EjercicioS11

May 21, 2020

1 ACTIVIDAD SESIÓN 11

Utiliza el dataset del proyecto final o si prefieres cualquier otro para hacer un ejemplo de red neuronal mediante Tensorflow, Keras u otro framework visto en el curso

Se utilizará el dataset del Titanic

1.1 Obtención de datos

Hemos usado los dos dataset que ya venían separados en train y test.

[1]:
```
## Data Preparation and Modeling
import pandas as pd
import numpy as np
# Fijamos la semilla para optener siempre los mismos datos
np.random.seed(0)
train = pd.read_csv('../Sesion7/titanic_train.csv')
test = pd.read_csv('../Sesion7/titanic_test.csv', names=train.columns.values)
train.tail(10)
```

[1]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
688	689	0	3	Fischer, Mr. Eberhard Thelander	male	18.0	0	0	350036	7.7958	NaN	S
689	690	1	1	Madill, Miss. Georgette Alexandra	female	15.0	0	1	24160	211.3375	B5	S
690	691	1	1	Dick, Mr. Albert Adrian	male	31.0	1	0	17474	57.0000	B20	S
691	692	1	3	Karun, Miss. Manca	female	4.0	0	1	349256	13.4167	NaN	C
692	693	1	3	Lam, Mr. Ali	male							
693	694	0	3	Saad, Mr. Khalil	male							
694	695	0	1	Weir, Col. John	male							
695	696	0	2	Chapman, Mr. Charles Henry	male							
696	697	0	3	Kelly, Mr. James	male							
697	698	1	3	Mullens, Miss. Katherine "Katie"	female							

```
692   NaN      0      0    1601   56.4958   NaN        S
693  25.0      0      0    2672    7.2250   NaN        C
694  60.0      0      0  113800   26.5500   NaN        S
695  52.0      0      0  248731   13.5000   NaN        S
696  44.0      0      0  363592    8.0500   NaN        S
697   NaN      0      0   35852    7.7333   NaN        Q
```

Nos quedamos con aquellas variables que consideramos importantes para nuestro problema: Eliminamos Name (el nombre no es decisivo sobre si sobrevives o no), PassengerId (el identificador de pasajero no es decisivo sobre si sobrevives o no), Ticket (puede informar sobre la zona donde tiene el camarote, pero es complicada de extraer, hay que realizar mucho procesamiento y consideramos mejor eliminarla, pero es un buen punto de mejora) y Cabin (a simple vista tiene muchos valores perdidos).

[2]:
```
# Nos quedamos con aquellas variables que consideramos importantes para nuestro␣
↪problema:
# Eliminamos Name, PassengerId, Ticket y Cabin
train = train.loc[:, ['Survived', 'Pclass', 'Sex', 'Age', 'SibSp', 'Parch',␣
↪'Fare', 'Embarked']]
test = test.loc[:, ['Survived', 'Pclass', 'Sex', 'Age', 'SibSp', 'Parch',␣
↪'Fare', 'Embarked']]
```

[3]:
```
## Separamos en conjunto de test y train
X_train = train.drop('Survived', axis=1)
y_train = train['Survived']

X_test = test.drop('Survived', axis=1)
y_test = test['Survived']
```

1.2 PROCESAMIENTO DE DATOS

Convertimos las variables categoricas en dummies.

[4]:
```
numeric_features = train.select_dtypes(include=['int64', 'float64']).
↪drop(['Survived'], axis=1).columns
numeric_features
```

[4]:
```
Index(['Pclass', 'Age', 'SibSp', 'Parch', 'Fare'], dtype='object')
```

[5]:
```
categorical_features = train.select_dtypes(include=['object']).columns
categorical_features
```

[5]:
```
Index(['Sex', 'Embarked'], dtype='object')
```

[6]:
```
# Convertimos las variables categoricas en dummies
X_train = pd.get_dummies(X_train)
```

```
X_test = pd.get_dummies(X_test)
X_train
```

[6]:

	Pclass	Age	SibSp	Parch	Fare	Sex_female	Sex_male	Embarked_C	Embarked_Q	Embarked_S
0	3	22.0	1	0	7.2500	0	1	0	0	1
1	1	38.0	1	0	71.2833	1	0	1	0	0
2	3	26.0	0	0	7.9250	1	0	0	0	1
3	1	35.0	1	0	53.1000	1	0	0	0	1
4	3	35.0	0	0	8.0500	0	1	0	0	1
..	…	…	…	…	…	…	…	…	…	…
693	3	25.0	0	0	7.2250	0	1	1	0	0
694	1	60.0	0	0	26.5500	0	1	0	0	1
695	2	52.0	0	0	13.5000	0	1	0	0	1
696	3	44.0	0	0	8.0500	0	1	0	0	1
697	3	NaN	0	0	7.7333	1	0	0	1	0

[698 rows x 10 columns]

Estudiamos los valores perdidos

[7]:
```
def ver_null(df):
    total = df.isnull().sum().sort_values(ascending = False)
    percent = (df.isnull().sum() / df.isnull().count()).sort_values(ascending =␣
 ↪False)
    missing_data = pd.concat([total, percent], axis = 1, keys = ['Total',␣
 ↪'Porcentaje'])
    return missing_data
ver_null(X_train)
```

[7]:

	Total	Porcentaje
Age	145	0.207736
Embarked_S	0	0.000000
Embarked_Q	0	0.000000
Embarked_C	0	0.000000

```
Sex_male        0    0.000000
Sex_female      0    0.000000
Fare            0    0.000000
Parch           0    0.000000
SibSp           0    0.000000
Pclass          0    0.000000
```

[8]:
```
# Eliminamos la columna Age ya que tiene muchos NaN
X_train = X_train.drop(['Age'], axis=1)
X_test = X_test.drop(['Age'], axis=1)
```

[9]:
```
# Convertimos a array
X_train = np.array(X_train, 'float32')
y_train = np.array(y_train, 'float32')
```

1.3 Aplicamos un modelo de clasificación

Definimos el modelo, entrenamos y obtenemos resultados. En nuestro caso creamos una red neuronal de 4 capas con activación sigmoide en la capa de salida y activación relu en las capas intermedias. Obviamente necesitamos dimension 9 de entrada de la primera capa, ya que disponemos de 9 variables o columnas del dataset una vez preprocesado.

[10]:
```
from keras.models import Sequential
from keras.layers.core import Dense
from keras.losses import MeanSquaredError

model = Sequential()
model.add(Dense(16, input_dim=9, activation='relu'))
model.add(Dense(16, input_dim=5, activation='relu'))
model.add(Dense(16, input_dim=10, activation='relu'))
model.add(Dense(1, activation='sigmoid'))

model.compile(loss=MeanSquaredError(),
              optimizer='adam',
              metrics=['binary_accuracy'])
```

```
Using TensorFlow backend.
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:516: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:517: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
```

```
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:518: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:519: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:520: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorflow/python/framework/dtypes.py:525: FutureWarning: Passing
(type, 1) or '1type' as a synonym of type is deprecated; in a future version of
numpy, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:541: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:542: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:543: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:544: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:545: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/alberto/.local/lib/python3.6/site-
packages/tensorboard/compat/tensorflow_stub/dtypes.py:550: FutureWarning:
Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
```

```
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
```

