

```
In [58]: import pandas as pd
import numpy as np
import seaborn as sns
```

```
In [59]: df = pd.read_csv('heart_failure_clinical_records_dataset.csv')
```

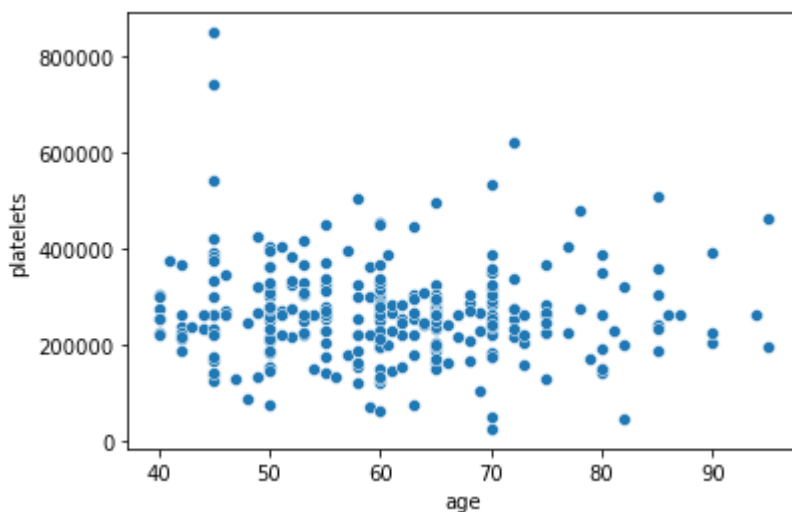
```
In [60]: df.head()
```

```
Out[60]:
```

	age	anaemia	creatinine_phosphokinase	diabetes	ejection_fraction	high_blood_pressure	platelets
0	75.0	0	582	0	20	1	265000.00
1	55.0	0	7861	0	38	0	263358.03
2	65.0	0	146	0	20	0	162000.00
3	50.0	1	111	0	20	0	210000.00
4	65.0	1	160	1	20	0	327000.00

```
In [61]: sns.scatterplot(x='age',y='platelets', data=df)
```

```
Out[61]: <AxesSubplot:xlabel='age', ylabel='platelets'>
```



```
In [62]: df['age'].value_counts()
```

```
Out[62]:
```

60.000	33
50.000	27
65.000	26
70.000	25
45.000	19
55.000	17
75.000	11
58.000	10
53.000	10
63.000	8
80.000	7
72.000	7
42.000	7
40.000	7
85.000	6

```

62.000    5
68.000    5
52.000    5
49.000    4
61.000    4
51.000    4
73.000    4
59.000    4
46.000    3
64.000    3
82.000    3
90.000    3
69.000    3
95.000    2
48.000    2
60.667    2
67.000    2
44.000    2
66.000    2
77.000    2
78.000    2
54.000    2
57.000    2
94.000    1
56.000    1
41.000    1
87.000    1
79.000    1
86.000    1
43.000    1
81.000    1
47.000    1
Name: age, dtype: int64

```

In [63]: `df.corr()`

Out[63]:

	age	anaemia	creatinine_phosphokinase	diabetes	ejection_fraction	hi
age	1.000000	0.088006	-0.081584	-0.101012	0.060098	
anaemia	0.088006	1.000000	-0.190741	-0.012729	0.031557	
creatinine_phosphokinase	-0.081584	-0.190741	1.000000	-0.009639	-0.044080	
diabetes	-0.101012	-0.012729	-0.009639	1.000000	-0.004850	
ejection_fraction	0.060098	0.031557	-0.044080	-0.004850	1.000000	
high_blood_pressure	0.093289	0.038182	-0.070590	-0.012732	0.024445	
platelets	-0.052354	-0.043786	0.024463	0.092193	0.072177	
serum_creatinine	0.159187	0.052174	-0.016408	-0.046975	-0.011302	
serum_sodium	-0.045966	0.041882	0.059550	-0.089551	0.175902	
sex	0.065430	-0.094769	0.079791	-0.157730	-0.148386	
smoking	0.018668	-0.107290	0.002421	-0.147173	-0.067315	
time	-0.224068	-0.141414	-0.009346	0.033726	0.041729	
DEATH_EVENT	0.253729	0.066270	0.062728	-0.001943	-0.268603	

```
In [64]: #High correlation between age and creatinine serum
```

```
In [65]: #Age, high blood pressure, and serum creatinine correlate to chances of death the most.  
  
df.corr()['age'].sort_values()
```

```
Out[65]: time                -0.224068  
diabetes                -0.101012  
creatinine_phosphokinase -0.081584  
platelets              -0.052354  
serum_sodium           -0.045966  
smoking                 0.018668  
ejection_fraction      0.060098  
sex                    0.065430  
anaemia                0.088006  
high_blood_pressure    0.093289  
serum_creatinine       0.159187  
DEATH_EVENT            0.253729  
age                    1.000000  
Name: age, dtype: float64
```

```
In [66]: #Within the data set, less than half the people died from heart failure.  
  
df['DEATH_EVENT'].value_counts()
```

```
Out[66]: 0    203  
         1     96  
         Name: DEATH_EVENT, dtype: int64
```

```
In [67]: df.drop('time',axis=1,inplace=True)
```

```
In [68]: from sklearn.model_selection import train_test_split
```

```
In [69]: X = df.drop('DEATH_EVENT',axis=1).values  
         y = df['DEATH_EVENT'].values  
  
         X_train, X_test, y_train, y_test = train_test_split(X, y,  
         test_size=0.25, random_state=101)
```

```
In [70]: from sklearn.preprocessing import MinMaxScaler
```

```
In [71]: scaler = MinMaxScaler()
```

```
In [72]: X_train = scaler.fit_transform(X_train)
```

```
In [73]: X_test = scaler.transform(X_test)
```

```
In [74]: from tensorflow.keras.models import Sequential
```

```
In [75]: from tensorflow.keras.layers import Dense,Dropout
```

```
In [76]: X_train.shape
```

```
Out[76]: (224, 11)
```

```
In [77]: model = Sequential()
```

```

model.add(Dense(11,activation='relu'))

model.add(Dense(5,activation='relu'))

# BINARY CLASSIFICATION
model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')

```

```
In [78]: model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test))
```

```

Epoch 1/600
7/7 [=====] - 1s 43ms/step - loss: 0.6935 - val_loss: 0.6888
Epoch 2/600
7/7 [=====] - 0s 10ms/step - loss: 0.6916 - val_loss: 0.6854
Epoch 3/600
7/7 [=====] - 0s 9ms/step - loss: 0.6898 - val_loss: 0.6827
Epoch 4/600
7/7 [=====] - 0s 9ms/step - loss: 0.6880 - val_loss: 0.6805
Epoch 5/600
7/7 [=====] - 0s 8ms/step - loss: 0.6866 - val_loss: 0.6786
Epoch 6/600
7/7 [=====] - 0s 8ms/step - loss: 0.6853 - val_loss: 0.6770
Epoch 7/600
7/7 [=====] - 0s 8ms/step - loss: 0.6842 - val_loss: 0.6754
Epoch 8/600
7/7 [=====] - 0s 7ms/step - loss: 0.6832 - val_loss: 0.6738
Epoch 9/600
7/7 [=====] - 0s 7ms/step - loss: 0.6821 - val_loss: 0.6721
Epoch 10/600
7/7 [=====] - 0s 6ms/step - loss: 0.6811 - val_loss: 0.6707
Epoch 11/600
7/7 [=====] - 0s 8ms/step - loss: 0.6801 - val_loss: 0.6697
Epoch 12/600
7/7 [=====] - 0s 8ms/step - loss: 0.6790 - val_loss: 0.6682
Epoch 13/600
7/7 [=====] - 0s 6ms/step - loss: 0.6781 - val_loss: 0.6666
Epoch 14/600
7/7 [=====] - 0s 6ms/step - loss: 0.6770 - val_loss: 0.6651
Epoch 15/600
7/7 [=====] - 0s 5ms/step - loss: 0.6761 - val_loss: 0.6632
Epoch 16/600
7/7 [=====] - 0s 6ms/step - loss: 0.6752 - val_loss: 0.6614
Epoch 17/600
7/7 [=====] - 0s 6ms/step - loss: 0.6739 - val_loss: 0.6604
Epoch 18/600
7/7 [=====] - 0s 6ms/step - loss: 0.6730 - val_loss: 0.6589
Epoch 19/600
7/7 [=====] - 0s 5ms/step - loss: 0.6720 - val_loss: 0.6576
Epoch 20/600
7/7 [=====] - 0s 6ms/step - loss: 0.6712 - val_loss: 0.6560
Epoch 21/600
7/7 [=====] - 0s 5ms/step - loss: 0.6701 - val_loss: 0.6547
Epoch 22/600
7/7 [=====] - 0s 5ms/step - loss: 0.6692 - val_loss: 0.6533
Epoch 23/600
7/7 [=====] - 0s 6ms/step - loss: 0.6683 - val_loss: 0.6519
Epoch 24/600
7/7 [=====] - 0s 6ms/step - loss: 0.6673 - val_loss: 0.6508
Epoch 25/600
7/7 [=====] - 0s 6ms/step - loss: 0.6665 - val_loss: 0.6493
Epoch 26/600
7/7 [=====] - 0s 5ms/step - loss: 0.6655 - val_loss: 0.6476
Epoch 27/600

```

```
7/7 [=====] - 0s 5ms/step - loss: 0.6644 - val_loss: 0.6455
Epoch 28/600
7/7 [=====] - 0s 5ms/step - loss: 0.6634 - val_loss: 0.6439
Epoch 29/600
7/7 [=====] - 0s 6ms/step - loss: 0.6625 - val_loss: 0.6419
Epoch 30/600
7/7 [=====] - 0s 6ms/step - loss: 0.6612 - val_loss: 0.6400
Epoch 31/600
7/7 [=====] - 0s 6ms/step - loss: 0.6601 - val_loss: 0.6369
Epoch 32/600
7/7 [=====] - 0s 6ms/step - loss: 0.6580 - val_loss: 0.6332
Epoch 33/600
7/7 [=====] - 0s 6ms/step - loss: 0.6550 - val_loss: 0.6286
Epoch 34/600
7/7 [=====] - 0s 5ms/step - loss: 0.6519 - val_loss: 0.6202
Epoch 35/600
7/7 [=====] - 0s 6ms/step - loss: 0.6461 - val_loss: 0.6123
Epoch 36/600
7/7 [=====] - 0s 5ms/step - loss: 0.6430 - val_loss: 0.6052
Epoch 37/600
7/7 [=====] - 0s 6ms/step - loss: 0.6405 - val_loss: 0.5997
Epoch 38/600
7/7 [=====] - 0s 6ms/step - loss: 0.6383 - val_loss: 0.5966
Epoch 39/600
7/7 [=====] - 0s 6ms/step - loss: 0.6369 - val_loss: 0.5912
Epoch 40/600
7/7 [=====] - 0s 5ms/step - loss: 0.6347 - val_loss: 0.5879
Epoch 41/600
7/7 [=====] - 0s 6ms/step - loss: 0.6333 - val_loss: 0.5854
Epoch 42/600
7/7 [=====] - 0s 6ms/step - loss: 0.6320 - val_loss: 0.5812
Epoch 43/600
7/7 [=====] - 0s 6ms/step - loss: 0.6308 - val_loss: 0.5777
Epoch 44/600
7/7 [=====] - 0s 5ms/step - loss: 0.6297 - val_loss: 0.5758
Epoch 45/600
7/7 [=====] - 0s 6ms/step - loss: 0.6288 - val_loss: 0.5776
Epoch 46/600
7/7 [=====] - 0s 6ms/step - loss: 0.6274 - val_loss: 0.5778
Epoch 47/600
7/7 [=====] - 0s 6ms/step - loss: 0.6261 - val_loss: 0.5752
Epoch 48/600
7/7 [=====] - 0s 6ms/step - loss: 0.6249 - val_loss: 0.5741
Epoch 49/600
7/7 [=====] - 0s 6ms/step - loss: 0.6242 - val_loss: 0.5714
Epoch 50/600
7/7 [=====] - 0s 5ms/step - loss: 0.6230 - val_loss: 0.5719
Epoch 51/600
7/7 [=====] - 0s 5ms/step - loss: 0.6218 - val_loss: 0.5718
Epoch 52/600
7/7 [=====] - 0s 6ms/step - loss: 0.6210 - val_loss: 0.5711
Epoch 53/600
7/7 [=====] - 0s 5ms/step - loss: 0.6199 - val_loss: 0.5702
Epoch 54/600
7/7 [=====] - 0s 6ms/step - loss: 0.6190 - val_loss: 0.5676
Epoch 55/600
7/7 [=====] - 0s 6ms/step - loss: 0.6180 - val_loss: 0.5656
Epoch 56/600
7/7 [=====] - 0s 6ms/step - loss: 0.6170 - val_loss: 0.5654
Epoch 57/600
7/7 [=====] - 0s 5ms/step - loss: 0.6160 - val_loss: 0.5639
Epoch 58/600
7/7 [=====] - 0s 5ms/step - loss: 0.6151 - val_loss: 0.5638
Epoch 59/600
7/7 [=====] - 0s 6ms/step - loss: 0.6141 - val_loss: 0.5634
```

```
Epoch 60/600
7/7 [=====] - 0s 6ms/step - loss: 0.6132 - val_loss: 0.5636
Epoch 61/600
7/7 [=====] - 0s 6ms/step - loss: 0.6122 - val_loss: 0.5628
Epoch 62/600
7/7 [=====] - 0s 6ms/step - loss: 0.6113 - val_loss: 0.5631
Epoch 63/600
7/7 [=====] - 0s 5ms/step - loss: 0.6101 - val_loss: 0.5626
Epoch 64/600
7/7 [=====] - 0s 5ms/step - loss: 0.6091 - val_loss: 0.5613
Epoch 65/600
7/7 [=====] - 0s 6ms/step - loss: 0.6080 - val_loss: 0.5601
Epoch 66/600
7/7 [=====] - 0s 5ms/step - loss: 0.6071 - val_loss: 0.5593
Epoch 67/600
7/7 [=====] - 0s 6ms/step - loss: 0.6061 - val_loss: 0.5598
Epoch 68/600
7/7 [=====] - 0s 6ms/step - loss: 0.6051 - val_loss: 0.5573
Epoch 69/600
7/7 [=====] - 0s 5ms/step - loss: 0.6037 - val_loss: 0.5560
Epoch 70/600
7/7 [=====] - 0s 6ms/step - loss: 0.6024 - val_loss: 0.5544
Epoch 71/600
7/7 [=====] - 0s 6ms/step - loss: 0.6007 - val_loss: 0.5533
Epoch 72/600
7/7 [=====] - 0s 6ms/step - loss: 0.5994 - val_loss: 0.5535
Epoch 73/600
7/7 [=====] - 0s 5ms/step - loss: 0.5977 - val_loss: 0.5520
Epoch 74/600
7/7 [=====] - 0s 5ms/step - loss: 0.5963 - val_loss: 0.5484
Epoch 75/600
7/7 [=====] - ETA: 0s - loss: 0.691 - 0s 5ms/step - loss: 0.594
6 - val_loss: 0.5469
Epoch 76/600
7/7 [=====] - 0s 6ms/step - loss: 0.5927 - val_loss: 0.5459
Epoch 77/600
7/7 [=====] - 0s 6ms/step - loss: 0.5914 - val_loss: 0.5449
Epoch 78/600
7/7 [=====] - 0s 6ms/step - loss: 0.5890 - val_loss: 0.5440
Epoch 79/600
7/7 [=====] - 0s 6ms/step - loss: 0.5875 - val_loss: 0.5415
Epoch 80/600
7/7 [=====] - 0s 6ms/step - loss: 0.5858 - val_loss: 0.5414
Epoch 81/600
7/7 [=====] - 0s 6ms/step - loss: 0.5838 - val_loss: 0.5410
Epoch 82/600
7/7 [=====] - 0s 6ms/step - loss: 0.5821 - val_loss: 0.5403
Epoch 83/600
7/7 [=====] - 0s 5ms/step - loss: 0.5798 - val_loss: 0.5386
Epoch 84/600
7/7 [=====] - 0s 6ms/step - loss: 0.5786 - val_loss: 0.5360
Epoch 85/600
7/7 [=====] - 0s 6ms/step - loss: 0.5756 - val_loss: 0.5345
Epoch 86/600
7/7 [=====] - 0s 5ms/step - loss: 0.5743 - val_loss: 0.5344
Epoch 87/600
7/7 [=====] - 0s 6ms/step - loss: 0.5716 - val_loss: 0.5300
Epoch 88/600
7/7 [=====] - 0s 6ms/step - loss: 0.5687 - val_loss: 0.5271
Epoch 89/600
7/7 [=====] - 0s 5ms/step - loss: 0.5658 - val_loss: 0.5260
Epoch 90/600
7/7 [=====] - 0s 6ms/step - loss: 0.5627 - val_loss: 0.5233
Epoch 91/600
7/7 [=====] - 0s 6ms/step - loss: 0.5607 - val_loss: 0.5224
```

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Epoch 92/600
7/7 [=====] - 0s 6ms/step - loss: 0.5576 - val_loss: 0.5196
Epoch 93/600
7/7 [=====] - 0s 6ms/step - loss: 0.5548 - val_loss: 0.5176
Epoch 94/600
7/7 [=====] - 0s 6ms/step - loss: 0.5520 - val_loss: 0.5162
Epoch 95/600
7/7 [=====] - 0s 6ms/step - loss: 0.5500 - val_loss: 0.5185
Epoch 96/600
7/7 [=====] - 0s 6ms/step - loss: 0.5472 - val_loss: 0.5179
Epoch 97/600
7/7 [=====] - 0s 6ms/step - loss: 0.5451 - val_loss: 0.5165
Epoch 98/600
7/7 [=====] - 0s 6ms/step - loss: 0.5437 - val_loss: 0.5164
Epoch 99/600
7/7 [=====] - 0s 6ms/step - loss: 0.5406 - val_loss: 0.5140
Epoch 100/600
7/7 [=====] - 0s 6ms/step - loss: 0.5387 - val_loss: 0.5126
Epoch 101/600
7/7 [=====] - 0s 5ms/step - loss: 0.5370 - val_loss: 0.5118
Epoch 102/600
7/7 [=====] - 0s 6ms/step - loss: 0.5368 - val_loss: 0.5199
Epoch 103/600
7/7 [=====] - 0s 6ms/step - loss: 0.5325 - val_loss: 0.5194
Epoch 104/600
7/7 [=====] - 0s 6ms/step - loss: 0.5291 - val_loss: 0.5142
Epoch 105/600
7/7 [=====] - 0s 5ms/step - loss: 0.5270 - val_loss: 0.5132
Epoch 106/600
7/7 [=====] - 0s 6ms/step - loss: 0.5234 - val_loss: 0.5140
Epoch 107/600
7/7 [=====] - 0s 6ms/step - loss: 0.5211 - val_loss: 0.5169
Epoch 108/600
7/7 [=====] - 0s 5ms/step - loss: 0.5176 - val_loss: 0.5209
Epoch 109/600
7/7 [=====] - 0s 6ms/step - loss: 0.5143 - val_loss: 0.5263
Epoch 110/600
7/7 [=====] - 0s 6ms/step - loss: 0.5104 - val_loss: 0.5278
Epoch 111/600
7/7 [=====] - 0s 6ms/step - loss: 0.5070 - val_loss: 0.5285
Epoch 112/600
7/7 [=====] - 0s 5ms/step - loss: 0.5054 - val_loss: 0.5230
Epoch 113/600
7/7 [=====] - 0s 5ms/step - loss: 0.5028 - val_loss: 0.5325
Epoch 114/600
7/7 [=====] - 0s 5ms/step - loss: 0.5004 - val_loss: 0.5282
Epoch 115/600
7/7 [=====] - 0s 6ms/step - loss: 0.4973 - val_loss: 0.5290
Epoch 116/600
7/7 [=====] - 0s 6ms/step - loss: 0.4952 - val_loss: 0.5272
Epoch 117/600
7/7 [=====] - 0s 6ms/step - loss: 0.4944 - val_loss: 0.5236
Epoch 118/600
7/7 [=====] - 0s 6ms/step - loss: 0.4925 - val_loss: 0.5293
Epoch 119/600
7/7 [=====] - 0s 6ms/step - loss: 0.4909 - val_loss: 0.5295
Epoch 120/600
7/7 [=====] - 0s 6ms/step - loss: 0.4889 - val_loss: 0.5263
Epoch 121/600
7/7 [=====] - 0s 5ms/step - loss: 0.4878 - val_loss: 0.5229
Epoch 122/600
7/7 [=====] - 0s 6ms/step - loss: 0.4869 - val_loss: 0.5233
Epoch 123/600
7/7 [=====] - 0s 5ms/step - loss: 0.4856 - val_loss: 0.5263
Epoch 124/600
```

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7/7 [=====] - 0s 6ms/step - loss: 0.4846 - val_loss: 0.5289
Epoch 125/600
7/7 [=====] - 0s 6ms/step - loss: 0.4833 - val_loss: 0.5265
Epoch 126/600
7/7 [=====] - 0s 6ms/step - loss: 0.4823 - val_loss: 0.5244
Epoch 127/600
7/7 [=====] - 0s 6ms/step - loss: 0.4822 - val_loss: 0.5221
Epoch 128/600
7/7 [=====] - 0s 5ms/step - loss: 0.4809 - val_loss: 0.5298
Epoch 129/600
7/7 [=====] - 0s 6ms/step - loss: 0.4798 - val_loss: 0.5256
Epoch 130/600
7/7 [=====] - 0s 6ms/step - loss: 0.4781 - val_loss: 0.5265
Epoch 131/600
7/7 [=====] - 0s 6ms/step - loss: 0.4777 - val_loss: 0.5251
Epoch 132/600
7/7 [=====] - 0s 6ms/step - loss: 0.4763 - val_loss: 0.5260
Epoch 133/600
7/7 [=====] - 0s 6ms/step - loss: 0.4759 - val_loss: 0.5303
Epoch 134/600
7/7 [=====] - 0s 5ms/step - loss: 0.4753 - val_loss: 0.5317
Epoch 135/600
7/7 [=====] - 0s 6ms/step - loss: 0.4745 - val_loss: 0.5223
Epoch 136/600
7/7 [=====] - 0s 6ms/step - loss: 0.4746 - val_loss: 0.5300
Epoch 137/600
7/7 [=====] - 0s 6ms/step - loss: 0.4737 - val_loss: 0.5214
Epoch 138/600
7/7 [=====] - 0s 5ms/step - loss: 0.4718 - val_loss: 0.5279
Epoch 139/600
7/7 [=====] - 0s 5ms/step - loss: 0.4716 - val_loss: 0.5345
Epoch 140/600
7/7 [=====] - 0s 6ms/step - loss: 0.4708 - val_loss: 0.5306
Epoch 141/600
7/7 [=====] - 0s 6ms/step - loss: 0.4710 - val_loss: 0.5245
Epoch 142/600
7/7 [=====] - 0s 6ms/step - loss: 0.4697 - val_loss: 0.5318
Epoch 143/600
7/7 [=====] - 0s 6ms/step - loss: 0.4686 - val_loss: 0.5336
Epoch 144/600
7/7 [=====] - 0s 6ms/step - loss: 0.4684 - val_loss: 0.5330
Epoch 145/600
7/7 [=====] - 0s 6ms/step - loss: 0.4672 - val_loss: 0.5349
Epoch 146/600
7/7 [=====] - 0s 6ms/step - loss: 0.4671 - val_loss: 0.5294
Epoch 147/600
7/7 [=====] - 0s 6ms/step - loss: 0.4663 - val_loss: 0.5331
Epoch 148/600
7/7 [=====] - 0s 6ms/step - loss: 0.4664 - val_loss: 0.5328
Epoch 149/600
7/7 [=====] - 0s 6ms/step - loss: 0.4659 - val_loss: 0.5356
Epoch 150/600
7/7 [=====] - 0s 6ms/step - loss: 0.4642 - val_loss: 0.5345
Epoch 151/600
7/7 [=====] - 0s 8ms/step - loss: 0.4640 - val_loss: 0.5297
Epoch 152/600
7/7 [=====] - 0s 7ms/step - loss: 0.4635 - val_loss: 0.5316
Epoch 153/600
7/7 [=====] - 0s 6ms/step - loss: 0.4637 - val_loss: 0.5377
Epoch 154/600
7/7 [=====] - 0s 6ms/step - loss: 0.4626 - val_loss: 0.5339
Epoch 155/600
7/7 [=====] - 0s 6ms/step - loss: 0.4617 - val_loss: 0.5341
Epoch 156/600
7/7 [=====] - 0s 6ms/step - loss: 0.4616 - val_loss: 0.5377
```



```
Epoch 157/600
7/7 [=====] - 0s 6ms/step - loss: 0.4611 - val_loss: 0.5347
Epoch 158/600
7/7 [=====] - 0s 6ms/step - loss: 0.4604 - val_loss: 0.5389
Epoch 159/600
7/7 [=====] - 0s 6ms/step - loss: 0.4611 - val_loss: 0.5434
Epoch 160/600
7/7 [=====] - 0s 5ms/step - loss: 0.4593 - val_loss: 0.5358
Epoch 161/600
7/7 [=====] - 0s 6ms/step - loss: 0.4591 - val_loss: 0.5344
Epoch 162/600
7/7 [=====] - 0s 6ms/step - loss: 0.4592 - val_loss: 0.5364
Epoch 163/600
7/7 [=====] - 0s 6ms/step - loss: 0.4585 - val_loss: 0.5396
Epoch 164/600
7/7 [=====] - 0s 6ms/step - loss: 0.4588 - val_loss: 0.5350
Epoch 165/600
7/7 [=====] - 0s 5ms/step - loss: 0.4596 - val_loss: 0.5453
Epoch 166/600
7/7 [=====] - 0s 6ms/step - loss: 0.4580 - val_loss: 0.5375
Epoch 167/600
7/7 [=====] - 0s 5ms/step - loss: 0.4573 - val_loss: 0.5371
Epoch 168/600
7/7 [=====] - 0s 5ms/step - loss: 0.4567 - val_loss: 0.5379
Epoch 169/600
7/7 [=====] - 0s 6ms/step - loss: 0.4559 - val_loss: 0.5423
Epoch 170/600
7/7 [=====] - 0s 6ms/step - loss: 0.4560 - val_loss: 0.5485
Epoch 171/600
7/7 [=====] - 0s 6ms/step - loss: 0.4557 - val_loss: 0.5454
Epoch 172/600
7/7 [=====] - 0s 6ms/step - loss: 0.4560 - val_loss: 0.5381
Epoch 173/600
7/7 [=====] - 0s 6ms/step - loss: 0.4549 - val_loss: 0.5443
Epoch 174/600
7/7 [=====] - 0s 6ms/step - loss: 0.4542 - val_loss: 0.5438
Epoch 175/600
7/7 [=====] - 0s 5ms/step - loss: 0.4532 - val_loss: 0.5444
Epoch 176/600
7/7 [=====] - 0s 5ms/step - loss: 0.4532 - val_loss: 0.5438
Epoch 177/600
7/7 [=====] - 0s 6ms/step - loss: 0.4526 - val_loss: 0.5464
Epoch 178/600
7/7 [=====] - 0s 6ms/step - loss: 0.4535 - val_loss: 0.5516
Epoch 179/600
7/7 [=====] - 0s 6ms/step - loss: 0.4529 - val_loss: 0.5411
Epoch 180/600
7/7 [=====] - 0s 6ms/step - loss: 0.4514 - val_loss: 0.5431
Epoch 181/600
7/7 [=====] - 0s 6ms/step - loss: 0.4507 - val_loss: 0.5475
Epoch 182/600
7/7 [=====] - 0s 7ms/step - loss: 0.4506 - val_loss: 0.5502
Epoch 183/600
7/7 [=====] - 0s 5ms/step - loss: 0.4505 - val_loss: 0.5467
Epoch 184/600
7/7 [=====] - 0s 5ms/step - loss: 0.4503 - val_loss: 0.5455
Epoch 185/600
7/7 [=====] - 0s 5ms/step - loss: 0.4501 - val_loss: 0.5477
Epoch 186/600
7/7 [=====] - 0s 6ms/step - loss: 0.4496 - val_loss: 0.5505
Epoch 187/600
7/7 [=====] - 0s 6ms/step - loss: 0.4497 - val_loss: 0.5483
Epoch 188/600
7/7 [=====] - 0s 6ms/step - loss: 0.4501 - val_loss: 0.5544
Epoch 189/600
```

