428 - val_ac
c: 0.7620
Epoch 463/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0168 - acc: 0.9857 - val_loss: 0.1398 - val_ac
c: 0.7660
Epoch 464/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1389 - val_ac
c: 0.7740
Epoch 465/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0168 - acc: 0.9929 - val_loss: 0.1414 - val_ac
c: 0.7620
Epoch 466/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0152 - acc: 1.0000 - val_loss: 0.1442 - val_ac
c: 0.7600
Epoch 467/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1461 - val_ac
c: 0.7540
Epoch 468/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1486 - val_ac
c: 0.7600
Epoch 469/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0170 - acc: 0.9786 - val_loss: 0.1492 - val_ac
c: 0.7680
Epoch 470/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1485 - val_ac
c: 0.7620
Epoch 471/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0162 - acc: 0.9929 - val_loss: 0.1464 - val_ac
c: 0.7580
Epoch 472/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1427 - val_ac
c: 0.7680
Epoch 473/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0167 - acc: 0.9786 - val_loss: 0.1393 - val_ac
```

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c: 0.7700
Epoch 474/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0185 - acc: 0.9643 - val_loss: 0.1376 - val_ac
c: 0.7780
Epoch 475/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0198 - acc: 0.9571 - val_loss: 0.1359 - val_ac
c: 0.7960
Epoch 476/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0176 - acc: 0.9857 - val_loss: 0.1360 - val_ac
c: 0.7900
Epoch 477/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0213 - acc: 0.9714 - val_loss: 0.1352 - val_ac
c: 0.7880
Epoch 478/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0174 - acc: 0.9786 - val_loss: 0.1367 - val_ac
c: 0.7840
Epoch 479/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0174 - acc: 0.9786 - val_loss: 0.1410 - val_ac
c: 0.7560
Epoch 480/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0174 - acc: 0.9786 - val_loss: 0.1476 - val_ac
c: 0.7600
Epoch 481/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0195 - acc: 0.9571 - val_loss: 0.1514 - val_ac
c: 0.7460
Epoch 482/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0181 - acc: 0.9714 - val_loss: 0.1477 - val_ac
c: 0.7620
Epoch 483/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0179 - acc: 0.9714 - val_loss: 0.1407 - val_ac
c: 0.7680
Epoch 484/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0176 - acc: 0.9857 - val_loss: 0.1348 - val_ac
c: 0.7800
Epoch 485/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0168 - acc: 0.9857 - val_loss: 0.1322 - val_ac
c: 0.7920
Epoch 486/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0194 - acc: 0.9643 - val_loss: 0.1319 - val_ac
c: 0.7960
Epoch 487/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0191 - acc: 0.9786 - val_loss: 0.1345 - val_ac
c: 0.7920
Epoch 488/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1379 - val_ac
c: 0.7840
Epoch 489/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0184 - acc: 0.9714 - val_loss: 0.1429 - val_ac
c: 0.7680
Epoch 490/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0186 - acc: 0.9786 - val_loss: 0.1449 - val_ac
c: 0.7600
Epoch 491/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0164 - acc: 0.9857 - val_loss: 0.1464 - val_ac
c: 0.7600
Epoch 492/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0195 - acc: 0.9714 - val_loss: 0.1463 - val_ac
c: 0.7620
Epoch 493/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1461 - val_ac
c: 0.7620
Epoch 494/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0186 - acc: 0.9643 - val_loss: 0.1456 - val_ac
c: 0.7680
Epoch 495/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0178 - acc: 0.9643 - val_loss: 0.1467 - val_ac
c: 0.7660
Epoch 496/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0172 - acc: 0.9643 - val_loss: 0.1496 - val_ac
c: 0.7680
Epoch 497/1000
```

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1/1 [==============================] - 0s 178ms/step - loss: 0.0167 - acc: 0.9786 - val_loss: 0.1503 - val_ac
c: 0.7540
Epoch 498/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0158 - acc: 1.0000 - val_loss: 0.1496 - val_ac
c: 0.7540
Epoch 499/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0171 - acc: 0.9857 - val_loss: 0.1487 - val_ac
c: 0.7500
Epoch 500/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0194 - acc: 0.9429 - val_loss: 0.1474 - val_ac
c: 0.7500
Epoch 501/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0151 - acc: 1.0000 - val_loss: 0.1466 - val_ac
c: 0.7560
Epoch 502/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0181 - acc: 0.9786 - val_loss: 0.1441 - val_ac
c: 0.7540
Epoch 503/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0190 - acc: 0.9643 - val_loss: 0.1443 - val_ac
c: 0.7580
Epoch 504/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1440 - val_ac
c: 0.7620
Epoch 505/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0164 - acc: 0.9857 - val_loss: 0.1428 - val_ac
c: 0.7620
Epoch 506/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0176 - acc: 0.9857 - val_loss: 0.1423 - val_ac
c: 0.7680
Epoch 507/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0197 - acc: 0.9714 - val_loss: 0.1425 - val_ac
c: 0.7700
Epoch 508/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0213 - acc: 0.9643 - val_loss: 0.1459 - val_ac
c: 0.7660
Epoch 509/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0160 - acc: 0.9929 - val_loss: 0.1474 - val_ac
c: 0.7600
Epoch 510/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0183 - acc: 0.9786 - val_loss: 0.1465 - val_ac
c: 0.7720
Epoch 511/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0164 - acc: 0.9929 - val_loss: 0.1457 - val_ac
c: 0.7720
Epoch 512/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0178 - acc: 0.9857 - val_loss: 0.1420 - val_ac
c: 0.7780
Epoch 513/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1380 - val_ac
c: 0.7820
Epoch 514/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0178 - acc: 0.9929 - val_loss: 0.1351 - val_ac
c: 0.7800
Epoch 515/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0171 - acc: 0.9714 - val_loss: 0.1339 - val_ac
c: 0.7820
Epoch 516/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0166 - acc: 0.9857 - val_loss: 0.1349 - val_ac
c: 0.7820
Epoch 517/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0168 - acc: 0.9786 - val_loss: 0.1370 - val_ac
c: 0.7760
Epoch 518/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0182 - acc: 0.9786 - val_loss: 0.1401 - val_ac
c: 0.7740
Epoch 519/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0181 - acc: 0.9786 - val_loss: 0.1414 - val_ac
c: 0.7740
Epoch 520/1000
1/1 [==============================] - 0s 211ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1432 - val_ac
c: 0.7700
```

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Epoch 521/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0177 - acc: 0.9714 - val_loss: 0.1477 - val_ac
c: 0.7700
Epoch 522/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0181 - acc: 0.9643 - val_loss: 0.1502 - val_ac
c: 0.7700
Epoch 523/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0168 - acc: 0.9714 - val_loss: 0.1516 - val_ac
c: 0.7760
Epoch 524/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0158 - acc: 0.9857 - val_loss: 0.1517 - val_ac
c: 0.7660
Epoch 525/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0187 - acc: 0.9714 - val_loss: 0.1449 - val_ac
c: 0.7760
Epoch 526/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0177 - acc: 0.9714 - val_loss: 0.1389 - val_ac
c: 0.7780
Epoch 527/1000
1/1 [==============================] - 0s 204ms/step - loss: 0.0166 - acc: 0.9786 - val_loss: 0.1350 - val_ac
c: 0.7820
Epoch 528/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0177 - acc: 0.9571 - val_loss: 0.1357 - val_ac
c: 0.7840
Epoch 529/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0190 - acc: 0.9714 - val_loss: 0.1380 - val_ac
c: 0.7860
Epoch 530/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0184 - acc: 0.9857 - val_loss: 0.1418 - val_ac
c: 0.7700
Epoch 531/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0156 - acc: 1.0000 - val_loss: 0.1479 - val_ac
c: 0.7640
Epoch 532/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0186 - acc: 0.9786 - val_loss: 0.1520 - val_ac
c: 0.7620
Epoch 533/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0168 - acc: 0.9857 - val_loss: 0.1541 - val_ac
c: 0.7700
Epoch 534/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0156 - acc: 0.9929 - val_loss: 0.1540 - val_ac
c: 0.7600
Epoch 535/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0176 - acc: 0.9714 - val_loss: 0.1525 - val_ac
c: 0.7700
Epoch 536/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1519 - val_ac
c: 0.7660
Epoch 537/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1494 - val_ac
c: 0.7580
Epoch 538/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0174 - acc: 0.9571 - val_loss: 0.1452 - val_ac
c: 0.7580
Epoch 539/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0187 - acc: 0.9857 - val_loss: 0.1393 - val_ac
c: 0.7640
Epoch 540/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1364 - val_ac
c: 0.7700
Epoch 541/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1369 - val_ac
c: 0.7600
Epoch 542/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0154 - acc: 0.9929 - val_loss: 0.1373 - val_ac
c: 0.7640
Epoch 543/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0174 - acc: 0.9714 - val_loss: 0.1373 - val_ac
c: 0.7740
Epoch 544/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0166 - acc: 0.9929 - val_loss: 0.1374 - val_ac
```

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c: 0.7820
Epoch 545/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0168 - acc: 1.0000 - val_loss: 0.1377 - val_ac
c: 0.7840
Epoch 546/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0188 - acc: 0.9643 - val_loss: 0.1353 - val_ac
c: 0.7820
Epoch 547/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0184 - acc: 0.9571 - val_loss: 0.1324 - val_ac
c: 0.7820
Epoch 548/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0175 - acc: 0.9714 - val_loss: 0.1339 - val_ac
c: 0.7780
Epoch 549/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0184 - acc: 0.9714 - val_loss: 0.1372 - val_ac
c: 0.7740
Epoch 550/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0159 - acc: 0.9786 - val_loss: 0.1410 - val_ac
c: 0.7680
Epoch 551/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1417 - val_ac
c: 0.7640
Epoch 552/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0192 - acc: 0.9643 - val_loss: 0.1390 - val_ac
c: 0.7680
Epoch 553/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1354 - val_ac
c: 0.7760
Epoch 554/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0154 - acc: 0.9786 - val_loss: 0.1351 - val_ac
c: 0.7780
Epoch 555/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0176 - acc: 0.9786 - val_loss: 0.1362 - val_ac
c: 0.7760
Epoch 556/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0164 - acc: 0.9857 - val_loss: 0.1384 - val_ac
c: 0.7780
Epoch 557/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0166 - acc: 0.9929 - val_loss: 0.1400 - val_ac
c: 0.7740
Epoch 558/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1399 - val_ac
c: 0.7740
Epoch 559/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0188 - acc: 0.9500 - val_loss: 0.1408 - val_ac
c: 0.7680
Epoch 560/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0188 - acc: 0.9571 - val_loss: 0.1436 - val_ac
c: 0.7640
Epoch 561/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0170 - acc: 0.9857 - val_loss: 0.1436 - val_ac
c: 0.7540
Epoch 562/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0182 - acc: 0.9571 - val_loss: 0.1436 - val_ac
c: 0.7460
Epoch 563/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1441 - val_ac
c: 0.7520
Epoch 564/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0146 - acc: 1.0000 - val_loss: 0.1441 - val_ac
c: 0.7560
Epoch 565/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1435 - val_ac
c: 0.7560
Epoch 566/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0171 - acc: 0.9643 - val_loss: 0.1429 - val_ac
c: 0.7580
Epoch 567/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0178 - acc: 0.9643 - val_loss: 0.1426 - val_ac
c: 0.7620
Epoch 568/1000
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1/1 [==============================] - 0s 176ms/step - loss: 0.0155 - acc: 1.0000 - val_loss: 0.1420 - val_ac
c: 0.7660
Epoch 569/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0168 - acc: 0.9857 - val_loss: 0.1397 - val_ac
c: 0.7660
Epoch 570/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0172 - acc: 0.9929 - val_loss: 0.1365 - val_ac
c: 0.7740
Epoch 571/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0170 - acc: 0.9786 - val_loss: 0.1340 - val_ac
c: 0.7940
Epoch 572/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0198 - acc: 0.9571 - val_loss: 0.1338 - val_ac
c: 0.7980
Epoch 573/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0156 - acc: 0.9929 - val_loss: 0.1365 - val_ac
c: 0.7900
Epoch 574/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0194 - acc: 0.9643 - val_loss: 0.1399 - val_ac
c: 0.7820
Epoch 575/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0169 - acc: 0.9714 - val_loss: 0.1460 - val_ac
c: 0.7700
Epoch 576/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1515 - val_ac
c: 0.7620
Epoch 577/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0167 - acc: 0.9714 - val_loss: 0.1569 - val_ac
c: 0.7540
Epoch 578/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0179 - acc: 0.9714 - val_loss: 0.1603 - val_ac
c: 0.7500
Epoch 579/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0178 - acc: 0.9786 - val_loss: 0.1587 - val_ac
c: 0.7580
Epoch 580/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0166 - acc: 0.9786 - val_loss: 0.1546 - val_ac
c: 0.7620
Epoch 581/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0169 - acc: 0.9929 - val_loss: 0.1519 - val_ac
c: 0.7640
Epoch 582/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0165 - acc: 0.9714 - val_loss: 0.1516 - val_ac
c: 0.7780
Epoch 583/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0172 - acc: 0.9857 - val_loss: 0.1508 - val_ac
c: 0.7700
Epoch 584/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0193 - acc: 0.9571 - val_loss: 0.1485 - val_ac
c: 0.7760
Epoch 585/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0168 - acc: 0.9786 - val_loss: 0.1444 - val_ac
c: 0.7720
Epoch 586/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0169 - acc: 0.9929 - val_loss: 0.1449 - val_ac
c: 0.7760
Epoch 587/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0159 - acc: 0.9786 - val_loss: 0.1459 - val_ac
c: 0.7680
Epoch 588/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0182 - acc: 0.9714 - val_loss: 0.1481 - val_ac
c: 0.7580
Epoch 589/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0179 - acc: 0.9857 - val_loss: 0.1456 - val_ac
c: 0.7680
Epoch 590/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0188 - acc: 0.9714 - val_loss: 0.1439 - val_ac
c: 0.7740
Epoch 591/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0157 - acc: 0.9857 - val_loss: 0.1450 - val_ac
c: 0.7740
```

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Epoch 592/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0166 - acc: 0.9786 - val_loss: 0.1474 - val_ac
c: 0.7720
Epoch 593/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0179 - acc: 0.9929 - val_loss: 0.1498 - val_ac
c: 0.7680
Epoch 594/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0178 - acc: 0.9714 - val_loss: 0.1537 - val_ac
c: 0.7560
Epoch 595/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0175 - acc: 0.9714 - val_loss: 0.1555 - val_ac
c: 0.7480
Epoch 596/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0169 - acc: 0.9643 - val_loss: 0.1516 - val_ac
c: 0.7480
Epoch 597/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0182 - acc: 0.9571 - val_loss: 0.1497 - val_ac
c: 0.7460
Epoch 598/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0182 - acc: 0.9643 - val_loss: 0.1463 - val_ac
c: 0.7440
Epoch 599/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0155 - acc: 0.9929 - val_loss: 0.1460 - val_ac
c: 0.7480
Epoch 600/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0149 - acc: 1.0000 - val_loss: 0.1460 - val_ac
c: 0.7580
Epoch 601/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0173 - acc: 0.9786 - val_loss: 0.1437 - val_ac
c: 0.7720
Epoch 602/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1404 - val_ac
c: 0.7800
Epoch 603/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0174 - acc: 0.9857 - val_loss: 0.1407 - val_ac
c: 0.7740
Epoch 604/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0174 - acc: 0.9857 - val_loss: 0.1415 - val_ac
c: 0.7820
Epoch 605/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0188 - acc: 0.9571 - val_loss: 0.1440 - val_ac
c: 0.7840
Epoch 606/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0185 - acc: 0.9786 - val_loss: 0.1482 - val_ac
c: 0.7860
Epoch 607/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0177 - acc: 0.9786 - val_loss: 0.1501 - val_ac
c: 0.7800
Epoch 608/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0148 - acc: 0.9857 - val_loss: 0.1508 - val_ac
c: 0.7740
Epoch 609/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0170 - acc: 0.9857 - val_loss: 0.1528 - val_ac
c: 0.7640
Epoch 610/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1486 - val_ac
c: 0.7660
Epoch 611/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0158 - acc: 0.9857 - val_loss: 0.1464 - val_ac
c: 0.7580
Epoch 612/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0162 - acc: 0.9786 - val_loss: 0.1452 - val_ac
c: 0.7520
Epoch 613/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0189 - acc: 0.9500 - val_loss: 0.1378 - val_ac
c: 0.7660
Epoch 614/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0154 - acc: 0.9786 - val_loss: 0.1335 - val_ac
c: 0.7680
Epoch 615/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0156 - acc: 0.9857 - val_loss: 0.1333 - val_ac
```

