Identifying between two modes of Z boson decay (Evaluator-OMID-BAGHCHEH-SARAEI)

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In particle physics, the W and Z bosons are vector bosons that are together known as the weak bosons or more generally as the intermediate vector bosons. These elementary particles mediate the weak interaction. The Z boson is electrically neutral and is its own antiparticle. Sometimes, physicists notice that particles seem to obey a rule, but they don't understand why. For example, Z bosons have been seen turning into an electron and a positron, or a muon and an anti-muon, but never into an electron and an anti-muon, or a muon and a positron.

For my work, I will consider two events here (**Zee** & **Zmumu**) as follows:

- **Zee** is an event in which a Z boson turns into an electron and a positron.
- **Zmumu** is an event in which a Z boson turns into a muon and an anti-muon.

I use two datasets, which are available on the CERN Open Data portal, `Zee.csv` and `Zmumu.csv`, each of which contains 10000 records. Datasets derived from the Run2011A. These data were selected from the primary datasets in order to obtain candidate Z boson events. More details on datasets can be found in http://opendata.cern.ch/record/545.

I use TensorFlow to create a model that can distinguish between two events (**Zee** & **Zmumu**). To do this, every record in `Zee.csv` is labeled with 0 and every record in `Zmumu.csv` is labeled with 1. These two datasets are then merged.

Content:

1) Run: The run number of the event.
2) Event: The event number.
3) pt: The transverse momentum of the lepton (in units of GeV), either a muon or an electron.
4) eta: The pseudorapidity of the lepton, either a muon or an electron.
5) phi: The phi angle (in radians) of the lepton, either a muon or an electron.
6) Q: The charge of the lepton, either a muon or an electron.

Source: opendata.cern

[ ]:
```
#Import libraries
import numpy as np
import scipy.optimize as opt
import re, seaborn as sns
```

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import preprocessing
import tensorflow as tf
from sklearn import metrics
from sklearn.metrics import classification_report
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from matplotlib.colors import ListedColormap
%matplotlib inline
```

1 Read data using pandas

1.1 The first DataFrame (Zee)

[ ]:
```
# Reading data
df_Zee = pd.read_csv('/content/drive/MyDrive/Zee.csv') # datafram
# Every record in df_Zee is labeled with 0
df_Zee['class'] = 0
# Removing unwanted columns from the original dataset
df_Zee = df_Zee.drop(['type1', 'type2', 'sigmaEtaEta1', 'sigmaEtaEta2',␣
 ↪'HoverE1', 'HoverE2', 'isoTrack1', 'isoTrack2', 'isoEcal1',
                      'isoHcal1', 'isoEcal2', 'isoHcal2'], axis=1)
df_Zee.head()
```

[ ]:

	Run	Event	pt1	eta1	phi1	Q1	pt2	eta2	phi2	\
0	163286	109060857	37.5667	2.2892	2.0526	-1	45.4315	1.4706	-1.1630	
1	163286	109275715	36.2901	-0.8373	-1.5859	1	60.5754	-0.4896	1.0496	
2	163286	109075352	25.9705	-0.6974	1.6360	-1	45.2954	-2.0401	3.1187	
3	163286	109169766	41.0075	1.4619	-0.5325	1	45.9013	1.1561	2.4786	
4	163286	108947653	39.8985	-0.5927	-2.3947	1	34.8931	-2.2444	0.6106	

	Q2	class
0	1	0
1	-1	0
2	1	0
3	-1	0
4	-1	0

1.2 The second DataFrame (Zmumu)

[ ]:
```
# Reading data
df_Zmumu = pd.read_csv('/content/drive/MyDrive/Zmumu.csv') # datafram
# Every record in df_Zmumu is labeled with 1
df_Zmumu['class'] = 1
# Removing unwanted columns from the original dataset
```

```
df_Zmumu = df_Zmumu.drop(['dxy1', 'dxy2', 'iso1', 'iso2'], axis=1)
df_Zmumu.head()
```

[ ]:
```
      Run     Event      pt1    eta1    phi1  Q1      pt2    eta2    phi2  Q2  \
0  165617  74969122  54.7055 -0.4324  2.5742   1  34.2464 -0.9885 -0.4987  -1
1  165617  75138253  24.5872 -2.0522  2.8666  -1  28.5389  0.3852 -1.9912   1
2  165617  75887636  31.7386 -2.2595 -1.3323  -1  30.2344 -0.4684  1.8833   1
3  165617  75779415  39.7394 -0.7123 -0.3123   1  48.2790 -0.1956  2.9703  -1
4  165617  75098104  41.2998 -0.1571 -3.0408   1  43.4508  0.5910 -0.0428  -1

   class
0      1
1      1
2      1
3      1
4      1
```

2 Combining two DataFrame with `concat()`

[ ]:
```
frames = [df_Zee, df_Zmumu]
result = pd.concat(frames)
df = result.sample(20000, random_state=42)
df.head(5)
```

[ ]:
```
         Run      Event      pt1    eta1    phi1  Q1      pt2    eta2    phi2  \
650   166784   20257329  42.9130 -1.3248 -3.0057  -1  42.2897 -0.6624  0.3485
2041  163261   64679856  39.8744 -0.0057 -0.7744  -1  36.3997  1.3710  2.2952
8668  165570  196860468  72.9296 -0.4162  0.9198   1  39.5410 -0.2680 -1.4629
1114  172163  497791581  33.4436  0.3063 -1.6034   1  27.2395 -1.6182  1.5315
3902  173692  550966077  43.9826  0.4276 -0.3876  -1  29.7856 -0.3080  2.8965

      Q2  class
650    1      1
2041   1      0
8668   1      0
1114  -1      0
3902   1      1
```

3 I need to know what type of data I am working with before I can work with DataFrame, so I check it using the `dtypes`.

[ ]:
```
df.dtypes
```

[ ]:
```
Run        int64
Event      int64
pt1      float64
```

```
eta1     float64
phi1     float64
Q1         int64
pt2      float64
eta2     float64
phi2     float64
Q2         int64
class      int64
dtype: object
```

4 In the DataFrame, there are 20000 records with 11 columns.

[ ]:
```
df.shape
```

[ ]:
```
(20000, 11)
```

5 I am going to test if there are NaN values in DataFrame

[ ]:
```
df.isnull().any().any()
```

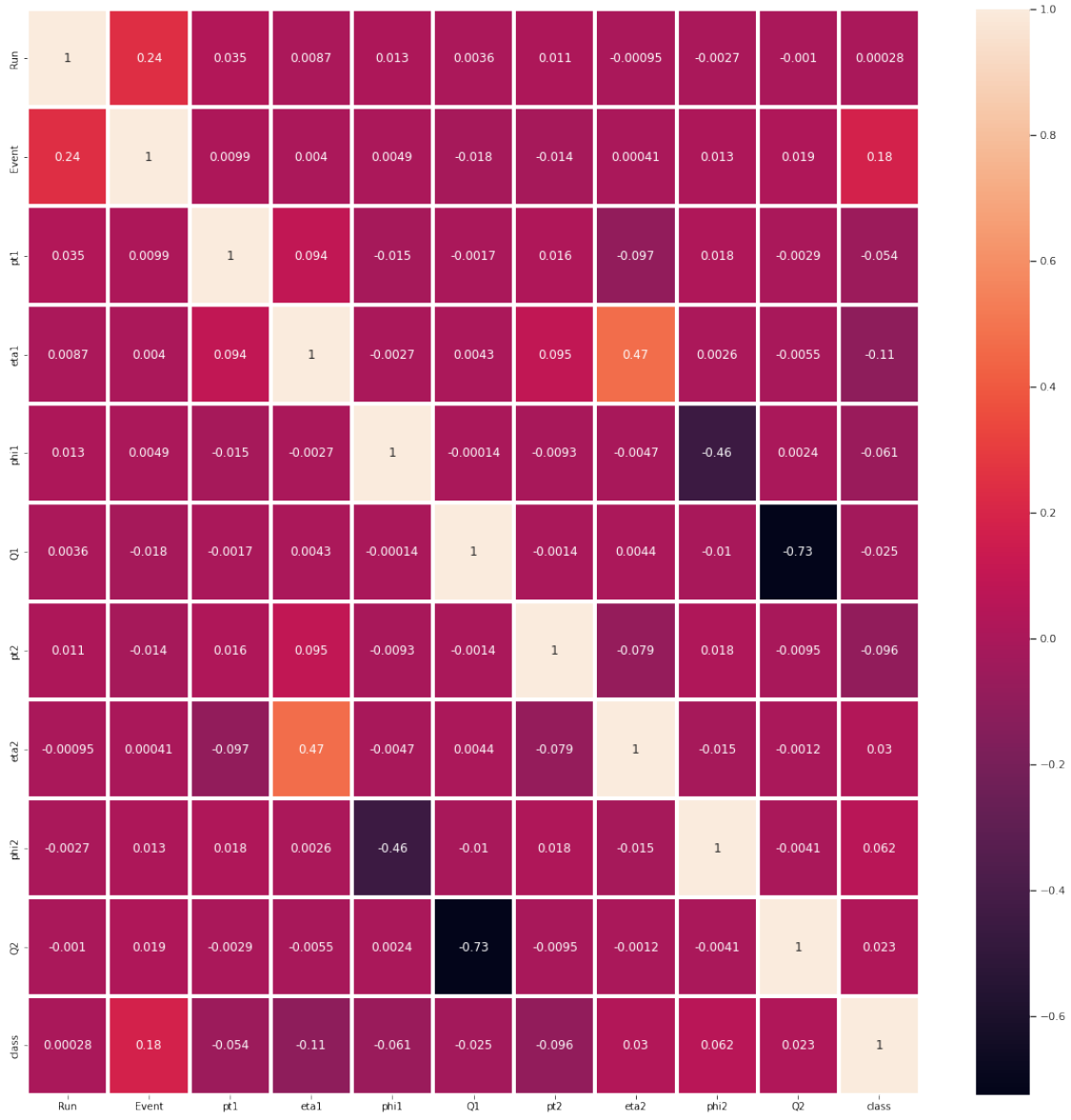
[ ]:
```
False
```

5.1 There are no NaN values

6 I use the Seaborn `heatmap()` function to determine which features have the most impact on `class`.

[ ]:
```
fig, ax = plt.subplots(figsize=(20,20))
sns.set(font_scale=1.0)
sns.heatmap(df.corr() , annot= True, linewidths=3, ax=ax)
```

[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f2183142cd0>
```



7 As can be seen, the class is only affected by Event (0.18).

8 The next step is to create a model to distinguish between two events (Zee & Zmumu) using TensorFlow.

8.1 First of all, I split the DataFrame into X (data) and Y (label), where:

[ ]:
```
X = df.drop(['class'], axis=1)
y = df['class']
```

8.2 Using a train-test split, I split X and Y into train and test data.

- Train Dataset: Used to fit model.
- Test Dataset: Used to evaluate the fit model.

[ ]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20,␣
↪random_state=0)
```

8.3 TensorFlow

The first thing I do is train a simple Neural Network using TensorFlow, and then plot accuracy and loss graphs on the training and validation datasets to find a balance between the model that is underfitting and one that is overfitting, resulting in a model with a good fit. I first need to convert the train and test data into a TensorFlow tensor.

8.4 To convert DataFrame to a tensor, I use tf.convert_to_tensor

[ ]:
```
tf.convert_to_tensor(X_train)
```

[ ]:
```
<tf.Tensor: shape=(16000, 10), dtype=float64, numpy=
array([[ 1.65548000e+05,  6.48707483e+08,  5.05841000e+01, ...,
         7.57700000e-01, -1.15100000e-01,  1.00000000e+00],
       [ 1.66438000e+05,  3.02651184e+08,  4.09797000e+01, ...,
        -1.47620000e+00, -2.11380000e+00,  1.00000000e+00],
       [ 1.66895000e+05,  9.42911570e+07,  1.34816000e+01, ...,
         1.28570000e+00, -2.77300000e-01, -1.00000000e+00],
       ...,
       [ 1.66841000e+05,  8.55049598e+08,  5.25216000e+01, ...,
         2.89900000e-01,  1.91300000e-01,  1.00000000e+00],
       [ 1.67807000e+05,  1.12731745e+09,  4.15585000e+01, ...,
        -7.40700000e-01, -3.85000000e-01,  1.00000000e+00],
       [ 1.70759000e+05,  3.91745013e+08,  3.10681000e+01, ...,
        -2.47390000e+00,  2.63060000e+00,  1.00000000e+00]])>
```

[ ]:
```
tf.convert_to_tensor(X_test)
```

[ ]:
```
<tf.Tensor: shape=(4000, 10), dtype=float64, numpy=
array([[ 1.67830000e+05,  2.30720986e+08,  3.70204000e+01, ...,
        -1.82500000e+00,  1.98250000e+00, -1.00000000e+00],
       [ 1.63237000e+05,  1.00349630e+07,  2.76417000e+01, ...,
         9.28800000e-01,  1.67100000e-01,  1.00000000e+00],
       [ 1.73406000e+05,  2.28414501e+08,  3.07497000e+01, ...,
         2.14560000e+00,  2.88740000e+00,  1.00000000e+00],
       ...,
       [ 1.65617000e+05,  1.09972750e+08,  5.49275000e+01, ...,
         7.10200000e-01, -3.64400000e-01,  1.00000000e+00],
       [ 1.72163000e+05,  5.01236827e+08,  2.85396000e+01, ...,
         1.20530000e+00,  1.12420000e+00,  1.00000000e+00],
       [ 1.67098000e+05,  1.95070668e+08,  2.57243000e+01, ...,
```

```
4.85500000e-01, -1.53040000e+00, -1.00000000e+00]])>
```

8.5 Normalize X_train, X_test

[ ]:
```
X_train_scaled = tf.keras.layers.Normalization(axis=-1)
X_train_scaled.adapt(X_train)
```

[ ]:
```
X_test_scaled = tf.keras.layers.Normalization(axis=-1)
X_test_scaled.adapt(X_test)
```

8.6 Building a simple neural network model

The compile function takes three arguments: optimizer, loss, and metrics.

- **Optimizer**: These are certain algorithms that are used to change the attributes of the neural network to decrease the loss rate.
- **Loss**: This is used to compute the quantity that a model should seek to minimize during training.
- Metrics: This is used to judge the performance of the model.

8.7 Model: There are two hidden layers, each with `64 neurons` and an activation function of `sigmoid`, `epochs = 1000`, and `batch_size = 100`

[ ]:
```
def get_basic_model():
  model = tf.keras.Sequential([
    X_train_scaled,
    tf.keras.layers.Dense(64, activation='sigmoid'),
    tf.keras.layers.Dense(64, activation='sigmoid'),
    tf.keras.layers.Dense(2, activation=tf.nn.softmax)
  ])

  model.compile(optimizer='adam',
                loss='sparse_categorical_crossentropy',
                metrics=['accuracy'])
  return model
model = get_basic_model()
history = model.fit(X_train, y_train, epochs=1000, validation_data=(X_test,␣
 ↪y_test), batch_size=100)
```

```
Epoch 1/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.6816 -
accuracy: 0.5527 - val_loss: 0.6666 - val_accuracy: 0.5700
Epoch 2/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6606 -
accuracy: 0.5899 - val_loss: 0.6602 - val_accuracy: 0.5835
Epoch 3/1000
```

```
160/160 [==============================] - 0s 3ms/step - loss: 0.6606 -
accuracy: 0.5848 - val_loss: 0.6594 - val_accuracy: 0.5950
Epoch 4/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6587 -
accuracy: 0.5899 - val_loss: 0.6586 - val_accuracy: 0.5950
Epoch 5/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6581 -
accuracy: 0.5901 - val_loss: 0.6588 - val_accuracy: 0.5792
Epoch 6/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6569 -
accuracy: 0.5888 - val_loss: 0.6676 - val_accuracy: 0.5590
Epoch 7/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6541 -
accuracy: 0.5951 - val_loss: 0.6539 - val_accuracy: 0.5978
Epoch 8/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6507 -
accuracy: 0.5985 - val_loss: 0.6481 - val_accuracy: 0.6035
Epoch 9/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.6416 -
accuracy: 0.6104 - val_loss: 0.6372 - val_accuracy: 0.6175
Epoch 10/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.6231 -
accuracy: 0.6365 - val_loss: 0.6086 - val_accuracy: 0.6693
Epoch 11/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.5919 -
accuracy: 0.6761 - val_loss: 0.5805 - val_accuracy: 0.6940
Epoch 12/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5674 -
accuracy: 0.6954 - val_loss: 0.5562 - val_accuracy: 0.6955
Epoch 13/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5527 -
accuracy: 0.7032 - val_loss: 0.5446 - val_accuracy: 0.7045
Epoch 14/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5444 -
accuracy: 0.7089 - val_loss: 0.5421 - val_accuracy: 0.7115
Epoch 15/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5382 -
accuracy: 0.7120 - val_loss: 0.5315 - val_accuracy: 0.7125
Epoch 16/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5327 -
accuracy: 0.7144 - val_loss: 0.5350 - val_accuracy: 0.7203
Epoch 17/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5259 -
accuracy: 0.7169 - val_loss: 0.5216 - val_accuracy: 0.7203
Epoch 18/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5198 -
accuracy: 0.7229 - val_loss: 0.5154 - val_accuracy: 0.7232
Epoch 19/1000
```