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7/7 [=====] - 0s 6ms/step - loss: 0.4500 - val_loss: 0.5544
Epoch 190/600
7/7 [=====] - 0s 6ms/step - loss: 0.4504 - val_loss: 0.5423
Epoch 191/600
7/7 [=====] - 0s 6ms/step - loss: 0.4489 - val_loss: 0.5441
Epoch 192/600
7/7 [=====] - 0s 6ms/step - loss: 0.4494 - val_loss: 0.5570
Epoch 193/600
7/7 [=====] - 0s 5ms/step - loss: 0.4480 - val_loss: 0.5543
Epoch 194/600
7/7 [=====] - 0s 6ms/step - loss: 0.4473 - val_loss: 0.5522
Epoch 195/600
7/7 [=====] - 0s 6ms/step - loss: 0.4475 - val_loss: 0.5480
Epoch 196/600
7/7 [=====] - 0s 6ms/step - loss: 0.4476 - val_loss: 0.5519
Epoch 197/600
7/7 [=====] - 0s 5ms/step - loss: 0.4464 - val_loss: 0.5504
Epoch 198/600
7/7 [=====] - 0s 6ms/step - loss: 0.4467 - val_loss: 0.5493
Epoch 199/600
7/7 [=====] - 0s 6ms/step - loss: 0.4463 - val_loss: 0.5516
Epoch 200/600
7/7 [=====] - 0s 6ms/step - loss: 0.4469 - val_loss: 0.5599
Epoch 201/600
7/7 [=====] - 0s 5ms/step - loss: 0.4466 - val_loss: 0.5518
Epoch 202/600
7/7 [=====] - 0s 6ms/step - loss: 0.4454 - val_loss: 0.5500
Epoch 203/600
7/7 [=====] - 0s 7ms/step - loss: 0.4463 - val_loss: 0.5512
Epoch 204/600
7/7 [=====] - 0s 5ms/step - loss: 0.4454 - val_loss: 0.5558
Epoch 205/600
7/7 [=====] - 0s 6ms/step - loss: 0.4455 - val_loss: 0.5587
Epoch 206/600
7/7 [=====] - 0s 6ms/step - loss: 0.4443 - val_loss: 0.5525
Epoch 207/600
7/7 [=====] - 0s 6ms/step - loss: 0.4449 - val_loss: 0.5491
Epoch 208/600
7/7 [=====] - 0s 6ms/step - loss: 0.4445 - val_loss: 0.5540
Epoch 209/600
7/7 [=====] - 0s 5ms/step - loss: 0.4439 - val_loss: 0.5575
Epoch 210/600
7/7 [=====] - 0s 5ms/step - loss: 0.4443 - val_loss: 0.5601
Epoch 211/600
7/7 [=====] - 0s 5ms/step - loss: 0.4439 - val_loss: 0.5545
Epoch 212/600
7/7 [=====] - 0s 5ms/step - loss: 0.4441 - val_loss: 0.5567
Epoch 213/600
7/7 [=====] - 0s 5ms/step - loss: 0.4442 - val_loss: 0.5509
Epoch 214/600
7/7 [=====] - 0s 6ms/step - loss: 0.4435 - val_loss: 0.5569
Epoch 215/600
7/7 [=====] - 0s 5ms/step - loss: 0.4426 - val_loss: 0.5587
Epoch 216/600
7/7 [=====] - 0s 6ms/step - loss: 0.4437 - val_loss: 0.5548
Epoch 217/600
7/7 [=====] - 0s 5ms/step - loss: 0.4421 - val_loss: 0.5605
Epoch 218/600
7/7 [=====] - 0s 5ms/step - loss: 0.4435 - val_loss: 0.5631
Epoch 219/600
7/7 [=====] - 0s 5ms/step - loss: 0.4420 - val_loss: 0.5605
Epoch 220/600
7/7 [=====] - 0s 5ms/step - loss: 0.4424 - val_loss: 0.5553
Epoch 221/600
7/7 [=====] - 0s 5ms/step - loss: 0.4436 - val_loss: 0.5552
```

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Epoch 222/600
7/7 [=====] - 0s 5ms/step - loss: 0.4441 - val_loss: 0.5675
Epoch 223/600
7/7 [=====] - 0s 5ms/step - loss: 0.4413 - val_loss: 0.5601
Epoch 224/600
7/7 [=====] - 0s 5ms/step - loss: 0.4410 - val_loss: 0.5560
Epoch 225/600
7/7 [=====] - 0s 5ms/step - loss: 0.4412 - val_loss: 0.5561
Epoch 226/600
7/7 [=====] - 0s 5ms/step - loss: 0.4426 - val_loss: 0.5675
Epoch 227/600
7/7 [=====] - 0s 5ms/step - loss: 0.4407 - val_loss: 0.5611
Epoch 228/600
7/7 [=====] - 0s 5ms/step - loss: 0.4403 - val_loss: 0.5579
Epoch 229/600
7/7 [=====] - 0s 5ms/step - loss: 0.4417 - val_loss: 0.5652
Epoch 230/600
7/7 [=====] - 0s 5ms/step - loss: 0.4401 - val_loss: 0.5637
Epoch 231/600
7/7 [=====] - 0s 5ms/step - loss: 0.4404 - val_loss: 0.5586
Epoch 232/600
7/7 [=====] - 0s 5ms/step - loss: 0.4406 - val_loss: 0.5554
Epoch 233/600
7/7 [=====] - 0s 5ms/step - loss: 0.4408 - val_loss: 0.5658
Epoch 234/600
7/7 [=====] - 0s 5ms/step - loss: 0.4408 - val_loss: 0.5706
Epoch 235/600
7/7 [=====] - 0s 5ms/step - loss: 0.4393 - val_loss: 0.5598
Epoch 236/600
7/7 [=====] - 0s 5ms/step - loss: 0.4394 - val_loss: 0.5581
Epoch 237/600
7/7 [=====] - 0s 5ms/step - loss: 0.4397 - val_loss: 0.5640
Epoch 238/600
7/7 [=====] - 0s 5ms/step - loss: 0.4385 - val_loss: 0.5656
Epoch 239/600
7/7 [=====] - 0s 5ms/step - loss: 0.4380 - val_loss: 0.5646
Epoch 240/600
7/7 [=====] - 0s 5ms/step - loss: 0.4391 - val_loss: 0.5598
Epoch 241/600
7/7 [=====] - 0s 4ms/step - loss: 0.4378 - val_loss: 0.5672
Epoch 242/600
7/7 [=====] - 0s 4ms/step - loss: 0.4381 - val_loss: 0.5689
Epoch 243/600
7/7 [=====] - 0s 5ms/step - loss: 0.4376 - val_loss: 0.5654
Epoch 244/600
7/7 [=====] - 0s 5ms/step - loss: 0.4378 - val_loss: 0.5679
Epoch 245/600
7/7 [=====] - 0s 4ms/step - loss: 0.4368 - val_loss: 0.5655
Epoch 246/600
7/7 [=====] - 0s 5ms/step - loss: 0.4378 - val_loss: 0.5631
Epoch 247/600
7/7 [=====] - 0s 5ms/step - loss: 0.4392 - val_loss: 0.5574
Epoch 248/600
7/7 [=====] - 0s 4ms/step - loss: 0.4382 - val_loss: 0.5737
Epoch 249/600
7/7 [=====] - 0s 5ms/step - loss: 0.4371 - val_loss: 0.5701
Epoch 250/600
7/7 [=====] - 0s 4ms/step - loss: 0.4364 - val_loss: 0.5710
Epoch 251/600
7/7 [=====] - 0s 4ms/step - loss: 0.4364 - val_loss: 0.5630
Epoch 252/600
7/7 [=====] - 0s 5ms/step - loss: 0.4361 - val_loss: 0.5627
Epoch 253/600
7/7 [=====] - 0s 5ms/step - loss: 0.4362 - val_loss: 0.5707
Epoch 254/600
```

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7/7 [=====] - 0s 5ms/step - loss: 0.4355 - val_loss: 0.5677
Epoch 255/600
7/7 [=====] - 0s 4ms/step - loss: 0.4357 - val_loss: 0.5659
Epoch 256/600
7/7 [=====] - 0s 4ms/step - loss: 0.4356 - val_loss: 0.5704
Epoch 257/600
7/7 [=====] - 0s 4ms/step - loss: 0.4359 - val_loss: 0.5739
Epoch 258/600
7/7 [=====] - 0s 4ms/step - loss: 0.4348 - val_loss: 0.5692
Epoch 259/600
7/7 [=====] - 0s 5ms/step - loss: 0.4344 - val_loss: 0.5677
Epoch 260/600
7/7 [=====] - 0s 5ms/step - loss: 0.4349 - val_loss: 0.5648
Epoch 261/600
7/7 [=====] - 0s 4ms/step - loss: 0.4351 - val_loss: 0.5671
Epoch 262/600
7/7 [=====] - 0s 4ms/step - loss: 0.4337 - val_loss: 0.5713
Epoch 263/600
7/7 [=====] - 0s 4ms/step - loss: 0.4342 - val_loss: 0.5743
Epoch 264/600
7/7 [=====] - 0s 4ms/step - loss: 0.4338 - val_loss: 0.5697
Epoch 265/600
7/7 [=====] - 0s 5ms/step - loss: 0.4344 - val_loss: 0.5663
Epoch 266/600
7/7 [=====] - 0s 4ms/step - loss: 0.4334 - val_loss: 0.5730
Epoch 267/600
7/7 [=====] - 0s 4ms/step - loss: 0.4332 - val_loss: 0.5740
Epoch 268/600
7/7 [=====] - 0s 5ms/step - loss: 0.4336 - val_loss: 0.5752
Epoch 269/600
7/7 [=====] - 0s 4ms/step - loss: 0.4328 - val_loss: 0.5722
Epoch 270/600
7/7 [=====] - 0s 5ms/step - loss: 0.4336 - val_loss: 0.5665
Epoch 271/600
7/7 [=====] - 0s 4ms/step - loss: 0.4331 - val_loss: 0.5670
Epoch 272/600
7/7 [=====] - 0s 4ms/step - loss: 0.4327 - val_loss: 0.5700
Epoch 273/600
7/7 [=====] - 0s 4ms/step - loss: 0.4330 - val_loss: 0.5804
Epoch 274/600
7/7 [=====] - 0s 4ms/step - loss: 0.4323 - val_loss: 0.5769
Epoch 275/600
7/7 [=====] - 0s 4ms/step - loss: 0.4317 - val_loss: 0.5742
Epoch 276/600
7/7 [=====] - 0s 4ms/step - loss: 0.4315 - val_loss: 0.5732
Epoch 277/600
7/7 [=====] - 0s 4ms/step - loss: 0.4319 - val_loss: 0.5727
Epoch 278/600
7/7 [=====] - 0s 4ms/step - loss: 0.4318 - val_loss: 0.5690
Epoch 279/600
7/7 [=====] - 0s 4ms/step - loss: 0.4316 - val_loss: 0.5739
Epoch 280/600
7/7 [=====] - 0s 4ms/step - loss: 0.4322 - val_loss: 0.5783
Epoch 281/600
7/7 [=====] - 0s 4ms/step - loss: 0.4324 - val_loss: 0.5694
Epoch 282/600
7/7 [=====] - 0s 4ms/step - loss: 0.4311 - val_loss: 0.5762
Epoch 283/600
7/7 [=====] - 0s 4ms/step - loss: 0.4312 - val_loss: 0.5795
Epoch 284/600
7/7 [=====] - 0s 3ms/step - loss: 0.4311 - val_loss: 0.5764
Epoch 285/600
7/7 [=====] - 0s 4ms/step - loss: 0.4312 - val_loss: 0.5684
Epoch 286/600
7/7 [=====] - 0s 4ms/step - loss: 0.4303 - val_loss: 0.5720
```

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Epoch 287/600
7/7 [=====] - 0s 4ms/step - loss: 0.4306 - val_loss: 0.5798
Epoch 288/600
7/7 [=====] - 0s 4ms/step - loss: 0.4302 - val_loss: 0.5815
Epoch 289/600
7/7 [=====] - 0s 4ms/step - loss: 0.4290 - val_loss: 0.5741
Epoch 290/600
7/7 [=====] - 0s 4ms/step - loss: 0.4309 - val_loss: 0.5664
Epoch 291/600
7/7 [=====] - 0s 4ms/step - loss: 0.4296 - val_loss: 0.5763
Epoch 292/600
7/7 [=====] - 0s 4ms/step - loss: 0.4289 - val_loss: 0.5810
Epoch 293/600
7/7 [=====] - 0s 4ms/step - loss: 0.4294 - val_loss: 0.5789
Epoch 294/600
7/7 [=====] - 0s 4ms/step - loss: 0.4287 - val_loss: 0.5753
Epoch 295/600
7/7 [=====] - 0s 4ms/step - loss: 0.4286 - val_loss: 0.5777
Epoch 296/600
7/7 [=====] - 0s 4ms/step - loss: 0.4284 - val_loss: 0.5766
Epoch 297/600
7/7 [=====] - 0s 4ms/step - loss: 0.4288 - val_loss: 0.5818
Epoch 298/600
7/7 [=====] - 0s 4ms/step - loss: 0.4281 - val_loss: 0.5768
Epoch 299/600
7/7 [=====] - 0s 4ms/step - loss: 0.4290 - val_loss: 0.5800
Epoch 300/600
7/7 [=====] - 0s 4ms/step - loss: 0.4280 - val_loss: 0.5773
Epoch 301/600
7/7 [=====] - 0s 4ms/step - loss: 0.4280 - val_loss: 0.5739
Epoch 302/600
7/7 [=====] - 0s 4ms/step - loss: 0.4277 - val_loss: 0.5796
Epoch 303/600
7/7 [=====] - 0s 4ms/step - loss: 0.4276 - val_loss: 0.5791
Epoch 304/600
7/7 [=====] - 0s 4ms/step - loss: 0.4274 - val_loss: 0.5783
Epoch 305/600
7/7 [=====] - 0s 4ms/step - loss: 0.4270 - val_loss: 0.5808
Epoch 306/600
7/7 [=====] - 0s 4ms/step - loss: 0.4277 - val_loss: 0.5767
Epoch 307/600
7/7 [=====] - 0s 4ms/step - loss: 0.4265 - val_loss: 0.5801
Epoch 308/600
7/7 [=====] - 0s 4ms/step - loss: 0.4266 - val_loss: 0.5837
Epoch 309/600
7/7 [=====] - 0s 4ms/step - loss: 0.4271 - val_loss: 0.5789
Epoch 310/600
7/7 [=====] - 0s 4ms/step - loss: 0.4269 - val_loss: 0.5793
Epoch 311/600
7/7 [=====] - 0s 4ms/step - loss: 0.4276 - val_loss: 0.5878
Epoch 312/600
7/7 [=====] - 0s 5ms/step - loss: 0.4273 - val_loss: 0.5769
Epoch 313/600
7/7 [=====] - 0s 4ms/step - loss: 0.4258 - val_loss: 0.5799
Epoch 314/600
7/7 [=====] - 0s 4ms/step - loss: 0.4260 - val_loss: 0.5841
Epoch 315/600
7/7 [=====] - 0s 4ms/step - loss: 0.4255 - val_loss: 0.5827
Epoch 316/600
7/7 [=====] - 0s 4ms/step - loss: 0.4256 - val_loss: 0.5809
Epoch 317/600
7/7 [=====] - 0s 4ms/step - loss: 0.4259 - val_loss: 0.5810
Epoch 318/600
7/7 [=====] - 0s 4ms/step - loss: 0.4280 - val_loss: 0.5869
Epoch 319/600
```

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7/7 [=====] - 0s 4ms/step - loss: 0.4252 - val_loss: 0.5786
Epoch 320/600
7/7 [=====] - 0s 4ms/step - loss: 0.4250 - val_loss: 0.5789
Epoch 321/600
7/7 [=====] - 0s 4ms/step - loss: 0.4250 - val_loss: 0.5848
Epoch 322/600
7/7 [=====] - 0s 4ms/step - loss: 0.4259 - val_loss: 0.5863
Epoch 323/600
7/7 [=====] - 0s 4ms/step - loss: 0.4247 - val_loss: 0.5801
Epoch 324/600
7/7 [=====] - 0s 5ms/step - loss: 0.4242 - val_loss: 0.5817
Epoch 325/600
7/7 [=====] - 0s 4ms/step - loss: 0.4252 - val_loss: 0.5882
Epoch 326/600
7/7 [=====] - 0s 4ms/step - loss: 0.4240 - val_loss: 0.5837
Epoch 327/600
7/7 [=====] - 0s 4ms/step - loss: 0.4249 - val_loss: 0.5774
Epoch 328/600
7/7 [=====] - 0s 4ms/step - loss: 0.4244 - val_loss: 0.5854
Epoch 329/600
7/7 [=====] - 0s 4ms/step - loss: 0.4242 - val_loss: 0.5929
Epoch 330/600
7/7 [=====] - 0s 4ms/step - loss: 0.4245 - val_loss: 0.5844
Epoch 331/600
7/7 [=====] - 0s 4ms/step - loss: 0.4241 - val_loss: 0.5818
Epoch 332/600
7/7 [=====] - 0s 5ms/step - loss: 0.4230 - val_loss: 0.5845
Epoch 333/600
7/7 [=====] - 0s 4ms/step - loss: 0.4230 - val_loss: 0.5857
Epoch 334/600
7/7 [=====] - 0s 4ms/step - loss: 0.4243 - val_loss: 0.5953
Epoch 335/600
7/7 [=====] - 0s 4ms/step - loss: 0.4236 - val_loss: 0.5847
Epoch 336/600
7/7 [=====] - 0s 4ms/step - loss: 0.4243 - val_loss: 0.5787
Epoch 337/600
7/7 [=====] - 0s 4ms/step - loss: 0.4240 - val_loss: 0.5909
Epoch 338/600
7/7 [=====] - 0s 4ms/step - loss: 0.4224 - val_loss: 0.5902
Epoch 339/600
7/7 [=====] - 0s 4ms/step - loss: 0.4219 - val_loss: 0.5896
Epoch 340/600
7/7 [=====] - 0s 3ms/step - loss: 0.4221 - val_loss: 0.5884
Epoch 341/600
7/7 [=====] - 0s 4ms/step - loss: 0.4221 - val_loss: 0.5833
Epoch 342/600
7/7 [=====] - 0s 5ms/step - loss: 0.4216 - val_loss: 0.5869
Epoch 343/600
7/7 [=====] - 0s 4ms/step - loss: 0.4218 - val_loss: 0.5879
Epoch 344/600
7/7 [=====] - 0s 4ms/step - loss: 0.4219 - val_loss: 0.5917
Epoch 345/600
7/7 [=====] - 0s 4ms/step - loss: 0.4219 - val_loss: 0.5877
Epoch 346/600
7/7 [=====] - 0s 4ms/step - loss: 0.4218 - val_loss: 0.5894
Epoch 347/600
7/7 [=====] - 0s 4ms/step - loss: 0.4221 - val_loss: 0.5937
Epoch 348/600
7/7 [=====] - 0s 4ms/step - loss: 0.4211 - val_loss: 0.5908
Epoch 349/600
7/7 [=====] - 0s 4ms/step - loss: 0.4206 - val_loss: 0.5898
Epoch 350/600
7/7 [=====] - 0s 4ms/step - loss: 0.4217 - val_loss: 0.5868
Epoch 351/600
7/7 [=====] - 0s 4ms/step - loss: 0.4202 - val_loss: 0.5886
```

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Epoch 352/600
7/7 [=====] - 0s 4ms/step - loss: 0.4210 - val_loss: 0.5911
Epoch 353/600
7/7 [=====] - 0s 4ms/step - loss: 0.4217 - val_loss: 0.5980
Epoch 354/600
7/7 [=====] - 0s 4ms/step - loss: 0.4205 - val_loss: 0.5886
Epoch 355/600
7/7 [=====] - 0s 4ms/step - loss: 0.4206 - val_loss: 0.5883
Epoch 356/600
7/7 [=====] - 0s 4ms/step - loss: 0.4201 - val_loss: 0.5902
Epoch 357/600
7/7 [=====] - 0s 3ms/step - loss: 0.4199 - val_loss: 0.5960
Epoch 358/600
7/7 [=====] - 0s 4ms/step - loss: 0.4224 - val_loss: 0.5972
Epoch 359/600
7/7 [=====] - 0s 4ms/step - loss: 0.4201 - val_loss: 0.5857
Epoch 360/600
7/7 [=====] - 0s 4ms/step - loss: 0.4204 - val_loss: 0.5897
Epoch 361/600
7/7 [=====] - 0s 4ms/step - loss: 0.4196 - val_loss: 0.5908
Epoch 362/600
7/7 [=====] - 0s 4ms/step - loss: 0.4192 - val_loss: 0.5935
Epoch 363/600
7/7 [=====] - 0s 4ms/step - loss: 0.4189 - val_loss: 0.5923
Epoch 364/600
7/7 [=====] - 0s 4ms/step - loss: 0.4191 - val_loss: 0.5948
Epoch 365/600
7/7 [=====] - 0s 4ms/step - loss: 0.4187 - val_loss: 0.5939
Epoch 366/600
7/7 [=====] - 0s 4ms/step - loss: 0.4216 - val_loss: 0.5857
Epoch 367/600
7/7 [=====] - 0s 4ms/step - loss: 0.4208 - val_loss: 0.5988
Epoch 368/600
7/7 [=====] - 0s 4ms/step - loss: 0.4184 - val_loss: 0.5963
Epoch 369/600
7/7 [=====] - 0s 4ms/step - loss: 0.4184 - val_loss: 0.5964
Epoch 370/600
7/7 [=====] - 0s 4ms/step - loss: 0.4185 - val_loss: 0.5893
Epoch 371/600
7/7 [=====] - 0s 4ms/step - loss: 0.4189 - val_loss: 0.5963
Epoch 372/600
7/7 [=====] - 0s 4ms/step - loss: 0.4181 - val_loss: 0.5970
Epoch 373/600
7/7 [=====] - 0s 5ms/step - loss: 0.4206 - val_loss: 0.5858
Epoch 374/600
7/7 [=====] - 0s 4ms/step - loss: 0.4185 - val_loss: 0.5963
Epoch 375/600
7/7 [=====] - 0s 4ms/step - loss: 0.4185 - val_loss: 0.5974
Epoch 376/600
7/7 [=====] - 0s 5ms/step - loss: 0.4177 - val_loss: 0.5958
Epoch 377/600
7/7 [=====] - 0s 4ms/step - loss: 0.4176 - val_loss: 0.5963
Epoch 378/600
7/7 [=====] - 0s 4ms/step - loss: 0.4179 - val_loss: 0.5932
Epoch 379/600
7/7 [=====] - 0s 4ms/step - loss: 0.4170 - val_loss: 0.5982
Epoch 380/600
7/7 [=====] - 0s 4ms/step - loss: 0.4168 - val_loss: 0.5950
Epoch 381/600
7/7 [=====] - 0s 4ms/step - loss: 0.4173 - val_loss: 0.5961
Epoch 382/600
7/7 [=====] - 0s 4ms/step - loss: 0.4180 - val_loss: 0.5899
Epoch 383/600
7/7 [=====] - 0s 4ms/step - loss: 0.4163 - val_loss: 0.5940
Epoch 384/600
```