Entrenamos el modelo

[11]:
```
model.fit(np.array(X_train), y_train, epochs=1000)
```

```
WARNING:tensorflow:From /home/alberto/.local/lib/python3.6/site-
packages/keras/backend/tensorflow_backend.py:422: The name tf.global_variables
is deprecated. Please use tf.compat.v1.global_variables instead.

Epoch 1/1000
698/698 [==============================] - 0s 251us/step - loss: 0.2641 -
binary_accuracy: 0.6562
Epoch 2/1000
698/698 [==============================] - 0s 45us/step - loss: 0.2212 -
binary_accuracy: 0.6848
Epoch 3/1000
698/698 [==============================] - 0s 45us/step - loss: 0.2072 -
binary_accuracy: 0.6805
Epoch 4/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1967 -
binary_accuracy: 0.7006
Epoch 5/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1928 -
binary_accuracy: 0.6991
Epoch 6/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1880 -
binary_accuracy: 0.7077
Epoch 7/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1844 -
binary_accuracy: 0.7063
Epoch 8/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1824 -
binary_accuracy: 0.7393
Epoch 9/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1750 -
binary_accuracy: 0.7464
Epoch 10/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1826 -
binary_accuracy: 0.7407
Epoch 11/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1708 -
binary_accuracy: 0.7679
Epoch 12/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1654 -
binary_accuracy: 0.7808
Epoch 13/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1635 -
binary_accuracy: 0.7851
Epoch 14/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1607 -
binary_accuracy: 0.7894
Epoch 15/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1583 -
binary_accuracy: 0.7865
Epoch 16/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1556 -
binary_accuracy: 0.7908
Epoch 17/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1566 -
binary_accuracy: 0.7937
Epoch 18/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1532 -
binary_accuracy: 0.7837
Epoch 19/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1586 -
binary_accuracy: 0.7865
Epoch 20/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1527 -
binary_accuracy: 0.7923
Epoch 21/1000
698/698 [==============================] - 0s 49us/step - loss: 0.1619 -
binary_accuracy: 0.7779
Epoch 22/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1598 -
binary_accuracy: 0.7765
Epoch 23/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1600 -
binary_accuracy: 0.7880
Epoch 24/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1546 -
binary_accuracy: 0.7894
Epoch 25/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1557 -
binary_accuracy: 0.7923
Epoch 26/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1533 -
binary_accuracy: 0.7880
Epoch 27/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1527 -
binary_accuracy: 0.7894
Epoch 28/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1510 -
binary_accuracy: 0.7937
Epoch 29/1000
```

```
698/698 [==============================] - 0s 42us/step - loss: 0.1543 -
binary_accuracy: 0.7880
Epoch 30/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1540 -
binary_accuracy: 0.7894
Epoch 31/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1515 -
binary_accuracy: 0.7966
Epoch 32/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1603 -
binary_accuracy: 0.7693
Epoch 33/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1537 -
binary_accuracy: 0.7880
Epoch 34/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1517 -
binary_accuracy: 0.7937
Epoch 35/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1558 -
binary_accuracy: 0.7951
Epoch 36/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1538 -
binary_accuracy: 0.7966
Epoch 37/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1544 -
binary_accuracy: 0.7966
Epoch 38/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1527 -
binary_accuracy: 0.7894
Epoch 39/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1508 -
binary_accuracy: 0.7894
Epoch 40/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1520 -
binary_accuracy: 0.7923
Epoch 41/1000
698/698 [==============================] - 0s 50us/step - loss: 0.1511 -
binary_accuracy: 0.7966
Epoch 42/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1488 -
binary_accuracy: 0.7994
Epoch 43/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1532 -
binary_accuracy: 0.7880
Epoch 44/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1486 -
binary_accuracy: 0.7908
Epoch 45/1000
```

```
698/698 [==============================] - 0s 37us/step - loss: 0.1561 -
binary_accuracy: 0.7779
Epoch 46/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1515 -
binary_accuracy: 0.7822
Epoch 47/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1513 -
binary_accuracy: 0.7937
Epoch 48/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1551 -
binary_accuracy: 0.7865
Epoch 49/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1552 -
binary_accuracy: 0.7951
Epoch 50/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1511 -
binary_accuracy: 0.7923
Epoch 51/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1485 -
binary_accuracy: 0.7966
Epoch 52/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1484 -
binary_accuracy: 0.8009
Epoch 53/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1489 -
binary_accuracy: 0.7980
Epoch 54/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1499 -
binary_accuracy: 0.7880
Epoch 55/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1534 -
binary_accuracy: 0.7894
Epoch 56/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1556 -
binary_accuracy: 0.7851
Epoch 57/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1501 -
binary_accuracy: 0.7937
Epoch 58/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1493 -
binary_accuracy: 0.7937
Epoch 59/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1492 -
binary_accuracy: 0.7923
Epoch 60/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1523 -
binary_accuracy: 0.7865
Epoch 61/1000
```

```
698/698 [==============================] - 0s 42us/step - loss: 0.1487 -
binary_accuracy: 0.7980
Epoch 62/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1461 -
binary_accuracy: 0.7994
Epoch 63/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1560 -
binary_accuracy: 0.7966
Epoch 64/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1512 -
binary_accuracy: 0.7894
Epoch 65/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1537 -
binary_accuracy: 0.7880
Epoch 66/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1530 -
binary_accuracy: 0.7894
Epoch 67/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1502 -
binary_accuracy: 0.8009
Epoch 68/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1478 -
binary_accuracy: 0.7923
Epoch 69/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1470 -
binary_accuracy: 0.8023
Epoch 70/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1482 -
binary_accuracy: 0.7937
Epoch 71/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1486 -
binary_accuracy: 0.7880
Epoch 72/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1500 -
binary_accuracy: 0.7937
Epoch 73/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1508 -
binary_accuracy: 0.7865
Epoch 74/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1459 -
binary_accuracy: 0.7951
Epoch 75/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1468 -
binary_accuracy: 0.7980
Epoch 76/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1457 -
binary_accuracy: 0.7980
Epoch 77/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1490 -
binary_accuracy: 0.7994
Epoch 78/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1575 -
binary_accuracy: 0.7794
Epoch 79/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1520 -
binary_accuracy: 0.8052
Epoch 80/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1462 -
binary_accuracy: 0.7994
Epoch 81/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1459 -
binary_accuracy: 0.8009
Epoch 82/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1495 -
binary_accuracy: 0.7894
Epoch 83/1000
698/698 [==============================] - ETA: 0s - loss: 0.0982 -
binary_accuracy: 0.875 - 0s 38us/step - loss: 0.1462 - binary_accuracy: 0.7966
Epoch 84/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1460 -
binary_accuracy: 0.7937
Epoch 85/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1493 -
binary_accuracy: 0.8037
Epoch 86/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1455 -
binary_accuracy: 0.8009
Epoch 87/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1479 -
binary_accuracy: 0.7880
Epoch 88/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1569 -
binary_accuracy: 0.7693
Epoch 89/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1531 -
binary_accuracy: 0.7937
Epoch 90/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1489 -
binary_accuracy: 0.7937
Epoch 91/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1454 -
binary_accuracy: 0.7980
Epoch 92/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1453 -
binary_accuracy: 0.7980
Epoch 93/1000
```

```
698/698 [==============================] - 0s 30us/step - loss: 0.1455 -
binary_accuracy: 0.8037
Epoch 94/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1461 -
binary_accuracy: 0.8052
Epoch 95/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1446 -
binary_accuracy: 0.8023
Epoch 96/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1462 -
binary_accuracy: 0.7851
Epoch 97/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1512 -
binary_accuracy: 0.8052
Epoch 98/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1521 -
binary_accuracy: 0.7851
Epoch 99/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1449 -
binary_accuracy: 0.7937
Epoch 100/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1435 -
binary_accuracy: 0.8037
Epoch 101/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1456 -
binary_accuracy: 0.7966
Epoch 102/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1480 -
binary_accuracy: 0.7937
Epoch 103/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1474 -
binary_accuracy: 0.7937
Epoch 104/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1477 -
binary_accuracy: 0.7951
Epoch 105/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1514 -
binary_accuracy: 0.7923
Epoch 106/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1489 -
binary_accuracy: 0.7865
Epoch 107/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1434 -
binary_accuracy: 0.8037
Epoch 108/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1437 -
binary_accuracy: 0.8023
Epoch 109/1000
```

```
698/698 [==============================] - 0s 32us/step - loss: 0.1433 -
binary_accuracy: 0.8095
Epoch 110/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1482 -
binary_accuracy: 0.7951
Epoch 111/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1424 -
binary_accuracy: 0.8009
Epoch 112/1000
698/698 [==============================] - 0s 54us/step - loss: 0.1455 -
binary_accuracy: 0.8023
Epoch 113/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1432 -
binary_accuracy: 0.8109
Epoch 114/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1421 -
binary_accuracy: 0.7994
Epoch 115/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1439 -
binary_accuracy: 0.8066
Epoch 116/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1457 -
binary_accuracy: 0.8066
Epoch 117/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1465 -
binary_accuracy: 0.8009
Epoch 118/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1497 -
binary_accuracy: 0.7908
Epoch 119/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1413 -
binary_accuracy: 0.8166
Epoch 120/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1434 -
binary_accuracy: 0.8066
Epoch 121/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1461 -
binary_accuracy: 0.8052
Epoch 122/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1412 -
binary_accuracy: 0.8052
Epoch 123/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1420 -
binary_accuracy: 0.8095
Epoch 124/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1420 -
binary_accuracy: 0.8037
Epoch 125/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1409 -
binary_accuracy: 0.8152
Epoch 126/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1398 -
binary_accuracy: 0.8095
Epoch 127/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1414 -
binary_accuracy: 0.8123
Epoch 128/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1441 -
binary_accuracy: 0.7951
Epoch 129/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1429 -
binary_accuracy: 0.8109
Epoch 130/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1420 -
binary_accuracy: 0.8138
Epoch 131/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1402 -
binary_accuracy: 0.8152
Epoch 132/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1418 -
binary_accuracy: 0.8052
Epoch 133/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1406 -
binary_accuracy: 0.8095
Epoch 134/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1397 -
binary_accuracy: 0.7994
Epoch 135/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1409 -
binary_accuracy: 0.8080
Epoch 136/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1468 -
binary_accuracy: 0.8023
Epoch 137/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1434 -
binary_accuracy: 0.8052
Epoch 138/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1410 -
binary_accuracy: 0.8109
Epoch 139/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1405 -
binary_accuracy: 0.8138
Epoch 140/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1394 -
binary_accuracy: 0.8109
Epoch 141/1000
```

```
698/698 [==============================] - 0s 37us/step - loss: 0.1399 -
binary_accuracy: 0.8080
Epoch 142/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1420 -
binary_accuracy: 0.8123
Epoch 143/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1388 -
binary_accuracy: 0.8166
Epoch 144/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1388 -
binary_accuracy: 0.8109
Epoch 145/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1413 -
binary_accuracy: 0.8080
Epoch 146/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1424 -
binary_accuracy: 0.8009
Epoch 147/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1380 -
binary_accuracy: 0.8152
Epoch 148/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1428 -
binary_accuracy: 0.8123
Epoch 149/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1387 -
binary_accuracy: 0.8152
Epoch 150/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1404 -
binary_accuracy: 0.8095
Epoch 151/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1443 -
binary_accuracy: 0.7966
Epoch 152/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1464 -
binary_accuracy: 0.7994
Epoch 153/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1417 -
binary_accuracy: 0.8080
Epoch 154/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1387 -
binary_accuracy: 0.8123
Epoch 155/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1395 -
binary_accuracy: 0.8138
Epoch 156/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1412 -
binary_accuracy: 0.8080
Epoch 157/1000
```

```
698/698 [==============================] - 0s 43us/step - loss: 0.1396 -
binary_accuracy: 0.8066
Epoch 158/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1378 -
binary_accuracy: 0.8080
Epoch 159/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1399 -
binary_accuracy: 0.8109
Epoch 160/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1375 -
binary_accuracy: 0.8123
Epoch 161/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1449 -
binary_accuracy: 0.8023
Epoch 162/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1455 -
binary_accuracy: 0.7980
Epoch 163/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1370 -
binary_accuracy: 0.8080
Epoch 164/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1361 -
binary_accuracy: 0.8152
Epoch 165/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1395 -
binary_accuracy: 0.8138
Epoch 166/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1382 -
binary_accuracy: 0.8109
Epoch 167/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1396 -
binary_accuracy: 0.8052
Epoch 168/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1390 -
binary_accuracy: 0.8123
Epoch 169/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1353 -
binary_accuracy: 0.8152
Epoch 170/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1385 -
binary_accuracy: 0.8095
Epoch 171/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1409 -
binary_accuracy: 0.8066
Epoch 172/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1371 -
binary_accuracy: 0.8080
Epoch 173/1000
```

```
698/698 [==============================] - 0s 38us/step - loss: 0.1414 -
binary_accuracy: 0.8037
Epoch 174/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1379 -
binary_accuracy: 0.8052
Epoch 175/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1372 -
binary_accuracy: 0.8109
Epoch 176/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1363 -
binary_accuracy: 0.8166
Epoch 177/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1354 -
binary_accuracy: 0.8209
Epoch 178/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1351 -
binary_accuracy: 0.8123
Epoch 179/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1345 -
binary_accuracy: 0.8166
Epoch 180/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1395 -
binary_accuracy: 0.8080
Epoch 181/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1357 -
binary_accuracy: 0.8080
Epoch 182/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1352 -
binary_accuracy: 0.8152
Epoch 183/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1375 -
binary_accuracy: 0.8052
Epoch 184/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1364 -
binary_accuracy: 0.8152
Epoch 185/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1364 -
binary_accuracy: 0.8109
Epoch 186/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1353 -
binary_accuracy: 0.8066
Epoch 187/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1340 -
binary_accuracy: 0.8152
Epoch 188/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1354 -
binary_accuracy: 0.8152
Epoch 189/1000
```

```
698/698 [==============================] - 0s 38us/step - loss: 0.1334 -
binary_accuracy: 0.8195
Epoch 190/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1343 -
binary_accuracy: 0.8123
Epoch 191/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1335 -
binary_accuracy: 0.8181
Epoch 192/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1351 -
binary_accuracy: 0.8166
Epoch 193/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1362 -
binary_accuracy: 0.8195
Epoch 194/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1380 -
binary_accuracy: 0.8138
Epoch 195/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1342 -
binary_accuracy: 0.8138
Epoch 196/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1341 -
binary_accuracy: 0.8181
Epoch 197/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1400 -
binary_accuracy: 0.8109
Epoch 198/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1416 -
binary_accuracy: 0.7980
Epoch 199/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1356 -
binary_accuracy: 0.8152
Epoch 200/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1345 -
binary_accuracy: 0.8181
Epoch 201/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1338 -
binary_accuracy: 0.8138
Epoch 202/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1353 -
binary_accuracy: 0.8123
Epoch 203/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1334 -
binary_accuracy: 0.8109
Epoch 204/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1332 -
binary_accuracy: 0.8181
Epoch 205/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1329 -
binary_accuracy: 0.8166
Epoch 206/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1337 -
binary_accuracy: 0.8066
Epoch 207/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1330 -
binary_accuracy: 0.8195
Epoch 208/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1336 -
binary_accuracy: 0.8152
Epoch 209/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1342 -
binary_accuracy: 0.8123
Epoch 210/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1335 -
binary_accuracy: 0.8152
Epoch 211/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1373 -
binary_accuracy: 0.8023
Epoch 212/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1364 -
binary_accuracy: 0.8138
Epoch 213/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1371 -
binary_accuracy: 0.8095
Epoch 214/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1362 -
binary_accuracy: 0.8138
Epoch 215/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1357 -
binary_accuracy: 0.8181
Epoch 216/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1322 -
binary_accuracy: 0.8195
Epoch 217/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1329 -
binary_accuracy: 0.8166
Epoch 218/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1336 -
binary_accuracy: 0.8138
Epoch 219/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1373 -
binary_accuracy: 0.8095
Epoch 220/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1343 -
binary_accuracy: 0.8109
Epoch 221/1000
```

```
698/698 [==============================] - 0s 36us/step - loss: 0.1342 -
binary_accuracy: 0.8152
Epoch 222/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1364 -
binary_accuracy: 0.8095
Epoch 223/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1321 -
binary_accuracy: 0.8123
Epoch 224/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1326 -
binary_accuracy: 0.8195
Epoch 225/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1322 -
binary_accuracy: 0.8195
Epoch 226/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1348 -
binary_accuracy: 0.8123
Epoch 227/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1372 -
binary_accuracy: 0.8095
Epoch 228/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1323 -
binary_accuracy: 0.8152
Epoch 229/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1353 -
binary_accuracy: 0.8080
Epoch 230/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1426 -
binary_accuracy: 0.7980
Epoch 231/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1359 -
binary_accuracy: 0.8181
Epoch 232/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1323 -
binary_accuracy: 0.8195
Epoch 233/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1359 -
binary_accuracy: 0.8109
Epoch 234/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1358 -
binary_accuracy: 0.8138
Epoch 235/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1348 -
binary_accuracy: 0.8138
Epoch 236/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1312 -
binary_accuracy: 0.8195
Epoch 237/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1335 -
binary_accuracy: 0.8166
Epoch 238/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1333 -
binary_accuracy: 0.8138
Epoch 239/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1320 -
binary_accuracy: 0.8209
Epoch 240/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1335 -
binary_accuracy: 0.8138
Epoch 241/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1319 -
binary_accuracy: 0.8238
Epoch 242/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1324 -
binary_accuracy: 0.8152
Epoch 243/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1325 -
binary_accuracy: 0.8195
Epoch 244/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1320 -
binary_accuracy: 0.8195
Epoch 245/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1366 -
binary_accuracy: 0.8109
Epoch 246/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1329 -
binary_accuracy: 0.8181
Epoch 247/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1318 -
binary_accuracy: 0.8152
Epoch 248/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1311 -
binary_accuracy: 0.8252
Epoch 249/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1331 -
binary_accuracy: 0.8109
Epoch 250/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1321 -
binary_accuracy: 0.8138
Epoch 251/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1350 -
binary_accuracy: 0.8152
Epoch 252/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1349 -
binary_accuracy: 0.8166
Epoch 253/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1321 -
binary_accuracy: 0.8195
Epoch 254/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1320 -
binary_accuracy: 0.8181
Epoch 255/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1333 -
binary_accuracy: 0.8123
Epoch 256/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1426 -
binary_accuracy: 0.7980
Epoch 257/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1358 -
binary_accuracy: 0.8166
Epoch 258/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1342 -
binary_accuracy: 0.8195
Epoch 259/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1371 -
binary_accuracy: 0.8166
Epoch 260/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1311 -
binary_accuracy: 0.8123
Epoch 261/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1305 -
binary_accuracy: 0.8181
Epoch 262/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1315 -
binary_accuracy: 0.8195
Epoch 263/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1313 -
binary_accuracy: 0.8195
Epoch 264/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1428 -
binary_accuracy: 0.8052
Epoch 265/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1323 -
binary_accuracy: 0.8181
Epoch 266/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1356 -
binary_accuracy: 0.8138
Epoch 267/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1340 -
binary_accuracy: 0.8080
Epoch 268/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1313 -
binary_accuracy: 0.8181
Epoch 269/1000
```

```
698/698 [==============================] - 0s 46us/step - loss: 0.1309 -
binary_accuracy: 0.8223
Epoch 270/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1313 -
binary_accuracy: 0.8223
Epoch 271/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1304 -
binary_accuracy: 0.8209
Epoch 272/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1331 -
binary_accuracy: 0.8152
Epoch 273/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1406 -
binary_accuracy: 0.8052
Epoch 274/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1335 -
binary_accuracy: 0.8195
Epoch 275/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1311 -
binary_accuracy: 0.8238
Epoch 276/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1311 -
binary_accuracy: 0.8223
Epoch 277/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1399 -
binary_accuracy: 0.8138
Epoch 278/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1327 -
binary_accuracy: 0.8195
Epoch 279/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1345 -
binary_accuracy: 0.8138
Epoch 280/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1315 -
binary_accuracy: 0.8138
Epoch 281/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1307 -
binary_accuracy: 0.8223
Epoch 282/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1306 -
binary_accuracy: 0.8223
Epoch 283/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1301 -
binary_accuracy: 0.8238
Epoch 284/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1333 -
binary_accuracy: 0.8181
Epoch 285/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1344 -
binary_accuracy: 0.8123
Epoch 286/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1335 -
binary_accuracy: 0.8152
Epoch 287/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1310 -
binary_accuracy: 0.8223
Epoch 288/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1315 -
binary_accuracy: 0.8281
Epoch 289/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1322 -
binary_accuracy: 0.8195
Epoch 290/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1309 -
binary_accuracy: 0.8209
Epoch 291/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1299 -
binary_accuracy: 0.8252
Epoch 292/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1333 -
binary_accuracy: 0.8152
Epoch 293/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1322 -
binary_accuracy: 0.8152
Epoch 294/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1290 -
binary_accuracy: 0.8238
Epoch 295/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1323 -
binary_accuracy: 0.8181
Epoch 296/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1314 -
binary_accuracy: 0.8152
Epoch 297/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1309 -
binary_accuracy: 0.8181
Epoch 298/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1313 -
binary_accuracy: 0.8152
Epoch 299/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1331 -
binary_accuracy: 0.8195
Epoch 300/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1317 -
binary_accuracy: 0.8138
Epoch 301/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1298 -
binary_accuracy: 0.8209
Epoch 302/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1307 -
binary_accuracy: 0.8152
Epoch 303/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1298 -
binary_accuracy: 0.8181
Epoch 304/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1312 -
binary_accuracy: 0.8152
Epoch 305/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1296 -
binary_accuracy: 0.8209
Epoch 306/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1304 -
binary_accuracy: 0.8195
Epoch 307/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1312 -
binary_accuracy: 0.8223
Epoch 308/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1310 -
binary_accuracy: 0.8181
Epoch 309/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1311 -
binary_accuracy: 0.8152
Epoch 310/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1312 -
binary_accuracy: 0.8166
Epoch 311/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1298 -
binary_accuracy: 0.8195
Epoch 312/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1316 -
binary_accuracy: 0.8223
Epoch 313/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1303 -
binary_accuracy: 0.8181
Epoch 314/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1307 -
binary_accuracy: 0.8195
Epoch 315/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1380 -
binary_accuracy: 0.8052
Epoch 316/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1324 -
binary_accuracy: 0.8181
Epoch 317/1000
```

```
698/698 [==============================] - 0s 43us/step - loss: 0.1308 -
binary_accuracy: 0.8252
Epoch 318/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1358 -
binary_accuracy: 0.8138
Epoch 319/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1362 -
binary_accuracy: 0.8181
Epoch 320/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1469 -
binary_accuracy: 0.7937
Epoch 321/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1309 -
binary_accuracy: 0.8195
Epoch 322/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1307 -
binary_accuracy: 0.8238
Epoch 323/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1290 -
binary_accuracy: 0.8209
Epoch 324/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1320 -
binary_accuracy: 0.8195
Epoch 325/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1322 -
binary_accuracy: 0.8266
Epoch 326/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1314 -
binary_accuracy: 0.8252
Epoch 327/1000
698/698 [==============================] - 0s 48us/step - loss: 0.1298 -
binary_accuracy: 0.8209
Epoch 328/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1301 -
binary_accuracy: 0.8223
Epoch 329/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1309 -
binary_accuracy: 0.8181
Epoch 330/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1322 -
binary_accuracy: 0.8223
Epoch 331/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1316 -
binary_accuracy: 0.8252
Epoch 332/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1311 -
binary_accuracy: 0.8152
Epoch 333/1000
```

```
698/698 [==============================] - 0s 37us/step - loss: 0.1298 -
binary_accuracy: 0.8152
Epoch 334/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1303 -
binary_accuracy: 0.8209
Epoch 335/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1290 -
binary_accuracy: 0.8252
Epoch 336/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1295 -
binary_accuracy: 0.8166
Epoch 337/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1293 -
binary_accuracy: 0.8238
Epoch 338/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1307 -
binary_accuracy: 0.8181
Epoch 339/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1289 -
binary_accuracy: 0.8209
Epoch 340/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1314 -
binary_accuracy: 0.8209
Epoch 341/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1308 -
binary_accuracy: 0.8195
Epoch 342/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1291 -
binary_accuracy: 0.8195
Epoch 343/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1334 -
binary_accuracy: 0.8138
Epoch 344/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1302 -
binary_accuracy: 0.8223
Epoch 345/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1300 -
binary_accuracy: 0.8238
Epoch 346/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1291 -
binary_accuracy: 0.8209
Epoch 347/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1299 -
binary_accuracy: 0.8223
Epoch 348/1000
698/698 [==============================] - 0s 53us/step - loss: 0.1282 -
binary_accuracy: 0.8238
Epoch 349/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1323 -
binary_accuracy: 0.8238
Epoch 350/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1320 -
binary_accuracy: 0.8195
Epoch 351/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1303 -
binary_accuracy: 0.8195
Epoch 352/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1313 -
binary_accuracy: 0.8209
Epoch 353/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1336 -
binary_accuracy: 0.8052
Epoch 354/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1292 -
binary_accuracy: 0.8209
Epoch 355/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1302 -
binary_accuracy: 0.8252
Epoch 356/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1368 -
binary_accuracy: 0.8080
Epoch 357/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1342 -
binary_accuracy: 0.8181
Epoch 358/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1295 -
binary_accuracy: 0.8195
Epoch 359/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1328 -
binary_accuracy: 0.8123
Epoch 360/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1301 -
binary_accuracy: 0.8195
Epoch 361/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1293 -
binary_accuracy: 0.8223
Epoch 362/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1332 -
binary_accuracy: 0.8166
Epoch 363/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1291 -
binary_accuracy: 0.8252
Epoch 364/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1284 -
binary_accuracy: 0.8252
Epoch 365/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1309 -
binary_accuracy: 0.8195
Epoch 366/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1297 -
binary_accuracy: 0.8181
Epoch 367/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1308 -
binary_accuracy: 0.8238
Epoch 368/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1319 -
binary_accuracy: 0.8181
Epoch 369/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1311 -
binary_accuracy: 0.8181
Epoch 370/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1277 -
binary_accuracy: 0.8223
Epoch 371/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1285 -
binary_accuracy: 0.8195
Epoch 372/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1279 -
binary_accuracy: 0.8238
Epoch 373/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1290 -
binary_accuracy: 0.8209
Epoch 374/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1295 -
binary_accuracy: 0.8252
Epoch 375/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1282 -
binary_accuracy: 0.8238
Epoch 376/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1277 -
binary_accuracy: 0.8266
Epoch 377/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1275 -
binary_accuracy: 0.8223
Epoch 378/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1270 -
binary_accuracy: 0.8252
Epoch 379/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1289 -
binary_accuracy: 0.8223
Epoch 380/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1308 -
binary_accuracy: 0.8152
Epoch 381/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1381 -
binary_accuracy: 0.7994
Epoch 382/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1291 -
binary_accuracy: 0.8238
Epoch 383/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1291 -
binary_accuracy: 0.8223
Epoch 384/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1292 -
binary_accuracy: 0.8252
Epoch 385/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1279 -
binary_accuracy: 0.8209
Epoch 386/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1276 -
binary_accuracy: 0.8209
Epoch 387/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1283 -
binary_accuracy: 0.8223
Epoch 388/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1312 -
binary_accuracy: 0.8195
Epoch 389/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1311 -
binary_accuracy: 0.8152
Epoch 390/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1306 -
binary_accuracy: 0.8181
Epoch 391/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1280 -
binary_accuracy: 0.8195
Epoch 392/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1354 -
binary_accuracy: 0.8138
Epoch 393/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1299 -
binary_accuracy: 0.8138
Epoch 394/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1277 -
binary_accuracy: 0.8223
Epoch 395/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1284 -
binary_accuracy: 0.8223
Epoch 396/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1277 -
binary_accuracy: 0.8223
Epoch 397/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1290 -
binary_accuracy: 0.8223
Epoch 398/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1283 -
binary_accuracy: 0.8252
Epoch 399/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1280 -
binary_accuracy: 0.8195
Epoch 400/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1292 -
binary_accuracy: 0.8209
Epoch 401/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1293 -
binary_accuracy: 0.8223
Epoch 402/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1294 -
binary_accuracy: 0.8223
Epoch 403/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1295 -
binary_accuracy: 0.8266
Epoch 404/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1277 -
binary_accuracy: 0.8252
Epoch 405/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1306 -
binary_accuracy: 0.8181
Epoch 406/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1293 -
binary_accuracy: 0.8181
Epoch 407/1000
698/698 [==============================] - 0s 53us/step - loss: 0.1301 -
binary_accuracy: 0.8195
Epoch 408/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1289 -
binary_accuracy: 0.8238
Epoch 409/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1272 -
binary_accuracy: 0.8281
Epoch 410/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1297 -
binary_accuracy: 0.8195
Epoch 411/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1278 -
binary_accuracy: 0.8223
Epoch 412/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1297 -
binary_accuracy: 0.8209
Epoch 413/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1275 -
binary_accuracy: 0.8209
Epoch 414/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1272 -
binary_accuracy: 0.8223
Epoch 415/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1310 -
binary_accuracy: 0.8252
Epoch 416/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1275 -
binary_accuracy: 0.8166
Epoch 417/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1336 -
binary_accuracy: 0.8209
Epoch 418/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1369 -
binary_accuracy: 0.8138
Epoch 419/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1370 -
binary_accuracy: 0.8066
Epoch 420/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1301 -
binary_accuracy: 0.8266
Epoch 421/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1285 -
binary_accuracy: 0.8238
Epoch 422/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1278 -
binary_accuracy: 0.8223
Epoch 423/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1273 -
binary_accuracy: 0.8266
Epoch 424/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1296 -
binary_accuracy: 0.8181
Epoch 425/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1302 -
binary_accuracy: 0.8109
Epoch 426/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1340 -
binary_accuracy: 0.8166
Epoch 427/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1331 -
binary_accuracy: 0.8195
Epoch 428/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1368 -
binary_accuracy: 0.8109
Epoch 429/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1297 -
binary_accuracy: 0.8223
Epoch 430/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1284 -
binary_accuracy: 0.8209
Epoch 431/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1263 -
binary_accuracy: 0.8252
Epoch 432/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1305 -
binary_accuracy: 0.8209
Epoch 433/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1270 -
binary_accuracy: 0.8138
Epoch 434/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1275 -
binary_accuracy: 0.8238
Epoch 435/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1264 -
binary_accuracy: 0.8209
Epoch 436/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1280 -
binary_accuracy: 0.8266
Epoch 437/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1275 -
binary_accuracy: 0.8252
Epoch 438/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1280 -
binary_accuracy: 0.8181
Epoch 439/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1264 -
binary_accuracy: 0.8266
Epoch 440/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1265 -
binary_accuracy: 0.8252
Epoch 441/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1295 -
binary_accuracy: 0.8138
Epoch 442/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1334 -
binary_accuracy: 0.8152
Epoch 443/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1260 -
binary_accuracy: 0.8223
Epoch 444/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1274 -
binary_accuracy: 0.8238
Epoch 445/1000
```

```
698/698 [==============================] - 0s 36us/step - loss: 0.1311 -
binary_accuracy: 0.8209
Epoch 446/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1282 -
binary_accuracy: 0.8209
Epoch 447/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1279 -
binary_accuracy: 0.8252
Epoch 448/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1277 -
binary_accuracy: 0.8223
Epoch 449/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1287 -
binary_accuracy: 0.8195
Epoch 450/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1308 -
binary_accuracy: 0.8209
Epoch 451/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1254 -
binary_accuracy: 0.8281
Epoch 452/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1322 -
binary_accuracy: 0.8181
Epoch 453/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1301 -
binary_accuracy: 0.8281
Epoch 454/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1266 -
binary_accuracy: 0.8281
Epoch 455/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1290 -
binary_accuracy: 0.8123
Epoch 456/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1289 -
binary_accuracy: 0.8223
Epoch 457/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1289 -
binary_accuracy: 0.8209
Epoch 458/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1286 -
binary_accuracy: 0.8252
Epoch 459/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1288 -
binary_accuracy: 0.8238
Epoch 460/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1274 -
binary_accuracy: 0.8223
Epoch 461/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1307 -
binary_accuracy: 0.8252
Epoch 462/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1261 -
binary_accuracy: 0.8252
Epoch 463/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1283 -
binary_accuracy: 0.8238
Epoch 464/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1260 -
binary_accuracy: 0.8266
Epoch 465/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1260 -
binary_accuracy: 0.8266
Epoch 466/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1284 -
binary_accuracy: 0.8195
Epoch 467/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1272 -
binary_accuracy: 0.8223
Epoch 468/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1257 -
binary_accuracy: 0.8195
Epoch 469/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1263 -
binary_accuracy: 0.8238
Epoch 470/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1301 -
binary_accuracy: 0.8195
Epoch 471/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1349 -
binary_accuracy: 0.8052
Epoch 472/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1276 -
binary_accuracy: 0.8238
Epoch 473/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1282 -
binary_accuracy: 0.8252
Epoch 474/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1282 -
binary_accuracy: 0.8166
Epoch 475/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1272 -
binary_accuracy: 0.8252
Epoch 476/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1269 -
binary_accuracy: 0.8209
Epoch 477/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1260 -
binary_accuracy: 0.8266
Epoch 478/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1286 -
binary_accuracy: 0.8152
Epoch 479/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1287 -
binary_accuracy: 0.8223
Epoch 480/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1295 -
binary_accuracy: 0.8223
Epoch 481/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1274 -
binary_accuracy: 0.8223
Epoch 482/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1269 -
binary_accuracy: 0.8238
Epoch 483/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1265 -
binary_accuracy: 0.8238
Epoch 484/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1247 -
binary_accuracy: 0.8223
Epoch 485/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1280 -
binary_accuracy: 0.8252
Epoch 486/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1286 -
binary_accuracy: 0.8138
Epoch 487/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1284 -
binary_accuracy: 0.8195
Epoch 488/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1271 -
binary_accuracy: 0.8195
Epoch 489/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1268 -
binary_accuracy: 0.8295
Epoch 490/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1300 -
binary_accuracy: 0.8166
Epoch 491/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1267 -
binary_accuracy: 0.8238
Epoch 492/1000
698/698 [==============================] - 0s 51us/step - loss: 0.1278 -
binary_accuracy: 0.8223
Epoch 493/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1250 -
binary_accuracy: 0.8252
Epoch 494/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1267 -
binary_accuracy: 0.8266
Epoch 495/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1339 -
binary_accuracy: 0.8138
Epoch 496/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1312 -
binary_accuracy: 0.8209
Epoch 497/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1262 -
binary_accuracy: 0.8209
Epoch 498/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1249 -
binary_accuracy: 0.8266
Epoch 499/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1262 -
binary_accuracy: 0.8238
Epoch 500/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1255 -
binary_accuracy: 0.8252
Epoch 501/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1256 -
binary_accuracy: 0.8195
Epoch 502/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1267 -
binary_accuracy: 0.8266
Epoch 503/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1269 -
binary_accuracy: 0.8238
Epoch 504/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1265 -
binary_accuracy: 0.8181
Epoch 505/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1263 -
binary_accuracy: 0.8324
Epoch 506/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1293 -
binary_accuracy: 0.8238
Epoch 507/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1259 -
binary_accuracy: 0.8223
Epoch 508/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1248 -
binary_accuracy: 0.8238
Epoch 509/1000
```

```
698/698 [==============================] - 0s 40us/step - loss: 0.1251 -
binary_accuracy: 0.8238
Epoch 510/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1253 -
binary_accuracy: 0.8223
Epoch 511/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1268 -
binary_accuracy: 0.8252
Epoch 512/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1270 -
binary_accuracy: 0.8195
Epoch 513/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1267 -
binary_accuracy: 0.8266
Epoch 514/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1297 -
binary_accuracy: 0.8195
Epoch 515/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1306 -
binary_accuracy: 0.8152
Epoch 516/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1266 -
binary_accuracy: 0.8223
Epoch 517/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1257 -
binary_accuracy: 0.8209
Epoch 518/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1286 -
binary_accuracy: 0.8195
Epoch 519/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1268 -
binary_accuracy: 0.8238
Epoch 520/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1253 -
binary_accuracy: 0.8209
Epoch 521/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1253 -
binary_accuracy: 0.8181
Epoch 522/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1273 -
binary_accuracy: 0.8238
Epoch 523/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1278 -
binary_accuracy: 0.8238
Epoch 524/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1281 -
binary_accuracy: 0.8238
Epoch 525/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1247 -
binary_accuracy: 0.8238
Epoch 526/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1251 -
binary_accuracy: 0.8238
Epoch 527/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1260 -
binary_accuracy: 0.8252
Epoch 528/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1265 -
binary_accuracy: 0.8195
Epoch 529/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1241 -
binary_accuracy: 0.8238
Epoch 530/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1256 -
binary_accuracy: 0.8324
Epoch 531/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1261 -
binary_accuracy: 0.8209
Epoch 532/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1254 -
binary_accuracy: 0.8209
Epoch 533/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1286 -
binary_accuracy: 0.8166
Epoch 534/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1269 -
binary_accuracy: 0.8252
Epoch 535/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1325 -
binary_accuracy: 0.8238
Epoch 536/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1267 -
binary_accuracy: 0.8181
Epoch 537/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1260 -
binary_accuracy: 0.8223
Epoch 538/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1261 -
binary_accuracy: 0.8281
Epoch 539/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1269 -
binary_accuracy: 0.8252
Epoch 540/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1255 -
binary_accuracy: 0.8238
Epoch 541/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1267 -
binary_accuracy: 0.8266
Epoch 542/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1242 -
binary_accuracy: 0.8252
Epoch 543/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1322 -
binary_accuracy: 0.8181
Epoch 544/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1275 -
binary_accuracy: 0.8252
Epoch 545/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1250 -
binary_accuracy: 0.8252
Epoch 546/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1245 -
binary_accuracy: 0.8252
Epoch 547/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1236 -
binary_accuracy: 0.8223
Epoch 548/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1262 -
binary_accuracy: 0.8209
Epoch 549/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1262 -
binary_accuracy: 0.8223
Epoch 550/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1253 -
binary_accuracy: 0.8238
Epoch 551/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1255 -
binary_accuracy: 0.8223
Epoch 552/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1241 -
binary_accuracy: 0.8266
Epoch 553/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1243 -
binary_accuracy: 0.8223
Epoch 554/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1260 -
binary_accuracy: 0.8238
Epoch 555/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1250 -
binary_accuracy: 0.8223
Epoch 556/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1244 -
binary_accuracy: 0.8238
Epoch 557/1000
```

```
698/698 [==============================] - 0s 46us/step - loss: 0.1259 -
binary_accuracy: 0.8209
Epoch 558/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1243 -
binary_accuracy: 0.8281
Epoch 559/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1274 -
binary_accuracy: 0.8152
Epoch 560/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1251 -
binary_accuracy: 0.8266
Epoch 561/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1238 -
binary_accuracy: 0.8252
Epoch 562/1000
698/698 [==============================] - 0s 48us/step - loss: 0.1232 -
binary_accuracy: 0.8309
Epoch 563/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1250 -
binary_accuracy: 0.8252
Epoch 564/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1249 -
binary_accuracy: 0.8223
Epoch 565/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1257 -
binary_accuracy: 0.8252
Epoch 566/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1258 -
binary_accuracy: 0.8281
Epoch 567/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1283 -
binary_accuracy: 0.8195
Epoch 568/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1262 -
binary_accuracy: 0.8181
Epoch 569/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1232 -
binary_accuracy: 0.8266
Epoch 570/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1266 -
binary_accuracy: 0.8223
Epoch 571/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1243 -
binary_accuracy: 0.8252
Epoch 572/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1245 -
binary_accuracy: 0.8252
Epoch 573/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1244 -
binary_accuracy: 0.8324
Epoch 574/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1230 -
binary_accuracy: 0.8266
Epoch 575/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1258 -
binary_accuracy: 0.8238
Epoch 576/1000
698/698 [==============================] - 0s 49us/step - loss: 0.1255 -
binary_accuracy: 0.8252
Epoch 577/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1279 -
binary_accuracy: 0.8166
Epoch 578/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1256 -
binary_accuracy: 0.8252
Epoch 579/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1255 -
binary_accuracy: 0.8266
Epoch 580/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1239 -
binary_accuracy: 0.8252
Epoch 581/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1248 -
binary_accuracy: 0.8209
Epoch 582/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1233 -
binary_accuracy: 0.8266
Epoch 583/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1251 -
binary_accuracy: 0.8223
Epoch 584/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1241 -
binary_accuracy: 0.8252
Epoch 585/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1239 -
binary_accuracy: 0.8223
Epoch 586/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1263 -
binary_accuracy: 0.8223
Epoch 587/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1304 -
binary_accuracy: 0.8181
Epoch 588/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1278 -
binary_accuracy: 0.8166
Epoch 589/1000
```

```
698/698 [==============================] - 0s 41us/step - loss: 0.1234 -
binary_accuracy: 0.8266
Epoch 590/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1233 -
binary_accuracy: 0.8223
Epoch 591/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1243 -
binary_accuracy: 0.8266
Epoch 592/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1289 -
binary_accuracy: 0.8266
Epoch 593/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1256 -
binary_accuracy: 0.8266
Epoch 594/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1267 -
binary_accuracy: 0.8195
Epoch 595/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1228 -
binary_accuracy: 0.8281
Epoch 596/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1234 -
binary_accuracy: 0.8295
Epoch 597/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1232 -
binary_accuracy: 0.8281
Epoch 598/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1240 -
binary_accuracy: 0.8252
Epoch 599/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1232 -
binary_accuracy: 0.8295
Epoch 600/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1231 -
binary_accuracy: 0.8324
Epoch 601/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1278 -
binary_accuracy: 0.8295
Epoch 602/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1286 -
binary_accuracy: 0.8195
Epoch 603/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1279 -
binary_accuracy: 0.8252
Epoch 604/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1275 -
binary_accuracy: 0.8266
Epoch 605/1000
```

```
698/698 [==============================] - 0s 36us/step - loss: 0.1233 -
binary_accuracy: 0.8238
Epoch 606/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1246 -
binary_accuracy: 0.8252
Epoch 607/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1233 -
binary_accuracy: 0.8223
Epoch 608/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1235 -
binary_accuracy: 0.8238
Epoch 609/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1263 -
binary_accuracy: 0.8209
Epoch 610/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1222 -
binary_accuracy: 0.8223
Epoch 611/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1243 -
binary_accuracy: 0.8223
Epoch 612/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1236 -
binary_accuracy: 0.8209
Epoch 613/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1271 -
binary_accuracy: 0.8195
Epoch 614/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1289 -
binary_accuracy: 0.8181
Epoch 615/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1266 -
binary_accuracy: 0.8209
Epoch 616/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1273 -
binary_accuracy: 0.8123
Epoch 617/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1281 -
binary_accuracy: 0.8195
Epoch 618/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1247 -
binary_accuracy: 0.8252
Epoch 619/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1223 -
binary_accuracy: 0.8266
Epoch 620/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1221 -
binary_accuracy: 0.8252
Epoch 621/1000
```

```
698/698 [==============================] - 0s 41us/step - loss: 0.1228 -
binary_accuracy: 0.8281
Epoch 622/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1240 -
binary_accuracy: 0.8223
Epoch 623/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1259 -
binary_accuracy: 0.8223
Epoch 624/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1271 -
binary_accuracy: 0.8223
Epoch 625/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1235 -
binary_accuracy: 0.8266
Epoch 626/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1235 -
binary_accuracy: 0.8181
Epoch 627/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1235 -
binary_accuracy: 0.8281
Epoch 628/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1239 -
binary_accuracy: 0.8266
Epoch 629/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1244 -
binary_accuracy: 0.8295
Epoch 630/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1224 -
binary_accuracy: 0.8295
Epoch 631/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1246 -
binary_accuracy: 0.8152
Epoch 632/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1244 -
binary_accuracy: 0.8266
Epoch 633/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1269 -
binary_accuracy: 0.8252
Epoch 634/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1370 -
binary_accuracy: 0.8095
Epoch 635/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1243 -
binary_accuracy: 0.8209
Epoch 636/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1235 -
binary_accuracy: 0.8195
Epoch 637/1000
```

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698/698 [==============================] - 0s 40us/step - loss: 0.1242 -
binary_accuracy: 0.8281
Epoch 638/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1250 -
binary_accuracy: 0.8281
Epoch 639/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1253 -
binary_accuracy: 0.8181
Epoch 640/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1225 -
binary_accuracy: 0.8295
Epoch 641/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1251 -
binary_accuracy: 0.8295
Epoch 642/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1235 -
binary_accuracy: 0.8281
Epoch 643/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1242 -
binary_accuracy: 0.8281
Epoch 644/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1288 -
binary_accuracy: 0.8238
Epoch 645/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1238 -
binary_accuracy: 0.8181
Epoch 646/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1245 -
binary_accuracy: 0.8352
Epoch 647/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1257 -
binary_accuracy: 0.8295
Epoch 648/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1251 -
binary_accuracy: 0.8209
Epoch 649/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1224 -
binary_accuracy: 0.8252
Epoch 650/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1238 -
binary_accuracy: 0.8338
Epoch 651/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1257 -
binary_accuracy: 0.8238
Epoch 652/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1229 -
binary_accuracy: 0.8338
Epoch 653/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1228 -
binary_accuracy: 0.8281
Epoch 654/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1234 -
binary_accuracy: 0.8309
Epoch 655/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1235 -
binary_accuracy: 0.8252
Epoch 656/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1223 -
binary_accuracy: 0.8238
Epoch 657/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1229 -
binary_accuracy: 0.8309
Epoch 658/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1232 -
binary_accuracy: 0.8324
Epoch 659/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1231 -
binary_accuracy: 0.8238
Epoch 660/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1223 -
binary_accuracy: 0.8309
Epoch 661/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1214 -
binary_accuracy: 0.8295
Epoch 662/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1206 -
binary_accuracy: 0.8309
Epoch 663/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1272 -
binary_accuracy: 0.8367
Epoch 664/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1228 -
binary_accuracy: 0.8324
Epoch 665/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1233 -
binary_accuracy: 0.8252
Epoch 666/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1244 -
binary_accuracy: 0.8266
Epoch 667/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1232 -
binary_accuracy: 0.8252
Epoch 668/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1249 -
binary_accuracy: 0.8309
Epoch 669/1000
```

```
698/698 [==============================] - 0s 36us/step - loss: 0.1213 -
binary_accuracy: 0.8295
Epoch 670/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1224 -
binary_accuracy: 0.8309
Epoch 671/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1235 -
binary_accuracy: 0.8295
Epoch 672/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1251 -
binary_accuracy: 0.8195
Epoch 673/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1224 -
binary_accuracy: 0.8309
Epoch 674/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1230 -
binary_accuracy: 0.8309
Epoch 675/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1253 -
binary_accuracy: 0.8238
Epoch 676/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1215 -
binary_accuracy: 0.8324
Epoch 677/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1222 -
binary_accuracy: 0.8281
Epoch 678/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1223 -
binary_accuracy: 0.8295
Epoch 679/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1219 -
binary_accuracy: 0.8338
Epoch 680/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1268 -
binary_accuracy: 0.8223
Epoch 681/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1260 -
binary_accuracy: 0.8324
Epoch 682/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1250 -
binary_accuracy: 0.8309
Epoch 683/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1235 -
binary_accuracy: 0.8266
Epoch 684/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1232 -
binary_accuracy: 0.8295
Epoch 685/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1205 -
binary_accuracy: 0.8324
Epoch 686/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1220 -
binary_accuracy: 0.8281
Epoch 687/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1209 -
binary_accuracy: 0.8266
Epoch 688/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1224 -
binary_accuracy: 0.8381
Epoch 689/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1218 -
binary_accuracy: 0.8309
Epoch 690/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1218 -
binary_accuracy: 0.8295
Epoch 691/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1206 -
binary_accuracy: 0.8295
Epoch 692/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1219 -
binary_accuracy: 0.8324
Epoch 693/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1259 -
binary_accuracy: 0.8209
Epoch 694/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1229 -
binary_accuracy: 0.8281
Epoch 695/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1250 -
binary_accuracy: 0.8223
Epoch 696/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1223 -
binary_accuracy: 0.8352
Epoch 697/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1227 -
binary_accuracy: 0.8238
Epoch 698/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1233 -
binary_accuracy: 0.8281
Epoch 699/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1222 -
binary_accuracy: 0.8324
Epoch 700/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1223 -
binary_accuracy: 0.8266
Epoch 701/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1219 -
binary_accuracy: 0.8295
Epoch 702/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1211 -
binary_accuracy: 0.8309
Epoch 703/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1217 -
binary_accuracy: 0.8252
Epoch 704/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1222 -
binary_accuracy: 0.8367
Epoch 705/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1217 -
binary_accuracy: 0.8295
Epoch 706/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1206 -
binary_accuracy: 0.8295
Epoch 707/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1210 -
binary_accuracy: 0.8324
Epoch 708/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1215 -
binary_accuracy: 0.8367
Epoch 709/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1228 -
binary_accuracy: 0.8281
Epoch 710/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1227 -
binary_accuracy: 0.8324
Epoch 711/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1208 -
binary_accuracy: 0.8309
Epoch 712/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1197 -
binary_accuracy: 0.8338
Epoch 713/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1234 -
binary_accuracy: 0.8266
Epoch 714/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1224 -
binary_accuracy: 0.8266
Epoch 715/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1210 -
binary_accuracy: 0.8324
Epoch 716/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1202 -
binary_accuracy: 0.8338
Epoch 717/1000
```

```
698/698 [==============================] - 0s 39us/step - loss: 0.1210 -
binary_accuracy: 0.8324
Epoch 718/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1224 -
binary_accuracy: 0.8238
Epoch 719/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1234 -
binary_accuracy: 0.8352
Epoch 720/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1230 -
binary_accuracy: 0.8381
Epoch 721/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1223 -
binary_accuracy: 0.8281
Epoch 722/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1200 -
binary_accuracy: 0.8352
Epoch 723/1000
698/698 [==============================] - 0s 49us/step - loss: 0.1209 -
binary_accuracy: 0.8324
Epoch 724/1000
698/698 [==============================] - 0s 50us/step - loss: 0.1223 -
binary_accuracy: 0.8252
Epoch 725/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1220 -
binary_accuracy: 0.8252
Epoch 726/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1209 -
binary_accuracy: 0.8295
Epoch 727/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1218 -
binary_accuracy: 0.8266
Epoch 728/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1217 -
binary_accuracy: 0.8295
Epoch 729/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1216 -
binary_accuracy: 0.8295
Epoch 730/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1213 -
binary_accuracy: 0.8352
Epoch 731/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1208 -
binary_accuracy: 0.8281
Epoch 732/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1214 -
binary_accuracy: 0.8338
Epoch 733/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1219 -
binary_accuracy: 0.8324
Epoch 734/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1225 -
binary_accuracy: 0.8324
Epoch 735/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1228 -
binary_accuracy: 0.8266
Epoch 736/1000
698/698 [==============================] - 0s 53us/step - loss: 0.1227 -
binary_accuracy: 0.8324
Epoch 737/1000
698/698 [==============================] - 0s 65us/step - loss: 0.1230 -
binary_accuracy: 0.8367
Epoch 738/1000
698/698 [==============================] - 0s 89us/step - loss: 0.1211 -
binary_accuracy: 0.8338
Epoch 739/1000
698/698 [==============================] - 0s 68us/step - loss: 0.1198 -
binary_accuracy: 0.8324
Epoch 740/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1201 -
binary_accuracy: 0.8266
Epoch 741/1000
698/698 [==============================] - 0s 52us/step - loss: 0.1202 -
binary_accuracy: 0.8295
Epoch 742/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1207 -
binary_accuracy: 0.8309
Epoch 743/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1221 -
binary_accuracy: 0.8324
Epoch 744/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1214 -
binary_accuracy: 0.8338
Epoch 745/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1202 -
binary_accuracy: 0.8324
Epoch 746/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1221 -
binary_accuracy: 0.8352
Epoch 747/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1278 -
binary_accuracy: 0.8266
Epoch 748/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1226 -
binary_accuracy: 0.8223
Epoch 749/1000
```

```
698/698 [==============================] - 0s 43us/step - loss: 0.1261 -
binary_accuracy: 0.8309
Epoch 750/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1244 -
binary_accuracy: 0.8266
Epoch 751/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1204 -
binary_accuracy: 0.8367
Epoch 752/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1245 -
binary_accuracy: 0.8295
Epoch 753/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1214 -
binary_accuracy: 0.8324
Epoch 754/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1205 -
binary_accuracy: 0.8424
Epoch 755/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1215 -
binary_accuracy: 0.8338
Epoch 756/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1216 -
binary_accuracy: 0.8381
Epoch 757/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1217 -
binary_accuracy: 0.8309
Epoch 758/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1206 -
binary_accuracy: 0.8252
Epoch 759/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1195 -
binary_accuracy: 0.8395
Epoch 760/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1230 -
binary_accuracy: 0.8309
Epoch 761/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1207 -
binary_accuracy: 0.8338
Epoch 762/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1207 -
binary_accuracy: 0.8295
Epoch 763/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1195 -
binary_accuracy: 0.8324
Epoch 764/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1250 -
binary_accuracy: 0.8324
Epoch 765/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1199 -
binary_accuracy: 0.8324
Epoch 766/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1194 -
binary_accuracy: 0.8309
Epoch 767/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1211 -
binary_accuracy: 0.8338
Epoch 768/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1202 -
binary_accuracy: 0.8381
Epoch 769/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1228 -
binary_accuracy: 0.8266
Epoch 770/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1211 -
binary_accuracy: 0.8352
Epoch 771/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1198 -
binary_accuracy: 0.8410
Epoch 772/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1203 -
binary_accuracy: 0.8352
Epoch 773/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1198 -
binary_accuracy: 0.8338
Epoch 774/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1193 -
binary_accuracy: 0.8352
Epoch 775/1000
698/698 [==============================] - 0s 47us/step - loss: 0.1203 -
binary_accuracy: 0.8352
Epoch 776/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1206 -
binary_accuracy: 0.8352
Epoch 777/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1222 -
binary_accuracy: 0.8324
Epoch 778/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1194 -
binary_accuracy: 0.8352
Epoch 779/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1209 -
binary_accuracy: 0.8309
Epoch 780/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1192 -
binary_accuracy: 0.8424
Epoch 781/1000
```

```
698/698 [==============================] - 0s 37us/step - loss: 0.1214 -
binary_accuracy: 0.8252
Epoch 782/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1203 -
binary_accuracy: 0.8309
Epoch 783/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1220 -
binary_accuracy: 0.8309
Epoch 784/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1208 -
binary_accuracy: 0.8295
Epoch 785/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1197 -
binary_accuracy: 0.8367
Epoch 786/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1194 -
binary_accuracy: 0.8324
Epoch 787/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1196 -
binary_accuracy: 0.8324
Epoch 788/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1220 -
binary_accuracy: 0.8338
Epoch 789/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1197 -
binary_accuracy: 0.8295
Epoch 790/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1187 -
binary_accuracy: 0.8324
Epoch 791/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1199 -
binary_accuracy: 0.8252
Epoch 792/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1203 -
binary_accuracy: 0.8367
Epoch 793/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1211 -
binary_accuracy: 0.8324
Epoch 794/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1205 -
binary_accuracy: 0.8367
Epoch 795/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1204 -
binary_accuracy: 0.8295
Epoch 796/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1201 -
binary_accuracy: 0.8352
Epoch 797/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1230 -
binary_accuracy: 0.8266
Epoch 798/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1201 -
binary_accuracy: 0.8395
Epoch 799/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1200 -
binary_accuracy: 0.8367
Epoch 800/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1205 -
binary_accuracy: 0.8381
Epoch 801/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1190 -
binary_accuracy: 0.8324
Epoch 802/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1179 -
binary_accuracy: 0.8352
Epoch 803/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1188 -
binary_accuracy: 0.8295
Epoch 804/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1204 -
binary_accuracy: 0.8266
Epoch 805/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1217 -
binary_accuracy: 0.8381
Epoch 806/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1193 -
binary_accuracy: 0.8367
Epoch 807/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1221 -
binary_accuracy: 0.8238
Epoch 808/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1244 -
binary_accuracy: 0.8309
Epoch 809/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1206 -
binary_accuracy: 0.8381
Epoch 810/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1208 -
binary_accuracy: 0.8352
Epoch 811/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1194 -
binary_accuracy: 0.8381
Epoch 812/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1196 -
binary_accuracy: 0.8338
Epoch 813/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1196 -
binary_accuracy: 0.8338
Epoch 814/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1192 -
binary_accuracy: 0.8338
Epoch 815/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1249 -
binary_accuracy: 0.8309
Epoch 816/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1252 -
binary_accuracy: 0.8309
Epoch 817/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1250 -
binary_accuracy: 0.8295
Epoch 818/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1203 -
binary_accuracy: 0.8352
Epoch 819/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1188 -
binary_accuracy: 0.8309
Epoch 820/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1190 -
binary_accuracy: 0.8338
Epoch 821/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1206 -
binary_accuracy: 0.8352
Epoch 822/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1202 -
binary_accuracy: 0.8309
Epoch 823/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1191 -
binary_accuracy: 0.8367
Epoch 824/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1209 -
binary_accuracy: 0.8266
Epoch 825/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1210 -
binary_accuracy: 0.8338
Epoch 826/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1231 -
binary_accuracy: 0.8238
Epoch 827/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1223 -
binary_accuracy: 0.8295
Epoch 828/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1197 -
binary_accuracy: 0.8295
Epoch 829/1000
```

```
698/698 [==============================] - 0s 36us/step - loss: 0.1188 -
binary_accuracy: 0.8424
Epoch 830/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1182 -
binary_accuracy: 0.8352
Epoch 831/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1198 -
binary_accuracy: 0.8367
Epoch 832/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1177 -
binary_accuracy: 0.8338
Epoch 833/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1209 -
binary_accuracy: 0.8295
Epoch 834/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1228 -
binary_accuracy: 0.8324
Epoch 835/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1202 -
binary_accuracy: 0.8309
Epoch 836/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1190 -
binary_accuracy: 0.8395
Epoch 837/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1191 -
binary_accuracy: 0.8324
Epoch 838/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1193 -
binary_accuracy: 0.8410
Epoch 839/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1180 -
binary_accuracy: 0.8338
Epoch 840/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1198 -
binary_accuracy: 0.8324
Epoch 841/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1180 -
binary_accuracy: 0.8352
Epoch 842/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1186 -
binary_accuracy: 0.8367
Epoch 843/1000
698/698 [==============================] - 0s 48us/step - loss: 0.1202 -
binary_accuracy: 0.8324
Epoch 844/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1199 -
binary_accuracy: 0.8367
Epoch 845/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1193 -
binary_accuracy: 0.8324
Epoch 846/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1184 -
binary_accuracy: 0.8309
Epoch 847/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1221 -
binary_accuracy: 0.8266
Epoch 848/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1179 -
binary_accuracy: 0.8352
Epoch 849/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1208 -
binary_accuracy: 0.8281
Epoch 850/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1196 -
binary_accuracy: 0.8295
Epoch 851/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1187 -
binary_accuracy: 0.8352
Epoch 852/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1182 -
binary_accuracy: 0.8338
Epoch 853/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1190 -
binary_accuracy: 0.8453
Epoch 854/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1195 -
binary_accuracy: 0.8295
Epoch 855/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1201 -
binary_accuracy: 0.8309
Epoch 856/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1189 -
binary_accuracy: 0.8395
Epoch 857/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1200 -
binary_accuracy: 0.8324
Epoch 858/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1175 -
binary_accuracy: 0.8381
Epoch 859/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1184 -
binary_accuracy: 0.8381
Epoch 860/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1191 -
binary_accuracy: 0.8324
Epoch 861/1000
```

```
698/698 [==============================] - 0s 34us/step - loss: 0.1190 -
binary_accuracy: 0.8395
Epoch 862/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1185 -
binary_accuracy: 0.8367
Epoch 863/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1195 -
binary_accuracy: 0.8324
Epoch 864/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1209 -
binary_accuracy: 0.8381
Epoch 865/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1177 -
binary_accuracy: 0.8324
Epoch 866/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1204 -
binary_accuracy: 0.8309
Epoch 867/1000
698/698 [==============================] - 0s 45us/step - loss: 0.1214 -
binary_accuracy: 0.8381
Epoch 868/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1196 -
binary_accuracy: 0.8367
Epoch 869/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1201 -
binary_accuracy: 0.8324
Epoch 870/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1262 -
binary_accuracy: 0.8266
Epoch 871/1000
698/698 [==============================] - 0s 49us/step - loss: 0.1210 -
binary_accuracy: 0.8309
Epoch 872/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1227 -
binary_accuracy: 0.8324
Epoch 873/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1188 -
binary_accuracy: 0.8424
Epoch 874/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1184 -
binary_accuracy: 0.8338
Epoch 875/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1174 -
binary_accuracy: 0.8424
Epoch 876/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1191 -
binary_accuracy: 0.8338
Epoch 877/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1243 -
binary_accuracy: 0.8295
Epoch 878/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1206 -
binary_accuracy: 0.8395
Epoch 879/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1225 -
binary_accuracy: 0.8266
Epoch 880/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1184 -
binary_accuracy: 0.8395
Epoch 881/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1191 -
binary_accuracy: 0.8410
Epoch 882/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1181 -
binary_accuracy: 0.8381
Epoch 883/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1177 -
binary_accuracy: 0.8410
Epoch 884/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1173 -
binary_accuracy: 0.8381
Epoch 885/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1172 -
binary_accuracy: 0.8410
Epoch 886/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1234 -
binary_accuracy: 0.8152
Epoch 887/1000
698/698 [==============================] - 0s 46us/step - loss: 0.1183 -
binary_accuracy: 0.8324
Epoch 888/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1193 -
binary_accuracy: 0.8367
Epoch 889/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1197 -
binary_accuracy: 0.8395
Epoch 890/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1200 -
binary_accuracy: 0.8266
Epoch 891/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1255 -
binary_accuracy: 0.8195
Epoch 892/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1189 -
binary_accuracy: 0.8367
Epoch 893/1000
```

```
698/698 [==============================] - 0s 35us/step - loss: 0.1200 -
binary_accuracy: 0.8352
Epoch 894/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1175 -
binary_accuracy: 0.8410
Epoch 895/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1189 -
binary_accuracy: 0.8381
Epoch 896/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1215 -
binary_accuracy: 0.8367
Epoch 897/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1200 -
binary_accuracy: 0.8352
Epoch 898/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1231 -
binary_accuracy: 0.8309
Epoch 899/1000
698/698 [==============================] - 0s 42us/step - loss: 0.1194 -
binary_accuracy: 0.8309
Epoch 900/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1203 -
binary_accuracy: 0.8367
Epoch 901/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1181 -
binary_accuracy: 0.8410
Epoch 902/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1188 -
binary_accuracy: 0.8367
Epoch 903/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1177 -
binary_accuracy: 0.8338
Epoch 904/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1166 -
binary_accuracy: 0.8410
Epoch 905/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1191 -
binary_accuracy: 0.8324
Epoch 906/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1176 -
binary_accuracy: 0.8367
Epoch 907/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1185 -
binary_accuracy: 0.8381
Epoch 908/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1190 -
binary_accuracy: 0.8352
Epoch 909/1000
```

```
698/698 [==============================] - 0s 33us/step - loss: 0.1207 -
binary_accuracy: 0.8381
Epoch 910/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1200 -
binary_accuracy: 0.8338
Epoch 911/1000
698/698 [==============================] - 0s 39us/step - loss: 0.1208 -
binary_accuracy: 0.8352
Epoch 912/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1260 -
binary_accuracy: 0.8338
Epoch 913/1000
698/698 [==============================] - 0s 44us/step - loss: 0.1184 -
binary_accuracy: 0.8367
Epoch 914/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1165 -
binary_accuracy: 0.8481
Epoch 915/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1184 -
binary_accuracy: 0.8496
Epoch 916/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1186 -
binary_accuracy: 0.8352
Epoch 917/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1177 -
binary_accuracy: 0.8395
Epoch 918/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1177 -
binary_accuracy: 0.8338
Epoch 919/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1185 -
binary_accuracy: 0.8352
Epoch 920/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1209 -
binary_accuracy: 0.8367
Epoch 921/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1289 -
binary_accuracy: 0.8209
Epoch 922/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1186 -
binary_accuracy: 0.8410
Epoch 923/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1190 -
binary_accuracy: 0.8352
Epoch 924/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1170 -
binary_accuracy: 0.8410
Epoch 925/1000
```

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698/698 [==============================] - 0s 37us/step - loss: 0.1224 -
binary_accuracy: 0.8410
Epoch 926/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1218 -
binary_accuracy: 0.8324
Epoch 927/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1245 -
binary_accuracy: 0.8281
Epoch 928/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1243 -
binary_accuracy: 0.8266
Epoch 929/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1229 -
binary_accuracy: 0.8309
Epoch 930/1000
698/698 [==============================] - 0s 43us/step - loss: 0.1233 -
binary_accuracy: 0.8352
Epoch 931/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1234 -
binary_accuracy: 0.8281
Epoch 932/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1199 -
binary_accuracy: 0.8352
Epoch 933/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1194 -
binary_accuracy: 0.8453
Epoch 934/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1180 -
binary_accuracy: 0.8467
Epoch 935/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1154 -
binary_accuracy: 0.8410
Epoch 936/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1224 -
binary_accuracy: 0.8352
Epoch 937/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1181 -
binary_accuracy: 0.8481
Epoch 938/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1171 -
binary_accuracy: 0.8367
Epoch 939/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1172 -
binary_accuracy: 0.8309
Epoch 940/1000
698/698 [==============================] - 0s 40us/step - loss: 0.1185 -
binary_accuracy: 0.8381
Epoch 941/1000
```

```
698/698 [==============================] - 0s 38us/step - loss: 0.1172 -
binary_accuracy: 0.8481
Epoch 942/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1161 -
binary_accuracy: 0.8424
Epoch 943/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1172 -
binary_accuracy: 0.8395
Epoch 944/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1155 -
binary_accuracy: 0.8381
Epoch 945/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1173 -
binary_accuracy: 0.8453
Epoch 946/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1168 -
binary_accuracy: 0.8410
Epoch 947/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1190 -
binary_accuracy: 0.8395
Epoch 948/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1179 -
binary_accuracy: 0.8381
Epoch 949/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1194 -
binary_accuracy: 0.8453
Epoch 950/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1164 -
binary_accuracy: 0.8424
Epoch 951/1000
698/698 [==============================] - 0s 36us/step - loss: 0.1212 -
binary_accuracy: 0.8367
Epoch 952/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1186 -
binary_accuracy: 0.8367
Epoch 953/1000
698/698 [==============================] - 0s 38us/step - loss: 0.1212 -
binary_accuracy: 0.8395
Epoch 954/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1185 -
binary_accuracy: 0.8338
Epoch 955/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1175 -
binary_accuracy: 0.8424
Epoch 956/1000
698/698 [==============================] - 0s 41us/step - loss: 0.1168 -
binary_accuracy: 0.8381
Epoch 957/1000
```

```
698/698 [==============================] - 0s 32us/step - loss: 0.1166 -
binary_accuracy: 0.8367
Epoch 958/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1177 -
binary_accuracy: 0.8352
Epoch 959/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1194 -
binary_accuracy: 0.8338
Epoch 960/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1172 -
binary_accuracy: 0.8352
Epoch 961/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1162 -
binary_accuracy: 0.8410
Epoch 962/1000
698/698 [==============================] - 0s 34us/step - loss: 0.1176 -
binary_accuracy: 0.8367
Epoch 963/1000
698/698 [==============================] - 0s 35us/step - loss: 0.1203 -
binary_accuracy: 0.8367
Epoch 964/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1201 -
binary_accuracy: 0.8352
Epoch 965/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1179 -
binary_accuracy: 0.8381
Epoch 966/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1170 -
binary_accuracy: 0.8324
Epoch 967/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1161 -
binary_accuracy: 0.8467
Epoch 968/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1168 -
binary_accuracy: 0.8410
Epoch 969/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1176 -
binary_accuracy: 0.8367
Epoch 970/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1207 -
binary_accuracy: 0.8352
Epoch 971/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1187 -
binary_accuracy: 0.8424
Epoch 972/1000
698/698 [==============================] - 0s 33us/step - loss: 0.1164 -
binary_accuracy: 0.8410
Epoch 973/1000
```

```
698/698 [==============================] - 0s 29us/step - loss: 0.1166 -
binary_accuracy: 0.8424
Epoch 974/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1155 -
binary_accuracy: 0.8510
Epoch 975/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1153 -
binary_accuracy: 0.8438
Epoch 976/1000
698/698 [==============================] - 0s 28us/step - loss: 0.1181 -
binary_accuracy: 0.8395
Epoch 977/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1163 -
binary_accuracy: 0.8424
Epoch 978/1000
698/698 [==============================] - 0s 37us/step - loss: 0.1192 -
binary_accuracy: 0.8367
Epoch 979/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1162 -
binary_accuracy: 0.8424
Epoch 980/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1169 -
binary_accuracy: 0.8438
Epoch 981/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1184 -
binary_accuracy: 0.8338
Epoch 982/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1183 -
binary_accuracy: 0.8424
Epoch 983/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1188 -
binary_accuracy: 0.8281
Epoch 984/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1165 -
binary_accuracy: 0.8467
Epoch 985/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1169 -
binary_accuracy: 0.8395
Epoch 986/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1176 -
binary_accuracy: 0.8481
Epoch 987/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1171 -
binary_accuracy: 0.8352
Epoch 988/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1228 -
binary_accuracy: 0.8338
Epoch 989/1000
```

```
698/698 [==============================] - 0s 30us/step - loss: 0.1183 -
binary_accuracy: 0.8410
Epoch 990/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1183 -
binary_accuracy: 0.8395
Epoch 991/1000
698/698 [==============================] - 0s 28us/step - loss: 0.1180 -
binary_accuracy: 0.8424
Epoch 992/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1184 -
binary_accuracy: 0.8424
Epoch 993/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1201 -
binary_accuracy: 0.8324
Epoch 994/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1184 -
binary_accuracy: 0.8395
Epoch 995/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1168 -
binary_accuracy: 0.8410
Epoch 996/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1153 -
binary_accuracy: 0.8453
Epoch 997/1000
698/698 [==============================] - 0s 29us/step - loss: 0.1172 -
binary_accuracy: 0.8467
Epoch 998/1000
698/698 [==============================] - 0s 32us/step - loss: 0.1169 -
binary_accuracy: 0.8438
Epoch 999/1000
698/698 [==============================] - 0s 31us/step - loss: 0.1173 -
binary_accuracy: 0.8352
Epoch 1000/1000
698/698 [==============================] - 0s 30us/step - loss: 0.1180 -
binary_accuracy: 0.8410
```

[11]:
```
<keras.callbacks.callbacks.History at 0x7f2efd213eb8>
```

[12]:
```
# Evaluamos el modelo
scores = model.evaluate(X_train, y_train)

print("\n%s: %.2f%%" % (model.metrics_names[1], scores[1]*100))
```

```
698/698 [==============================] - 0s 46us/step

binary_accuracy: 84.67%
```

Mostramos el resultado de la prediccion con los datos de test

[13]:
```
print (model.predict(X_test).round())
```

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```

Vemos que hemos tenido un resultado notable (mas del 80% de datos predecidos). Es análogo al que obtuvimos con RandomForest en la unidad 7. Así podemos variar la estructura de la red para lograr mejores resultados y que se adapte mejor a nuestro problema como posible mejora o preprocesar mucho mejor los datos, sin embargo, para el objetivo del ejercicio hemos completado lo que queríamos.