```
160/160 [==============================] - 0s 3ms/step - loss: 0.5140 -
accuracy: 0.7259 - val_loss: 0.5116 - val_accuracy: 0.7297
Epoch 20/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5077 -
accuracy: 0.7295 - val_loss: 0.5039 - val_accuracy: 0.7295
Epoch 21/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.5013 -
accuracy: 0.7349 - val_loss: 0.5001 - val_accuracy: 0.7385
Epoch 22/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.4955 -
accuracy: 0.7406 - val_loss: 0.4961 - val_accuracy: 0.7358
Epoch 23/1000
160/160 [==============================] - 0s 2ms/step - loss: 0.4884 -
accuracy: 0.7451 - val_loss: 0.4893 - val_accuracy: 0.7437
Epoch 24/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.4819 -
accuracy: 0.7529 - val_loss: 0.4800 - val_accuracy: 0.7523
Epoch 25/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.4753 -
accuracy: 0.7571 - val_loss: 0.4778 - val_accuracy: 0.7487
Epoch 26/1000
160/160 [==============================] - 0s 2ms/step - loss: 0.4715 -
accuracy: 0.7620 - val_loss: 0.4722 - val_accuracy: 0.7558
Epoch 27/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.4660 -
accuracy: 0.7664 - val_loss: 0.4659 - val_accuracy: 0.7615
Epoch 28/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.4617 -
accuracy: 0.7679 - val_loss: 0.4637 - val_accuracy: 0.7663
Epoch 29/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4559 -
accuracy: 0.7739 - val_loss: 0.4578 - val_accuracy: 0.7722
Epoch 30/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4515 -
accuracy: 0.7772 - val_loss: 0.4533 - val_accuracy: 0.7812
Epoch 31/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4458 -
accuracy: 0.7816 - val_loss: 0.4466 - val_accuracy: 0.7818
Epoch 32/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.4403 -
accuracy: 0.7860 - val_loss: 0.4449 - val_accuracy: 0.7825
Epoch 33/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.4354 -
accuracy: 0.7891 - val_loss: 0.4343 - val_accuracy: 0.7937
Epoch 34/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4275 -
accuracy: 0.7961 - val_loss: 0.4310 - val_accuracy: 0.7915
Epoch 35/1000
```

```
160/160 [==============================] - 1s 4ms/step - loss: 0.4204 -
accuracy: 0.8016 - val_loss: 0.4240 - val_accuracy: 0.8035
Epoch 36/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4142 -
accuracy: 0.8036 - val_loss: 0.4129 - val_accuracy: 0.8075
Epoch 37/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.4033 -
accuracy: 0.8136 - val_loss: 0.4028 - val_accuracy: 0.8158
Epoch 38/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3978 -
accuracy: 0.8138 - val_loss: 0.3991 - val_accuracy: 0.8135
Epoch 39/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3879 -
accuracy: 0.8227 - val_loss: 0.3862 - val_accuracy: 0.8280
Epoch 40/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.3796 -
accuracy: 0.8282 - val_loss: 0.3808 - val_accuracy: 0.8305
Epoch 41/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3706 -
accuracy: 0.8346 - val_loss: 0.3679 - val_accuracy: 0.8363
Epoch 42/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.3614 -
accuracy: 0.8392 - val_loss: 0.3623 - val_accuracy: 0.8380
Epoch 43/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.3545 -
accuracy: 0.8454 - val_loss: 0.3559 - val_accuracy: 0.8453
Epoch 44/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.3474 -
accuracy: 0.8476 - val_loss: 0.3501 - val_accuracy: 0.8413
Epoch 45/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3423 -
accuracy: 0.8512 - val_loss: 0.3456 - val_accuracy: 0.8447
Epoch 46/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3370 -
accuracy: 0.8537 - val_loss: 0.3428 - val_accuracy: 0.8478
Epoch 47/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3330 -
accuracy: 0.8553 - val_loss: 0.3342 - val_accuracy: 0.8512
Epoch 48/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3287 -
accuracy: 0.8597 - val_loss: 0.3411 - val_accuracy: 0.8485
Epoch 49/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3258 -
accuracy: 0.8593 - val_loss: 0.3287 - val_accuracy: 0.8555
Epoch 50/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3221 -
accuracy: 0.8624 - val_loss: 0.3283 - val_accuracy: 0.8555
Epoch 51/1000
```

```
160/160 [==============================] - 1s 4ms/step - loss: 0.3194 -
accuracy: 0.8631 - val_loss: 0.3240 - val_accuracy: 0.8558
Epoch 52/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3174 -
accuracy: 0.8608 - val_loss: 0.3236 - val_accuracy: 0.8558
Epoch 53/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.3146 -
accuracy: 0.8648 - val_loss: 0.3191 - val_accuracy: 0.8630
Epoch 54/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.3137 -
accuracy: 0.8641 - val_loss: 0.3180 - val_accuracy: 0.8593
Epoch 55/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.3120 -
accuracy: 0.8655 - val_loss: 0.3373 - val_accuracy: 0.8482
Epoch 56/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3104 -
accuracy: 0.8664 - val_loss: 0.3191 - val_accuracy: 0.8610
Epoch 57/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3084 -
accuracy: 0.8673 - val_loss: 0.3212 - val_accuracy: 0.8605
Epoch 58/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3093 -
accuracy: 0.8672 - val_loss: 0.3135 - val_accuracy: 0.8630
Epoch 59/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3052 -
accuracy: 0.8673 - val_loss: 0.3163 - val_accuracy: 0.8608
Epoch 60/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3044 -
accuracy: 0.8678 - val_loss: 0.3196 - val_accuracy: 0.8587
Epoch 61/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3027 -
accuracy: 0.8694 - val_loss: 0.3138 - val_accuracy: 0.8605
Epoch 62/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3048 -
accuracy: 0.8695 - val_loss: 0.3102 - val_accuracy: 0.8615
Epoch 63/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3023 -
accuracy: 0.8691 - val_loss: 0.3107 - val_accuracy: 0.8643
Epoch 64/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.3014 -
accuracy: 0.8693 - val_loss: 0.3090 - val_accuracy: 0.8637
Epoch 65/1000
160/160 [==============================] - 1s 8ms/step - loss: 0.3012 -
accuracy: 0.8722 - val_loss: 0.3218 - val_accuracy: 0.8553
Epoch 66/1000
160/160 [==============================] - 1s 9ms/step - loss: 0.2985 -
accuracy: 0.8713 - val_loss: 0.3128 - val_accuracy: 0.8622
Epoch 67/1000
```

```
160/160 [==============================] - 1s 7ms/step - loss: 0.2980 -
accuracy: 0.8704 - val_loss: 0.3102 - val_accuracy: 0.8627
Epoch 68/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2972 -
accuracy: 0.8698 - val_loss: 0.3063 - val_accuracy: 0.8650
Epoch 69/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2969 -
accuracy: 0.8719 - val_loss: 0.3056 - val_accuracy: 0.8673
Epoch 70/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2965 -
accuracy: 0.8714 - val_loss: 0.3100 - val_accuracy: 0.8602
Epoch 71/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2949 -
accuracy: 0.8737 - val_loss: 0.3045 - val_accuracy: 0.8668
Epoch 72/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2951 -
accuracy: 0.8733 - val_loss: 0.3025 - val_accuracy: 0.8675
Epoch 73/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2957 -
accuracy: 0.8729 - val_loss: 0.3040 - val_accuracy: 0.8675
Epoch 74/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2932 -
accuracy: 0.8744 - val_loss: 0.3031 - val_accuracy: 0.8677
Epoch 75/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2936 -
accuracy: 0.8733 - val_loss: 0.3075 - val_accuracy: 0.8648
Epoch 76/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2927 -
accuracy: 0.8723 - val_loss: 0.3036 - val_accuracy: 0.8680
Epoch 77/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2914 -
accuracy: 0.8746 - val_loss: 0.3042 - val_accuracy: 0.8660
Epoch 78/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2910 -
accuracy: 0.8734 - val_loss: 0.2996 - val_accuracy: 0.8670
Epoch 79/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2899 -
accuracy: 0.8752 - val_loss: 0.3014 - val_accuracy: 0.8708
Epoch 80/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2884 -
accuracy: 0.8753 - val_loss: 0.2997 - val_accuracy: 0.8685
Epoch 81/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2889 -
accuracy: 0.8754 - val_loss: 0.3049 - val_accuracy: 0.8670
Epoch 82/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2893 -
accuracy: 0.8741 - val_loss: 0.3006 - val_accuracy: 0.8698
Epoch 83/1000
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160/160 [==============================] - 1s 5ms/step - loss: 0.2881 -
accuracy: 0.8774 - val_loss: 0.2992 - val_accuracy: 0.8665
Epoch 84/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2889 -
accuracy: 0.8763 - val_loss: 0.3052 - val_accuracy: 0.8645
Epoch 85/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2891 -
accuracy: 0.8748 - val_loss: 0.3047 - val_accuracy: 0.8648
Epoch 86/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2877 -
accuracy: 0.8758 - val_loss: 0.3067 - val_accuracy: 0.8625
Epoch 87/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2878 -
accuracy: 0.8741 - val_loss: 0.3017 - val_accuracy: 0.8670
Epoch 88/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2850 -
accuracy: 0.8763 - val_loss: 0.2980 - val_accuracy: 0.8730
Epoch 89/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2858 -
accuracy: 0.8765 - val_loss: 0.3007 - val_accuracy: 0.8625
Epoch 90/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2856 -
accuracy: 0.8774 - val_loss: 0.2981 - val_accuracy: 0.8725
Epoch 91/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2860 -
accuracy: 0.8752 - val_loss: 0.3084 - val_accuracy: 0.8645
Epoch 92/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2841 -
accuracy: 0.8764 - val_loss: 0.2992 - val_accuracy: 0.8685
Epoch 93/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2842 -
accuracy: 0.8766 - val_loss: 0.2993 - val_accuracy: 0.8658
Epoch 94/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2837 -
accuracy: 0.8766 - val_loss: 0.2962 - val_accuracy: 0.8687
Epoch 95/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2830 -
accuracy: 0.8782 - val_loss: 0.2961 - val_accuracy: 0.8685
Epoch 96/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2838 -
accuracy: 0.8782 - val_loss: 0.3000 - val_accuracy: 0.8673
Epoch 97/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2840 -
accuracy: 0.8751 - val_loss: 0.3036 - val_accuracy: 0.8637
Epoch 98/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2845 -
accuracy: 0.8766 - val_loss: 0.2952 - val_accuracy: 0.8708
Epoch 99/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2849 -
accuracy: 0.8761 - val_loss: 0.2954 - val_accuracy: 0.8712
Epoch 100/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2827 -
accuracy: 0.8762 - val_loss: 0.2939 - val_accuracy: 0.8700
Epoch 101/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2833 -
accuracy: 0.8773 - val_loss: 0.2951 - val_accuracy: 0.8715
Epoch 102/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2814 -
accuracy: 0.8766 - val_loss: 0.2942 - val_accuracy: 0.8700
Epoch 103/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2809 -
accuracy: 0.8787 - val_loss: 0.2953 - val_accuracy: 0.8712
Epoch 104/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2802 -
accuracy: 0.8791 - val_loss: 0.2925 - val_accuracy: 0.8723
Epoch 105/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2800 -
accuracy: 0.8784 - val_loss: 0.2964 - val_accuracy: 0.8670
Epoch 106/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2786 -
accuracy: 0.8802 - val_loss: 0.2928 - val_accuracy: 0.8717
Epoch 107/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2806 -
accuracy: 0.8766 - val_loss: 0.3057 - val_accuracy: 0.8610
Epoch 108/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2792 -
accuracy: 0.8776 - val_loss: 0.2950 - val_accuracy: 0.8705
Epoch 109/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2791 -
accuracy: 0.8784 - val_loss: 0.2927 - val_accuracy: 0.8730
Epoch 110/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2808 -
accuracy: 0.8771 - val_loss: 0.2947 - val_accuracy: 0.8680
Epoch 111/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2780 -
accuracy: 0.8804 - val_loss: 0.2940 - val_accuracy: 0.8700
Epoch 112/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2773 -
accuracy: 0.8792 - val_loss: 0.2987 - val_accuracy: 0.8662
Epoch 113/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2777 -
accuracy: 0.8786 - val_loss: 0.2945 - val_accuracy: 0.8708
Epoch 114/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2766 -
accuracy: 0.8788 - val_loss: 0.2994 - val_accuracy: 0.8675
Epoch 115/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2774 -
accuracy: 0.8792 - val_loss: 0.2966 - val_accuracy: 0.8677
Epoch 116/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2770 -
accuracy: 0.8813 - val_loss: 0.2927 - val_accuracy: 0.8683
Epoch 117/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2757 -
accuracy: 0.8796 - val_loss: 0.2897 - val_accuracy: 0.8720
Epoch 118/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2767 -
accuracy: 0.8784 - val_loss: 0.2935 - val_accuracy: 0.8677
Epoch 119/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2751 -
accuracy: 0.8798 - val_loss: 0.2902 - val_accuracy: 0.8737
Epoch 120/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2754 -
accuracy: 0.8796 - val_loss: 0.2939 - val_accuracy: 0.8687
Epoch 121/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2770 -
accuracy: 0.8769 - val_loss: 0.2934 - val_accuracy: 0.8680
Epoch 122/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2766 -
accuracy: 0.8794 - val_loss: 0.2982 - val_accuracy: 0.8662
Epoch 123/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2752 -
accuracy: 0.8789 - val_loss: 0.2881 - val_accuracy: 0.8745
Epoch 124/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2753 -
accuracy: 0.8800 - val_loss: 0.2894 - val_accuracy: 0.8715
Epoch 125/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2747 -
accuracy: 0.8791 - val_loss: 0.2896 - val_accuracy: 0.8695
Epoch 126/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2755 -
accuracy: 0.8801 - val_loss: 0.2897 - val_accuracy: 0.8692
Epoch 127/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2729 -
accuracy: 0.8812 - val_loss: 0.2900 - val_accuracy: 0.8740
Epoch 128/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2742 -
accuracy: 0.8814 - val_loss: 0.2931 - val_accuracy: 0.8670
Epoch 129/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2738 -
accuracy: 0.8807 - val_loss: 0.2901 - val_accuracy: 0.8708
Epoch 130/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2752 -
accuracy: 0.8791 - val_loss: 0.2898 - val_accuracy: 0.8698
Epoch 131/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2722 -
accuracy: 0.8816 - val_loss: 0.2930 - val_accuracy: 0.8685
Epoch 132/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2728 -
accuracy: 0.8807 - val_loss: 0.2897 - val_accuracy: 0.8675
Epoch 133/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2729 -
accuracy: 0.8813 - val_loss: 0.2902 - val_accuracy: 0.8712
Epoch 134/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2717 -
accuracy: 0.8823 - val_loss: 0.2891 - val_accuracy: 0.8690
Epoch 135/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2720 -
accuracy: 0.8821 - val_loss: 0.2952 - val_accuracy: 0.8710
Epoch 136/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2720 -
accuracy: 0.8800 - val_loss: 0.2894 - val_accuracy: 0.8720
Epoch 137/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2738 -
accuracy: 0.8792 - val_loss: 0.2891 - val_accuracy: 0.8717
Epoch 138/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2726 -
accuracy: 0.8822 - val_loss: 0.2989 - val_accuracy: 0.8655
Epoch 139/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2724 -
accuracy: 0.8790 - val_loss: 0.2888 - val_accuracy: 0.8675
Epoch 140/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2707 -
accuracy: 0.8814 - val_loss: 0.2902 - val_accuracy: 0.8685
Epoch 141/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2714 -
accuracy: 0.8823 - val_loss: 0.2942 - val_accuracy: 0.8665
Epoch 142/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2703 -
accuracy: 0.8831 - val_loss: 0.2937 - val_accuracy: 0.8712
Epoch 143/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2714 -
accuracy: 0.8810 - val_loss: 0.2892 - val_accuracy: 0.8723
Epoch 144/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2709 -
accuracy: 0.8809 - val_loss: 0.2916 - val_accuracy: 0.8698
Epoch 145/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2700 -
accuracy: 0.8812 - val_loss: 0.2871 - val_accuracy: 0.8712
Epoch 146/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2698 -
accuracy: 0.8823 - val_loss: 0.2873 - val_accuracy: 0.8708
Epoch 147/1000
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160/160 [==============================] - 1s 5ms/step - loss: 0.2694 -
accuracy: 0.8821 - val_loss: 0.2905 - val_accuracy: 0.8700
Epoch 148/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2701 -
accuracy: 0.8814 - val_loss: 0.3000 - val_accuracy: 0.8658
Epoch 149/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2703 -
accuracy: 0.8824 - val_loss: 0.2871 - val_accuracy: 0.8730
Epoch 150/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2707 -
accuracy: 0.8820 - val_loss: 0.2887 - val_accuracy: 0.8690
Epoch 151/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2695 -
accuracy: 0.8809 - val_loss: 0.2859 - val_accuracy: 0.8715
Epoch 152/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2675 -
accuracy: 0.8821 - val_loss: 0.2894 - val_accuracy: 0.8710
Epoch 153/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2683 -
accuracy: 0.8819 - val_loss: 0.2864 - val_accuracy: 0.8700
Epoch 154/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2704 -
accuracy: 0.8817 - val_loss: 0.2858 - val_accuracy: 0.8727
Epoch 155/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2680 -
accuracy: 0.8836 - val_loss: 0.2859 - val_accuracy: 0.8723
Epoch 156/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2666 -
accuracy: 0.8834 - val_loss: 0.2916 - val_accuracy: 0.8690
Epoch 157/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2690 -
accuracy: 0.8816 - val_loss: 0.2853 - val_accuracy: 0.8725
Epoch 158/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2667 -
accuracy: 0.8835 - val_loss: 0.2962 - val_accuracy: 0.8665
Epoch 159/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2694 -
accuracy: 0.8823 - val_loss: 0.2875 - val_accuracy: 0.8670
Epoch 160/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2662 -
accuracy: 0.8813 - val_loss: 0.2874 - val_accuracy: 0.8675
Epoch 161/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2658 -
accuracy: 0.8823 - val_loss: 0.3020 - val_accuracy: 0.8620
Epoch 162/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2681 -
accuracy: 0.8832 - val_loss: 0.2900 - val_accuracy: 0.8700
Epoch 163/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2668 -
accuracy: 0.8812 - val_loss: 0.2910 - val_accuracy: 0.8662
Epoch 164/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2661 -
accuracy: 0.8817 - val_loss: 0.2967 - val_accuracy: 0.8683
Epoch 165/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2656 -
accuracy: 0.8831 - val_loss: 0.2875 - val_accuracy: 0.8695
Epoch 166/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2645 -
accuracy: 0.8840 - val_loss: 0.2895 - val_accuracy: 0.8720
Epoch 167/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2686 -
accuracy: 0.8816 - val_loss: 0.2860 - val_accuracy: 0.8723
Epoch 168/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2645 -
accuracy: 0.8829 - val_loss: 0.2859 - val_accuracy: 0.8705
Epoch 169/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2645 -
accuracy: 0.8836 - val_loss: 0.2998 - val_accuracy: 0.8640
Epoch 170/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2659 -
accuracy: 0.8834 - val_loss: 0.2870 - val_accuracy: 0.8692
Epoch 171/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2642 -
accuracy: 0.8834 - val_loss: 0.2864 - val_accuracy: 0.8733
Epoch 172/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2651 -
accuracy: 0.8833 - val_loss: 0.2845 - val_accuracy: 0.8710
Epoch 173/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2651 -
accuracy: 0.8841 - val_loss: 0.2882 - val_accuracy: 0.8705
Epoch 174/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2644 -
accuracy: 0.8837 - val_loss: 0.2860 - val_accuracy: 0.8712
Epoch 175/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2647 -
accuracy: 0.8834 - val_loss: 0.2884 - val_accuracy: 0.8683
Epoch 176/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2634 -
accuracy: 0.8856 - val_loss: 0.2851 - val_accuracy: 0.8705
Epoch 177/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2634 -
accuracy: 0.8848 - val_loss: 0.2891 - val_accuracy: 0.8683
Epoch 178/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2633 -
accuracy: 0.8857 - val_loss: 0.2849 - val_accuracy: 0.8723
Epoch 179/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2619 -
accuracy: 0.8851 - val_loss: 0.2845 - val_accuracy: 0.8710
Epoch 180/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2641 -
accuracy: 0.8843 - val_loss: 0.2834 - val_accuracy: 0.8733
Epoch 181/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2618 -
accuracy: 0.8855 - val_loss: 0.2845 - val_accuracy: 0.8687
Epoch 182/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2626 -
accuracy: 0.8833 - val_loss: 0.2899 - val_accuracy: 0.8675
Epoch 183/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2630 -
accuracy: 0.8854 - val_loss: 0.2868 - val_accuracy: 0.8710
Epoch 184/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2622 -
accuracy: 0.8844 - val_loss: 0.2836 - val_accuracy: 0.8720
Epoch 185/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2611 -
accuracy: 0.8858 - val_loss: 0.2842 - val_accuracy: 0.8723
Epoch 186/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2624 -
accuracy: 0.8844 - val_loss: 0.2855 - val_accuracy: 0.8705
Epoch 187/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2614 -
accuracy: 0.8849 - val_loss: 0.2866 - val_accuracy: 0.8717
Epoch 188/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2629 -
accuracy: 0.8852 - val_loss: 0.2841 - val_accuracy: 0.8710
Epoch 189/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2608 -
accuracy: 0.8859 - val_loss: 0.2832 - val_accuracy: 0.8720
Epoch 190/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2592 -
accuracy: 0.8863 - val_loss: 0.2951 - val_accuracy: 0.8662
Epoch 191/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2631 -
accuracy: 0.8861 - val_loss: 0.2957 - val_accuracy: 0.8625
Epoch 192/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2608 -
accuracy: 0.8857 - val_loss: 0.2883 - val_accuracy: 0.8683
Epoch 193/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2595 -
accuracy: 0.8863 - val_loss: 0.2835 - val_accuracy: 0.8720
Epoch 194/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2597 -
accuracy: 0.8869 - val_loss: 0.2812 - val_accuracy: 0.8723
Epoch 195/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2589 -
accuracy: 0.8874 - val_loss: 0.2867 - val_accuracy: 0.8740
Epoch 196/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2591 -
accuracy: 0.8882 - val_loss: 0.2822 - val_accuracy: 0.8740
Epoch 197/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2594 -
accuracy: 0.8857 - val_loss: 0.2841 - val_accuracy: 0.8677
Epoch 198/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2600 -
accuracy: 0.8851 - val_loss: 0.2835 - val_accuracy: 0.8712
Epoch 199/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2593 -
accuracy: 0.8859 - val_loss: 0.2865 - val_accuracy: 0.8700
Epoch 200/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2586 -
accuracy: 0.8877 - val_loss: 0.2807 - val_accuracy: 0.8737
Epoch 201/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2574 -
accuracy: 0.8863 - val_loss: 0.2812 - val_accuracy: 0.8735
Epoch 202/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2575 -
accuracy: 0.8885 - val_loss: 0.2829 - val_accuracy: 0.8687
Epoch 203/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2566 -
accuracy: 0.8879 - val_loss: 0.2814 - val_accuracy: 0.8733
Epoch 204/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2575 -
accuracy: 0.8881 - val_loss: 0.2849 - val_accuracy: 0.8698
Epoch 205/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2564 -
accuracy: 0.8867 - val_loss: 0.2821 - val_accuracy: 0.8710
Epoch 206/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2558 -
accuracy: 0.8876 - val_loss: 0.2877 - val_accuracy: 0.8700
Epoch 207/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2583 -
accuracy: 0.8869 - val_loss: 0.2819 - val_accuracy: 0.8705
Epoch 208/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2564 -
accuracy: 0.8869 - val_loss: 0.2899 - val_accuracy: 0.8633
Epoch 209/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2568 -
accuracy: 0.8872 - val_loss: 0.2790 - val_accuracy: 0.8745
Epoch 210/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2549 -
accuracy: 0.8880 - val_loss: 0.2812 - val_accuracy: 0.8685
Epoch 211/1000
```

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160/160 [==============================] - 1s 4ms/step - loss: 0.2557 -
accuracy: 0.8879 - val_loss: 0.2820 - val_accuracy: 0.8702
Epoch 212/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2563 -
accuracy: 0.8868 - val_loss: 0.2928 - val_accuracy: 0.8673
Epoch 213/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2537 -
accuracy: 0.8875 - val_loss: 0.2819 - val_accuracy: 0.8685
Epoch 214/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2555 -
accuracy: 0.8863 - val_loss: 0.2802 - val_accuracy: 0.8700
Epoch 215/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2536 -
accuracy: 0.8886 - val_loss: 0.2788 - val_accuracy: 0.8700
Epoch 216/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2546 -
accuracy: 0.8878 - val_loss: 0.2848 - val_accuracy: 0.8710
Epoch 217/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2531 -
accuracy: 0.8884 - val_loss: 0.2794 - val_accuracy: 0.8712
Epoch 218/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2531 -
accuracy: 0.8902 - val_loss: 0.2797 - val_accuracy: 0.8717
Epoch 219/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2539 -
accuracy: 0.8876 - val_loss: 0.2780 - val_accuracy: 0.8705
Epoch 220/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2527 -
accuracy: 0.8889 - val_loss: 0.2782 - val_accuracy: 0.8720
Epoch 221/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2525 -
accuracy: 0.8890 - val_loss: 0.2833 - val_accuracy: 0.8675
Epoch 222/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2523 -
accuracy: 0.8878 - val_loss: 0.2981 - val_accuracy: 0.8660
Epoch 223/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2516 -
accuracy: 0.8894 - val_loss: 0.2836 - val_accuracy: 0.8698
Epoch 224/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2493 -
accuracy: 0.8899 - val_loss: 0.2768 - val_accuracy: 0.8737
Epoch 225/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2521 -
accuracy: 0.8890 - val_loss: 0.2815 - val_accuracy: 0.8685
Epoch 226/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2525 -
accuracy: 0.8886 - val_loss: 0.2873 - val_accuracy: 0.8715
Epoch 227/1000
```