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7/7 [=====] - 0s 4ms/step - loss: 0.4165 - val_loss: 0.6010
Epoch 385/600
7/7 [=====] - 0s 4ms/step - loss: 0.4171 - val_loss: 0.6008
Epoch 386/600
7/7 [=====] - 0s 4ms/step - loss: 0.4163 - val_loss: 0.5947
Epoch 387/600
7/7 [=====] - 0s 4ms/step - loss: 0.4170 - val_loss: 0.5925
Epoch 388/600
7/7 [=====] - 0s 3ms/step - loss: 0.4167 - val_loss: 0.5909
Epoch 389/600
7/7 [=====] - 0s 4ms/step - loss: 0.4182 - val_loss: 0.6032
Epoch 390/600
7/7 [=====] - 0s 4ms/step - loss: 0.4163 - val_loss: 0.5969
Epoch 391/600
7/7 [=====] - 0s 4ms/step - loss: 0.4157 - val_loss: 0.5934
Epoch 392/600
7/7 [=====] - 0s 4ms/step - loss: 0.4156 - val_loss: 0.5955
Epoch 393/600
7/7 [=====] - 0s 4ms/step - loss: 0.4151 - val_loss: 0.6001
Epoch 394/600
7/7 [=====] - 0s 4ms/step - loss: 0.4151 - val_loss: 0.6010
Epoch 395/600
7/7 [=====] - 0s 4ms/step - loss: 0.4150 - val_loss: 0.5994
Epoch 396/600
7/7 [=====] - 0s 4ms/step - loss: 0.4151 - val_loss: 0.5991
Epoch 397/600
7/7 [=====] - 0s 4ms/step - loss: 0.4157 - val_loss: 0.6024
Epoch 398/600
7/7 [=====] - 0s 5ms/step - loss: 0.4155 - val_loss: 0.5924
Epoch 399/600
7/7 [=====] - 0s 4ms/step - loss: 0.4155 - val_loss: 0.5967
Epoch 400/600
7/7 [=====] - 0s 4ms/step - loss: 0.4159 - val_loss: 0.6023
Epoch 401/600
7/7 [=====] - 0s 4ms/step - loss: 0.4154 - val_loss: 0.5964
Epoch 402/600
7/7 [=====] - 0s 4ms/step - loss: 0.4150 - val_loss: 0.6015
Epoch 403/600
7/7 [=====] - 0s 5ms/step - loss: 0.4142 - val_loss: 0.6006
Epoch 404/600
7/7 [=====] - 0s 4ms/step - loss: 0.4144 - val_loss: 0.5942
Epoch 405/600
7/7 [=====] - 0s 4ms/step - loss: 0.4139 - val_loss: 0.5979
Epoch 406/600
7/7 [=====] - 0s 4ms/step - loss: 0.4142 - val_loss: 0.6012
Epoch 407/600
7/7 [=====] - 0s 4ms/step - loss: 0.4136 - val_loss: 0.5970
Epoch 408/600
7/7 [=====] - 0s 4ms/step - loss: 0.4138 - val_loss: 0.6001
Epoch 409/600
7/7 [=====] - 0s 4ms/step - loss: 0.4136 - val_loss: 0.5984
Epoch 410/600
7/7 [=====] - 0s 4ms/step - loss: 0.4139 - val_loss: 0.6007
Epoch 411/600
7/7 [=====] - 0s 4ms/step - loss: 0.4129 - val_loss: 0.5981
Epoch 412/600
7/7 [=====] - 0s 4ms/step - loss: 0.4135 - val_loss: 0.6016
Epoch 413/600
7/7 [=====] - 0s 5ms/step - loss: 0.4145 - val_loss: 0.6057
Epoch 414/600
7/7 [=====] - 0s 4ms/step - loss: 0.4127 - val_loss: 0.5975
Epoch 415/600
7/7 [=====] - 0s 4ms/step - loss: 0.4133 - val_loss: 0.5990
Epoch 416/600
7/7 [=====] - 0s 4ms/step - loss: 0.4153 - val_loss: 0.6056
```



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Epoch 417/600
7/7 [=====] - 0s 4ms/step - loss: 0.4125 - val_loss: 0.5985
Epoch 418/600
7/7 [=====] - 0s 4ms/step - loss: 0.4129 - val_loss: 0.5973
Epoch 419/600
7/7 [=====] - 0s 4ms/step - loss: 0.4140 - val_loss: 0.6058
Epoch 420/600
7/7 [=====] - 0s 4ms/step - loss: 0.4118 - val_loss: 0.5992
Epoch 421/600
7/7 [=====] - 0s 4ms/step - loss: 0.4130 - val_loss: 0.5969
Epoch 422/600
7/7 [=====] - 0s 4ms/step - loss: 0.4123 - val_loss: 0.6014
Epoch 423/600
7/7 [=====] - 0s 4ms/step - loss: 0.4131 - val_loss: 0.6007
Epoch 424/600
7/7 [=====] - 0s 4ms/step - loss: 0.4148 - val_loss: 0.6124
Epoch 425/600
7/7 [=====] - 0s 4ms/step - loss: 0.4124 - val_loss: 0.6004
Epoch 426/600
7/7 [=====] - 0s 4ms/step - loss: 0.4116 - val_loss: 0.6006
Epoch 427/600
7/7 [=====] - 0s 4ms/step - loss: 0.4120 - val_loss: 0.5980
Epoch 428/600
7/7 [=====] - 0s 4ms/step - loss: 0.4116 - val_loss: 0.6058
Epoch 429/600
7/7 [=====] - 0s 4ms/step - loss: 0.4114 - val_loss: 0.6088
Epoch 430/600
7/7 [=====] - 0s 5ms/step - loss: 0.4112 - val_loss: 0.6072
Epoch 431/600
7/7 [=====] - 0s 4ms/step - loss: 0.4114 - val_loss: 0.5982
Epoch 432/600
7/7 [=====] - 0s 4ms/step - loss: 0.4117 - val_loss: 0.6036
Epoch 433/600
7/7 [=====] - 0s 4ms/step - loss: 0.4106 - val_loss: 0.6016
Epoch 434/600
7/7 [=====] - 0s 4ms/step - loss: 0.4105 - val_loss: 0.6050
Epoch 435/600
7/7 [=====] - 0s 4ms/step - loss: 0.4119 - val_loss: 0.5991
Epoch 436/600
7/7 [=====] - 0s 4ms/step - loss: 0.4108 - val_loss: 0.6057
Epoch 437/600
7/7 [=====] - 0s 4ms/step - loss: 0.4117 - val_loss: 0.6012
Epoch 438/600
7/7 [=====] - 0s 4ms/step - loss: 0.4103 - val_loss: 0.6063
Epoch 439/600
7/7 [=====] - 0s 4ms/step - loss: 0.4103 - val_loss: 0.6100
Epoch 440/600
7/7 [=====] - 0s 4ms/step - loss: 0.4105 - val_loss: 0.6097
Epoch 441/600
7/7 [=====] - 0s 4ms/step - loss: 0.4117 - val_loss: 0.5978
Epoch 442/600
7/7 [=====] - 0s 4ms/step - loss: 0.4100 - val_loss: 0.6006
Epoch 443/600
7/7 [=====] - 0s 5ms/step - loss: 0.4095 - val_loss: 0.6095
Epoch 444/600
7/7 [=====] - 0s 4ms/step - loss: 0.4101 - val_loss: 0.6068
Epoch 445/600
7/7 [=====] - 0s 4ms/step - loss: 0.4097 - val_loss: 0.6072
Epoch 446/600
7/7 [=====] - 0s 4ms/step - loss: 0.4094 - val_loss: 0.6098
Epoch 447/600
7/7 [=====] - 0s 4ms/step - loss: 0.4089 - val_loss: 0.6077
Epoch 448/600
7/7 [=====] - 0s 4ms/step - loss: 0.4096 - val_loss: 0.6094
Epoch 449/600
```

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7/7 [=====] - 0s 4ms/step - loss: 0.4089 - val_loss: 0.6023
Epoch 450/600
7/7 [=====] - 0s 4ms/step - loss: 0.4111 - val_loss: 0.5984
Epoch 451/600
7/7 [=====] - 0s 5ms/step - loss: 0.4084 - val_loss: 0.6067
Epoch 452/600
7/7 [=====] - 0s 4ms/step - loss: 0.4108 - val_loss: 0.6164
Epoch 453/600
7/7 [=====] - 0s 4ms/step - loss: 0.4091 - val_loss: 0.6044
Epoch 454/600
7/7 [=====] - 0s 4ms/step - loss: 0.4097 - val_loss: 0.6032
Epoch 455/600
7/7 [=====] - 0s 4ms/step - loss: 0.4085 - val_loss: 0.6053
Epoch 456/600
7/7 [=====] - 0s 4ms/step - loss: 0.4081 - val_loss: 0.6082
Epoch 457/600
7/7 [=====] - 0s 5ms/step - loss: 0.4078 - val_loss: 0.6055
Epoch 458/600
7/7 [=====] - 0s 4ms/step - loss: 0.4078 - val_loss: 0.6071
Epoch 459/600
7/7 [=====] - 0s 4ms/step - loss: 0.4081 - val_loss: 0.6118
Epoch 460/600
7/7 [=====] - 0s 4ms/step - loss: 0.4074 - val_loss: 0.6082
Epoch 461/600
7/7 [=====] - 0s 4ms/step - loss: 0.4074 - val_loss: 0.6062
Epoch 462/600
7/7 [=====] - 0s 4ms/step - loss: 0.4071 - val_loss: 0.6044
Epoch 463/600
7/7 [=====] - 0s 4ms/step - loss: 0.4069 - val_loss: 0.6054
Epoch 464/600
7/7 [=====] - 0s 4ms/step - loss: 0.4073 - val_loss: 0.6110
Epoch 465/600
7/7 [=====] - 0s 4ms/step - loss: 0.4073 - val_loss: 0.6046
Epoch 466/600
7/7 [=====] - 0s 3ms/step - loss: 0.4076 - val_loss: 0.6019
Epoch 467/600
7/7 [=====] - 0s 5ms/step - loss: 0.4067 - val_loss: 0.6074
Epoch 468/600
7/7 [=====] - 0s 4ms/step - loss: 0.4079 - val_loss: 0.6170
Epoch 469/600
7/7 [=====] - 0s 4ms/step - loss: 0.4064 - val_loss: 0.6076
Epoch 470/600
7/7 [=====] - 0s 4ms/step - loss: 0.4061 - val_loss: 0.6043
Epoch 471/600
7/7 [=====] - 0s 4ms/step - loss: 0.4081 - val_loss: 0.5979
Epoch 472/600
7/7 [=====] - 0s 4ms/step - loss: 0.4065 - val_loss: 0.6069
Epoch 473/600
7/7 [=====] - 0s 4ms/step - loss: 0.4066 - val_loss: 0.6042
Epoch 474/600
7/7 [=====] - 0s 4ms/step - loss: 0.4056 - val_loss: 0.6096
Epoch 475/600
7/7 [=====] - 0s 4ms/step - loss: 0.4063 - val_loss: 0.6140
Epoch 476/600
7/7 [=====] - 0s 4ms/step - loss: 0.4063 - val_loss: 0.6024
Epoch 477/600
7/7 [=====] - 0s 4ms/step - loss: 0.4060 - val_loss: 0.6073
Epoch 478/600
7/7 [=====] - 0s 4ms/step - loss: 0.4075 - val_loss: 0.6120
Epoch 479/600
7/7 [=====] - 0s 4ms/step - loss: 0.4051 - val_loss: 0.6065
Epoch 480/600
7/7 [=====] - 0s 4ms/step - loss: 0.4057 - val_loss: 0.5989
Epoch 481/600
7/7 [=====] - 0s 4ms/step - loss: 0.4056 - val_loss: 0.6012
```

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Epoch 482/600
7/7 [=====] - 0s 4ms/step - loss: 0.4041 - val_loss: 0.6078
Epoch 483/600
7/7 [=====] - 0s 4ms/step - loss: 0.4043 - val_loss: 0.6119
Epoch 484/600
7/7 [=====] - 0s 4ms/step - loss: 0.4051 - val_loss: 0.6075
Epoch 485/600
7/7 [=====] - 0s 4ms/step - loss: 0.4044 - val_loss: 0.6066
Epoch 486/600
7/7 [=====] - 0s 5ms/step - loss: 0.4043 - val_loss: 0.6055
Epoch 487/600
7/7 [=====] - 0s 5ms/step - loss: 0.4040 - val_loss: 0.6075
Epoch 488/600
7/7 [=====] - 0s 5ms/step - loss: 0.4038 - val_loss: 0.6097
Epoch 489/600
7/7 [=====] - 0s 4ms/step - loss: 0.4048 - val_loss: 0.6127
Epoch 490/600
7/7 [=====] - 0s 4ms/step - loss: 0.4034 - val_loss: 0.6047
Epoch 491/600
7/7 [=====] - 0s 4ms/step - loss: 0.4040 - val_loss: 0.6019
Epoch 492/600
7/7 [=====] - 0s 4ms/step - loss: 0.4033 - val_loss: 0.6056
Epoch 493/600
7/7 [=====] - 0s 5ms/step - loss: 0.4034 - val_loss: 0.6093
Epoch 494/600
7/7 [=====] - 0s 4ms/step - loss: 0.4032 - val_loss: 0.6094
Epoch 495/600
7/7 [=====] - 0s 4ms/step - loss: 0.4031 - val_loss: 0.6062
Epoch 496/600
7/7 [=====] - 0s 4ms/step - loss: 0.4029 - val_loss: 0.6036
Epoch 497/600
7/7 [=====] - 0s 4ms/step - loss: 0.4027 - val_loss: 0.6077
Epoch 498/600
7/7 [=====] - 0s 4ms/step - loss: 0.4024 - val_loss: 0.6083
Epoch 499/600
7/7 [=====] - 0s 3ms/step - loss: 0.4031 - val_loss: 0.6110
Epoch 500/600
7/7 [=====] - 0s 4ms/step - loss: 0.4023 - val_loss: 0.6064
Epoch 501/600
7/7 [=====] - 0s 4ms/step - loss: 0.4026 - val_loss: 0.6042
Epoch 502/600
7/7 [=====] - 0s 4ms/step - loss: 0.4022 - val_loss: 0.6053
Epoch 503/600
7/7 [=====] - 0s 5ms/step - loss: 0.4038 - val_loss: 0.6165
Epoch 504/600
7/7 [=====] - 0s 4ms/step - loss: 0.4023 - val_loss: 0.6049
Epoch 505/600
7/7 [=====] - 0s 4ms/step - loss: 0.4019 - val_loss: 0.6018
Epoch 506/600
7/7 [=====] - 0s 4ms/step - loss: 0.4034 - val_loss: 0.6108
Epoch 507/600
7/7 [=====] - 0s 4ms/step - loss: 0.4019 - val_loss: 0.6105
Epoch 508/600
7/7 [=====] - 0s 4ms/step - loss: 0.4012 - val_loss: 0.6052
Epoch 509/600
7/7 [=====] - 0s 4ms/step - loss: 0.4017 - val_loss: 0.6027
Epoch 510/600
7/7 [=====] - 0s 4ms/step - loss: 0.4026 - val_loss: 0.6117
Epoch 511/600
7/7 [=====] - 0s 4ms/step - loss: 0.4014 - val_loss: 0.6060
Epoch 512/600
7/7 [=====] - 0s 5ms/step - loss: 0.4012 - val_loss: 0.6067
Epoch 513/600
7/7 [=====] - 0s 4ms/step - loss: 0.4008 - val_loss: 0.6070
Epoch 514/600
```

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7/7 [=====] - 0s 4ms/step - loss: 0.4006 - val_loss: 0.6086
Epoch 515/600
7/7 [=====] - 0s 4ms/step - loss: 0.4004 - val_loss: 0.6099
Epoch 516/600
7/7 [=====] - 0s 4ms/step - loss: 0.4009 - val_loss: 0.6095
Epoch 517/600
7/7 [=====] - 0s 4ms/step - loss: 0.4009 - val_loss: 0.6067
Epoch 518/600
7/7 [=====] - 0s 4ms/step - loss: 0.4010 - val_loss: 0.6122
Epoch 519/600
7/7 [=====] - 0s 4ms/step - loss: 0.4001 - val_loss: 0.6089
Epoch 520/600
7/7 [=====] - 0s 4ms/step - loss: 0.4005 - val_loss: 0.6084
Epoch 521/600
7/7 [=====] - 0s 4ms/step - loss: 0.3997 - val_loss: 0.6089
Epoch 522/600
7/7 [=====] - 0s 4ms/step - loss: 0.3995 - val_loss: 0.6060
Epoch 523/600
7/7 [=====] - 0s 4ms/step - loss: 0.4023 - val_loss: 0.6127
Epoch 524/600
7/7 [=====] - 0s 4ms/step - loss: 0.3994 - val_loss: 0.6075
Epoch 525/600
7/7 [=====] - 0s 4ms/step - loss: 0.3992 - val_loss: 0.6054
Epoch 526/600
7/7 [=====] - 0s 4ms/step - loss: 0.3995 - val_loss: 0.6045
Epoch 527/600
7/7 [=====] - 0s 5ms/step - loss: 0.3992 - val_loss: 0.6095
Epoch 528/600
7/7 [=====] - 0s 4ms/step - loss: 0.4016 - val_loss: 0.6185
Epoch 529/600
7/7 [=====] - 0s 4ms/step - loss: 0.3989 - val_loss: 0.6050
Epoch 530/600
7/7 [=====] - 0s 4ms/step - loss: 0.3993 - val_loss: 0.6013
Epoch 531/600
7/7 [=====] - 0s 4ms/step - loss: 0.4000 - val_loss: 0.6013
Epoch 532/600
7/7 [=====] - 0s 4ms/step - loss: 0.3979 - val_loss: 0.6110
Epoch 533/600
7/7 [=====] - 0s 4ms/step - loss: 0.3989 - val_loss: 0.6165
Epoch 534/600
7/7 [=====] - 0s 4ms/step - loss: 0.3991 - val_loss: 0.6152
Epoch 535/600
7/7 [=====] - 0s 5ms/step - loss: 0.3978 - val_loss: 0.6074
Epoch 536/600
7/7 [=====] - 0s 4ms/step - loss: 0.3980 - val_loss: 0.6084
Epoch 537/600
7/7 [=====] - 0s 5ms/step - loss: 0.3978 - val_loss: 0.6061
Epoch 538/600
7/7 [=====] - 0s 4ms/step - loss: 0.3979 - val_loss: 0.6146
Epoch 539/600
7/7 [=====] - 0s 4ms/step - loss: 0.3973 - val_loss: 0.6120
Epoch 540/600
7/7 [=====] - 0s 4ms/step - loss: 0.3968 - val_loss: 0.6101
Epoch 541/600
7/7 [=====] - 0s 4ms/step - loss: 0.3977 - val_loss: 0.6089
Epoch 542/600
7/7 [=====] - 0s 4ms/step - loss: 0.3970 - val_loss: 0.6119
Epoch 543/600
7/7 [=====] - 0s 4ms/step - loss: 0.3985 - val_loss: 0.6040
Epoch 544/600
7/7 [=====] - 0s 4ms/step - loss: 0.3974 - val_loss: 0.6043
Epoch 545/600
7/7 [=====] - 0s 4ms/step - loss: 0.3974 - val_loss: 0.6164
Epoch 546/600
7/7 [=====] - 0s 4ms/step - loss: 0.3970 - val_loss: 0.6120
```

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Epoch 547/600
7/7 [=====] - 0s 4ms/step - loss: 0.3965 - val_loss: 0.6110
Epoch 548/600
7/7 [=====] - 0s 4ms/step - loss: 0.3969 - val_loss: 0.6066
Epoch 549/600
7/7 [=====] - 0s 4ms/step - loss: 0.3962 - val_loss: 0.6100
Epoch 550/600
7/7 [=====] - 0s 5ms/step - loss: 0.3970 - val_loss: 0.6151
Epoch 551/600
7/7 [=====] - 0s 4ms/step - loss: 0.3955 - val_loss: 0.6092
Epoch 552/600
7/7 [=====] - 0s 4ms/step - loss: 0.3957 - val_loss: 0.6041
Epoch 553/600
7/7 [=====] - 0s 5ms/step - loss: 0.3963 - val_loss: 0.6092
Epoch 554/600
7/7 [=====] - 0s 4ms/step - loss: 0.3964 - val_loss: 0.6139
Epoch 555/600
7/7 [=====] - 0s 3ms/step - loss: 0.3953 - val_loss: 0.6086
Epoch 556/600
7/7 [=====] - 0s 4ms/step - loss: 0.3960 - val_loss: 0.6055
Epoch 557/600
7/7 [=====] - 0s 4ms/step - loss: 0.3965 - val_loss: 0.6144
Epoch 558/600
7/7 [=====] - 0s 4ms/step - loss: 0.3953 - val_loss: 0.6064
Epoch 559/600
7/7 [=====] - 0s 4ms/step - loss: 0.3949 - val_loss: 0.6085
Epoch 560/600
7/7 [=====] - 0s 4ms/step - loss: 0.3950 - val_loss: 0.6057
Epoch 561/600
7/7 [=====] - 0s 4ms/step - loss: 0.3953 - val_loss: 0.6106
Epoch 562/600
7/7 [=====] - 0s 4ms/step - loss: 0.3944 - val_loss: 0.6115
Epoch 563/600
7/7 [=====] - 0s 5ms/step - loss: 0.3952 - val_loss: 0.6070
Epoch 564/600
7/7 [=====] - 0s 4ms/step - loss: 0.3950 - val_loss: 0.6120
Epoch 565/600
7/7 [=====] - 0s 4ms/step - loss: 0.3941 - val_loss: 0.6075
Epoch 566/600
7/7 [=====] - 0s 4ms/step - loss: 0.3957 - val_loss: 0.6051
Epoch 567/600
7/7 [=====] - 0s 4ms/step - loss: 0.3944 - val_loss: 0.6129
Epoch 568/600
7/7 [=====] - 0s 5ms/step - loss: 0.3940 - val_loss: 0.6113
Epoch 569/600
7/7 [=====] - 0s 4ms/step - loss: 0.3934 - val_loss: 0.6106
Epoch 570/600
7/7 [=====] - 0s 4ms/step - loss: 0.3940 - val_loss: 0.6134
Epoch 571/600
7/7 [=====] - ETA: 0s - loss: 0.301 - 0s 4ms/step - loss: 0.394
4 - val_loss: 0.6117
Epoch 572/600
7/7 [=====] - 0s 5ms/step - loss: 0.3933 - val_loss: 0.6058
Epoch 573/600
7/7 [=====] - 0s 4ms/step - loss: 0.3938 - val_loss: 0.6095
Epoch 574/600
7/7 [=====] - 0s 4ms/step - loss: 0.3938 - val_loss: 0.6156
Epoch 575/600
7/7 [=====] - 0s 4ms/step - loss: 0.3929 - val_loss: 0.6071
Epoch 576/600
7/7 [=====] - 0s 4ms/step - loss: 0.3935 - val_loss: 0.6091
Epoch 577/600
7/7 [=====] - 0s 4ms/step - loss: 0.3927 - val_loss: 0.6114
Epoch 578/600
7/7 [=====] - 0s 4ms/step - loss: 0.3925 - val_loss: 0.6088
```

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Epoch 579/600
7/7 [=====] - 0s 4ms/step - loss: 0.3922 - val_loss: 0.6108
Epoch 580/600
7/7 [=====] - 0s 4ms/step - loss: 0.3928 - val_loss: 0.6127
Epoch 581/600
7/7 [=====] - 0s 4ms/step - loss: 0.3927 - val_loss: 0.6134
Epoch 582/600
7/7 [=====] - 0s 5ms/step - loss: 0.3925 - val_loss: 0.6063
Epoch 583/600
7/7 [=====] - 0s 4ms/step - loss: 0.3920 - val_loss: 0.6068
Epoch 584/600
7/7 [=====] - 0s 4ms/step - loss: 0.3917 - val_loss: 0.6153
Epoch 585/600
7/7 [=====] - 0s 4ms/step - loss: 0.3923 - val_loss: 0.6173
Epoch 586/600
7/7 [=====] - 0s 4ms/step - loss: 0.3940 - val_loss: 0.6170
Epoch 587/600
7/7 [=====] - 0s 4ms/step - loss: 0.3932 - val_loss: 0.6028
Epoch 588/600
7/7 [=====] - 0s 4ms/step - loss: 0.3928 - val_loss: 0.6061
Epoch 589/600
7/7 [=====] - 0s 4ms/step - loss: 0.3936 - val_loss: 0.6155
Epoch 590/600
7/7 [=====] - 0s 4ms/step - loss: 0.3937 - val_loss: 0.6078
Epoch 591/600
7/7 [=====] - 0s 4ms/step - loss: 0.3917 - val_loss: 0.6152
Epoch 592/600
7/7 [=====] - 0s 4ms/step - loss: 0.3913 - val_loss: 0.6134
Epoch 593/600
7/7 [=====] - 0s 4ms/step - loss: 0.3908 - val_loss: 0.6088
Epoch 594/600
7/7 [=====] - 0s 5ms/step - loss: 0.3907 - val_loss: 0.6088
Epoch 595/600
7/7 [=====] - 0s 4ms/step - loss: 0.3905 - val_loss: 0.6127
Epoch 596/600
7/7 [=====] - 0s 4ms/step - loss: 0.3920 - val_loss: 0.6185
Epoch 597/600
7/7 [=====] - 0s 4ms/step - loss: 0.3900 - val_loss: 0.6098
Epoch 598/600
7/7 [=====] - 0s 4ms/step - loss: 0.3907 - val_loss: 0.6079
Epoch 599/600
7/7 [=====] - 0s 4ms/step - loss: 0.3902 - val_loss: 0.6110
Epoch 600/600
7/7 [=====] - 0s 4ms/step - loss: 0.3897 - val_loss: 0.6121

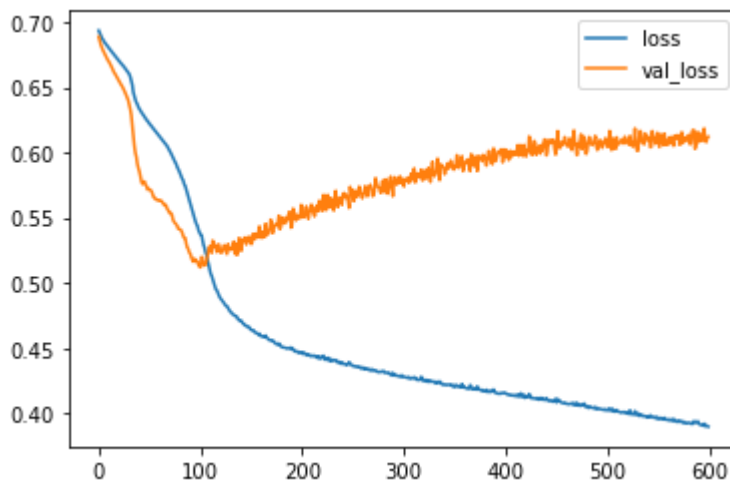
```

Out[78]: <keras.callbacks.History at 0x1f5c53adc70>

```
In [79]: losses = pd.DataFrame(model.history.history)
```

```
In [80]: losses.plot()
```

Out[80]: <AxesSubplot:>



In [81]: *#Data was way too overfit, needed to use callbacks*

```
In [82]: model = Sequential()

model.add(Dense(11,activation='relu'))

model.add(Dense(5,activation='relu'))

model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')
```

```
In [83]: from tensorflow.keras.callbacks import EarlyStopping
```

```
In [84]: early_stop = EarlyStopping(monitor='val_loss',mode='min',
    verbose=1,patience=25)
```

