In [1]:
```
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```

In [2]:
```
import math
import numpy as np
import pandas as pd
import tensorflow as tf
import matplotlib.pyplot as plt
from tensorflow.keras import Model
from tensorflow.keras import Sequential
from tensorflow.keras.optimizers import Adam
from sklearn.preprocessing import StandardScaler
from tensorflow.keras.layers import Dense, Dropout
from sklearn.model_selection import train_test_split
from tensorflow.keras.losses import MeanSquaredLogarithmicError
```

In [3]:
```
df = np.loadtxt('https://raw.githubusercontent.com/jbrownlee/Datasets/master/pim
```

In [4]:
```
df
```

Out[4]:
```
array([[  6.   , 148.   ,  72.   , ...,   0.627,  50.   ,   1.   ],
       [  1.   ,  85.   ,  66.   , ...,   0.351,  31.   ,   0.   ],
       [  8.   , 183.   ,  64.   , ...,   0.672,  32.   ,   1.   ],
       ...,
       [  5.   , 121.   ,  72.   , ...,   0.245,  30.   ,   0.   ],
       [  1.   , 126.   ,  60.   , ...,   0.349,  47.   ,   1.   ],
       [  1.   ,  93.   ,  70.   , ...,   0.315,  23.   ,   0.   ]])
```

In [5]:
```
df.shape
```

Out[5]:
```
(768, 9)
```

In [6]:
```
x = df[:,:8]
y = df[:,8]
```

In [7]:
```
from sklearn.model_selection import train_test_split
X_train, X_temp, y_train, y_temp = train_test_split(x, y, test_size=0.2, random_

X_test, X_val, y_test, y_val = train_test_split(X_temp, y_temp, test_size=0.5, r
```

In [8]:
```
print(f"x train shape{X_train.shape}")
print(f"y train shape{y_train.shape}")
print(f"x test shape{X_test.shape}")
print(f"y test shape{y_test.shape}")
print(f"x val shape{X_val.shape}")
print(f"y val shape{y_val.shape}")
```

```
x train shape(614, 8)
y train shape(614,)
x test shape(77, 8)
y test shape(77,)
x val shape(77, 8)
y val shape(77,)
```

In [9]:
```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
```

```
X_test = scaler.transform(X_test)
X_val = scaler.transform(X_val)
```

In [10]:
```
from collections import Counter
Counter(y)
```

Out[10]:
```
Counter({1.0: 268, 0.0: 500})
```

In [11]:
```
import seaborn as sns
```

In [12]:
```
# sns.countplot(y)
```

In [13]:
```
from tensorflow.keras.models import Sequential
```

In [14]:
```
model = Sequential([

tf.keras.layers.InputLayer(8,),
Dense(50,activation='relu'),

Dense(50,activation='relu'),
Dense(50,activation='relu'),
Dense(50,activation='relu'),

Dense(1,activation='sigmoid')
])
```

```
2022-11-12 19:23:28.405404: I tensorflow/core/common_runtime/process_util.cc:146] Creating new thread pool with default inter op setting: 2. Tune using inter_op_parallelism_threads for best performance.
```

In [15]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense (Dense)                (None, 50)                450
_________________________________________________________________
dense_1 (Dense)              (None, 50)                2550
_________________________________________________________________
dense_2 (Dense)              (None, 50)                2550
_________________________________________________________________
dense_3 (Dense)              (None, 50)                2550
_________________________________________________________________
dense_4 (Dense)              (None, 1)                 51
=================================================================
Total params: 8,151
Trainable params: 8,151
Non-trainable params: 0
_________________________________________________________________
```

In [16]:
```
opt = tf.keras.optimizers.Adam(learning_rate=0.0001)
model.compile(loss='binary_crossentropy', optimizer=opt, metrics=['accuracy'])
```

In [17]:
```
history = model.fit(x=x,y=y,epochs=300, batch_size=50,validation_data=(X_val,y_v
```

```
2022-11-12 19:23:28.666100: I tensorflow/compiler/mlir/mlir_graph_optimization_pass.cc:185] None of the MLIR Optimization Passes are enabled (registered 2)
```

```
Epoch 1/300
16/16 [==============================] - 1s 20ms/step - loss: 4.3687 - accuracy:
0.6484 - val_loss: 0.7085 - val_accuracy: 0.3766
Epoch 2/300
16/16 [==============================] - 0s 5ms/step - loss: 1.8559 - accuracy:
0.5820 - val_loss: 0.7094 - val_accuracy: 0.4156
Epoch 3/300
16/16 [==============================] - 0s 5ms/step - loss: 0.9362 - accuracy:
0.4987 - val_loss: 0.7087 - val_accuracy: 0.4286
Epoch 4/300
16/16 [==============================] - 0s 5ms/step - loss: 0.7237 - accuracy:
0.6276 - val_loss: 0.7089 - val_accuracy: 0.4286
Epoch 5/300
16/16 [==============================] - 0s 6ms/step - loss: 0.6846 - accuracy:
0.6341 - val_loss: 0.7092 - val_accuracy: 0.4156
Epoch 6/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6645 - accuracy:
0.6406 - val_loss: 0.7088 - val_accuracy: 0.4156
Epoch 7/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6514 - accuracy:
0.6471 - val_loss: 0.7083 - val_accuracy: 0.4026
Epoch 8/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6433 - accuracy:
0.6562 - val_loss: 0.7080 - val_accuracy: 0.4156
Epoch 9/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6350 - accuracy:
0.6641 - val_loss: 0.7077 - val_accuracy: 0.4156
Epoch 10/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6243 - accuracy:
0.6706 - val_loss: 0.7072 - val_accuracy: 0.4156
Epoch 11/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6146 - accuracy:
0.6667 - val_loss: 0.7070 - val_accuracy: 0.3896
Epoch 12/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6075 - accuracy:
0.6849 - val_loss: 0.7066 - val_accuracy: 0.3896
Epoch 13/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6069 - accuracy:
0.6823 - val_loss: 0.7061 - val_accuracy: 0.4026
Epoch 14/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5973 - accuracy:
0.6888 - val_loss: 0.7054 - val_accuracy: 0.4026
Epoch 15/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5979 - accuracy:
0.6823 - val_loss: 0.7049 - val_accuracy: 0.4156
Epoch 16/300
16/16 [==============================] - 0s 5ms/step - loss: 0.6024 - accuracy:
0.6901 - val_loss: 0.7043 - val_accuracy: 0.4156
Epoch 17/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5915 - accuracy:
0.6927 - val_loss: 0.7039 - val_accuracy: 0.4156
Epoch 18/300
16/16 [==============================] - 0s 6ms/step - loss: 0.6017 - accuracy:
0.6797 - val_loss: 0.7033 - val_accuracy: 0.4416
Epoch 19/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5847 - accuracy:
0.6888 - val_loss: 0.7029 - val_accuracy: 0.4416
Epoch 20/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5832 - accuracy:
0.7044 - val_loss: 0.7021 - val_accuracy: 0.4675
```

```
Epoch 21/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5780 - accuracy:
0.7070 - val_loss: 0.7018 - val_accuracy: 0.4675
Epoch 22/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5734 - accuracy:
0.7044 - val_loss: 0.7014 - val_accuracy: 0.4545
Epoch 23/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5774 - accuracy:
0.7109 - val_loss: 0.7009 - val_accuracy: 0.4675
Epoch 24/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5749 - accuracy:
0.7096 - val_loss: 0.7004 - val_accuracy: 0.4805
Epoch 25/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5749 - accuracy:
0.7122 - val_loss: 0.7001 - val_accuracy: 0.4935
Epoch 26/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5731 - accuracy:
0.7135 - val_loss: 0.6995 - val_accuracy: 0.5325
Epoch 27/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5646 - accuracy:
0.7331 - val_loss: 0.6993 - val_accuracy: 0.5195
Epoch 28/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5831 - accuracy:
0.6979 - val_loss: 0.6987 - val_accuracy: 0.5195
Epoch 29/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5697 - accuracy:
0.7005 - val_loss: 0.6983 - val_accuracy: 0.5195
Epoch 30/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5623 - accuracy:
0.7292 - val_loss: 0.6980 - val_accuracy: 0.5195
Epoch 31/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5587 - accuracy:
0.7109 - val_loss: 0.6975 - val_accuracy: 0.5065
Epoch 32/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5611 - accuracy:
0.7174 - val_loss: 0.6971 - val_accuracy: 0.5065
Epoch 33/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5619 - accuracy:
0.7227 - val_loss: 0.6967 - val_accuracy: 0.4935
Epoch 34/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5540 - accuracy:
0.7357 - val_loss: 0.6963 - val_accuracy: 0.5065
Epoch 35/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5552 - accuracy:
0.7214 - val_loss: 0.6960 - val_accuracy: 0.4935
Epoch 36/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5528 - accuracy:
0.7279 - val_loss: 0.6955 - val_accuracy: 0.5065
Epoch 37/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5540 - accuracy:
0.7174 - val_loss: 0.6952 - val_accuracy: 0.5065
Epoch 38/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5522 - accuracy:
0.7357 - val_loss: 0.6950 - val_accuracy: 0.4805
Epoch 39/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5536 - accuracy:
0.7214 - val_loss: 0.6945 - val_accuracy: 0.4675
Epoch 40/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5521 - accuracy:
0.7266 - val_loss: 0.6941 - val_accuracy: 0.4675
```

```
Epoch 41/300
16/16 [==============================] - 0s 7ms/step - loss: 0.5580 - accuracy:
0.7201 - val_loss: 0.6935 - val_accuracy: 0.4675
Epoch 42/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5480 - accuracy:
0.7331 - val_loss: 0.6930 - val_accuracy: 0.4675
Epoch 43/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5494 - accuracy:
0.7214 - val_loss: 0.6927 - val_accuracy: 0.5065
Epoch 44/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5573 - accuracy:
0.7227 - val_loss: 0.6923 - val_accuracy: 0.4935
Epoch 45/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5440 - accuracy:
0.7318 - val_loss: 0.6919 - val_accuracy: 0.5065
Epoch 46/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5462 - accuracy:
0.7135 - val_loss: 0.6917 - val_accuracy: 0.5065
Epoch 47/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5392 - accuracy:
0.7292 - val_loss: 0.6909 - val_accuracy: 0.5325
Epoch 48/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5374 - accuracy:
0.7344 - val_loss: 0.6908 - val_accuracy: 0.5325
Epoch 49/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5382 - accuracy:
0.7266 - val_loss: 0.6904 - val_accuracy: 0.5455
Epoch 50/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5440 - accuracy:
0.7279 - val_loss: 0.6902 - val_accuracy: 0.5455
Epoch 51/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5350 - accuracy:
0.7305 - val_loss: 0.6898 - val_accuracy: 0.5455
Epoch 52/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5325 - accuracy:
0.7344 - val_loss: 0.6893 - val_accuracy: 0.5455
Epoch 53/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5316 - accuracy:
0.7318 - val_loss: 0.6887 - val_accuracy: 0.5455
Epoch 54/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5328 - accuracy:
0.7487 - val_loss: 0.6885 - val_accuracy: 0.5584
Epoch 55/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5327 - accuracy:
0.7305 - val_loss: 0.6882 - val_accuracy: 0.5584
Epoch 56/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5335 - accuracy:
0.7422 - val_loss: 0.6879 - val_accuracy: 0.5584
Epoch 57/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5343 - accuracy:
0.7331 - val_loss: 0.6875 - val_accuracy: 0.5584