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c: 0.7740
Epoch 616/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0175 - acc: 0.9643 - val_loss: 0.1367 - val_ac
c: 0.7660
Epoch 617/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1436 - val_ac
c: 0.7700
Epoch 618/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0180 - acc: 0.9643 - val_loss: 0.1533 - val_ac
c: 0.7640
Epoch 619/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0174 - acc: 0.9857 - val_loss: 0.1604 - val_ac
c: 0.7640
Epoch 620/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0168 - acc: 0.9714 - val_loss: 0.1608 - val_ac
c: 0.7580
Epoch 621/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0154 - acc: 1.0000 - val_loss: 0.1572 - val_ac
c: 0.7540
Epoch 622/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0169 - acc: 0.9714 - val_loss: 0.1524 - val_ac
c: 0.7620
Epoch 623/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0165 - acc: 0.9786 - val_loss: 0.1476 - val_ac
c: 0.7620
Epoch 624/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0173 - acc: 0.9643 - val_loss: 0.1434 - val_ac
c: 0.7620
Epoch 625/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0168 - acc: 0.9786 - val_loss: 0.1415 - val_ac
c: 0.7740
Epoch 626/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0185 - acc: 0.9643 - val_loss: 0.1402 - val_ac
c: 0.7680
Epoch 627/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0162 - acc: 0.9786 - val_loss: 0.1404 - val_ac
c: 0.7640
Epoch 628/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0151 - acc: 0.9857 - val_loss: 0.1415 - val_ac
c: 0.7720
Epoch 629/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0176 - acc: 0.9714 - val_loss: 0.1406 - val_ac
c: 0.7860
Epoch 630/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0173 - acc: 0.9786 - val_loss: 0.1416 - val_ac
c: 0.7720
Epoch 631/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0158 - acc: 0.9643 - val_loss: 0.1433 - val_ac
c: 0.7600
Epoch 632/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0162 - acc: 0.9929 - val_loss: 0.1440 - val_ac
c: 0.7620
Epoch 633/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0159 - acc: 0.9857 - val_loss: 0.1465 - val_ac
c: 0.7600
Epoch 634/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0176 - acc: 0.9643 - val_loss: 0.1470 - val_ac
c: 0.7660
Epoch 635/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0174 - acc: 0.9643 - val_loss: 0.1484 - val_ac
c: 0.7720
Epoch 636/1000
1/1 [==============================] - 0s 238ms/step - loss: 0.0172 - acc: 0.9714 - val_loss: 0.1530 - val_ac
c: 0.7660
Epoch 637/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0167 - acc: 0.9929 - val_loss: 0.1537 - val_ac
c: 0.7640
Epoch 638/1000
1/1 [==============================] - 0s 207ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1572 - val_ac
c: 0.7660
Epoch 639/1000
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1/1 [==============================] - 0s 197ms/step - loss: 0.0182 - acc: 0.9643 - val_loss: 0.1540 - val_ac
c: 0.7600
Epoch 640/1000
1/1 [==============================] - 0s 204ms/step - loss: 0.0151 - acc: 0.9929 - val_loss: 0.1479 - val_ac
c: 0.7600
Epoch 641/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0176 - acc: 0.9714 - val_loss: 0.1428 - val_ac
c: 0.7580
Epoch 642/1000
1/1 [==============================] - 0s 210ms/step - loss: 0.0166 - acc: 0.9714 - val_loss: 0.1372 - val_ac
c: 0.7660
Epoch 643/1000
1/1 [==============================] - 0s 216ms/step - loss: 0.0167 - acc: 0.9929 - val_loss: 0.1344 - val_ac
c: 0.7680
Epoch 644/1000
1/1 [==============================] - 0s 216ms/step - loss: 0.0164 - acc: 0.9714 - val_loss: 0.1324 - val_ac
c: 0.7680
Epoch 645/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1336 - val_ac
c: 0.7800
Epoch 646/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0164 - acc: 0.9786 - val_loss: 0.1389 - val_ac
c: 0.7740
Epoch 647/1000
1/1 [==============================] - 0s 216ms/step - loss: 0.0167 - acc: 0.9857 - val_loss: 0.1442 - val_ac
c: 0.7700
Epoch 648/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0158 - acc: 0.9929 - val_loss: 0.1497 - val_ac
c: 0.7720
Epoch 649/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0186 - acc: 0.9786 - val_loss: 0.1464 - val_ac
c: 0.7800
Epoch 650/1000
1/1 [==============================] - 0s 204ms/step - loss: 0.0174 - acc: 0.9714 - val_loss: 0.1397 - val_ac
c: 0.7720
Epoch 651/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0156 - acc: 0.9929 - val_loss: 0.1357 - val_ac
c: 0.7720
Epoch 652/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0153 - acc: 0.9929 - val_loss: 0.1340 - val_ac
c: 0.7740
Epoch 653/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0158 - acc: 0.9786 - val_loss: 0.1338 - val_ac
c: 0.7840
Epoch 654/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0143 - acc: 0.9929 - val_loss: 0.1366 - val_ac
c: 0.7760
Epoch 655/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1413 - val_ac
c: 0.7740
Epoch 656/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0140 - acc: 1.0000 - val_loss: 0.1459 - val_ac
c: 0.7600
Epoch 657/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0145 - acc: 1.0000 - val_loss: 0.1496 - val_ac
c: 0.7520
Epoch 658/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0163 - acc: 0.9714 - val_loss: 0.1495 - val_ac
c: 0.7620
Epoch 659/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0170 - acc: 0.9643 - val_loss: 0.1502 - val_ac
c: 0.7820
Epoch 660/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0163 - acc: 0.9786 - val_loss: 0.1496 - val_ac
c: 0.7920
Epoch 661/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0151 - acc: 0.9857 - val_loss: 0.1484 - val_ac
c: 0.7900
Epoch 662/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0176 - acc: 0.9500 - val_loss: 0.1456 - val_ac
c: 0.7820
```

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Epoch 663/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0153 - acc: 0.9857 - val_loss: 0.1457 - val_ac
c: 0.7820
Epoch 664/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0184 - acc: 0.9500 - val_loss: 0.1465 - val_ac
c: 0.7800
Epoch 665/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0149 - acc: 0.9929 - val_loss: 0.1491 - val_ac
c: 0.7680
Epoch 666/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0159 - acc: 0.9857 - val_loss: 0.1521 - val_ac
c: 0.7580
Epoch 667/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1539 - val_ac
c: 0.7500
Epoch 668/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0145 - acc: 0.9929 - val_loss: 0.1553 - val_ac
c: 0.7440
Epoch 669/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0148 - acc: 0.9929 - val_loss: 0.1533 - val_ac
c: 0.7480
Epoch 670/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1481 - val_ac
c: 0.7540
Epoch 671/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0171 - acc: 0.9714 - val_loss: 0.1426 - val_ac
c: 0.7680
Epoch 672/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0175 - acc: 0.9857 - val_loss: 0.1391 - val_ac
c: 0.7800
Epoch 673/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0160 - acc: 1.0000 - val_loss: 0.1383 - val_ac
c: 0.7820
Epoch 674/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0166 - acc: 0.9857 - val_loss: 0.1390 - val_ac
c: 0.7820
Epoch 675/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0164 - acc: 0.9857 - val_loss: 0.1422 - val_ac
c: 0.7780
Epoch 676/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0154 - acc: 0.9714 - val_loss: 0.1480 - val_ac
c: 0.7780
Epoch 677/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0169 - acc: 0.9714 - val_loss: 0.1545 - val_ac
c: 0.7660
Epoch 678/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0155 - acc: 0.9857 - val_loss: 0.1566 - val_ac
c: 0.7640
Epoch 679/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0180 - acc: 0.9714 - val_loss: 0.1539 - val_ac
c: 0.7540
Epoch 680/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0161 - acc: 0.9929 - val_loss: 0.1491 - val_ac
c: 0.7580
Epoch 681/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1444 - val_ac
c: 0.7620
Epoch 682/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0179 - acc: 0.9714 - val_loss: 0.1383 - val_ac
c: 0.7700
Epoch 683/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1373 - val_ac
c: 0.7760
Epoch 684/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0149 - acc: 0.9929 - val_loss: 0.1393 - val_ac
c: 0.7800
Epoch 685/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0174 - acc: 0.9643 - val_loss: 0.1411 - val_ac
c: 0.7780
Epoch 686/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0162 - acc: 0.9929 - val_loss: 0.1430 - val_ac
```

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c: 0.7780
Epoch 687/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1453 - val_ac
c: 0.7820
Epoch 688/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0150 - acc: 0.9929 - val_loss: 0.1502 - val_ac
c: 0.7740
Epoch 689/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0175 - acc: 0.9714 - val_loss: 0.1543 - val_ac
c: 0.7740
Epoch 690/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0155 - acc: 0.9929 - val_loss: 0.1581 - val_ac
c: 0.7580
Epoch 691/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0143 - acc: 0.9929 - val_loss: 0.1550 - val_ac
c: 0.7660
Epoch 692/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0160 - acc: 0.9714 - val_loss: 0.1462 - val_ac
c: 0.7600
Epoch 693/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0167 - acc: 0.9714 - val_loss: 0.1333 - val_ac
c: 0.7840
Epoch 694/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1270 - val_ac
c: 0.8000
Epoch 695/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1265 - val_ac
c: 0.7940
Epoch 696/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0146 - acc: 0.9929 - val_loss: 0.1265 - val_ac
c: 0.7900
Epoch 697/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0168 - acc: 0.9643 - val_loss: 0.1292 - val_ac
c: 0.7900
Epoch 698/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0184 - acc: 0.9643 - val_loss: 0.1374 - val_ac
c: 0.7700
Epoch 699/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1460 - val_ac
c: 0.7600
Epoch 700/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0165 - acc: 0.9786 - val_loss: 0.1537 - val_ac
c: 0.7500
Epoch 701/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1568 - val_ac
c: 0.7440
Epoch 702/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0170 - acc: 0.9714 - val_loss: 0.1547 - val_ac
c: 0.7480
Epoch 703/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0174 - acc: 0.9786 - val_loss: 0.1484 - val_ac
c: 0.7520
Epoch 704/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0155 - acc: 0.9857 - val_loss: 0.1407 - val_ac
c: 0.7580
Epoch 705/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1351 - val_ac
c: 0.7780
Epoch 706/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0167 - acc: 0.9786 - val_loss: 0.1307 - val_ac
c: 0.7860
Epoch 707/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1294 - val_ac
c: 0.7880
Epoch 708/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0146 - acc: 0.9929 - val_loss: 0.1297 - val_ac
c: 0.7900
Epoch 709/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0164 - acc: 0.9714 - val_loss: 0.1326 - val_ac
c: 0.7860
Epoch 710/1000
```

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1/1 [==============================] - 0s 175ms/step - loss: 0.0157 - acc: 0.9786 - val_loss: 0.1381 - val_ac
c: 0.7820
Epoch 711/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0157 - acc: 0.9643 - val_loss: 0.1477 - val_ac
c: 0.7800
Epoch 712/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0158 - acc: 0.9786 - val_loss: 0.1596 - val_ac
c: 0.7620
Epoch 713/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1674 - val_ac
c: 0.7440
Epoch 714/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0177 - acc: 0.9714 - val_loss: 0.1647 - val_ac
c: 0.7500
Epoch 715/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0162 - acc: 0.9786 - val_loss: 0.1556 - val_ac
c: 0.7480
Epoch 716/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0154 - acc: 0.9786 - val_loss: 0.1461 - val_ac
c: 0.7620
Epoch 717/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1386 - val_ac
c: 0.7680
Epoch 718/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1350 - val_ac
c: 0.7700
Epoch 719/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0145 - acc: 0.9929 - val_loss: 0.1325 - val_ac
c: 0.7820
Epoch 720/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0168 - acc: 0.9714 - val_loss: 0.1307 - val_ac
c: 0.7880
Epoch 721/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0166 - acc: 0.9500 - val_loss: 0.1335 - val_ac
c: 0.7820
Epoch 722/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0152 - acc: 0.9929 - val_loss: 0.1399 - val_ac
c: 0.7900
Epoch 723/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0159 - acc: 0.9929 - val_loss: 0.1473 - val_ac
c: 0.7760
Epoch 724/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0165 - acc: 0.9643 - val_loss: 0.1525 - val_ac
c: 0.7620
Epoch 725/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0162 - acc: 0.9786 - val_loss: 0.1519 - val_ac
c: 0.7580
Epoch 726/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0164 - acc: 0.9714 - val_loss: 0.1490 - val_ac
c: 0.7700
Epoch 727/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0160 - acc: 0.9643 - val_loss: 0.1445 - val_ac
c: 0.7760
Epoch 728/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0157 - acc: 0.9857 - val_loss: 0.1405 - val_ac
c: 0.7700
Epoch 729/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0143 - acc: 0.9929 - val_loss: 0.1380 - val_ac
c: 0.7680
Epoch 730/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0154 - acc: 0.9929 - val_loss: 0.1375 - val_ac
c: 0.7720
Epoch 731/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0177 - acc: 0.9786 - val_loss: 0.1389 - val_ac
c: 0.7780
Epoch 732/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0152 - acc: 0.9786 - val_loss: 0.1384 - val_ac
c: 0.7780
Epoch 733/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1406 - val_ac
c: 0.7780
```

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Epoch 734/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1432 - val_ac
c: 0.7660
Epoch 735/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0163 - acc: 0.9714 - val_loss: 0.1449 - val_ac
c: 0.7720
Epoch 736/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1475 - val_ac
c: 0.7620
Epoch 737/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0162 - acc: 1.0000 - val_loss: 0.1492 - val_ac
c: 0.7620
Epoch 738/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0178 - acc: 0.9571 - val_loss: 0.1451 - val_ac
c: 0.7660
Epoch 739/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1436 - val_ac
c: 0.7700
Epoch 740/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0152 - acc: 1.0000 - val_loss: 0.1409 - val_ac
c: 0.7720
Epoch 741/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0167 - acc: 0.9643 - val_loss: 0.1372 - val_ac
c: 0.7720
Epoch 742/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1344 - val_ac
c: 0.7780
Epoch 743/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0157 - acc: 0.9714 - val_loss: 0.1337 - val_ac
c: 0.7840
Epoch 744/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0152 - acc: 0.9786 - val_loss: 0.1367 - val_ac
c: 0.7920
Epoch 745/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1414 - val_ac
c: 0.7820
Epoch 746/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0167 - acc: 0.9857 - val_loss: 0.1469 - val_ac
c: 0.7800
Epoch 747/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0155 - acc: 0.9929 - val_loss: 0.1512 - val_ac
c: 0.7680
Epoch 748/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1545 - val_ac
c: 0.7580
Epoch 749/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0169 - acc: 0.9786 - val_loss: 0.1524 - val_ac
c: 0.7640
Epoch 750/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1516 - val_ac
c: 0.7580
Epoch 751/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0134 - acc: 0.9857 - val_loss: 0.1487 - val_ac
c: 0.7640
Epoch 752/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0181 - acc: 0.9500 - val_loss: 0.1461 - val_ac
c: 0.7740
Epoch 753/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0159 - acc: 0.9643 - val_loss: 0.1411 - val_ac
c: 0.7820
Epoch 754/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0190 - acc: 0.9571 - val_loss: 0.1388 - val_ac
c: 0.7740
Epoch 755/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1388 - val_ac
c: 0.7660
Epoch 756/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0145 - acc: 1.0000 - val_loss: 0.1411 - val_ac
c: 0.7620
Epoch 757/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0177 - acc: 0.9643 - val_loss: 0.1445 - val_ac
```

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c: 0.7560
Epoch 758/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0175 - acc: 0.9929 - val_loss: 0.1502 - val_ac
c: 0.7540
Epoch 759/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0175 - acc: 0.9714 - val_loss: 0.1502 - val_ac
c: 0.7540
Epoch 760/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0169 - acc: 0.9714 - val_loss: 0.1471 - val_ac
c: 0.7620
Epoch 761/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0164 - acc: 0.9786 - val_loss: 0.1448 - val_ac
c: 0.7620
Epoch 762/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0147 - acc: 0.9929 - val_loss: 0.1459 - val_ac
c: 0.7620
Epoch 763/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0164 - acc: 0.9714 - val_loss: 0.1481 - val_ac
c: 0.7620
Epoch 764/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1471 - val_ac
c: 0.7660
Epoch 765/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0157 - acc: 0.9857 - val_loss: 0.1441 - val_ac
c: 0.7700
Epoch 766/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1429 - val_ac
c: 0.7700
Epoch 767/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0166 - acc: 0.9643 - val_loss: 0.1444 - val_ac
c: 0.7680
Epoch 768/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0156 - acc: 0.9857 - val_loss: 0.1444 - val_ac
c: 0.7740
Epoch 769/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0164 - acc: 0.9786 - val_loss: 0.1424 - val_ac
c: 0.7780
Epoch 770/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1383 - val_ac
c: 0.7800
Epoch 771/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0159 - acc: 0.9714 - val_loss: 0.1369 - val_ac
c: 0.7820
Epoch 772/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1362 - val_ac
c: 0.7720
Epoch 773/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0145 - acc: 1.0000 - val_loss: 0.1360 - val_ac
c: 0.7720
Epoch 774/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0143 - acc: 1.0000 - val_loss: 0.1357 - val_ac
c: 0.7720
Epoch 775/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1377 - val_ac
c: 0.7720
Epoch 776/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0153 - acc: 0.9857 - val_loss: 0.1394 - val_ac
c: 0.7760
Epoch 777/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0160 - acc: 0.9786 - val_loss: 0.1397 - val_ac
c: 0.7820
Epoch 778/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1390 - val_ac
c: 0.7820
Epoch 779/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1383 - val_ac
c: 0.7760
Epoch 780/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0174 - acc: 0.9571 - val_loss: 0.1379 - val_ac
c: 0.7820
Epoch 781/1000
```