```
In [85]: model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test),
    callbacks=[early_stop])
```

```
Epoch 1/600
7/7 [=====] - 0s 21ms/step - loss: 0.6860 - val_loss: 0.6722
Epoch 2/600
7/7 [=====] - 0s 5ms/step - loss: 0.6791 - val_loss: 0.6612
Epoch 3/600
7/7 [=====] - 0s 4ms/step - loss: 0.6716 - val_loss: 0.6541
Epoch 4/600
7/7 [=====] - 0s 4ms/step - loss: 0.6665 - val_loss: 0.6485
Epoch 5/600
7/7 [=====] - 0s 4ms/step - loss: 0.6623 - val_loss: 0.6433
Epoch 6/600
7/7 [=====] - 0s 5ms/step - loss: 0.6581 - val_loss: 0.6389
Epoch 7/600
7/7 [=====] - 0s 5ms/step - loss: 0.6549 - val_loss: 0.6345
Epoch 8/600
7/7 [=====] - 0s 4ms/step - loss: 0.6518 - val_loss: 0.6298
Epoch 9/600
7/7 [=====] - 0s 4ms/step - loss: 0.6489 - val_loss: 0.6257
Epoch 10/600
7/7 [=====] - 0s 4ms/step - loss: 0.6459 - val_loss: 0.6221
Epoch 11/600
7/7 [=====] - 0s 4ms/step - loss: 0.6443 - val_loss: 0.6180
Epoch 12/600
7/7 [=====] - 0s 4ms/step - loss: 0.6416 - val_loss: 0.6148
```

```
Epoch 13/600
7/7 [=====] - 0s 4ms/step - loss: 0.6395 - val_loss: 0.6126
Epoch 14/600
7/7 [=====] - 0s 5ms/step - loss: 0.6377 - val_loss: 0.6105
Epoch 15/600
7/7 [=====] - 0s 4ms/step - loss: 0.6363 - val_loss: 0.6081
Epoch 16/600
7/7 [=====] - 0s 4ms/step - loss: 0.6350 - val_loss: 0.6055
Epoch 17/600
7/7 [=====] - 0s 5ms/step - loss: 0.6333 - val_loss: 0.6041
Epoch 18/600
7/7 [=====] - 0s 4ms/step - loss: 0.6323 - val_loss: 0.6019
Epoch 19/600
7/7 [=====] - 0s 5ms/step - loss: 0.6309 - val_loss: 0.6008
Epoch 20/600
7/7 [=====] - 0s 4ms/step - loss: 0.6302 - val_loss: 0.5981
Epoch 21/600
7/7 [=====] - 0s 4ms/step - loss: 0.6287 - val_loss: 0.5972
Epoch 22/600
7/7 [=====] - 0s 4ms/step - loss: 0.6278 - val_loss: 0.5958
Epoch 23/600
7/7 [=====] - 0s 4ms/step - loss: 0.6270 - val_loss: 0.5947
Epoch 24/600
7/7 [=====] - 0s 4ms/step - loss: 0.6261 - val_loss: 0.5947
Epoch 25/600
7/7 [=====] - 0s 5ms/step - loss: 0.6257 - val_loss: 0.5932
Epoch 26/600
7/7 [=====] - 0s 4ms/step - loss: 0.6246 - val_loss: 0.5930
Epoch 27/600
7/7 [=====] - 0s 4ms/step - loss: 0.6240 - val_loss: 0.5918
Epoch 28/600
7/7 [=====] - 0s 4ms/step - loss: 0.6232 - val_loss: 0.5909
Epoch 29/600
7/7 [=====] - 0s 5ms/step - loss: 0.6225 - val_loss: 0.5902
Epoch 30/600
7/7 [=====] - 0s 4ms/step - loss: 0.6219 - val_loss: 0.5899
Epoch 31/600
7/7 [=====] - 0s 4ms/step - loss: 0.6211 - val_loss: 0.5900
Epoch 32/600
7/7 [=====] - 0s 4ms/step - loss: 0.6204 - val_loss: 0.5898
Epoch 33/600
7/7 [=====] - 0s 4ms/step - loss: 0.6195 - val_loss: 0.5894
Epoch 34/600
7/7 [=====] - 0s 4ms/step - loss: 0.6188 - val_loss: 0.5885
Epoch 35/600
7/7 [=====] - 0s 4ms/step - loss: 0.6180 - val_loss: 0.5892
Epoch 36/600
7/7 [=====] - 0s 3ms/step - loss: 0.6172 - val_loss: 0.5892
Epoch 37/600
7/7 [=====] - 0s 4ms/step - loss: 0.6165 - val_loss: 0.5877
Epoch 38/600
7/7 [=====] - 0s 4ms/step - loss: 0.6155 - val_loss: 0.5878
Epoch 39/600
7/7 [=====] - 0s 4ms/step - loss: 0.6147 - val_loss: 0.5870
Epoch 40/600
7/7 [=====] - 0s 5ms/step - loss: 0.6139 - val_loss: 0.5868
Epoch 41/600
7/7 [=====] - 0s 4ms/step - loss: 0.6132 - val_loss: 0.5856
Epoch 42/600
7/7 [=====] - 0s 4ms/step - loss: 0.6125 - val_loss: 0.5853
Epoch 43/600
7/7 [=====] - 0s 4ms/step - loss: 0.6116 - val_loss: 0.5849
Epoch 44/600
7/7 [=====] - 0s 4ms/step - loss: 0.6111 - val_loss: 0.5840
Epoch 45/600
```



```
7/7 [=====] - 0s 4ms/step - loss: 0.6104 - val_loss: 0.5831
Epoch 46/600
7/7 [=====] - 0s 4ms/step - loss: 0.6094 - val_loss: 0.5829
Epoch 47/600
7/7 [=====] - 0s 4ms/step - loss: 0.6089 - val_loss: 0.5841
Epoch 48/600
7/7 [=====] - 0s 4ms/step - loss: 0.6079 - val_loss: 0.5833
Epoch 49/600
7/7 [=====] - 0s 4ms/step - loss: 0.6069 - val_loss: 0.5827
Epoch 50/600
7/7 [=====] - 0s 4ms/step - loss: 0.6061 - val_loss: 0.5823
Epoch 51/600
7/7 [=====] - 0s 4ms/step - loss: 0.6054 - val_loss: 0.5826
Epoch 52/600
7/7 [=====] - 0s 4ms/step - loss: 0.6042 - val_loss: 0.5819
Epoch 53/600
7/7 [=====] - 0s 5ms/step - loss: 0.6031 - val_loss: 0.5821
Epoch 54/600
7/7 [=====] - 0s 4ms/step - loss: 0.6018 - val_loss: 0.5818
Epoch 55/600
7/7 [=====] - 0s 5ms/step - loss: 0.6003 - val_loss: 0.5813
Epoch 56/600
7/7 [=====] - 0s 5ms/step - loss: 0.5990 - val_loss: 0.5813
Epoch 57/600
7/7 [=====] - 0s 5ms/step - loss: 0.5971 - val_loss: 0.5796
Epoch 58/600
7/7 [=====] - 0s 5ms/step - loss: 0.5954 - val_loss: 0.5808
Epoch 59/600
7/7 [=====] - 0s 4ms/step - loss: 0.5935 - val_loss: 0.5823
Epoch 60/600
7/7 [=====] - 0s 5ms/step - loss: 0.5912 - val_loss: 0.5821
Epoch 61/600
7/7 [=====] - 0s 4ms/step - loss: 0.5901 - val_loss: 0.5783
Epoch 62/600
7/7 [=====] - 0s 4ms/step - loss: 0.5878 - val_loss: 0.5791
Epoch 63/600
7/7 [=====] - 0s 4ms/step - loss: 0.5855 - val_loss: 0.5779
Epoch 64/600
7/7 [=====] - 0s 4ms/step - loss: 0.5835 - val_loss: 0.5764
Epoch 65/600
7/7 [=====] - 0s 4ms/step - loss: 0.5820 - val_loss: 0.5735
Epoch 66/600
7/7 [=====] - 0s 5ms/step - loss: 0.5796 - val_loss: 0.5725
Epoch 67/600
7/7 [=====] - 0s 4ms/step - loss: 0.5779 - val_loss: 0.5733
Epoch 68/600
7/7 [=====] - 0s 5ms/step - loss: 0.5763 - val_loss: 0.5724
Epoch 69/600
7/7 [=====] - 0s 5ms/step - loss: 0.5742 - val_loss: 0.5742
Epoch 70/600
7/7 [=====] - 0s 4ms/step - loss: 0.5723 - val_loss: 0.5755
Epoch 71/600
7/7 [=====] - 0s 4ms/step - loss: 0.5706 - val_loss: 0.5752
Epoch 72/600
7/7 [=====] - 0s 5ms/step - loss: 0.5680 - val_loss: 0.5712
Epoch 73/600
7/7 [=====] - 0s 4ms/step - loss: 0.5664 - val_loss: 0.5689
Epoch 74/600
7/7 [=====] - 0s 5ms/step - loss: 0.5641 - val_loss: 0.5694
Epoch 75/600
7/7 [=====] - 0s 5ms/step - loss: 0.5624 - val_loss: 0.5672
Epoch 76/600
7/7 [=====] - 0s 5ms/step - loss: 0.5604 - val_loss: 0.5682
Epoch 77/600
7/7 [=====] - 0s 4ms/step - loss: 0.5590 - val_loss: 0.5707
```

```
Epoch 78/600
7/7 [=====] - 0s 4ms/step - loss: 0.5571 - val_loss: 0.5676
Epoch 79/600
7/7 [=====] - 0s 4ms/step - loss: 0.5549 - val_loss: 0.5659
Epoch 80/600
7/7 [=====] - 0s 4ms/step - loss: 0.5536 - val_loss: 0.5645
Epoch 81/600
7/7 [=====] - 0s 4ms/step - loss: 0.5513 - val_loss: 0.5654
Epoch 82/600
7/7 [=====] - 0s 4ms/step - loss: 0.5497 - val_loss: 0.5651
Epoch 83/600
7/7 [=====] - 0s 4ms/step - loss: 0.5480 - val_loss: 0.5643
Epoch 84/600
7/7 [=====] - 0s 4ms/step - loss: 0.5461 - val_loss: 0.5620
Epoch 85/600
7/7 [=====] - 0s 4ms/step - loss: 0.5441 - val_loss: 0.5637
Epoch 86/600
7/7 [=====] - 0s 4ms/step - loss: 0.5432 - val_loss: 0.5665
Epoch 87/600
7/7 [=====] - 0s 4ms/step - loss: 0.5408 - val_loss: 0.5622
Epoch 88/600
7/7 [=====] - 0s 4ms/step - loss: 0.5392 - val_loss: 0.5599
Epoch 89/600
7/7 [=====] - 0s 4ms/step - loss: 0.5373 - val_loss: 0.5576
Epoch 90/600
7/7 [=====] - 0s 4ms/step - loss: 0.5358 - val_loss: 0.5562
Epoch 91/600
7/7 [=====] - 0s 5ms/step - loss: 0.5346 - val_loss: 0.5590
Epoch 92/600
7/7 [=====] - 0s 4ms/step - loss: 0.5331 - val_loss: 0.5559
Epoch 93/600
7/7 [=====] - 0s 4ms/step - loss: 0.5317 - val_loss: 0.5546
Epoch 94/600
7/7 [=====] - 0s 4ms/step - loss: 0.5298 - val_loss: 0.5578
Epoch 95/600
7/7 [=====] - 0s 4ms/step - loss: 0.5283 - val_loss: 0.5563
Epoch 96/600
7/7 [=====] - 0s 4ms/step - loss: 0.5276 - val_loss: 0.5517
Epoch 97/600
7/7 [=====] - 0s 4ms/step - loss: 0.5257 - val_loss: 0.5556
Epoch 98/600
7/7 [=====] - 0s 4ms/step - loss: 0.5248 - val_loss: 0.5511
Epoch 99/600
7/7 [=====] - 0s 4ms/step - loss: 0.5225 - val_loss: 0.5524
Epoch 100/600
7/7 [=====] - 0s 4ms/step - loss: 0.5218 - val_loss: 0.5552
Epoch 101/600
7/7 [=====] - 0s 4ms/step - loss: 0.5203 - val_loss: 0.5537
Epoch 102/600
7/7 [=====] - 0s 4ms/step - loss: 0.5192 - val_loss: 0.5515
Epoch 103/600
7/7 [=====] - 0s 4ms/step - loss: 0.5180 - val_loss: 0.5478
Epoch 104/600
7/7 [=====] - 0s 4ms/step - loss: 0.5175 - val_loss: 0.5446
Epoch 105/600
7/7 [=====] - 0s 4ms/step - loss: 0.5158 - val_loss: 0.5481
Epoch 106/600
7/7 [=====] - 0s 4ms/step - loss: 0.5147 - val_loss: 0.5483
Epoch 107/600
7/7 [=====] - 0s 4ms/step - loss: 0.5134 - val_loss: 0.5498
Epoch 108/600
7/7 [=====] - 0s 4ms/step - loss: 0.5129 - val_loss: 0.5510
Epoch 109/600
7/7 [=====] - 0s 5ms/step - loss: 0.5117 - val_loss: 0.5467
Epoch 110/600
```

```
7/7 [=====] - 0s 5ms/step - loss: 0.5103 - val_loss: 0.5451
Epoch 111/600
7/7 [=====] - 0s 4ms/step - loss: 0.5106 - val_loss: 0.5421
Epoch 112/600
7/7 [=====] - 0s 4ms/step - loss: 0.5083 - val_loss: 0.5450
Epoch 113/600
7/7 [=====] - 0s 4ms/step - loss: 0.5076 - val_loss: 0.5498
Epoch 114/600
7/7 [=====] - 0s 5ms/step - loss: 0.5071 - val_loss: 0.5462
Epoch 115/600
7/7 [=====] - 0s 4ms/step - loss: 0.5066 - val_loss: 0.5421
Epoch 116/600
7/7 [=====] - 0s 4ms/step - loss: 0.5066 - val_loss: 0.5476
Epoch 117/600
7/7 [=====] - 0s 4ms/step - loss: 0.5039 - val_loss: 0.5433
Epoch 118/600
7/7 [=====] - 0s 4ms/step - loss: 0.5037 - val_loss: 0.5453
Epoch 119/600
7/7 [=====] - 0s 4ms/step - loss: 0.5023 - val_loss: 0.5419
Epoch 120/600
7/7 [=====] - 0s 4ms/step - loss: 0.5016 - val_loss: 0.5407
Epoch 121/600
7/7 [=====] - 0s 4ms/step - loss: 0.5007 - val_loss: 0.5413
Epoch 122/600
7/7 [=====] - 0s 4ms/step - loss: 0.5001 - val_loss: 0.5424
Epoch 123/600
7/7 [=====] - 0s 4ms/step - loss: 0.4995 - val_loss: 0.5433
Epoch 124/600
7/7 [=====] - 0s 4ms/step - loss: 0.4989 - val_loss: 0.5468
Epoch 125/600
7/7 [=====] - 0s 4ms/step - loss: 0.4978 - val_loss: 0.5410
Epoch 126/600
7/7 [=====] - 0s 4ms/step - loss: 0.4977 - val_loss: 0.5374
Epoch 127/600
7/7 [=====] - 0s 5ms/step - loss: 0.4965 - val_loss: 0.5402
Epoch 128/600
7/7 [=====] - 0s 4ms/step - loss: 0.4960 - val_loss: 0.5441
Epoch 129/600
7/7 [=====] - 0s 4ms/step - loss: 0.4967 - val_loss: 0.5383
Epoch 130/600
7/7 [=====] - 0s 4ms/step - loss: 0.4943 - val_loss: 0.5419
Epoch 131/600
7/7 [=====] - 0s 4ms/step - loss: 0.4939 - val_loss: 0.5435
Epoch 132/600
7/7 [=====] - 0s 4ms/step - loss: 0.4936 - val_loss: 0.5444
Epoch 133/600
7/7 [=====] - 0s 4ms/step - loss: 0.4926 - val_loss: 0.5400
Epoch 134/600
7/7 [=====] - 0s 4ms/step - loss: 0.4920 - val_loss: 0.5406
Epoch 135/600
7/7 [=====] - 0s 4ms/step - loss: 0.4921 - val_loss: 0.5429
Epoch 136/600
7/7 [=====] - 0s 4ms/step - loss: 0.4906 - val_loss: 0.5407
Epoch 137/600
7/7 [=====] - 0s 5ms/step - loss: 0.4904 - val_loss: 0.5390
Epoch 138/600
7/7 [=====] - 0s 4ms/step - loss: 0.4897 - val_loss: 0.5389
Epoch 139/600
7/7 [=====] - 0s 4ms/step - loss: 0.4894 - val_loss: 0.5395
Epoch 140/600
7/7 [=====] - 0s 5ms/step - loss: 0.4885 - val_loss: 0.5397
Epoch 141/600
7/7 [=====] - 0s 4ms/step - loss: 0.4882 - val_loss: 0.5384
Epoch 142/600
7/7 [=====] - 0s 4ms/step - loss: 0.4880 - val_loss: 0.5418
```

```

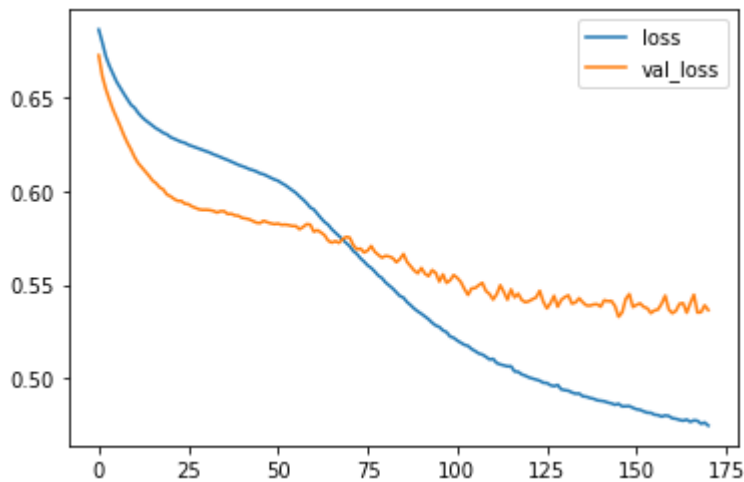
Epoch 143/600
7/7 [=====] - 0s 5ms/step - loss: 0.4873 - val_loss: 0.5413
Epoch 144/600
7/7 [=====] - 0s 4ms/step - loss: 0.4869 - val_loss: 0.5414
Epoch 145/600
7/7 [=====] - 0s 4ms/step - loss: 0.4861 - val_loss: 0.5387
Epoch 146/600
7/7 [=====] - 0s 5ms/step - loss: 0.4866 - val_loss: 0.5329
Epoch 147/600
7/7 [=====] - 0s 4ms/step - loss: 0.4852 - val_loss: 0.5354
Epoch 148/600
7/7 [=====] - 0s 5ms/step - loss: 0.4853 - val_loss: 0.5425
Epoch 149/600
7/7 [=====] - 0s 4ms/step - loss: 0.4854 - val_loss: 0.5451
Epoch 150/600
7/7 [=====] - 0s 4ms/step - loss: 0.4845 - val_loss: 0.5382
Epoch 151/600
7/7 [=====] - 0s 4ms/step - loss: 0.4837 - val_loss: 0.5393
Epoch 152/600
7/7 [=====] - 0s 4ms/step - loss: 0.4834 - val_loss: 0.5401
Epoch 153/600
7/7 [=====] - 0s 3ms/step - loss: 0.4826 - val_loss: 0.5382
Epoch 154/600
7/7 [=====] - 0s 4ms/step - loss: 0.4819 - val_loss: 0.5375
Epoch 155/600
7/7 [=====] - 0s 4ms/step - loss: 0.4818 - val_loss: 0.5349
Epoch 156/600
7/7 [=====] - 0s 4ms/step - loss: 0.4808 - val_loss: 0.5364
Epoch 157/600
7/7 [=====] - 0s 4ms/step - loss: 0.4806 - val_loss: 0.5368
Epoch 158/600
7/7 [=====] - 0s 4ms/step - loss: 0.4798 - val_loss: 0.5400
Epoch 159/600
7/7 [=====] - 0s 4ms/step - loss: 0.4804 - val_loss: 0.5442
Epoch 160/600
7/7 [=====] - 0s 4ms/step - loss: 0.4801 - val_loss: 0.5369
Epoch 161/600
7/7 [=====] - 0s 4ms/step - loss: 0.4789 - val_loss: 0.5349
Epoch 162/600
7/7 [=====] - 0s 4ms/step - loss: 0.4787 - val_loss: 0.5362
Epoch 163/600
7/7 [=====] - 0s 5ms/step - loss: 0.4780 - val_loss: 0.5399
Epoch 164/600
7/7 [=====] - 0s 4ms/step - loss: 0.4776 - val_loss: 0.5402
Epoch 165/600
7/7 [=====] - 0s 4ms/step - loss: 0.4782 - val_loss: 0.5351
Epoch 166/600
7/7 [=====] - 0s 5ms/step - loss: 0.4770 - val_loss: 0.5402
Epoch 167/600
7/7 [=====] - 0s 4ms/step - loss: 0.4778 - val_loss: 0.5447
Epoch 168/600
7/7 [=====] - 0s 4ms/step - loss: 0.4776 - val_loss: 0.5352
Epoch 169/600
7/7 [=====] - 0s 4ms/step - loss: 0.4760 - val_loss: 0.5354
Epoch 170/600
7/7 [=====] - 0s 4ms/step - loss: 0.4767 - val_loss: 0.5391
Epoch 171/600
7/7 [=====] - 0s 5ms/step - loss: 0.4750 - val_loss: 0.5365
Epoch 00171: early stopping

```

```
Out[85]: <keras.callbacks.History at 0x1f5c553b910>
```

```
In [86]: model_loss = pd.DataFrame(model.history.history)
         model_loss.plot()
```

Out[86]: <AxesSubplot:>

In [87]: *#Training got better, will now add dropout layers*In [88]: `from tensorflow.keras.layers import Dropout`

```
In [89]: model = Sequential()

model.add(Dense(11,activation='relu'))
model.add(Dropout(0.5))

model.add(Dense(5,activation='relu'))
model.add(Dropout(0.5))

model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')
```

```
In [90]: model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test),
                  callbacks=[early_stop])
```

```
Epoch 1/600
7/7 [=====] - 0s 21ms/step - loss: 0.7794 - val_loss: 0.6063
Epoch 2/600
7/7 [=====] - 0s 5ms/step - loss: 0.7910 - val_loss: 0.6044
Epoch 3/600
7/7 [=====] - 0s 5ms/step - loss: 0.7799 - val_loss: 0.6026
Epoch 4/600
7/7 [=====] - 0s 5ms/step - loss: 0.7477 - val_loss: 0.6024
Epoch 5/600
7/7 [=====] - 0s 5ms/step - loss: 0.7799 - val_loss: 0.6038
Epoch 6/600
7/7 [=====] - 0s 4ms/step - loss: 0.7026 - val_loss: 0.6037
Epoch 7/600
7/7 [=====] - 0s 4ms/step - loss: 0.7399 - val_loss: 0.6035
Epoch 8/600
7/7 [=====] - 0s 4ms/step - loss: 0.7711 - val_loss: 0.6035
Epoch 9/600
7/7 [=====] - 0s 4ms/step - loss: 0.6708 - val_loss: 0.6024
Epoch 10/600
7/7 [=====] - 0s 4ms/step - loss: 0.6927 - val_loss: 0.6015
Epoch 11/600
7/7 [=====] - 0s 4ms/step - loss: 0.7090 - val_loss: 0.6018
Epoch 12/600
7/7 [=====] - 0s 5ms/step - loss: 0.6742 - val_loss: 0.6016
```

```

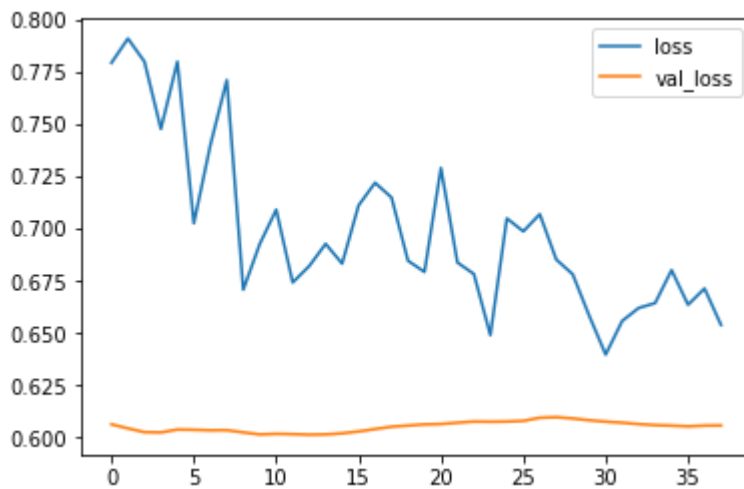
Epoch 13/600
7/7 [=====] - 0s 5ms/step - loss: 0.6820 - val_loss: 0.6014
Epoch 14/600
7/7 [=====] - 0s 5ms/step - loss: 0.6927 - val_loss: 0.6015
Epoch 15/600
7/7 [=====] - 0s 4ms/step - loss: 0.6833 - val_loss: 0.6020
Epoch 16/600
7/7 [=====] - 0s 4ms/step - loss: 0.7111 - val_loss: 0.6029
Epoch 17/600
7/7 [=====] - 0s 5ms/step - loss: 0.7219 - val_loss: 0.6041
Epoch 18/600
7/7 [=====] - 0s 4ms/step - loss: 0.7149 - val_loss: 0.6052
Epoch 19/600
7/7 [=====] - 0s 5ms/step - loss: 0.6846 - val_loss: 0.6057
Epoch 20/600
7/7 [=====] - 0s 4ms/step - loss: 0.6793 - val_loss: 0.6063
Epoch 21/600
7/7 [=====] - 0s 5ms/step - loss: 0.7290 - val_loss: 0.6065
Epoch 22/600
7/7 [=====] - 0s 4ms/step - loss: 0.6838 - val_loss: 0.6071
Epoch 23/600
7/7 [=====] - 0s 4ms/step - loss: 0.6783 - val_loss: 0.6077
Epoch 24/600
7/7 [=====] - 0s 5ms/step - loss: 0.6490 - val_loss: 0.6075
Epoch 25/600
7/7 [=====] - 0s 5ms/step - loss: 0.7049 - val_loss: 0.6077
Epoch 26/600
7/7 [=====] - 0s 4ms/step - loss: 0.6987 - val_loss: 0.6080
Epoch 27/600
7/7 [=====] - 0s 5ms/step - loss: 0.7069 - val_loss: 0.6095
Epoch 28/600
7/7 [=====] - 0s 4ms/step - loss: 0.6852 - val_loss: 0.6097
Epoch 29/600
7/7 [=====] - 0s 4ms/step - loss: 0.6781 - val_loss: 0.6091
Epoch 30/600
7/7 [=====] - 0s 4ms/step - loss: 0.6583 - val_loss: 0.6083
Epoch 31/600
7/7 [=====] - 0s 4ms/step - loss: 0.6397 - val_loss: 0.6076
Epoch 32/600
7/7 [=====] - 0s 5ms/step - loss: 0.6558 - val_loss: 0.6071
Epoch 33/600
7/7 [=====] - 0s 5ms/step - loss: 0.6620 - val_loss: 0.6064
Epoch 34/600
7/7 [=====] - 0s 4ms/step - loss: 0.6643 - val_loss: 0.6059
Epoch 35/600
7/7 [=====] - 0s 4ms/step - loss: 0.6801 - val_loss: 0.6057
Epoch 36/600
7/7 [=====] - 0s 4ms/step - loss: 0.6636 - val_loss: 0.6053
Epoch 37/600
7/7 [=====] - 0s 4ms/step - loss: 0.6713 - val_loss: 0.6057
Epoch 38/600
7/7 [=====] - 0s 4ms/step - loss: 0.6539 - val_loss: 0.6058
Epoch 00038: early stopping

```