Epoch 58/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5298 - accuracy:
0.7370 - val_loss: 0.6869 - val_accuracy: 0.5714
Epoch 59/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5294 - accuracy:
0.7409 - val_loss: 0.6862 - val_accuracy: 0.5584
Epoch 60/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5323 - accuracy:
0.7461 - val_loss: 0.6859 - val_accuracy: 0.5714
```

```
Epoch 61/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5301 - accuracy:
0.7383 - val_loss: 0.6855 - val_accuracy: 0.5714
Epoch 62/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5381 - accuracy:
0.7318 - val_loss: 0.6852 - val_accuracy: 0.5714
Epoch 63/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5295 - accuracy:
0.7370 - val_loss: 0.6850 - val_accuracy: 0.5714
Epoch 64/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5247 - accuracy:
0.7344 - val_loss: 0.6847 - val_accuracy: 0.5714
Epoch 65/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5213 - accuracy:
0.7448 - val_loss: 0.6844 - val_accuracy: 0.5584
Epoch 66/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5219 - accuracy:
0.7461 - val_loss: 0.6840 - val_accuracy: 0.5584
Epoch 67/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5246 - accuracy:
0.7422 - val_loss: 0.6836 - val_accuracy: 0.5584
Epoch 68/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5222 - accuracy:
0.7396 - val_loss: 0.6832 - val_accuracy: 0.5584
Epoch 69/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5229 - accuracy:
0.7396 - val_loss: 0.6830 - val_accuracy: 0.5584
Epoch 70/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5212 - accuracy:
0.7383 - val_loss: 0.6825 - val_accuracy: 0.5584
Epoch 71/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5177 - accuracy:
0.7422 - val_loss: 0.6824 - val_accuracy: 0.5584
Epoch 72/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5214 - accuracy:
0.7383 - val_loss: 0.6822 - val_accuracy: 0.5195
Epoch 73/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5248 - accuracy:
0.7344 - val_loss: 0.6817 - val_accuracy: 0.5065
Epoch 74/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5227 - accuracy:
0.7396 - val_loss: 0.6814 - val_accuracy: 0.5195
Epoch 75/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5220 - accuracy:
0.7240 - val_loss: 0.6810 - val_accuracy: 0.5065
Epoch 76/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5191 - accuracy:
0.7383 - val_loss: 0.6804 - val_accuracy: 0.5325
Epoch 77/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5221 - accuracy:
0.7318 - val_loss: 0.6804 - val_accuracy: 0.5325
Epoch 78/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5211 - accuracy:
0.7344 - val_loss: 0.6802 - val_accuracy: 0.5325
Epoch 79/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5251 - accuracy:
0.7279 - val_loss: 0.6798 - val_accuracy: 0.5325
Epoch 80/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5234 - accuracy:
0.7344 - val_loss: 0.6795 - val_accuracy: 0.5325
```

```
Epoch 81/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5118 - accuracy:
0.7526 - val_loss: 0.6792 - val_accuracy: 0.5584
Epoch 82/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5099 - accuracy:
0.7565 - val_loss: 0.6788 - val_accuracy: 0.5584
Epoch 83/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5155 - accuracy:
0.7344 - val_loss: 0.6785 - val_accuracy: 0.5584
Epoch 84/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5088 - accuracy:
0.7448 - val_loss: 0.6783 - val_accuracy: 0.5714
Epoch 85/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5140 - accuracy:
0.7448 - val_loss: 0.6779 - val_accuracy: 0.5844
Epoch 86/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5303 - accuracy:
0.7227 - val_loss: 0.6779 - val_accuracy: 0.5844
Epoch 87/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5261 - accuracy:
0.7370 - val_loss: 0.6775 - val_accuracy: 0.5844
Epoch 88/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5108 - accuracy:
0.7357 - val_loss: 0.6771 - val_accuracy: 0.5844
Epoch 89/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5140 - accuracy:
0.7422 - val_loss: 0.6769 - val_accuracy: 0.5844
Epoch 90/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5082 - accuracy:
0.7357 - val_loss: 0.6768 - val_accuracy: 0.5844
Epoch 91/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5083 - accuracy:
0.7552 - val_loss: 0.6766 - val_accuracy: 0.5844
Epoch 92/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5105 - accuracy:
0.7344 - val_loss: 0.6764 - val_accuracy: 0.5844
Epoch 93/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5057 - accuracy:
0.7487 - val_loss: 0.6762 - val_accuracy: 0.5974
Epoch 94/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5112 - accuracy:
0.7370 - val_loss: 0.6760 - val_accuracy: 0.5974
Epoch 95/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5042 - accuracy:
0.7487 - val_loss: 0.6758 - val_accuracy: 0.5974
Epoch 96/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5055 - accuracy:
0.7461 - val_loss: 0.6754 - val_accuracy: 0.5974
Epoch 97/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5065 - accuracy:
0.7474 - val_loss: 0.6752 - val_accuracy: 0.5974
Epoch 98/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5075 - accuracy:
0.7474 - val_loss: 0.6752 - val_accuracy: 0.5974
Epoch 99/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5053 - accuracy:
0.7461 - val_loss: 0.6750 - val_accuracy: 0.5974
Epoch 100/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5002 - accuracy:
0.7474 - val_loss: 0.6749 - val_accuracy: 0.5974
```

```
Epoch 101/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5015 - accuracy:
0.7669 - val_loss: 0.6749 - val_accuracy: 0.6104
Epoch 102/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5127 - accuracy:
0.7435 - val_loss: 0.6748 - val_accuracy: 0.6104
Epoch 103/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5332 - accuracy:
0.7266 - val_loss: 0.6744 - val_accuracy: 0.6104
Epoch 104/300
16/16 [==============================] - 0s 6ms/step - loss: 0.5029 - accuracy:
0.7578 - val_loss: 0.6742 - val_accuracy: 0.6104
Epoch 105/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5004 - accuracy:
0.7695 - val_loss: 0.6742 - val_accuracy: 0.6104
Epoch 106/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5040 - accuracy:
0.7461 - val_loss: 0.6738 - val_accuracy: 0.6104
Epoch 107/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4965 - accuracy:
0.7604 - val_loss: 0.6737 - val_accuracy: 0.6104
Epoch 108/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5004 - accuracy:
0.7513 - val_loss: 0.6737 - val_accuracy: 0.6104
Epoch 109/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5205 - accuracy:
0.7331 - val_loss: 0.6735 - val_accuracy: 0.6104
Epoch 110/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5035 - accuracy:
0.7513 - val_loss: 0.6731 - val_accuracy: 0.6104
Epoch 111/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5064 - accuracy:
0.7565 - val_loss: 0.6735 - val_accuracy: 0.6104
Epoch 112/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5020 - accuracy:
0.7448 - val_loss: 0.6737 - val_accuracy: 0.6104
Epoch 113/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5225 - accuracy:
0.7292 - val_loss: 0.6727 - val_accuracy: 0.6104
Epoch 114/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5040 - accuracy:
0.7357 - val_loss: 0.6725 - val_accuracy: 0.6104
Epoch 115/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4999 - accuracy:
0.7422 - val_loss: 0.6728 - val_accuracy: 0.6104
Epoch 116/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4982 - accuracy:
0.7487 - val_loss: 0.6727 - val_accuracy: 0.6104
Epoch 117/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5224 - accuracy:
0.7292 - val_loss: 0.6725 - val_accuracy: 0.6104
Epoch 118/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5021 - accuracy:
0.7474 - val_loss: 0.6723 - val_accuracy: 0.6104
Epoch 119/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4913 - accuracy:
0.7643 - val_loss: 0.6724 - val_accuracy: 0.6104
Epoch 120/300
16/16 [==============================] - 0s 7ms/step - loss: 0.4949 - accuracy:
0.7552 - val_loss: 0.6719 - val_accuracy: 0.6104
```

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Epoch 121/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4995 - accuracy:
0.7461 - val_loss: 0.6718 - val_accuracy: 0.6104
Epoch 122/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4984 - accuracy:
0.7539 - val_loss: 0.6721 - val_accuracy: 0.6104
Epoch 123/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4979 - accuracy:
0.7539 - val_loss: 0.6720 - val_accuracy: 0.6104
Epoch 124/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4959 - accuracy:
0.7513 - val_loss: 0.6719 - val_accuracy: 0.6104
Epoch 125/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4918 - accuracy:
0.7565 - val_loss: 0.6718 - val_accuracy: 0.6104
Epoch 126/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4905 - accuracy:
0.7565 - val_loss: 0.6716 - val_accuracy: 0.6104
Epoch 127/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4877 - accuracy:
0.7578 - val_loss: 0.6717 - val_accuracy: 0.6104
Epoch 128/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4849 - accuracy:
0.7474 - val_loss: 0.6720 - val_accuracy: 0.6104
Epoch 129/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4938 - accuracy:
0.7526 - val_loss: 0.6717 - val_accuracy: 0.6104
Epoch 130/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4926 - accuracy:
0.7539 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 131/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4905 - accuracy:
0.7604 - val_loss: 0.6712 - val_accuracy: 0.6104
Epoch 132/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4948 - accuracy:
0.7591 - val_loss: 0.6712 - val_accuracy: 0.6104
Epoch 133/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5104 - accuracy:
0.7461 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 134/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4953 - accuracy:
0.7604 - val_loss: 0.6716 - val_accuracy: 0.6104
Epoch 135/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4909 - accuracy:
0.7552 - val_loss: 0.6714 - val_accuracy: 0.6104
Epoch 136/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4898 - accuracy:
0.7552 - val_loss: 0.6711 - val_accuracy: 0.6104
Epoch 137/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4850 - accuracy:
0.7448 - val_loss: 0.6715 - val_accuracy: 0.6104
Epoch 138/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4857 - accuracy:
0.7669 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 139/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4868 - accuracy:
0.7578 - val_loss: 0.6715 - val_accuracy: 0.6104
Epoch 140/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4922 - accuracy:
0.7578 - val_loss: 0.6714 - val_accuracy: 0.6104
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Epoch 141/300
16/16 [==============================] - 0s 5ms/step - loss: 0.5093 - accuracy:
0.7266 - val_loss: 0.6715 - val_accuracy: 0.6104
Epoch 142/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4896 - accuracy:
0.7604 - val_loss: 0.6708 - val_accuracy: 0.6104
Epoch 143/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4852 - accuracy:
0.7656 - val_loss: 0.6712 - val_accuracy: 0.6104
Epoch 144/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4792 - accuracy:
0.7682 - val_loss: 0.6710 - val_accuracy: 0.6104
Epoch 145/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4849 - accuracy:
0.7721 - val_loss: 0.6708 - val_accuracy: 0.6104
Epoch 146/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4989 - accuracy:
0.7500 - val_loss: 0.6714 - val_accuracy: 0.6104
Epoch 147/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4814 - accuracy:
0.7604 - val_loss: 0.6712 - val_accuracy: 0.6104
Epoch 148/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4816 - accuracy:
0.7773 - val_loss: 0.6708 - val_accuracy: 0.6104
Epoch 149/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4989 - accuracy:
0.7474 - val_loss: 0.6716 - val_accuracy: 0.6104
Epoch 150/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4812 - accuracy:
0.7799 - val_loss: 0.6715 - val_accuracy: 0.6104
Epoch 151/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4786 - accuracy:
0.7695 - val_loss: 0.6714 - val_accuracy: 0.6104
Epoch 152/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4904 - accuracy:
0.7656 - val_loss: 0.6720 - val_accuracy: 0.6104
Epoch 153/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4902 - accuracy:
0.7526 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 154/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4916 - accuracy:
0.7604 - val_loss: 0.6716 - val_accuracy: 0.6104
Epoch 155/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4977 - accuracy:
0.7539 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 156/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4892 - accuracy:
0.7565 - val_loss: 0.6711 - val_accuracy: 0.6104
Epoch 157/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4901 - accuracy:
0.7487 - val_loss: 0.6713 - val_accuracy: 0.6104
Epoch 158/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4845 - accuracy:
0.7552 - val_loss: 0.6714 - val_accuracy: 0.6104
Epoch 159/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4788 - accuracy:
0.7630 - val_loss: 0.6714 - val_accuracy: 0.6104
Epoch 160/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4835 - accuracy:
0.7630 - val_loss: 0.6719 - val_accuracy: 0.6104
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Epoch 161/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4739 - accuracy:
0.7747 - val_loss: 0.6723 - val_accuracy: 0.6104
Epoch 162/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4763 - accuracy:
0.7773 - val_loss: 0.6721 - val_accuracy: 0.6104
Epoch 163/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4768 - accuracy:
0.7760 - val_loss: 0.6720 - val_accuracy: 0.6104
Epoch 164/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4856 - accuracy:
0.7409 - val_loss: 0.6719 - val_accuracy: 0.6104
Epoch 165/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4732 - accuracy:
0.7799 - val_loss: 0.6720 - val_accuracy: 0.6104
Epoch 166/300
16/16 [==============================] - 0s 7ms/step - loss: 0.4775 - accuracy:
0.7656 - val_loss: 0.6721 - val_accuracy: 0.6104
Epoch 167/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4764 - accuracy:
0.7682 - val_loss: 0.6729 - val_accuracy: 0.6104
Epoch 168/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4789 - accuracy:
0.7578 - val_loss: 0.6719 - val_accuracy: 0.6104
Epoch 169/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4775 - accuracy:
0.7734 - val_loss: 0.6726 - val_accuracy: 0.6104
Epoch 170/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4844 - accuracy:
0.7578 - val_loss: 0.6730 - val_accuracy: 0.6104
Epoch 171/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4750 - accuracy:
0.7786 - val_loss: 0.6728 - val_accuracy: 0.6104
Epoch 172/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4692 - accuracy:
0.7878 - val_loss: 0.6727 - val_accuracy: 0.6104
Epoch 173/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4776 - accuracy:
0.7526 - val_loss: 0.6728 - val_accuracy: 0.6104
Epoch 174/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4720 - accuracy:
0.7812 - val_loss: 0.6736 - val_accuracy: 0.6104
Epoch 175/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4859 - accuracy:
0.7721 - val_loss: 0.6734 - val_accuracy: 0.6104
Epoch 176/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4762 - accuracy:
0.7591 - val_loss: 0.6730 - val_accuracy: 0.6104
Epoch 177/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4756 - accuracy:
0.7682 - val_loss: 0.6730 - val_accuracy: 0.6104
Epoch 178/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4699 - accuracy:
0.7799 - val_loss: 0.6738 - val_accuracy: 0.6104
Epoch 179/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4687 - accuracy:
0.7721 - val_loss: 0.6737 - val_accuracy: 0.6104
Epoch 180/300
16/16 [==============================] - 0s 9ms/step - loss: 0.4667 - accuracy:
0.7773 - val_loss: 0.6740 - val_accuracy: 0.6104
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Epoch 181/300
16/16 [==============================] - 0s 9ms/step - loss: 0.4745 - accuracy:
0.7799 - val_loss: 0.6742 - val_accuracy: 0.6104
Epoch 182/300
16/16 [==============================] - 0s 7ms/step - loss: 0.4704 - accuracy:
0.7721 - val_loss: 0.6742 - val_accuracy: 0.6104
Epoch 183/300
16/16 [==============================] - 0s 13ms/step - loss: 0.4688 - accuracy:
0.7839 - val_loss: 0.6747 - val_accuracy: 0.6104
Epoch 184/300
16/16 [==============================] - 0s 10ms/step - loss: 0.4740 - accuracy:
0.7721 - val_loss: 0.6749 - val_accuracy: 0.6104
Epoch 185/300
16/16 [==============================] - 0s 11ms/step - loss: 0.4693 - accuracy:
0.7643 - val_loss: 0.6750 - val_accuracy: 0.6104
Epoch 186/300
16/16 [==============================] - 0s 8ms/step - loss: 0.4661 - accuracy:
0.7786 - val_loss: 0.6749 - val_accuracy: 0.6104
Epoch 187/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4753 - accuracy:
0.7773 - val_loss: 0.6752 - val_accuracy: 0.6104
Epoch 188/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4650 - accuracy:
0.7839 - val_loss: 0.6751 - val_accuracy: 0.6104
Epoch 189/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4732 - accuracy:
0.7682 - val_loss: 0.6748 - val_accuracy: 0.6104
Epoch 190/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4701 - accuracy:
0.7812 - val_loss: 0.6753 - val_accuracy: 0.6104
Epoch 191/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4676 - accuracy:
0.7773 - val_loss: 0.6754 - val_accuracy: 0.6104
Epoch 192/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4631 - accuracy:
0.7865 - val_loss: 0.6756 - val_accuracy: 0.6104
Epoch 193/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4631 - accuracy:
0.7773 - val_loss: 0.6761 - val_accuracy: 0.6104
Epoch 194/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4677 - accuracy:
0.7760 - val_loss: 0.6765 - val_accuracy: 0.6104
Epoch 195/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4657 - accuracy:
0.7773 - val_loss: 0.6766 - val_accuracy: 0.6104
Epoch 196/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4643 - accuracy:
0.7839 - val_loss: 0.6761 - val_accuracy: 0.6104
Epoch 197/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4670 - accuracy:
0.7799 - val_loss: 0.6765 - val_accuracy: 0.6104
Epoch 198/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4740 - accuracy:
0.7682 - val_loss: 0.6771 - val_accuracy: 0.6104
Epoch 199/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4729 - accuracy:
0.7630 - val_loss: 0.6774 - val_accuracy: 0.6104
Epoch 200/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4656 - accuracy:
0.7917 - val_loss: 0.6779 - val_accuracy: 0.6104
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Epoch 201/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4694 - accuracy:
0.7839 - val_loss: 0.6778 - val_accuracy: 0.6104
Epoch 202/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4601 - accuracy:
0.7917 - val_loss: 0.6774 - val_accuracy: 0.6104
Epoch 203/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4621 - accuracy:
0.7799 - val_loss: 0.6773 - val_accuracy: 0.6104
Epoch 204/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4953 - accuracy:
0.7734 - val_loss: 0.6789 - val_accuracy: 0.6104
Epoch 205/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4812 - accuracy:
0.7500 - val_loss: 0.6793 - val_accuracy: 0.6104
Epoch 206/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4736 - accuracy:
0.7643 - val_loss: 0.6792 - val_accuracy: 0.6104
Epoch 207/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4730 - accuracy:
0.7578 - val_loss: 0.6783 - val_accuracy: 0.6104
Epoch 208/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4666 - accuracy:
0.7734 - val_loss: 0.6786 - val_accuracy: 0.6104
Epoch 209/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4659 - accuracy:
0.7773 - val_loss: 0.6783 - val_accuracy: 0.6104
Epoch 210/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4854 - accuracy:
0.7734 - val_loss: 0.6793 - val_accuracy: 0.6104
Epoch 211/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4732 - accuracy:
0.7669 - val_loss: 0.6795 - val_accuracy: 0.6104
Epoch 212/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4569 - accuracy:
0.7852 - val_loss: 0.6808 - val_accuracy: 0.6104
Epoch 213/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4636 - accuracy:
0.7682 - val_loss: 0.6803 - val_accuracy: 0.6104
Epoch 214/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4551 - accuracy:
0.7878 - val_loss: 0.6814 - val_accuracy: 0.6104
Epoch 215/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4691 - accuracy:
0.7630 - val_loss: 0.6807 - val_accuracy: 0.6104
Epoch 216/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4593 - accuracy:
0.7891 - val_loss: 0.6821 - val_accuracy: 0.6104
Epoch 217/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4693 - accuracy:
0.7708 - val_loss: 0.6820 - val_accuracy: 0.6104
Epoch 218/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4620 - accuracy:
0.7812 - val_loss: 0.6822 - val_accuracy: 0.6104
Epoch 219/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4572 - accuracy:
0.7917 - val_loss: 0.6819 - val_accuracy: 0.6104
Epoch 220/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4532 - accuracy:
0.7839 - val_loss: 0.6822 - val_accuracy: 0.6104
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Epoch 221/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4633 - accuracy:
0.7760 - val_loss: 0.6825 - val_accuracy: 0.6104
Epoch 222/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4660 - accuracy:
0.7656 - val_loss: 0.6828 - val_accuracy: 0.6104
Epoch 223/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4581 - accuracy:
0.7917 - val_loss: 0.6832 - val_accuracy: 0.6104
Epoch 224/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4714 - accuracy:
0.7604 - val_loss: 0.6846 - val_accuracy: 0.6104
Epoch 225/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4729 - accuracy:
0.7812 - val_loss: 0.6840 - val_accuracy: 0.6104
Epoch 226/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4743 - accuracy:
0.7539 - val_loss: 0.6838 - val_accuracy: 0.6104
Epoch 227/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4545 - accuracy:
0.7891 - val_loss: 0.6840 - val_accuracy: 0.6104
Epoch 228/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4543 - accuracy:
0.7852 - val_loss: 0.6843 - val_accuracy: 0.6104
Epoch 229/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4583 - accuracy:
0.7773 - val_loss: 0.6844 - val_accuracy: 0.6104
Epoch 230/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4592 - accuracy:
0.7839 - val_loss: 0.6847 - val_accuracy: 0.6104
Epoch 231/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4551 - accuracy:
0.7773 - val_loss: 0.6855 - val_accuracy: 0.6104
Epoch 232/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4560 - accuracy:
0.7773 - val_loss: 0.6855 - val_accuracy: 0.6104
Epoch 233/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4536 - accuracy:
0.7839 - val_loss: 0.6862 - val_accuracy: 0.6104
Epoch 234/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4556 - accuracy:
0.7826 - val_loss: 0.6859 - val_accuracy: 0.6104
Epoch 235/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4556 - accuracy:
0.7826 - val_loss: 0.6872 - val_accuracy: 0.6104
Epoch 236/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4600 - accuracy:
0.7865 - val_loss: 0.6871 - val_accuracy: 0.6104
Epoch 237/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4797 - accuracy:
0.7643 - val_loss: 0.6866 - val_accuracy: 0.6104
Epoch 238/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4932 - accuracy:
0.7604 - val_loss: 0.6869 - val_accuracy: 0.6104
Epoch 239/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4672 - accuracy:
0.7526 - val_loss: 0.6863 - val_accuracy: 0.6104
Epoch 240/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4571 - accuracy:
0.7812 - val_loss: 0.6872 - val_accuracy: 0.6104
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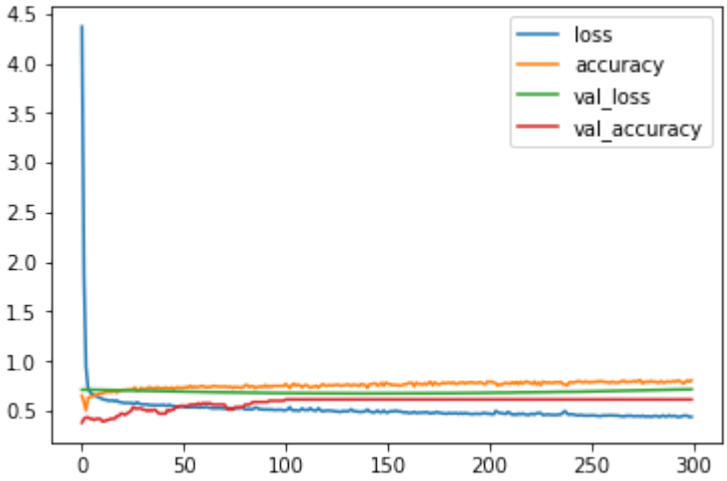
Epoch 241/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4634 - accuracy:
0.7852 - val_loss: 0.6871 - val_accuracy: 0.6104
Epoch 242/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4604 - accuracy:
0.7786 - val_loss: 0.6880 - val_accuracy: 0.6104
Epoch 243/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4553 - accuracy:
0.7865 - val_loss: 0.6890 - val_accuracy: 0.6104
Epoch 244/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4496 - accuracy:
0.7917 - val_loss: 0.6888 - val_accuracy: 0.6104
Epoch 245/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4519 - accuracy:
0.7943 - val_loss: 0.6892 - val_accuracy: 0.6104
Epoch 246/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4544 - accuracy:
0.7878 - val_loss: 0.6896 - val_accuracy: 0.6104
Epoch 247/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4483 - accuracy:
0.7799 - val_loss: 0.6896 - val_accuracy: 0.6104
Epoch 248/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4475 - accuracy:
0.7943 - val_loss: 0.6904 - val_accuracy: 0.6104
Epoch 249/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4480 - accuracy:
0.7865 - val_loss: 0.6902 - val_accuracy: 0.6104
Epoch 250/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4490 - accuracy:
0.7799 - val_loss: 0.6917 - val_accuracy: 0.6104
Epoch 251/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4492 - accuracy:
0.7891 - val_loss: 0.6909 - val_accuracy: 0.6104
Epoch 252/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4504 - accuracy:
0.7839 - val_loss: 0.6914 - val_accuracy: 0.6104
Epoch 253/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4475 - accuracy:
0.7917 - val_loss: 0.6918 - val_accuracy: 0.6104
Epoch 254/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4455 - accuracy:
0.7878 - val_loss: 0.6923 - val_accuracy: 0.6104
Epoch 255/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4424 - accuracy:
0.7956 - val_loss: 0.6928 - val_accuracy: 0.6104
Epoch 256/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4460 - accuracy:
0.7917 - val_loss: 0.6935 - val_accuracy: 0.6104
Epoch 257/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4498 - accuracy:
0.7891 - val_loss: 0.6942 - val_accuracy: 0.6104
Epoch 258/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4475 - accuracy:
0.7865 - val_loss: 0.6938 - val_accuracy: 0.6104
Epoch 259/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4502 - accuracy:
0.7826 - val_loss: 0.6942 - val_accuracy: 0.6104
Epoch 260/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4509 - accuracy:
0.7773 - val_loss: 0.6949 - val_accuracy: 0.6104
```

```
Epoch 261/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4492 - accuracy:
0.7904 - val_loss: 0.6956 - val_accuracy: 0.6104
Epoch 262/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4499 - accuracy:
0.7826 - val_loss: 0.6963 - val_accuracy: 0.6104
Epoch 263/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4478 - accuracy:
0.7799 - val_loss: 0.6959 - val_accuracy: 0.6104
Epoch 264/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4477 - accuracy:
0.7799 - val_loss: 0.6970 - val_accuracy: 0.6104
Epoch 265/300
16/16 [==============================] - 0s 6ms/step - loss: 0.4424 - accuracy:
0.7865 - val_loss: 0.6968 - val_accuracy: 0.6104
Epoch 266/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4418 - accuracy:
0.7982 - val_loss: 0.6969 - val_accuracy: 0.6104
Epoch 267/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4399 - accuracy:
0.7969 - val_loss: 0.6972 - val_accuracy: 0.6104
Epoch 268/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4466 - accuracy:
0.7826 - val_loss: 0.6974 - val_accuracy: 0.6104
Epoch 269/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4447 - accuracy:
0.7904 - val_loss: 0.6990 - val_accuracy: 0.6104
Epoch 270/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4476 - accuracy:
0.7878 - val_loss: 0.6991 - val_accuracy: 0.6104
Epoch 271/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4442 - accuracy:
0.7904 - val_loss: 0.6997 - val_accuracy: 0.6104
Epoch 272/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4400 - accuracy:
0.7956 - val_loss: 0.6999 - val_accuracy: 0.6104
Epoch 273/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4436 - accuracy:
0.7865 - val_loss: 0.7003 - val_accuracy: 0.6104
Epoch 274/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4437 - accuracy:
0.8021 - val_loss: 0.7012 - val_accuracy: 0.6104
Epoch 275/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4388 - accuracy:
0.8034 - val_loss: 0.7021 - val_accuracy: 0.6104
Epoch 276/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4472 - accuracy:
0.7721 - val_loss: 0.7025 - val_accuracy: 0.6104
Epoch 277/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4388 - accuracy:
0.7865 - val_loss: 0.7020 - val_accuracy: 0.6104
Epoch 278/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4382 - accuracy:
0.7904 - val_loss: 0.7037 - val_accuracy: 0.6104
Epoch 279/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4425 - accuracy:
0.7852 - val_loss: 0.7032 - val_accuracy: 0.6104
Epoch 280/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4357 - accuracy:
0.7982 - val_loss: 0.7040 - val_accuracy: 0.6104
```

```
Epoch 281/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4400 - accuracy:
0.7878 - val_loss: 0.7038 - val_accuracy: 0.6104
Epoch 282/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4445 - accuracy:
0.7917 - val_loss: 0.7044 - val_accuracy: 0.6104
Epoch 283/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4441 - accuracy:
0.7839 - val_loss: 0.7065 - val_accuracy: 0.6104
Epoch 284/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4351 - accuracy:
0.7786 - val_loss: 0.7043 - val_accuracy: 0.6104
Epoch 285/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4402 - accuracy:
0.7969 - val_loss: 0.7052 - val_accuracy: 0.6104
Epoch 286/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4496 - accuracy:
0.7812 - val_loss: 0.7061 - val_accuracy: 0.6104
Epoch 287/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4395 - accuracy:
0.7799 - val_loss: 0.7075 - val_accuracy: 0.6104
Epoch 288/300
16/16 [==============================] - 0s 7ms/step - loss: 0.4394 - accuracy:
0.7930 - val_loss: 0.7064 - val_accuracy: 0.6104
Epoch 289/300
16/16 [==============================] - 0s 7ms/step - loss: 0.4505 - accuracy:
0.7891 - val_loss: 0.7066 - val_accuracy: 0.6104
Epoch 290/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4408 - accuracy:
0.7865 - val_loss: 0.7081 - val_accuracy: 0.6104
Epoch 291/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4434 - accuracy:
0.7969 - val_loss: 0.7075 - val_accuracy: 0.6104
Epoch 292/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4456 - accuracy:
0.7865 - val_loss: 0.7088 - val_accuracy: 0.6104
Epoch 293/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4344 - accuracy:
0.7995 - val_loss: 0.7098 - val_accuracy: 0.6104
Epoch 294/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4346 - accuracy:
0.7995 - val_loss: 0.7106 - val_accuracy: 0.6104
Epoch 295/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4384 - accuracy:
0.7865 - val_loss: 0.7120 - val_accuracy: 0.6104
Epoch 296/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4464 - accuracy:
0.7695 - val_loss: 0.7113 - val_accuracy: 0.6104
Epoch 297/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4481 - accuracy:
0.7852 - val_loss: 0.7110 - val_accuracy: 0.6104
Epoch 298/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4457 - accuracy:
0.8021 - val_loss: 0.7113 - val_accuracy: 0.6104
Epoch 299/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4336 - accuracy:
0.7891 - val_loss: 0.7128 - val_accuracy: 0.6104
Epoch 300/300
16/16 [==============================] - 0s 5ms/step - loss: 0.4352 - accuracy:
0.8034 - val_loss: 0.7133 - val_accuracy: 0.6104
```

In [18]:
```
losses = pd.DataFrame(model.history.history)
losses.plot()
```

Out[18]: <AxesSubplot:>



In [19]:
```
model.evaluate(x,y)
```

```
24/24 [==============================] - 0s 2ms/step - loss: 0.4277 - accuracy:
0.8099
```

Out[19]: [0.42774689197540283, 0.8098958134651184]

In [20]:
```
y_pred = model.predict(X_test)
```

In [21]:
```
y_pred
```

Out[21]:
```
array([[0.29241186],
       [0.25659525],
       [0.2345556 ],
       [0.25635856],
       [0.2683779 ],
       [0.26534295],
       [0.24615443],
       [0.18696874],
       [0.23531413],
       [0.26499653],
       [0.25147843],
       [0.19693151],
       [0.2525043 ],
       [0.2924193 ],
       [0.24108097],
       [0.24926525],
       [0.24154398],
       [0.30027997],
       [0.26890767],
       [0.18842933],
       [0.27719277],
       [0.23296693],
       [0.25262323],
       [0.23384169],
       [0.26180875],
       [0.2531795 ],
       [0.21080497],
       [0.2493422 ],
       [0.27968198],
       [0.22347766],
       [0.2744137 ],
       [0.22154438],
       [0.24633941],
       [0.26000386],
       [0.30314064],
       [0.1814619 ],
       [0.17811224],
       [0.22696063],
       [0.23095623],
       [0.24577609],
       [0.21299466],
       [0.25943238],
       [0.26748422],
       [0.28173897],
       [0.21895227],
       [0.25581098],
       [0.2772973 ],
       [0.26322144],
       [0.27639455],
       [0.2651384 ],
       [0.29406345],
       [0.19382304],
       [0.24121556],
       [0.2256059 ],
       [0.2787133 ],
       [0.28141072],
       [0.22622645],
       [0.30917984],
       [0.23824352],
       [0.25481486],
```

```
[0.25906867],
[0.2787506 ],
[0.20846003],
[0.2344867 ],
[0.27582753],
[0.24831259],
[0.29489657],
[0.26952785],
[0.26609173],
[0.26449886],
[0.3253206 ],
[0.20729351],
[0.27737445],
[0.27037466],
[0.2857654 ],
[0.21922398],
[0.2420043 ]], dtype=float32)
```