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1/1 [==============================] - 0s 184ms/step - loss: 0.0148 - acc: 0.9786 - val_loss: 0.1384 - val_ac
c: 0.7720
Epoch 782/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0167 - acc: 0.9571 - val_loss: 0.1388 - val_ac
c: 0.7700
Epoch 783/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1381 - val_ac
c: 0.7640
Epoch 784/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0161 - acc: 0.9786 - val_loss: 0.1375 - val_ac
c: 0.7660
Epoch 785/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0142 - acc: 0.9857 - val_loss: 0.1369 - val_ac
c: 0.7680
Epoch 786/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0156 - acc: 0.9857 - val_loss: 0.1385 - val_ac
c: 0.7740
Epoch 787/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0144 - acc: 0.9857 - val_loss: 0.1420 - val_ac
c: 0.7740
Epoch 788/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0151 - acc: 0.9786 - val_loss: 0.1466 - val_ac
c: 0.7700
Epoch 789/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0147 - acc: 0.9857 - val_loss: 0.1489 - val_ac
c: 0.7700
Epoch 790/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0143 - acc: 1.0000 - val_loss: 0.1485 - val_ac
c: 0.7700
Epoch 791/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0145 - acc: 0.9857 - val_loss: 0.1427 - val_ac
c: 0.7660
Epoch 792/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0158 - acc: 0.9714 - val_loss: 0.1378 - val_ac
c: 0.7700
Epoch 793/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0149 - acc: 0.9786 - val_loss: 0.1359 - val_ac
c: 0.7740
Epoch 794/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0155 - acc: 0.9714 - val_loss: 0.1373 - val_ac
c: 0.7820
Epoch 795/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0154 - acc: 0.9714 - val_loss: 0.1422 - val_ac
c: 0.7640
Epoch 796/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0142 - acc: 0.9857 - val_loss: 0.1485 - val_ac
c: 0.7560
Epoch 797/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0164 - acc: 0.9786 - val_loss: 0.1567 - val_ac
c: 0.7460
Epoch 798/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0159 - acc: 0.9786 - val_loss: 0.1582 - val_ac
c: 0.7460
Epoch 799/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0153 - acc: 0.9857 - val_loss: 0.1521 - val_ac
c: 0.7560
Epoch 800/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0142 - acc: 0.9857 - val_loss: 0.1454 - val_ac
c: 0.7680
Epoch 801/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0134 - acc: 0.9786 - val_loss: 0.1405 - val_ac
c: 0.7760
Epoch 802/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0139 - acc: 0.9929 - val_loss: 0.1365 - val_ac
c: 0.7800
Epoch 803/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0154 - acc: 0.9786 - val_loss: 0.1329 - val_ac
c: 0.7880
Epoch 804/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0164 - acc: 0.9714 - val_loss: 0.1312 - val_ac
c: 0.7900
```

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Epoch 805/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0145 - acc: 0.9929 - val_loss: 0.1316 - val_ac
c: 0.7900
Epoch 806/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0158 - acc: 0.9786 - val_loss: 0.1360 - val_ac
c: 0.7780
Epoch 807/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1428 - val_ac
c: 0.7680
Epoch 808/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0150 - acc: 0.9786 - val_loss: 0.1502 - val_ac
c: 0.7640
Epoch 809/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0142 - acc: 0.9929 - val_loss: 0.1544 - val_ac
c: 0.7700
Epoch 810/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0164 - acc: 0.9857 - val_loss: 0.1517 - val_ac
c: 0.7640
Epoch 811/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1474 - val_ac
c: 0.7700
Epoch 812/1000
1/1 [==============================] - 0s 166ms/step - loss: 0.0135 - acc: 0.9929 - val_loss: 0.1426 - val_ac
c: 0.7660
Epoch 813/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0165 - acc: 0.9714 - val_loss: 0.1359 - val_ac
c: 0.7740
Epoch 814/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0149 - acc: 0.9929 - val_loss: 0.1278 - val_ac
c: 0.7840
Epoch 815/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1244 - val_ac
c: 0.7940
Epoch 816/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0176 - acc: 0.9571 - val_loss: 0.1243 - val_ac
c: 0.7920
Epoch 817/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0147 - acc: 0.9714 - val_loss: 0.1267 - val_ac
c: 0.7840
Epoch 818/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0169 - acc: 0.9857 - val_loss: 0.1340 - val_ac
c: 0.7760
Epoch 819/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0132 - acc: 0.9929 - val_loss: 0.1446 - val_ac
c: 0.7640
Epoch 820/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0169 - acc: 0.9643 - val_loss: 0.1591 - val_ac
c: 0.7540
Epoch 821/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0157 - acc: 0.9857 - val_loss: 0.1694 - val_ac
c: 0.7460
Epoch 822/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0156 - acc: 0.9714 - val_loss: 0.1682 - val_ac
c: 0.7400
Epoch 823/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0177 - acc: 0.9571 - val_loss: 0.1574 - val_ac
c: 0.7560
Epoch 824/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0152 - acc: 0.9929 - val_loss: 0.1446 - val_ac
c: 0.7600
Epoch 825/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0151 - acc: 0.9786 - val_loss: 0.1364 - val_ac
c: 0.7740
Epoch 826/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0158 - acc: 0.9714 - val_loss: 0.1340 - val_ac
c: 0.7800
Epoch 827/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0153 - acc: 0.9857 - val_loss: 0.1360 - val_ac
c: 0.7780
Epoch 828/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0169 - acc: 0.9643 - val_loss: 0.1403 - val_ac
```

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c: 0.7720
Epoch 829/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0156 - acc: 0.9786 - val_loss: 0.1470 - val_ac
c: 0.7580
Epoch 830/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0171 - acc: 0.9786 - val_loss: 0.1538 - val_ac
c: 0.7600
Epoch 831/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0166 - acc: 0.9714 - val_loss: 0.1600 - val_ac
c: 0.7480
Epoch 832/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0162 - acc: 0.9929 - val_loss: 0.1626 - val_ac
c: 0.7460
Epoch 833/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0144 - acc: 1.0000 - val_loss: 0.1629 - val_ac
c: 0.7420
Epoch 834/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0169 - acc: 0.9714 - val_loss: 0.1576 - val_ac
c: 0.7620
Epoch 835/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0167 - acc: 0.9643 - val_loss: 0.1510 - val_ac
c: 0.7640
Epoch 836/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0165 - acc: 0.9786 - val_loss: 0.1478 - val_ac
c: 0.7760
Epoch 837/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0174 - acc: 0.9643 - val_loss: 0.1501 - val_ac
c: 0.7780
Epoch 838/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1508 - val_ac
c: 0.7780
Epoch 839/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0167 - acc: 0.9786 - val_loss: 0.1472 - val_ac
c: 0.7760
Epoch 840/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0153 - acc: 0.9857 - val_loss: 0.1436 - val_ac
c: 0.7780
Epoch 841/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0156 - acc: 0.9857 - val_loss: 0.1437 - val_ac
c: 0.7740
Epoch 842/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0174 - acc: 0.9571 - val_loss: 0.1463 - val_ac
c: 0.7600
Epoch 843/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1483 - val_ac
c: 0.7560
Epoch 844/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0147 - acc: 0.9786 - val_loss: 0.1512 - val_ac
c: 0.7600
Epoch 845/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0157 - acc: 0.9929 - val_loss: 0.1553 - val_ac
c: 0.7560
Epoch 846/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0141 - acc: 1.0000 - val_loss: 0.1569 - val_ac
c: 0.7600
Epoch 847/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0147 - acc: 0.9857 - val_loss: 0.1568 - val_ac
c: 0.7620
Epoch 848/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0163 - acc: 0.9857 - val_loss: 0.1525 - val_ac
c: 0.7620
Epoch 849/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0148 - acc: 0.9786 - val_loss: 0.1470 - val_ac
c: 0.7720
Epoch 850/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0148 - acc: 0.9857 - val_loss: 0.1403 - val_ac
c: 0.7780
Epoch 851/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1370 - val_ac
c: 0.7800
Epoch 852/1000
```

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1/1 [==============================] - 0s 189ms/step - loss: 0.0158 - acc: 0.9857 - val_loss: 0.1375 - val_ac
c: 0.7740
Epoch 853/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0141 - acc: 0.9857 - val_loss: 0.1389 - val_ac
c: 0.7740
Epoch 854/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0135 - acc: 0.9929 - val_loss: 0.1421 - val_ac
c: 0.7660
Epoch 855/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0140 - acc: 0.9929 - val_loss: 0.1455 - val_ac
c: 0.7680
Epoch 856/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0161 - acc: 0.9643 - val_loss: 0.1472 - val_ac
c: 0.7640
Epoch 857/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1468 - val_ac
c: 0.7620
Epoch 858/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0151 - acc: 0.9786 - val_loss: 0.1432 - val_ac
c: 0.7700
Epoch 859/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0154 - acc: 0.9714 - val_loss: 0.1394 - val_ac
c: 0.7760
Epoch 860/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0147 - acc: 0.9857 - val_loss: 0.1376 - val_ac
c: 0.7720
Epoch 861/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0135 - acc: 0.9929 - val_loss: 0.1386 - val_ac
c: 0.7700
Epoch 862/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0135 - acc: 0.9929 - val_loss: 0.1392 - val_ac
c: 0.7720
Epoch 863/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1396 - val_ac
c: 0.7640
Epoch 864/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0144 - acc: 0.9929 - val_loss: 0.1426 - val_ac
c: 0.7640
Epoch 865/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0164 - acc: 0.9500 - val_loss: 0.1449 - val_ac
c: 0.7760
Epoch 866/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0169 - acc: 0.9571 - val_loss: 0.1470 - val_ac
c: 0.7900
Epoch 867/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0136 - acc: 0.9786 - val_loss: 0.1513 - val_ac
c: 0.7860
Epoch 868/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0136 - acc: 0.9786 - val_loss: 0.1524 - val_ac
c: 0.7840
Epoch 869/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0147 - acc: 1.0000 - val_loss: 0.1486 - val_ac
c: 0.7780
Epoch 870/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0145 - acc: 0.9786 - val_loss: 0.1417 - val_ac
c: 0.7820
Epoch 871/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0134 - acc: 1.0000 - val_loss: 0.1355 - val_ac
c: 0.7760
Epoch 872/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0148 - acc: 0.9786 - val_loss: 0.1315 - val_ac
c: 0.7720
Epoch 873/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0166 - acc: 0.9571 - val_loss: 0.1338 - val_ac
c: 0.7720
Epoch 874/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0139 - acc: 0.9929 - val_loss: 0.1391 - val_ac
c: 0.7580
Epoch 875/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0149 - acc: 0.9929 - val_loss: 0.1439 - val_ac
c: 0.7560
```

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Epoch 876/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0141 - acc: 0.9857 - val_loss: 0.1505 - val_ac
c: 0.7480
Epoch 877/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0160 - acc: 0.9714 - val_loss: 0.1579 - val_ac
c: 0.7460
Epoch 878/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0155 - acc: 0.9786 - val_loss: 0.1624 - val_ac
c: 0.7400
Epoch 879/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0147 - acc: 0.9929 - val_loss: 0.1617 - val_ac
c: 0.7500
Epoch 880/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0165 - acc: 0.9643 - val_loss: 0.1522 - val_ac
c: 0.7540
Epoch 881/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0155 - acc: 0.9857 - val_loss: 0.1416 - val_ac
c: 0.7620
Epoch 882/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1356 - val_ac
c: 0.7740
Epoch 883/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0142 - acc: 0.9929 - val_loss: 0.1342 - val_ac
c: 0.7760
Epoch 884/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1347 - val_ac
c: 0.7760
Epoch 885/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0151 - acc: 0.9929 - val_loss: 0.1351 - val_ac
c: 0.7760
Epoch 886/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0155 - acc: 0.9857 - val_loss: 0.1348 - val_ac
c: 0.7780
Epoch 887/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0141 - acc: 1.0000 - val_loss: 0.1374 - val_ac
c: 0.7640
Epoch 888/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0155 - acc: 0.9929 - val_loss: 0.1434 - val_ac
c: 0.7500
Epoch 889/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0149 - acc: 0.9929 - val_loss: 0.1482 - val_ac
c: 0.7480
Epoch 890/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0149 - acc: 0.9786 - val_loss: 0.1495 - val_ac
c: 0.7420
Epoch 891/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0153 - acc: 0.9786 - val_loss: 0.1477 - val_ac
c: 0.7460
Epoch 892/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0146 - acc: 0.9929 - val_loss: 0.1449 - val_ac
c: 0.7480
Epoch 893/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0147 - acc: 0.9786 - val_loss: 0.1426 - val_ac
c: 0.7620
Epoch 894/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0142 - acc: 0.9929 - val_loss: 0.1423 - val_ac
c: 0.7660
Epoch 895/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0140 - acc: 1.0000 - val_loss: 0.1412 - val_ac
c: 0.7800
Epoch 896/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0151 - acc: 0.9857 - val_loss: 0.1431 - val_ac
c: 0.7640
Epoch 897/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1426 - val_ac
c: 0.7720
Epoch 898/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0149 - acc: 0.9714 - val_loss: 0.1389 - val_ac
c: 0.7780
Epoch 899/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0165 - acc: 0.9643 - val_loss: 0.1365 - val_ac
```

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c: 0.7820
Epoch 900/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0132 - acc: 1.0000 - val_loss: 0.1361 - val_ac
c: 0.7840
Epoch 901/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0152 - acc: 0.9786 - val_loss: 0.1379 - val_ac
c: 0.7800
Epoch 902/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1393 - val_ac
c: 0.7840
Epoch 903/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1389 - val_ac
c: 0.7800
Epoch 904/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0145 - acc: 0.9857 - val_loss: 0.1410 - val_ac
c: 0.7760
Epoch 905/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0156 - acc: 0.9643 - val_loss: 0.1489 - val_ac
c: 0.7540
Epoch 906/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1572 - val_ac
c: 0.7460
Epoch 907/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0124 - acc: 0.9929 - val_loss: 0.1650 - val_ac
c: 0.7340
Epoch 908/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0147 - acc: 0.9929 - val_loss: 0.1626 - val_ac
c: 0.7340
Epoch 909/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0177 - acc: 0.9571 - val_loss: 0.1582 - val_ac
c: 0.7400
Epoch 910/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0145 - acc: 0.9786 - val_loss: 0.1499 - val_ac
c: 0.7620
Epoch 911/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0141 - acc: 0.9857 - val_loss: 0.1428 - val_ac
c: 0.7720
Epoch 912/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1367 - val_ac
c: 0.7860
Epoch 913/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0139 - acc: 0.9714 - val_loss: 0.1333 - val_ac
c: 0.7900
Epoch 914/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0134 - acc: 0.9929 - val_loss: 0.1308 - val_ac
c: 0.7920
Epoch 915/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0152 - acc: 0.9929 - val_loss: 0.1311 - val_ac
c: 0.7980
Epoch 916/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0155 - acc: 0.9929 - val_loss: 0.1325 - val_ac
c: 0.7900
Epoch 917/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0156 - acc: 0.9786 - val_loss: 0.1347 - val_ac
c: 0.7900
Epoch 918/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0148 - acc: 0.9857 - val_loss: 0.1411 - val_ac
c: 0.7820
Epoch 919/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0166 - acc: 0.9571 - val_loss: 0.1508 - val_ac
c: 0.7680
Epoch 920/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1626 - val_ac
c: 0.7520
Epoch 921/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0177 - acc: 0.9643 - val_loss: 0.1661 - val_ac
c: 0.7480
Epoch 922/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0165 - acc: 0.9786 - val_loss: 0.1628 - val_ac
c: 0.7640
Epoch 923/1000
```