```
Out[90]: <keras.callbacks.History at 0x1f5c6692d00>
```

```
In [91]: model_loss = pd.DataFrame(model.history.history)
         model_loss.plot()
```

```
Out[91]: <AxesSubplot:>
```



```
In [92]: #The neuro network is too small to use 0.5 dropouts.
```

```
In [93]: df.corr()['DEATH_EVENT'].sort_values()
```

```
Out[93]: ejection_fraction      -0.268603
serum_sodium      -0.195204
platelets         -0.049139
smoking           -0.012623
sex               -0.004316
diabetes          -0.001943
creatinine_phosphokinase  0.062728
anaemia           0.066270
high_blood_pressure  0.079351
age               0.253729
serum_creatinine  0.294278
DEATH_EVENT       1.000000
Name: DEATH_EVENT, dtype: float64
```

```
In [94]: df.drop('ejection_fraction',axis=1,inplace=True)
```

```
In [95]: X = df.drop('DEATH_EVENT',axis=1).values
y = df['DEATH_EVENT'].values

X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.25, random_state=101)
```

```
In [96]: from sklearn.preprocessing import MinMaxScaler
```

```
In [97]: scaler = MinMaxScaler()
```

```
In [98]: X_train = scaler.fit_transform(X_train)
```

```
In [99]: X_test = scaler.transform(X_test)
```

```
In [100... from tensorflow.keras.models import Sequential
```

```
In [101... from tensorflow.keras.layers import Dense,Dropout
```

```
In [102... model = Sequential()

model.add(Dense(11,activation='relu'))
```

```

model.add(Dense(5,activation='relu'))

# BINARY CLASSIFICATION
model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')

```

```
In [103... from tensorflow.keras.callbacks import EarlyStopping
```

```
In [104... early_stop = EarlyStopping(monitor='val_loss',mode='min',
                             verbose=1,patience=25)
```

```
In [105... model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test),
               callbacks=[early_stop])
```

```

Epoch 1/600
7/7 [=====] - 0s 22ms/step - loss: 0.8354 - val_loss: 0.8569
Epoch 2/600
7/7 [=====] - 0s 4ms/step - loss: 0.8086 - val_loss: 0.8274
Epoch 3/600
7/7 [=====] - 0s 5ms/step - loss: 0.7873 - val_loss: 0.8017
Epoch 4/600
7/7 [=====] - 0s 4ms/step - loss: 0.7666 - val_loss: 0.7807
Epoch 5/600
7/7 [=====] - 0s 5ms/step - loss: 0.7517 - val_loss: 0.7615
Epoch 6/600
7/7 [=====] - 0s 5ms/step - loss: 0.7377 - val_loss: 0.7457
Epoch 7/600
7/7 [=====] - 0s 5ms/step - loss: 0.7266 - val_loss: 0.7323
Epoch 8/600
7/7 [=====] - 0s 4ms/step - loss: 0.7175 - val_loss: 0.7207
Epoch 9/600
7/7 [=====] - 0s 4ms/step - loss: 0.7097 - val_loss: 0.7107
Epoch 10/600
7/7 [=====] - 0s 4ms/step - loss: 0.7036 - val_loss: 0.7018
Epoch 11/600
7/7 [=====] - 0s 4ms/step - loss: 0.6966 - val_loss: 0.6947
Epoch 12/600
7/7 [=====] - 0s 4ms/step - loss: 0.6911 - val_loss: 0.6882
Epoch 13/600
7/7 [=====] - 0s 5ms/step - loss: 0.6864 - val_loss: 0.6813
Epoch 14/600
7/7 [=====] - 0s 4ms/step - loss: 0.6820 - val_loss: 0.6741
Epoch 15/600
7/7 [=====] - 0s 5ms/step - loss: 0.6768 - val_loss: 0.6674
Epoch 16/600
7/7 [=====] - 0s 4ms/step - loss: 0.6726 - val_loss: 0.6607
Epoch 17/600
7/7 [=====] - 0s 4ms/step - loss: 0.6681 - val_loss: 0.6540
Epoch 18/600
7/7 [=====] - 0s 4ms/step - loss: 0.6638 - val_loss: 0.6471
Epoch 19/600
7/7 [=====] - 0s 4ms/step - loss: 0.6604 - val_loss: 0.6400
Epoch 20/600
7/7 [=====] - 0s 4ms/step - loss: 0.6566 - val_loss: 0.6334
Epoch 21/600
7/7 [=====] - 0s 4ms/step - loss: 0.6535 - val_loss: 0.6271
Epoch 22/600
7/7 [=====] - 0s 4ms/step - loss: 0.6494 - val_loss: 0.6222
Epoch 23/600
7/7 [=====] - 0s 4ms/step - loss: 0.6464 - val_loss: 0.6167
Epoch 24/600

```



```
7/7 [=====] - 0s 4ms/step - loss: 0.6432 - val_loss: 0.6115
Epoch 25/600
7/7 [=====] - 0s 4ms/step - loss: 0.6405 - val_loss: 0.6071
Epoch 26/600
7/7 [=====] - 0s 5ms/step - loss: 0.6383 - val_loss: 0.6033
Epoch 27/600
7/7 [=====] - 0s 4ms/step - loss: 0.6365 - val_loss: 0.6002
Epoch 28/600
7/7 [=====] - 0s 5ms/step - loss: 0.6354 - val_loss: 0.5963
Epoch 29/600
7/7 [=====] - 0s 4ms/step - loss: 0.6333 - val_loss: 0.5944
Epoch 30/600
7/7 [=====] - 0s 4ms/step - loss: 0.6324 - val_loss: 0.5916
Epoch 31/600
7/7 [=====] - 0s 5ms/step - loss: 0.6308 - val_loss: 0.5903
Epoch 32/600
7/7 [=====] - 0s 6ms/step - loss: 0.6299 - val_loss: 0.5882
Epoch 33/600
7/7 [=====] - 0s 4ms/step - loss: 0.6284 - val_loss: 0.5869
Epoch 34/600
7/7 [=====] - 0s 4ms/step - loss: 0.6272 - val_loss: 0.5866
Epoch 35/600
7/7 [=====] - 0s 5ms/step - loss: 0.6260 - val_loss: 0.5851
Epoch 36/600
7/7 [=====] - 0s 5ms/step - loss: 0.6248 - val_loss: 0.5837
Epoch 37/600
7/7 [=====] - 0s 4ms/step - loss: 0.6236 - val_loss: 0.5829
Epoch 38/600
7/7 [=====] - 0s 4ms/step - loss: 0.6224 - val_loss: 0.5825
Epoch 39/600
7/7 [=====] - 0s 5ms/step - loss: 0.6215 - val_loss: 0.5823
Epoch 40/600
7/7 [=====] - 0s 4ms/step - loss: 0.6201 - val_loss: 0.5799
Epoch 41/600
7/7 [=====] - 0s 4ms/step - loss: 0.6186 - val_loss: 0.5796
Epoch 42/600
7/7 [=====] - 0s 5ms/step - loss: 0.6173 - val_loss: 0.5786
Epoch 43/600
7/7 [=====] - 0s 4ms/step - loss: 0.6159 - val_loss: 0.5773
Epoch 44/600
7/7 [=====] - 0s 4ms/step - loss: 0.6148 - val_loss: 0.5763
Epoch 45/600
7/7 [=====] - 0s 4ms/step - loss: 0.6134 - val_loss: 0.5749
Epoch 46/600
7/7 [=====] - 0s 4ms/step - loss: 0.6121 - val_loss: 0.5741
Epoch 47/600
7/7 [=====] - 0s 4ms/step - loss: 0.6109 - val_loss: 0.5728
Epoch 48/600
7/7 [=====] - 0s 4ms/step - loss: 0.6096 - val_loss: 0.5720
Epoch 49/600
7/7 [=====] - 0s 4ms/step - loss: 0.6084 - val_loss: 0.5711
Epoch 50/600
7/7 [=====] - 0s 4ms/step - loss: 0.6069 - val_loss: 0.5705
Epoch 51/600
7/7 [=====] - 0s 4ms/step - loss: 0.6056 - val_loss: 0.5706
Epoch 52/600
7/7 [=====] - 0s 4ms/step - loss: 0.6043 - val_loss: 0.5688
Epoch 53/600
7/7 [=====] - 0s 4ms/step - loss: 0.6028 - val_loss: 0.5685
Epoch 54/600
7/7 [=====] - 0s 4ms/step - loss: 0.6015 - val_loss: 0.5670
Epoch 55/600
7/7 [=====] - 0s 5ms/step - loss: 0.6005 - val_loss: 0.5675
Epoch 56/600
7/7 [=====] - 0s 5ms/step - loss: 0.5989 - val_loss: 0.5655
```

```
Epoch 57/600
7/7 [=====] - 0s 4ms/step - loss: 0.5982 - val_loss: 0.5671
Epoch 58/600
7/7 [=====] - 0s 5ms/step - loss: 0.5960 - val_loss: 0.5644
Epoch 59/600
7/7 [=====] - 0s 4ms/step - loss: 0.5944 - val_loss: 0.5641
Epoch 60/600
7/7 [=====] - 0s 4ms/step - loss: 0.5930 - val_loss: 0.5636
Epoch 61/600
7/7 [=====] - 0s 5ms/step - loss: 0.5917 - val_loss: 0.5617
Epoch 62/600
7/7 [=====] - 0s 4ms/step - loss: 0.5905 - val_loss: 0.5624
Epoch 63/600
7/7 [=====] - 0s 4ms/step - loss: 0.5886 - val_loss: 0.5612
Epoch 64/600
7/7 [=====] - 0s 4ms/step - loss: 0.5873 - val_loss: 0.5620
Epoch 65/600
7/7 [=====] - 0s 4ms/step - loss: 0.5857 - val_loss: 0.5592
Epoch 66/600
7/7 [=====] - 0s 4ms/step - loss: 0.5843 - val_loss: 0.5599
Epoch 67/600
7/7 [=====] - 0s 4ms/step - loss: 0.5827 - val_loss: 0.5580
Epoch 68/600
7/7 [=====] - 0s 4ms/step - loss: 0.5809 - val_loss: 0.5574
Epoch 69/600
7/7 [=====] - 0s 4ms/step - loss: 0.5791 - val_loss: 0.5565
Epoch 70/600
7/7 [=====] - 0s 4ms/step - loss: 0.5777 - val_loss: 0.5562
Epoch 71/600
7/7 [=====] - 0s 4ms/step - loss: 0.5759 - val_loss: 0.5548
Epoch 72/600
7/7 [=====] - 0s 4ms/step - loss: 0.5744 - val_loss: 0.5546
Epoch 73/600
7/7 [=====] - 0s 4ms/step - loss: 0.5729 - val_loss: 0.5537
Epoch 74/600
7/7 [=====] - 0s 4ms/step - loss: 0.5715 - val_loss: 0.5527
Epoch 75/600
7/7 [=====] - 0s 4ms/step - loss: 0.5700 - val_loss: 0.5519
Epoch 76/600
7/7 [=====] - 0s 4ms/step - loss: 0.5683 - val_loss: 0.5529
Epoch 77/600
7/7 [=====] - 0s 4ms/step - loss: 0.5671 - val_loss: 0.5532
Epoch 78/600
7/7 [=====] - 0s 5ms/step - loss: 0.5655 - val_loss: 0.5525
Epoch 79/600
7/7 [=====] - 0s 5ms/step - loss: 0.5642 - val_loss: 0.5525
Epoch 80/600
7/7 [=====] - 0s 4ms/step - loss: 0.5629 - val_loss: 0.5522
Epoch 81/600
7/7 [=====] - 0s 4ms/step - loss: 0.5613 - val_loss: 0.5516
Epoch 82/600
7/7 [=====] - 0s 5ms/step - loss: 0.5601 - val_loss: 0.5483
Epoch 83/600
7/7 [=====] - 0s 4ms/step - loss: 0.5587 - val_loss: 0.5482
Epoch 84/600
7/7 [=====] - 0s 4ms/step - loss: 0.5572 - val_loss: 0.5481
Epoch 85/600
7/7 [=====] - 0s 4ms/step - loss: 0.5559 - val_loss: 0.5497
Epoch 86/600
7/7 [=====] - 0s 4ms/step - loss: 0.5547 - val_loss: 0.5503
Epoch 87/600
7/7 [=====] - 0s 4ms/step - loss: 0.5534 - val_loss: 0.5492
Epoch 88/600
7/7 [=====] - 0s 4ms/step - loss: 0.5523 - val_loss: 0.5499
Epoch 89/600
```

```

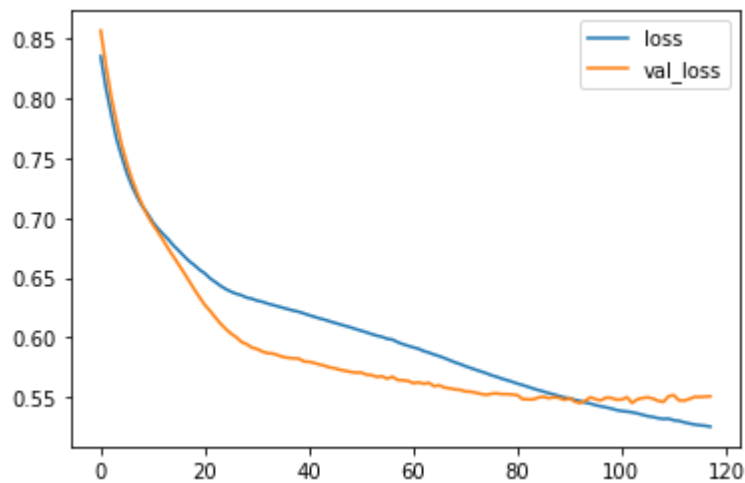
7/7 [=====] - 0s 4ms/step - loss: 0.5510 - val_loss: 0.5494
Epoch 90/600
7/7 [=====] - 0s 5ms/step - loss: 0.5498 - val_loss: 0.5477
Epoch 91/600
7/7 [=====] - 0s 4ms/step - loss: 0.5492 - val_loss: 0.5493
Epoch 92/600
7/7 [=====] - 0s 4ms/step - loss: 0.5478 - val_loss: 0.5463
Epoch 93/600
7/7 [=====] - 0s 4ms/step - loss: 0.5468 - val_loss: 0.5451
Epoch 94/600
7/7 [=====] - 0s 4ms/step - loss: 0.5455 - val_loss: 0.5470
Epoch 95/600
7/7 [=====] - 0s 4ms/step - loss: 0.5446 - val_loss: 0.5499
Epoch 96/600
7/7 [=====] - 0s 5ms/step - loss: 0.5433 - val_loss: 0.5483
Epoch 97/600
7/7 [=====] - 0s 4ms/step - loss: 0.5423 - val_loss: 0.5473
Epoch 98/600
7/7 [=====] - 0s 4ms/step - loss: 0.5415 - val_loss: 0.5496
Epoch 99/600
7/7 [=====] - 0s 4ms/step - loss: 0.5405 - val_loss: 0.5494
Epoch 100/600
7/7 [=====] - 0s 4ms/step - loss: 0.5392 - val_loss: 0.5479
Epoch 101/600
7/7 [=====] - 0s 4ms/step - loss: 0.5384 - val_loss: 0.5480
Epoch 102/600
7/7 [=====] - 0s 4ms/step - loss: 0.5379 - val_loss: 0.5500
Epoch 103/600
7/7 [=====] - 0s 4ms/step - loss: 0.5373 - val_loss: 0.5452
Epoch 104/600
7/7 [=====] - 0s 4ms/step - loss: 0.5364 - val_loss: 0.5482
Epoch 105/600
7/7 [=====] - 0s 4ms/step - loss: 0.5353 - val_loss: 0.5492
Epoch 106/600
7/7 [=====] - 0s 4ms/step - loss: 0.5341 - val_loss: 0.5499
Epoch 107/600
7/7 [=====] - 0s 5ms/step - loss: 0.5334 - val_loss: 0.5488
Epoch 108/600
7/7 [=====] - 0s 4ms/step - loss: 0.5324 - val_loss: 0.5470
Epoch 109/600
7/7 [=====] - 0s 4ms/step - loss: 0.5318 - val_loss: 0.5460
Epoch 110/600
7/7 [=====] - 0s 4ms/step - loss: 0.5320 - val_loss: 0.5508
Epoch 111/600
7/7 [=====] - 0s 4ms/step - loss: 0.5307 - val_loss: 0.5517
Epoch 112/600
7/7 [=====] - 0s 5ms/step - loss: 0.5302 - val_loss: 0.5473
Epoch 113/600
7/7 [=====] - 0s 4ms/step - loss: 0.5289 - val_loss: 0.5471
Epoch 114/600
7/7 [=====] - 0s 5ms/step - loss: 0.5279 - val_loss: 0.5485
Epoch 115/600
7/7 [=====] - 0s 4ms/step - loss: 0.5271 - val_loss: 0.5502
Epoch 116/600
7/7 [=====] - 0s 4ms/step - loss: 0.5265 - val_loss: 0.5502
Epoch 117/600
7/7 [=====] - 0s 4ms/step - loss: 0.5261 - val_loss: 0.5504
Epoch 118/600
7/7 [=====] - 0s 4ms/step - loss: 0.5253 - val_loss: 0.5507
Epoch 00118: early stopping

```

Out[105... <keras.callbacks.History at 0x1f5c6844be0>

```
In [106... model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

Out[106... <AxesSubplot:>

In [107... `from tensorflow.keras.layers import Dropout`In [127... `X_train.shape`Out[127... `(224, 10)`

```
In [122... model = Sequential()

model.add(Dense(11,activation='relu'))
model.add(Dropout(0.6))

model.add(Dense(5,activation='relu'))
model.add(Dropout(0.6))

model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')
```

```
In [123... model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test),
                    callbacks=[early_stop])
```

```
Epoch 1/600
7/7 [=====] - 1s 49ms/step - loss: 0.8210 - val_loss: 0.8158
Epoch 2/600
7/7 [=====] - 0s 10ms/step - loss: 0.8776 - val_loss: 0.7944
Epoch 3/600
7/7 [=====] - 0s 9ms/step - loss: 0.8284 - val_loss: 0.7748
Epoch 4/600
7/7 [=====] - 0s 10ms/step - loss: 0.8473 - val_loss: 0.7579
Epoch 5/600
7/7 [=====] - 0s 10ms/step - loss: 0.7872 - val_loss: 0.7438
Epoch 6/600
7/7 [=====] - 0s 10ms/step - loss: 0.7646 - val_loss: 0.7313
Epoch 7/600
7/7 [=====] - 0s 11ms/step - loss: 0.7939 - val_loss: 0.7199
Epoch 8/600
7/7 [=====] - 0s 10ms/step - loss: 0.7357 - val_loss: 0.7113
Epoch 9/600
7/7 [=====] - 0s 10ms/step - loss: 0.7170 - val_loss: 0.7043
Epoch 10/600
7/7 [=====] - 0s 10ms/step - loss: 0.7622 - val_loss: 0.6977
Epoch 11/600
```

```
7/7 [=====] - 0s 8ms/step - loss: 0.7305 - val_loss: 0.6920
Epoch 12/600
7/7 [=====] - 0s 8ms/step - loss: 0.7482 - val_loss: 0.6872
Epoch 13/600
7/7 [=====] - 0s 8ms/step - loss: 0.7089 - val_loss: 0.6830
Epoch 14/600
7/7 [=====] - 0s 8ms/step - loss: 0.7144 - val_loss: 0.6792
Epoch 15/600
7/7 [=====] - 0s 8ms/step - loss: 0.7122 - val_loss: 0.6759
Epoch 16/600
7/7 [=====] - 0s 8ms/step - loss: 0.7133 - val_loss: 0.6731
Epoch 17/600
7/7 [=====] - 0s 8ms/step - loss: 0.6985 - val_loss: 0.6700
Epoch 18/600
7/7 [=====] - 0s 8ms/step - loss: 0.7001 - val_loss: 0.6674
Epoch 19/600
7/7 [=====] - 0s 7ms/step - loss: 0.7015 - val_loss: 0.6651
Epoch 20/600
7/7 [=====] - 0s 8ms/step - loss: 0.7073 - val_loss: 0.6630
Epoch 21/600
7/7 [=====] - 0s 9ms/step - loss: 0.6853 - val_loss: 0.6610
Epoch 22/600
7/7 [=====] - 0s 8ms/step - loss: 0.6958 - val_loss: 0.6591
Epoch 23/600
7/7 [=====] - 0s 8ms/step - loss: 0.6971 - val_loss: 0.6573
Epoch 24/600
7/7 [=====] - 0s 9ms/step - loss: 0.6853 - val_loss: 0.6556
Epoch 25/600
7/7 [=====] - 0s 9ms/step - loss: 0.6892 - val_loss: 0.6540
Epoch 26/600
7/7 [=====] - 0s 8ms/step - loss: 0.6748 - val_loss: 0.6526
Epoch 27/600
7/7 [=====] - 0s 8ms/step - loss: 0.6791 - val_loss: 0.6512
Epoch 28/600
7/7 [=====] - 0s 8ms/step - loss: 0.6719 - val_loss: 0.6497
Epoch 29/600
7/7 [=====] - 0s 8ms/step - loss: 0.6829 - val_loss: 0.6483
Epoch 30/600
7/7 [=====] - 0s 9ms/step - loss: 0.6766 - val_loss: 0.6468
Epoch 31/600
7/7 [=====] - 0s 8ms/step - loss: 0.6713 - val_loss: 0.6454
Epoch 32/600
7/7 [=====] - 0s 8ms/step - loss: 0.6685 - val_loss: 0.6441
Epoch 33/600
7/7 [=====] - 0s 8ms/step - loss: 0.6753 - val_loss: 0.6427
Epoch 34/600
7/7 [=====] - 0s 7ms/step - loss: 0.6696 - val_loss: 0.6413
Epoch 35/600
7/7 [=====] - 0s 8ms/step - loss: 0.6672 - val_loss: 0.6401
Epoch 36/600
7/7 [=====] - 0s 8ms/step - loss: 0.6781 - val_loss: 0.6389
Epoch 37/600
7/7 [=====] - 0s 7ms/step - loss: 0.6662 - val_loss: 0.6379
Epoch 38/600
7/7 [=====] - 0s 8ms/step - loss: 0.6662 - val_loss: 0.6366
Epoch 39/600
7/7 [=====] - 0s 9ms/step - loss: 0.6654 - val_loss: 0.6355
Epoch 40/600
7/7 [=====] - 0s 9ms/step - loss: 0.6605 - val_loss: 0.6344
Epoch 41/600
7/7 [=====] - 0s 9ms/step - loss: 0.6612 - val_loss: 0.6330
Epoch 42/600
7/7 [=====] - 0s 9ms/step - loss: 0.6704 - val_loss: 0.6320
Epoch 43/600
7/7 [=====] - 0s 9ms/step - loss: 0.6600 - val_loss: 0.6307
```

Epoch 44/600
7/7 [=====] - 0s 9ms/step - loss: 0.6602 - val_loss: 0.6297
Epoch 45/600
7/7 [=====] - ETA: 0s - loss: 0.625 - 0s 9ms/step - loss: 0.660
2 - val_loss: 0.6286
Epoch 46/600
7/7 [=====] - 0s 9ms/step - loss: 0.6574 - val_loss: 0.6276
Epoch 47/600
7/7 [=====] - 0s 8ms/step - loss: 0.6582 - val_loss: 0.6264
Epoch 48/600
7/7 [=====] - 0s 10ms/step - loss: 0.6554 - val_loss: 0.6255
Epoch 49/600
7/7 [=====] - 0s 10ms/step - loss: 0.6696 - val_loss: 0.6246
Epoch 50/600
7/7 [=====] - 0s 8ms/step - loss: 0.6613 - val_loss: 0.6237
Epoch 51/600
7/7 [=====] - 0s 8ms/step - loss: 0.6538 - val_loss: 0.6225
Epoch 52/600
7/7 [=====] - 0s 9ms/step - loss: 0.6634 - val_loss: 0.6216
Epoch 53/600
7/7 [=====] - 0s 9ms/step - loss: 0.6469 - val_loss: 0.6207
Epoch 54/600
7/7 [=====] - 0s 9ms/step - loss: 0.6677 - val_loss: 0.6201
Epoch 55/600
7/7 [=====] - 0s 8ms/step - loss: 0.6658 - val_loss: 0.6197
Epoch 56/600
7/7 [=====] - 0s 9ms/step - loss: 0.6548 - val_loss: 0.6193
Epoch 57/600
7/7 [=====] - 0s 10ms/step - loss: 0.6596 - val_loss: 0.6190
Epoch 58/600
7/7 [=====] - 0s 9ms/step - loss: 0.6546 - val_loss: 0.6187
Epoch 59/600
7/7 [=====] - 0s 9ms/step - loss: 0.6532 - val_loss: 0.6184
Epoch 60/600
7/7 [=====] - 0s 9ms/step - loss: 0.6552 - val_loss: 0.6180
Epoch 61/600
7/7 [=====] - 0s 9ms/step - loss: 0.6633 - val_loss: 0.6175
Epoch 62/600
7/7 [=====] - 0s 9ms/step - loss: 0.6537 - val_loss: 0.6174
Epoch 63/600
7/7 [=====] - 0s 8ms/step - loss: 0.6536 - val_loss: 0.6171
Epoch 64/600
7/7 [=====] - 0s 9ms/step - loss: 0.6502 - val_loss: 0.6167
Epoch 65/600
7/7 [=====] - 0s 10ms/step - loss: 0.6577 - val_loss: 0.6164
Epoch 66/600
7/7 [=====] - ETA: 0s - loss: 0.626 - 0s 9ms/step - loss: 0.650
2 - val_loss: 0.6159
Epoch 67/600
7/7 [=====] - 0s 9ms/step - loss: 0.6592 - val_loss: 0.6154
Epoch 68/600
7/7 [=====] - 0s 9ms/step - loss: 0.6559 - val_loss: 0.6152
Epoch 69/600
7/7 [=====] - 0s 9ms/step - loss: 0.6493 - val_loss: 0.6148
Epoch 70/600
7/7 [=====] - 0s 9ms/step - loss: 0.6604 - val_loss: 0.6144
Epoch 71/600
7/7 [=====] - 0s 9ms/step - loss: 0.6397 - val_loss: 0.6139
Epoch 72/600
7/7 [=====] - 0s 9ms/step - loss: 0.6538 - val_loss: 0.6135
Epoch 73/600
7/7 [=====] - 0s 9ms/step - loss: 0.6547 - val_loss: 0.6131
Epoch 74/600
7/7 [=====] - 0s 9ms/step - loss: 0.6492 - val_loss: 0.6130
Epoch 75/600