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160/160 [==============================] - 1s 4ms/step - loss: 0.2503 -
accuracy: 0.8876 - val_loss: 0.2750 - val_accuracy: 0.8740
Epoch 228/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2485 -
accuracy: 0.8898 - val_loss: 0.2844 - val_accuracy: 0.8658
Epoch 229/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2506 -
accuracy: 0.8905 - val_loss: 0.2799 - val_accuracy: 0.8715
Epoch 230/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2488 -
accuracy: 0.8910 - val_loss: 0.2891 - val_accuracy: 0.8680
Epoch 231/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2497 -
accuracy: 0.8890 - val_loss: 0.2731 - val_accuracy: 0.8740
Epoch 232/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2498 -
accuracy: 0.8890 - val_loss: 0.2774 - val_accuracy: 0.8740
Epoch 233/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2476 -
accuracy: 0.8898 - val_loss: 0.2739 - val_accuracy: 0.8708
Epoch 234/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2469 -
accuracy: 0.8910 - val_loss: 0.2720 - val_accuracy: 0.8737
Epoch 235/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2466 -
accuracy: 0.8892 - val_loss: 0.2726 - val_accuracy: 0.8740
Epoch 236/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2465 -
accuracy: 0.8913 - val_loss: 0.2741 - val_accuracy: 0.8733
Epoch 237/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2480 -
accuracy: 0.8914 - val_loss: 0.2721 - val_accuracy: 0.8737
Epoch 238/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2455 -
accuracy: 0.8898 - val_loss: 0.2715 - val_accuracy: 0.8748
Epoch 239/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2446 -
accuracy: 0.8914 - val_loss: 0.2722 - val_accuracy: 0.8745
Epoch 240/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2449 -
accuracy: 0.8916 - val_loss: 0.2714 - val_accuracy: 0.8737
Epoch 241/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2445 -
accuracy: 0.8918 - val_loss: 0.2777 - val_accuracy: 0.8683
Epoch 242/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2472 -
accuracy: 0.8910 - val_loss: 0.2713 - val_accuracy: 0.8723
Epoch 243/1000
```

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160/160 [==============================] - 1s 4ms/step - loss: 0.2455 -
accuracy: 0.8895 - val_loss: 0.2772 - val_accuracy: 0.8710
Epoch 244/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2461 -
accuracy: 0.8912 - val_loss: 0.2691 - val_accuracy: 0.8755
Epoch 245/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2445 -
accuracy: 0.8913 - val_loss: 0.2719 - val_accuracy: 0.8742
Epoch 246/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2430 -
accuracy: 0.8924 - val_loss: 0.2685 - val_accuracy: 0.8752
Epoch 247/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2426 -
accuracy: 0.8921 - val_loss: 0.2665 - val_accuracy: 0.8760
Epoch 248/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2448 -
accuracy: 0.8907 - val_loss: 0.2739 - val_accuracy: 0.8742
Epoch 249/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2427 -
accuracy: 0.8923 - val_loss: 0.2709 - val_accuracy: 0.8737
Epoch 250/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2417 -
accuracy: 0.8917 - val_loss: 0.2661 - val_accuracy: 0.8765
Epoch 251/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2428 -
accuracy: 0.8917 - val_loss: 0.2670 - val_accuracy: 0.8765
Epoch 252/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2413 -
accuracy: 0.8907 - val_loss: 0.2677 - val_accuracy: 0.8765
Epoch 253/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2400 -
accuracy: 0.8915 - val_loss: 0.2653 - val_accuracy: 0.8763
Epoch 254/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2404 -
accuracy: 0.8921 - val_loss: 0.2684 - val_accuracy: 0.8767
Epoch 255/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2428 -
accuracy: 0.8919 - val_loss: 0.2686 - val_accuracy: 0.8755
Epoch 256/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2397 -
accuracy: 0.8929 - val_loss: 0.2670 - val_accuracy: 0.8785
Epoch 257/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2399 -
accuracy: 0.8944 - val_loss: 0.2686 - val_accuracy: 0.8763
Epoch 258/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2429 -
accuracy: 0.8925 - val_loss: 0.2683 - val_accuracy: 0.8785
Epoch 259/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2415 -
accuracy: 0.8932 - val_loss: 0.2691 - val_accuracy: 0.8733
Epoch 260/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2393 -
accuracy: 0.8919 - val_loss: 0.2678 - val_accuracy: 0.8760
Epoch 261/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2394 -
accuracy: 0.8951 - val_loss: 0.2674 - val_accuracy: 0.8800
Epoch 262/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2392 -
accuracy: 0.8927 - val_loss: 0.2653 - val_accuracy: 0.8795
Epoch 263/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2411 -
accuracy: 0.8917 - val_loss: 0.2632 - val_accuracy: 0.8800
Epoch 264/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2382 -
accuracy: 0.8948 - val_loss: 0.2711 - val_accuracy: 0.8752
Epoch 265/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2367 -
accuracy: 0.8944 - val_loss: 0.2658 - val_accuracy: 0.8792
Epoch 266/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2373 -
accuracy: 0.8963 - val_loss: 0.2633 - val_accuracy: 0.8795
Epoch 267/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2364 -
accuracy: 0.8954 - val_loss: 0.2661 - val_accuracy: 0.8763
Epoch 268/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2375 -
accuracy: 0.8940 - val_loss: 0.2635 - val_accuracy: 0.8765
Epoch 269/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2359 -
accuracy: 0.8963 - val_loss: 0.2751 - val_accuracy: 0.8745
Epoch 270/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2374 -
accuracy: 0.8949 - val_loss: 0.2665 - val_accuracy: 0.8758
Epoch 271/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2356 -
accuracy: 0.8947 - val_loss: 0.2633 - val_accuracy: 0.8800
Epoch 272/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2368 -
accuracy: 0.8950 - val_loss: 0.2626 - val_accuracy: 0.8808
Epoch 273/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2358 -
accuracy: 0.8956 - val_loss: 0.2691 - val_accuracy: 0.8758
Epoch 274/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2349 -
accuracy: 0.8963 - val_loss: 0.2647 - val_accuracy: 0.8785
Epoch 275/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2350 -
accuracy: 0.8956 - val_loss: 0.2637 - val_accuracy: 0.8798
Epoch 276/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2349 -
accuracy: 0.8949 - val_loss: 0.2609 - val_accuracy: 0.8802
Epoch 277/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2358 -
accuracy: 0.8953 - val_loss: 0.2661 - val_accuracy: 0.8783
Epoch 278/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2351 -
accuracy: 0.8950 - val_loss: 0.2667 - val_accuracy: 0.8775
Epoch 279/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2330 -
accuracy: 0.8970 - val_loss: 0.2680 - val_accuracy: 0.8773
Epoch 280/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2346 -
accuracy: 0.8968 - val_loss: 0.2668 - val_accuracy: 0.8783
Epoch 281/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2334 -
accuracy: 0.8969 - val_loss: 0.2771 - val_accuracy: 0.8750
Epoch 282/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2352 -
accuracy: 0.8949 - val_loss: 0.2583 - val_accuracy: 0.8848
Epoch 283/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2338 -
accuracy: 0.8961 - val_loss: 0.2673 - val_accuracy: 0.8765
Epoch 284/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2363 -
accuracy: 0.8946 - val_loss: 0.2605 - val_accuracy: 0.8830
Epoch 285/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2330 -
accuracy: 0.8960 - val_loss: 0.2653 - val_accuracy: 0.8785
Epoch 286/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2358 -
accuracy: 0.8961 - val_loss: 0.2593 - val_accuracy: 0.8800
Epoch 287/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2311 -
accuracy: 0.8970 - val_loss: 0.2790 - val_accuracy: 0.8717
Epoch 288/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2311 -
accuracy: 0.8978 - val_loss: 0.2606 - val_accuracy: 0.8823
Epoch 289/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2343 -
accuracy: 0.8954 - val_loss: 0.2582 - val_accuracy: 0.8823
Epoch 290/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2330 -
accuracy: 0.8977 - val_loss: 0.2685 - val_accuracy: 0.8792
Epoch 291/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.2310 -
accuracy: 0.8985 - val_loss: 0.2562 - val_accuracy: 0.8845
Epoch 292/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2326 -
accuracy: 0.8984 - val_loss: 0.2590 - val_accuracy: 0.8802
Epoch 293/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2319 -
accuracy: 0.8982 - val_loss: 0.2554 - val_accuracy: 0.8867
Epoch 294/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2305 -
accuracy: 0.8985 - val_loss: 0.2581 - val_accuracy: 0.8815
Epoch 295/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2303 -
accuracy: 0.9002 - val_loss: 0.2542 - val_accuracy: 0.8855
Epoch 296/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2329 -
accuracy: 0.8986 - val_loss: 0.2562 - val_accuracy: 0.8827
Epoch 297/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2299 -
accuracy: 0.9007 - val_loss: 0.2616 - val_accuracy: 0.8783
Epoch 298/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2298 -
accuracy: 0.8994 - val_loss: 0.2741 - val_accuracy: 0.8775
Epoch 299/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2330 -
accuracy: 0.8956 - val_loss: 0.2604 - val_accuracy: 0.8813
Epoch 300/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2322 -
accuracy: 0.8976 - val_loss: 0.2564 - val_accuracy: 0.8848
Epoch 301/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2293 -
accuracy: 0.8998 - val_loss: 0.2563 - val_accuracy: 0.8848
Epoch 302/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2304 -
accuracy: 0.9001 - val_loss: 0.2582 - val_accuracy: 0.8808
Epoch 303/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2296 -
accuracy: 0.8994 - val_loss: 0.2553 - val_accuracy: 0.8840
Epoch 304/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2303 -
accuracy: 0.8983 - val_loss: 0.2595 - val_accuracy: 0.8802
Epoch 305/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2289 -
accuracy: 0.9013 - val_loss: 0.2555 - val_accuracy: 0.8823
Epoch 306/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2279 -
accuracy: 0.8996 - val_loss: 0.2549 - val_accuracy: 0.8832
Epoch 307/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2280 -
accuracy: 0.9006 - val_loss: 0.2609 - val_accuracy: 0.8827
Epoch 308/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2283 -
accuracy: 0.9004 - val_loss: 0.2599 - val_accuracy: 0.8850
Epoch 309/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2280 -
accuracy: 0.9022 - val_loss: 0.2671 - val_accuracy: 0.8792
Epoch 310/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2293 -
accuracy: 0.9003 - val_loss: 0.2675 - val_accuracy: 0.8770
Epoch 311/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2304 -
accuracy: 0.8997 - val_loss: 0.2507 - val_accuracy: 0.8895
Epoch 312/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2295 -
accuracy: 0.9000 - val_loss: 0.2691 - val_accuracy: 0.8752
Epoch 313/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2269 -
accuracy: 0.8999 - val_loss: 0.2504 - val_accuracy: 0.8888
Epoch 314/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2275 -
accuracy: 0.9009 - val_loss: 0.2603 - val_accuracy: 0.8817
Epoch 315/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2270 -
accuracy: 0.9002 - val_loss: 0.2550 - val_accuracy: 0.8848
Epoch 316/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2279 -
accuracy: 0.9003 - val_loss: 0.2500 - val_accuracy: 0.8873
Epoch 317/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2258 -
accuracy: 0.9021 - val_loss: 0.2497 - val_accuracy: 0.8880
Epoch 318/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2260 -
accuracy: 0.9030 - val_loss: 0.2531 - val_accuracy: 0.8885
Epoch 319/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2262 -
accuracy: 0.9001 - val_loss: 0.2507 - val_accuracy: 0.8895
Epoch 320/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2247 -
accuracy: 0.9013 - val_loss: 0.2519 - val_accuracy: 0.8857
Epoch 321/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2260 -
accuracy: 0.9020 - val_loss: 0.2507 - val_accuracy: 0.8855
Epoch 322/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2250 -
accuracy: 0.9015 - val_loss: 0.2512 - val_accuracy: 0.8860
Epoch 323/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.2245 -
accuracy: 0.9032 - val_loss: 0.2511 - val_accuracy: 0.8900
Epoch 324/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2273 -
accuracy: 0.9001 - val_loss: 0.2523 - val_accuracy: 0.8838
Epoch 325/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2246 -
accuracy: 0.9036 - val_loss: 0.2498 - val_accuracy: 0.8888
Epoch 326/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2236 -
accuracy: 0.9022 - val_loss: 0.2521 - val_accuracy: 0.8857
Epoch 327/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2265 -
accuracy: 0.9026 - val_loss: 0.2497 - val_accuracy: 0.8888
Epoch 328/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2236 -
accuracy: 0.9038 - val_loss: 0.2514 - val_accuracy: 0.8848
Epoch 329/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2242 -
accuracy: 0.9014 - val_loss: 0.2510 - val_accuracy: 0.8888
Epoch 330/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2240 -
accuracy: 0.9022 - val_loss: 0.2567 - val_accuracy: 0.8817
Epoch 331/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2245 -
accuracy: 0.9030 - val_loss: 0.2528 - val_accuracy: 0.8865
Epoch 332/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2239 -
accuracy: 0.9024 - val_loss: 0.2710 - val_accuracy: 0.8792
Epoch 333/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2242 -
accuracy: 0.9029 - val_loss: 0.2521 - val_accuracy: 0.8845
Epoch 334/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2240 -
accuracy: 0.9032 - val_loss: 0.2500 - val_accuracy: 0.8885
Epoch 335/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2223 -
accuracy: 0.9043 - val_loss: 0.2686 - val_accuracy: 0.8805
Epoch 336/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2235 -
accuracy: 0.9019 - val_loss: 0.2532 - val_accuracy: 0.8850
Epoch 337/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2242 -
accuracy: 0.9021 - val_loss: 0.2470 - val_accuracy: 0.8873
Epoch 338/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2222 -
accuracy: 0.9030 - val_loss: 0.2461 - val_accuracy: 0.8907
Epoch 339/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2213 -
accuracy: 0.9030 - val_loss: 0.2523 - val_accuracy: 0.8852
Epoch 340/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2220 -
accuracy: 0.9036 - val_loss: 0.2485 - val_accuracy: 0.8882
Epoch 341/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2221 -
accuracy: 0.9052 - val_loss: 0.2461 - val_accuracy: 0.8935
Epoch 342/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2215 -
accuracy: 0.9034 - val_loss: 0.2498 - val_accuracy: 0.8873
Epoch 343/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2226 -
accuracy: 0.9038 - val_loss: 0.2448 - val_accuracy: 0.8915
Epoch 344/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2213 -
accuracy: 0.9035 - val_loss: 0.2490 - val_accuracy: 0.8878
Epoch 345/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2198 -
accuracy: 0.9043 - val_loss: 0.2483 - val_accuracy: 0.8895
Epoch 346/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2207 -
accuracy: 0.9039 - val_loss: 0.2443 - val_accuracy: 0.8910
Epoch 347/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2210 -
accuracy: 0.9049 - val_loss: 0.2539 - val_accuracy: 0.8850
Epoch 348/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2206 -
accuracy: 0.9054 - val_loss: 0.2462 - val_accuracy: 0.8895
Epoch 349/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2203 -
accuracy: 0.9049 - val_loss: 0.2501 - val_accuracy: 0.8890
Epoch 350/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2208 -
accuracy: 0.9051 - val_loss: 0.2442 - val_accuracy: 0.8935
Epoch 351/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2220 -
accuracy: 0.9026 - val_loss: 0.2446 - val_accuracy: 0.8935
Epoch 352/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2222 -
accuracy: 0.9034 - val_loss: 0.2531 - val_accuracy: 0.8850
Epoch 353/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2199 -
accuracy: 0.9057 - val_loss: 0.2467 - val_accuracy: 0.8925
Epoch 354/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2208 -
accuracy: 0.9039 - val_loss: 0.2480 - val_accuracy: 0.8892
Epoch 355/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.2210 -
accuracy: 0.9046 - val_loss: 0.2446 - val_accuracy: 0.8890
Epoch 356/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2187 -
accuracy: 0.9051 - val_loss: 0.2421 - val_accuracy: 0.8935
Epoch 357/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2188 -
accuracy: 0.9072 - val_loss: 0.2488 - val_accuracy: 0.8885
Epoch 358/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2205 -
accuracy: 0.9053 - val_loss: 0.2499 - val_accuracy: 0.8885
Epoch 359/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2197 -
accuracy: 0.9053 - val_loss: 0.2445 - val_accuracy: 0.8938
Epoch 360/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2180 -
accuracy: 0.9059 - val_loss: 0.2444 - val_accuracy: 0.8932
Epoch 361/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2174 -
accuracy: 0.9056 - val_loss: 0.2533 - val_accuracy: 0.8845
Epoch 362/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2189 -
accuracy: 0.9057 - val_loss: 0.2517 - val_accuracy: 0.8878
Epoch 363/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2193 -
accuracy: 0.9059 - val_loss: 0.2473 - val_accuracy: 0.8930
Epoch 364/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2202 -
accuracy: 0.9046 - val_loss: 0.2454 - val_accuracy: 0.8923
Epoch 365/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2169 -
accuracy: 0.9068 - val_loss: 0.2495 - val_accuracy: 0.8885
Epoch 366/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2172 -
accuracy: 0.9058 - val_loss: 0.2428 - val_accuracy: 0.8930
Epoch 367/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2171 -
accuracy: 0.9074 - val_loss: 0.2426 - val_accuracy: 0.8930
Epoch 368/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2162 -
accuracy: 0.9061 - val_loss: 0.2465 - val_accuracy: 0.8880
Epoch 369/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2192 -
accuracy: 0.9059 - val_loss: 0.2438 - val_accuracy: 0.8915
Epoch 370/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2176 -
accuracy: 0.9057 - val_loss: 0.2425 - val_accuracy: 0.8945
Epoch 371/1000
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160/160 [==============================] - 1s 6ms/step - loss: 0.2168 -
accuracy: 0.9053 - val_loss: 0.2420 - val_accuracy: 0.8932
Epoch 372/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2158 -
accuracy: 0.9072 - val_loss: 0.2551 - val_accuracy: 0.8873
Epoch 373/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2159 -
accuracy: 0.9076 - val_loss: 0.2433 - val_accuracy: 0.8915
Epoch 374/1000
160/160 [==============================] - 1s 6ms/step - loss: 0.2163 -
accuracy: 0.9072 - val_loss: 0.2418 - val_accuracy: 0.8950
Epoch 375/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2146 -
accuracy: 0.9071 - val_loss: 0.2490 - val_accuracy: 0.8903
Epoch 376/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2157 -
accuracy: 0.9073 - val_loss: 0.2408 - val_accuracy: 0.8930
Epoch 377/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2167 -
accuracy: 0.9071 - val_loss: 0.2453 - val_accuracy: 0.8910
Epoch 378/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2164 -
accuracy: 0.9069 - val_loss: 0.2460 - val_accuracy: 0.8907
Epoch 379/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2168 -
accuracy: 0.9066 - val_loss: 0.2437 - val_accuracy: 0.8923
Epoch 380/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2134 -
accuracy: 0.9090 - val_loss: 0.2486 - val_accuracy: 0.8880
Epoch 381/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2142 -
accuracy: 0.9094 - val_loss: 0.2433 - val_accuracy: 0.8940
Epoch 382/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2151 -
accuracy: 0.9072 - val_loss: 0.2437 - val_accuracy: 0.8942
Epoch 383/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2167 -
accuracy: 0.9069 - val_loss: 0.2478 - val_accuracy: 0.8867
Epoch 384/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2150 -
accuracy: 0.9057 - val_loss: 0.2440 - val_accuracy: 0.8882
Epoch 385/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2141 -
accuracy: 0.9091 - val_loss: 0.2412 - val_accuracy: 0.8942
Epoch 386/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2164 -
accuracy: 0.9089 - val_loss: 0.2546 - val_accuracy: 0.8873
Epoch 387/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.2140 -
accuracy: 0.9096 - val_loss: 0.2447 - val_accuracy: 0.8915
Epoch 388/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2146 -
accuracy: 0.9078 - val_loss: 0.2443 - val_accuracy: 0.8917
Epoch 389/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2154 -
accuracy: 0.9072 - val_loss: 0.2446 - val_accuracy: 0.8930
Epoch 390/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2146 -
accuracy: 0.9074 - val_loss: 0.2410 - val_accuracy: 0.8945
Epoch 391/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2128 -
accuracy: 0.9093 - val_loss: 0.2447 - val_accuracy: 0.8905
Epoch 392/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2149 -
accuracy: 0.9069 - val_loss: 0.2453 - val_accuracy: 0.8913
Epoch 393/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2145 -
accuracy: 0.9079 - val_loss: 0.2405 - val_accuracy: 0.8935
Epoch 394/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2128 -
accuracy: 0.9094 - val_loss: 0.2400 - val_accuracy: 0.8953
Epoch 395/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2137 -
accuracy: 0.9091 - val_loss: 0.2408 - val_accuracy: 0.8940
Epoch 396/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2157 -
accuracy: 0.9081 - val_loss: 0.2418 - val_accuracy: 0.8907
Epoch 397/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2128 -
accuracy: 0.9089 - val_loss: 0.2526 - val_accuracy: 0.8870
Epoch 398/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2135 -
accuracy: 0.9091 - val_loss: 0.2463 - val_accuracy: 0.8907
Epoch 399/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2116 -
accuracy: 0.9092 - val_loss: 0.2541 - val_accuracy: 0.8857
Epoch 400/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2138 -
accuracy: 0.9078 - val_loss: 0.2409 - val_accuracy: 0.8928
Epoch 401/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2119 -
accuracy: 0.9100 - val_loss: 0.2368 - val_accuracy: 0.8965
Epoch 402/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2116 -
accuracy: 0.9093 - val_loss: 0.2416 - val_accuracy: 0.8950
Epoch 403/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2119 -
accuracy: 0.9092 - val_loss: 0.2403 - val_accuracy: 0.8938
Epoch 404/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2129 -
accuracy: 0.9079 - val_loss: 0.2422 - val_accuracy: 0.8930
Epoch 405/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2121 -
accuracy: 0.9093 - val_loss: 0.2427 - val_accuracy: 0.8942
Epoch 406/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2112 -
accuracy: 0.9086 - val_loss: 0.2399 - val_accuracy: 0.8938
Epoch 407/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2107 -
accuracy: 0.9100 - val_loss: 0.2404 - val_accuracy: 0.8945
Epoch 408/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2130 -
accuracy: 0.9073 - val_loss: 0.2432 - val_accuracy: 0.8950
Epoch 409/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2115 -
accuracy: 0.9090 - val_loss: 0.2366 - val_accuracy: 0.8988
Epoch 410/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2110 -
accuracy: 0.9103 - val_loss: 0.2447 - val_accuracy: 0.8892
Epoch 411/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2100 -
accuracy: 0.9116 - val_loss: 0.2435 - val_accuracy: 0.8925
Epoch 412/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2128 -
accuracy: 0.9078 - val_loss: 0.2369 - val_accuracy: 0.8967
Epoch 413/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2094 -
accuracy: 0.9104 - val_loss: 0.2465 - val_accuracy: 0.8885
Epoch 414/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2141 -
accuracy: 0.9066 - val_loss: 0.2407 - val_accuracy: 0.8932
Epoch 415/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2101 -
accuracy: 0.9100 - val_loss: 0.2473 - val_accuracy: 0.8905
Epoch 416/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2099 -
accuracy: 0.9093 - val_loss: 0.2481 - val_accuracy: 0.8903
Epoch 417/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2126 -
accuracy: 0.9086 - val_loss: 0.2568 - val_accuracy: 0.8880
Epoch 418/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2095 -
accuracy: 0.9100 - val_loss: 0.2406 - val_accuracy: 0.8915
Epoch 419/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2111 -
accuracy: 0.9104 - val_loss: 0.2374 - val_accuracy: 0.8975
Epoch 420/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2101 -
accuracy: 0.9107 - val_loss: 0.2428 - val_accuracy: 0.8947
Epoch 421/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2109 -
accuracy: 0.9091 - val_loss: 0.2391 - val_accuracy: 0.8970
Epoch 422/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2095 -
accuracy: 0.9101 - val_loss: 0.2511 - val_accuracy: 0.8882
Epoch 423/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2084 -
accuracy: 0.9107 - val_loss: 0.2451 - val_accuracy: 0.8935
Epoch 424/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2129 -
accuracy: 0.9087 - val_loss: 0.2385 - val_accuracy: 0.8995
Epoch 425/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2099 -
accuracy: 0.9087 - val_loss: 0.2383 - val_accuracy: 0.8980
Epoch 426/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2095 -
accuracy: 0.9111 - val_loss: 0.2365 - val_accuracy: 0.8967
Epoch 427/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2078 -
accuracy: 0.9106 - val_loss: 0.2355 - val_accuracy: 0.8985
Epoch 428/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2080 -
accuracy: 0.9116 - val_loss: 0.2547 - val_accuracy: 0.8870
Epoch 429/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2081 -
accuracy: 0.9105 - val_loss: 0.2432 - val_accuracy: 0.8945
Epoch 430/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2077 -
accuracy: 0.9119 - val_loss: 0.2386 - val_accuracy: 0.8960
Epoch 431/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2090 -
accuracy: 0.9115 - val_loss: 0.2359 - val_accuracy: 0.8980
Epoch 432/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2096 -
accuracy: 0.9114 - val_loss: 0.2367 - val_accuracy: 0.8965
Epoch 433/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2077 -
accuracy: 0.9105 - val_loss: 0.2412 - val_accuracy: 0.8935
Epoch 434/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2092 -
accuracy: 0.9099 - val_loss: 0.2372 - val_accuracy: 0.8942
Epoch 435/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2085 -
accuracy: 0.9118 - val_loss: 0.2385 - val_accuracy: 0.8957
Epoch 436/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2072 -
accuracy: 0.9111 - val_loss: 0.2473 - val_accuracy: 0.8907
Epoch 437/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2065 -
accuracy: 0.9118 - val_loss: 0.2426 - val_accuracy: 0.8925
Epoch 438/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2083 -
accuracy: 0.9107 - val_loss: 0.2397 - val_accuracy: 0.8938
Epoch 439/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2071 -
accuracy: 0.9128 - val_loss: 0.2371 - val_accuracy: 0.8978
Epoch 440/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2053 -
accuracy: 0.9108 - val_loss: 0.2428 - val_accuracy: 0.8910
Epoch 441/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2092 -
accuracy: 0.9109 - val_loss: 0.2369 - val_accuracy: 0.8967
Epoch 442/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2093 -
accuracy: 0.9104 - val_loss: 0.2507 - val_accuracy: 0.8900
Epoch 443/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2071 -
accuracy: 0.9112 - val_loss: 0.2371 - val_accuracy: 0.8953
Epoch 444/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2067 -
accuracy: 0.9114 - val_loss: 0.2370 - val_accuracy: 0.8975
Epoch 445/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2080 -
accuracy: 0.9110 - val_loss: 0.2405 - val_accuracy: 0.8947
Epoch 446/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2073 -
accuracy: 0.9116 - val_loss: 0.2385 - val_accuracy: 0.8978
Epoch 447/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2065 -
accuracy: 0.9126 - val_loss: 0.2364 - val_accuracy: 0.8967
Epoch 448/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2059 -
accuracy: 0.9116 - val_loss: 0.2491 - val_accuracy: 0.8930
Epoch 449/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2070 -
accuracy: 0.9129 - val_loss: 0.2384 - val_accuracy: 0.8950
Epoch 450/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2081 -
accuracy: 0.9103 - val_loss: 0.2356 - val_accuracy: 0.8972
Epoch 451/1000
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160/160 [==============================] - 1s 4ms/step - loss: 0.2074 -
accuracy: 0.9109 - val_loss: 0.2397 - val_accuracy: 0.8932
Epoch 452/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2050 -
accuracy: 0.9121 - val_loss: 0.2394 - val_accuracy: 0.8947
Epoch 453/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2047 -
accuracy: 0.9119 - val_loss: 0.2402 - val_accuracy: 0.8957
Epoch 454/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2057 -
accuracy: 0.9121 - val_loss: 0.2399 - val_accuracy: 0.8947
Epoch 455/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2044 -
accuracy: 0.9119 - val_loss: 0.2409 - val_accuracy: 0.8963
Epoch 456/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2079 -
accuracy: 0.9112 - val_loss: 0.2351 - val_accuracy: 0.8982
Epoch 457/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.2048 -
accuracy: 0.9119 - val_loss: 0.2403 - val_accuracy: 0.8938
Epoch 458/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2042 -
accuracy: 0.9121 - val_loss: 0.2409 - val_accuracy: 0.8917
Epoch 459/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2050 -
accuracy: 0.9124 - val_loss: 0.2537 - val_accuracy: 0.8875
Epoch 460/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2043 -
accuracy: 0.9147 - val_loss: 0.2374 - val_accuracy: 0.8945
Epoch 461/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2054 -
accuracy: 0.9116 - val_loss: 0.2467 - val_accuracy: 0.8938
Epoch 462/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2053 -
accuracy: 0.9133 - val_loss: 0.2367 - val_accuracy: 0.8985
Epoch 463/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2048 -
accuracy: 0.9136 - val_loss: 0.2355 - val_accuracy: 0.9013
Epoch 464/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2042 -
accuracy: 0.9134 - val_loss: 0.2370 - val_accuracy: 0.8972
Epoch 465/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2052 -
accuracy: 0.9122 - val_loss: 0.2419 - val_accuracy: 0.8935
Epoch 466/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2037 -
accuracy: 0.9141 - val_loss: 0.2378 - val_accuracy: 0.8975
Epoch 467/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2031 -
accuracy: 0.9128 - val_loss: 0.2540 - val_accuracy: 0.8882
Epoch 468/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2035 -
accuracy: 0.9133 - val_loss: 0.2381 - val_accuracy: 0.8950
Epoch 469/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2027 -
accuracy: 0.9137 - val_loss: 0.2487 - val_accuracy: 0.8885
Epoch 470/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2055 -
accuracy: 0.9119 - val_loss: 0.2407 - val_accuracy: 0.8940
Epoch 471/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2033 -
accuracy: 0.9130 - val_loss: 0.2356 - val_accuracy: 0.8997
Epoch 472/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2029 -
accuracy: 0.9142 - val_loss: 0.2486 - val_accuracy: 0.8892
Epoch 473/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2032 -
accuracy: 0.9128 - val_loss: 0.2383 - val_accuracy: 0.8960
Epoch 474/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2029 -
accuracy: 0.9135 - val_loss: 0.2392 - val_accuracy: 0.8975
Epoch 475/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.2023 -
accuracy: 0.9141 - val_loss: 0.2475 - val_accuracy: 0.8898
Epoch 476/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2025 -
accuracy: 0.9152 - val_loss: 0.2374 - val_accuracy: 0.8967
Epoch 477/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2026 -
accuracy: 0.9136 - val_loss: 0.2462 - val_accuracy: 0.8932
Epoch 478/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2034 -
accuracy: 0.9116 - val_loss: 0.2482 - val_accuracy: 0.8903
Epoch 479/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2078 -
accuracy: 0.9119 - val_loss: 0.2391 - val_accuracy: 0.8945
Epoch 480/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2014 -
accuracy: 0.9134 - val_loss: 0.2362 - val_accuracy: 0.8985
Epoch 481/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2023 -
accuracy: 0.9125 - val_loss: 0.2383 - val_accuracy: 0.8945
Epoch 482/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2018 -
accuracy: 0.9141 - val_loss: 0.2353 - val_accuracy: 0.8970
Epoch 483/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2029 -
accuracy: 0.9137 - val_loss: 0.2355 - val_accuracy: 0.8985
Epoch 484/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2006 -
accuracy: 0.9140 - val_loss: 0.2449 - val_accuracy: 0.8917
Epoch 485/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2011 -
accuracy: 0.9154 - val_loss: 0.2333 - val_accuracy: 0.8992
Epoch 486/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2005 -
accuracy: 0.9158 - val_loss: 0.2397 - val_accuracy: 0.8967
Epoch 487/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2013 -
accuracy: 0.9139 - val_loss: 0.2374 - val_accuracy: 0.8950
Epoch 488/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2005 -
accuracy: 0.9142 - val_loss: 0.2365 - val_accuracy: 0.8957
Epoch 489/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2023 -
accuracy: 0.9146 - val_loss: 0.2371 - val_accuracy: 0.8965
Epoch 490/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2015 -
accuracy: 0.9143 - val_loss: 0.2384 - val_accuracy: 0.8928
Epoch 491/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1995 -
accuracy: 0.9161 - val_loss: 0.2371 - val_accuracy: 0.8975
Epoch 492/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2022 -
accuracy: 0.9145 - val_loss: 0.2353 - val_accuracy: 0.8982
Epoch 493/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.2026 -
accuracy: 0.9137 - val_loss: 0.2401 - val_accuracy: 0.8945
Epoch 494/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2022 -
accuracy: 0.9124 - val_loss: 0.2347 - val_accuracy: 0.8997
Epoch 495/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2013 -
accuracy: 0.9146 - val_loss: 0.2414 - val_accuracy: 0.8950
Epoch 496/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2008 -
accuracy: 0.9146 - val_loss: 0.2379 - val_accuracy: 0.8950
Epoch 497/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2028 -
accuracy: 0.9129 - val_loss: 0.2344 - val_accuracy: 0.8980
Epoch 498/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2005 -
accuracy: 0.9144 - val_loss: 0.2345 - val_accuracy: 0.8985
Epoch 499/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2002 -
accuracy: 0.9155 - val_loss: 0.2376 - val_accuracy: 0.8963
Epoch 500/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2013 -
accuracy: 0.9151 - val_loss: 0.2405 - val_accuracy: 0.8950
Epoch 501/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1993 -
accuracy: 0.9156 - val_loss: 0.2364 - val_accuracy: 0.8963
Epoch 502/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1995 -
accuracy: 0.9143 - val_loss: 0.2547 - val_accuracy: 0.8880
Epoch 503/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1988 -
accuracy: 0.9153 - val_loss: 0.2366 - val_accuracy: 0.8985
Epoch 504/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1991 -
accuracy: 0.9143 - val_loss: 0.2469 - val_accuracy: 0.8932
Epoch 505/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2002 -
accuracy: 0.9151 - val_loss: 0.2350 - val_accuracy: 0.8970
Epoch 506/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1992 -
accuracy: 0.9156 - val_loss: 0.2382 - val_accuracy: 0.8960
Epoch 507/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1982 -
accuracy: 0.9161 - val_loss: 0.2327 - val_accuracy: 0.8990
Epoch 508/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1992 -
accuracy: 0.9148 - val_loss: 0.2356 - val_accuracy: 0.8955
Epoch 509/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1993 -
accuracy: 0.9143 - val_loss: 0.2341 - val_accuracy: 0.8963
Epoch 510/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2001 -
accuracy: 0.9158 - val_loss: 0.2341 - val_accuracy: 0.8957
Epoch 511/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2011 -
accuracy: 0.9144 - val_loss: 0.2370 - val_accuracy: 0.8945
Epoch 512/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1986 -
accuracy: 0.9163 - val_loss: 0.2376 - val_accuracy: 0.8945
Epoch 513/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1978 -
accuracy: 0.9173 - val_loss: 0.2380 - val_accuracy: 0.8955
Epoch 514/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1986 -
accuracy: 0.9151 - val_loss: 0.2374 - val_accuracy: 0.8935
Epoch 515/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.2012 -
accuracy: 0.9149 - val_loss: 0.2439 - val_accuracy: 0.8907
Epoch 516/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1987 -
accuracy: 0.9174 - val_loss: 0.2446 - val_accuracy: 0.8917
Epoch 517/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1991 -
accuracy: 0.9161 - val_loss: 0.2384 - val_accuracy: 0.8992
Epoch 518/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1985 -
accuracy: 0.9164 - val_loss: 0.2378 - val_accuracy: 0.8963
Epoch 519/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1993 -
accuracy: 0.9149 - val_loss: 0.2361 - val_accuracy: 0.8970
Epoch 520/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1984 -
accuracy: 0.9173 - val_loss: 0.2364 - val_accuracy: 0.8975
Epoch 521/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1995 -
accuracy: 0.9164 - val_loss: 0.2364 - val_accuracy: 0.8978
Epoch 522/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1974 -
accuracy: 0.9156 - val_loss: 0.2339 - val_accuracy: 0.8978
Epoch 523/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1984 -
accuracy: 0.9153 - val_loss: 0.2330 - val_accuracy: 0.8985
Epoch 524/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1983 -
accuracy: 0.9152 - val_loss: 0.2384 - val_accuracy: 0.8938
Epoch 525/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1979 -
accuracy: 0.9172 - val_loss: 0.2325 - val_accuracy: 0.8997
Epoch 526/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1994 -
accuracy: 0.9150 - val_loss: 0.2355 - val_accuracy: 0.8967
Epoch 527/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1977 -
accuracy: 0.9170 - val_loss: 0.2357 - val_accuracy: 0.8980
Epoch 528/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1973 -
accuracy: 0.9166 - val_loss: 0.2329 - val_accuracy: 0.8988
Epoch 529/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1974 -
accuracy: 0.9158 - val_loss: 0.2366 - val_accuracy: 0.8975
Epoch 530/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1978 -
accuracy: 0.9165 - val_loss: 0.2390 - val_accuracy: 0.8938
Epoch 531/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1972 -
accuracy: 0.9157 - val_loss: 0.2311 - val_accuracy: 0.8982
Epoch 532/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1965 -
accuracy: 0.9172 - val_loss: 0.2329 - val_accuracy: 0.8997
Epoch 533/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1963 -
accuracy: 0.9162 - val_loss: 0.2349 - val_accuracy: 0.8975
Epoch 534/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1964 -
accuracy: 0.9164 - val_loss: 0.2342 - val_accuracy: 0.8970
Epoch 535/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.2001 -
accuracy: 0.9140 - val_loss: 0.2356 - val_accuracy: 0.8963
Epoch 536/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1967 -
accuracy: 0.9166 - val_loss: 0.2379 - val_accuracy: 0.8982
Epoch 537/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1969 -
accuracy: 0.9155 - val_loss: 0.2388 - val_accuracy: 0.8955
Epoch 538/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1979 -
accuracy: 0.9159 - val_loss: 0.2346 - val_accuracy: 0.8967
Epoch 539/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1957 -
accuracy: 0.9184 - val_loss: 0.2441 - val_accuracy: 0.8940
Epoch 540/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1964 -
accuracy: 0.9166 - val_loss: 0.2335 - val_accuracy: 0.8980
Epoch 541/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1975 -
accuracy: 0.9178 - val_loss: 0.2371 - val_accuracy: 0.8955
Epoch 542/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1946 -
accuracy: 0.9186 - val_loss: 0.2535 - val_accuracy: 0.8898
Epoch 543/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1967 -
accuracy: 0.9171 - val_loss: 0.2433 - val_accuracy: 0.8932
Epoch 544/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1978 -
accuracy: 0.9147 - val_loss: 0.2338 - val_accuracy: 0.8970
Epoch 545/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1943 -
accuracy: 0.9181 - val_loss: 0.2346 - val_accuracy: 0.8932
Epoch 546/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1961 -
accuracy: 0.9153 - val_loss: 0.2361 - val_accuracy: 0.8967
Epoch 547/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1972 -
accuracy: 0.9163 - val_loss: 0.2395 - val_accuracy: 0.8907
Epoch 548/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1951 -
accuracy: 0.9167 - val_loss: 0.2365 - val_accuracy: 0.8935
Epoch 549/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1955 -
accuracy: 0.9195 - val_loss: 0.2402 - val_accuracy: 0.8967
Epoch 550/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1950 -
accuracy: 0.9178 - val_loss: 0.2376 - val_accuracy: 0.8950
Epoch 551/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1957 -
accuracy: 0.9187 - val_loss: 0.2352 - val_accuracy: 0.8955
Epoch 552/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1945 -
accuracy: 0.9198 - val_loss: 0.2377 - val_accuracy: 0.8950
Epoch 553/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1948 -
accuracy: 0.9174 - val_loss: 0.2421 - val_accuracy: 0.8940
Epoch 554/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1944 -
accuracy: 0.9177 - val_loss: 0.2361 - val_accuracy: 0.8963
Epoch 555/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1960 -
accuracy: 0.9168 - val_loss: 0.2337 - val_accuracy: 0.8972
Epoch 556/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1956 -
accuracy: 0.9179 - val_loss: 0.2406 - val_accuracy: 0.8957
Epoch 557/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1939 -
accuracy: 0.9189 - val_loss: 0.2371 - val_accuracy: 0.8960
Epoch 558/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1965 -
accuracy: 0.9167 - val_loss: 0.2345 - val_accuracy: 0.8972
Epoch 559/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1946 -
accuracy: 0.9172 - val_loss: 0.2397 - val_accuracy: 0.8955
Epoch 560/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1944 -
accuracy: 0.9180 - val_loss: 0.2384 - val_accuracy: 0.8930
Epoch 561/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1932 -
accuracy: 0.9178 - val_loss: 0.2366 - val_accuracy: 0.8960
Epoch 562/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1954 -
accuracy: 0.9181 - val_loss: 0.2322 - val_accuracy: 0.8967
Epoch 563/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1934 -
accuracy: 0.9185 - val_loss: 0.2333 - val_accuracy: 0.8990
Epoch 564/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1938 -
accuracy: 0.9177 - val_loss: 0.2381 - val_accuracy: 0.8925
Epoch 565/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1928 -
accuracy: 0.9171 - val_loss: 0.2452 - val_accuracy: 0.8940
Epoch 566/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1935 -
accuracy: 0.9188 - val_loss: 0.2342 - val_accuracy: 0.8972
Epoch 567/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1942 -
accuracy: 0.9175 - val_loss: 0.2321 - val_accuracy: 0.8975
Epoch 568/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1938 -
accuracy: 0.9192 - val_loss: 0.2350 - val_accuracy: 0.8913
Epoch 569/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1948 -
accuracy: 0.9188 - val_loss: 0.2400 - val_accuracy: 0.8953
Epoch 570/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1946 -
accuracy: 0.9193 - val_loss: 0.2340 - val_accuracy: 0.8970
Epoch 571/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1925 -
accuracy: 0.9204 - val_loss: 0.2364 - val_accuracy: 0.8995
Epoch 572/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1929 -
accuracy: 0.9168 - val_loss: 0.2371 - val_accuracy: 0.8975
Epoch 573/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1936 -
accuracy: 0.9194 - val_loss: 0.2333 - val_accuracy: 0.8967
Epoch 574/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1930 -
accuracy: 0.9183 - val_loss: 0.2372 - val_accuracy: 0.8965
Epoch 575/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1917 -
accuracy: 0.9181 - val_loss: 0.2338 - val_accuracy: 0.8997
Epoch 576/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1937 -
accuracy: 0.9191 - val_loss: 0.2374 - val_accuracy: 0.8950
Epoch 577/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1945 -
accuracy: 0.9191 - val_loss: 0.2367 - val_accuracy: 0.8935
Epoch 578/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1916 -
accuracy: 0.9187 - val_loss: 0.2345 - val_accuracy: 0.8955
Epoch 579/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1945 -
accuracy: 0.9182 - val_loss: 0.2335 - val_accuracy: 0.8957
Epoch 580/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1912 -
accuracy: 0.9194 - val_loss: 0.2353 - val_accuracy: 0.8957
Epoch 581/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1954 -
accuracy: 0.9161 - val_loss: 0.2476 - val_accuracy: 0.8957
Epoch 582/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1933 -
accuracy: 0.9184 - val_loss: 0.2346 - val_accuracy: 0.9000
Epoch 583/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1910 -
accuracy: 0.9198 - val_loss: 0.2316 - val_accuracy: 0.9000
Epoch 584/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1929 -
accuracy: 0.9180 - val_loss: 0.2348 - val_accuracy: 0.8992
Epoch 585/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1920 -
accuracy: 0.9189 - val_loss: 0.2357 - val_accuracy: 0.8965
Epoch 586/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1918 -
accuracy: 0.9183 - val_loss: 0.2399 - val_accuracy: 0.8905
Epoch 587/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1923 -
accuracy: 0.9186 - val_loss: 0.2474 - val_accuracy: 0.8888
Epoch 588/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1923 -
accuracy: 0.9201 - val_loss: 0.2449 - val_accuracy: 0.8972
Epoch 589/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1906 -
accuracy: 0.9196 - val_loss: 0.2330 - val_accuracy: 0.8960
Epoch 590/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1900 -
accuracy: 0.9201 - val_loss: 0.2338 - val_accuracy: 0.8953
Epoch 591/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1928 -
accuracy: 0.9183 - val_loss: 0.2383 - val_accuracy: 0.8985
Epoch 592/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1914 -
accuracy: 0.9200 - val_loss: 0.2427 - val_accuracy: 0.8970
Epoch 593/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1910 -
accuracy: 0.9193 - val_loss: 0.2394 - val_accuracy: 0.8988
Epoch 594/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1929 -
accuracy: 0.9171 - val_loss: 0.2335 - val_accuracy: 0.8967
Epoch 595/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1910 -
accuracy: 0.9199 - val_loss: 0.2368 - val_accuracy: 0.9000
Epoch 596/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1912 -
accuracy: 0.9189 - val_loss: 0.2366 - val_accuracy: 0.8957
Epoch 597/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1905 -
accuracy: 0.9208 - val_loss: 0.2390 - val_accuracy: 0.8917
Epoch 598/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1902 -
accuracy: 0.9198 - val_loss: 0.2386 - val_accuracy: 0.8923
Epoch 599/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1899 -
accuracy: 0.9199 - val_loss: 0.2397 - val_accuracy: 0.8947
Epoch 600/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1909 -
accuracy: 0.9181 - val_loss: 0.2367 - val_accuracy: 0.8945
Epoch 601/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1917 -
accuracy: 0.9178 - val_loss: 0.2336 - val_accuracy: 0.8957
Epoch 602/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1901 -
accuracy: 0.9201 - val_loss: 0.2445 - val_accuracy: 0.8903
Epoch 603/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1918 -
accuracy: 0.9193 - val_loss: 0.2335 - val_accuracy: 0.8982
Epoch 604/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1916 -
accuracy: 0.9196 - val_loss: 0.2371 - val_accuracy: 0.8992
Epoch 605/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1916 -
accuracy: 0.9184 - val_loss: 0.2357 - val_accuracy: 0.8942
Epoch 606/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1906 -
accuracy: 0.9197 - val_loss: 0.2376 - val_accuracy: 0.8938
Epoch 607/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1903 -
accuracy: 0.9202 - val_loss: 0.2349 - val_accuracy: 0.8995
Epoch 608/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1900 -
accuracy: 0.9201 - val_loss: 0.2372 - val_accuracy: 0.8970
Epoch 609/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1885 -
accuracy: 0.9199 - val_loss: 0.2396 - val_accuracy: 0.8965
Epoch 610/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1914 -
accuracy: 0.9196 - val_loss: 0.2325 - val_accuracy: 0.8972
Epoch 611/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1895 -
accuracy: 0.9203 - val_loss: 0.2336 - val_accuracy: 0.8967
Epoch 612/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1884 -
accuracy: 0.9206 - val_loss: 0.2427 - val_accuracy: 0.8925
Epoch 613/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1928 -
accuracy: 0.9189 - val_loss: 0.2508 - val_accuracy: 0.8852
Epoch 614/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1887 -
accuracy: 0.9210 - val_loss: 0.2344 - val_accuracy: 0.8975
Epoch 615/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1904 -
accuracy: 0.9186 - val_loss: 0.2406 - val_accuracy: 0.8970
Epoch 616/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1896 -
accuracy: 0.9197 - val_loss: 0.2339 - val_accuracy: 0.8950
Epoch 617/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1891 -
accuracy: 0.9206 - val_loss: 0.2346 - val_accuracy: 0.8965
Epoch 618/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1897 -
accuracy: 0.9197 - val_loss: 0.2402 - val_accuracy: 0.8915
Epoch 619/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1904 -
accuracy: 0.9204 - val_loss: 0.2357 - val_accuracy: 0.8938
Epoch 620/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1888 -
accuracy: 0.9213 - val_loss: 0.2473 - val_accuracy: 0.8965
Epoch 621/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1891 -
accuracy: 0.9211 - val_loss: 0.2413 - val_accuracy: 0.8953
Epoch 622/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1901 -
accuracy: 0.9206 - val_loss: 0.2318 - val_accuracy: 0.8975
Epoch 623/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1886 -
accuracy: 0.9212 - val_loss: 0.2449 - val_accuracy: 0.8895
Epoch 624/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1890 -
accuracy: 0.9204 - val_loss: 0.2352 - val_accuracy: 0.8988
Epoch 625/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1900 -
accuracy: 0.9184 - val_loss: 0.2390 - val_accuracy: 0.8967
Epoch 626/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1887 -
accuracy: 0.9202 - val_loss: 0.2359 - val_accuracy: 0.8953
Epoch 627/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1881 -
accuracy: 0.9209 - val_loss: 0.2364 - val_accuracy: 0.8965
Epoch 628/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1888 -
accuracy: 0.9201 - val_loss: 0.2371 - val_accuracy: 0.8963
Epoch 629/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1883 -
accuracy: 0.9208 - val_loss: 0.2352 - val_accuracy: 0.8965
Epoch 630/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1903 -
accuracy: 0.9199 - val_loss: 0.2360 - val_accuracy: 0.8955
Epoch 631/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1881 -
accuracy: 0.9193 - val_loss: 0.2335 - val_accuracy: 0.8972
Epoch 632/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1873 -
accuracy: 0.9214 - val_loss: 0.2392 - val_accuracy: 0.8990
Epoch 633/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1867 -
accuracy: 0.9204 - val_loss: 0.2362 - val_accuracy: 0.8957
Epoch 634/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1873 -
accuracy: 0.9198 - val_loss: 0.2356 - val_accuracy: 0.8957
Epoch 635/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1871 -
accuracy: 0.9204 - val_loss: 0.2329 - val_accuracy: 0.9003
Epoch 636/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1871 -
accuracy: 0.9218 - val_loss: 0.2384 - val_accuracy: 0.8965
Epoch 637/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1874 -
accuracy: 0.9214 - val_loss: 0.2371 - val_accuracy: 0.8935
Epoch 638/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1875 -
accuracy: 0.9214 - val_loss: 0.2374 - val_accuracy: 0.8940
Epoch 639/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1886 -
accuracy: 0.9191 - val_loss: 0.2376 - val_accuracy: 0.8967
Epoch 640/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1870 -
accuracy: 0.9209 - val_loss: 0.2335 - val_accuracy: 0.8980
Epoch 641/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1880 -
accuracy: 0.9210 - val_loss: 0.2434 - val_accuracy: 0.8947
Epoch 642/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1858 -
accuracy: 0.9226 - val_loss: 0.2328 - val_accuracy: 0.9005
Epoch 643/1000
```