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1/1 [==============================] - 0s 172ms/step - loss: 0.0148 - acc: 0.9929 - val_loss: 0.1585 - val_ac
c: 0.7740
Epoch 924/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0160 - acc: 0.9857 - val_loss: 0.1551 - val_ac
c: 0.7740
Epoch 925/1000
1/1 [==============================] - 0s 216ms/step - loss: 0.0162 - acc: 0.9714 - val_loss: 0.1518 - val_ac
c: 0.7720
Epoch 926/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0160 - acc: 0.9714 - val_loss: 0.1518 - val_ac
c: 0.7780
Epoch 927/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0150 - acc: 0.9929 - val_loss: 0.1536 - val_ac
c: 0.7760
Epoch 928/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0141 - acc: 0.9857 - val_loss: 0.1564 - val_ac
c: 0.7680
Epoch 929/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0149 - acc: 0.9786 - val_loss: 0.1579 - val_ac
c: 0.7700
Epoch 930/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0167 - acc: 0.9714 - val_loss: 0.1551 - val_ac
c: 0.7760
Epoch 931/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1538 - val_ac
c: 0.7760
Epoch 932/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0172 - acc: 0.9500 - val_loss: 0.1547 - val_ac
c: 0.7700
Epoch 933/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0138 - acc: 1.0000 - val_loss: 0.1564 - val_ac
c: 0.7680
Epoch 934/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0158 - acc: 0.9714 - val_loss: 0.1542 - val_ac
c: 0.7660
Epoch 935/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0147 - acc: 0.9929 - val_loss: 0.1521 - val_ac
c: 0.7660
Epoch 936/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0165 - acc: 0.9643 - val_loss: 0.1516 - val_ac
c: 0.7680
Epoch 937/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0163 - acc: 0.9786 - val_loss: 0.1504 - val_ac
c: 0.7780
Epoch 938/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0147 - acc: 0.9857 - val_loss: 0.1494 - val_ac
c: 0.7860
Epoch 939/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1449 - val_ac
c: 0.7920
Epoch 940/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0147 - acc: 0.9714 - val_loss: 0.1416 - val_ac
c: 0.7860
Epoch 941/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0154 - acc: 0.9929 - val_loss: 0.1377 - val_ac
c: 0.7880
Epoch 942/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0168 - acc: 0.9643 - val_loss: 0.1373 - val_ac
c: 0.7900
Epoch 943/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1409 - val_ac
c: 0.7940
Epoch 944/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0144 - acc: 0.9929 - val_loss: 0.1456 - val_ac
c: 0.7720
Epoch 945/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0137 - acc: 0.9929 - val_loss: 0.1523 - val_ac
c: 0.7620
Epoch 946/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0156 - acc: 0.9857 - val_loss: 0.1557 - val_ac
c: 0.7600
```

```
Epoch 947/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0150 - acc: 0.9786 - val_loss: 0.1587 - val_ac
c: 0.7560
Epoch 948/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0139 - acc: 0.9857 - val_loss: 0.1543 - val_ac
c: 0.7600
Epoch 949/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0141 - acc: 0.9929 - val_loss: 0.1500 - val_ac
c: 0.7620
Epoch 950/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0142 - acc: 0.9786 - val_loss: 0.1450 - val_ac
c: 0.7760
Epoch 951/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1400 - val_ac
c: 0.7820
Epoch 952/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0135 - acc: 0.9857 - val_loss: 0.1379 - val_ac
c: 0.7820
Epoch 953/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0138 - acc: 0.9929 - val_loss: 0.1369 - val_ac
c: 0.7940
Epoch 954/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0163 - acc: 0.9786 - val_loss: 0.1367 - val_ac
c: 0.7760
Epoch 955/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0153 - acc: 0.9714 - val_loss: 0.1377 - val_ac
c: 0.7760
Epoch 956/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0130 - acc: 0.9857 - val_loss: 0.1383 - val_ac
c: 0.7760
Epoch 957/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0139 - acc: 0.9857 - val_loss: 0.1411 - val_ac
c: 0.7680
Epoch 958/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0135 - acc: 0.9929 - val_loss: 0.1470 - val_ac
c: 0.7600
Epoch 959/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0159 - acc: 0.9714 - val_loss: 0.1522 - val_ac
c: 0.7540
Epoch 960/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0131 - acc: 0.9929 - val_loss: 0.1613 - val_ac
c: 0.7440
Epoch 961/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0155 - acc: 0.9786 - val_loss: 0.1677 - val_ac
c: 0.7360
Epoch 962/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0149 - acc: 0.9857 - val_loss: 0.1694 - val_ac
c: 0.7380
Epoch 963/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0147 - acc: 0.9786 - val_loss: 0.1618 - val_ac
c: 0.7500
Epoch 964/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0161 - acc: 0.9714 - val_loss: 0.1479 - val_ac
c: 0.7680
Epoch 965/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0152 - acc: 0.9714 - val_loss: 0.1386 - val_ac
c: 0.7740
Epoch 966/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0143 - acc: 0.9857 - val_loss: 0.1351 - val_ac
c: 0.7740
Epoch 967/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0150 - acc: 0.9786 - val_loss: 0.1348 - val_ac
c: 0.7700
Epoch 968/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0137 - acc: 0.9929 - val_loss: 0.1344 - val_ac
c: 0.7740
Epoch 969/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0161 - acc: 0.9857 - val_loss: 0.1366 - val_ac
c: 0.7700
Epoch 970/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0158 - acc: 0.9786 - val_loss: 0.1408 - val_ac
```

```
c: 0.7700
Epoch 971/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0146 - acc: 0.9857 - val_loss: 0.1472 - val_ac
c: 0.7740
Epoch 972/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0136 - acc: 0.9786 - val_loss: 0.1528 - val_ac
c: 0.7640
Epoch 973/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0131 - acc: 1.0000 - val_loss: 0.1567 - val_ac
c: 0.7580
Epoch 974/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0149 - acc: 0.9714 - val_loss: 0.1587 - val_ac
c: 0.7620
Epoch 975/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0143 - acc: 0.9929 - val_loss: 0.1550 - val_ac
c: 0.7680
Epoch 976/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0129 - acc: 1.0000 - val_loss: 0.1478 - val_ac
c: 0.7860
Epoch 977/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0130 - acc: 1.0000 - val_loss: 0.1414 - val_ac
c: 0.7820
Epoch 978/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0124 - acc: 0.9857 - val_loss: 0.1381 - val_ac
c: 0.7740
Epoch 979/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0154 - acc: 0.9714 - val_loss: 0.1394 - val_ac
c: 0.7660
Epoch 980/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0148 - acc: 0.9571 - val_loss: 0.1423 - val_ac
c: 0.7480
Epoch 981/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0131 - acc: 0.9786 - val_loss: 0.1451 - val_ac
c: 0.7400
Epoch 982/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0140 - acc: 0.9786 - val_loss: 0.1483 - val_ac
c: 0.7560
Epoch 983/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0145 - acc: 0.9714 - val_loss: 0.1548 - val_ac
c: 0.7620
Epoch 984/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1589 - val_ac
c: 0.7680
Epoch 985/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0138 - acc: 0.9857 - val_loss: 0.1584 - val_ac
c: 0.7680
Epoch 986/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0155 - acc: 0.9786 - val_loss: 0.1526 - val_ac
c: 0.7600
Epoch 987/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0127 - acc: 0.9929 - val_loss: 0.1447 - val_ac
c: 0.7640
Epoch 988/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0156 - acc: 0.9643 - val_loss: 0.1372 - val_ac
c: 0.7720
Epoch 989/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0146 - acc: 0.9857 - val_loss: 0.1351 - val_ac
c: 0.7820
Epoch 990/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0152 - acc: 0.9929 - val_loss: 0.1370 - val_ac
c: 0.7780
Epoch 991/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0142 - acc: 0.9857 - val_loss: 0.1426 - val_ac
c: 0.7740
Epoch 992/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0145 - acc: 0.9929 - val_loss: 0.1478 - val_ac
c: 0.7660
Epoch 993/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0142 - acc: 1.0000 - val_loss: 0.1491 - val_ac
c: 0.7660
Epoch 994/1000
```

```
1/1 [==============================] - 0s 175ms/step - loss: 0.0142 - acc: 0.9857 - val_loss: 0.1499 - val_ac
c: 0.7680
Epoch 995/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0160 - acc: 0.9643 - val_loss: 0.1488 - val_ac
c: 0.7680
Epoch 996/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0150 - acc: 0.9929 - val_loss: 0.1462 - val_ac
c: 0.7740
Epoch 997/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0150 - acc: 0.9857 - val_loss: 0.1448 - val_ac
c: 0.7800
Epoch 998/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0142 - acc: 0.9929 - val_loss: 0.1451 - val_ac
c: 0.7780
Epoch 999/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0137 - acc: 0.9929 - val_loss: 0.1440 - val_ac
c: 0.7840
Epoch 1000/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0165 - acc: 0.9786 - val_loss: 0.1434 - val_ac
c: 0.7820
```

Out[ ]: <tensorflow.python.keras.callbacks.History at 0x28987542188>

In [ ]:
```
# Evaluate model
X_te = X[test_mask]
A_te = A[test_mask,:][:,test_mask]
y_te = labels_encoded[test_mask]

y_pred = model.predict([X_te, A_te], batch_size=N)
report = classification_report(np.argmax(y_te,axis=1), np.argmax(y_pred,axis=1), target_names=classes)
print('GCN Classification Report: \n {}'.format(report))
```

```
GCN Classification Report:
                        precision    recall  f1-score   support

            Case_Based       0.70      0.81      0.75       114
    Genetic_Algorithms       0.88      0.88      0.88       156
       Neural_Networks       0.79      0.66      0.71       290
 Probabilistic_Methods       0.78      0.71      0.74       172
Reinforcement_Learning       0.62      0.80      0.70        85
         Rule_Learning       0.57      0.83      0.68        60
                Theory       0.61      0.58      0.59       123

              accuracy                           0.73      1000
             macro avg       0.71      0.75      0.72      1000
          weighted avg       0.74      0.73      0.73      1000
```

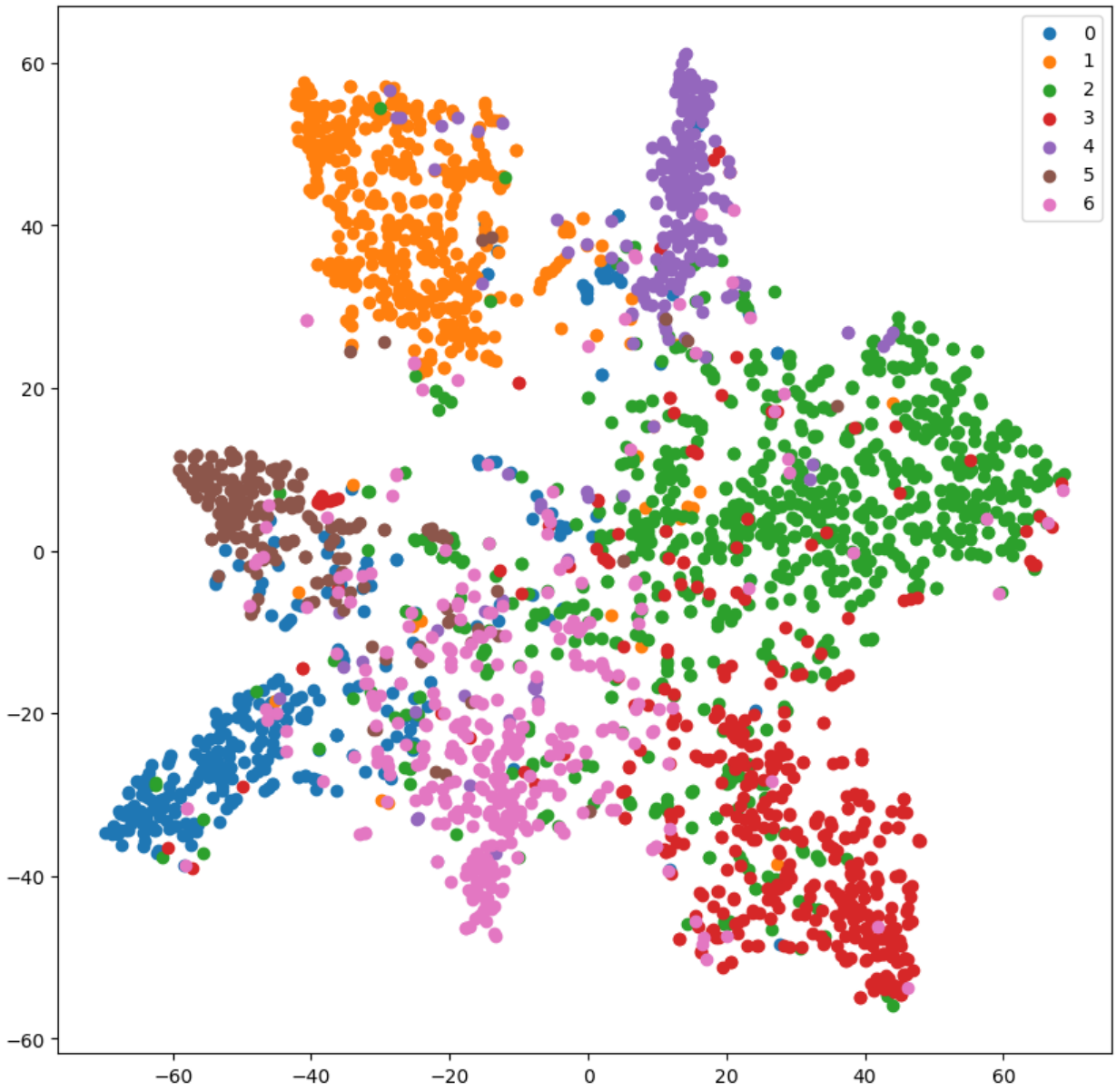
Get hidden layer representation for GCN

In [ ]:
```
layer_outputs = [layer.output for layer in model.layers]
activation_model = Model(inputs=model.input, outputs=layer_outputs)
activations = activation_model.predict([X,A],batch_size=N)

#Get t-SNE Representation
#get the hidden layer representation after the first GCN layer
x_tsne = TSNE(n_components=2).fit_transform(activations[3])
```

In [ ]:
```
def plot_tSNE(labels_encoded,x_tsne):
    color_map = np.argmax(labels_encoded, axis=1)
    plt.figure(figsize=(10,10))
    for cl in range(num_classes):
        indices = np.where(color_map==cl)
        indices = indices[0]
        plt.scatter(x_tsne[indices,0], x_tsne[indices, 1], label=cl)
    plt.legend()
    plt.show()

plot_tSNE(labels_encoded,x_tsne)
```



Comparison to Fully-Connected Neural Networks

Building and Training FNN

In [ ]:
```
es_patience = 500
optimizer = Adam(lr=1e-2)
l2_reg = 5e-4
epochs = 1000

#Compare with FNN
#Construct the model
model_fnn = Sequential()
model_fnn.add(Dense(
                    128,
                    input_dim=X.shape[1],
                    activation=tf.nn.relu,
                    kernel_regularizer=tf.keras.regularizers.l2(l2_reg))
              )
model_fnn.add(Dropout(0.5))
model_fnn.add(Dense(256, activation=tf.nn.relu))
model_fnn.add(Dropout(0.5))
model_fnn.add(Dense(num_classes, activation=tf.keras.activations.softmax))
```

```
model_fnn.compile(optimizer=optimizer,
              loss='categorical_crossentropy',
              weighted_metrics=['acc'])


#define TensorBoard
tbCallBack_FNN = TensorBoard(
    log_dir='./Tensorboard_FNN_cora',
)

#Train model
validation_data_fnn = (X, labels_encoded, val_mask)
model_fnn.fit(
                X,labels_encoded,
                sample_weight=train_mask,
                epochs=epochs,
                batch_size=N,
                validation_data=validation_data_fnn,
                shuffle=False,
                callbacks=[
                  EarlyStopping(patience=es_patience,  restore_best_weights=True),
                  tbCallBack_FNN
          ])
```

```
Epoch 1/1000
1/1 [==============================] - 0s 273ms/step - loss: 0.2181 - acc: 0.1643 - val_loss: 0.4326 - val_ac
c: 0.3220
Epoch 2/1000
1/1 [==============================] - ETA: 0s - loss: 0.1742 - acc: 0.4000WARNING:tensorflow:Method (on_trai
n_batch_end) is slow compared to the batch update (0.151014). Check your callbacks.
1/1 [==============================] - 0s 177ms/step - loss: 0.1742 - acc: 0.4000 - val_loss: 0.3955 - val_ac
c: 0.4580
Epoch 3/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.1397 - acc: 0.5857 - val_loss: 0.3610 - val_ac
c: 0.5340
Epoch 4/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.1081 - acc: 0.7357 - val_loss: 0.3283 - val_ac
c: 0.5460
Epoch 5/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0852 - acc: 0.7643 - val_loss: 0.2957 - val_ac
c: 0.5680
Epoch 6/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0625 - acc: 0.8571 - val_loss: 0.2732 - val_ac
c: 0.5700
Epoch 7/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0515 - acc: 0.9357 - val_loss: 0.2676 - val_ac
c: 0.5360
Epoch 8/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0428 - acc: 0.9571 - val_loss: 0.2602 - val_ac
c: 0.5920
Epoch 9/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0429 - acc: 0.9571 - val_loss: 0.2648 - val_ac
c: 0.5980
Epoch 10/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0411 - acc: 0.9929 - val_loss: 0.2874 - val_ac
c: 0.5720
Epoch 11/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0413 - acc: 0.9857 - val_loss: 0.3204 - val_ac
c: 0.5560
Epoch 12/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0413 - acc: 0.9929 - val_loss: 0.3415 - val_ac
c: 0.5580
Epoch 13/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0397 - acc: 1.0000 - val_loss: 0.3647 - val_ac
c: 0.5540
Epoch 14/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0379 - acc: 1.0000 - val_loss: 0.3850 - val_ac
c: 0.5400
Epoch 15/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0361 - acc: 0.9929 - val_loss: 0.3988 - val_ac
c: 0.5360
Epoch 16/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0331 - acc: 0.9857 - val_loss: 0.3992 - val_ac
c: 0.5320
Epoch 17/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0305 - acc: 0.9929 - val_loss: 0.3927 - val_ac
c: 0.5320
Epoch 18/1000
1/1 [==============================] - 0s 230ms/step - loss: 0.0269 - acc: 1.0000 - val_loss: 0.3894 - val_ac
c: 0.5360
Epoch 19/1000
1/1 [==============================] - 0s 231ms/step - loss: 0.0247 - acc: 1.0000 - val_loss: 0.3859 - val_ac
c: 0.5400
Epoch 20/1000
1/1 [==============================] - 0s 300ms/step - loss: 0.0254 - acc: 0.9786 - val_loss: 0.3761 - val_ac
c: 0.5340
Epoch 21/1000
1/1 [==============================] - 0s 282ms/step - loss: 0.0213 - acc: 1.0000 - val_loss: 0.3717 - val_ac
c: 0.5440
Epoch 22/1000
1/1 [==============================] - 0s 258ms/step - loss: 0.0233 - acc: 0.9571 - val_loss: 0.3721 - val_ac
c: 0.5460
Epoch 23/1000
1/1 [==============================] - 0s 349ms/step - loss: 0.0213 - acc: 0.9714 - val_loss: 0.3683 - val_ac
c: 0.5300
```