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7/7 [=====] - 0s 9ms/step - loss: 0.6490 - val_loss: 0.6126
Epoch 76/600
7/7 [=====] - 0s 9ms/step - loss: 0.6512 - val_loss: 0.6121
Epoch 77/600
7/7 [=====] - 0s 9ms/step - loss: 0.6420 - val_loss: 0.6115
Epoch 78/600
7/7 [=====] - 0s 9ms/step - loss: 0.6484 - val_loss: 0.6108
Epoch 79/600
7/7 [=====] - 0s 9ms/step - loss: 0.6500 - val_loss: 0.6104
Epoch 80/600
7/7 [=====] - 0s 9ms/step - loss: 0.6616 - val_loss: 0.6104
Epoch 81/600
7/7 [=====] - 0s 8ms/step - loss: 0.6475 - val_loss: 0.6102
Epoch 82/600
7/7 [=====] - 0s 8ms/step - loss: 0.6362 - val_loss: 0.6097
Epoch 83/600
7/7 [=====] - 0s 8ms/step - loss: 0.6574 - val_loss: 0.6094
Epoch 84/600
7/7 [=====] - 0s 9ms/step - loss: 0.6509 - val_loss: 0.6091
Epoch 85/600
7/7 [=====] - 0s 9ms/step - loss: 0.6512 - val_loss: 0.6088
Epoch 86/600
7/7 [=====] - 0s 9ms/step - loss: 0.6461 - val_loss: 0.6085
Epoch 87/600
7/7 [=====] - 0s 9ms/step - loss: 0.6499 - val_loss: 0.6082
Epoch 88/600
7/7 [=====] - 0s 9ms/step - loss: 0.6595 - val_loss: 0.6080
Epoch 89/600
7/7 [=====] - 0s 8ms/step - loss: 0.6445 - val_loss: 0.6080
Epoch 90/600
7/7 [=====] - 0s 9ms/step - loss: 0.6476 - val_loss: 0.6078
Epoch 91/600
7/7 [=====] - 0s 9ms/step - loss: 0.6341 - val_loss: 0.6071
Epoch 92/600
7/7 [=====] - 0s 9ms/step - loss: 0.6403 - val_loss: 0.6064
Epoch 93/600
7/7 [=====] - 0s 10ms/step - loss: 0.6418 - val_loss: 0.6060
Epoch 94/600
7/7 [=====] - 0s 9ms/step - loss: 0.6316 - val_loss: 0.6051
Epoch 95/600
7/7 [=====] - 0s 9ms/step - loss: 0.6472 - val_loss: 0.6045
Epoch 96/600
7/7 [=====] - 0s 9ms/step - loss: 0.6543 - val_loss: 0.6044
Epoch 97/600
7/7 [=====] - 0s 8ms/step - loss: 0.6433 - val_loss: 0.6042
Epoch 98/600
7/7 [=====] - 0s 9ms/step - loss: 0.6583 - val_loss: 0.6043
Epoch 99/600
7/7 [=====] - 0s 9ms/step - loss: 0.6547 - val_loss: 0.6045
Epoch 100/600
7/7 [=====] - 0s 9ms/step - loss: 0.6524 - val_loss: 0.6048
Epoch 101/600
7/7 [=====] - 0s 9ms/step - loss: 0.6585 - val_loss: 0.6051
Epoch 102/600
7/7 [=====] - 0s 8ms/step - loss: 0.6359 - val_loss: 0.6051
Epoch 103/600
7/7 [=====] - 0s 9ms/step - loss: 0.6507 - val_loss: 0.6049
Epoch 104/600
7/7 [=====] - 0s 10ms/step - loss: 0.6376 - val_loss: 0.6046
Epoch 105/600
7/7 [=====] - 0s 9ms/step - loss: 0.6535 - val_loss: 0.6044
Epoch 106/600
7/7 [=====] - 0s 9ms/step - loss: 0.6491 - val_loss: 0.6045
Epoch 107/600
7/7 [=====] - 0s 9ms/step - loss: 0.6398 - val_loss: 0.6044
```

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Epoch 108/600
7/7 [=====] - 0s 8ms/step - loss: 0.6371 - val_loss: 0.6041
Epoch 109/600
7/7 [=====] - 0s 8ms/step - loss: 0.6496 - val_loss: 0.6036
Epoch 110/600
7/7 [=====] - 0s 9ms/step - loss: 0.6520 - val_loss: 0.6036
Epoch 111/600
7/7 [=====] - 0s 8ms/step - loss: 0.6410 - val_loss: 0.6035
Epoch 112/600
7/7 [=====] - 0s 9ms/step - loss: 0.6451 - val_loss: 0.6032
Epoch 113/600
7/7 [=====] - 0s 10ms/step - loss: 0.6392 - val_loss: 0.6030
Epoch 114/600
7/7 [=====] - 0s 8ms/step - loss: 0.6430 - val_loss: 0.6026
Epoch 115/600
7/7 [=====] - 0s 9ms/step - loss: 0.6437 - val_loss: 0.6025
Epoch 116/600
7/7 [=====] - 0s 9ms/step - loss: 0.6454 - val_loss: 0.6024
Epoch 117/600
7/7 [=====] - 0s 9ms/step - loss: 0.6482 - val_loss: 0.6024
Epoch 118/600
7/7 [=====] - 0s 8ms/step - loss: 0.6530 - val_loss: 0.6026
Epoch 119/600
7/7 [=====] - 0s 8ms/step - loss: 0.6484 - val_loss: 0.6027
Epoch 120/600
7/7 [=====] - 0s 9ms/step - loss: 0.6468 - val_loss: 0.6028
Epoch 121/600
7/7 [=====] - 0s 8ms/step - loss: 0.6448 - val_loss: 0.6027
Epoch 122/600
7/7 [=====] - ETA: 0s - loss: 0.565 - 0s 8ms/step - loss: 0.642
2 - val_loss: 0.6025
Epoch 123/600
7/7 [=====] - 0s 8ms/step - loss: 0.6425 - val_loss: 0.6023
Epoch 124/600
7/7 [=====] - 0s 9ms/step - loss: 0.6437 - val_loss: 0.6020
Epoch 125/600
7/7 [=====] - 0s 9ms/step - loss: 0.6447 - val_loss: 0.6018
Epoch 126/600
7/7 [=====] - 0s 9ms/step - loss: 0.6410 - val_loss: 0.6016
Epoch 127/600
7/7 [=====] - 0s 8ms/step - loss: 0.6452 - val_loss: 0.6014
Epoch 128/600
7/7 [=====] - 0s 9ms/step - loss: 0.6437 - val_loss: 0.6012
Epoch 129/600
7/7 [=====] - 0s 9ms/step - loss: 0.6472 - val_loss: 0.6010
Epoch 130/600
7/7 [=====] - 0s 8ms/step - loss: 0.6502 - val_loss: 0.6010
Epoch 131/600
7/7 [=====] - 0s 9ms/step - loss: 0.6351 - val_loss: 0.6010
Epoch 132/600
7/7 [=====] - 0s 8ms/step - loss: 0.6441 - val_loss: 0.6008
Epoch 133/600
7/7 [=====] - 0s 8ms/step - loss: 0.6393 - val_loss: 0.6005
Epoch 134/600
7/7 [=====] - 0s 9ms/step - loss: 0.6442 - val_loss: 0.6003
Epoch 135/600
7/7 [=====] - 0s 9ms/step - loss: 0.6405 - val_loss: 0.6000
Epoch 136/600
7/7 [=====] - 0s 8ms/step - loss: 0.6410 - val_loss: 0.5999
Epoch 137/600
7/7 [=====] - 0s 9ms/step - loss: 0.6388 - val_loss: 0.5998
Epoch 138/600
7/7 [=====] - 0s 9ms/step - loss: 0.6396 - val_loss: 0.5995
Epoch 139/600
7/7 [=====] - 0s 8ms/step - loss: 0.6460 - val_loss: 0.5994
```


Epoch 140/600
7/7 [=====] - 0s 9ms/step - loss: 0.6409 - val_loss: 0.5993
Epoch 141/600
7/7 [=====] - 0s 9ms/step - loss: 0.6429 - val_loss: 0.5990
Epoch 142/600
7/7 [=====] - 0s 8ms/step - loss: 0.6426 - val_loss: 0.5989
Epoch 143/600
7/7 [=====] - 0s 9ms/step - loss: 0.6412 - val_loss: 0.5988
Epoch 144/600
7/7 [=====] - 0s 9ms/step - loss: 0.6423 - val_loss: 0.5986
Epoch 145/600
7/7 [=====] - 0s 8ms/step - loss: 0.6428 - val_loss: 0.5986
Epoch 146/600
7/7 [=====] - 0s 9ms/step - loss: 0.6357 - val_loss: 0.5985
Epoch 147/600
7/7 [=====] - 0s 9ms/step - loss: 0.6492 - val_loss: 0.5984
Epoch 148/600
7/7 [=====] - 0s 8ms/step - loss: 0.6462 - val_loss: 0.5985
Epoch 149/600
7/7 [=====] - 0s 10ms/step - loss: 0.6390 - val_loss: 0.5984
Epoch 150/600
7/7 [=====] - 0s 9ms/step - loss: 0.6391 - val_loss: 0.5983
Epoch 151/600
7/7 [=====] - 0s 9ms/step - loss: 0.6450 - val_loss: 0.5982
Epoch 152/600
7/7 [=====] - 0s 9ms/step - loss: 0.6391 - val_loss: 0.5980
Epoch 153/600
7/7 [=====] - 0s 9ms/step - loss: 0.6344 - val_loss: 0.5976
Epoch 154/600
7/7 [=====] - 0s 8ms/step - loss: 0.6389 - val_loss: 0.5975
Epoch 155/600
7/7 [=====] - 0s 9ms/step - loss: 0.6328 - val_loss: 0.5972
Epoch 156/600
7/7 [=====] - 0s 9ms/step - loss: 0.6436 - val_loss: 0.5970
Epoch 157/600
7/7 [=====] - 0s 8ms/step - loss: 0.6415 - val_loss: 0.5969
Epoch 158/600
7/7 [=====] - 0s 9ms/step - loss: 0.6463 - val_loss: 0.5969
Epoch 159/600
7/7 [=====] - 0s 9ms/step - loss: 0.6463 - val_loss: 0.5969
Epoch 160/600
7/7 [=====] - 0s 9ms/step - loss: 0.6425 - val_loss: 0.5969
Epoch 161/600
7/7 [=====] - 0s 9ms/step - loss: 0.6338 - val_loss: 0.5968
Epoch 162/600
7/7 [=====] - 0s 8ms/step - loss: 0.6414 - val_loss: 0.5966
Epoch 163/600
7/7 [=====] - 0s 9ms/step - loss: 0.6440 - val_loss: 0.5965
Epoch 164/600
7/7 [=====] - 0s 11ms/step - loss: 0.6389 - val_loss: 0.5963
Epoch 165/600
7/7 [=====] - 0s 8ms/step - loss: 0.6463 - val_loss: 0.5963
Epoch 166/600
7/7 [=====] - 0s 9ms/step - loss: 0.6465 - val_loss: 0.5963
Epoch 167/600
7/7 [=====] - 0s 9ms/step - loss: 0.6343 - val_loss: 0.5964
Epoch 168/600
7/7 [=====] - 0s 8ms/step - loss: 0.6386 - val_loss: 0.5963
Epoch 169/600
7/7 [=====] - 0s 8ms/step - loss: 0.6361 - val_loss: 0.5961
Epoch 170/600
7/7 [=====] - 0s 9ms/step - loss: 0.6355 - val_loss: 0.5958
Epoch 171/600
7/7 [=====] - 0s 9ms/step - loss: 0.6352 - val_loss: 0.5954
Epoch 172/600

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7/7 [=====] - 0s 8ms/step - loss: 0.6413 - val_loss: 0.5952
Epoch 173/600
7/7 [=====] - 0s 8ms/step - loss: 0.6478 - val_loss: 0.5952
Epoch 174/600
7/7 [=====] - 0s 8ms/step - loss: 0.6396 - val_loss: 0.5952
Epoch 175/600
7/7 [=====] - 0s 8ms/step - loss: 0.6368 - val_loss: 0.5953
Epoch 176/600
7/7 [=====] - 0s 10ms/step - loss: 0.6392 - val_loss: 0.5953
Epoch 177/600
7/7 [=====] - 0s 9ms/step - loss: 0.6370 - val_loss: 0.5953
Epoch 178/600
7/7 [=====] - 0s 9ms/step - loss: 0.6414 - val_loss: 0.5952
Epoch 179/600
7/7 [=====] - 0s 9ms/step - loss: 0.6331 - val_loss: 0.5951
Epoch 180/600
7/7 [=====] - 0s 9ms/step - loss: 0.6435 - val_loss: 0.5949
Epoch 181/600
7/7 [=====] - 0s 9ms/step - loss: 0.6402 - val_loss: 0.5948
Epoch 182/600
7/7 [=====] - 0s 9ms/step - loss: 0.6455 - val_loss: 0.5949
Epoch 183/600
7/7 [=====] - 0s 11ms/step - loss: 0.6442 - val_loss: 0.5948
Epoch 184/600
7/7 [=====] - 0s 7ms/step - loss: 0.6405 - val_loss: 0.5947
Epoch 185/600
7/7 [=====] - 0s 7ms/step - loss: 0.6425 - val_loss: 0.5948
Epoch 186/600
7/7 [=====] - 0s 7ms/step - loss: 0.6384 - val_loss: 0.5949
Epoch 187/600
7/7 [=====] - 0s 7ms/step - loss: 0.6357 - val_loss: 0.5947
Epoch 188/600
7/7 [=====] - 0s 6ms/step - loss: 0.6417 - val_loss: 0.5948
Epoch 189/600
7/7 [=====] - 0s 7ms/step - loss: 0.6420 - val_loss: 0.5948
Epoch 190/600
7/7 [=====] - 0s 7ms/step - loss: 0.6388 - val_loss: 0.5947
Epoch 191/600
7/7 [=====] - 0s 7ms/step - loss: 0.6402 - val_loss: 0.5947
Epoch 192/600
7/7 [=====] - 0s 9ms/step - loss: 0.6384 - val_loss: 0.5946
Epoch 193/600
7/7 [=====] - 0s 8ms/step - loss: 0.6356 - val_loss: 0.5945
Epoch 194/600
7/7 [=====] - 0s 10ms/step - loss: 0.6377 - val_loss: 0.5944
Epoch 195/600
7/7 [=====] - 0s 8ms/step - loss: 0.6476 - val_loss: 0.5945
Epoch 196/600
7/7 [=====] - 0s 9ms/step - loss: 0.6402 - val_loss: 0.5945
Epoch 197/600
7/7 [=====] - 0s 9ms/step - loss: 0.6366 - val_loss: 0.5944
Epoch 198/600
7/7 [=====] - 0s 8ms/step - loss: 0.6450 - val_loss: 0.5943
Epoch 199/600
7/7 [=====] - 0s 8ms/step - loss: 0.6382 - val_loss: 0.5942
Epoch 200/600
7/7 [=====] - 0s 8ms/step - loss: 0.6392 - val_loss: 0.5942
Epoch 201/600
7/7 [=====] - 0s 8ms/step - loss: 0.6448 - val_loss: 0.5943
Epoch 202/600
7/7 [=====] - 0s 9ms/step - loss: 0.6380 - val_loss: 0.5944
Epoch 203/600
7/7 [=====] - 0s 9ms/step - loss: 0.6423 - val_loss: 0.5943
Epoch 204/600
7/7 [=====] - 0s 9ms/step - loss: 0.6374 - val_loss: 0.5943
```

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Epoch 205/600
7/7 [=====] - 0s 9ms/step - loss: 0.6372 - val_loss: 0.5942
Epoch 206/600
7/7 [=====] - 0s 8ms/step - loss: 0.6407 - val_loss: 0.5939
Epoch 207/600
7/7 [=====] - 0s 9ms/step - loss: 0.6306 - val_loss: 0.5937
Epoch 208/600
7/7 [=====] - 0s 8ms/step - loss: 0.6411 - val_loss: 0.5936
Epoch 209/600
7/7 [=====] - 0s 8ms/step - loss: 0.6389 - val_loss: 0.5935
Epoch 210/600
7/7 [=====] - 0s 8ms/step - loss: 0.6386 - val_loss: 0.5934
Epoch 211/600
7/7 [=====] - 0s 8ms/step - loss: 0.6420 - val_loss: 0.5933
Epoch 212/600
7/7 [=====] - 0s 8ms/step - loss: 0.6470 - val_loss: 0.5935
Epoch 213/600
7/7 [=====] - 0s 9ms/step - loss: 0.6302 - val_loss: 0.5935
Epoch 214/600
7/7 [=====] - 0s 8ms/step - loss: 0.6372 - val_loss: 0.5934
Epoch 215/600
7/7 [=====] - 0s 10ms/step - loss: 0.6462 - val_loss: 0.5933
Epoch 216/600
7/7 [=====] - 0s 9ms/step - loss: 0.6417 - val_loss: 0.5934
Epoch 217/600
7/7 [=====] - 0s 8ms/step - loss: 0.6415 - val_loss: 0.5934
Epoch 218/600
7/7 [=====] - 0s 9ms/step - loss: 0.6413 - val_loss: 0.5935
Epoch 219/600
7/7 [=====] - 0s 9ms/step - loss: 0.6350 - val_loss: 0.5933
Epoch 220/600
7/7 [=====] - 0s 9ms/step - loss: 0.6369 - val_loss: 0.5932
Epoch 221/600
7/7 [=====] - 0s 8ms/step - loss: 0.6403 - val_loss: 0.5931
Epoch 222/600
7/7 [=====] - 0s 11ms/step - loss: 0.6374 - val_loss: 0.5930
Epoch 223/600
7/7 [=====] - 0s 9ms/step - loss: 0.6449 - val_loss: 0.5930
Epoch 224/600
7/7 [=====] - 0s 9ms/step - loss: 0.6445 - val_loss: 0.5931
Epoch 225/600
7/7 [=====] - 0s 9ms/step - loss: 0.6345 - val_loss: 0.5931
Epoch 226/600
7/7 [=====] - 0s 9ms/step - loss: 0.6296 - val_loss: 0.5930
Epoch 227/600
7/7 [=====] - 0s 8ms/step - loss: 0.6331 - val_loss: 0.5927
Epoch 228/600
7/7 [=====] - 0s 10ms/step - loss: 0.6437 - val_loss: 0.5927
Epoch 229/600
7/7 [=====] - 0s 9ms/step - loss: 0.6355 - val_loss: 0.5928
Epoch 230/600
7/7 [=====] - 0s 9ms/step - loss: 0.6377 - val_loss: 0.5927
Epoch 231/600
7/7 [=====] - 0s 8ms/step - loss: 0.6421 - val_loss: 0.5925
Epoch 232/600
7/7 [=====] - 0s 9ms/step - loss: 0.6459 - val_loss: 0.5927
Epoch 233/600
7/7 [=====] - 0s 9ms/step - loss: 0.6448 - val_loss: 0.5929
Epoch 234/600
7/7 [=====] - 0s 9ms/step - loss: 0.6359 - val_loss: 0.5929
Epoch 235/600
7/7 [=====] - 0s 8ms/step - loss: 0.6381 - val_loss: 0.5928
Epoch 236/600
7/7 [=====] - 0s 11ms/step - loss: 0.6350 - val_loss: 0.5929
Epoch 237/600
```

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7/7 [=====] - 0s 8ms/step - loss: 0.6382 - val_loss: 0.5927
Epoch 238/600
7/7 [=====] - ETA: 0s - loss: 0.640 - 0s 9ms/step - loss: 0.637
5 - val_loss: 0.5925
Epoch 239/600
7/7 [=====] - 0s 9ms/step - loss: 0.6377 - val_loss: 0.5925
Epoch 240/600
7/7 [=====] - 0s 8ms/step - loss: 0.6360 - val_loss: 0.5924
Epoch 241/600
7/7 [=====] - 0s 9ms/step - loss: 0.6399 - val_loss: 0.5922
Epoch 242/600
7/7 [=====] - 0s 9ms/step - loss: 0.6407 - val_loss: 0.5922
Epoch 243/600
7/7 [=====] - 0s 8ms/step - loss: 0.6404 - val_loss: 0.5923
Epoch 244/600
7/7 [=====] - 0s 8ms/step - loss: 0.6418 - val_loss: 0.5924
Epoch 245/600
7/7 [=====] - 0s 9ms/step - loss: 0.6411 - val_loss: 0.5924
Epoch 246/600
7/7 [=====] - 0s 9ms/step - loss: 0.6369 - val_loss: 0.5924
Epoch 247/600
7/7 [=====] - 0s 9ms/step - loss: 0.6385 - val_loss: 0.5922
Epoch 248/600
7/7 [=====] - 0s 9ms/step - loss: 0.6353 - val_loss: 0.5922
Epoch 249/600
7/7 [=====] - 0s 9ms/step - loss: 0.6377 - val_loss: 0.5921
Epoch 250/600
7/7 [=====] - 0s 9ms/step - loss: 0.6378 - val_loss: 0.5920
Epoch 251/600
7/7 [=====] - 0s 9ms/step - loss: 0.6322 - val_loss: 0.5918
Epoch 252/600
7/7 [=====] - 0s 8ms/step - loss: 0.6423 - val_loss: 0.5917
Epoch 253/600
7/7 [=====] - 0s 9ms/step - loss: 0.6400 - val_loss: 0.5917
Epoch 254/600
7/7 [=====] - 0s 8ms/step - loss: 0.6410 - val_loss: 0.5917
Epoch 255/600
7/7 [=====] - 0s 9ms/step - loss: 0.6394 - val_loss: 0.5918
Epoch 256/600
7/7 [=====] - 0s 9ms/step - loss: 0.6412 - val_loss: 0.5918
Epoch 257/600
7/7 [=====] - 0s 9ms/step - loss: 0.6394 - val_loss: 0.5918
Epoch 258/600
7/7 [=====] - 0s 8ms/step - loss: 0.6361 - val_loss: 0.5918
Epoch 259/600
7/7 [=====] - 0s 8ms/step - loss: 0.6414 - val_loss: 0.5918
Epoch 260/600
7/7 [=====] - 0s 9ms/step - loss: 0.6365 - val_loss: 0.5918
Epoch 261/600
7/7 [=====] - 0s 9ms/step - loss: 0.6407 - val_loss: 0.5918
Epoch 262/600
7/7 [=====] - 0s 9ms/step - loss: 0.6400 - val_loss: 0.5918
Epoch 263/600
7/7 [=====] - 0s 8ms/step - loss: 0.6394 - val_loss: 0.5919
Epoch 264/600
7/7 [=====] - 0s 8ms/step - loss: 0.6335 - val_loss: 0.5917
Epoch 265/600
7/7 [=====] - 0s 8ms/step - loss: 0.6397 - val_loss: 0.5917
Epoch 266/600
7/7 [=====] - 0s 8ms/step - loss: 0.6374 - val_loss: 0.5917
Epoch 267/600
7/7 [=====] - 0s 9ms/step - loss: 0.6354 - val_loss: 0.5916
Epoch 268/600
7/7 [=====] - 0s 9ms/step - loss: 0.6436 - val_loss: 0.5916
Epoch 269/600
```

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7/7 [=====] - 0s 9ms/step - loss: 0.6385 - val_loss: 0.5916
Epoch 270/600
7/7 [=====] - 0s 9ms/step - loss: 0.6401 - val_loss: 0.5917
Epoch 271/600
7/7 [=====] - 0s 9ms/step - loss: 0.6263 - val_loss: 0.5915
Epoch 272/600
7/7 [=====] - 0s 9ms/step - loss: 0.6366 - val_loss: 0.5915
Epoch 273/600
7/7 [=====] - 0s 10ms/step - loss: 0.6337 - val_loss: 0.5914
Epoch 274/600
7/7 [=====] - 0s 10ms/step - loss: 0.6430 - val_loss: 0.5913
Epoch 275/600
7/7 [=====] - 0s 10ms/step - loss: 0.6388 - val_loss: 0.5913
Epoch 276/600
7/7 [=====] - 0s 9ms/step - loss: 0.6351 - val_loss: 0.5912
Epoch 277/600
7/7 [=====] - 0s 9ms/step - loss: 0.6434 - val_loss: 0.5912
Epoch 278/600
7/7 [=====] - 0s 10ms/step - loss: 0.6363 - val_loss: 0.5911
Epoch 279/600
7/7 [=====] - 0s 8ms/step - loss: 0.6391 - val_loss: 0.5910
Epoch 280/600
7/7 [=====] - 0s 8ms/step - loss: 0.6396 - val_loss: 0.5909
Epoch 281/600
7/7 [=====] - 0s 8ms/step - loss: 0.6429 - val_loss: 0.5910
Epoch 282/600
7/7 [=====] - 0s 8ms/step - loss: 0.6382 - val_loss: 0.5910
Epoch 283/600
7/7 [=====] - 0s 8ms/step - loss: 0.6390 - val_loss: 0.5910
Epoch 284/600
7/7 [=====] - 0s 8ms/step - loss: 0.6462 - val_loss: 0.5910
Epoch 285/600
7/7 [=====] - 0s 8ms/step - loss: 0.6326 - val_loss: 0.5908
Epoch 286/600
7/7 [=====] - 0s 8ms/step - loss: 0.6379 - val_loss: 0.5907
Epoch 287/600
7/7 [=====] - 0s 8ms/step - loss: 0.6413 - val_loss: 0.5907
Epoch 288/600
7/7 [=====] - 0s 7ms/step - loss: 0.6401 - val_loss: 0.5909
Epoch 289/600
7/7 [=====] - 0s 8ms/step - loss: 0.6346 - val_loss: 0.5909
Epoch 290/600
7/7 [=====] - 0s 8ms/step - loss: 0.6315 - val_loss: 0.5907
Epoch 291/600
7/7 [=====] - 0s 8ms/step - loss: 0.6372 - val_loss: 0.5907
Epoch 292/600
7/7 [=====] - 0s 8ms/step - loss: 0.6432 - val_loss: 0.5905
Epoch 293/600
7/7 [=====] - 0s 9ms/step - loss: 0.6434 - val_loss: 0.5906
Epoch 294/600
7/7 [=====] - 0s 8ms/step - loss: 0.6407 - val_loss: 0.5907
Epoch 295/600
7/7 [=====] - 0s 8ms/step - loss: 0.6380 - val_loss: 0.5908
Epoch 296/600
7/7 [=====] - 0s 8ms/step - loss: 0.6371 - val_loss: 0.5909
Epoch 297/600
7/7 [=====] - 0s 8ms/step - loss: 0.6467 - val_loss: 0.5910
Epoch 298/600
7/7 [=====] - 0s 8ms/step - loss: 0.6360 - val_loss: 0.5911
Epoch 299/600
7/7 [=====] - 0s 9ms/step - loss: 0.6349 - val_loss: 0.5910
Epoch 300/600
7/7 [=====] - 0s 8ms/step - loss: 0.6368 - val_loss: 0.5908
Epoch 301/600
7/7 [=====] - 0s 8ms/step - loss: 0.6378 - val_loss: 0.5908
```