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160/160 [==============================] - 0s 3ms/step - loss: 0.1867 -
accuracy: 0.9219 - val_loss: 0.2424 - val_accuracy: 0.8965
Epoch 644/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1874 -
accuracy: 0.9206 - val_loss: 0.2374 - val_accuracy: 0.8925
Epoch 645/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1870 -
accuracy: 0.9228 - val_loss: 0.2347 - val_accuracy: 0.8967
Epoch 646/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1887 -
accuracy: 0.9202 - val_loss: 0.2340 - val_accuracy: 0.8972
Epoch 647/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1858 -
accuracy: 0.9227 - val_loss: 0.2411 - val_accuracy: 0.8990
Epoch 648/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1870 -
accuracy: 0.9207 - val_loss: 0.2349 - val_accuracy: 0.8953
Epoch 649/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1861 -
accuracy: 0.9214 - val_loss: 0.2470 - val_accuracy: 0.8930
Epoch 650/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1882 -
accuracy: 0.9195 - val_loss: 0.2346 - val_accuracy: 0.8988
Epoch 651/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1845 -
accuracy: 0.9212 - val_loss: 0.2353 - val_accuracy: 0.8975
Epoch 652/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1883 -
accuracy: 0.9217 - val_loss: 0.2393 - val_accuracy: 0.8932
Epoch 653/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1867 -
accuracy: 0.9222 - val_loss: 0.2378 - val_accuracy: 0.8935
Epoch 654/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1870 -
accuracy: 0.9218 - val_loss: 0.2367 - val_accuracy: 0.8963
Epoch 655/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1846 -
accuracy: 0.9236 - val_loss: 0.2345 - val_accuracy: 0.8970
Epoch 656/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1877 -
accuracy: 0.9208 - val_loss: 0.2374 - val_accuracy: 0.8980
Epoch 657/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1864 -
accuracy: 0.9206 - val_loss: 0.2330 - val_accuracy: 0.8982
Epoch 658/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1851 -
accuracy: 0.9231 - val_loss: 0.2367 - val_accuracy: 0.8947
Epoch 659/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1862 -
accuracy: 0.9223 - val_loss: 0.2347 - val_accuracy: 0.9013
Epoch 660/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1846 -
accuracy: 0.9232 - val_loss: 0.2356 - val_accuracy: 0.8967
Epoch 661/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1855 -
accuracy: 0.9220 - val_loss: 0.2386 - val_accuracy: 0.8935
Epoch 662/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1868 -
accuracy: 0.9209 - val_loss: 0.2359 - val_accuracy: 0.8970
Epoch 663/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1852 -
accuracy: 0.9236 - val_loss: 0.2357 - val_accuracy: 0.8953
Epoch 664/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1861 -
accuracy: 0.9221 - val_loss: 0.2361 - val_accuracy: 0.8945
Epoch 665/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1855 -
accuracy: 0.9210 - val_loss: 0.2357 - val_accuracy: 0.8992
Epoch 666/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1860 -
accuracy: 0.9215 - val_loss: 0.2491 - val_accuracy: 0.8935
Epoch 667/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1848 -
accuracy: 0.9206 - val_loss: 0.2352 - val_accuracy: 0.9003
Epoch 668/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1850 -
accuracy: 0.9242 - val_loss: 0.2386 - val_accuracy: 0.8898
Epoch 669/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1841 -
accuracy: 0.9228 - val_loss: 0.2355 - val_accuracy: 0.8955
Epoch 670/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1845 -
accuracy: 0.9233 - val_loss: 0.2384 - val_accuracy: 0.8970
Epoch 671/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1852 -
accuracy: 0.9227 - val_loss: 0.2362 - val_accuracy: 0.8972
Epoch 672/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1845 -
accuracy: 0.9238 - val_loss: 0.2324 - val_accuracy: 0.8980
Epoch 673/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1835 -
accuracy: 0.9234 - val_loss: 0.2367 - val_accuracy: 0.8935
Epoch 674/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1847 -
accuracy: 0.9230 - val_loss: 0.2361 - val_accuracy: 0.8955
Epoch 675/1000
```

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160/160 [==============================] - 1s 3ms/step - loss: 0.1832 -
accuracy: 0.9232 - val_loss: 0.2329 - val_accuracy: 0.9005
Epoch 676/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1843 -
accuracy: 0.9236 - val_loss: 0.2356 - val_accuracy: 0.8992
Epoch 677/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1841 -
accuracy: 0.9227 - val_loss: 0.2340 - val_accuracy: 0.8953
Epoch 678/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1838 -
accuracy: 0.9218 - val_loss: 0.2417 - val_accuracy: 0.8935
Epoch 679/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1839 -
accuracy: 0.9229 - val_loss: 0.2385 - val_accuracy: 0.8942
Epoch 680/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1829 -
accuracy: 0.9242 - val_loss: 0.2377 - val_accuracy: 0.8928
Epoch 681/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1839 -
accuracy: 0.9227 - val_loss: 0.2360 - val_accuracy: 0.8960
Epoch 682/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1825 -
accuracy: 0.9230 - val_loss: 0.2358 - val_accuracy: 0.8953
Epoch 683/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1846 -
accuracy: 0.9211 - val_loss: 0.2411 - val_accuracy: 0.8965
Epoch 684/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1840 -
accuracy: 0.9234 - val_loss: 0.2411 - val_accuracy: 0.8957
Epoch 685/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1848 -
accuracy: 0.9224 - val_loss: 0.2368 - val_accuracy: 0.8992
Epoch 686/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1829 -
accuracy: 0.9243 - val_loss: 0.2497 - val_accuracy: 0.8920
Epoch 687/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1826 -
accuracy: 0.9236 - val_loss: 0.2382 - val_accuracy: 0.8978
Epoch 688/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1837 -
accuracy: 0.9246 - val_loss: 0.2403 - val_accuracy: 0.8970
Epoch 689/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1842 -
accuracy: 0.9238 - val_loss: 0.2402 - val_accuracy: 0.8965
Epoch 690/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1836 -
accuracy: 0.9229 - val_loss: 0.2367 - val_accuracy: 0.8995
Epoch 691/1000
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160/160 [==============================] - 0s 3ms/step - loss: 0.1839 -
accuracy: 0.9233 - val_loss: 0.2447 - val_accuracy: 0.8910
Epoch 692/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1829 -
accuracy: 0.9243 - val_loss: 0.2350 - val_accuracy: 0.8965
Epoch 693/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1822 -
accuracy: 0.9243 - val_loss: 0.2357 - val_accuracy: 0.8990
Epoch 694/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1826 -
accuracy: 0.9237 - val_loss: 0.2437 - val_accuracy: 0.8900
Epoch 695/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1823 -
accuracy: 0.9246 - val_loss: 0.2349 - val_accuracy: 0.8988
Epoch 696/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1824 -
accuracy: 0.9241 - val_loss: 0.2583 - val_accuracy: 0.8792
Epoch 697/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1827 -
accuracy: 0.9228 - val_loss: 0.2342 - val_accuracy: 0.8978
Epoch 698/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1826 -
accuracy: 0.9239 - val_loss: 0.2391 - val_accuracy: 0.8930
Epoch 699/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1823 -
accuracy: 0.9220 - val_loss: 0.2339 - val_accuracy: 0.8955
Epoch 700/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1821 -
accuracy: 0.9236 - val_loss: 0.2369 - val_accuracy: 0.8950
Epoch 701/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1819 -
accuracy: 0.9242 - val_loss: 0.2328 - val_accuracy: 0.8985
Epoch 702/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1825 -
accuracy: 0.9239 - val_loss: 0.2436 - val_accuracy: 0.8970
Epoch 703/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1812 -
accuracy: 0.9244 - val_loss: 0.2371 - val_accuracy: 0.8953
Epoch 704/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1816 -
accuracy: 0.9233 - val_loss: 0.2410 - val_accuracy: 0.8980
Epoch 705/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1822 -
accuracy: 0.9245 - val_loss: 0.2395 - val_accuracy: 0.8950
Epoch 706/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1825 -
accuracy: 0.9246 - val_loss: 0.2352 - val_accuracy: 0.8955
Epoch 707/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1818 -
accuracy: 0.9233 - val_loss: 0.2364 - val_accuracy: 0.8978
Epoch 708/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1821 -
accuracy: 0.9238 - val_loss: 0.2365 - val_accuracy: 0.8985
Epoch 709/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1808 -
accuracy: 0.9234 - val_loss: 0.2355 - val_accuracy: 0.8963
Epoch 710/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1813 -
accuracy: 0.9240 - val_loss: 0.2427 - val_accuracy: 0.8917
Epoch 711/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1815 -
accuracy: 0.9231 - val_loss: 0.2370 - val_accuracy: 0.8990
Epoch 712/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1820 -
accuracy: 0.9252 - val_loss: 0.2421 - val_accuracy: 0.8903
Epoch 713/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1816 -
accuracy: 0.9236 - val_loss: 0.2618 - val_accuracy: 0.8930
Epoch 714/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1813 -
accuracy: 0.9244 - val_loss: 0.2493 - val_accuracy: 0.8953
Epoch 715/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1823 -
accuracy: 0.9245 - val_loss: 0.2407 - val_accuracy: 0.8903
Epoch 716/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1800 -
accuracy: 0.9243 - val_loss: 0.2478 - val_accuracy: 0.8963
Epoch 717/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1814 -
accuracy: 0.9244 - val_loss: 0.2365 - val_accuracy: 0.8960
Epoch 718/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1816 -
accuracy: 0.9236 - val_loss: 0.2378 - val_accuracy: 0.8972
Epoch 719/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1801 -
accuracy: 0.9247 - val_loss: 0.2392 - val_accuracy: 0.8967
Epoch 720/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1807 -
accuracy: 0.9261 - val_loss: 0.2379 - val_accuracy: 0.8963
Epoch 721/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1793 -
accuracy: 0.9251 - val_loss: 0.2415 - val_accuracy: 0.8953
Epoch 722/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1802 -
accuracy: 0.9251 - val_loss: 0.2376 - val_accuracy: 0.8960
Epoch 723/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1812 -
accuracy: 0.9244 - val_loss: 0.2397 - val_accuracy: 0.8965
Epoch 724/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1801 -
accuracy: 0.9243 - val_loss: 0.2356 - val_accuracy: 0.8967
Epoch 725/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1804 -
accuracy: 0.9246 - val_loss: 0.2389 - val_accuracy: 0.8992
Epoch 726/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1804 -
accuracy: 0.9254 - val_loss: 0.2384 - val_accuracy: 0.8938
Epoch 727/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1800 -
accuracy: 0.9238 - val_loss: 0.2345 - val_accuracy: 0.8953
Epoch 728/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1791 -
accuracy: 0.9247 - val_loss: 0.2376 - val_accuracy: 0.8978
Epoch 729/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1800 -
accuracy: 0.9241 - val_loss: 0.2444 - val_accuracy: 0.8963
Epoch 730/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1785 -
accuracy: 0.9261 - val_loss: 0.2356 - val_accuracy: 0.8970
Epoch 731/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1789 -
accuracy: 0.9252 - val_loss: 0.2388 - val_accuracy: 0.8935
Epoch 732/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1805 -
accuracy: 0.9257 - val_loss: 0.2381 - val_accuracy: 0.8955
Epoch 733/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1805 -
accuracy: 0.9257 - val_loss: 0.2412 - val_accuracy: 0.8960
Epoch 734/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1808 -
accuracy: 0.9226 - val_loss: 0.2397 - val_accuracy: 0.8988
Epoch 735/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1820 -
accuracy: 0.9246 - val_loss: 0.2560 - val_accuracy: 0.8930
Epoch 736/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1798 -
accuracy: 0.9254 - val_loss: 0.2458 - val_accuracy: 0.8915
Epoch 737/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1790 -
accuracy: 0.9254 - val_loss: 0.2384 - val_accuracy: 0.8960
Epoch 738/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1779 -
accuracy: 0.9258 - val_loss: 0.2365 - val_accuracy: 0.8955
Epoch 739/1000
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160/160 [==============================] - 1s 5ms/step - loss: 0.1809 -
accuracy: 0.9255 - val_loss: 0.2382 - val_accuracy: 0.8965
Epoch 740/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1780 -
accuracy: 0.9260 - val_loss: 0.2506 - val_accuracy: 0.8945
Epoch 741/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1800 -
accuracy: 0.9255 - val_loss: 0.2451 - val_accuracy: 0.8972
Epoch 742/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1805 -
accuracy: 0.9241 - val_loss: 0.2439 - val_accuracy: 0.8920
Epoch 743/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1796 -
accuracy: 0.9266 - val_loss: 0.2364 - val_accuracy: 0.8957
Epoch 744/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1779 -
accuracy: 0.9264 - val_loss: 0.2392 - val_accuracy: 0.8995
Epoch 745/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1787 -
accuracy: 0.9256 - val_loss: 0.2388 - val_accuracy: 0.8947
Epoch 746/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1787 -
accuracy: 0.9261 - val_loss: 0.2377 - val_accuracy: 0.8915
Epoch 747/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1774 -
accuracy: 0.9274 - val_loss: 0.2369 - val_accuracy: 0.8960
Epoch 748/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1770 -
accuracy: 0.9249 - val_loss: 0.2410 - val_accuracy: 0.8940
Epoch 749/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1786 -
accuracy: 0.9258 - val_loss: 0.2445 - val_accuracy: 0.8982
Epoch 750/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1773 -
accuracy: 0.9268 - val_loss: 0.2387 - val_accuracy: 0.8960
Epoch 751/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1773 -
accuracy: 0.9274 - val_loss: 0.2403 - val_accuracy: 0.8975
Epoch 752/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1792 -
accuracy: 0.9251 - val_loss: 0.2369 - val_accuracy: 0.8947
Epoch 753/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1786 -
accuracy: 0.9244 - val_loss: 0.2393 - val_accuracy: 0.8988
Epoch 754/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1780 -
accuracy: 0.9256 - val_loss: 0.2461 - val_accuracy: 0.8972
Epoch 755/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1778 -
accuracy: 0.9262 - val_loss: 0.2383 - val_accuracy: 0.8988
Epoch 756/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1807 -
accuracy: 0.9238 - val_loss: 0.2491 - val_accuracy: 0.8967
Epoch 757/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1774 -
accuracy: 0.9258 - val_loss: 0.2441 - val_accuracy: 0.8955
Epoch 758/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1787 -
accuracy: 0.9258 - val_loss: 0.2409 - val_accuracy: 0.8950
Epoch 759/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1776 -
accuracy: 0.9262 - val_loss: 0.2370 - val_accuracy: 0.8967
Epoch 760/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1777 -
accuracy: 0.9254 - val_loss: 0.2389 - val_accuracy: 0.8988
Epoch 761/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1781 -
accuracy: 0.9263 - val_loss: 0.2411 - val_accuracy: 0.8978
Epoch 762/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1781 -
accuracy: 0.9256 - val_loss: 0.2385 - val_accuracy: 0.8982
Epoch 763/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1762 -
accuracy: 0.9276 - val_loss: 0.2474 - val_accuracy: 0.8950
Epoch 764/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1767 -
accuracy: 0.9259 - val_loss: 0.2377 - val_accuracy: 0.8980
Epoch 765/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1764 -
accuracy: 0.9255 - val_loss: 0.2415 - val_accuracy: 0.8990
Epoch 766/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1789 -
accuracy: 0.9249 - val_loss: 0.2396 - val_accuracy: 0.8950
Epoch 767/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1765 -
accuracy: 0.9255 - val_loss: 0.2449 - val_accuracy: 0.8910
Epoch 768/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1774 -
accuracy: 0.9249 - val_loss: 0.2498 - val_accuracy: 0.8955
Epoch 769/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1761 -
accuracy: 0.9271 - val_loss: 0.2391 - val_accuracy: 0.8950
Epoch 770/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1762 -
accuracy: 0.9260 - val_loss: 0.2430 - val_accuracy: 0.8957
Epoch 771/1000
```