```
Epoch 24/1000
1/1 [==============================] - 0s 293ms/step - loss: 0.0185 - acc: 0.9857 - val_loss: 0.3707 - val_ac
c: 0.5260
Epoch 25/1000
1/1 [==============================] - 0s 244ms/step - loss: 0.0180 - acc: 0.9929 - val_loss: 0.3731 - val_ac
c: 0.5220
Epoch 26/1000
1/1 [==============================] - 0s 247ms/step - loss: 0.0174 - acc: 1.0000 - val_loss: 0.3702 - val_ac
c: 0.5100
Epoch 27/1000
1/1 [==============================] - 0s 234ms/step - loss: 0.0188 - acc: 0.9714 - val_loss: 0.3514 - val_ac
c: 0.5260
Epoch 28/1000
1/1 [==============================] - 0s 262ms/step - loss: 0.0191 - acc: 0.9786 - val_loss: 0.3273 - val_ac
c: 0.5360
Epoch 29/1000
1/1 [==============================] - 0s 238ms/step - loss: 0.0180 - acc: 0.9786 - val_loss: 0.3115 - val_ac
c: 0.5600
Epoch 30/1000
1/1 [==============================] - 0s 255ms/step - loss: 0.0203 - acc: 0.9714 - val_loss: 0.3128 - val_ac
c: 0.5520
Epoch 31/1000
1/1 [==============================] - 0s 284ms/step - loss: 0.0195 - acc: 0.9786 - val_loss: 0.3167 - val_ac
c: 0.5360
Epoch 32/1000
1/1 [==============================] - 0s 246ms/step - loss: 0.0180 - acc: 0.9929 - val_loss: 0.3155 - val_ac
c: 0.5360
Epoch 33/1000
1/1 [==============================] - 0s 247ms/step - loss: 0.0186 - acc: 0.9929 - val_loss: 0.3196 - val_ac
c: 0.5260
Epoch 34/1000
1/1 [==============================] - 0s 331ms/step - loss: 0.0198 - acc: 0.9929 - val_loss: 0.3158 - val_ac
c: 0.5340
Epoch 35/1000
1/1 [==============================] - 0s 261ms/step - loss: 0.0184 - acc: 1.0000 - val_loss: 0.3140 - val_ac
c: 0.5440
Epoch 36/1000
1/1 [==============================] - 0s 244ms/step - loss: 0.0198 - acc: 0.9929 - val_loss: 0.3214 - val_ac
c: 0.5460
Epoch 37/1000
1/1 [==============================] - 0s 260ms/step - loss: 0.0199 - acc: 0.9929 - val_loss: 0.3274 - val_ac
c: 0.5460
Epoch 38/1000
1/1 [==============================] - 0s 278ms/step - loss: 0.0209 - acc: 0.9929 - val_loss: 0.3339 - val_ac
c: 0.5320
Epoch 39/1000
1/1 [==============================] - 0s 298ms/step - loss: 0.0202 - acc: 0.9929 - val_loss: 0.3395 - val_ac
c: 0.5380
Epoch 40/1000
1/1 [==============================] - 0s 245ms/step - loss: 0.0221 - acc: 0.9929 - val_loss: 0.3370 - val_ac
c: 0.5320
Epoch 41/1000
1/1 [==============================] - 0s 239ms/step - loss: 0.0211 - acc: 0.9929 - val_loss: 0.3377 - val_ac
c: 0.5360
Epoch 42/1000
1/1 [==============================] - 0s 217ms/step - loss: 0.0218 - acc: 0.9786 - val_loss: 0.3372 - val_ac
c: 0.5360
Epoch 43/1000
1/1 [==============================] - 0s 227ms/step - loss: 0.0193 - acc: 1.0000 - val_loss: 0.3339 - val_ac
c: 0.5280
Epoch 44/1000
1/1 [==============================] - 0s 275ms/step - loss: 0.0185 - acc: 1.0000 - val_loss: 0.3331 - val_ac
c: 0.5340
Epoch 45/1000
1/1 [==============================] - 0s 293ms/step - loss: 0.0211 - acc: 0.9857 - val_loss: 0.3378 - val_ac
c: 0.5380
Epoch 46/1000
1/1 [==============================] - 0s 214ms/step - loss: 0.0191 - acc: 0.9857 - val_loss: 0.3450 - val_ac
c: 0.5180
Epoch 47/1000
1/1 [==============================] - 0s 227ms/step - loss: 0.0187 - acc: 0.9929 - val_loss: 0.3510 - val_ac
```

```
c: 0.5120
Epoch 48/1000
1/1 [==============================] - 0s 228ms/step - loss: 0.0189 - acc: 0.9786 - val_loss: 0.3613 - val_ac
c: 0.5120
Epoch 49/1000
1/1 [==============================] - 0s 256ms/step - loss: 0.0187 - acc: 0.9786 - val_loss: 0.3701 - val_ac
c: 0.4960
Epoch 50/1000
1/1 [==============================] - 0s 238ms/step - loss: 0.0192 - acc: 0.9786 - val_loss: 0.3747 - val_ac
c: 0.4840
Epoch 51/1000
1/1 [==============================] - 0s 212ms/step - loss: 0.0178 - acc: 0.9857 - val_loss: 0.3658 - val_ac
c: 0.4900
Epoch 52/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0184 - acc: 0.9857 - val_loss: 0.3604 - val_ac
c: 0.4980
Epoch 53/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0204 - acc: 0.9571 - val_loss: 0.3511 - val_ac
c: 0.5000
Epoch 54/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0169 - acc: 1.0000 - val_loss: 0.3441 - val_ac
c: 0.5060
Epoch 55/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0175 - acc: 0.9857 - val_loss: 0.3367 - val_ac
c: 0.5180
Epoch 56/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0190 - acc: 0.9786 - val_loss: 0.3318 - val_ac
c: 0.5240
Epoch 57/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0216 - acc: 0.9643 - val_loss: 0.3309 - val_ac
c: 0.5320
Epoch 58/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0202 - acc: 0.9786 - val_loss: 0.3378 - val_ac
c: 0.5180
Epoch 59/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0201 - acc: 0.9786 - val_loss: 0.3449 - val_ac
c: 0.5160
Epoch 60/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0198 - acc: 0.9786 - val_loss: 0.3533 - val_ac
c: 0.5140
Epoch 61/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0202 - acc: 0.9857 - val_loss: 0.3622 - val_ac
c: 0.5060
Epoch 62/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0221 - acc: 0.9786 - val_loss: 0.3607 - val_ac
c: 0.5140
Epoch 63/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0207 - acc: 0.9929 - val_loss: 0.3578 - val_ac
c: 0.5140
Epoch 64/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0234 - acc: 0.9714 - val_loss: 0.3450 - val_ac
c: 0.5240
Epoch 65/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0213 - acc: 0.9857 - val_loss: 0.3310 - val_ac
c: 0.5340
Epoch 66/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0277 - acc: 0.9571 - val_loss: 0.3170 - val_ac
c: 0.5600
Epoch 67/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0258 - acc: 0.9786 - val_loss: 0.3106 - val_ac
c: 0.5880
Epoch 68/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0247 - acc: 0.9643 - val_loss: 0.3129 - val_ac
c: 0.5900
Epoch 69/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0246 - acc: 0.9857 - val_loss: 0.3159 - val_ac
c: 0.5740
Epoch 70/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0232 - acc: 0.9857 - val_loss: 0.3230 - val_ac
c: 0.5740
Epoch 71/1000
```

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1/1 [==============================] - 0s 183ms/step - loss: 0.0238 - acc: 0.9929 - val_loss: 0.3333 - val_ac
c: 0.5820
Epoch 72/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0271 - acc: 0.9857 - val_loss: 0.3451 - val_ac
c: 0.5800
Epoch 73/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0263 - acc: 0.9786 - val_loss: 0.3607 - val_ac
c: 0.5600
Epoch 74/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0255 - acc: 0.9714 - val_loss: 0.3684 - val_ac
c: 0.5500
Epoch 75/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0252 - acc: 0.9857 - val_loss: 0.3692 - val_ac
c: 0.5400
Epoch 76/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0268 - acc: 0.9714 - val_loss: 0.3654 - val_ac
c: 0.5240
Epoch 77/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0258 - acc: 0.9929 - val_loss: 0.3641 - val_ac
c: 0.5340
Epoch 78/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0273 - acc: 0.9929 - val_loss: 0.3675 - val_ac
c: 0.5340
Epoch 79/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0263 - acc: 0.9929 - val_loss: 0.3693 - val_ac
c: 0.5160
Epoch 80/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0285 - acc: 0.9643 - val_loss: 0.3603 - val_ac
c: 0.5340
Epoch 81/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0258 - acc: 1.0000 - val_loss: 0.3553 - val_ac
c: 0.5460
Epoch 82/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0267 - acc: 0.9929 - val_loss: 0.3501 - val_ac
c: 0.5500
Epoch 83/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0332 - acc: 0.9643 - val_loss: 0.3477 - val_ac
c: 0.5560
Epoch 84/1000
1/1 [==============================] - 0s 200ms/step - loss: 0.0291 - acc: 0.9714 - val_loss: 0.3488 - val_ac
c: 0.5380
Epoch 85/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0318 - acc: 0.9571 - val_loss: 0.3665 - val_ac
c: 0.5100
Epoch 86/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0272 - acc: 0.9857 - val_loss: 0.3792 - val_ac
c: 0.4900
Epoch 87/1000
1/1 [==============================] - 0s 194ms/step - loss: 0.0293 - acc: 0.9786 - val_loss: 0.3882 - val_ac
c: 0.4860
Epoch 88/1000
1/1 [==============================] - 0s 209ms/step - loss: 0.0279 - acc: 0.9714 - val_loss: 0.3983 - val_ac
c: 0.4700
Epoch 89/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0292 - acc: 0.9857 - val_loss: 0.4001 - val_ac
c: 0.4640
Epoch 90/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0293 - acc: 0.9643 - val_loss: 0.3906 - val_ac
c: 0.4700
Epoch 91/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0289 - acc: 0.9714 - val_loss: 0.3762 - val_ac
c: 0.4960
Epoch 92/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0281 - acc: 0.9786 - val_loss: 0.3673 - val_ac
c: 0.5200
Epoch 93/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0278 - acc: 0.9857 - val_loss: 0.3670 - val_ac
c: 0.5280
Epoch 94/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0284 - acc: 0.9857 - val_loss: 0.3667 - val_ac
c: 0.5280
```

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Epoch 95/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0309 - acc: 0.9714 - val_loss: 0.3681 - val_ac
c: 0.5340
Epoch 96/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0290 - acc: 0.9786 - val_loss: 0.3706 - val_ac
c: 0.5240
Epoch 97/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0305 - acc: 0.9643 - val_loss: 0.3807 - val_ac
c: 0.5000
Epoch 98/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0305 - acc: 0.9786 - val_loss: 0.3864 - val_ac
c: 0.4980
Epoch 99/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0271 - acc: 0.9929 - val_loss: 0.3890 - val_ac
c: 0.5020
Epoch 100/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0316 - acc: 0.9571 - val_loss: 0.3861 - val_ac
c: 0.5180
Epoch 101/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0273 - acc: 0.9857 - val_loss: 0.3795 - val_ac
c: 0.5140
Epoch 102/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0275 - acc: 0.9929 - val_loss: 0.3806 - val_ac
c: 0.5120
Epoch 103/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0272 - acc: 0.9857 - val_loss: 0.3818 - val_ac
c: 0.5120
Epoch 104/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0295 - acc: 0.9786 - val_loss: 0.3785 - val_ac
c: 0.5180
Epoch 105/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0292 - acc: 0.9786 - val_loss: 0.3726 - val_ac
c: 0.5240
Epoch 106/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0282 - acc: 0.9929 - val_loss: 0.3670 - val_ac
c: 0.5500
Epoch 107/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0343 - acc: 0.9786 - val_loss: 0.3616 - val_ac
c: 0.5580
Epoch 108/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0327 - acc: 0.9714 - val_loss: 0.3596 - val_ac
c: 0.5580
Epoch 109/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0278 - acc: 0.9857 - val_loss: 0.3607 - val_ac
c: 0.5460
Epoch 110/1000
1/1 [==============================] - 0s 207ms/step - loss: 0.0324 - acc: 0.9714 - val_loss: 0.3615 - val_ac
c: 0.5340
Epoch 111/1000
1/1 [==============================] - 0s 203ms/step - loss: 0.0325 - acc: 0.9571 - val_loss: 0.3610 - val_ac
c: 0.5240
Epoch 112/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0306 - acc: 0.9857 - val_loss: 0.3622 - val_ac
c: 0.5000
Epoch 113/1000
1/1 [==============================] - 0s 192ms/step - loss: 0.0290 - acc: 0.9929 - val_loss: 0.3710 - val_ac
c: 0.4960
Epoch 114/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0272 - acc: 1.0000 - val_loss: 0.3861 - val_ac
c: 0.4860
Epoch 115/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0299 - acc: 0.9857 - val_loss: 0.3992 - val_ac
c: 0.4780
Epoch 116/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0310 - acc: 0.9714 - val_loss: 0.4224 - val_ac
c: 0.4560
Epoch 117/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0306 - acc: 0.9857 - val_loss: 0.4305 - val_ac
c: 0.4600
Epoch 118/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0296 - acc: 0.9857 - val_loss: 0.4399 - val_ac
```

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c: 0.4720
Epoch 119/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0291 - acc: 0.9857 - val_loss: 0.4471 - val_ac
c: 0.4720
Epoch 120/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0324 - acc: 0.9643 - val_loss: 0.4388 - val_ac
c: 0.4780
Epoch 121/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0313 - acc: 0.9714 - val_loss: 0.4308 - val_ac
c: 0.4760
Epoch 122/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0281 - acc: 1.0000 - val_loss: 0.4246 - val_ac
c: 0.4780
Epoch 123/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0316 - acc: 0.9714 - val_loss: 0.4093 - val_ac
c: 0.4800
Epoch 124/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0292 - acc: 0.9857 - val_loss: 0.3975 - val_ac
c: 0.4900
Epoch 125/1000
1/1 [==============================] - 0s 195ms/step - loss: 0.0285 - acc: 1.0000 - val_loss: 0.3877 - val_ac
c: 0.4880
Epoch 126/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0284 - acc: 1.0000 - val_loss: 0.3733 - val_ac
c: 0.5080
Epoch 127/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0303 - acc: 0.9786 - val_loss: 0.3587 - val_ac
c: 0.5260
Epoch 128/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0298 - acc: 0.9714 - val_loss: 0.3490 - val_ac
c: 0.5480
Epoch 129/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0306 - acc: 0.9857 - val_loss: 0.3427 - val_ac
c: 0.5580
Epoch 130/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0302 - acc: 0.9786 - val_loss: 0.3407 - val_ac
c: 0.5640
Epoch 131/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0289 - acc: 0.9786 - val_loss: 0.3432 - val_ac
c: 0.5640
Epoch 132/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0302 - acc: 0.9643 - val_loss: 0.3452 - val_ac
c: 0.5700
Epoch 133/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0291 - acc: 0.9857 - val_loss: 0.3460 - val_ac
c: 0.5700
Epoch 134/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0278 - acc: 0.9857 - val_loss: 0.3557 - val_ac
c: 0.5780
Epoch 135/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0283 - acc: 0.9857 - val_loss: 0.3593 - val_ac
c: 0.5560
Epoch 136/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0316 - acc: 0.9786 - val_loss: 0.3592 - val_ac
c: 0.5440
Epoch 137/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0303 - acc: 0.9714 - val_loss: 0.3626 - val_ac
c: 0.5540
Epoch 138/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0277 - acc: 0.9857 - val_loss: 0.3691 - val_ac
c: 0.5520
Epoch 139/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0294 - acc: 0.9714 - val_loss: 0.3778 - val_ac
c: 0.5480
Epoch 140/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0296 - acc: 0.9643 - val_loss: 0.3812 - val_ac
c: 0.5520
Epoch 141/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0268 - acc: 1.0000 - val_loss: 0.3869 - val_ac
c: 0.5340
Epoch 142/1000
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1/1 [==============================] - 0s 172ms/step - loss: 0.0311 - acc: 0.9714 - val_loss: 0.3833 - val_ac
c: 0.5460
Epoch 143/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0321 - acc: 0.9571 - val_loss: 0.3671 - val_ac
c: 0.5440
Epoch 144/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0289 - acc: 0.9857 - val_loss: 0.3622 - val_ac
c: 0.5480
Epoch 145/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0320 - acc: 0.9714 - val_loss: 0.3695 - val_ac
c: 0.5580
Epoch 146/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0327 - acc: 0.9714 - val_loss: 0.3785 - val_ac
c: 0.5480
Epoch 147/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0358 - acc: 0.9643 - val_loss: 0.3893 - val_ac
c: 0.5400
Epoch 148/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0309 - acc: 0.9857 - val_loss: 0.4003 - val_ac
c: 0.5260
Epoch 149/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0321 - acc: 0.9857 - val_loss: 0.4141 - val_ac
c: 0.5100
Epoch 150/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0316 - acc: 0.9929 - val_loss: 0.4246 - val_ac
c: 0.5000
Epoch 151/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0323 - acc: 0.9857 - val_loss: 0.4344 - val_ac
c: 0.4880
Epoch 152/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0338 - acc: 0.9786 - val_loss: 0.4297 - val_ac
c: 0.4960
Epoch 153/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0340 - acc: 0.9714 - val_loss: 0.4222 - val_ac
c: 0.5060
Epoch 154/1000
1/1 [==============================] - 0s 231ms/step - loss: 0.0351 - acc: 0.9714 - val_loss: 0.4203 - val_ac
c: 0.5120
Epoch 155/1000
1/1 [==============================] - 0s 198ms/step - loss: 0.0335 - acc: 0.9857 - val_loss: 0.4190 - val_ac
c: 0.5220
Epoch 156/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0329 - acc: 0.9857 - val_loss: 0.4197 - val_ac
c: 0.5280
Epoch 157/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0351 - acc: 0.9714 - val_loss: 0.4172 - val_ac
c: 0.5220
Epoch 158/1000
1/1 [==============================] - 0s 218ms/step - loss: 0.0343 - acc: 0.9786 - val_loss: 0.4135 - val_ac
c: 0.5180
Epoch 159/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0360 - acc: 0.9857 - val_loss: 0.4145 - val_ac
c: 0.5180
Epoch 160/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0363 - acc: 0.9786 - val_loss: 0.4142 - val_ac
c: 0.5260
Epoch 161/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0386 - acc: 0.9643 - val_loss: 0.4063 - val_ac
c: 0.5160
Epoch 162/1000
1/1 [==============================] - 0s 202ms/step - loss: 0.0336 - acc: 0.9929 - val_loss: 0.4086 - val_ac
c: 0.5060
Epoch 163/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0356 - acc: 0.9714 - val_loss: 0.4080 - val_ac
c: 0.5100
Epoch 164/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0360 - acc: 0.9786 - val_loss: 0.4035 - val_ac
c: 0.5040
Epoch 165/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0361 - acc: 0.9714 - val_loss: 0.3999 - val_ac
c: 0.5060
```