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Epoch 302/600
7/7 [=====] - 0s 8ms/step - loss: 0.6363 - val_loss: 0.5907
Epoch 303/600
7/7 [=====] - 0s 8ms/step - loss: 0.6449 - val_loss: 0.5908
Epoch 304/600
7/7 [=====] - 0s 8ms/step - loss: 0.6324 - val_loss: 0.5908
Epoch 305/600
7/7 [=====] - 0s 8ms/step - loss: 0.6402 - val_loss: 0.5906
Epoch 306/600
7/7 [=====] - 0s 7ms/step - loss: 0.6396 - val_loss: 0.5904
Epoch 307/600
7/7 [=====] - 0s 9ms/step - loss: 0.6337 - val_loss: 0.5904
Epoch 308/600
7/7 [=====] - 0s 8ms/step - loss: 0.6378 - val_loss: 0.5905
Epoch 309/600
7/7 [=====] - 0s 8ms/step - loss: 0.6402 - val_loss: 0.5905
Epoch 310/600
7/7 [=====] - 0s 9ms/step - loss: 0.6402 - val_loss: 0.5907
Epoch 311/600
7/7 [=====] - 0s 8ms/step - loss: 0.6390 - val_loss: 0.5908
Epoch 312/600
7/7 [=====] - 0s 9ms/step - loss: 0.6347 - val_loss: 0.5906
Epoch 313/600
7/7 [=====] - 0s 9ms/step - loss: 0.6381 - val_loss: 0.5906
Epoch 314/600
7/7 [=====] - 0s 9ms/step - loss: 0.6403 - val_loss: 0.5907
Epoch 315/600
7/7 [=====] - 0s 10ms/step - loss: 0.6380 - val_loss: 0.5908
Epoch 316/600
7/7 [=====] - 0s 9ms/step - loss: 0.6391 - val_loss: 0.5907
Epoch 317/600
7/7 [=====] - 0s 9ms/step - loss: 0.6388 - val_loss: 0.5904
Epoch 318/600
7/7 [=====] - 0s 9ms/step - loss: 0.6336 - val_loss: 0.5901
Epoch 319/600
7/7 [=====] - 0s 8ms/step - loss: 0.6329 - val_loss: 0.5898
Epoch 320/600
7/7 [=====] - 0s 9ms/step - loss: 0.6402 - val_loss: 0.5897
Epoch 321/600
7/7 [=====] - 0s 9ms/step - loss: 0.6308 - val_loss: 0.5896
Epoch 322/600
7/7 [=====] - 0s 9ms/step - loss: 0.6504 - val_loss: 0.5898
Epoch 323/600
7/7 [=====] - 0s 10ms/step - loss: 0.6400 - val_loss: 0.5898
Epoch 324/600
7/7 [=====] - 0s 10ms/step - loss: 0.6351 - val_loss: 0.5898
Epoch 325/600
7/7 [=====] - 0s 9ms/step - loss: 0.6360 - val_loss: 0.5897
Epoch 326/600
7/7 [=====] - 0s 9ms/step - loss: 0.6229 - val_loss: 0.5895
Epoch 327/600
7/7 [=====] - 0s 10ms/step - loss: 0.6350 - val_loss: 0.5893
Epoch 328/600
7/7 [=====] - 0s 8ms/step - loss: 0.6356 - val_loss: 0.5891
Epoch 329/600
7/7 [=====] - 0s 9ms/step - loss: 0.6372 - val_loss: 0.5889
Epoch 330/600
7/7 [=====] - 0s 9ms/step - loss: 0.6342 - val_loss: 0.5885
Epoch 331/600
7/7 [=====] - 0s 10ms/step - loss: 0.6282 - val_loss: 0.5884
Epoch 332/600
7/7 [=====] - 0s 9ms/step - loss: 0.6410 - val_loss: 0.5883
Epoch 333/600
7/7 [=====] - 0s 9ms/step - loss: 0.6383 - val_loss: 0.5883
Epoch 334/600
```

```
7/7 [=====] - 0s 9ms/step - loss: 0.6340 - val_loss: 0.5885
Epoch 335/600
7/7 [=====] - 0s 9ms/step - loss: 0.6249 - val_loss: 0.5885
Epoch 336/600
7/7 [=====] - 0s 9ms/step - loss: 0.6377 - val_loss: 0.5884
Epoch 337/600
7/7 [=====] - 0s 9ms/step - loss: 0.6308 - val_loss: 0.5881
Epoch 338/600
7/7 [=====] - 0s 9ms/step - loss: 0.6326 - val_loss: 0.5879
Epoch 339/600
7/7 [=====] - 0s 9ms/step - loss: 0.6308 - val_loss: 0.5876
Epoch 340/600
7/7 [=====] - 0s 9ms/step - loss: 0.6363 - val_loss: 0.5874
Epoch 341/600
7/7 [=====] - 0s 9ms/step - loss: 0.6395 - val_loss: 0.5873
Epoch 342/600
7/7 [=====] - 0s 10ms/step - loss: 0.6302 - val_loss: 0.5870
Epoch 343/600
7/7 [=====] - 0s 10ms/step - loss: 0.6297 - val_loss: 0.5868
Epoch 344/600
7/7 [=====] - 0s 10ms/step - loss: 0.6340 - val_loss: 0.5867
Epoch 345/600
7/7 [=====] - 0s 9ms/step - loss: 0.6405 - val_loss: 0.5866
Epoch 346/600
7/7 [=====] - 0s 9ms/step - loss: 0.6307 - val_loss: 0.5867
Epoch 347/600
7/7 [=====] - 0s 9ms/step - loss: 0.6381 - val_loss: 0.5866
Epoch 348/600
7/7 [=====] - 0s 9ms/step - loss: 0.6312 - val_loss: 0.5865
Epoch 349/600
7/7 [=====] - 0s 11ms/step - loss: 0.6385 - val_loss: 0.5866
Epoch 350/600
7/7 [=====] - 0s 8ms/step - loss: 0.6258 - val_loss: 0.5865
Epoch 351/600
7/7 [=====] - 0s 7ms/step - loss: 0.6277 - val_loss: 0.5864
Epoch 352/600
7/7 [=====] - 0s 8ms/step - loss: 0.6340 - val_loss: 0.5861
Epoch 353/600
7/7 [=====] - 0s 7ms/step - loss: 0.6316 - val_loss: 0.5859
Epoch 354/600
7/7 [=====] - 0s 8ms/step - loss: 0.6329 - val_loss: 0.5856
Epoch 355/600
7/7 [=====] - 0s 7ms/step - loss: 0.6337 - val_loss: 0.5853
Epoch 356/600
7/7 [=====] - 0s 7ms/step - loss: 0.6362 - val_loss: 0.5853
Epoch 357/600
7/7 [=====] - 0s 8ms/step - loss: 0.6369 - val_loss: 0.5853
Epoch 358/600
7/7 [=====] - 0s 7ms/step - loss: 0.6303 - val_loss: 0.5854
Epoch 359/600
7/7 [=====] - 0s 9ms/step - loss: 0.6398 - val_loss: 0.5853
Epoch 360/600
7/7 [=====] - 0s 9ms/step - loss: 0.6304 - val_loss: 0.5851
Epoch 361/600
7/7 [=====] - 0s 9ms/step - loss: 0.6365 - val_loss: 0.5849
Epoch 362/600
7/7 [=====] - 0s 9ms/step - loss: 0.6365 - val_loss: 0.5847
Epoch 363/600
7/7 [=====] - 0s 9ms/step - loss: 0.6368 - val_loss: 0.5847
Epoch 364/600
7/7 [=====] - 0s 9ms/step - loss: 0.6486 - val_loss: 0.5848
Epoch 365/600
7/7 [=====] - 0s 10ms/step - loss: 0.6323 - val_loss: 0.5850
Epoch 366/600
7/7 [=====] - 0s 9ms/step - loss: 0.6311 - val_loss: 0.5849
```

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Epoch 367/600
7/7 [=====] - 0s 9ms/step - loss: 0.6466 - val_loss: 0.5850
Epoch 368/600
7/7 [=====] - 0s 12ms/step - loss: 0.6315 - val_loss: 0.5852
Epoch 369/600
7/7 [=====] - 0s 9ms/step - loss: 0.6289 - val_loss: 0.5849
Epoch 370/600
7/7 [=====] - 0s 9ms/step - loss: 0.6292 - val_loss: 0.5849
Epoch 371/600
7/7 [=====] - 0s 8ms/step - loss: 0.6330 - val_loss: 0.5848
Epoch 372/600
7/7 [=====] - 0s 9ms/step - loss: 0.6370 - val_loss: 0.5846
Epoch 373/600
7/7 [=====] - 0s 10ms/step - loss: 0.6292 - val_loss: 0.5843
Epoch 374/600
7/7 [=====] - 0s 11ms/step - loss: 0.6366 - val_loss: 0.5840
Epoch 375/600
7/7 [=====] - 0s 9ms/step - loss: 0.6368 - val_loss: 0.5838
Epoch 376/600
7/7 [=====] - 0s 9ms/step - loss: 0.6294 - val_loss: 0.5839
Epoch 377/600
7/7 [=====] - 0s 9ms/step - loss: 0.6374 - val_loss: 0.5840
Epoch 378/600
7/7 [=====] - 0s 9ms/step - loss: 0.6303 - val_loss: 0.5841
Epoch 379/600
7/7 [=====] - 0s 9ms/step - loss: 0.6369 - val_loss: 0.5840
Epoch 380/600
7/7 [=====] - 0s 9ms/step - loss: 0.6263 - val_loss: 0.5839
Epoch 381/600
7/7 [=====] - 0s 9ms/step - loss: 0.6365 - val_loss: 0.5836
Epoch 382/600
7/7 [=====] - 0s 9ms/step - loss: 0.6261 - val_loss: 0.5833
Epoch 383/600
7/7 [=====] - 0s 10ms/step - loss: 0.6313 - val_loss: 0.5831
Epoch 384/600
7/7 [=====] - 0s 11ms/step - loss: 0.6307 - val_loss: 0.5829
Epoch 385/600
7/7 [=====] - 0s 9ms/step - loss: 0.6323 - val_loss: 0.5831
Epoch 386/600
7/7 [=====] - 0s 10ms/step - loss: 0.6343 - val_loss: 0.5829
Epoch 387/600
7/7 [=====] - 0s 9ms/step - loss: 0.6228 - val_loss: 0.5829
Epoch 388/600
7/7 [=====] - 0s 10ms/step - loss: 0.6423 - val_loss: 0.5829
Epoch 389/600
7/7 [=====] - 0s 9ms/step - loss: 0.6396 - val_loss: 0.5830
Epoch 390/600
7/7 [=====] - 0s 9ms/step - loss: 0.6385 - val_loss: 0.5835
Epoch 391/600
7/7 [=====] - 0s 9ms/step - loss: 0.6287 - val_loss: 0.5837
Epoch 392/600
7/7 [=====] - 0s 9ms/step - loss: 0.6286 - val_loss: 0.5834
Epoch 393/600
7/7 [=====] - 0s 8ms/step - loss: 0.6342 - val_loss: 0.5834
Epoch 394/600
7/7 [=====] - 0s 9ms/step - loss: 0.6319 - val_loss: 0.5833
Epoch 395/600
7/7 [=====] - 0s 9ms/step - loss: 0.6340 - val_loss: 0.5832
Epoch 396/600
7/7 [=====] - 0s 8ms/step - loss: 0.6335 - val_loss: 0.5831
Epoch 397/600
7/7 [=====] - 0s 8ms/step - loss: 0.6273 - val_loss: 0.5828
Epoch 398/600
7/7 [=====] - 0s 10ms/step - loss: 0.6293 - val_loss: 0.5825
Epoch 399/600
```



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7/7 [=====] - ETA: 0s - loss: 0.645 - 0s 9ms/step - loss: 0.642
9 - val_loss: 0.5822
Epoch 400/600
7/7 [=====] - 0s 9ms/step - loss: 0.6233 - val_loss: 0.5821
Epoch 401/600
7/7 [=====] - 0s 9ms/step - loss: 0.6397 - val_loss: 0.5820
Epoch 402/600
7/7 [=====] - 0s 9ms/step - loss: 0.6456 - val_loss: 0.5819
Epoch 403/600
7/7 [=====] - 0s 8ms/step - loss: 0.6252 - val_loss: 0.5821
Epoch 404/600
7/7 [=====] - 0s 9ms/step - loss: 0.6375 - val_loss: 0.5822
Epoch 405/600
7/7 [=====] - 0s 9ms/step - loss: 0.6198 - val_loss: 0.5820
Epoch 406/600
7/7 [=====] - 0s 10ms/step - loss: 0.6242 - val_loss: 0.5819
Epoch 407/600
7/7 [=====] - 0s 9ms/step - loss: 0.6357 - val_loss: 0.5816
Epoch 408/600
7/7 [=====] - 0s 8ms/step - loss: 0.6354 - val_loss: 0.5817
Epoch 409/600
7/7 [=====] - 0s 9ms/step - loss: 0.6289 - val_loss: 0.5818
Epoch 410/600
7/7 [=====] - 0s 10ms/step - loss: 0.6289 - val_loss: 0.5818
Epoch 411/600
7/7 [=====] - 0s 10ms/step - loss: 0.6265 - val_loss: 0.5815
Epoch 412/600
7/7 [=====] - 0s 9ms/step - loss: 0.6234 - val_loss: 0.5813
Epoch 413/600
7/7 [=====] - 0s 9ms/step - loss: 0.6297 - val_loss: 0.5808
Epoch 414/600
7/7 [=====] - 0s 8ms/step - loss: 0.6289 - val_loss: 0.5803
Epoch 415/600
7/7 [=====] - 0s 8ms/step - loss: 0.6295 - val_loss: 0.5799
Epoch 416/600
7/7 [=====] - 0s 9ms/step - loss: 0.6361 - val_loss: 0.5797
Epoch 417/600
7/7 [=====] - 0s 8ms/step - loss: 0.6287 - val_loss: 0.5796
Epoch 418/600
7/7 [=====] - 0s 10ms/step - loss: 0.6307 - val_loss: 0.5795
Epoch 419/600
7/7 [=====] - 0s 9ms/step - loss: 0.6265 - val_loss: 0.5794
Epoch 420/600
7/7 [=====] - 0s 10ms/step - loss: 0.6260 - val_loss: 0.5793
Epoch 421/600
7/7 [=====] - 0s 9ms/step - loss: 0.6248 - val_loss: 0.5795
Epoch 422/600
7/7 [=====] - 0s 9ms/step - loss: 0.6375 - val_loss: 0.5794
Epoch 423/600
7/7 [=====] - 0s 8ms/step - loss: 0.6213 - val_loss: 0.5790
Epoch 424/600
7/7 [=====] - 0s 9ms/step - loss: 0.6267 - val_loss: 0.5786
Epoch 425/600
7/7 [=====] - 0s 9ms/step - loss: 0.6231 - val_loss: 0.5779
Epoch 426/600
7/7 [=====] - 0s 9ms/step - loss: 0.6278 - val_loss: 0.5778
Epoch 427/600
7/7 [=====] - 0s 9ms/step - loss: 0.6295 - val_loss: 0.5776
Epoch 428/600
7/7 [=====] - 0s 9ms/step - loss: 0.6390 - val_loss: 0.5774
Epoch 429/600
7/7 [=====] - 0s 9ms/step - loss: 0.6404 - val_loss: 0.5775
Epoch 430/600
7/7 [=====] - 0s 9ms/step - loss: 0.6322 - val_loss: 0.5776
Epoch 431/600
```

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7/7 [=====] - 0s 9ms/step - loss: 0.6321 - val_loss: 0.5780
Epoch 432/600
7/7 [=====] - 0s 9ms/step - loss: 0.6218 - val_loss: 0.5780
Epoch 433/600
7/7 [=====] - 0s 9ms/step - loss: 0.6373 - val_loss: 0.5784
Epoch 434/600
7/7 [=====] - 0s 9ms/step - loss: 0.6272 - val_loss: 0.5786
Epoch 435/600
7/7 [=====] - 0s 9ms/step - loss: 0.6383 - val_loss: 0.5787
Epoch 436/600
7/7 [=====] - 0s 10ms/step - loss: 0.6253 - val_loss: 0.5790
Epoch 437/600
7/7 [=====] - 0s 9ms/step - loss: 0.6307 - val_loss: 0.5787
Epoch 438/600
7/7 [=====] - 0s 9ms/step - loss: 0.6248 - val_loss: 0.5785
Epoch 439/600
7/7 [=====] - 0s 9ms/step - loss: 0.6299 - val_loss: 0.5785
Epoch 440/600
7/7 [=====] - 0s 10ms/step - loss: 0.6252 - val_loss: 0.5784
Epoch 441/600
7/7 [=====] - 0s 8ms/step - loss: 0.6246 - val_loss: 0.5784
Epoch 442/600
7/7 [=====] - 0s 9ms/step - loss: 0.6345 - val_loss: 0.5786
Epoch 443/600
7/7 [=====] - 0s 9ms/step - loss: 0.6249 - val_loss: 0.5786
Epoch 444/600
7/7 [=====] - 0s 8ms/step - loss: 0.6273 - val_loss: 0.5786
Epoch 445/600
7/7 [=====] - 0s 10ms/step - loss: 0.6239 - val_loss: 0.5785
Epoch 446/600
7/7 [=====] - ETA: 0s - loss: 0.679 - 0s 8ms/step - loss: 0.624
9 - val_loss: 0.5779
Epoch 447/600
7/7 [=====] - 0s 10ms/step - loss: 0.6284 - val_loss: 0.5776
Epoch 448/600
7/7 [=====] - 0s 9ms/step - loss: 0.6253 - val_loss: 0.5773
Epoch 449/600
7/7 [=====] - 0s 9ms/step - loss: 0.6344 - val_loss: 0.5771
Epoch 450/600
7/7 [=====] - 0s 9ms/step - loss: 0.6272 - val_loss: 0.5773
Epoch 451/600
7/7 [=====] - 0s 9ms/step - loss: 0.6443 - val_loss: 0.5776
Epoch 452/600
7/7 [=====] - 0s 9ms/step - loss: 0.6332 - val_loss: 0.5783
Epoch 453/600
7/7 [=====] - 0s 9ms/step - loss: 0.6165 - val_loss: 0.5786
Epoch 454/600
7/7 [=====] - 0s 9ms/step - loss: 0.6130 - val_loss: 0.5783
Epoch 455/600
7/7 [=====] - 0s 8ms/step - loss: 0.6217 - val_loss: 0.5778
Epoch 456/600
7/7 [=====] - 0s 9ms/step - loss: 0.6144 - val_loss: 0.5767
Epoch 457/600
7/7 [=====] - 0s 9ms/step - loss: 0.6242 - val_loss: 0.5762
Epoch 458/600
7/7 [=====] - 0s 9ms/step - loss: 0.6158 - val_loss: 0.5760
Epoch 459/600
7/7 [=====] - 0s 10ms/step - loss: 0.6245 - val_loss: 0.5758
Epoch 460/600
7/7 [=====] - 0s 8ms/step - loss: 0.6275 - val_loss: 0.5759
Epoch 461/600
7/7 [=====] - 0s 9ms/step - loss: 0.6254 - val_loss: 0.5759
Epoch 462/600
7/7 [=====] - 0s 9ms/step - loss: 0.6299 - val_loss: 0.5758
Epoch 463/600
```

```
7/7 [=====] - ETA: 0s - loss: 0.775 - 0s 9ms/step - loss: 0.623
8 - val_loss: 0.5761
Epoch 464/600
7/7 [=====] - 0s 9ms/step - loss: 0.6212 - val_loss: 0.5761
Epoch 465/600
7/7 [=====] - 0s 9ms/step - loss: 0.6216 - val_loss: 0.5755
Epoch 466/600
7/7 [=====] - 0s 9ms/step - loss: 0.6237 - val_loss: 0.5751
Epoch 467/600
7/7 [=====] - 0s 9ms/step - loss: 0.6290 - val_loss: 0.5750
Epoch 468/600
7/7 [=====] - 0s 9ms/step - loss: 0.6337 - val_loss: 0.5751
Epoch 469/600
7/7 [=====] - 0s 10ms/step - loss: 0.6296 - val_loss: 0.5753
Epoch 470/600
7/7 [=====] - 0s 10ms/step - loss: 0.6172 - val_loss: 0.5753
Epoch 471/600
7/7 [=====] - 0s 9ms/step - loss: 0.6137 - val_loss: 0.5746
Epoch 472/600
7/7 [=====] - 0s 9ms/step - loss: 0.6115 - val_loss: 0.5737
Epoch 473/600
7/7 [=====] - 0s 9ms/step - loss: 0.6310 - val_loss: 0.5732
Epoch 474/600
7/7 [=====] - 0s 10ms/step - loss: 0.6149 - val_loss: 0.5729
Epoch 475/600
7/7 [=====] - 0s 9ms/step - loss: 0.6175 - val_loss: 0.5728
Epoch 476/600
7/7 [=====] - 0s 9ms/step - loss: 0.6223 - val_loss: 0.5729
Epoch 477/600
7/7 [=====] - 0s 9ms/step - loss: 0.6312 - val_loss: 0.5733
Epoch 478/600
7/7 [=====] - 0s 9ms/step - loss: 0.6255 - val_loss: 0.5737
Epoch 479/600
7/7 [=====] - 0s 9ms/step - loss: 0.6230 - val_loss: 0.5741
Epoch 480/600
7/7 [=====] - 0s 9ms/step - loss: 0.6386 - val_loss: 0.5744
Epoch 481/600
7/7 [=====] - 0s 9ms/step - loss: 0.6383 - val_loss: 0.5750
Epoch 482/600
7/7 [=====] - 0s 9ms/step - loss: 0.6170 - val_loss: 0.5752
Epoch 483/600
7/7 [=====] - 0s 9ms/step - loss: 0.6285 - val_loss: 0.5752
Epoch 484/600
7/7 [=====] - 0s 9ms/step - loss: 0.6226 - val_loss: 0.5750
Epoch 485/600
7/7 [=====] - 0s 9ms/step - loss: 0.6238 - val_loss: 0.5752
Epoch 486/600
7/7 [=====] - 0s 11ms/step - loss: 0.6387 - val_loss: 0.5753
Epoch 487/600
7/7 [=====] - 0s 10ms/step - loss: 0.6222 - val_loss: 0.5758
Epoch 488/600
7/7 [=====] - 0s 8ms/step - loss: 0.6268 - val_loss: 0.5760
Epoch 489/600
7/7 [=====] - 0s 8ms/step - loss: 0.6267 - val_loss: 0.5763
Epoch 490/600
7/7 [=====] - 0s 9ms/step - loss: 0.6361 - val_loss: 0.5765
Epoch 491/600
7/7 [=====] - 0s 9ms/step - loss: 0.6155 - val_loss: 0.5763
Epoch 492/600
7/7 [=====] - 0s 9ms/step - loss: 0.6079 - val_loss: 0.5756
Epoch 493/600
7/7 [=====] - 0s 8ms/step - loss: 0.6132 - val_loss: 0.5747
Epoch 494/600
7/7 [=====] - 0s 9ms/step - loss: 0.6275 - val_loss: 0.5744
Epoch 495/600
```

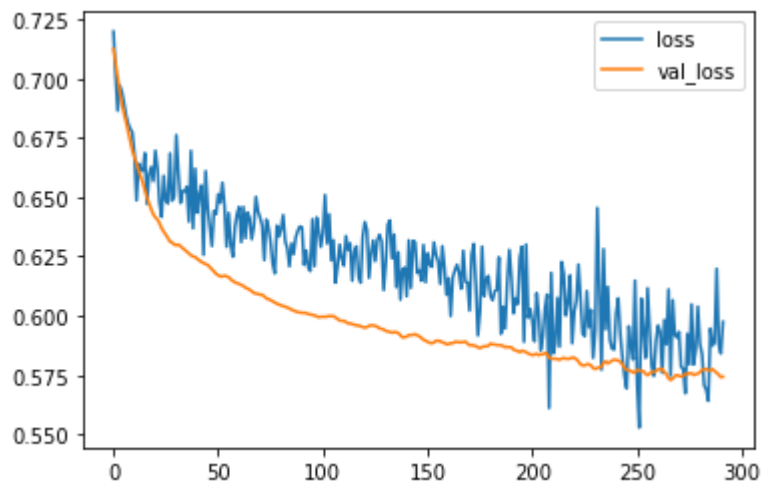
```
7/7 [=====] - 0s 9ms/step - loss: 0.6293 - val_loss: 0.5741
Epoch 496/600
7/7 [=====] - 0s 9ms/step - loss: 0.6243 - val_loss: 0.5739
Epoch 497/600
7/7 [=====] - 0s 10ms/step - loss: 0.6285 - val_loss: 0.5740
Epoch 498/600
7/7 [=====] - 0s 9ms/step - loss: 0.6486 - val_loss: 0.5746
Epoch 499/600
7/7 [=====] - 0s 9ms/step - loss: 0.6158 - val_loss: 0.5750
Epoch 500/600
7/7 [=====] - 0s 9ms/step - loss: 0.6260 - val_loss: 0.5753
Epoch 00500: early stopping
```