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160/160 [==============================] - 0s 3ms/step - loss: 0.1758 -
accuracy: 0.9268 - val_loss: 0.2406 - val_accuracy: 0.8947
Epoch 772/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1762 -
accuracy: 0.9267 - val_loss: 0.2467 - val_accuracy: 0.8953
Epoch 773/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1755 -
accuracy: 0.9269 - val_loss: 0.2428 - val_accuracy: 0.8985
Epoch 774/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1773 -
accuracy: 0.9267 - val_loss: 0.2377 - val_accuracy: 0.8942
Epoch 775/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1768 -
accuracy: 0.9262 - val_loss: 0.2374 - val_accuracy: 0.8985
Epoch 776/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1751 -
accuracy: 0.9287 - val_loss: 0.2386 - val_accuracy: 0.8995
Epoch 777/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1764 -
accuracy: 0.9260 - val_loss: 0.2398 - val_accuracy: 0.8980
Epoch 778/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1773 -
accuracy: 0.9245 - val_loss: 0.2393 - val_accuracy: 0.8928
Epoch 779/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1771 -
accuracy: 0.9241 - val_loss: 0.2381 - val_accuracy: 0.8932
Epoch 780/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1760 -
accuracy: 0.9273 - val_loss: 0.2413 - val_accuracy: 0.8953
Epoch 781/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1758 -
accuracy: 0.9273 - val_loss: 0.2391 - val_accuracy: 0.8988
Epoch 782/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1761 -
accuracy: 0.9259 - val_loss: 0.2501 - val_accuracy: 0.8947
Epoch 783/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1763 -
accuracy: 0.9271 - val_loss: 0.2423 - val_accuracy: 0.8980
Epoch 784/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1765 -
accuracy: 0.9274 - val_loss: 0.2367 - val_accuracy: 0.8972
Epoch 785/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1757 -
accuracy: 0.9263 - val_loss: 0.2373 - val_accuracy: 0.8982
Epoch 786/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1756 -
accuracy: 0.9254 - val_loss: 0.2410 - val_accuracy: 0.8972
Epoch 787/1000
```

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160/160 [==============================] - 1s 5ms/step - loss: 0.1746 -
accuracy: 0.9271 - val_loss: 0.2458 - val_accuracy: 0.8935
Epoch 788/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1752 -
accuracy: 0.9276 - val_loss: 0.2416 - val_accuracy: 0.8965
Epoch 789/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1754 -
accuracy: 0.9268 - val_loss: 0.2389 - val_accuracy: 0.8967
Epoch 790/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1754 -
accuracy: 0.9271 - val_loss: 0.2387 - val_accuracy: 0.8950
Epoch 791/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1744 -
accuracy: 0.9279 - val_loss: 0.2424 - val_accuracy: 0.8980
Epoch 792/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1760 -
accuracy: 0.9263 - val_loss: 0.2422 - val_accuracy: 0.8992
Epoch 793/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1744 -
accuracy: 0.9277 - val_loss: 0.2623 - val_accuracy: 0.8947
Epoch 794/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1753 -
accuracy: 0.9264 - val_loss: 0.2386 - val_accuracy: 0.8932
Epoch 795/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1740 -
accuracy: 0.9269 - val_loss: 0.2422 - val_accuracy: 0.8960
Epoch 796/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1744 -
accuracy: 0.9271 - val_loss: 0.2447 - val_accuracy: 0.8963
Epoch 797/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1743 -
accuracy: 0.9269 - val_loss: 0.2383 - val_accuracy: 0.8960
Epoch 798/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1740 -
accuracy: 0.9269 - val_loss: 0.2386 - val_accuracy: 0.8965
Epoch 799/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1736 -
accuracy: 0.9274 - val_loss: 0.2402 - val_accuracy: 0.8975
Epoch 800/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1736 -
accuracy: 0.9287 - val_loss: 0.2418 - val_accuracy: 0.8982
Epoch 801/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1735 -
accuracy: 0.9284 - val_loss: 0.2444 - val_accuracy: 0.8963
Epoch 802/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1742 -
accuracy: 0.9264 - val_loss: 0.2432 - val_accuracy: 0.8953
Epoch 803/1000
```

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160/160 [==============================] - 1s 3ms/step - loss: 0.1753 -
accuracy: 0.9277 - val_loss: 0.2439 - val_accuracy: 0.8928
Epoch 804/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1744 -
accuracy: 0.9276 - val_loss: 0.2432 - val_accuracy: 0.8935
Epoch 805/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1737 -
accuracy: 0.9281 - val_loss: 0.2437 - val_accuracy: 0.8950
Epoch 806/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1734 -
accuracy: 0.9282 - val_loss: 0.2428 - val_accuracy: 0.8967
Epoch 807/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1732 -
accuracy: 0.9269 - val_loss: 0.2534 - val_accuracy: 0.8892
Epoch 808/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1726 -
accuracy: 0.9284 - val_loss: 0.2426 - val_accuracy: 0.8985
Epoch 809/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1726 -
accuracy: 0.9281 - val_loss: 0.2385 - val_accuracy: 0.8955
Epoch 810/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1740 -
accuracy: 0.9276 - val_loss: 0.2377 - val_accuracy: 0.8985
Epoch 811/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1725 -
accuracy: 0.9281 - val_loss: 0.2401 - val_accuracy: 0.8982
Epoch 812/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1727 -
accuracy: 0.9294 - val_loss: 0.2417 - val_accuracy: 0.8957
Epoch 813/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1729 -
accuracy: 0.9291 - val_loss: 0.2438 - val_accuracy: 0.8972
Epoch 814/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1718 -
accuracy: 0.9296 - val_loss: 0.2424 - val_accuracy: 0.8978
Epoch 815/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1722 -
accuracy: 0.9290 - val_loss: 0.2405 - val_accuracy: 0.8928
Epoch 816/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1720 -
accuracy: 0.9283 - val_loss: 0.2498 - val_accuracy: 0.8892
Epoch 817/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1736 -
accuracy: 0.9274 - val_loss: 0.2418 - val_accuracy: 0.8967
Epoch 818/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1722 -
accuracy: 0.9286 - val_loss: 0.2390 - val_accuracy: 0.8972
Epoch 819/1000
```

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160/160 [==============================] - 1s 5ms/step - loss: 0.1716 -
accuracy: 0.9285 - val_loss: 0.2461 - val_accuracy: 0.8990
Epoch 820/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1724 -
accuracy: 0.9294 - val_loss: 0.2394 - val_accuracy: 0.8967
Epoch 821/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1736 -
accuracy: 0.9280 - val_loss: 0.2415 - val_accuracy: 0.8982
Epoch 822/1000
160/160 [==============================] - 1s 5ms/step - loss: 0.1735 -
accuracy: 0.9264 - val_loss: 0.2617 - val_accuracy: 0.8917
Epoch 823/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1722 -
accuracy: 0.9268 - val_loss: 0.2422 - val_accuracy: 0.8960
Epoch 824/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1740 -
accuracy: 0.9269 - val_loss: 0.2492 - val_accuracy: 0.8935
Epoch 825/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1729 -
accuracy: 0.9283 - val_loss: 0.2493 - val_accuracy: 0.8953
Epoch 826/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1732 -
accuracy: 0.9285 - val_loss: 0.2433 - val_accuracy: 0.8978
Epoch 827/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1728 -
accuracy: 0.9275 - val_loss: 0.2422 - val_accuracy: 0.8965
Epoch 828/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1724 -
accuracy: 0.9302 - val_loss: 0.2487 - val_accuracy: 0.8955
Epoch 829/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1731 -
accuracy: 0.9289 - val_loss: 0.2409 - val_accuracy: 0.8955
Epoch 830/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1730 -
accuracy: 0.9274 - val_loss: 0.2434 - val_accuracy: 0.8957
Epoch 831/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1713 -
accuracy: 0.9285 - val_loss: 0.2467 - val_accuracy: 0.8940
Epoch 832/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1715 -
accuracy: 0.9298 - val_loss: 0.2432 - val_accuracy: 0.8960
Epoch 833/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1713 -
accuracy: 0.9289 - val_loss: 0.2444 - val_accuracy: 0.8938
Epoch 834/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1710 -
accuracy: 0.9293 - val_loss: 0.2435 - val_accuracy: 0.8947
Epoch 835/1000
```

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160/160 [==============================] - 1s 3ms/step - loss: 0.1723 -
accuracy: 0.9281 - val_loss: 0.2451 - val_accuracy: 0.8928
Epoch 836/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1722 -
accuracy: 0.9278 - val_loss: 0.2419 - val_accuracy: 0.8953
Epoch 837/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1713 -
accuracy: 0.9291 - val_loss: 0.2425 - val_accuracy: 0.8967
Epoch 838/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1717 -
accuracy: 0.9293 - val_loss: 0.2420 - val_accuracy: 0.8980
Epoch 839/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1699 -
accuracy: 0.9292 - val_loss: 0.2439 - val_accuracy: 0.8960
Epoch 840/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1707 -
accuracy: 0.9298 - val_loss: 0.2448 - val_accuracy: 0.8928
Epoch 841/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1722 -
accuracy: 0.9302 - val_loss: 0.2490 - val_accuracy: 0.8895
Epoch 842/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1703 -
accuracy: 0.9299 - val_loss: 0.2453 - val_accuracy: 0.8950
Epoch 843/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1695 -
accuracy: 0.9306 - val_loss: 0.2474 - val_accuracy: 0.8925
Epoch 844/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1706 -
accuracy: 0.9284 - val_loss: 0.2416 - val_accuracy: 0.8975
Epoch 845/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1743 -
accuracy: 0.9280 - val_loss: 0.2436 - val_accuracy: 0.8963
Epoch 846/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1697 -
accuracy: 0.9279 - val_loss: 0.2400 - val_accuracy: 0.8963
Epoch 847/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1717 -
accuracy: 0.9277 - val_loss: 0.2402 - val_accuracy: 0.8957
Epoch 848/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1705 -
accuracy: 0.9296 - val_loss: 0.2425 - val_accuracy: 0.8955
Epoch 849/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1710 -
accuracy: 0.9291 - val_loss: 0.2542 - val_accuracy: 0.8930
Epoch 850/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1707 -
accuracy: 0.9299 - val_loss: 0.2429 - val_accuracy: 0.8953
Epoch 851/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1690 -
accuracy: 0.9306 - val_loss: 0.2538 - val_accuracy: 0.8923
Epoch 852/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1704 -
accuracy: 0.9284 - val_loss: 0.2511 - val_accuracy: 0.8963
Epoch 853/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1689 -
accuracy: 0.9311 - val_loss: 0.2469 - val_accuracy: 0.8917
Epoch 854/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1700 -
accuracy: 0.9291 - val_loss: 0.2426 - val_accuracy: 0.8945
Epoch 855/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1708 -
accuracy: 0.9298 - val_loss: 0.2521 - val_accuracy: 0.8947
Epoch 856/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1715 -
accuracy: 0.9286 - val_loss: 0.2445 - val_accuracy: 0.8957
Epoch 857/1000
160/160 [==============================] - 0s 3ms/step - loss: 0.1721 -
accuracy: 0.9274 - val_loss: 0.2435 - val_accuracy: 0.8960
Epoch 858/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1700 -
accuracy: 0.9288 - val_loss: 0.2605 - val_accuracy: 0.8925
Epoch 859/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1713 -
accuracy: 0.9284 - val_loss: 0.2430 - val_accuracy: 0.8963
Epoch 860/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1700 -
accuracy: 0.9287 - val_loss: 0.2456 - val_accuracy: 0.8940
Epoch 861/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1690 -
accuracy: 0.9290 - val_loss: 0.2536 - val_accuracy: 0.8938
Epoch 862/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1684 -
accuracy: 0.9293 - val_loss: 0.2470 - val_accuracy: 0.8932
Epoch 863/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1681 -
accuracy: 0.9307 - val_loss: 0.2467 - val_accuracy: 0.8942
Epoch 864/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1698 -
accuracy: 0.9302 - val_loss: 0.2460 - val_accuracy: 0.8935
Epoch 865/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1689 -
accuracy: 0.9301 - val_loss: 0.2570 - val_accuracy: 0.8953
Epoch 866/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1694 -
accuracy: 0.9309 - val_loss: 0.2567 - val_accuracy: 0.8953
Epoch 867/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1679 -
accuracy: 0.9302 - val_loss: 0.2417 - val_accuracy: 0.8975
Epoch 868/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1678 -
accuracy: 0.9294 - val_loss: 0.2410 - val_accuracy: 0.8942
Epoch 869/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1683 -
accuracy: 0.9294 - val_loss: 0.2481 - val_accuracy: 0.8925
Epoch 870/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1686 -
accuracy: 0.9294 - val_loss: 0.2454 - val_accuracy: 0.8930
Epoch 871/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1683 -
accuracy: 0.9303 - val_loss: 0.2446 - val_accuracy: 0.8957
Epoch 872/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1686 -
accuracy: 0.9287 - val_loss: 0.2476 - val_accuracy: 0.8980
Epoch 873/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1674 -
accuracy: 0.9311 - val_loss: 0.2463 - val_accuracy: 0.8945
Epoch 874/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1683 -
accuracy: 0.9296 - val_loss: 0.2540 - val_accuracy: 0.8955
Epoch 875/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1684 -
accuracy: 0.9298 - val_loss: 0.2450 - val_accuracy: 0.8965
Epoch 876/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1696 -
accuracy: 0.9295 - val_loss: 0.2468 - val_accuracy: 0.8975
Epoch 877/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1675 -
accuracy: 0.9308 - val_loss: 0.2461 - val_accuracy: 0.8935
Epoch 878/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1685 -
accuracy: 0.9306 - val_loss: 0.2418 - val_accuracy: 0.9013
Epoch 879/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1671 -
accuracy: 0.9302 - val_loss: 0.2442 - val_accuracy: 0.8972
Epoch 880/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1673 -
accuracy: 0.9313 - val_loss: 0.2441 - val_accuracy: 0.8960
Epoch 881/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1673 -
accuracy: 0.9296 - val_loss: 0.2449 - val_accuracy: 0.8963
Epoch 882/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1689 -
accuracy: 0.9296 - val_loss: 0.2428 - val_accuracy: 0.8990
Epoch 883/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1705 -
accuracy: 0.9292 - val_loss: 0.2474 - val_accuracy: 0.8950
Epoch 884/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1663 -
accuracy: 0.9306 - val_loss: 0.2457 - val_accuracy: 0.8960
Epoch 885/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1694 -
accuracy: 0.9294 - val_loss: 0.2440 - val_accuracy: 0.8972
Epoch 886/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1680 -
accuracy: 0.9298 - val_loss: 0.2460 - val_accuracy: 0.8967
Epoch 887/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1672 -
accuracy: 0.9293 - val_loss: 0.2446 - val_accuracy: 0.8955
Epoch 888/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1657 -
accuracy: 0.9315 - val_loss: 0.2477 - val_accuracy: 0.8955
Epoch 889/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1661 -
accuracy: 0.9301 - val_loss: 0.2446 - val_accuracy: 0.8967
Epoch 890/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1675 -
accuracy: 0.9310 - val_loss: 0.2489 - val_accuracy: 0.8938
Epoch 891/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1670 -
accuracy: 0.9298 - val_loss: 0.2456 - val_accuracy: 0.8978
Epoch 892/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1684 -
accuracy: 0.9287 - val_loss: 0.2547 - val_accuracy: 0.8935
Epoch 893/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1655 -
accuracy: 0.9324 - val_loss: 0.2445 - val_accuracy: 0.8980
Epoch 894/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1675 -
accuracy: 0.9297 - val_loss: 0.2512 - val_accuracy: 0.8960
Epoch 895/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1659 -
accuracy: 0.9304 - val_loss: 0.2432 - val_accuracy: 0.8975
Epoch 896/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1664 -
accuracy: 0.9310 - val_loss: 0.2475 - val_accuracy: 0.8930
Epoch 897/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1669 -
accuracy: 0.9305 - val_loss: 0.2454 - val_accuracy: 0.8975
Epoch 898/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1657 -
accuracy: 0.9313 - val_loss: 0.2461 - val_accuracy: 0.8965
Epoch 899/1000
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160/160 [==============================] - 1s 3ms/step - loss: 0.1661 -
accuracy: 0.9305 - val_loss: 0.2431 - val_accuracy: 0.8992
Epoch 900/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1663 -
accuracy: 0.9303 - val_loss: 0.2443 - val_accuracy: 0.8950
Epoch 901/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1659 -
accuracy: 0.9323 - val_loss: 0.2450 - val_accuracy: 0.8963
Epoch 902/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1669 -
accuracy: 0.9297 - val_loss: 0.2451 - val_accuracy: 0.8935
Epoch 903/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1649 -
accuracy: 0.9314 - val_loss: 0.2442 - val_accuracy: 0.8963
Epoch 904/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1647 -
accuracy: 0.9323 - val_loss: 0.2556 - val_accuracy: 0.8892
Epoch 905/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1659 -
accuracy: 0.9311 - val_loss: 0.2465 - val_accuracy: 0.8990
Epoch 906/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1658 -
accuracy: 0.9326 - val_loss: 0.2501 - val_accuracy: 0.8963
Epoch 907/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1660 -
accuracy: 0.9316 - val_loss: 0.2458 - val_accuracy: 0.8978
Epoch 908/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1649 -
accuracy: 0.9320 - val_loss: 0.2538 - val_accuracy: 0.8915
Epoch 909/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1654 -
accuracy: 0.9314 - val_loss: 0.2537 - val_accuracy: 0.8950
Epoch 910/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1649 -
accuracy: 0.9306 - val_loss: 0.2508 - val_accuracy: 0.8963
Epoch 911/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1649 -
accuracy: 0.9306 - val_loss: 0.2432 - val_accuracy: 0.8980
Epoch 912/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1664 -
accuracy: 0.9322 - val_loss: 0.2456 - val_accuracy: 0.8965
Epoch 913/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1664 -
accuracy: 0.9316 - val_loss: 0.2472 - val_accuracy: 0.8955
Epoch 914/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1652 -
accuracy: 0.9317 - val_loss: 0.2457 - val_accuracy: 0.8980
Epoch 915/1000
```

```
160/160 [==============================] - 1s 3ms/step - loss: 0.1641 -
accuracy: 0.9316 - val_loss: 0.2492 - val_accuracy: 0.8938
Epoch 916/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1661 -
accuracy: 0.9302 - val_loss: 0.2496 - val_accuracy: 0.8967
Epoch 917/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1654 -
accuracy: 0.9318 - val_loss: 0.2440 - val_accuracy: 0.8965
Epoch 918/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1644 -
accuracy: 0.9316 - val_loss: 0.2420 - val_accuracy: 0.8988
Epoch 919/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1631 -
accuracy: 0.9341 - val_loss: 0.2470 - val_accuracy: 0.8967
Epoch 920/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1652 -
accuracy: 0.9307 - val_loss: 0.2481 - val_accuracy: 0.8925
Epoch 921/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1649 -
accuracy: 0.9309 - val_loss: 0.2648 - val_accuracy: 0.8930
Epoch 922/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1645 -
accuracy: 0.9331 - val_loss: 0.2501 - val_accuracy: 0.8913
Epoch 923/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1643 -
accuracy: 0.9333 - val_loss: 0.2658 - val_accuracy: 0.8915
Epoch 924/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1646 -
accuracy: 0.9321 - val_loss: 0.2427 - val_accuracy: 0.8992
Epoch 925/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1635 -
accuracy: 0.9319 - val_loss: 0.2452 - val_accuracy: 0.8978
Epoch 926/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1630 -
accuracy: 0.9324 - val_loss: 0.2449 - val_accuracy: 0.8955
Epoch 927/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1646 -
accuracy: 0.9324 - val_loss: 0.2437 - val_accuracy: 0.8992
Epoch 928/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1635 -
accuracy: 0.9308 - val_loss: 0.2544 - val_accuracy: 0.8932
Epoch 929/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1630 -
accuracy: 0.9330 - val_loss: 0.2446 - val_accuracy: 0.8967
Epoch 930/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1623 -
accuracy: 0.9323 - val_loss: 0.2478 - val_accuracy: 0.8955
Epoch 931/1000
```

```
160/160 [==============================] - 1s 4ms/step - loss: 0.1635 -
accuracy: 0.9324 - val_loss: 0.2456 - val_accuracy: 0.9005
Epoch 932/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1629 -
accuracy: 0.9323 - val_loss: 0.2490 - val_accuracy: 0.8965
Epoch 933/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1645 -
accuracy: 0.9326 - val_loss: 0.2460 - val_accuracy: 0.9005
Epoch 934/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1634 -
accuracy: 0.9334 - val_loss: 0.2496 - val_accuracy: 0.9013
Epoch 935/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1624 -
accuracy: 0.9333 - val_loss: 0.2503 - val_accuracy: 0.8985
Epoch 936/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1641 -
accuracy: 0.9311 - val_loss: 0.2477 - val_accuracy: 0.8938
Epoch 937/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1619 -
accuracy: 0.9331 - val_loss: 0.2500 - val_accuracy: 0.8963
Epoch 938/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1633 -
accuracy: 0.9317 - val_loss: 0.2524 - val_accuracy: 0.8975
Epoch 939/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1650 -
accuracy: 0.9311 - val_loss: 0.2593 - val_accuracy: 0.8947
Epoch 940/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1635 -
accuracy: 0.9333 - val_loss: 0.2447 - val_accuracy: 0.9000
Epoch 941/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1631 -
accuracy: 0.9329 - val_loss: 0.2514 - val_accuracy: 0.8988
Epoch 942/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1635 -
accuracy: 0.9314 - val_loss: 0.2492 - val_accuracy: 0.8945
Epoch 943/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1617 -
accuracy: 0.9336 - val_loss: 0.2537 - val_accuracy: 0.8950
Epoch 944/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1624 -
accuracy: 0.9317 - val_loss: 0.2485 - val_accuracy: 0.8955
Epoch 945/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1621 -
accuracy: 0.9321 - val_loss: 0.2496 - val_accuracy: 0.8965
Epoch 946/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1630 -
accuracy: 0.9320 - val_loss: 0.2615 - val_accuracy: 0.8935
Epoch 947/1000
```

```
160/160 [==============================] - 1s 3ms/step - loss: 0.1624 -
accuracy: 0.9318 - val_loss: 0.2498 - val_accuracy: 0.8980
Epoch 948/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1622 -
accuracy: 0.9317 - val_loss: 0.2487 - val_accuracy: 0.8965
Epoch 949/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1613 -
accuracy: 0.9341 - val_loss: 0.2586 - val_accuracy: 0.8947
Epoch 950/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1631 -
accuracy: 0.9326 - val_loss: 0.2484 - val_accuracy: 0.8985
Epoch 951/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1612 -
accuracy: 0.9306 - val_loss: 0.2517 - val_accuracy: 0.8950
Epoch 952/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1620 -
accuracy: 0.9328 - val_loss: 0.2491 - val_accuracy: 0.8972
Epoch 953/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1618 -
accuracy: 0.9320 - val_loss: 0.2545 - val_accuracy: 0.8965
Epoch 954/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1611 -
accuracy: 0.9339 - val_loss: 0.2487 - val_accuracy: 0.8940
Epoch 955/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1619 -
accuracy: 0.9334 - val_loss: 0.2466 - val_accuracy: 0.9000
Epoch 956/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1628 -
accuracy: 0.9328 - val_loss: 0.2488 - val_accuracy: 0.8955
Epoch 957/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1620 -
accuracy: 0.9321 - val_loss: 0.2496 - val_accuracy: 0.8965
Epoch 958/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1607 -
accuracy: 0.9349 - val_loss: 0.2568 - val_accuracy: 0.8957
Epoch 959/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1608 -
accuracy: 0.9336 - val_loss: 0.2498 - val_accuracy: 0.8995
Epoch 960/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1624 -
accuracy: 0.9328 - val_loss: 0.2596 - val_accuracy: 0.8963
Epoch 961/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1608 -
accuracy: 0.9341 - val_loss: 0.2780 - val_accuracy: 0.8910
Epoch 962/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1637 -
accuracy: 0.9318 - val_loss: 0.2487 - val_accuracy: 0.8940
Epoch 963/1000
```

```
160/160 [==============================] - 1s 3ms/step - loss: 0.1611 -
accuracy: 0.9324 - val_loss: 0.2532 - val_accuracy: 0.8970
Epoch 964/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1630 -
accuracy: 0.9315 - val_loss: 0.2474 - val_accuracy: 0.8957
Epoch 965/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1613 -
accuracy: 0.9339 - val_loss: 0.2472 - val_accuracy: 0.8965
Epoch 966/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1605 -
accuracy: 0.9340 - val_loss: 0.2630 - val_accuracy: 0.8950
Epoch 967/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1612 -
accuracy: 0.9335 - val_loss: 0.2611 - val_accuracy: 0.8992
Epoch 968/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1600 -
accuracy: 0.9331 - val_loss: 0.2512 - val_accuracy: 0.8965
Epoch 969/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1610 -
accuracy: 0.9325 - val_loss: 0.2489 - val_accuracy: 0.8980
Epoch 970/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1613 -
accuracy: 0.9329 - val_loss: 0.2512 - val_accuracy: 0.8928
Epoch 971/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1609 -
accuracy: 0.9327 - val_loss: 0.2488 - val_accuracy: 0.8967
Epoch 972/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1613 -
accuracy: 0.9320 - val_loss: 0.2496 - val_accuracy: 0.8960
Epoch 973/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1602 -
accuracy: 0.9351 - val_loss: 0.2555 - val_accuracy: 0.8950
Epoch 974/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1604 -
accuracy: 0.9331 - val_loss: 0.2459 - val_accuracy: 0.8992
Epoch 975/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1601 -
accuracy: 0.9319 - val_loss: 0.2578 - val_accuracy: 0.8955
Epoch 976/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1594 -
accuracy: 0.9344 - val_loss: 0.2470 - val_accuracy: 0.8970
Epoch 977/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1605 -
accuracy: 0.9344 - val_loss: 0.2496 - val_accuracy: 0.8972
Epoch 978/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1592 -
accuracy: 0.9335 - val_loss: 0.2520 - val_accuracy: 0.9003
Epoch 979/1000
```

```
160/160 [==============================] - 1s 3ms/step - loss: 0.1597 -
accuracy: 0.9330 - val_loss: 0.2674 - val_accuracy: 0.8942
Epoch 980/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1596 -
accuracy: 0.9329 - val_loss: 0.2572 - val_accuracy: 0.8942
Epoch 981/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1591 -
accuracy: 0.9339 - val_loss: 0.2514 - val_accuracy: 0.8953
Epoch 982/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1593 -
accuracy: 0.9339 - val_loss: 0.2503 - val_accuracy: 0.8970
Epoch 983/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1609 -
accuracy: 0.9349 - val_loss: 0.2582 - val_accuracy: 0.8940
Epoch 984/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1585 -
accuracy: 0.9346 - val_loss: 0.2493 - val_accuracy: 0.8995
Epoch 985/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1598 -
accuracy: 0.9342 - val_loss: 0.2561 - val_accuracy: 0.8957
Epoch 986/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1590 -
accuracy: 0.9325 - val_loss: 0.2531 - val_accuracy: 0.8975
Epoch 987/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1590 -
accuracy: 0.9342 - val_loss: 0.2503 - val_accuracy: 0.8930
Epoch 988/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1598 -
accuracy: 0.9326 - val_loss: 0.2497 - val_accuracy: 0.8980
Epoch 989/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1595 -
accuracy: 0.9339 - val_loss: 0.2528 - val_accuracy: 0.8955
Epoch 990/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1595 -
accuracy: 0.9339 - val_loss: 0.2496 - val_accuracy: 0.8967
Epoch 991/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1580 -
accuracy: 0.9361 - val_loss: 0.2488 - val_accuracy: 0.8982
Epoch 992/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1586 -
accuracy: 0.9334 - val_loss: 0.2507 - val_accuracy: 0.8950
Epoch 993/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1606 -
accuracy: 0.9327 - val_loss: 0.2499 - val_accuracy: 0.8965
Epoch 994/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1572 -
accuracy: 0.9356 - val_loss: 0.2527 - val_accuracy: 0.8953
Epoch 995/1000
```

```
160/160 [==============================] - 1s 4ms/step - loss: 0.1590 -
accuracy: 0.9349 - val_loss: 0.2515 - val_accuracy: 0.8955
Epoch 996/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1584 -
accuracy: 0.9341 - val_loss: 0.2509 - val_accuracy: 0.8957
Epoch 997/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1583 -
accuracy: 0.9352 - val_loss: 0.2510 - val_accuracy: 0.8947
Epoch 998/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1572 -
accuracy: 0.9349 - val_loss: 0.2589 - val_accuracy: 0.8972
Epoch 999/1000
160/160 [==============================] - 1s 3ms/step - loss: 0.1575 -
accuracy: 0.9345 - val_loss: 0.2510 - val_accuracy: 0.8988
Epoch 1000/1000
160/160 [==============================] - 1s 4ms/step - loss: 0.1595 -
accuracy: 0.9344 - val_loss: 0.2484 - val_accuracy: 0.9000
```

8.8 Evaluating the model

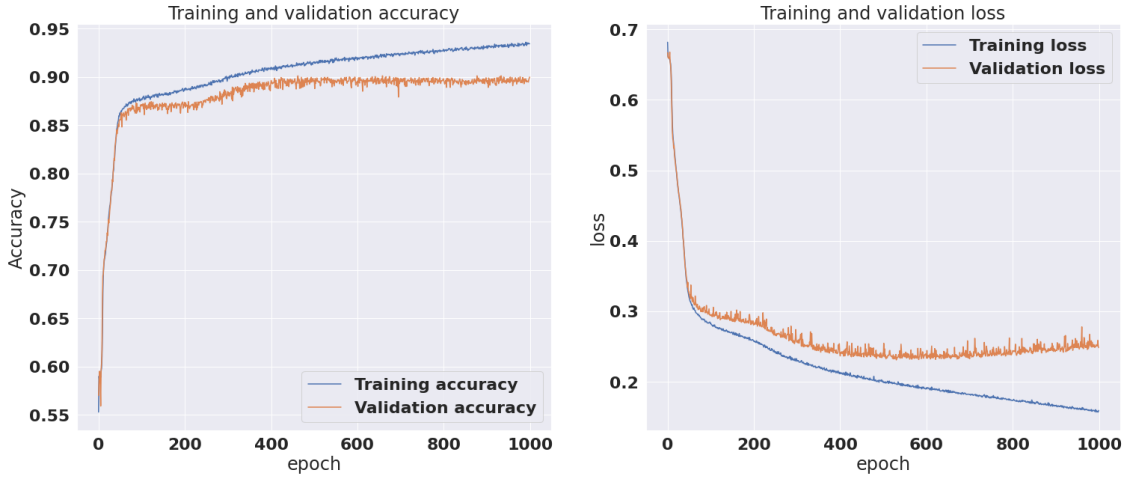
I create plots from the collected history data.

- A plot of accuracy on the training and validation datasets over training epochs.
- A plot of loss on the training and validation datasets over training epochs.

[ ]:
```
font = {'family' : 'normal',
        'weight' : 'bold',
        'size'   : 18}

plt.rc('font', **font)

plt.figure(figsize=(25,10))

ax1 = plt.subplot(121)
ax2 = plt.subplot(122)

ax1.plot(history.history['accuracy'], label='Training accuracy')
ax1.plot(history.history['val_accuracy'], label = 'Validation accuracy')
ax1.set_title("Training and validation accuracy")
ax1.set(xlabel='epoch', ylabel='Accuracy')
ax1.legend(loc='lower right')

ax2.plot(history.history['loss'], label='Training loss')
ax2.plot(history.history['val_loss'], label='Validation loss')
ax2.set_title("Training and validation loss")
ax2.set(xlabel='epoch', ylabel='loss')
ax2.legend(loc='upper right')
#To check the network accuracy on test data
```

```
test_loss, test_acc = model.evaluate(X_test,  y_test, verbose=2)
```

```
125/125 - 0s - loss: 0.2484 - accuracy: 0.9000 - 288ms/epoch - 2ms/step

WARNING:matplotlib.font_manager:findfont: Font family ['normal'] not found.
Falling back to DejaVu Sans.
WARNING:matplotlib.font_manager:findfont: Font family ['normal'] not found.
Falling back to DejaVu Sans.
```



According to the plot of loss, validation loss is decreasing before the 600th epoch, so the model is underfitting. However, after the 600th epoch, Validation loss is increasing, indicating an overfitted model. At the 600th epoch, when the model is either perfectly fitted or in a local minimum, the neural network model achieved an accuracy of 90%. The goal of Deep Learning training is to find a balance between a model that is underfitting and one that is overfitting(converging), resulting in a model with a good fit. I found an optimum where the change in the slope of loss is around the 600th epoch, as shown above. At that point, the training process can be stopped.