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Epoch 166/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0350 - acc: 0.9786 - val_loss: 0.3961 - val_ac
c: 0.5100
Epoch 167/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0387 - acc: 0.9429 - val_loss: 0.4043 - val_ac
c: 0.5040
Epoch 168/1000
1/1 [==============================] - 0s 221ms/step - loss: 0.0339 - acc: 0.9929 - val_loss: 0.4124 - val_ac
c: 0.4900
Epoch 169/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0361 - acc: 0.9857 - val_loss: 0.4142 - val_ac
c: 0.4920
Epoch 170/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0354 - acc: 0.9643 - val_loss: 0.4206 - val_ac
c: 0.5040
Epoch 171/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0394 - acc: 0.9714 - val_loss: 0.4387 - val_ac
c: 0.4840
Epoch 172/1000
1/1 [==============================] - 0s 211ms/step - loss: 0.0374 - acc: 0.9643 - val_loss: 0.4555 - val_ac
c: 0.4780
Epoch 173/1000
1/1 [==============================] - 0s 166ms/step - loss: 0.0384 - acc: 0.9357 - val_loss: 0.4542 - val_ac
c: 0.4860
Epoch 174/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0376 - acc: 0.9786 - val_loss: 0.4443 - val_ac
c: 0.4840
Epoch 175/1000
1/1 [==============================] - 0s 216ms/step - loss: 0.0367 - acc: 0.9643 - val_loss: 0.4411 - val_ac
c: 0.5060
Epoch 176/1000
1/1 [==============================] - 0s 207ms/step - loss: 0.0335 - acc: 1.0000 - val_loss: 0.4376 - val_ac
c: 0.5160
Epoch 177/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0348 - acc: 0.9786 - val_loss: 0.4200 - val_ac
c: 0.5220
Epoch 178/1000
1/1 [==============================] - 0s 206ms/step - loss: 0.0391 - acc: 0.9643 - val_loss: 0.4060 - val_ac
c: 0.5480
Epoch 179/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0387 - acc: 0.9714 - val_loss: 0.3980 - val_ac
c: 0.5600
Epoch 180/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0371 - acc: 0.9714 - val_loss: 0.3916 - val_ac
c: 0.5660
Epoch 181/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0370 - acc: 0.9857 - val_loss: 0.3891 - val_ac
c: 0.5740
Epoch 182/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0390 - acc: 0.9643 - val_loss: 0.3892 - val_ac
c: 0.5780
Epoch 183/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0369 - acc: 0.9786 - val_loss: 0.3821 - val_ac
c: 0.5700
Epoch 184/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0367 - acc: 0.9786 - val_loss: 0.3820 - val_ac
c: 0.5680
Epoch 185/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0361 - acc: 0.9857 - val_loss: 0.3910 - val_ac
c: 0.5480
Epoch 186/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0365 - acc: 0.9786 - val_loss: 0.4081 - val_ac
c: 0.5320
Epoch 187/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0371 - acc: 0.9857 - val_loss: 0.4309 - val_ac
c: 0.5060
Epoch 188/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0433 - acc: 0.9643 - val_loss: 0.4415 - val_ac
c: 0.4920
Epoch 189/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0445 - acc: 0.9500 - val_loss: 0.4539 - val_ac
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c: 0.4800
Epoch 190/1000
1/1 [==============================] - 0s 205ms/step - loss: 0.0375 - acc: 0.9857 - val_loss: 0.4604 - val_ac
c: 0.4720
Epoch 191/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0401 - acc: 0.9786 - val_loss: 0.4655 - val_ac
c: 0.4700
Epoch 192/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0437 - acc: 0.9286 - val_loss: 0.4597 - val_ac
c: 0.4900
Epoch 193/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0440 - acc: 0.9571 - val_loss: 0.4410 - val_ac
c: 0.4960
Epoch 194/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0386 - acc: 0.9714 - val_loss: 0.4329 - val_ac
c: 0.5080
Epoch 195/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0407 - acc: 0.9714 - val_loss: 0.4268 - val_ac
c: 0.5020
Epoch 196/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0408 - acc: 0.9786 - val_loss: 0.4206 - val_ac
c: 0.5080
Epoch 197/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0448 - acc: 0.9643 - val_loss: 0.4257 - val_ac
c: 0.5000
Epoch 198/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0395 - acc: 0.9857 - val_loss: 0.4363 - val_ac
c: 0.4900
Epoch 199/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0437 - acc: 0.9714 - val_loss: 0.4446 - val_ac
c: 0.4820
Epoch 200/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0421 - acc: 0.9714 - val_loss: 0.4515 - val_ac
c: 0.4840
Epoch 201/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0458 - acc: 0.9429 - val_loss: 0.4502 - val_ac
c: 0.4960
Epoch 202/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0478 - acc: 0.9786 - val_loss: 0.4457 - val_ac
c: 0.4880
Epoch 203/1000
1/1 [==============================] - 0s 199ms/step - loss: 0.0432 - acc: 0.9786 - val_loss: 0.4456 - val_ac
c: 0.4800
Epoch 204/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0421 - acc: 0.9786 - val_loss: 0.4446 - val_ac
c: 0.4740
Epoch 205/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0437 - acc: 0.9714 - val_loss: 0.4442 - val_ac
c: 0.4740
Epoch 206/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0436 - acc: 0.9714 - val_loss: 0.4417 - val_ac
c: 0.4700
Epoch 207/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0420 - acc: 0.9929 - val_loss: 0.4441 - val_ac
c: 0.4740
Epoch 208/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0462 - acc: 0.9643 - val_loss: 0.4467 - val_ac
c: 0.4700
Epoch 209/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0424 - acc: 0.9857 - val_loss: 0.4458 - val_ac
c: 0.4600
Epoch 210/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0479 - acc: 0.9714 - val_loss: 0.4384 - val_ac
c: 0.4560
Epoch 211/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0490 - acc: 0.9500 - val_loss: 0.4306 - val_ac
c: 0.4600
Epoch 212/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0432 - acc: 0.9714 - val_loss: 0.4256 - val_ac
c: 0.4780
Epoch 213/1000
```

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1/1 [==============================] - 0s 178ms/step - loss: 0.0409 - acc: 0.9786 - val_loss: 0.4242 - val_ac
c: 0.4720
Epoch 214/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0396 - acc: 0.9929 - val_loss: 0.4199 - val_ac
c: 0.4780
Epoch 215/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0435 - acc: 0.9786 - val_loss: 0.4192 - val_ac
c: 0.4860
Epoch 216/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0409 - acc: 0.9714 - val_loss: 0.4153 - val_ac
c: 0.4980
Epoch 217/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0393 - acc: 0.9857 - val_loss: 0.4176 - val_ac
c: 0.4900
Epoch 218/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0392 - acc: 0.9929 - val_loss: 0.4171 - val_ac
c: 0.4960
Epoch 219/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0466 - acc: 0.9571 - val_loss: 0.4164 - val_ac
c: 0.4980
Epoch 220/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0412 - acc: 0.9714 - val_loss: 0.4140 - val_ac
c: 0.5060
Epoch 221/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0403 - acc: 0.9643 - val_loss: 0.4153 - val_ac
c: 0.5100
Epoch 222/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0402 - acc: 0.9786 - val_loss: 0.4235 - val_ac
c: 0.5000
Epoch 223/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0420 - acc: 0.9643 - val_loss: 0.4303 - val_ac
c: 0.5020
Epoch 224/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0400 - acc: 0.9714 - val_loss: 0.4437 - val_ac
c: 0.4860
Epoch 225/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0367 - acc: 0.9857 - val_loss: 0.4499 - val_ac
c: 0.4780
Epoch 226/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0395 - acc: 0.9786 - val_loss: 0.4457 - val_ac
c: 0.4960
Epoch 227/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0484 - acc: 0.9429 - val_loss: 0.4379 - val_ac
c: 0.4840
Epoch 228/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0427 - acc: 0.9500 - val_loss: 0.4269 - val_ac
c: 0.4840
Epoch 229/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0387 - acc: 0.9786 - val_loss: 0.4251 - val_ac
c: 0.4800
Epoch 230/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0390 - acc: 0.9500 - val_loss: 0.4240 - val_ac
c: 0.4820
Epoch 231/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0384 - acc: 0.9786 - val_loss: 0.4167 - val_ac
c: 0.4740
Epoch 232/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0373 - acc: 0.9786 - val_loss: 0.4126 - val_ac
c: 0.4720
Epoch 233/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0355 - acc: 1.0000 - val_loss: 0.4093 - val_ac
c: 0.4760
Epoch 234/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0368 - acc: 0.9857 - val_loss: 0.4038 - val_ac
c: 0.4800
Epoch 235/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0378 - acc: 0.9857 - val_loss: 0.4053 - val_ac
c: 0.4820
Epoch 236/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0387 - acc: 0.9786 - val_loss: 0.3995 - val_ac
c: 0.4900
```

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Epoch 237/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0397 - acc: 0.9714 - val_loss: 0.3970 - val_ac
c: 0.4740
Epoch 238/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0359 - acc: 0.9857 - val_loss: 0.3973 - val_ac
c: 0.4760
Epoch 239/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0375 - acc: 0.9929 - val_loss: 0.4055 - val_ac
c: 0.4700
Epoch 240/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0400 - acc: 0.9643 - val_loss: 0.4105 - val_ac
c: 0.4700
Epoch 241/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0341 - acc: 0.9929 - val_loss: 0.4106 - val_ac
c: 0.4760
Epoch 242/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0381 - acc: 0.9643 - val_loss: 0.4032 - val_ac
c: 0.4820
Epoch 243/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0369 - acc: 0.9714 - val_loss: 0.3894 - val_ac
c: 0.4920
Epoch 244/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0356 - acc: 0.9857 - val_loss: 0.3797 - val_ac
c: 0.5060
Epoch 245/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0350 - acc: 0.9786 - val_loss: 0.3772 - val_ac
c: 0.5120
Epoch 246/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0340 - acc: 0.9857 - val_loss: 0.3801 - val_ac
c: 0.5220
Epoch 247/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0378 - acc: 0.9643 - val_loss: 0.3806 - val_ac
c: 0.5100
Epoch 248/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0346 - acc: 0.9714 - val_loss: 0.3868 - val_ac
c: 0.5000
Epoch 249/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0341 - acc: 0.9714 - val_loss: 0.3866 - val_ac
c: 0.5000
Epoch 250/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0331 - acc: 0.9857 - val_loss: 0.3819 - val_ac
c: 0.5200
Epoch 251/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0327 - acc: 0.9929 - val_loss: 0.3825 - val_ac
c: 0.5200
Epoch 252/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0343 - acc: 0.9714 - val_loss: 0.3774 - val_ac
c: 0.5280
Epoch 253/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0330 - acc: 0.9714 - val_loss: 0.3708 - val_ac
c: 0.5340
Epoch 254/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0346 - acc: 0.9571 - val_loss: 0.3659 - val_ac
c: 0.5460
Epoch 255/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0303 - acc: 0.9929 - val_loss: 0.3654 - val_ac
c: 0.5480
Epoch 256/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0360 - acc: 0.9857 - val_loss: 0.3694 - val_ac
c: 0.5400
Epoch 257/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0379 - acc: 0.9714 - val_loss: 0.3747 - val_ac
c: 0.5280
Epoch 258/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0317 - acc: 0.9857 - val_loss: 0.3829 - val_ac
c: 0.5220
Epoch 259/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0298 - acc: 1.0000 - val_loss: 0.3910 - val_ac
c: 0.5260
Epoch 260/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0364 - acc: 0.9714 - val_loss: 0.3878 - val_ac
```

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c: 0.5160
Epoch 261/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0341 - acc: 0.9786 - val_loss: 0.3856 - val_ac
c: 0.5180
Epoch 262/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0344 - acc: 0.9714 - val_loss: 0.3939 - val_ac
c: 0.5080
Epoch 263/1000
1/1 [==============================] - 0s 189ms/step - loss: 0.0316 - acc: 0.9857 - val_loss: 0.4090 - val_ac
c: 0.4840
Epoch 264/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0343 - acc: 0.9571 - val_loss: 0.4139 - val_ac
c: 0.4760
Epoch 265/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0329 - acc: 0.9786 - val_loss: 0.4099 - val_ac
c: 0.4740
Epoch 266/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0367 - acc: 0.9571 - val_loss: 0.3799 - val_ac
c: 0.5080
Epoch 267/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0316 - acc: 0.9714 - val_loss: 0.3637 - val_ac
c: 0.5220
Epoch 268/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0335 - acc: 0.9714 - val_loss: 0.3557 - val_ac
c: 0.5300
Epoch 269/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0331 - acc: 0.9786 - val_loss: 0.3523 - val_ac
c: 0.5300
Epoch 270/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0355 - acc: 0.9714 - val_loss: 0.3477 - val_ac
c: 0.5380
Epoch 271/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0369 - acc: 0.9643 - val_loss: 0.3415 - val_ac
c: 0.5420
Epoch 272/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0315 - acc: 0.9857 - val_loss: 0.3396 - val_ac
c: 0.5500
Epoch 273/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0322 - acc: 0.9929 - val_loss: 0.3430 - val_ac
c: 0.5680
Epoch 274/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0344 - acc: 0.9714 - val_loss: 0.3481 - val_ac
c: 0.5720
Epoch 275/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0321 - acc: 1.0000 - val_loss: 0.3513 - val_ac
c: 0.5720
Epoch 276/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0355 - acc: 0.9643 - val_loss: 0.3543 - val_ac
c: 0.5720
Epoch 277/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0346 - acc: 0.9857 - val_loss: 0.3595 - val_ac
c: 0.5640
Epoch 278/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0382 - acc: 0.9643 - val_loss: 0.3620 - val_ac
c: 0.5620
Epoch 279/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0331 - acc: 0.9857 - val_loss: 0.3663 - val_ac
c: 0.5600
Epoch 280/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0355 - acc: 0.9786 - val_loss: 0.3743 - val_ac
c: 0.5640
Epoch 281/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0332 - acc: 1.0000 - val_loss: 0.3827 - val_ac
c: 0.5500
Epoch 282/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0399 - acc: 0.9429 - val_loss: 0.3864 - val_ac
c: 0.5400
Epoch 283/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0344 - acc: 0.9857 - val_loss: 0.3898 - val_ac
c: 0.5440
Epoch 284/1000
```

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1/1 [==============================] - 0s 177ms/step - loss: 0.0351 - acc: 0.9929 - val_loss: 0.3973 - val_ac
c: 0.5300
Epoch 285/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0387 - acc: 0.9857 - val_loss: 0.4001 - val_ac
c: 0.5220
Epoch 286/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0406 - acc: 0.9500 - val_loss: 0.3923 - val_ac
c: 0.5280
Epoch 287/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0363 - acc: 0.9857 - val_loss: 0.3839 - val_ac
c: 0.5280
Epoch 288/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0371 - acc: 0.9643 - val_loss: 0.3809 - val_ac
c: 0.5320
Epoch 289/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0361 - acc: 0.9929 - val_loss: 0.3778 - val_ac
c: 0.5300
Epoch 290/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0355 - acc: 0.9857 - val_loss: 0.3772 - val_ac
c: 0.5380
Epoch 291/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0371 - acc: 0.9714 - val_loss: 0.3803 - val_ac
c: 0.5440
Epoch 292/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0390 - acc: 0.9786 - val_loss: 0.3831 - val_ac
c: 0.5340
Epoch 293/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0370 - acc: 0.9786 - val_loss: 0.3814 - val_ac
c: 0.5400
Epoch 294/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0381 - acc: 0.9571 - val_loss: 0.3754 - val_ac
c: 0.5480
Epoch 295/1000
1/1 [==============================] - 0s 193ms/step - loss: 0.0365 - acc: 0.9786 - val_loss: 0.3714 - val_ac
c: 0.5560
Epoch 296/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0417 - acc: 0.9500 - val_loss: 0.3688 - val_ac
c: 0.5540
Epoch 297/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0412 - acc: 0.9714 - val_loss: 0.3643 - val_ac
c: 0.5520
Epoch 298/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0466 - acc: 0.9500 - val_loss: 0.3629 - val_ac
c: 0.5700
Epoch 299/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0382 - acc: 0.9643 - val_loss: 0.3734 - val_ac
c: 0.5660
Epoch 300/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0362 - acc: 1.0000 - val_loss: 0.3888 - val_ac
c: 0.5400
Epoch 301/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0385 - acc: 0.9714 - val_loss: 0.4052 - val_ac
c: 0.5420
Epoch 302/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0492 - acc: 0.9286 - val_loss: 0.3888 - val_ac
c: 0.5420
Epoch 303/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0432 - acc: 0.9571 - val_loss: 0.3715 - val_ac
c: 0.5580
Epoch 304/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0421 - acc: 0.9643 - val_loss: 0.3566 - val_ac
c: 0.5680
Epoch 305/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0438 - acc: 0.9714 - val_loss: 0.3534 - val_ac
c: 0.5720
Epoch 306/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0450 - acc: 0.9643 - val_loss: 0.3621 - val_ac
c: 0.5680
Epoch 307/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0498 - acc: 0.9786 - val_loss: 0.3795 - val_ac
c: 0.5400
```

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Epoch 308/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0445 - acc: 0.9643 - val_loss: 0.3955 - val_ac
c: 0.5300
Epoch 309/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0421 - acc: 0.9929 - val_loss: 0.4108 - val_ac
c: 0.5240
Epoch 310/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0507 - acc: 0.9571 - val_loss: 0.4193 - val_ac
c: 0.5240
Epoch 311/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0427 - acc: 0.9857 - val_loss: 0.4300 - val_ac
c: 0.5080
Epoch 312/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0446 - acc: 0.9786 - val_loss: 0.4376 - val_ac
c: 0.5060
Epoch 313/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0486 - acc: 0.9714 - val_loss: 0.4430 - val_ac
c: 0.5140
Epoch 314/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0467 - acc: 0.9857 - val_loss: 0.4478 - val_ac
c: 0.4960
Epoch 315/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0473 - acc: 0.9714 - val_loss: 0.4525 - val_ac
c: 0.4920
Epoch 316/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0467 - acc: 0.9643 - val_loss: 0.4444 - val_ac
c: 0.4980
Epoch 317/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0477 - acc: 0.9643 - val_loss: 0.4382 - val_ac
c: 0.5060
Epoch 318/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0484 - acc: 0.9571 - val_loss: 0.4275 - val_ac
c: 0.5180
Epoch 319/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0443 - acc: 0.9786 - val_loss: 0.4182 - val_ac
c: 0.5160
Epoch 320/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0472 - acc: 0.9643 - val_loss: 0.4033 - val_ac
c: 0.5180
Epoch 321/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0438 - acc: 0.9857 - val_loss: 0.3925 - val_ac
c: 0.5280
Epoch 322/1000
1/1 [==============================] - 0s 201ms/step - loss: 0.0446 - acc: 0.9714 - val_loss: 0.3769 - val_ac
c: 0.5560
Epoch 323/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0458 - acc: 0.9786 - val_loss: 0.3681 - val_ac
c: 0.5540
Epoch 324/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0467 - acc: 0.9643 - val_loss: 0.3674 - val_ac
c: 0.5480
Epoch 325/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0475 - acc: 0.9714 - val_loss: 0.3688 - val_ac
c: 0.5580
Epoch 326/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0424 - acc: 0.9786 - val_loss: 0.3722 - val_ac
c: 0.5620
Epoch 327/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0455 - acc: 0.9786 - val_loss: 0.3783 - val_ac
c: 0.5400
Epoch 328/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0432 - acc: 0.9786 - val_loss: 0.3847 - val_ac
c: 0.5360
Epoch 329/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0427 - acc: 0.9643 - val_loss: 0.3901 - val_ac
c: 0.5340
Epoch 330/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0410 - acc: 0.9714 - val_loss: 0.3959 - val_ac
c: 0.5180
Epoch 331/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0425 - acc: 0.9929 - val_loss: 0.3976 - val_ac
```

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c: 0.5140
Epoch 332/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0400 - acc: 0.9857 - val_loss: 0.3998 - val_ac
c: 0.5140
Epoch 333/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0501 - acc: 0.9214 - val_loss: 0.3950 - val_ac
c: 0.5200
Epoch 334/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0424 - acc: 0.9643 - val_loss: 0.3962 - val_ac
c: 0.5100
Epoch 335/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0395 - acc: 0.9786 - val_loss: 0.4012 - val_ac
c: 0.5080
Epoch 336/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0392 - acc: 0.9643 - val_loss: 0.4079 - val_ac
c: 0.5000
Epoch 337/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0385 - acc: 0.9786 - val_loss: 0.4139 - val_ac
c: 0.5040
Epoch 338/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0382 - acc: 0.9786 - val_loss: 0.4186 - val_ac
c: 0.5060
Epoch 339/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0448 - acc: 0.9429 - val_loss: 0.4175 - val_ac
c: 0.5060
Epoch 340/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0437 - acc: 0.9571 - val_loss: 0.4179 - val_ac
c: 0.5160
Epoch 341/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0414 - acc: 0.9643 - val_loss: 0.4193 - val_ac
c: 0.5160
Epoch 342/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0374 - acc: 0.9929 - val_loss: 0.4203 - val_ac
c: 0.5140
Epoch 343/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0405 - acc: 0.9643 - val_loss: 0.4190 - val_ac
c: 0.5140
Epoch 344/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0419 - acc: 0.9643 - val_loss: 0.4209 - val_ac
c: 0.5060
Epoch 345/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0443 - acc: 0.9571 - val_loss: 0.4218 - val_ac
c: 0.5080
Epoch 346/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0493 - acc: 0.9429 - val_loss: 0.4168 - val_ac
c: 0.5320
Epoch 347/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0464 - acc: 0.9643 - val_loss: 0.4148 - val_ac
c: 0.5280
Epoch 348/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0513 - acc: 0.9429 - val_loss: 0.4088 - val_ac
c: 0.5420
Epoch 349/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0420 - acc: 0.9643 - val_loss: 0.4029 - val_ac
c: 0.5260
Epoch 350/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0429 - acc: 0.9571 - val_loss: 0.4034 - val_ac
c: 0.5280
Epoch 351/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0457 - acc: 0.9643 - val_loss: 0.4075 - val_ac
c: 0.5340
Epoch 352/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0405 - acc: 0.9857 - val_loss: 0.4149 - val_ac
c: 0.5260
Epoch 353/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0430 - acc: 0.9714 - val_loss: 0.4201 - val_ac
c: 0.5200
Epoch 354/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0452 - acc: 0.9500 - val_loss: 0.4274 - val_ac
c: 0.5160
Epoch 355/1000
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1/1 [==============================] - 0s 171ms/step - loss: 0.0445 - acc: 0.9643 - val_loss: 0.4385 - val_ac
c: 0.5060
Epoch 356/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0478 - acc: 0.9643 - val_loss: 0.4555 - val_ac
c: 0.4760
Epoch 357/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0472 - acc: 0.9571 - val_loss: 0.4633 - val_ac
c: 0.4800
Epoch 358/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0493 - acc: 0.9571 - val_loss: 0.4647 - val_ac
c: 0.4660
Epoch 359/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0427 - acc: 0.9929 - val_loss: 0.4642 - val_ac
c: 0.4660
Epoch 360/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0532 - acc: 0.9214 - val_loss: 0.4693 - val_ac
c: 0.4760
Epoch 361/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0426 - acc: 0.9929 - val_loss: 0.4780 - val_ac
c: 0.4740
Epoch 362/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0443 - acc: 0.9857 - val_loss: 0.4866 - val_ac
c: 0.4680
Epoch 363/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0470 - acc: 0.9714 - val_loss: 0.4945 - val_ac
c: 0.4660
Epoch 364/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0560 - acc: 0.9429 - val_loss: 0.5091 - val_ac
c: 0.4580
Epoch 365/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0502 - acc: 0.9500 - val_loss: 0.5249 - val_ac
c: 0.4560
Epoch 366/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0475 - acc: 0.9643 - val_loss: 0.5369 - val_ac
c: 0.4480
Epoch 367/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0465 - acc: 0.9714 - val_loss: 0.5338 - val_ac
c: 0.4440
Epoch 368/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0477 - acc: 0.9500 - val_loss: 0.5297 - val_ac
c: 0.4320
Epoch 369/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0467 - acc: 0.9643 - val_loss: 0.5193 - val_ac
c: 0.4420
Epoch 370/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0499 - acc: 0.9571 - val_loss: 0.5099 - val_ac
c: 0.4400
Epoch 371/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0527 - acc: 0.9500 - val_loss: 0.4962 - val_ac
c: 0.4480
Epoch 372/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0521 - acc: 0.9714 - val_loss: 0.4825 - val_ac
c: 0.4640
Epoch 373/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0511 - acc: 0.9643 - val_loss: 0.4655 - val_ac
c: 0.4700
Epoch 374/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0526 - acc: 0.9571 - val_loss: 0.4445 - val_ac
c: 0.4860
Epoch 375/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0454 - acc: 1.0000 - val_loss: 0.4314 - val_ac
c: 0.4940
Epoch 376/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0466 - acc: 0.9857 - val_loss: 0.4200 - val_ac
c: 0.5000
Epoch 377/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0467 - acc: 0.9786 - val_loss: 0.4137 - val_ac
c: 0.5120
Epoch 378/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0525 - acc: 0.9571 - val_loss: 0.4092 - val_ac
c: 0.5080
```

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Epoch 379/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0488 - acc: 0.9786 - val_loss: 0.4065 - val_ac
c: 0.5060
Epoch 380/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0461 - acc: 0.9857 - val_loss: 0.4035 - val_ac
c: 0.5060
Epoch 381/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0460 - acc: 0.9929 - val_loss: 0.4023 - val_ac
c: 0.5120
Epoch 382/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0468 - acc: 0.9786 - val_loss: 0.4026 - val_ac
c: 0.5160
Epoch 383/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0465 - acc: 0.9714 - val_loss: 0.4014 - val_ac
c: 0.5080
Epoch 384/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0465 - acc: 0.9786 - val_loss: 0.3987 - val_ac
c: 0.5120
Epoch 385/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0443 - acc: 0.9929 - val_loss: 0.3991 - val_ac
c: 0.5080
Epoch 386/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0495 - acc: 0.9714 - val_loss: 0.3986 - val_ac
c: 0.5040
Epoch 387/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0472 - acc: 0.9643 - val_loss: 0.3932 - val_ac
c: 0.5000
Epoch 388/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0438 - acc: 0.9857 - val_loss: 0.3934 - val_ac
c: 0.4980
Epoch 389/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0440 - acc: 0.9714 - val_loss: 0.3956 - val_ac
c: 0.5000
Epoch 390/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0481 - acc: 0.9500 - val_loss: 0.3999 - val_ac
c: 0.4920
Epoch 391/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0440 - acc: 0.9786 - val_loss: 0.4109 - val_ac
c: 0.4740
Epoch 392/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0408 - acc: 0.9786 - val_loss: 0.4181 - val_ac
c: 0.4840
Epoch 393/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0395 - acc: 0.9929 - val_loss: 0.4246 - val_ac
c: 0.4720
Epoch 394/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0406 - acc: 0.9857 - val_loss: 0.4280 - val_ac
c: 0.4660
Epoch 395/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0405 - acc: 0.9643 - val_loss: 0.4271 - val_ac
c: 0.4620
Epoch 396/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0449 - acc: 0.9714 - val_loss: 0.4244 - val_ac
c: 0.4640
Epoch 397/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0388 - acc: 0.9786 - val_loss: 0.4164 - val_ac
c: 0.4660
Epoch 398/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0398 - acc: 0.9786 - val_loss: 0.4090 - val_ac
c: 0.4640
Epoch 399/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0380 - acc: 0.9786 - val_loss: 0.4045 - val_ac
c: 0.4720
Epoch 400/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0367 - acc: 0.9857 - val_loss: 0.4070 - val_ac
c: 0.4700
Epoch 401/1000
1/1 [==============================] - 0s 196ms/step - loss: 0.0394 - acc: 0.9714 - val_loss: 0.4081 - val_ac
c: 0.4840
Epoch 402/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0402 - acc: 0.9571 - val_loss: 0.4027 - val_ac
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c: 0.5000
Epoch 403/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0437 - acc: 0.9500 - val_loss: 0.3814 - val_ac
c: 0.5140
Epoch 404/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0387 - acc: 0.9786 - val_loss: 0.3681 - val_ac
c: 0.5340
Epoch 405/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0350 - acc: 0.9857 - val_loss: 0.3585 - val_ac
c: 0.5500
Epoch 406/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0369 - acc: 0.9786 - val_loss: 0.3526 - val_ac
c: 0.5640
Epoch 407/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0354 - acc: 0.9714 - val_loss: 0.3521 - val_ac
c: 0.5660
Epoch 408/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0346 - acc: 0.9786 - val_loss: 0.3564 - val_ac
c: 0.5660
Epoch 409/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0375 - acc: 0.9929 - val_loss: 0.3640 - val_ac
c: 0.5420
Epoch 410/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0376 - acc: 0.9857 - val_loss: 0.3763 - val_ac
c: 0.5320
Epoch 411/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0358 - acc: 0.9714 - val_loss: 0.3842 - val_ac
c: 0.5020
Epoch 412/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0382 - acc: 0.9571 - val_loss: 0.3892 - val_ac
c: 0.4940
Epoch 413/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0328 - acc: 0.9857 - val_loss: 0.3950 - val_ac
c: 0.5060
Epoch 414/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0368 - acc: 0.9857 - val_loss: 0.3981 - val_ac
c: 0.5000
Epoch 415/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0380 - acc: 0.9571 - val_loss: 0.3988 - val_ac
c: 0.5000
Epoch 416/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0360 - acc: 0.9571 - val_loss: 0.4020 - val_ac
c: 0.4860
Epoch 417/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0363 - acc: 0.9571 - val_loss: 0.4024 - val_ac
c: 0.5000
Epoch 418/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0357 - acc: 0.9643 - val_loss: 0.4023 - val_ac
c: 0.5000
Epoch 419/1000
1/1 [==============================] - 0s 163ms/step - loss: 0.0323 - acc: 0.9857 - val_loss: 0.4053 - val_ac
c: 0.5000
Epoch 420/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0344 - acc: 0.9714 - val_loss: 0.4088 - val_ac
c: 0.4940
Epoch 421/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0361 - acc: 0.9643 - val_loss: 0.4098 - val_ac
c: 0.4880
Epoch 422/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0339 - acc: 0.9643 - val_loss: 0.4097 - val_ac
c: 0.4900
Epoch 423/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0338 - acc: 0.9786 - val_loss: 0.4145 - val_ac
c: 0.4920
Epoch 424/1000
1/1 [==============================] - 0s 168ms/step - loss: 0.0344 - acc: 0.9857 - val_loss: 0.4173 - val_ac
c: 0.5000
Epoch 425/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0402 - acc: 0.9500 - val_loss: 0.4195 - val_ac
c: 0.4920
Epoch 426/1000
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1/1 [==============================] - 0s 166ms/step - loss: 0.0338 - acc: 0.9786 - val_loss: 0.4250 - val_ac
c: 0.5000
Epoch 427/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0352 - acc: 0.9714 - val_loss: 0.4228 - val_ac
c: 0.4960
Epoch 428/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0369 - acc: 0.9500 - val_loss: 0.4152 - val_ac
c: 0.4960
Epoch 429/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0367 - acc: 0.9643 - val_loss: 0.4122 - val_ac
c: 0.4980
Epoch 430/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0354 - acc: 0.9786 - val_loss: 0.4131 - val_ac
c: 0.4920
Epoch 431/1000
1/1 [==============================] - 0s 162ms/step - loss: 0.0351 - acc: 0.9643 - val_loss: 0.4162 - val_ac
c: 0.4780
Epoch 432/1000
1/1 [==============================] - 0s 165ms/step - loss: 0.0358 - acc: 0.9643 - val_loss: 0.4205 - val_ac
c: 0.4720
Epoch 433/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0333 - acc: 0.9857 - val_loss: 0.4283 - val_ac
c: 0.4660
Epoch 434/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0330 - acc: 0.9929 - val_loss: 0.4359 - val_ac
c: 0.4600
Epoch 435/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0330 - acc: 0.9929 - val_loss: 0.4397 - val_ac
c: 0.4500
Epoch 436/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0335 - acc: 0.9857 - val_loss: 0.4465 - val_ac
c: 0.4500
Epoch 437/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0367 - acc: 0.9786 - val_loss: 0.4491 - val_ac
c: 0.4580
Epoch 438/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0376 - acc: 0.9714 - val_loss: 0.4459 - val_ac
c: 0.4500
Epoch 439/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0367 - acc: 0.9643 - val_loss: 0.4439 - val_ac
c: 0.4500
Epoch 440/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0365 - acc: 0.9571 - val_loss: 0.4322 - val_ac
c: 0.4600
Epoch 441/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0340 - acc: 0.9714 - val_loss: 0.4217 - val_ac
c: 0.4740
Epoch 442/1000
1/1 [==============================] - 0s 204ms/step - loss: 0.0329 - acc: 0.9857 - val_loss: 0.4146 - val_ac
c: 0.4880
Epoch 443/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0360 - acc: 0.9500 - val_loss: 0.4128 - val_ac
c: 0.4860
Epoch 444/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0340 - acc: 0.9714 - val_loss: 0.4103 - val_ac
c: 0.4880
Epoch 445/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0361 - acc: 0.9643 - val_loss: 0.4087 - val_ac
c: 0.4840
Epoch 446/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0352 - acc: 0.9429 - val_loss: 0.4055 - val_ac
c: 0.4800
Epoch 447/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0434 - acc: 0.9357 - val_loss: 0.4056 - val_ac
c: 0.4800
Epoch 448/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0348 - acc: 0.9714 - val_loss: 0.4083 - val_ac
c: 0.4840
Epoch 449/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0342 - acc: 0.9643 - val_loss: 0.4187 - val_ac
c: 0.4920
```

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Epoch 450/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0324 - acc: 0.9857 - val_loss: 0.4239 - val_ac
c: 0.4780
Epoch 451/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0325 - acc: 0.9786 - val_loss: 0.4333 - val_ac
c: 0.4660
Epoch 452/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0337 - acc: 0.9786 - val_loss: 0.4385 - val_ac
c: 0.4680
Epoch 453/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0356 - acc: 0.9714 - val_loss: 0.4435 - val_ac
c: 0.4780
Epoch 454/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0340 - acc: 0.9714 - val_loss: 0.4485 - val_ac
c: 0.4800
Epoch 455/1000
1/1 [==============================] - 0s 191ms/step - loss: 0.0367 - acc: 0.9500 - val_loss: 0.4628 - val_ac
c: 0.4680
Epoch 456/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0428 - acc: 0.9429 - val_loss: 0.4628 - val_ac
c: 0.4720
Epoch 457/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0379 - acc: 0.9500 - val_loss: 0.4558 - val_ac
c: 0.4800
Epoch 458/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0357 - acc: 0.9857 - val_loss: 0.4470 - val_ac
c: 0.4900
Epoch 459/1000
1/1 [==============================] - 0s 186ms/step - loss: 0.0332 - acc: 0.9857 - val_loss: 0.4381 - val_ac
c: 0.5100
Epoch 460/1000
1/1 [==============================] - 0s 167ms/step - loss: 0.0379 - acc: 0.9643 - val_loss: 0.4263 - val_ac
c: 0.5100
Epoch 461/1000
1/1 [==============================] - 0s 166ms/step - loss: 0.0355 - acc: 0.9786 - val_loss: 0.4219 - val_ac
c: 0.5220
Epoch 462/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0356 - acc: 0.9857 - val_loss: 0.4189 - val_ac
c: 0.5200
Epoch 463/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0431 - acc: 0.9643 - val_loss: 0.4189 - val_ac
c: 0.5160
Epoch 464/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0409 - acc: 0.9714 - val_loss: 0.4236 - val_ac
c: 0.5040
Epoch 465/1000
1/1 [==============================] - 0s 181ms/step - loss: 0.0423 - acc: 0.9643 - val_loss: 0.4258 - val_ac
c: 0.4940
Epoch 466/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0429 - acc: 0.9571 - val_loss: 0.4285 - val_ac
c: 0.5020
Epoch 467/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0430 - acc: 0.9429 - val_loss: 0.4355 - val_ac
c: 0.4940
Epoch 468/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0405 - acc: 0.9643 - val_loss: 0.4424 - val_ac
c: 0.4880
Epoch 469/1000
1/1 [==============================] - 0s 187ms/step - loss: 0.0395 - acc: 0.9786 - val_loss: 0.4471 - val_ac
c: 0.4880
Epoch 470/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0389 - acc: 0.9786 - val_loss: 0.4500 - val_ac
c: 0.4800
Epoch 471/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0443 - acc: 0.9571 - val_loss: 0.4417 - val_ac
c: 0.5020
Epoch 472/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0414 - acc: 0.9643 - val_loss: 0.4405 - val_ac
c: 0.5000
Epoch 473/1000
1/1 [==============================] - 0s 183ms/step - loss: 0.0428 - acc: 0.9571 - val_loss: 0.4423 - val_ac
```

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c: 0.5040
Epoch 474/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0426 - acc: 0.9929 - val_loss: 0.4438 - val_ac
c: 0.4960
Epoch 475/1000
1/1 [==============================] - 0s 197ms/step - loss: 0.0422 - acc: 0.9714 - val_loss: 0.4444 - val_ac
c: 0.4880
Epoch 476/1000
1/1 [==============================] - 0s 220ms/step - loss: 0.0470 - acc: 0.9643 - val_loss: 0.4310 - val_ac
c: 0.5080
Epoch 477/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0497 - acc: 0.9357 - val_loss: 0.4202 - val_ac
c: 0.5300
Epoch 478/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0484 - acc: 0.9643 - val_loss: 0.4063 - val_ac
c: 0.5360
Epoch 479/1000
1/1 [==============================] - 0s 190ms/step - loss: 0.0455 - acc: 0.9571 - val_loss: 0.3974 - val_ac
c: 0.5440
Epoch 480/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0461 - acc: 0.9643 - val_loss: 0.3901 - val_ac
c: 0.5540
Epoch 481/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0468 - acc: 0.9571 - val_loss: 0.3802 - val_ac
c: 0.5660
Epoch 482/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0471 - acc: 0.9571 - val_loss: 0.3777 - val_ac
c: 0.5640
Epoch 483/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0448 - acc: 0.9714 - val_loss: 0.3805 - val_ac
c: 0.5600
Epoch 484/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0456 - acc: 0.9714 - val_loss: 0.3859 - val_ac
c: 0.5560
Epoch 485/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0451 - acc: 0.9786 - val_loss: 0.3887 - val_ac
c: 0.5420
Epoch 486/1000
1/1 [==============================] - 0s 177ms/step - loss: 0.0461 - acc: 0.9857 - val_loss: 0.3943 - val_ac
c: 0.5380
Epoch 487/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0464 - acc: 0.9571 - val_loss: 0.4013 - val_ac
c: 0.5260
Epoch 488/1000
1/1 [==============================] - 0s 185ms/step - loss: 0.0486 - acc: 0.9714 - val_loss: 0.4069 - val_ac
c: 0.5200
Epoch 489/1000
1/1 [==============================] - 0s 178ms/step - loss: 0.0452 - acc: 0.9786 - val_loss: 0.4139 - val_ac
c: 0.5060
Epoch 490/1000
1/1 [==============================] - 0s 171ms/step - loss: 0.0467 - acc: 0.9857 - val_loss: 0.4197 - val_ac
c: 0.5060
Epoch 491/1000
1/1 [==============================] - 0s 176ms/step - loss: 0.0436 - acc: 0.9929 - val_loss: 0.4226 - val_ac
c: 0.5040
Epoch 492/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0476 - acc: 0.9500 - val_loss: 0.4270 - val_ac
c: 0.5020
Epoch 493/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0483 - acc: 0.9571 - val_loss: 0.4321 - val_ac
c: 0.5020
Epoch 494/1000
1/1 [==============================] - 0s 174ms/step - loss: 0.0460 - acc: 0.9643 - val_loss: 0.4372 - val_ac
c: 0.5080
Epoch 495/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0517 - acc: 0.9714 - val_loss: 0.4448 - val_ac
c: 0.5060
Epoch 496/1000
1/1 [==============================] - 0s 173ms/step - loss: 0.0462 - acc: 0.9714 - val_loss: 0.4505 - val_ac
c: 0.5060
Epoch 497/1000
```

```
1/1 [==============================] - 0s 192ms/step - loss: 0.0446 - acc: 0.9643 - val_loss: 0.4543 - val_ac
c: 0.4980
Epoch 498/1000
1/1 [==============================] - 0s 175ms/step - loss: 0.0440 - acc: 0.9643 - val_loss: 0.4580 - val_ac
c: 0.4840
Epoch 499/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0526 - acc: 0.9357 - val_loss: 0.4655 - val_ac
c: 0.4820
Epoch 500/1000
1/1 [==============================] - 0s 188ms/step - loss: 0.0427 - acc: 0.9643 - val_loss: 0.4682 - val_ac
c: 0.4780
Epoch 501/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0536 - acc: 0.9571 - val_loss: 0.4606 - val_ac
c: 0.4760
Epoch 502/1000
1/1 [==============================] - 0s 169ms/step - loss: 0.0417 - acc: 0.9786 - val_loss: 0.4579 - val_ac
c: 0.4700
Epoch 503/1000
1/1 [==============================] - 0s 170ms/step - loss: 0.0455 - acc: 0.9643 - val_loss: 0.4561 - val_ac
c: 0.4720
Epoch 504/1000
1/1 [==============================] - 0s 182ms/step - loss: 0.0421 - acc: 0.9786 - val_loss: 0.4511 - val_ac
c: 0.4920
Epoch 505/1000
1/1 [==============================] - 0s 184ms/step - loss: 0.0429 - acc: 0.9571 - val_loss: 0.4481 - val_ac
c: 0.4820
Epoch 506/1000
1/1 [==============================] - 0s 172ms/step - loss: 0.0458 - acc: 0.9643 - val_loss: 0.4450 - val_ac
c: 0.4820
Epoch 507/1000
1/1 [==============================] - 0s 179ms/step - loss: 0.0402 - acc: 0.9786 - val_loss: 0.4443 - val_ac
c: 0.4860
Epoch 508/1000
1/1 [==============================] - 0s 180ms/step - loss: 0.0495 - acc: 0.9357 - val_loss: 0.4498 - val_ac
c: 0.4740
```

Out[ ]: <tensorflow.python.keras.callbacks.History at 0x28996ae5888>

In [ ]:
```
# Evaluate model
y_pred = model_fnn.predict(X_te)
report = classification_report(np.argmax(y_te,axis=1), np.argmax(y_pred,axis=1), target_names=classes)
print('FCNN Classification Report: \n {}'.format(report))
```

```
FCNN Classification Report:
                         precision    recall  f1-score   support

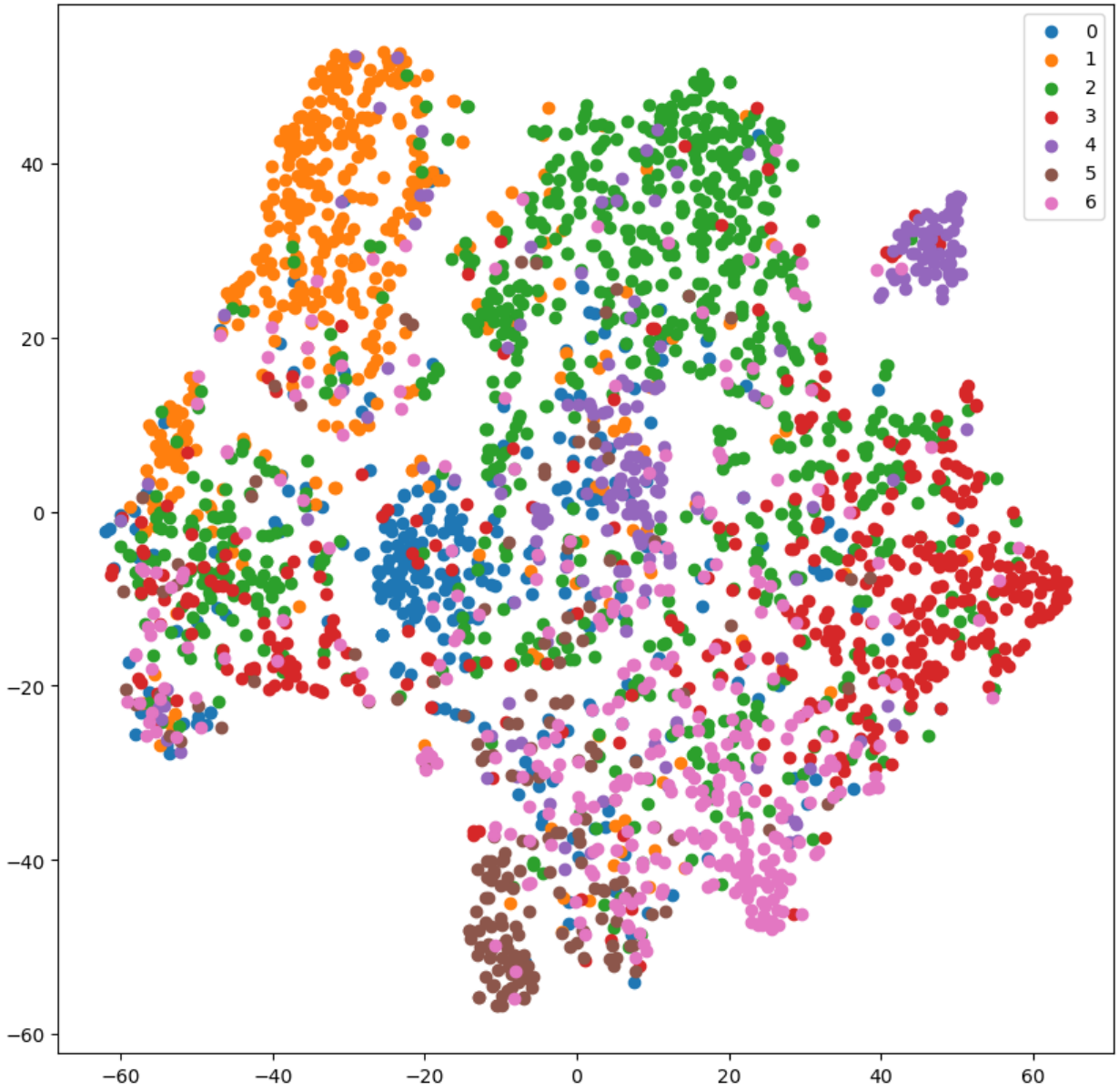
            Case_Based       0.50      0.52      0.51       114
    Genetic_Algorithms       0.76      0.73      0.75       156
       Neural_Networks       0.71      0.57      0.63       290
 Probabilistic_Methods       0.74      0.49      0.59       172
Reinforcement_Learning       0.41      0.52      0.46        85
         Rule_Learning       0.34      0.78      0.47        60
                Theory       0.40      0.44      0.42       123

              accuracy                           0.57      1000
             macro avg       0.55      0.58      0.55      1000
          weighted avg       0.61      0.57      0.58      1000
```

Get hidden layer representation for FNN

In [ ]:
```
layer_outputs = [layer.output for layer in model_fnn.layers]
activation_model = Model(inputs=model_fnn.input, outputs=layer_outputs)
activations = activation_model.predict([X])
```

In [ ]:
```
x_tsne = TSNE(n_components=2).fit_transform(activations[3])
plot_tSNE(labels_encoded,x_tsne)
```



In [ ]:
```
### END OF NOTEBOOK ###
```