Out[123... <keras.callbacks.History at 0x1f5c9e20550>

```
In [110... #dropout = 0.5

model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

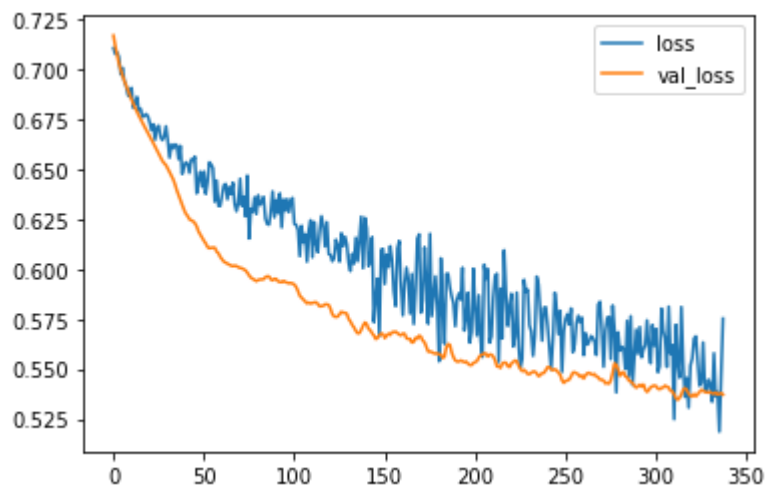
Out[110... <AxesSubplot:>



```
In [115... #dropout = 0.2

model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

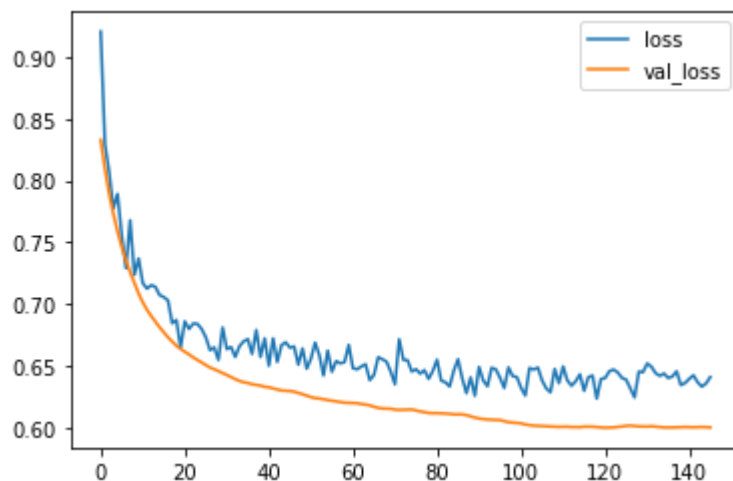
Out[115... <AxesSubplot:>



```
In [118... #dropout = 0.6

model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

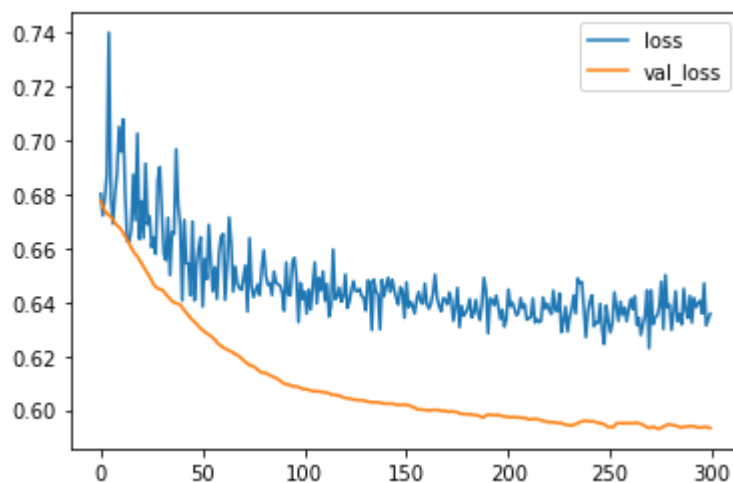
Out[118... <AxesSubplot:>



```
In [121... #dropout = 0.7

model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

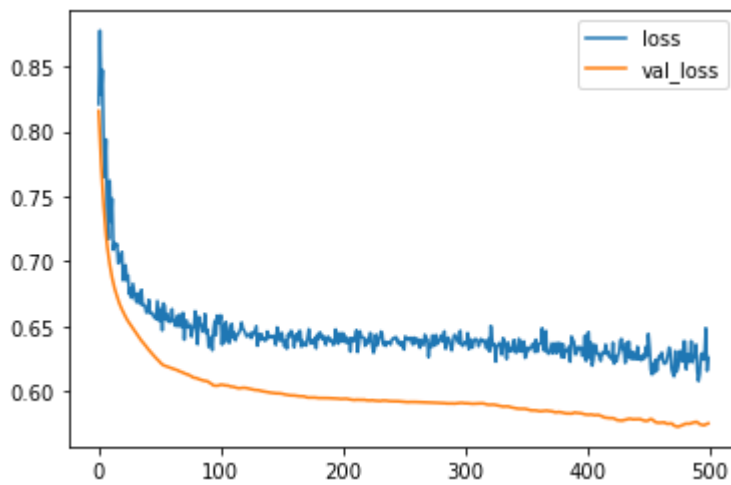
Out[121... <AxesSubplot:>



```
In [124... #best dropout = 0.6

model_loss = pd.DataFrame(model.history.history)
model_loss.plot()
```

Out[124... <AxesSubplot:>



```
In [130... model = Sequential()

model.add(Dense(10,activation='relu'))

model.add(Dense(5,activation='relu'))

model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam')

model.fit(x=X_train,y=y_train,epochs=600,validation_data=(X_test,y_test),
          callbacks=[early_stop])
```

```
Epoch 1/600
7/7 [=====] - 1s 45ms/step - loss: 0.7231 - val_loss: 0.7235
Epoch 2/600
7/7 [=====] - 0s 9ms/step - loss: 0.7146 - val_loss: 0.7136
Epoch 3/600
7/7 [=====] - 0s 8ms/step - loss: 0.7075 - val_loss: 0.7044
Epoch 4/600
7/7 [=====] - 0s 9ms/step - loss: 0.7010 - val_loss: 0.6976
Epoch 5/600
7/7 [=====] - 0s 8ms/step - loss: 0.6961 - val_loss: 0.6925
Epoch 6/600
7/7 [=====] - 0s 9ms/step - loss: 0.6925 - val_loss: 0.6883
Epoch 7/600
7/7 [=====] - ETA: 0s - loss: 0.687 - 0s 9ms/step - loss: 0.689
5 - val_loss: 0.6844
Epoch 8/600
7/7 [=====] - 0s 9ms/step - loss: 0.6871 - val_loss: 0.6806
Epoch 9/600
7/7 [=====] - 0s 8ms/step - loss: 0.6847 - val_loss: 0.6775
Epoch 10/600
7/7 [=====] - 0s 8ms/step - loss: 0.6826 - val_loss: 0.6743
Epoch 11/600
7/7 [=====] - 0s 9ms/step - loss: 0.6807 - val_loss: 0.6710
Epoch 12/600
7/7 [=====] - 0s 10ms/step - loss: 0.6786 - val_loss: 0.6677
Epoch 13/600
7/7 [=====] - 0s 9ms/step - loss: 0.6766 - val_loss: 0.6644
Epoch 14/600
7/7 [=====] - 0s 8ms/step - loss: 0.6745 - val_loss: 0.6612
Epoch 15/600
7/7 [=====] - 0s 8ms/step - loss: 0.6724 - val_loss: 0.6581
Epoch 16/600
7/7 [=====] - 0s 7ms/step - loss: 0.6707 - val_loss: 0.6548
```

```
Epoch 17/600
7/7 [=====] - 0s 7ms/step - loss: 0.6687 - val_loss: 0.6518
Epoch 18/600
7/7 [=====] - 0s 7ms/step - loss: 0.6672 - val_loss: 0.6486
Epoch 19/600
7/7 [=====] - 0s 8ms/step - loss: 0.6652 - val_loss: 0.6455
Epoch 20/600
7/7 [=====] - 0s 7ms/step - loss: 0.6635 - val_loss: 0.6425
Epoch 21/600
7/7 [=====] - 0s 8ms/step - loss: 0.6620 - val_loss: 0.6392
Epoch 22/600
7/7 [=====] - 0s 7ms/step - loss: 0.6602 - val_loss: 0.6359
Epoch 23/600
7/7 [=====] - 0s 7ms/step - loss: 0.6587 - val_loss: 0.6327
Epoch 24/600
7/7 [=====] - 0s 7ms/step - loss: 0.6569 - val_loss: 0.6298
Epoch 25/600
7/7 [=====] - 0s 8ms/step - loss: 0.6559 - val_loss: 0.6266
Epoch 26/600
7/7 [=====] - 0s 7ms/step - loss: 0.6541 - val_loss: 0.6243
Epoch 27/600
7/7 [=====] - 0s 7ms/step - loss: 0.6531 - val_loss: 0.6215
Epoch 28/600
7/7 [=====] - 0s 8ms/step - loss: 0.6519 - val_loss: 0.6191
Epoch 29/600
7/7 [=====] - 0s 8ms/step - loss: 0.6510 - val_loss: 0.6165
Epoch 30/600
7/7 [=====] - 0s 8ms/step - loss: 0.6501 - val_loss: 0.6139
Epoch 31/600
7/7 [=====] - 0s 8ms/step - loss: 0.6488 - val_loss: 0.6125
Epoch 32/600
7/7 [=====] - 0s 8ms/step - loss: 0.6482 - val_loss: 0.6103
Epoch 33/600
7/7 [=====] - 0s 10ms/step - loss: 0.6474 - val_loss: 0.6086
Epoch 34/600
7/7 [=====] - 0s 8ms/step - loss: 0.6471 - val_loss: 0.6064
Epoch 35/600
7/7 [=====] - 0s 9ms/step - loss: 0.6461 - val_loss: 0.6050
Epoch 36/600
7/7 [=====] - 0s 9ms/step - loss: 0.6455 - val_loss: 0.6038
Epoch 37/600
7/7 [=====] - 0s 9ms/step - loss: 0.6451 - val_loss: 0.6026
Epoch 38/600
7/7 [=====] - 0s 9ms/step - loss: 0.6446 - val_loss: 0.6015
Epoch 39/600
7/7 [=====] - 0s 8ms/step - loss: 0.6445 - val_loss: 0.6000
Epoch 40/600
7/7 [=====] - 0s 8ms/step - loss: 0.6438 - val_loss: 0.5991
Epoch 41/600
7/7 [=====] - 0s 8ms/step - loss: 0.6434 - val_loss: 0.5985
Epoch 42/600
7/7 [=====] - 0s 9ms/step - loss: 0.6432 - val_loss: 0.5978
Epoch 43/600
7/7 [=====] - 0s 8ms/step - loss: 0.6428 - val_loss: 0.5969
Epoch 44/600
7/7 [=====] - ETA: 0s - loss: 0.671 - 0s 9ms/step - loss: 0.642
5 - val_loss: 0.5968
Epoch 45/600
7/7 [=====] - 0s 8ms/step - loss: 0.6420 - val_loss: 0.5962
Epoch 46/600
7/7 [=====] - 0s 8ms/step - loss: 0.6418 - val_loss: 0.5956
Epoch 47/600
7/7 [=====] - 0s 9ms/step - loss: 0.6415 - val_loss: 0.5948
Epoch 48/600
7/7 [=====] - 0s 9ms/step - loss: 0.6411 - val_loss: 0.5941
```

```
Epoch 49/600
7/7 [=====] - 0s 8ms/step - loss: 0.6408 - val_loss: 0.5934
Epoch 50/600
7/7 [=====] - 0s 8ms/step - loss: 0.6405 - val_loss: 0.5928
Epoch 51/600
7/7 [=====] - 0s 8ms/step - loss: 0.6403 - val_loss: 0.5920
Epoch 52/600
7/7 [=====] - 0s 8ms/step - loss: 0.6400 - val_loss: 0.5914
Epoch 53/600
7/7 [=====] - 0s 9ms/step - loss: 0.6396 - val_loss: 0.5916
Epoch 54/600
7/7 [=====] - 0s 10ms/step - loss: 0.6393 - val_loss: 0.5913
Epoch 55/600
7/7 [=====] - 0s 9ms/step - loss: 0.6389 - val_loss: 0.5909
Epoch 56/600
7/7 [=====] - 0s 9ms/step - loss: 0.6386 - val_loss: 0.5903
Epoch 57/600
7/7 [=====] - 0s 8ms/step - loss: 0.6383 - val_loss: 0.5899
Epoch 58/600
7/7 [=====] - 0s 9ms/step - loss: 0.6380 - val_loss: 0.5896
Epoch 59/600
7/7 [=====] - 0s 9ms/step - loss: 0.6377 - val_loss: 0.5888
Epoch 60/600
7/7 [=====] - 0s 9ms/step - loss: 0.6374 - val_loss: 0.5884
Epoch 61/600
7/7 [=====] - 0s 9ms/step - loss: 0.6371 - val_loss: 0.5877
Epoch 62/600
7/7 [=====] - 0s 9ms/step - loss: 0.6367 - val_loss: 0.5872
Epoch 63/600
7/7 [=====] - 0s 9ms/step - loss: 0.6363 - val_loss: 0.5870
Epoch 64/600
7/7 [=====] - 0s 8ms/step - loss: 0.6361 - val_loss: 0.5871
Epoch 65/600
7/7 [=====] - 0s 8ms/step - loss: 0.6358 - val_loss: 0.5864
Epoch 66/600
7/7 [=====] - 0s 9ms/step - loss: 0.6354 - val_loss: 0.5860
Epoch 67/600
7/7 [=====] - 0s 8ms/step - loss: 0.6352 - val_loss: 0.5859
Epoch 68/600
7/7 [=====] - 0s 9ms/step - loss: 0.6348 - val_loss: 0.5853
Epoch 69/600
7/7 [=====] - 0s 9ms/step - loss: 0.6344 - val_loss: 0.5848
Epoch 70/600
7/7 [=====] - 0s 9ms/step - loss: 0.6342 - val_loss: 0.5842
Epoch 71/600
7/7 [=====] - 0s 9ms/step - loss: 0.6338 - val_loss: 0.5842
Epoch 72/600
7/7 [=====] - 0s 9ms/step - loss: 0.6335 - val_loss: 0.5835
Epoch 73/600
7/7 [=====] - 0s 9ms/step - loss: 0.6331 - val_loss: 0.5833
Epoch 74/600
7/7 [=====] - 0s 10ms/step - loss: 0.6328 - val_loss: 0.5828
Epoch 75/600
7/7 [=====] - 0s 9ms/step - loss: 0.6324 - val_loss: 0.5825
Epoch 76/600
7/7 [=====] - 0s 10ms/step - loss: 0.6321 - val_loss: 0.5823
Epoch 77/600
7/7 [=====] - 0s 8ms/step - loss: 0.6319 - val_loss: 0.5826
Epoch 78/600
7/7 [=====] - 0s 7ms/step - loss: 0.6315 - val_loss: 0.5818
Epoch 79/600
7/7 [=====] - 0s 7ms/step - loss: 0.6311 - val_loss: 0.5818
Epoch 80/600
7/7 [=====] - 0s 8ms/step - loss: 0.6306 - val_loss: 0.5813
Epoch 81/600
```



```
7/7 [=====] - 0s 9ms/step - loss: 0.6303 - val_loss: 0.5807
Epoch 82/600
7/7 [=====] - 0s 10ms/step - loss: 0.6299 - val_loss: 0.5803
Epoch 83/600
7/7 [=====] - 0s 8ms/step - loss: 0.6295 - val_loss: 0.5801
Epoch 84/600
7/7 [=====] - 0s 7ms/step - loss: 0.6293 - val_loss: 0.5802
Epoch 85/600
7/7 [=====] - 0s 7ms/step - loss: 0.6287 - val_loss: 0.5793
Epoch 86/600
7/7 [=====] - 0s 7ms/step - loss: 0.6284 - val_loss: 0.5794
Epoch 87/600
7/7 [=====] - 0s 7ms/step - loss: 0.6278 - val_loss: 0.5788
Epoch 88/600
7/7 [=====] - 0s 8ms/step - loss: 0.6274 - val_loss: 0.5782
Epoch 89/600
7/7 [=====] - 0s 8ms/step - loss: 0.6271 - val_loss: 0.5782
Epoch 90/600
7/7 [=====] - 0s 8ms/step - loss: 0.6266 - val_loss: 0.5775
Epoch 91/600
7/7 [=====] - 0s 9ms/step - loss: 0.6262 - val_loss: 0.5773
Epoch 92/600
7/7 [=====] - 0s 9ms/step - loss: 0.6257 - val_loss: 0.5765
Epoch 93/600
7/7 [=====] - 0s 8ms/step - loss: 0.6253 - val_loss: 0.5764
Epoch 94/600
7/7 [=====] - 0s 8ms/step - loss: 0.6249 - val_loss: 0.5757
Epoch 95/600
7/7 [=====] - 0s 8ms/step - loss: 0.6244 - val_loss: 0.5750
Epoch 96/600
7/7 [=====] - 0s 9ms/step - loss: 0.6240 - val_loss: 0.5750
Epoch 97/600
7/7 [=====] - 0s 8ms/step - loss: 0.6236 - val_loss: 0.5753
Epoch 98/600
7/7 [=====] - 0s 9ms/step - loss: 0.6230 - val_loss: 0.5747
Epoch 99/600
7/7 [=====] - 0s 8ms/step - loss: 0.6224 - val_loss: 0.5738
Epoch 100/600
7/7 [=====] - 0s 8ms/step - loss: 0.6218 - val_loss: 0.5736
Epoch 101/600
7/7 [=====] - 0s 9ms/step - loss: 0.6213 - val_loss: 0.5732
Epoch 102/600
7/7 [=====] - 0s 8ms/step - loss: 0.6207 - val_loss: 0.5726
Epoch 103/600
7/7 [=====] - 0s 9ms/step - loss: 0.6203 - val_loss: 0.5726
Epoch 104/600
7/7 [=====] - 0s 9ms/step - loss: 0.6195 - val_loss: 0.5721
Epoch 105/600
7/7 [=====] - 0s 7ms/step - loss: 0.6187 - val_loss: 0.5717
Epoch 106/600
7/7 [=====] - 0s 8ms/step - loss: 0.6178 - val_loss: 0.5709
Epoch 107/600
7/7 [=====] - 0s 8ms/step - loss: 0.6170 - val_loss: 0.5711
Epoch 108/600
7/7 [=====] - 0s 8ms/step - loss: 0.6160 - val_loss: 0.5714
Epoch 109/600
7/7 [=====] - 0s 9ms/step - loss: 0.6151 - val_loss: 0.5717
Epoch 110/600
7/7 [=====] - 0s 8ms/step - loss: 0.6137 - val_loss: 0.5725
Epoch 111/600
7/7 [=====] - 0s 8ms/step - loss: 0.6130 - val_loss: 0.5714
Epoch 112/600
7/7 [=====] - 0s 9ms/step - loss: 0.6115 - val_loss: 0.5723
Epoch 113/600
7/7 [=====] - 0s 8ms/step - loss: 0.6105 - val_loss: 0.5724
```

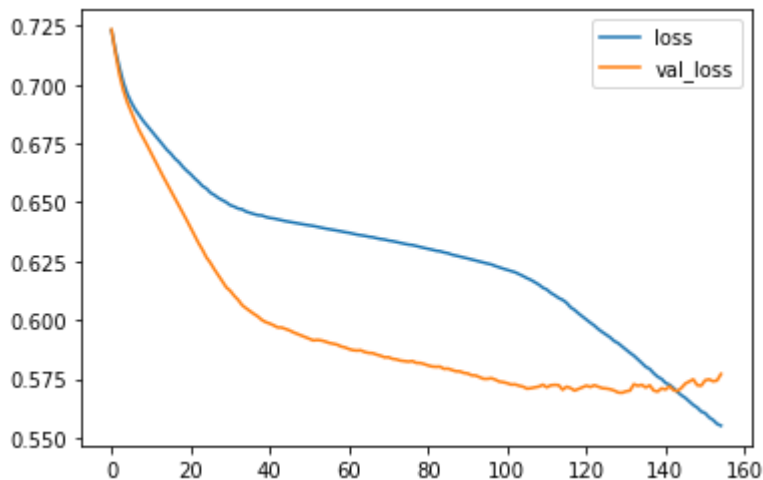
```
Epoch 114/600
7/7 [=====] - 0s 9ms/step - loss: 0.6094 - val_loss: 0.5723
Epoch 115/600
7/7 [=====] - 0s 9ms/step - loss: 0.6086 - val_loss: 0.5704
Epoch 116/600
7/7 [=====] - 0s 9ms/step - loss: 0.6073 - val_loss: 0.5717
Epoch 117/600
7/7 [=====] - 0s 9ms/step - loss: 0.6054 - val_loss: 0.5711
Epoch 118/600
7/7 [=====] - 0s 8ms/step - loss: 0.6043 - val_loss: 0.5700
Epoch 119/600
7/7 [=====] - 0s 8ms/step - loss: 0.6028 - val_loss: 0.5707
Epoch 120/600
7/7 [=====] - 0s 9ms/step - loss: 0.6015 - val_loss: 0.5714
Epoch 121/600
7/7 [=====] - 0s 8ms/step - loss: 0.6001 - val_loss: 0.5721
Epoch 122/600
7/7 [=====] - 0s 9ms/step - loss: 0.5989 - val_loss: 0.5716
Epoch 123/600
7/7 [=====] - 0s 9ms/step - loss: 0.5977 - val_loss: 0.5723
Epoch 124/600
7/7 [=====] - 0s 9ms/step - loss: 0.5962 - val_loss: 0.5717
Epoch 125/600
7/7 [=====] - 0s 8ms/step - loss: 0.5949 - val_loss: 0.5711
Epoch 126/600
7/7 [=====] - 0s 9ms/step - loss: 0.5938 - val_loss: 0.5709
Epoch 127/600
7/7 [=====] - 0s 9ms/step - loss: 0.5926 - val_loss: 0.5706
Epoch 128/600
7/7 [=====] - 0s 8ms/step - loss: 0.5911 - val_loss: 0.5701
Epoch 129/600
7/7 [=====] - 0s 9ms/step - loss: 0.5902 - val_loss: 0.5692
Epoch 130/600
7/7 [=====] - 0s 8ms/step - loss: 0.5888 - val_loss: 0.5691
Epoch 131/600
7/7 [=====] - 0s 8ms/step - loss: 0.5874 - val_loss: 0.5697
Epoch 132/600
7/7 [=====] - 0s 8ms/step - loss: 0.5861 - val_loss: 0.5700
Epoch 133/600
7/7 [=====] - 0s 9ms/step - loss: 0.5849 - val_loss: 0.5727
Epoch 134/600
7/7 [=====] - 0s 9ms/step - loss: 0.5834 - val_loss: 0.5720
Epoch 135/600
7/7 [=====] - 0s 9ms/step - loss: 0.5817 - val_loss: 0.5725
Epoch 136/600
7/7 [=====] - 0s 7ms/step - loss: 0.5801 - val_loss: 0.5713
Epoch 137/600
7/7 [=====] - 0s 8ms/step - loss: 0.5792 - val_loss: 0.5723
Epoch 138/600
7/7 [=====] - 0s 7ms/step - loss: 0.5774 - val_loss: 0.5701
Epoch 139/600
7/7 [=====] - 0s 8ms/step - loss: 0.5759 - val_loss: 0.5696
Epoch 140/600
7/7 [=====] - 0s 7ms/step - loss: 0.5750 - val_loss: 0.5710
Epoch 141/600
7/7 [=====] - 0s 7ms/step - loss: 0.5733 - val_loss: 0.5705
Epoch 142/600
7/7 [=====] - 0s 7ms/step - loss: 0.5725 - val_loss: 0.5719
Epoch 143/600
7/7 [=====] - 0s 7ms/step - loss: 0.5711 - val_loss: 0.5702
Epoch 144/600
7/7 [=====] - 0s 7ms/step - loss: 0.5694 - val_loss: 0.5698
Epoch 145/600
7/7 [=====] - 0s 7ms/step - loss: 0.5681 - val_loss: 0.5712
Epoch 146/600
```

```
7/7 [=====] - 0s 7ms/step - loss: 0.5669 - val_loss: 0.5730
Epoch 147/600
7/7 [=====] - 0s 8ms/step - loss: 0.5655 - val_loss: 0.5739
Epoch 148/600
7/7 [=====] - 0s 7ms/step - loss: 0.5639 - val_loss: 0.5748
Epoch 149/600
7/7 [=====] - 0s 7ms/step - loss: 0.5628 - val_loss: 0.5723
Epoch 150/600
7/7 [=====] - 0s 7ms/step - loss: 0.5611 - val_loss: 0.5721
Epoch 151/600
7/7 [=====] - 0s 7ms/step - loss: 0.5605 - val_loss: 0.5744
Epoch 152/600
7/7 [=====] - 0s 8ms/step - loss: 0.5586 - val_loss: 0.5748
Epoch 153/600
7/7 [=====] - 0s 8ms/step - loss: 0.5576 - val_loss: 0.5740
Epoch 154/600
7/7 [=====] - 0s 8ms/step - loss: 0.5559 - val_loss: 0.5743
Epoch 155/600
7/7 [=====] - 0s 7ms/step - loss: 0.5551 - val_loss: 0.5771
Epoch 00155: early stopping
```

Out[130...] <keras.callbacks.History at 0x1f5cb286400>

```
In [131...] model_loss = pd.DataFrame(model.history.history)
            model_loss.plot()
```

Out[131...] <AxesSubplot:>



In []: