

# Ataque al corazón

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## FITS

```
In [62]: # import numpy as np

# from sklearn.model_selection import train_test_split

# def train(pd):
#     pd = pd.copy()
#     y = pd["output"].copy()
#     x = pd.drop(['output'],axis=1)

#     x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.25)

#     print(f'({len(x_train)+len(y_train)}),(len(x_test)+len(y_test))')

#     return x_train, y_train,x_test,y_test
```

```
In [63]: import matplotlib.pyplot as plt
def boxplot_general(pd,cadena):
```

```

for tipo in pd.columns:
    if tipo != cadena:
        data_to_plot = [pd[pd[cadena] == i][tipo].values for i in sorted(pd[
plt.figure(figsize=(10, 6))
plt.boxplot(data_to_plot, labels=sorted(pd[cadena].unique()), notch=True,
            showmeans=True, whiskerprops=dict(color='deeppink', linewidth=2),
            medianprops=dict(color='deeppink'),
            flierprops=dict(color='deeppink', markerfacecolor='pink',
            boxprops=dict(edgecolor='deeppink', facecolor='pink', linewidth=2),
            capprops=dict(color='deeppink', linewidth=2)
        )
        plt.xlabel(cadena)
        plt.ylabel(f'{tipo}')
        plt.title(f'Boxplot Quality/ {tipo}')
        plt.show()
def boxplot(pd,y,x):
    data_to_plot = [pd[pd[x] == i][y].values for i in sorted(pd[x].unique())]
    plt.figure(figsize=(10, 6))
    plt.boxplot(data_to_plot, labels=sorted(pd[x].unique()), notch=True, patch
        showmeans=True, whiskerprops=dict(color='deeppink', linewidth=2),
        medianprops=dict(color='deeppink'),
        flierprops=dict(color='deeppink', markerfacecolor='pink', linewidth=2),
        boxprops=dict(edgecolor='deeppink', facecolor='pink', linewidth=2),
        capprops=dict(color='deeppink', linewidth=2)
    )
    plt.xlabel(x)
    plt.ylabel(f'{y}')
    plt.title(f'Boxplot Quality/ {y}')
    plt.show()
def mapa_calor(corr_matrix):
    fig, ax = plt.subplots(figsize=(15, 8))
    text_colors = ("black", "white")
    im = ax.imshow(corr_matrix, cmap= "Oranges" ) # mapa de calor
    cbar = fig.colorbar(im, ax=ax, label= "Correlacion" ) # Leyenda
    cbar.outline.set_visible(False)

    x = corr_matrix.columns
    y = corr_matrix.index
    # Mostrar las etiquetas. El color del texto cambia en función de su normalización
    for i in range(len(y)):
        for j in range(len(x)):
            value = corr_matrix.iloc[i, j]
            text_color = text_colors[int(im.norm(value) > 0.5)] # color etiqueta
            ax.text(j, i, f"{value:.2f}", color=text_color, va= "center" , ha= "center")

    # Formateo de los ejes
    ax.set_xticks(range(len(x)))
    ax.set_xticklabels(x, rotation=90)
    ax.set_yticks(range(len(y)))
    ax.set_yticklabels(y)
    ax.invert_yaxis()
    ax.spines["right"].set_visible(False) # ocultar borde derecho
    ax.spines["top"].set_visible(False) # ocultar borde superior
    fig.tight_layout()

```

In [64]: `import pandas as pd`

```
heart_df = pd.read_csv('heart.csv')
heart_df
```

Out[64]:

	age	sex	cp	trtbps	chol	fbs	restecg	thalachh	exng	oldpeak	slp	caa	thall
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...
298	57	0	0	140	241	0	1	123	1	0.2	1	0	3
299	45	1	3	110	264	0	1	132	0	1.2	1	0	3
300	68	1	0	144	193	1	1	141	0	3.4	1	2	3
301	57	1	0	130	131	0	1	115	1	1.2	1	1	3
302	57	0	1	130	236	0	0	174	0	0.0	1	1	2

303 rows × 14 columns



In [65]: heart\_df.describe()

Out[65]:

	age	sex	cp	trtbps	chol	fbs	restecg
count	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000
mean	54.366337	0.683168	0.966997	131.623762	246.264026	0.148515	0.528000
std	9.082101	0.466011	1.032052	17.538143	51.830751	0.356198	0.525000
min	29.000000	0.000000	0.000000	94.000000	126.000000	0.000000	0.000000
25%	47.500000	0.000000	0.000000	120.000000	211.000000	0.000000	0.000000
50%	55.000000	1.000000	1.000000	130.000000	240.000000	0.000000	1.000000
75%	61.000000	1.000000	2.000000	140.000000	274.500000	0.000000	1.000000
max	77.000000	1.000000	3.000000	200.000000	564.000000	1.000000	2.000000



In [66]: heart\_df.shape

Out[66]: (303, 14)

In [67]: heart\_df.info()

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 303 entries, 0 to 302
Data columns (total 14 columns):
#   Column      Non-Null Count  Dtype
---  -
0   age         303 non-null   int64
1   sex         303 non-null   int64
2   cp          303 non-null   int64
3   trtbps      303 non-null   int64
4   chol        303 non-null   int64
5   fbs         303 non-null   int64
6   restecg     303 non-null   int64
7   thalachh    303 non-null   int64
8   exng        303 non-null   int64
9   oldpeak     303 non-null   float64
10  slp         303 non-null   int64
11  caa         303 non-null   int64
12  thall       303 non-null   int64
13  output      303 non-null   int64
dtypes: float64(1), int64(13)
memory usage: 33.3 KB

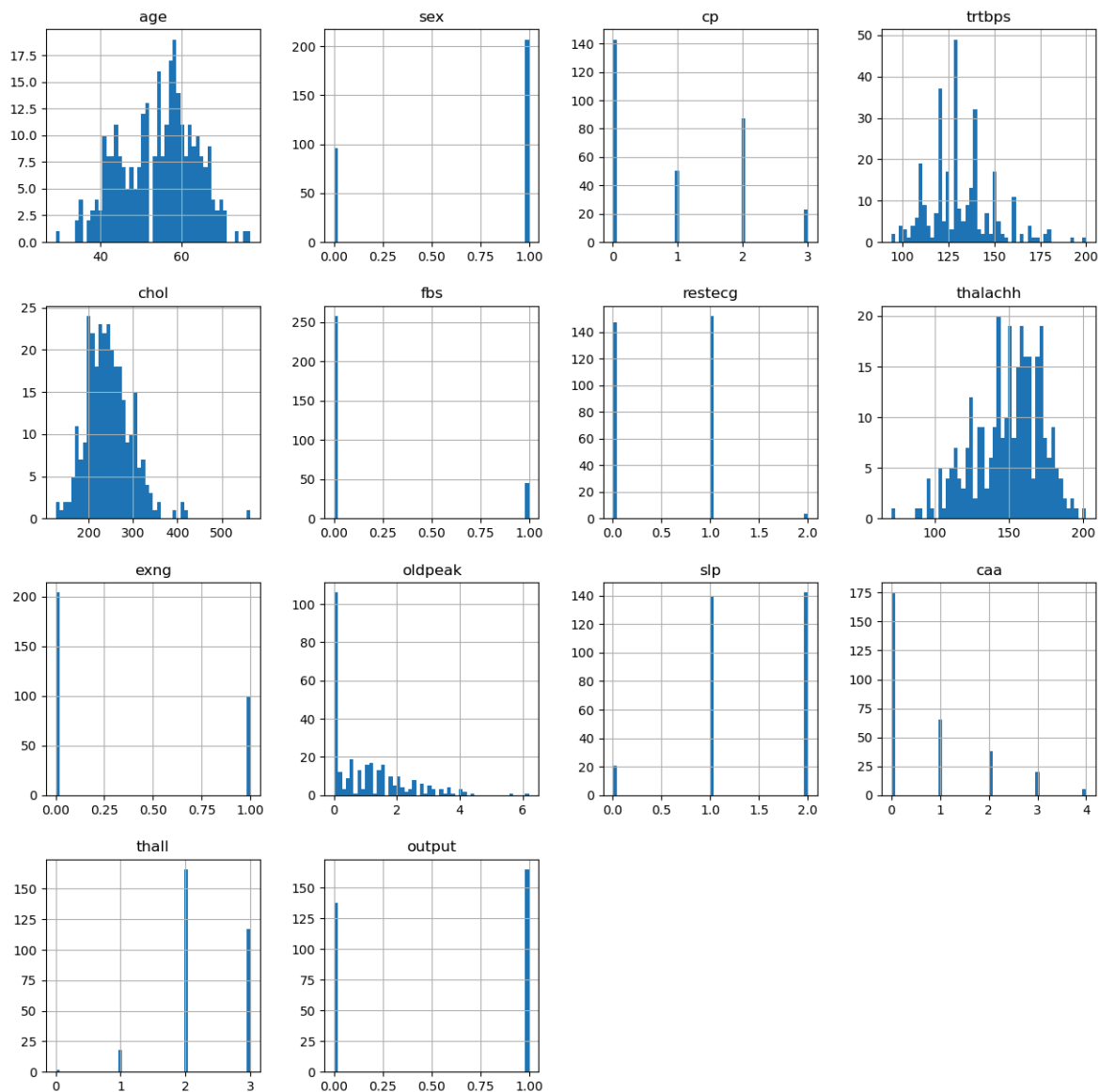
```

```
In [68]: heart_df.hist(bins=50, figsize=(15,15))
```

```

Out[68]: array([[<Axes: title={'center': 'age'}>, <Axes: title={'center': 'sex'}>,
  <Axes: title={'center': 'cp'}>,
  <Axes: title={'center': 'trtbps'}>],
  [<Axes: title={'center': 'chol'}>,
  <Axes: title={'center': 'fbs'}>,
  <Axes: title={'center': 'restecg'}>,
  <Axes: title={'center': 'thalachh'}>],
  [<Axes: title={'center': 'exng'}>,
  <Axes: title={'center': 'oldpeak'}>,
  <Axes: title={'center': 'slp'}>, <Axes: title={'center': 'caa'}>],
  [<Axes: title={'center': 'thall'}>,
  <Axes: title={'center': 'output'}>, <Axes: >, <Axes: >]],
  dtype=object)

```



```
In [69]: heart_df.isna().sum()
```

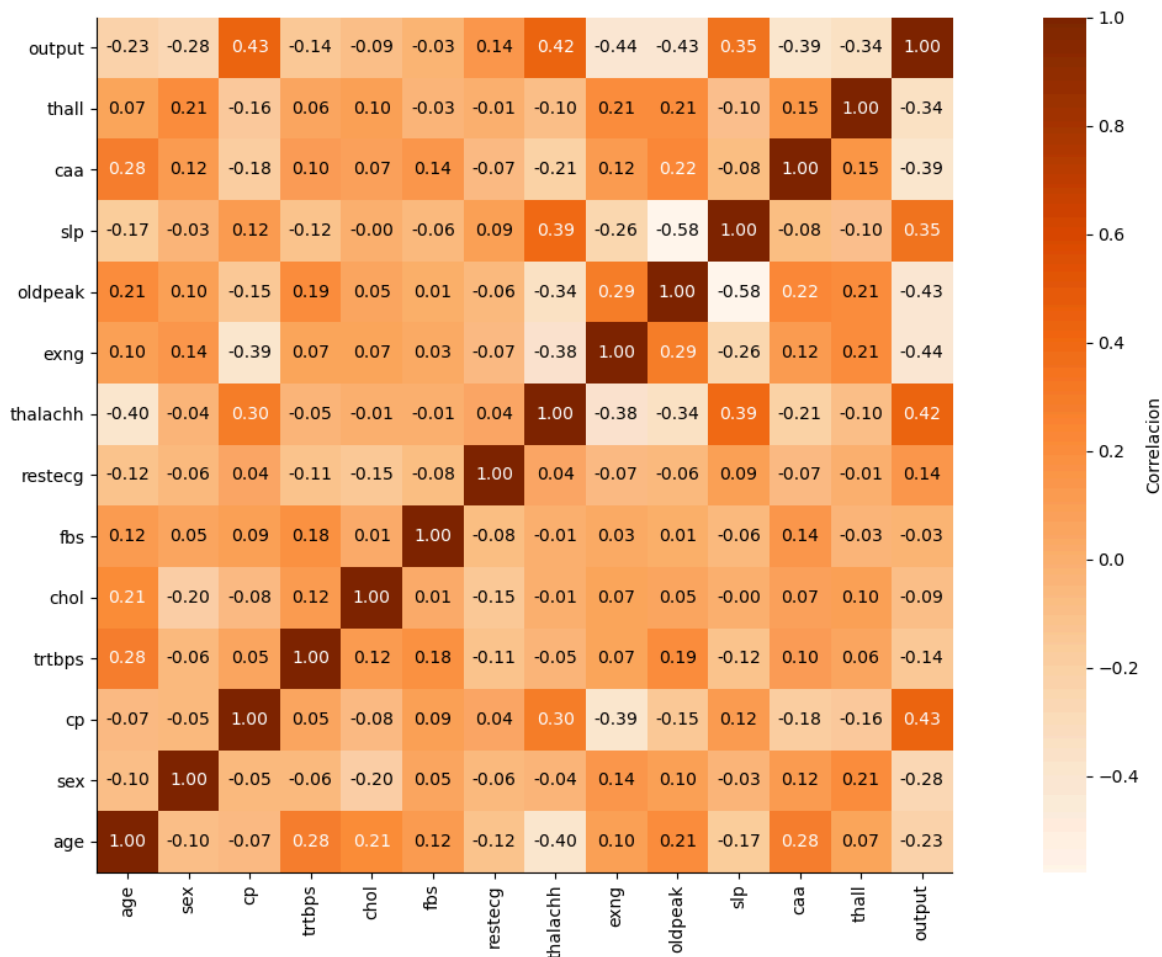
```
Out[69]: age      0
sex      0
cp       0
trtbps   0
chol     0
fbs      0
restecg  0
thalachh 0
exng     0
oldpeak  0
slp      0
caa      0
thall    0
output   0
dtype: int64
```

## MATRIZ\_DE\_CORRELACION

```
In [70]: corr_matrix= heart_df.corr()
corr_matrix
```

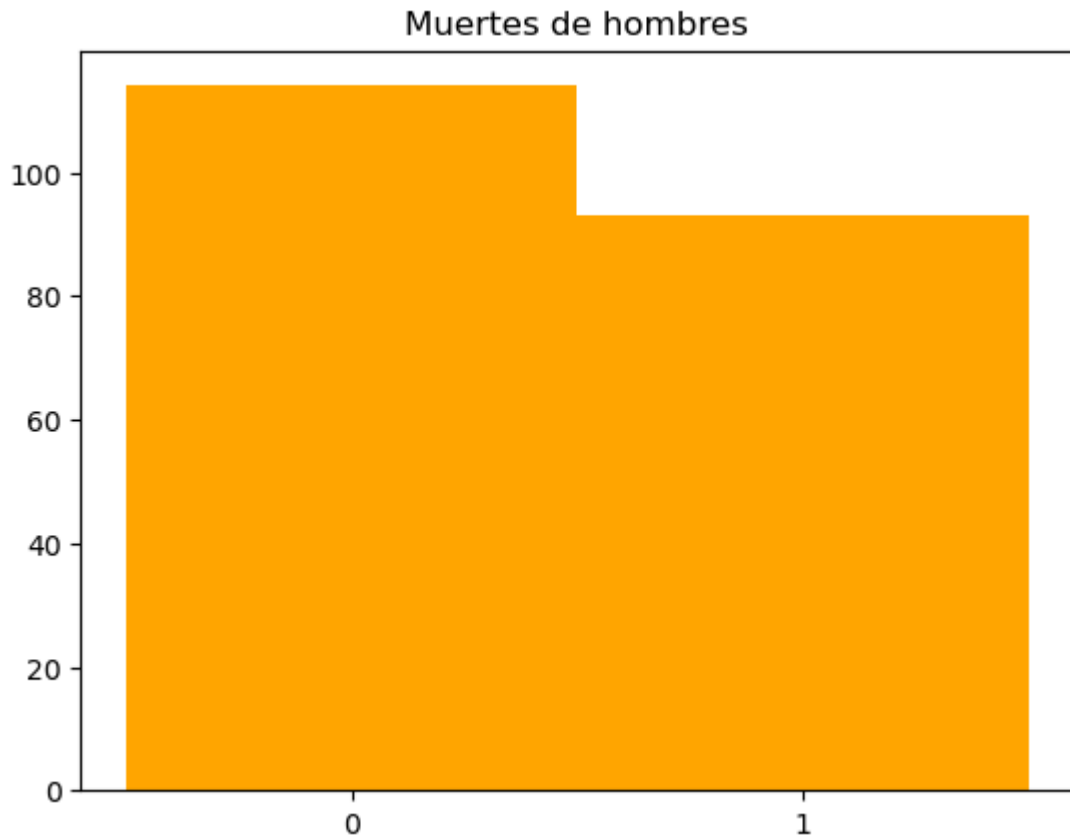
Out[70]:

	age	sex	cp	trtbps	chol	fbs	restecg	tl
<b>age</b>	1.000000	-0.098447	-0.068653	0.279351	0.213678	0.121308	-0.116211	-0.
<b>sex</b>	-0.098447	1.000000	-0.049353	-0.056769	-0.197912	0.045032	-0.058196	-0.
<b>cp</b>	-0.068653	-0.049353	1.000000	0.047608	-0.076904	0.094444	0.044421	0.
<b>trtbps</b>	0.279351	-0.056769	0.047608	1.000000	0.123174	0.177531	-0.114103	-0.
<b>chol</b>	0.213678	-0.197912	-0.076904	0.123174	1.000000	0.013294	-0.151040	-0.
<b>fbs</b>	0.121308	0.045032	0.094444	0.177531	0.013294	1.000000	-0.084189	-0.
<b>restecg</b>	-0.116211	-0.058196	0.044421	-0.114103	-0.151040	-0.084189	1.000000	0.
<b>thalachh</b>	-0.398522	-0.044020	0.295762	-0.046698	-0.009940	-0.008567	0.044123	1.
<b>exng</b>	0.096801	0.141664	-0.394280	0.067616	0.067023	0.025665	-0.070733	-0.
<b>oldpeak</b>	0.210013	0.096093	-0.149230	0.193216	0.053952	0.005747	-0.058770	-0.
<b>slp</b>	-0.168814	-0.030711	0.119717	-0.121475	-0.004038	-0.059894	0.093045	0.
<b>caa</b>	0.276326	0.118261	-0.181053	0.101389	0.070511	0.137979	-0.072042	-0.
<b>thall</b>	0.068001	0.210041	-0.161736	0.062210	0.098803	-0.032019	-0.011981	-0.
<b>output</b>	-0.225439	-0.280937	0.433798	-0.144931	-0.085239	-0.028046	0.137230	0.

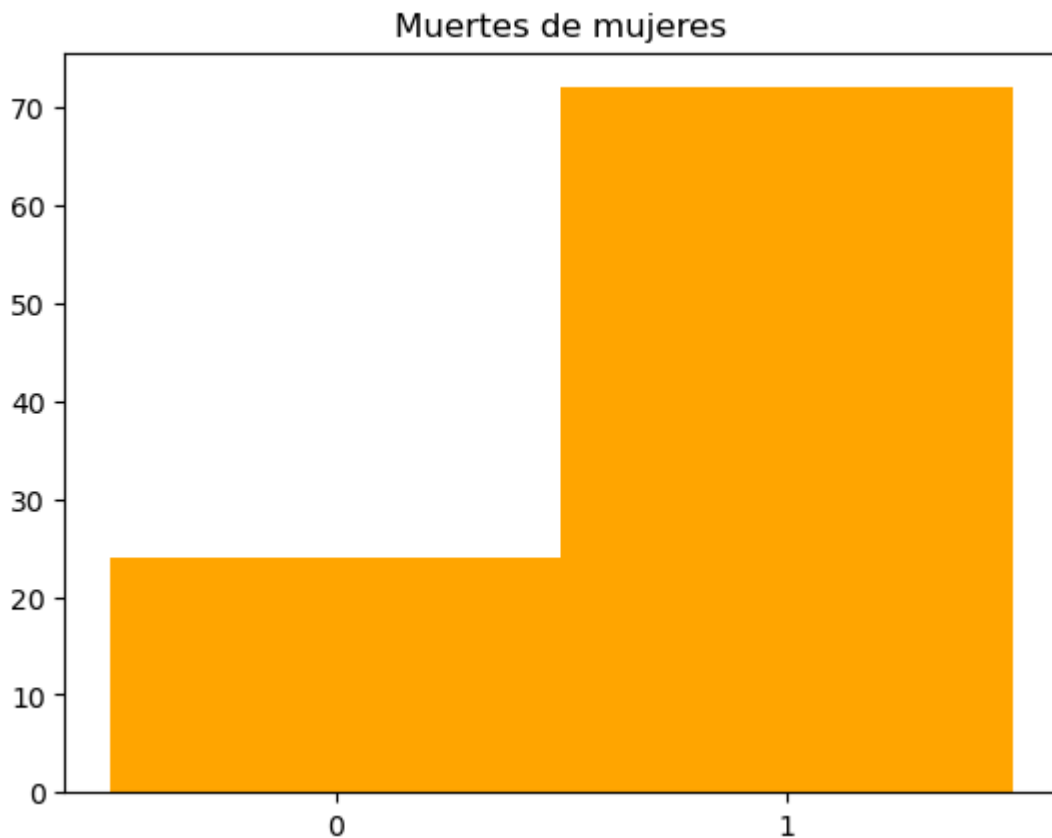
In [71]: `mapa_calor(corr_matrix)`

```
In [72]: h = heart_df[heart_df['sex']==1]
m = heart_df[heart_df['sex']==0]
```

```
In [73]: plt.hist(h['output'], bins=[-0.5, 0.5, 1.5],color='orange')
plt.xticks([0, 1])
plt.title('Muertes de hombres')
plt.show()
```



```
In [74]: plt.hist(m['output'], bins=[-0.5, 0.5, 1.5],color='orange')
plt.xticks([0, 1])
plt.title('Muertes de mujeres')
plt.show()
```



```
In [75]: heart_df = heart_df.drop(['chol', 'fbs'], axis=1)
```

## ENTRENAMIENTO

```
In [86]: from sklearn.model_selection import train_test_split

def train(pd):
    pd = pd.copy()
    y = pd["output"].copy()
    x = pd.drop(['output'], axis=1)

    x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.25)

    print(f'({len(x_train)+len(y_train)}), ({len(x_test)+len(y_test)})')

    return x_train, y_train, x_test, y_test

x_train, y_train, x_test, y_test = train(heart_df)
```

(454, 152)

```
In [92]: from sklearn.discriminant_analysis import StandardScaler

ss = StandardScaler()
x_train = ss.fit_transform(x_train)
x_test = ss.transform(x_test)
```

```
In [95]: import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
```



```

import tensorflow as tf
from tensorflow import keras
from keras.datasets import mnist
from keras.models import Sequential
from keras.layers import Dense
from keras.optimizers import SGD
dimension_entrada = x_train.shape[1]
dimension_salida = 1
modelo = Sequential()
modelo.add(Dense(20, input_dim=dimension_entrada, activation="relu"))
# modelo.add(Input(shape=dimension_entrada))
# modelo.add(Dense(20, activation="relu"))
modelo.add(Dense(1, activation="sigmoid"))
sgd=SGD(learning_rate=0.001)
modelo.compile(loss="binary_crossentropy", optimizer=sgd,
               metrics=["accuracy", "recall", "precision"])
modelo.summary()

```

Model: "sequential\_10"

Layer (type)	Output Shape	
dense_20 (Dense)	(None, 20)	
dense_21 (Dense)	(None, 1)	



Total params: 261 (1.02 KB)


Trainable params: 261 (1.02 KB)


Non-trainable params: 0 (0.00 B)


```


In [96]: epochs = 1000
batch_size = 20
early_stopping_cb= keras.callbacks.EarlyStopping(patience=5, restore_best_weights=True)
historia = modelo.fit(x_train, y_train, epochs=epochs,
                     batch_size = batch_size, validation_data=(x_test,y_test), callbacks=[early_stopping_cb])


```


Epoch 1/1000  
12/12  1s 26ms/step - accuracy: 0.2912 - loss: 1.1874 - precision: 0.0464 - recall: 0.0151 - val\_accuracy: 0.4211 - val\_loss: 1.1170 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 2/1000  
12/12  0s 3ms/step - accuracy: 0.3167 - loss: 1.1466 - precision: 0.0551 - recall: 0.0150 - val\_accuracy: 0.4211 - val\_loss: 1.1086 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 3/1000  
12/12  0s 3ms/step - accuracy: 0.3044 - loss: 1.1601 - precision: 0.0485 - recall: 0.0143 - val\_accuracy: 0.4211 - val\_loss: 1.0998 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 4/1000  
12/12  0s 3ms/step - accuracy: 0.3077 - loss: 1.1564 - precision: 0.1136 - recall: 0.0455 - val\_accuracy: 0.4211 - val\_loss: 1.0914 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 5/1000  
12/12  0s 3ms/step - accuracy: 0.3012 - loss: 1.1211 - precision: 0.0633 - recall: 0.0192 - val\_accuracy: 0.4211 - val\_loss: 1.0835 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 6/1000  
12/12  0s 3ms/step - accuracy: 0.2797 - loss: 1.1407 - precision: 0.0591 - recall: 0.0162 - val\_accuracy: 0.4211 - val\_loss: 1.0753 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 7/1000  
12/12  0s 3ms/step - accuracy: 0.2990 - loss: 1.1477 - precision: 0.0521 - recall: 0.0134 - val\_accuracy: 0.4211 - val\_loss: 1.0674 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 8/1000  
12/12  0s 3ms/step - accuracy: 0.2952 - loss: 1.1178 - precision: 0.0277 - recall: 0.0075 - val\_accuracy: 0.4211 - val\_loss: 1.0599 - val\_precision: 0.1818 - val\_recall: 0.0541


Epoch 9/1000  
12/12  0s 3ms/step - accuracy: 0.3383 - loss: 1.1018 - precision: 0.0428 - recall: 0.0111 - val\_accuracy: 0.4342 - val\_loss: 1.0525 - val\_precision: 0.2000 - val\_recall: 0.0541


Epoch 10/1000  
12/12  0s 3ms/step - accuracy: 0.3229 - loss: 1.0383 - precision: 0.0119 - recall: 0.0030 - val\_accuracy: 0.4342 - val\_loss: 1.0450 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 11/1000  
12/12  0s 3ms/step - accuracy: 0.2936 - loss: 1.1360 - precision: 0.0726 - recall: 0.0183 - val\_accuracy: 0.4342 - val\_loss: 1.0378 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 12/1000  
12/12  0s 3ms/step - accuracy: 0.2895 - loss: 1.1403 - precision: 0.0768 - recall: 0.0168 - val\_accuracy: 0.4342 - val\_loss: 1.0304 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 13/1000  
12/12  0s 3ms/step - accuracy: 0.3314 - loss: 1.0813 - precision: 0.1404 - recall: 0.0317 - val\_accuracy: 0.4342 - val\_loss: 1.0235 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 14/1000  
12/12  0s 3ms/step - accuracy: 0.3335 - loss: 1.0340 - precision: 0.0572 - recall: 0.0171 - val\_accuracy: 0.4342 - val\_loss: 1.0167 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 15/1000  
12/12  0s 4ms/step - accuracy: 0.3315 - loss: 1.0103 - precision: 0.0817 - recall: 0.0269 - val\_accuracy: 0.4342 - val\_loss: 1.0096 - val\_precision: 0.2000 - val\_recall: 0.0541

Epoch 16/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3235 - loss: 1.0424 - precision: 0.1026 - recall: 0.0248 - val\_accuracy: 0.4342 - val\_loss: 1.0028 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 17/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3089 - loss: 1.0485 - precision: 0.0804 - recall: 0.0223 - val\_accuracy: 0.4342 - val\_loss: 0.9966 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 18/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3054 - loss: 1.0605 - precision: 0.0943 - recall: 0.0255 - val\_accuracy: 0.4342 - val\_loss: 0.9903 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 19/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3463 - loss: 0.9782 - precision: 0.1036 - recall: 0.0327 - val\_accuracy: 0.4342 - val\_loss: 0.9838 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 20/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3240 - loss: 1.0142 - precision: 0.1150 - recall: 0.0318 - val\_accuracy: 0.4342 - val\_loss: 0.9775 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 21/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3556 - loss: 0.9944 - precision: 0.1248 - recall: 0.0358 - val\_accuracy: 0.4342 - val\_loss: 0.9715 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 22/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3121 - loss: 1.0131 - precision: 0.1464 - recall: 0.0342 - val\_accuracy: 0.4342 - val\_loss: 0.9652 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 23/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3853 - loss: 0.9592 - precision: 0.1475 - recall: 0.0458 - val\_accuracy: 0.4342 - val\_loss: 0.9594 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 24/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3604 - loss: 0.9616 - precision: 0.1275 - recall: 0.0272 - val\_accuracy: 0.4342 - val\_loss: 0.9537 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 25/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3251 - loss: 0.9901 - precision: 0.1123 - recall: 0.0252 - val\_accuracy: 0.4474 - val\_loss: 0.9481 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 26/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3508 - loss: 0.9958 - precision: 0.0662 - recall: 0.0139 - val\_accuracy: 0.4474 - val\_loss: 0.9424 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 27/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3464 - loss: 0.9471 - precision: 0.1291 - recall: 0.0314 - val\_accuracy: 0.4474 - val\_loss: 0.9369 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 28/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3403 - loss: 1.0110 - precision: 0.1022 - recall: 0.0214 - val\_accuracy: 0.4474 - val\_loss: 0.9314 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 29/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3512 - loss: 0.9410 - precision: 0.1004 - recall: 0.0219 - val\_accuracy: 0.4474 - val\_loss: 0.9259 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 30/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3379 - loss: 0.9595 - precision: 0.0878 - recall: 0.0203 - val\_accuracy: 0.4474 - val\_loss: 0.9209 - val\_precision: 0.2727 - val\_recall: 0.0811

Epoch 31/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3386 - loss: 0.9958 - precision: 0.1202 - recall: 0.0252 - val\_accuracy: 0.4342 - val\_loss: 0.9156 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 32/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3390 - loss: 0.9330 - precision: 0.1600 - recall: 0.0286 - val\_accuracy: 0.4342 - val\_loss: 0.9106 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 33/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3190 - loss: 0.9705 - precision: 0.0927 - recall: 0.0194 - val\_accuracy: 0.4342 - val\_loss: 0.9054 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 34/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3535 - loss: 0.9342 - precision: 0.1487 - recall: 0.0328 - val\_accuracy: 0.4342 - val\_loss: 0.9005 - val\_precision: 0.2000 - val\_recall: 0.0541  
Epoch 35/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.3392 - loss: 0.9359 - precision: 0.1190 - recall: 0.0236 - val\_accuracy: 0.4474 - val\_loss: 0.8957 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 36/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3655 - loss: 0.8882 - precision: 0.1344 - recall: 0.0304 - val\_accuracy: 0.4474 - val\_loss: 0.8907 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 37/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3805 - loss: 0.8720 - precision: 0.1726 - recall: 0.0383 - val\_accuracy: 0.4474 - val\_loss: 0.8860 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 38/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3614 - loss: 0.9263 - precision: 0.2017 - recall: 0.0442 - val\_accuracy: 0.4474 - val\_loss: 0.8813 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 39/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3684 - loss: 0.8778 - precision: 0.1542 - recall: 0.0334 - val\_accuracy: 0.4474 - val\_loss: 0.8770 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 40/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4073 - loss: 0.8517 - precision: 0.3171 - recall: 0.0828 - val\_accuracy: 0.4474 - val\_loss: 0.8723 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 41/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3849 - loss: 0.8495 - precision: 0.1859 - recall: 0.0570 - val\_accuracy: 0.4474 - val\_loss: 0.8679 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 42/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3527 - loss: 0.9293 - precision: 0.2799 - recall: 0.0583 - val\_accuracy: 0.4474 - val\_loss: 0.8635 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 43/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3681 - loss: 0.8732 - precision: 0.2145 - recall: 0.0514 - val\_accuracy: 0.4474 - val\_loss: 0.8591 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 44/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3467 - loss: 0.8897 - precision: 0.1674 - recall: 0.0399 - val\_accuracy: 0.4474 - val\_loss: 0.8550 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 45/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4296 - loss: 0.8019 - precision: 0.2985 - recall: 0.0963 - val\_accuracy: 0.4474 - val\_loss: 0.8509 - val\_precision: 0.2727 - val\_recall: 0.0811

Epoch 46/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3963 - loss: 0.8362 - precision: 0.3737 - recall: 0.1067 - val\_accuracy: 0.4474 - val\_loss: 0.8465 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 47/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3819 - loss: 0.8506 - precision: 0.2589 - recall: 0.0585 - val\_accuracy: 0.4474 - val\_loss: 0.8424 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 48/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3824 - loss: 0.8599 - precision: 0.3482 - recall: 0.0952 - val\_accuracy: 0.4474 - val\_loss: 0.8385 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 49/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3588 - loss: 0.8614 - precision: 0.3010 - recall: 0.0846 - val\_accuracy: 0.4474 - val\_loss: 0.8344 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 50/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3673 - loss: 0.8561 - precision: 0.3153 - recall: 0.0810 - val\_accuracy: 0.4474 - val\_loss: 0.8305 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 51/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3914 - loss: 0.8405 - precision: 0.3256 - recall: 0.0750 - val\_accuracy: 0.4474 - val\_loss: 0.8269 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 52/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.3666 - loss: 0.8384 - precision: 0.2885 - recall: 0.0620 - val\_accuracy: 0.4474 - val\_loss: 0.8230 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 53/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3532 - loss: 0.8720 - precision: 0.3046 - recall: 0.0747 - val\_accuracy: 0.4474 - val\_loss: 0.8193 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 54/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3392 - loss: 0.8407 - precision: 0.2648 - recall: 0.0871 - val\_accuracy: 0.4474 - val\_loss: 0.8158 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 55/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3522 - loss: 0.8441 - precision: 0.3003 - recall: 0.0654 - val\_accuracy: 0.4474 - val\_loss: 0.8122 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 56/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4124 - loss: 0.8113 - precision: 0.3096 - recall: 0.0880 - val\_accuracy: 0.4474 - val\_loss: 0.8088 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 57/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4532 - loss: 0.7747 - precision: 0.4229 - recall: 0.0981 - val\_accuracy: 0.4474 - val\_loss: 0.8053 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 58/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4187 - loss: 0.7890 - precision: 0.3637 - recall: 0.0942 - val\_accuracy: 0.4474 - val\_loss: 0.8019 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 59/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4022 - loss: 0.8081 - precision: 0.2928 - recall: 0.0724 - val\_accuracy: 0.4474 - val\_loss: 0.7985 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 60/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3693 - loss: 0.8177 - precision: 0.2562 - recall: 0.0695 - val\_accuracy: 0.4474 - val\_loss: 0.7951 - val\_precision: 0.2727 - val\_recall: 0.0811

Epoch 61/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4109 - loss: 0.7923 - precision: 0.3378 - recall: 0.0861 - val\_accuracy: 0.4474 - val\_loss: 0.7919 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 62/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3523 - loss: 0.8091 - precision: 0.1947 - recall: 0.0517 - val\_accuracy: 0.4474 - val\_loss: 0.7887 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 63/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4101 - loss: 0.7837 - precision: 0.2920 - recall: 0.0850 - val\_accuracy: 0.4474 - val\_loss: 0.7855 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 64/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.3504 - loss: 0.8051 - precision: 0.3204 - recall: 0.0805 - val\_accuracy: 0.4474 - val\_loss: 0.7822 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 65/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4220 - loss: 0.7909 - precision: 0.4223 - recall: 0.1337 - val\_accuracy: 0.4474 - val\_loss: 0.7791 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 66/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4126 - loss: 0.7787 - precision: 0.2918 - recall: 0.0734 - val\_accuracy: 0.4474 - val\_loss: 0.7760 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 67/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4083 - loss: 0.7815 - precision: 0.3738 - recall: 0.1143 - val\_accuracy: 0.4474 - val\_loss: 0.7729 - val\_precision: 0.2727 - val\_recall: 0.0811  
Epoch 68/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4668 - loss: 0.7556 - precision: 0.5473 - recall: 0.1526 - val\_accuracy: 0.4605 - val\_loss: 0.7698 - val\_precision: 0.3333 - val\_recall: 0.1081  
Epoch 69/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4055 - loss: 0.7985 - precision: 0.5302 - recall: 0.1335 - val\_accuracy: 0.4737 - val\_loss: 0.7668 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 70/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3652 - loss: 0.7927 - precision: 0.4460 - recall: 0.1206 - val\_accuracy: 0.4737 - val\_loss: 0.7638 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 71/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4127 - loss: 0.7845 - precision: 0.4938 - recall: 0.1228 - val\_accuracy: 0.4737 - val\_loss: 0.7608 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 72/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.3623 - loss: 0.8042 - precision: 0.4289 - recall: 0.1152 - val\_accuracy: 0.4737 - val\_loss: 0.7580 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 73/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4742 - loss: 0.7534 - precision: 0.6160 - recall: 0.1644 - val\_accuracy: 0.4737 - val\_loss: 0.7550 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 74/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4571 - loss: 0.7455 - precision: 0.6406 - recall: 0.2121 - val\_accuracy: 0.4737 - val\_loss: 0.7522 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 75/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4753 - loss: 0.7340 - precision: 0.5133 - recall: 0.1285 - val\_accuracy: 0.4737 - val\_loss: 0.7494 - val\_precision: 0.3636 - val\_recall: 0.1081



Epoch 76/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4907 - loss: 0.7221 - precision: 0.6296 - recall: 0.1867 - val\_accuracy: 0.4737 - val\_loss: 0.7466 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 77/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4509 - loss: 0.7680 - precision: 0.4882 - recall: 0.1623 - val\_accuracy: 0.4737 - val\_loss: 0.7439 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 78/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5095 - loss: 0.7310 - precision: 0.5918 - recall: 0.2036 - val\_accuracy: 0.4737 - val\_loss: 0.7412 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 79/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4322 - loss: 0.7627 - precision: 0.5419 - recall: 0.1808 - val\_accuracy: 0.4737 - val\_loss: 0.7384 - val\_precision: 0.3636 - val\_recall: 0.1081  
Epoch 80/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4403 - loss: 0.7565 - precision: 0.5443 - recall: 0.1502 - val\_accuracy: 0.5000 - val\_loss: 0.7357 - val\_precision: 0.4545 - val\_recall: 0.1351  
Epoch 81/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5045 - loss: 0.7328 - precision: 0.6404 - recall: 0.2133 - val\_accuracy: 0.5000 - val\_loss: 0.7330 - val\_precision: 0.4545 - val\_recall: 0.1351  
Epoch 82/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4758 - loss: 0.7468 - precision: 0.6365 - recall: 0.2144 - val\_accuracy: 0.5000 - val\_loss: 0.7304 - val\_precision: 0.4545 - val\_recall: 0.1351  
Epoch 83/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5036 - loss: 0.7497 - precision: 0.7181 - recall: 0.1893 - val\_accuracy: 0.5000 - val\_loss: 0.7279 - val\_precision: 0.4545 - val\_recall: 0.1351  
Epoch 84/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5509 - loss: 0.7006 - precision: 0.6791 - recall: 0.2945 - val\_accuracy: 0.5263 - val\_loss: 0.7253 - val\_precision: 0.5556 - val\_recall: 0.1351  
Epoch 85/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.4718 - loss: 0.7477 - precision: 0.6248 - recall: 0.2080 - val\_accuracy: 0.5263 - val\_loss: 0.7227 - val\_precision: 0.5556 - val\_recall: 0.1351  
Epoch 86/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4676 - loss: 0.7454 - precision: 0.6588 - recall: 0.2088 - val\_accuracy: 0.5395 - val\_loss: 0.7202 - val\_precision: 0.6250 - val\_recall: 0.1351  
Epoch 87/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.4920 - loss: 0.7324 - precision: 0.6876 - recall: 0.2498 - val\_accuracy: 0.5526 - val\_loss: 0.7178 - val\_precision: 0.7143 - val\_recall: 0.1351  
Epoch 88/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4845 - loss: 0.7061 - precision: 0.5837 - recall: 0.2020 - val\_accuracy: 0.5526 - val\_loss: 0.7153 - val\_precision: 0.7143 - val\_recall: 0.1351  
Epoch 89/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4711 - loss: 0.7353 - precision: 0.7030 - recall: 0.2094 - val\_accuracy: 0.5658 - val\_loss: 0.7129 - val\_precision: 0.7500 - val\_recall: 0.1622  
Epoch 90/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5036 - loss: 0.7171 - precision: 0.7113 - recall: 0.2202 - val\_accuracy: 0.5789 - val\_loss: 0.7105 - val\_precision: 0.8571 - val\_recall: 0.1622


Epoch 91/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5181 - loss: 0.7034 - precision: 0.7349 - recall: 0.2115 - val\_accuracy: 0.5921 - val\_loss: 0.7081 - val\_precision: 0.8750 - val\_recall: 0.1892  
Epoch 92/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.4599 - loss: 0.7281 - precision: 0.6386 - recall: 0.1962 - val\_accuracy: 0.5921 - val\_loss: 0.7057 - val\_precision: 0.8750 - val\_recall: 0.1892  
Epoch 93/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5313 - loss: 0.7218 - precision: 0.7866 - recall: 0.2614 - val\_accuracy: 0.5921 - val\_loss: 0.7035 - val\_precision: 0.8750 - val\_recall: 0.1892  
Epoch 94/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5325 - loss: 0.7112 - precision: 0.8210 - recall: 0.2434 - val\_accuracy: 0.6053 - val\_loss: 0.7012 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 95/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5271 - loss: 0.6943 - precision: 0.7538 - recall: 0.2537 - val\_accuracy: 0.6053 - val\_loss: 0.6988 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 96/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5432 - loss: 0.6944 - precision: 0.7801 - recall: 0.2618 - val\_accuracy: 0.6053 - val\_loss: 0.6966 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 97/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5276 - loss: 0.6880 - precision: 0.7096 - recall: 0.2475 - val\_accuracy: 0.6053 - val\_loss: 0.6943 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 98/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.5282 - loss: 0.6888 - precision: 0.7409 - recall: 0.2465 - val\_accuracy: 0.6053 - val\_loss: 0.6921 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 99/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5294 - loss: 0.6909 - precision: 0.7495 - recall: 0.2635 - val\_accuracy: 0.6053 - val\_loss: 0.6900 - val\_precision: 0.8889 - val\_recall: 0.2162  
Epoch 100/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5166 - loss: 0.7147 - precision: 0.7629 - recall: 0.2598 - val\_accuracy: 0.6184 - val\_loss: 0.6877 - val\_precision: 0.9000 - val\_recall: 0.2432  
Epoch 101/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5372 - loss: 0.6842 - precision: 0.7014 - recall: 0.2850 - val\_accuracy: 0.6316 - val\_loss: 0.6856 - val\_precision: 0.9091 - val\_recall: 0.2703  
Epoch 102/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5790 - loss: 0.6794 - precision: 0.8104 - recall: 0.3213 - val\_accuracy: 0.6316 - val\_loss: 0.6835 - val\_precision: 0.9091 - val\_recall: 0.2703  
Epoch 103/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5223 - loss: 0.7110 - precision: 0.7907 - recall: 0.2859 - val\_accuracy: 0.6316 - val\_loss: 0.6814 - val\_precision: 0.9091 - val\_recall: 0.2703  
Epoch 104/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.5467 - loss: 0.6879 - precision: 0.8202 - recall: 0.2923 - val\_accuracy: 0.6184 - val\_loss: 0.6793 - val\_precision: 0.8333 - val\_recall: 0.2703  
Epoch 105/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.6010 - loss: 0.6700 - precision: 0.8179 - recall: 0.3782 - val\_accuracy: 0.6184 - val\_loss: 0.6773 - val\_precision: 0.8333 - val\_recall: 0.2703




Epoch 106/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5856 - loss: 0.6699 - precision: 0.7838 - recall: 0.3536 - val\_accuracy: 0.6053 - val\_loss: 0.6752 - val\_precision: 0.7692 - val\_recall: 0.2703  
Epoch 107/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5559 - loss: 0.6875 - precision: 0.7510 - recall: 0.3087 - val\_accuracy: 0.6184 - val\_loss: 0.6732 - val\_precision: 0.7857 - val\_recall: 0.2973  
Epoch 108/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5847 - loss: 0.6513 - precision: 0.6648 - recall: 0.2934 - val\_accuracy: 0.6316 - val\_loss: 0.6712 - val\_precision: 0.8000 - val\_recall: 0.3243  
Epoch 109/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5835 - loss: 0.6563 - precision: 0.8067 - recall: 0.3363 - val\_accuracy: 0.6316 - val\_loss: 0.6692 - val\_precision: 0.8000 - val\_recall: 0.3243  
Epoch 110/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.6111 - loss: 0.6618 - precision: 0.8575 - recall: 0.3353 - val\_accuracy: 0.6447 - val\_loss: 0.6672 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 111/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5657 - loss: 0.6702 - precision: 0.7876 - recall: 0.3568 - val\_accuracy: 0.6447 - val\_loss: 0.6652 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 112/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.5748 - loss: 0.6601 - precision: 0.7096 - recall: 0.2884 - val\_accuracy: 0.6447 - val\_loss: 0.6633 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 113/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5988 - loss: 0.6512 - precision: 0.7863 - recall: 0.3792 - val\_accuracy: 0.6447 - val\_loss: 0.6615 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 114/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5757 - loss: 0.6860 - precision: 0.8191 - recall: 0.3730 - val\_accuracy: 0.6447 - val\_loss: 0.6596 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 115/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.5914 - loss: 0.6650 - precision: 0.8282 - recall: 0.3614 - val\_accuracy: 0.6447 - val\_loss: 0.6577 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 116/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5614 - loss: 0.6805 - precision: 0.7679 - recall: 0.3518 - val\_accuracy: 0.6447 - val\_loss: 0.6558 - val\_precision: 0.8125 - val\_recall: 0.3514  
Epoch 117/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.6065 - loss: 0.6608 - precision: 0.8334 - recall: 0.4027 - val\_accuracy: 0.6579 - val\_loss: 0.6540 - val\_precision: 0.8235 - val\_recall: 0.3784  
Epoch 118/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6325 - loss: 0.6510 - precision: 0.8586 - recall: 0.4035 - val\_accuracy: 0.6711 - val\_loss: 0.6521 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 119/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.5871 - loss: 0.6660 - precision: 0.7934 - recall: 0.3552 - val\_accuracy: 0.6711 - val\_loss: 0.6504 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 120/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.6212 - loss: 0.6542 - precision: 0.9106 - recall: 0.4310 - val\_accuracy: 0.6711 - val\_loss: 0.6486 - val\_precision: 0.8750 - val\_recall: 0.3784

Epoch 121/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.6235 - loss: 0.6384 - precision: 0.8713 - recall: 0.3962 - val\_accuracy: 0.6711 - val\_loss: 0.6469 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 122/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.6396 - loss: 0.6496 - precision: 0.8680 - recall: 0.4497 - val\_accuracy: 0.6711 - val\_loss: 0.6451 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 123/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.6315 - loss: 0.6669 - precision: 0.8449 - recall: 0.4461 - val\_accuracy: 0.6711 - val\_loss: 0.6434 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 124/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.6367 - loss: 0.6437 - precision: 0.7998 - recall: 0.4028 - val\_accuracy: 0.6711 - val\_loss: 0.6417 - val\_precision: 0.8750 - val\_recall: 0.3784  
Epoch 125/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6730 - loss: 0.6363 - precision: 0.8888 - recall: 0.4851 - val\_accuracy: 0.6842 - val\_loss: 0.6400 - val\_precision: 0.8824 - val\_recall: 0.4054  
Epoch 126/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6808 - loss: 0.6311 - precision: 0.9116 - recall: 0.4766 - val\_accuracy: 0.6842 - val\_loss: 0.6382 - val\_precision: 0.8824 - val\_recall: 0.4054  
Epoch 127/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6542 - loss: 0.6463 - precision: 0.8162 - recall: 0.4823 - val\_accuracy: 0.7105 - val\_loss: 0.6365 - val\_precision: 0.8947 - val\_recall: 0.4595  
Epoch 128/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6725 - loss: 0.6469 - precision: 0.8804 - recall: 0.5221 - val\_accuracy: 0.7105 - val\_loss: 0.6348 - val\_precision: 0.8947 - val\_recall: 0.4595  
Epoch 129/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6018 - loss: 0.6587 - precision: 0.8324 - recall: 0.4018 - val\_accuracy: 0.7237 - val\_loss: 0.6333 - val\_precision: 0.9000 - val\_recall: 0.4865  
Epoch 130/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6554 - loss: 0.6349 - precision: 0.8326 - recall: 0.4988 - val\_accuracy: 0.7237 - val\_loss: 0.6316 - val\_precision: 0.9000 - val\_recall: 0.4865  
Epoch 131/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6651 - loss: 0.6146 - precision: 0.8242 - recall: 0.5073 - val\_accuracy: 0.7237 - val\_loss: 0.6300 - val\_precision: 0.9000 - val\_recall: 0.4865  
Epoch 132/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6765 - loss: 0.6170 - precision: 0.8218 - recall: 0.5147 - val\_accuracy: 0.7368 - val\_loss: 0.6283 - val\_precision: 0.9048 - val\_recall: 0.5135  
Epoch 133/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7107 - loss: 0.6210 - precision: 0.8544 - recall: 0.5769 - val\_accuracy: 0.7368 - val\_loss: 0.6267 - val\_precision: 0.9048 - val\_recall: 0.5135  
Epoch 134/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6678 - loss: 0.6307 - precision: 0.8347 - recall: 0.5336 - val\_accuracy: 0.7368 - val\_loss: 0.6251 - val\_precision: 0.9048 - val\_recall: 0.5135  
Epoch 135/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6998 - loss: 0.6246 - precision: 0.8472 - recall: 0.5691 - val\_accuracy: 0.7368 - val\_loss: 0.6235 - val\_precision: 0.9048 - val\_recall: 0.5135


Epoch 136/1000

**12/12**  0s 3ms/step - accuracy: 0.6871 - loss: 0.6215 - precision: 0.8381 - recall: 0.5567 - val\_accuracy: 0.7368 - val\_loss: 0.6219 - val\_precision: 0.9048 - val\_recall: 0.5135


Epoch 137/1000

**12/12**  0s 3ms/step - accuracy: 0.7014 - loss: 0.6168 - precision: 0.8936 - recall: 0.5388 - val\_accuracy: 0.7500 - val\_loss: 0.6203 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 138/1000

**12/12**  0s 4ms/step - accuracy: 0.7262 - loss: 0.6188 - precision: 0.9132 - recall: 0.5771 - val\_accuracy: 0.7500 - val\_loss: 0.6187 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 139/1000

**12/12**  0s 3ms/step - accuracy: 0.6623 - loss: 0.6296 - precision: 0.8120 - recall: 0.4912 - val\_accuracy: 0.7500 - val\_loss: 0.6173 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 140/1000

**12/12**  0s 3ms/step - accuracy: 0.7504 - loss: 0.6018 - precision: 0.9016 - recall: 0.5845 - val\_accuracy: 0.7500 - val\_loss: 0.6157 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 141/1000

**12/12**  0s 3ms/step - accuracy: 0.7168 - loss: 0.6148 - precision: 0.8684 - recall: 0.5906 - val\_accuracy: 0.7500 - val\_loss: 0.6142 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 142/1000

**12/12**  0s 4ms/step - accuracy: 0.7054 - loss: 0.6084 - precision: 0.8593 - recall: 0.5743 - val\_accuracy: 0.7500 - val\_loss: 0.6128 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 143/1000

**12/12**  0s 3ms/step - accuracy: 0.7003 - loss: 0.5988 - precision: 0.8007 - recall: 0.5156 - val\_accuracy: 0.7500 - val\_loss: 0.6113 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 144/1000

**12/12**  0s 3ms/step - accuracy: 0.7236 - loss: 0.5955 - precision: 0.8950 - recall: 0.5585 - val\_accuracy: 0.7500 - val\_loss: 0.6098 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 145/1000

**12/12**  0s 4ms/step - accuracy: 0.6888 - loss: 0.6196 - precision: 0.8876 - recall: 0.5705 - val\_accuracy: 0.7500 - val\_loss: 0.6084 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 146/1000

**12/12**  0s 3ms/step - accuracy: 0.6893 - loss: 0.6112 - precision: 0.8588 - recall: 0.5006 - val\_accuracy: 0.7500 - val\_loss: 0.6070 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 147/1000

**12/12**  0s 3ms/step - accuracy: 0.6706 - loss: 0.6265 - precision: 0.8217 - recall: 0.5196 - val\_accuracy: 0.7500 - val\_loss: 0.6055 - val\_precision: 0.9091 - val\_recall: 0.5405


Epoch 148/1000

**12/12**  0s 3ms/step - accuracy: 0.6950 - loss: 0.6160 - precision: 0.8836 - recall: 0.5511 - val\_accuracy: 0.7500 - val\_loss: 0.6041 - val\_precision: 0.9091 - val\_recall: 0.5405

Epoch 149/1000


**12/12**  0s 3ms/step - accuracy: 0.7349 - loss: 0.5948 - precision: 0.8538 - recall: 0.5825 - val\_accuracy: 0.7500 - val\_loss: 0.6026 - val\_precision: 0.9091 - val\_recall: 0.5405

Epoch 150/1000


**12/12**  0s 3ms/step - accuracy: 0.7331 - loss: 0.6004 - precision: 0.8529 - recall: 0.6373 - val\_accuracy: 0.7632 - val\_loss: 0.6013 - val\_precision: 0.9130 - val\_recall: 0.5676

Epoch 151/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7269 - loss: 0.5933 - precision: 0.8584 - recall: 0.5899 - val\_accuracy: 0.7763 - val\_loss: 0.5998 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 152/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7119 - loss: 0.6006 - precision: 0.8747 - recall: 0.5875 - val\_accuracy: 0.7763 - val\_loss: 0.5985 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 153/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6944 - loss: 0.6078 - precision: 0.8463 - recall: 0.5544 - val\_accuracy: 0.7763 - val\_loss: 0.5972 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 154/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.7095 - loss: 0.5918 - precision: 0.8462 - recall: 0.5587 - val\_accuracy: 0.7763 - val\_loss: 0.5959 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 155/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.7331 - loss: 0.5883 - precision: 0.8921 - recall: 0.6086 - val\_accuracy: 0.7763 - val\_loss: 0.5946 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 156/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7141 - loss: 0.6054 - precision: 0.9001 - recall: 0.5761 - val\_accuracy: 0.7763 - val\_loss: 0.5932 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 157/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7435 - loss: 0.5962 - precision: 0.8770 - recall: 0.6361 - val\_accuracy: 0.7763 - val\_loss: 0.5919 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 158/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7326 - loss: 0.5952 - precision: 0.9005 - recall: 0.6066 - val\_accuracy: 0.7763 - val\_loss: 0.5906 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 159/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.6912 - loss: 0.6086 - precision: 0.8671 - recall: 0.5679 - val\_accuracy: 0.7763 - val\_loss: 0.5892 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 160/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7302 - loss: 0.5896 - precision: 0.8551 - recall: 0.6135 - val\_accuracy: 0.7763 - val\_loss: 0.5879 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 161/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7341 - loss: 0.5760 - precision: 0.8976 - recall: 0.6282 - val\_accuracy: 0.7763 - val\_loss: 0.5866 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 162/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7319 - loss: 0.5798 - precision: 0.8465 - recall: 0.6118 - val\_accuracy: 0.7763 - val\_loss: 0.5853 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 163/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7253 - loss: 0.5862 - precision: 0.8527 - recall: 0.6482 - val\_accuracy: 0.7763 - val\_loss: 0.5841 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 164/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7306 - loss: 0.5808 - precision: 0.8663 - recall: 0.6392 - val\_accuracy: 0.7763 - val\_loss: 0.5829 - val\_precision: 0.9167 - val\_recall: 0.5946  
Epoch 165/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.7443 - loss: 0.5832 - precision: 0.8866 - recall: 0.6332 - val\_accuracy: 0.7763 - val\_loss: 0.5816 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 166/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7452 - loss: 0.5873 - precision: 0.8967 - recall: 0.6421 - val\_accuracy: 0.7763 - val\_loss: 0.5804 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 167/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7373 - loss: 0.5853 - precision: 0.8603 - recall: 0.6512 - val\_accuracy: 0.7763 - val\_loss: 0.5791 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 168/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7794 - loss: 0.5700 - precision: 0.9141 - recall: 0.6798 - val\_accuracy: 0.7763 - val\_loss: 0.5779 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 169/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7648 - loss: 0.5693 - precision: 0.8825 - recall: 0.6745 - val\_accuracy: 0.7763 - val\_loss: 0.5766 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 170/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7364 - loss: 0.5740 - precision: 0.8674 - recall: 0.6254 - val\_accuracy: 0.7763 - val\_loss: 0.5755 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 171/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7662 - loss: 0.5592 - precision: 0.9325 - recall: 0.6286 - val\_accuracy: 0.7763 - val\_loss: 0.5742 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 172/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7398 - loss: 0.5723 - precision: 0.8939 - recall: 0.6412 - val\_accuracy: 0.7763 - val\_loss: 0.5730 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 173/1000

**12/12**  **0s** 3ms/step - accuracy: 0.6932 - loss: 0.5914 - precision: 0.8647 - recall: 0.5810 - val\_accuracy: 0.7763 - val\_loss: 0.5718 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 174/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7572 - loss: 0.5645 - precision: 0.8366 - recall: 0.6649 - val\_accuracy: 0.7763 - val\_loss: 0.5706 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 175/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7200 - loss: 0.5824 - precision: 0.8246 - recall: 0.6258 - val\_accuracy: 0.7763 - val\_loss: 0.5695 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 176/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7368 - loss: 0.5637 - precision: 0.8790 - recall: 0.6051 - val\_accuracy: 0.7763 - val\_loss: 0.5682 - val\_precision: 0.9167 - val\_recall: 0.5946


Epoch 177/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7188 - loss: 0.5843 - precision: 0.8632 - recall: 0.6312 - val\_accuracy: 0.7632 - val\_loss: 0.5670 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 178/1000

**12/12**  **0s** 2ms/step - accuracy: 0.7594 - loss: 0.5644 - precision: 0.8594 - recall: 0.6613 - val\_accuracy: 0.7632 - val\_loss: 0.5659 - val\_precision: 0.8800 - val\_recall: 0.5946

Epoch 179/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7387 - loss: 0.5795 - precision: 0.8963 - recall: 0.6307 - val\_accuracy: 0.7632 - val\_loss: 0.5647 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 180/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7595 - loss: 0.5650 - precision: 0.8953 - recall: 0.6577 - val\_accuracy: 0.7632 - val\_loss: 0.5636 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 181/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.7528 - loss: 0.5669 - precision: 0.8910 - recall: 0.6617 - val\_accuracy: 0.7632 - val\_loss: 0.5624 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 182/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7532 - loss: 0.5586 - precision: 0.8892 - recall: 0.6438 - val\_accuracy: 0.7632 - val\_loss: 0.5613 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 183/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7406 - loss: 0.5631 - precision: 0.8410 - recall: 0.6761 - val\_accuracy: 0.7632 - val\_loss: 0.5602 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 184/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.7669 - loss: 0.5648 - precision: 0.9279 - recall: 0.6513 - val\_accuracy: 0.7632 - val\_loss: 0.5591 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 185/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7464 - loss: 0.5662 - precision: 0.8874 - recall: 0.6615 - val\_accuracy: 0.7632 - val\_loss: 0.5580 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 186/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7792 - loss: 0.5443 - precision: 0.8879 - recall: 0.7080 - val\_accuracy: 0.7632 - val\_loss: 0.5569 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 187/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7625 - loss: 0.5559 - precision: 0.9022 - recall: 0.6460 - val\_accuracy: 0.7632 - val\_loss: 0.5558 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 188/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.7653 - loss: 0.5510 - precision: 0.8968 - recall: 0.6756 - val\_accuracy: 0.7632 - val\_loss: 0.5547 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 189/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7558 - loss: 0.5631 - precision: 0.9160 - recall: 0.6534 - val\_accuracy: 0.7632 - val\_loss: 0.5536 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 190/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7637 - loss: 0.5632 - precision: 0.8790 - recall: 0.6920 - val\_accuracy: 0.7632 - val\_loss: 0.5526 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 191/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7686 - loss: 0.5509 - precision: 0.8875 - recall: 0.6786 - val\_accuracy: 0.7632 - val\_loss: 0.5516 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 192/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7745 - loss: 0.5502 - precision: 0.9037 - recall: 0.6680 - val\_accuracy: 0.7632 - val\_loss: 0.5506 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 193/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7776 - loss: 0.5396 - precision: 0.8698 - recall: 0.6925 - val\_accuracy: 0.7632 - val\_loss: 0.5495 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 194/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7868 - loss: 0.5409 - precision: 0.8977 - recall: 0.7075 - val\_accuracy: 0.7632 - val\_loss: 0.5485 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 195/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7749 - loss: 0.5528 - precision: 0.8262 - recall: 0.7226 - val\_accuracy: 0.7632 - val\_loss: 0.5475 - val\_precision: 0.8800 - val\_recall: 0.5946




Epoch 196/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7822 - loss: 0.5517 - precision: 0.9093 - recall: 0.6879 - val\_accuracy: 0.7632 - val\_loss: 0.5464 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 197/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7451 - loss: 0.5485 - precision: 0.8556 - recall: 0.6641 - val\_accuracy: 0.7632 - val\_loss: 0.5454 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 198/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7513 - loss: 0.5529 - precision: 0.8451 - recall: 0.6487 - val\_accuracy: 0.7632 - val\_loss: 0.5444 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 199/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8007 - loss: 0.5263 - precision: 0.8463 - recall: 0.7707 - val\_accuracy: 0.7632 - val\_loss: 0.5434 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 200/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7816 - loss: 0.5388 - precision: 0.8962 - recall: 0.7179 - val\_accuracy: 0.7632 - val\_loss: 0.5424 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 201/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7854 - loss: 0.5372 - precision: 0.9201 - recall: 0.7098 - val\_accuracy: 0.7632 - val\_loss: 0.5414 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 202/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7785 - loss: 0.5472 - precision: 0.8997 - recall: 0.7110 - val\_accuracy: 0.7632 - val\_loss: 0.5404 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 203/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8152 - loss: 0.5353 - precision: 0.9007 - recall: 0.7475 - val\_accuracy: 0.7632 - val\_loss: 0.5394 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 204/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7636 - loss: 0.5537 - precision: 0.8551 - recall: 0.7218 - val\_accuracy: 0.7632 - val\_loss: 0.5384 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 205/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7532 - loss: 0.5490 - precision: 0.8038 - recall: 0.7312 - val\_accuracy: 0.7632 - val\_loss: 0.5375 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 206/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7807 - loss: 0.5404 - precision: 0.8659 - recall: 0.7032 - val\_accuracy: 0.7632 - val\_loss: 0.5365 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 207/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7866 - loss: 0.5495 - precision: 0.8721 - recall: 0.7250 - val\_accuracy: 0.7632 - val\_loss: 0.5355 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 208/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8000 - loss: 0.5382 - precision: 0.8925 - recall: 0.7307 - val\_accuracy: 0.7632 - val\_loss: 0.5346 - val\_precision: 0.8800 - val\_recall: 0.5946

Epoch 209/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7996 - loss: 0.5405 - precision: 0.8752 - recall: 0.7411 - val\_accuracy: 0.7632 - val\_loss: 0.5337 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 210/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8172 - loss: 0.5337 - precision: 0.9059 - recall: 0.7858 - val\_accuracy: 0.7632 - val\_loss: 0.5327 - val\_precision: 0.8800 - val\_recall: 0.5946


Epoch 211/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7948 - loss: 0.5464 - precision: 0.8747 - recall: 0.7335 - val\_accuracy: 0.7632 - val\_loss: 0.5318 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 212/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.8275 - loss: 0.5347 - precision: 0.9123 - recall: 0.7824 - val\_accuracy: 0.7632 - val\_loss: 0.5309 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 213/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7986 - loss: 0.5389 - precision: 0.8750 - recall: 0.7518 - val\_accuracy: 0.7632 - val\_loss: 0.5299 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 214/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8300 - loss: 0.5169 - precision: 0.8859 - recall: 0.8005 - val\_accuracy: 0.7632 - val\_loss: 0.5290 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 215/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8215 - loss: 0.5295 - precision: 0.8856 - recall: 0.7671 - val\_accuracy: 0.7632 - val\_loss: 0.5280 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 216/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8024 - loss: 0.5339 - precision: 0.8504 - recall: 0.7802 - val\_accuracy: 0.7632 - val\_loss: 0.5271 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 217/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8471 - loss: 0.5218 - precision: 0.9003 - recall: 0.8258 - val\_accuracy: 0.7632 - val\_loss: 0.5262 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 218/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8506 - loss: 0.5058 - precision: 0.9096 - recall: 0.8168 - val\_accuracy: 0.7632 - val\_loss: 0.5254 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 219/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8272 - loss: 0.5172 - precision: 0.8745 - recall: 0.8001 - val\_accuracy: 0.7632 - val\_loss: 0.5244 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 220/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8263 - loss: 0.5131 - precision: 0.8602 - recall: 0.8072 - val\_accuracy: 0.7632 - val\_loss: 0.5236 - val\_precision: 0.8800 - val\_recall: 0.5946  
Epoch 221/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8112 - loss: 0.5215 - precision: 0.8548 - recall: 0.7886 - val\_accuracy: 0.7763 - val\_loss: 0.5227 - val\_precision: 0.8846 - val\_recall: 0.6216  
Epoch 222/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8100 - loss: 0.5239 - precision: 0.8757 - recall: 0.7624 - val\_accuracy: 0.7763 - val\_loss: 0.5218 - val\_precision: 0.8846 - val\_recall: 0.6216  
Epoch 223/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8234 - loss: 0.5178 - precision: 0.8950 - recall: 0.7813 - val\_accuracy: 0.7632 - val\_loss: 0.5210 - val\_precision: 0.8519 - val\_recall: 0.6216  
Epoch 224/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8128 - loss: 0.5142 - precision: 0.8803 - recall: 0.7655 - val\_accuracy: 0.7632 - val\_loss: 0.5201 - val\_precision: 0.8519 - val\_recall: 0.6216  
Epoch 225/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8114 - loss: 0.5272 - precision: 0.8737 - recall: 0.7809 - val\_accuracy: 0.7632 - val\_loss: 0.5193 - val\_precision: 0.8519 - val\_recall: 0.6216




Epoch 226/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8204 - loss: 0.5108 - precision: 0.9049 - recall: 0.7702 - val\_accuracy: 0.7632 - val\_loss: 0.5185 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 227/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8048 - loss: 0.5156 - precision: 0.8292 - recall: 0.8209 - val\_accuracy: 0.7632 - val\_loss: 0.5176 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 228/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7926 - loss: 0.5274 - precision: 0.8677 - recall: 0.7666 - val\_accuracy: 0.7632 - val\_loss: 0.5167 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 229/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8204 - loss: 0.5142 - precision: 0.8788 - recall: 0.7881 - val\_accuracy: 0.7632 - val\_loss: 0.5159 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 230/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8446 - loss: 0.5012 - precision: 0.9214 - recall: 0.7945 - val\_accuracy: 0.7632 - val\_loss: 0.5151 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 231/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8272 - loss: 0.5105 - precision: 0.8703 - recall: 0.7900 - val\_accuracy: 0.7632 - val\_loss: 0.5144 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 232/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8110 - loss: 0.5165 - precision: 0.8507 - recall: 0.7672 - val\_accuracy: 0.7632 - val\_loss: 0.5135 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 233/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8450 - loss: 0.5059 - precision: 0.8948 - recall: 0.8071 - val\_accuracy: 0.7632 - val\_loss: 0.5127 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 234/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8254 - loss: 0.5123 - precision: 0.8526 - recall: 0.8176 - val\_accuracy: 0.7632 - val\_loss: 0.5120 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 235/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8374 - loss: 0.5131 - precision: 0.8676 - recall: 0.8186 - val\_accuracy: 0.7632 - val\_loss: 0.5111 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 236/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8212 - loss: 0.5040 - precision: 0.8786 - recall: 0.7997 - val\_accuracy: 0.7632 - val\_loss: 0.5103 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 237/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8302 - loss: 0.5142 - precision: 0.8713 - recall: 0.8234 - val\_accuracy: 0.7632 - val\_loss: 0.5096 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 238/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8430 - loss: 0.4906 - precision: 0.8780 - recall: 0.8136 - val\_accuracy: 0.7632 - val\_loss: 0.5088 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 239/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8140 - loss: 0.5029 - precision: 0.8745 - recall: 0.8051 - val\_accuracy: 0.7632 - val\_loss: 0.5080 - val\_precision: 0.8519 - val\_recall: 0.6216


Epoch 240/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8280 - loss: 0.4842 - precision: 0.8984 - recall: 0.7927 - val\_accuracy: 0.7763 - val\_loss: 0.5072 - val\_precision: 0.8571 - val\_recall: 0.6486


Epoch 241/1000  
12/12  0s 3ms/step - accuracy: 0.7879 - loss: 0.5172 - precision: 0.8285 - recall: 0.7836 - val\_accuracy: 0.7895 - val\_loss: 0.5065 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 242/1000  
12/12  0s 5ms/step - accuracy: 0.8115 - loss: 0.5064 - precision: 0.8311 - recall: 0.8327 - val\_accuracy: 0.7895 - val\_loss: 0.5057 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 243/1000  
12/12  0s 3ms/step - accuracy: 0.8236 - loss: 0.4986 - precision: 0.8710 - recall: 0.7957 - val\_accuracy: 0.7895 - val\_loss: 0.5049 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 244/1000  
12/12  0s 3ms/step - accuracy: 0.8013 - loss: 0.4995 - precision: 0.8633 - recall: 0.7831 - val\_accuracy: 0.7895 - val\_loss: 0.5041 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 245/1000  
12/12  0s 3ms/step - accuracy: 0.7919 - loss: 0.5115 - precision: 0.8506 - recall: 0.7867 - val\_accuracy: 0.7895 - val\_loss: 0.5034 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 246/1000  
12/12  0s 3ms/step - accuracy: 0.8398 - loss: 0.4942 - precision: 0.8801 - recall: 0.8210 - val\_accuracy: 0.7895 - val\_loss: 0.5026 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 247/1000  
12/12  0s 3ms/step - accuracy: 0.8224 - loss: 0.4843 - precision: 0.8958 - recall: 0.7922 - val\_accuracy: 0.7895 - val\_loss: 0.5019 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 248/1000  
12/12  0s 3ms/step - accuracy: 0.7826 - loss: 0.5050 - precision: 0.8521 - recall: 0.7561 - val\_accuracy: 0.7895 - val\_loss: 0.5011 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 249/1000  
12/12  0s 4ms/step - accuracy: 0.8388 - loss: 0.4904 - precision: 0.8738 - recall: 0.8176 - val\_accuracy: 0.7895 - val\_loss: 0.5004 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 250/1000  
12/12  0s 5ms/step - accuracy: 0.8343 - loss: 0.4949 - precision: 0.8787 - recall: 0.8346 - val\_accuracy: 0.7895 - val\_loss: 0.4996 - val\_precision: 0.8621 - val\_recall: 0.6757

Epoch 251/1000  
12/12  0s 5ms/step - accuracy: 0.8068 - loss: 0.5044 - precision: 0.8486 - recall: 0.7894 - val\_accuracy: 0.7895 - val\_loss: 0.4990 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 252/1000  
12/12  0s 5ms/step - accuracy: 0.8366 - loss: 0.4964 - precision: 0.8711 - recall: 0.8478 - val\_accuracy: 0.7895 - val\_loss: 0.4982 - val\_precision: 0.8621 - val\_recall: 0.6757

Epoch 253/1000  
12/12  0s 5ms/step - accuracy: 0.8128 - loss: 0.5025 - precision: 0.8336 - recall: 0.8365 - val\_accuracy: 0.7895 - val\_loss: 0.4975 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 254/1000  
12/12  0s 4ms/step - accuracy: 0.8040 - loss: 0.4963 - precision: 0.8091 - recall: 0.8236 - val\_accuracy: 0.7895 - val\_loss: 0.4968 - val\_precision: 0.8621 - val\_recall: 0.6757

Epoch 255/1000  
12/12  0s 5ms/step - accuracy: 0.8619 - loss: 0.4823 - precision: 0.8890 - recall: 0.8743 - val\_accuracy: 0.7895 - val\_loss: 0.4961 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 256/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8304 - loss: 0.4895 - precision: 0.8835 - recall: 0.8358 - val\_accuracy: 0.7895 - val\_loss: 0.4954 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 257/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8576 - loss: 0.4721 - precision: 0.8771 - recall: 0.8735 - val\_accuracy: 0.7895 - val\_loss: 0.4947 - val\_precision: 0.8621 - val\_recall: 0.6757


Epoch 258/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8128 - loss: 0.4918 - precision: 0.8218 - recall: 0.8334 - val\_accuracy: 0.8026 - val\_loss: 0.4940 - val\_precision: 0.8667 - val\_recall: 0.7027


Epoch 259/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8309 - loss: 0.4801 - precision: 0.8708 - recall: 0.8306 - val\_accuracy: 0.8026 - val\_loss: 0.4933 - val\_precision: 0.8667 - val\_recall: 0.7027


Epoch 260/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8055 - loss: 0.4978 - precision: 0.8367 - recall: 0.8111 - val\_accuracy: 0.8026 - val\_loss: 0.4927 - val\_precision: 0.8667 - val\_recall: 0.7027


Epoch 261/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8510 - loss: 0.4833 - precision: 0.8833 - recall: 0.8599 - val\_accuracy: 0.8026 - val\_loss: 0.4920 - val\_precision: 0.8667 - val\_recall: 0.7027


Epoch 262/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8188 - loss: 0.4865 - precision: 0.8607 - recall: 0.8235 - val\_accuracy: 0.8026 - val\_loss: 0.4913 - val\_precision: 0.8667 - val\_recall: 0.7027


Epoch 263/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8183 - loss: 0.4943 - precision: 0.8580 - recall: 0.8272 - val\_accuracy: 0.8158 - val\_loss: 0.4907 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 264/1000

**12/12**  **0s** 5ms/step - accuracy: 0.7948 - loss: 0.4989 - precision: 0.8457 - recall: 0.8039 - val\_accuracy: 0.8158 - val\_loss: 0.4900 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 265/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8165 - loss: 0.4804 - precision: 0.8511 - recall: 0.8103 - val\_accuracy: 0.8158 - val\_loss: 0.4893 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 266/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8329 - loss: 0.4872 - precision: 0.8514 - recall: 0.8496 - val\_accuracy: 0.8158 - val\_loss: 0.4886 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 267/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7851 - loss: 0.4960 - precision: 0.7715 - recall: 0.7697 - val\_accuracy: 0.8158 - val\_loss: 0.4880 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 268/1000

**12/12**  **0s** 6ms/step - accuracy: 0.7827 - loss: 0.5072 - precision: 0.8217 - recall: 0.7761 - val\_accuracy: 0.8158 - val\_loss: 0.4873 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 269/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8371 - loss: 0.4872 - precision: 0.8605 - recall: 0.8454 - val\_accuracy: 0.8158 - val\_loss: 0.4867 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 270/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7862 - loss: 0.4805 - precision: 0.8255 - recall: 0.7725 - val\_accuracy: 0.8158 - val\_loss: 0.4860 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 271/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8009 - loss: 0.4850 - precision: 0.8185 - recall: 0.8381 - val\_accuracy: 0.8158 - val\_loss: 0.4853 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 272/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8090 - loss: 0.4954 - precision: 0.8191 - recall: 0.8398 - val\_accuracy: 0.8158 - val\_loss: 0.4847 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 273/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7740 - loss: 0.4865 - precision: 0.8039 - recall: 0.7932 - val\_accuracy: 0.8158 - val\_loss: 0.4840 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 274/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8222 - loss: 0.4740 - precision: 0.8485 - recall: 0.8419 - val\_accuracy: 0.8158 - val\_loss: 0.4834 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 275/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7985 - loss: 0.4932 - precision: 0.8196 - recall: 0.8146 - val\_accuracy: 0.8158 - val\_loss: 0.4827 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 276/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8279 - loss: 0.4792 - precision: 0.8467 - recall: 0.8326 - val\_accuracy: 0.8158 - val\_loss: 0.4821 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 277/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8077 - loss: 0.4780 - precision: 0.8198 - recall: 0.8221 - val\_accuracy: 0.8158 - val\_loss: 0.4814 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 278/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8162 - loss: 0.4765 - precision: 0.8823 - recall: 0.8033 - val\_accuracy: 0.8158 - val\_loss: 0.4808 - val\_precision: 0.8710 - val\_recall: 0.7297


Epoch 279/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8142 - loss: 0.4956 - precision: 0.8417 - recall: 0.8143 - val\_accuracy: 0.8026 - val\_loss: 0.4801 - val\_precision: 0.8438 - val\_recall: 0.7297


Epoch 280/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8352 - loss: 0.4591 - precision: 0.8382 - recall: 0.8728 - val\_accuracy: 0.8026 - val\_loss: 0.4795 - val\_precision: 0.8438 - val\_recall: 0.7297


Epoch 281/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7965 - loss: 0.4863 - precision: 0.8372 - recall: 0.8139 - val\_accuracy: 0.8026 - val\_loss: 0.4789 - val\_precision: 0.8438 - val\_recall: 0.7297


Epoch 282/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8357 - loss: 0.4633 - precision: 0.8434 - recall: 0.8812 - val\_accuracy: 0.8026 - val\_loss: 0.4783 - val\_precision: 0.8438 - val\_recall: 0.7297


Epoch 283/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8220 - loss: 0.4687 - precision: 0.8168 - recall: 0.8644 - val\_accuracy: 0.8026 - val\_loss: 0.4777 - val\_precision: 0.8438 - val\_recall: 0.7297

Epoch 284/1000


**12/12**  **0s** 4ms/step - accuracy: 0.7939 - loss: 0.4916 - precision: 0.8135 - recall: 0.8445 - val\_accuracy: 0.8026 - val\_loss: 0.4771 - val\_precision: 0.8438 - val\_recall: 0.7297

Epoch 285/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8188 - loss: 0.4746 - precision: 0.8574 - recall: 0.8227 - val\_accuracy: 0.8026 - val\_loss: 0.4765 - val\_precision: 0.8438 - val\_recall: 0.7297

Epoch 286/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8135 - loss: 0.4819 - precision: 0.8474 - recall: 0.8209 - val\_accuracy: 0.8026 - val\_loss: 0.4759 - val\_precision: 0.8438 - val\_recall: 0.7297  
Epoch 287/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8072 - loss: 0.4715 - precision: 0.8084 - recall: 0.8544 - val\_accuracy: 0.8026 - val\_loss: 0.4753 - val\_precision: 0.8438 - val\_recall: 0.7297  
Epoch 288/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8333 - loss: 0.4756 - precision: 0.8548 - recall: 0.8678 - val\_accuracy: 0.8026 - val\_loss: 0.4748 - val\_precision: 0.8438 - val\_recall: 0.7297  
Epoch 289/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8066 - loss: 0.4861 - precision: 0.8264 - recall: 0.8405 - val\_accuracy: 0.8026 - val\_loss: 0.4741 - val\_precision: 0.8438 - val\_recall: 0.7297  
Epoch 290/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8491 - loss: 0.4619 - precision: 0.8535 - recall: 0.8701 - val\_accuracy: 0.8026 - val\_loss: 0.4736 - val\_precision: 0.8438 - val\_recall: 0.7297  
Epoch 291/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8406 - loss: 0.4567 - precision: 0.8596 - recall: 0.8497 - val\_accuracy: 0.8158 - val\_loss: 0.4730 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 292/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8356 - loss: 0.4617 - precision: 0.8769 - recall: 0.8466 - val\_accuracy: 0.8158 - val\_loss: 0.4724 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 293/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8410 - loss: 0.4526 - precision: 0.8563 - recall: 0.8119 - val\_accuracy: 0.8158 - val\_loss: 0.4719 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 294/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8290 - loss: 0.4640 - precision: 0.8497 - recall: 0.8371 - val\_accuracy: 0.8158 - val\_loss: 0.4713 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 295/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8392 - loss: 0.4554 - precision: 0.8295 - recall: 0.8835 - val\_accuracy: 0.8158 - val\_loss: 0.4708 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 296/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8155 - loss: 0.4727 - precision: 0.8355 - recall: 0.8583 - val\_accuracy: 0.8158 - val\_loss: 0.4702 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 297/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8045 - loss: 0.4791 - precision: 0.8214 - recall: 0.8409 - val\_accuracy: 0.8158 - val\_loss: 0.4696 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 298/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8057 - loss: 0.4780 - precision: 0.8462 - recall: 0.8227 - val\_accuracy: 0.8158 - val\_loss: 0.4690 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 299/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8374 - loss: 0.4575 - precision: 0.8657 - recall: 0.8616 - val\_accuracy: 0.8158 - val\_loss: 0.4685 - val\_precision: 0.8485 - val\_recall: 0.7568  
Epoch 300/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8289 - loss: 0.4581 - precision: 0.8262 - recall: 0.8749 - val\_accuracy: 0.8289 - val\_loss: 0.4679 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 301/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8130 - loss: 0.4818 - precision: 0.8278 - recall: 0.8366 - val\_accuracy: 0.8289 - val\_loss: 0.4674 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 302/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8409 - loss: 0.4551 - precision: 0.8740 - recall: 0.8450 - val\_accuracy: 0.8289 - val\_loss: 0.4669 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 303/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8269 - loss: 0.4662 - precision: 0.8458 - recall: 0.8397 - val\_accuracy: 0.8289 - val\_loss: 0.4664 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 304/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8409 - loss: 0.4654 - precision: 0.8610 - recall: 0.8598 - val\_accuracy: 0.8289 - val\_loss: 0.4658 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 305/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8427 - loss: 0.4556 - precision: 0.8677 - recall: 0.8675 - val\_accuracy: 0.8289 - val\_loss: 0.4653 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 306/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8160 - loss: 0.4812 - precision: 0.8188 - recall: 0.8496 - val\_accuracy: 0.8289 - val\_loss: 0.4648 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 307/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8311 - loss: 0.4671 - precision: 0.8423 - recall: 0.8565 - val\_accuracy: 0.8289 - val\_loss: 0.4643 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 308/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8369 - loss: 0.4665 - precision: 0.8821 - recall: 0.8356 - val\_accuracy: 0.8289 - val\_loss: 0.4638 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 309/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8384 - loss: 0.4491 - precision: 0.8389 - recall: 0.8759 - val\_accuracy: 0.8289 - val\_loss: 0.4633 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 310/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8238 - loss: 0.4634 - precision: 0.8127 - recall: 0.8443 - val\_accuracy: 0.8289 - val\_loss: 0.4628 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 311/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8288 - loss: 0.4613 - precision: 0.8497 - recall: 0.8639 - val\_accuracy: 0.8289 - val\_loss: 0.4622 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 312/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8285 - loss: 0.4506 - precision: 0.8323 - recall: 0.8826 - val\_accuracy: 0.8289 - val\_loss: 0.4617 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 313/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8352 - loss: 0.4578 - precision: 0.8299 - recall: 0.8825 - val\_accuracy: 0.8289 - val\_loss: 0.4612 - val\_precision: 0.8529 - val\_recall: 0.7838

Epoch 314/1000


**12/12**  **0s** 4ms/step - accuracy: 0.8386 - loss: 0.4555 - precision: 0.8643 - recall: 0.8514 - val\_accuracy: 0.8289 - val\_loss: 0.4607 - val\_precision: 0.8529 - val\_recall: 0.7838

Epoch 315/1000


**12/12**  **0s** 7ms/step - accuracy: 0.8599 - loss: 0.4390 - precision: 0.8788 - recall: 0.8753 - val\_accuracy: 0.8289 - val\_loss: 0.4602 - val\_precision: 0.8529 - val\_recall: 0.7838




Epoch 316/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8152 - loss: 0.4669 - precision: 0.7831 - recall: 0.8916 - val\_accuracy: 0.8289 - val\_loss: 0.4596 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 317/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8496 - loss: 0.4516 - precision: 0.8471 - recall: 0.8793 - val\_accuracy: 0.8289 - val\_loss: 0.4591 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 318/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8535 - loss: 0.4591 - precision: 0.8630 - recall: 0.8793 - val\_accuracy: 0.8289 - val\_loss: 0.4586 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 319/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8256 - loss: 0.4473 - precision: 0.8189 - recall: 0.8505 - val\_accuracy: 0.8289 - val\_loss: 0.4581 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 320/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8273 - loss: 0.4614 - precision: 0.8384 - recall: 0.8657 - val\_accuracy: 0.8289 - val\_loss: 0.4577 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 321/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8208 - loss: 0.4622 - precision: 0.8174 - recall: 0.8474 - val\_accuracy: 0.8289 - val\_loss: 0.4572 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 322/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8221 - loss: 0.4518 - precision: 0.8247 - recall: 0.8612 - val\_accuracy: 0.8289 - val\_loss: 0.4567 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 323/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8215 - loss: 0.4620 - precision: 0.8547 - recall: 0.8538 - val\_accuracy: 0.8289 - val\_loss: 0.4562 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 324/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8230 - loss: 0.4412 - precision: 0.8615 - recall: 0.8339 - val\_accuracy: 0.8289 - val\_loss: 0.4557 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 325/1000

**12/12**  **0s** 4ms/step - accuracy: 0.7971 - loss: 0.4742 - precision: 0.8051 - recall: 0.8427 - val\_accuracy: 0.8289 - val\_loss: 0.4553 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 326/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8493 - loss: 0.4285 - precision: 0.8619 - recall: 0.8759 - val\_accuracy: 0.8289 - val\_loss: 0.4548 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 327/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8447 - loss: 0.4421 - precision: 0.8155 - recall: 0.9257 - val\_accuracy: 0.8289 - val\_loss: 0.4543 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 328/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8444 - loss: 0.4411 - precision: 0.8664 - recall: 0.8784 - val\_accuracy: 0.8289 - val\_loss: 0.4539 - val\_precision: 0.8529 - val\_recall: 0.7838


Epoch 329/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8357 - loss: 0.4589 - precision: 0.8335 - recall: 0.9043 - val\_accuracy: 0.8421 - val\_loss: 0.4534 - val\_precision: 0.8571 - val\_recall: 0.8108


Epoch 330/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8346 - loss: 0.4553 - precision: 0.8172 - recall: 0.9041 - val\_accuracy: 0.8421 - val\_loss: 0.4529 - val\_precision: 0.8571 - val\_recall: 0.8108


Epoch 331/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8178 - loss: 0.4619 - precision: 0.8390 - recall: 0.8455 - val\_accuracy: 0.8421 - val\_loss: 0.4525 - val\_precision: 0.8571 - val\_recall: 0.8108


Epoch 332/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8351 - loss: 0.4579 - precision: 0.8420 - recall: 0.8652 - val\_accuracy: 0.8421 - val\_loss: 0.4521 - val\_precision: 0.8571 - val\_recall: 0.8108


Epoch 333/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8210 - loss: 0.4462 - precision: 0.8204 - recall: 0.8875 - val\_accuracy: 0.8421 - val\_loss: 0.4516 - val\_precision: 0.8571 - val\_recall: 0.8108


Epoch 334/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7983 - loss: 0.4672 - precision: 0.8185 - recall: 0.8442 - val\_accuracy: 0.8553 - val\_loss: 0.4511 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 335/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8080 - loss: 0.4441 - precision: 0.8013 - recall: 0.8809 - val\_accuracy: 0.8553 - val\_loss: 0.4507 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 336/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8454 - loss: 0.4338 - precision: 0.8594 - recall: 0.8827 - val\_accuracy: 0.8553 - val\_loss: 0.4502 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 337/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8025 - loss: 0.4628 - precision: 0.8176 - recall: 0.8483 - val\_accuracy: 0.8553 - val\_loss: 0.4498 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 338/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8422 - loss: 0.4324 - precision: 0.8497 - recall: 0.8886 - val\_accuracy: 0.8553 - val\_loss: 0.4493 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 339/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8033 - loss: 0.4540 - precision: 0.8137 - recall: 0.8585 - val\_accuracy: 0.8553 - val\_loss: 0.4489 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 340/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8628 - loss: 0.4155 - precision: 0.8706 - recall: 0.8989 - val\_accuracy: 0.8553 - val\_loss: 0.4484 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 341/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8235 - loss: 0.4337 - precision: 0.8177 - recall: 0.8694 - val\_accuracy: 0.8553 - val\_loss: 0.4480 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 342/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8296 - loss: 0.4500 - precision: 0.8273 - recall: 0.8965 - val\_accuracy: 0.8553 - val\_loss: 0.4476 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 343/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8587 - loss: 0.4218 - precision: 0.8716 - recall: 0.8957 - val\_accuracy: 0.8553 - val\_loss: 0.4472 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 344/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8343 - loss: 0.4309 - precision: 0.8394 - recall: 0.8833 - val\_accuracy: 0.8553 - val\_loss: 0.4468 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 345/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8343 - loss: 0.4399 - precision: 0.8079 - recall: 0.9027 - val\_accuracy: 0.8553 - val\_loss: 0.4464 - val\_precision: 0.8611 - val\_recall: 0.8378





Epoch 346/1000  
12/12  0s 3ms/step - accuracy: 0.8529 - loss: 0.4334 - precision: 0.8472 - recall: 0.9080 - val\_accuracy: 0.8553 - val\_loss: 0.4460 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 347/1000  
12/12  0s 3ms/step - accuracy: 0.8284 - loss: 0.4536 - precision: 0.8624 - recall: 0.8520 - val\_accuracy: 0.8553 - val\_loss: 0.4456 - val\_precision: 0.8611 - val\_recall: 0.8378


Epoch 348/1000  
12/12  0s 3ms/step - accuracy: 0.8298 - loss: 0.4476 - precision: 0.8301 - recall: 0.8921 - val\_accuracy: 0.8553 - val\_loss: 0.4452 - val\_precision: 0.8611 - val\_recall: 0.8378

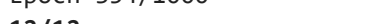
Epoch 349/1000  
12/12  0s 3ms/step - accuracy: 0.8237 - loss: 0.4360 - precision: 0.8270 - recall: 0.8621 - val\_accuracy: 0.8553 - val\_loss: 0.4447 - val\_precision: 0.8611 - val\_recall: 0.8378

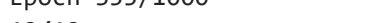
Epoch 350/1000  
12/12  0s 3ms/step - accuracy: 0.8249 - loss: 0.4438 - precision: 0.8551 - recall: 0.8451 - val\_accuracy: 0.8553 - val\_loss: 0.4443 - val\_precision: 0.8611 - val\_recall: 0.8378

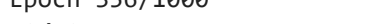
Epoch 351/1000  
12/12  0s 5ms/step - accuracy: 0.7825 - loss: 0.4685 - precision: 0.7988 - recall: 0.8502 - val\_accuracy: 0.8684 - val\_loss: 0.4439 - val\_precision: 0.8649 - val\_recall: 0.8649

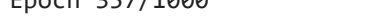
Epoch 352/1000  
12/12  0s 3ms/step - accuracy: 0.8271 - loss: 0.4371 - precision: 0.8371 - recall: 0.8693 - val\_accuracy: 0.8684 - val\_loss: 0.4435 - val\_precision: 0.8649 - val\_recall: 0.8649

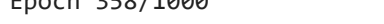
Epoch 353/1000  
12/12  0s 3ms/step - accuracy: 0.7688 - loss: 0.4664 - precision: 0.7765 - recall: 0.8408 - val\_accuracy: 0.8684 - val\_loss: 0.4431 - val\_precision: 0.8649 - val\_recall: 0.8649

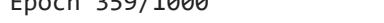
Epoch 354/1000  
12/12  0s 3ms/step - accuracy: 0.8550 - loss: 0.4247 - precision: 0.8580 - recall: 0.8930 - val\_accuracy: 0.8684 - val\_loss: 0.4427 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 355/1000  
12/12  0s 4ms/step - accuracy: 0.8151 - loss: 0.4349 - precision: 0.7927 - recall: 0.8684 - val\_accuracy: 0.8684 - val\_loss: 0.4423 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 356/1000  
12/12  0s 3ms/step - accuracy: 0.8300 - loss: 0.4270 - precision: 0.8426 - recall: 0.8735 - val\_accuracy: 0.8684 - val\_loss: 0.4419 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 357/1000  
12/12  0s 4ms/step - accuracy: 0.8341 - loss: 0.4237 - precision: 0.8383 - recall: 0.8726 - val\_accuracy: 0.8684 - val\_loss: 0.4415 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 358/1000  
12/12  0s 4ms/step - accuracy: 0.8034 - loss: 0.4459 - precision: 0.8179 - recall: 0.8546 - val\_accuracy: 0.8684 - val\_loss: 0.4411 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 359/1000  
12/12  0s 3ms/step - accuracy: 0.8169 - loss: 0.4430 - precision: 0.7790 - recall: 0.9090 - val\_accuracy: 0.8684 - val\_loss: 0.4407 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 360/1000  
12/12  0s 3ms/step - accuracy: 0.8456 - loss: 0.4323 - precision: 0.8274 - recall: 0.9043 - val\_accuracy: 0.8684 - val\_loss: 0.4403 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 361/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8002 - loss: 0.4464 - precision: 0.7837 - recall: 0.8957 - val\_accuracy: 0.8684 - val\_loss: 0.4399 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 362/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7856 - loss: 0.4567 - precision: 0.7763 - recall: 0.8645 - val\_accuracy: 0.8684 - val\_loss: 0.4395 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 363/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8302 - loss: 0.4391 - precision: 0.8198 - recall: 0.8787 - val\_accuracy: 0.8684 - val\_loss: 0.4392 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 364/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8220 - loss: 0.4388 - precision: 0.8173 - recall: 0.8891 - val\_accuracy: 0.8684 - val\_loss: 0.4388 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 365/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8499 - loss: 0.4273 - precision: 0.8438 - recall: 0.9026 - val\_accuracy: 0.8684 - val\_loss: 0.4384 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 366/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8253 - loss: 0.4383 - precision: 0.8097 - recall: 0.8713 - val\_accuracy: 0.8684 - val\_loss: 0.4380 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 367/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8606 - loss: 0.4221 - precision: 0.8474 - recall: 0.9204 - val\_accuracy: 0.8684 - val\_loss: 0.4377 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 368/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8239 - loss: 0.4340 - precision: 0.8120 - recall: 0.8556 - val\_accuracy: 0.8684 - val\_loss: 0.4373 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 369/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8301 - loss: 0.4219 - precision: 0.8198 - recall: 0.8801 - val\_accuracy: 0.8684 - val\_loss: 0.4369 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 370/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8443 - loss: 0.4290 - precision: 0.8415 - recall: 0.8931 - val\_accuracy: 0.8684 - val\_loss: 0.4365 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 371/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8286 - loss: 0.4275 - precision: 0.8166 - recall: 0.8829 - val\_accuracy: 0.8684 - val\_loss: 0.4362 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 372/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8353 - loss: 0.4305 - precision: 0.8376 - recall: 0.8820 - val\_accuracy: 0.8684 - val\_loss: 0.4358 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 373/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8576 - loss: 0.4112 - precision: 0.8584 - recall: 0.9067 - val\_accuracy: 0.8684 - val\_loss: 0.4354 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 374/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8238 - loss: 0.4266 - precision: 0.8213 - recall: 0.8756 - val\_accuracy: 0.8684 - val\_loss: 0.4351 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 375/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8046 - loss: 0.4369 - precision: 0.8071 - recall: 0.8618 - val\_accuracy: 0.8684 - val\_loss: 0.4348 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 376/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8174 - loss: 0.4225 - precision: 0.8110 - recall: 0.8902 - val\_accuracy: 0.8684 - val\_loss: 0.4344 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 377/1000

**12/12**  **0s** 3ms/step - accuracy: 0.7796 - loss: 0.4589 - precision: 0.7725 - recall: 0.8490 - val\_accuracy: 0.8684 - val\_loss: 0.4340 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 378/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8070 - loss: 0.4339 - precision: 0.8181 - recall: 0.8379 - val\_accuracy: 0.8684 - val\_loss: 0.4337 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 379/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8270 - loss: 0.4237 - precision: 0.8410 - recall: 0.8652 - val\_accuracy: 0.8684 - val\_loss: 0.4333 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 380/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8030 - loss: 0.4488 - precision: 0.7735 - recall: 0.9053 - val\_accuracy: 0.8684 - val\_loss: 0.4330 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 381/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8463 - loss: 0.4197 - precision: 0.8395 - recall: 0.9077 - val\_accuracy: 0.8684 - val\_loss: 0.4327 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 382/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8255 - loss: 0.4177 - precision: 0.8355 - recall: 0.8713 - val\_accuracy: 0.8684 - val\_loss: 0.4324 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 383/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8557 - loss: 0.4177 - precision: 0.8483 - recall: 0.9037 - val\_accuracy: 0.8684 - val\_loss: 0.4320 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 384/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8094 - loss: 0.4398 - precision: 0.7946 - recall: 0.8697 - val\_accuracy: 0.8684 - val\_loss: 0.4317 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 385/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8284 - loss: 0.4243 - precision: 0.8198 - recall: 0.8954 - val\_accuracy: 0.8684 - val\_loss: 0.4314 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 386/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8602 - loss: 0.4159 - precision: 0.8729 - recall: 0.9005 - val\_accuracy: 0.8684 - val\_loss: 0.4311 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 387/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8327 - loss: 0.4234 - precision: 0.8147 - recall: 0.8985 - val\_accuracy: 0.8684 - val\_loss: 0.4308 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 388/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8564 - loss: 0.4121 - precision: 0.8525 - recall: 0.9003 - val\_accuracy: 0.8684 - val\_loss: 0.4305 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 389/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8345 - loss: 0.4238 - precision: 0.8565 - recall: 0.8649 - val\_accuracy: 0.8684 - val\_loss: 0.4301 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 390/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8562 - loss: 0.4256 - precision: 0.8365 - recall: 0.9187 - val\_accuracy: 0.8684 - val\_loss: 0.4298 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 391/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8678 - loss: 0.4086 - precision: 0.8800 - recall: 0.8989 - val\_accuracy: 0.8684 - val\_loss: 0.4295 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 392/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8280 - loss: 0.4174 - precision: 0.8303 - recall: 0.8818 - val\_accuracy: 0.8684 - val\_loss: 0.4292 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 393/1000  
12/12 ————— 0s 7ms/step - accuracy: 0.8600 - loss: 0.3934 - precision: 0.8377 - recall: 0.9201 - val\_accuracy: 0.8684 - val\_loss: 0.4289 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 394/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8337 - loss: 0.4149 - precision: 0.8325 - recall: 0.8809 - val\_accuracy: 0.8684 - val\_loss: 0.4286 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 395/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8420 - loss: 0.4283 - precision: 0.8132 - recall: 0.9242 - val\_accuracy: 0.8684 - val\_loss: 0.4283 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 396/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8517 - loss: 0.4023 - precision: 0.8412 - recall: 0.9146 - val\_accuracy: 0.8684 - val\_loss: 0.4280 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 397/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8651 - loss: 0.4061 - precision: 0.8754 - recall: 0.9021 - val\_accuracy: 0.8684 - val\_loss: 0.4277 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 398/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8015 - loss: 0.4400 - precision: 0.7926 - recall: 0.8731 - val\_accuracy: 0.8684 - val\_loss: 0.4274 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 399/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8582 - loss: 0.4089 - precision: 0.8549 - recall: 0.9170 - val\_accuracy: 0.8684 - val\_loss: 0.4271 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 400/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8572 - loss: 0.3884 - precision: 0.8435 - recall: 0.9024 - val\_accuracy: 0.8684 - val\_loss: 0.4268 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 401/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8200 - loss: 0.4399 - precision: 0.8311 - recall: 0.8632 - val\_accuracy: 0.8684 - val\_loss: 0.4265 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 402/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.7891 - loss: 0.4385 - precision: 0.7555 - recall: 0.8541 - val\_accuracy: 0.8684 - val\_loss: 0.4262 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 403/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.7885 - loss: 0.4428 - precision: 0.8015 - recall: 0.8451 - val\_accuracy: 0.8684 - val\_loss: 0.4259 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 404/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8271 - loss: 0.4308 - precision: 0.8319 - recall: 0.8756 - val\_accuracy: 0.8684 - val\_loss: 0.4256 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 405/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8537 - loss: 0.4025 - precision: 0.8474 - recall: 0.9056 - val\_accuracy: 0.8684 - val\_loss: 0.4254 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 406/1000

12/12  0s 4ms/step - accuracy: 0.8718 - loss: 0.3795 - precision: 0.8650 - recall: 0.9248 - val\_accuracy: 0.8684 - val\_loss: 0.4251 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 407/1000

12/12  0s 4ms/step - accuracy: 0.8231 - loss: 0.4264 - precision: 0.8233 - recall: 0.8708 - val\_accuracy: 0.8684 - val\_loss: 0.4248 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 408/1000

12/12  0s 4ms/step - accuracy: 0.8606 - loss: 0.3965 - precision: 0.8346 - recall: 0.9321 - val\_accuracy: 0.8684 - val\_loss: 0.4245 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 409/1000

12/12  0s 4ms/step - accuracy: 0.8698 - loss: 0.3837 - precision: 0.8472 - recall: 0.9268 - val\_accuracy: 0.8684 - val\_loss: 0.4242 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 410/1000

12/12  0s 3ms/step - accuracy: 0.8560 - loss: 0.4065 - precision: 0.8512 - recall: 0.9076 - val\_accuracy: 0.8684 - val\_loss: 0.4239 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 411/1000

12/12  0s 3ms/step - accuracy: 0.8619 - loss: 0.4001 - precision: 0.8742 - recall: 0.8958 - val\_accuracy: 0.8684 - val\_loss: 0.4237 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 412/1000

12/12  0s 4ms/step - accuracy: 0.8338 - loss: 0.4122 - precision: 0.8251 - recall: 0.8890 - val\_accuracy: 0.8684 - val\_loss: 0.4234 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 413/1000

12/12  0s 4ms/step - accuracy: 0.8716 - loss: 0.4017 - precision: 0.8454 - recall: 0.9495 - val\_accuracy: 0.8684 - val\_loss: 0.4231 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 414/1000

12/12  0s 7ms/step - accuracy: 0.8651 - loss: 0.3985 - precision: 0.8520 - recall: 0.9243 - val\_accuracy: 0.8684 - val\_loss: 0.4229 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 415/1000

12/12  0s 4ms/step - accuracy: 0.8503 - loss: 0.4032 - precision: 0.8454 - recall: 0.9030 - val\_accuracy: 0.8684 - val\_loss: 0.4226 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 416/1000

12/12  0s 4ms/step - accuracy: 0.8530 - loss: 0.4165 - precision: 0.8649 - recall: 0.8847 - val\_accuracy: 0.8684 - val\_loss: 0.4223 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 417/1000

12/12  0s 4ms/step - accuracy: 0.8284 - loss: 0.4189 - precision: 0.8189 - recall: 0.8887 - val\_accuracy: 0.8684 - val\_loss: 0.4220 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 418/1000

12/12  0s 5ms/step - accuracy: 0.8656 - loss: 0.4099 - precision: 0.8439 - recall: 0.9241 - val\_accuracy: 0.8684 - val\_loss: 0.4217 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 419/1000

12/12  0s 3ms/step - accuracy: 0.8880 - loss: 0.3784 - precision: 0.8752 - recall: 0.9294 - val\_accuracy: 0.8684 - val\_loss: 0.4215 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 420/1000

12/12  0s 3ms/step - accuracy: 0.8459 - loss: 0.4112 - precision: 0.8346 - recall: 0.9144 - val\_accuracy: 0.8684 - val\_loss: 0.4212 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 421/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8379 - loss: 0.4203 - precision: 0.8161 - recall: 0.9194 - val\_accuracy: 0.8684 - val\_loss: 0.4210 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 422/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8482 - loss: 0.4197 - precision: 0.8488 - recall: 0.8833 - val\_accuracy: 0.8684 - val\_loss: 0.4207 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 423/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8348 - loss: 0.4113 - precision: 0.8278 - recall: 0.8825 - val\_accuracy: 0.8684 - val\_loss: 0.4204 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 424/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8342 - loss: 0.4094 - precision: 0.7988 - recall: 0.8993 - val\_accuracy: 0.8684 - val\_loss: 0.4202 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 425/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8734 - loss: 0.3931 - precision: 0.8708 - recall: 0.9094 - val\_accuracy: 0.8684 - val\_loss: 0.4199 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 426/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8471 - loss: 0.3854 - precision: 0.8484 - recall: 0.8912 - val\_accuracy: 0.8684 - val\_loss: 0.4196 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 427/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8390 - loss: 0.4086 - precision: 0.8360 - recall: 0.8976 - val\_accuracy: 0.8684 - val\_loss: 0.4194 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 428/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8280 - loss: 0.4297 - precision: 0.8237 - recall: 0.8758 - val\_accuracy: 0.8684 - val\_loss: 0.4192 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 429/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8522 - loss: 0.3933 - precision: 0.8416 - recall: 0.9163 - val\_accuracy: 0.8684 - val\_loss: 0.4189 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 430/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8478 - loss: 0.4197 - precision: 0.8344 - recall: 0.9188 - val\_accuracy: 0.8684 - val\_loss: 0.4186 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 431/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8268 - loss: 0.4146 - precision: 0.8222 - recall: 0.8926 - val\_accuracy: 0.8684 - val\_loss: 0.4184 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 432/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8177 - loss: 0.4267 - precision: 0.7912 - recall: 0.9001 - val\_accuracy: 0.8684 - val\_loss: 0.4181 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 433/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8186 - loss: 0.4312 - precision: 0.7973 - recall: 0.8730 - val\_accuracy: 0.8684 - val\_loss: 0.4179 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 434/1000


**12/12**  **0s** 4ms/step - accuracy: 0.8512 - loss: 0.3980 - precision: 0.8493 - recall: 0.8962 - val\_accuracy: 0.8684 - val\_loss: 0.4176 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 435/1000


**12/12**  **0s** 3ms/step - accuracy: 0.7978 - loss: 0.4281 - precision: 0.8042 - recall: 0.8507 - val\_accuracy: 0.8684 - val\_loss: 0.4174 - val\_precision: 0.8649 - val\_recall: 0.8649




Epoch 436/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8139 - loss: 0.4109 - precision: 0.8024 - recall: 0.8782 - val\_accuracy: 0.8684 - val\_loss: 0.4171 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 437/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8265 - loss: 0.4198 - precision: 0.8170 - recall: 0.8874 - val\_accuracy: 0.8684 - val\_loss: 0.4169 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 438/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8395 - loss: 0.4205 - precision: 0.8095 - recall: 0.9178 - val\_accuracy: 0.8684 - val\_loss: 0.4166 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 439/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8482 - loss: 0.4031 - precision: 0.8272 - recall: 0.9212 - val\_accuracy: 0.8684 - val\_loss: 0.4164 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 440/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8314 - loss: 0.4195 - precision: 0.8190 - recall: 0.9128 - val\_accuracy: 0.8684 - val\_loss: 0.4161 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 441/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8500 - loss: 0.3961 - precision: 0.8474 - recall: 0.9011 - val\_accuracy: 0.8684 - val\_loss: 0.4159 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 442/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8341 - loss: 0.4012 - precision: 0.8172 - recall: 0.8882 - val\_accuracy: 0.8684 - val\_loss: 0.4157 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 443/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8472 - loss: 0.4017 - precision: 0.8479 - recall: 0.8993 - val\_accuracy: 0.8684 - val\_loss: 0.4155 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 444/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8352 - loss: 0.4094 - precision: 0.8394 - recall: 0.8746 - val\_accuracy: 0.8684 - val\_loss: 0.4153 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 445/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8490 - loss: 0.4153 - precision: 0.8432 - recall: 0.8847 - val\_accuracy: 0.8684 - val\_loss: 0.4151 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 446/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8530 - loss: 0.3929 - precision: 0.8438 - recall: 0.9051 - val\_accuracy: 0.8684 - val\_loss: 0.4148 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 447/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8381 - loss: 0.4059 - precision: 0.8557 - recall: 0.8884 - val\_accuracy: 0.8684 - val\_loss: 0.4146 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 448/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8484 - loss: 0.4024 - precision: 0.8273 - recall: 0.9153 - val\_accuracy: 0.8684 - val\_loss: 0.4144 - val\_precision: 0.8649 - val\_recall: 0.8649

Epoch 449/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8346 - loss: 0.4061 - precision: 0.8269 - recall: 0.8876 - val\_accuracy: 0.8684 - val\_loss: 0.4142 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 450/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8530 - loss: 0.3826 - precision: 0.8515 - recall: 0.9057 - val\_accuracy: 0.8684 - val\_loss: 0.4140 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 451/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8418 - loss: 0.4012 - precision: 0.8331 - recall: 0.9146 - val\_accuracy: 0.8684 - val\_loss: 0.4138 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 452/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8499 - loss: 0.3945 - precision: 0.8476 - recall: 0.9153 - val\_accuracy: 0.8684 - val\_loss: 0.4135 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 453/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8434 - loss: 0.3919 - precision: 0.8312 - recall: 0.9050 - val\_accuracy: 0.8684 - val\_loss: 0.4134 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 454/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8665 - loss: 0.4024 - precision: 0.8586 - recall: 0.9221 - val\_accuracy: 0.8684 - val\_loss: 0.4131 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 455/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8475 - loss: 0.3899 - precision: 0.8546 - recall: 0.8768 - val\_accuracy: 0.8684 - val\_loss: 0.4129 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 456/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8540 - loss: 0.3932 - precision: 0.8502 - recall: 0.9027 - val\_accuracy: 0.8684 - val\_loss: 0.4127 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 457/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8347 - loss: 0.4173 - precision: 0.8346 - recall: 0.8960 - val\_accuracy: 0.8684 - val\_loss: 0.4125 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 458/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8573 - loss: 0.3860 - precision: 0.8414 - recall: 0.9260 - val\_accuracy: 0.8684 - val\_loss: 0.4123 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 459/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8610 - loss: 0.3874 - precision: 0.8430 - recall: 0.9180 - val\_accuracy: 0.8684 - val\_loss: 0.4121 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 460/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8065 - loss: 0.4380 - precision: 0.7707 - recall: 0.9011 - val\_accuracy: 0.8684 - val\_loss: 0.4119 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 461/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8558 - loss: 0.3779 - precision: 0.8525 - recall: 0.8924 - val\_accuracy: 0.8684 - val\_loss: 0.4117 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 462/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8432 - loss: 0.4106 - precision: 0.8208 - recall: 0.9081 - val\_accuracy: 0.8684 - val\_loss: 0.4115 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 463/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8339 - loss: 0.4029 - precision: 0.8172 - recall: 0.9093 - val\_accuracy: 0.8684 - val\_loss: 0.4113 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 464/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8345 - loss: 0.4084 - precision: 0.8139 - recall: 0.9115 - val\_accuracy: 0.8684 - val\_loss: 0.4112 - val\_precision: 0.8649 - val\_recall: 0.8649  
Epoch 465/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8540 - loss: 0.3943 - precision: 0.8085 - recall: 0.9579 - val\_accuracy: 0.8684 - val\_loss: 0.4110 - val\_precision: 0.8649 - val\_recall: 0.8649




Epoch 466/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8453 - loss: 0.4040 - precision: 0.8207 - recall: 0.9232 - val\_accuracy: 0.8684 - val\_loss: 0.4108 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 467/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8237 - loss: 0.4155 - precision: 0.7994 - recall: 0.9068 - val\_accuracy: 0.8684 - val\_loss: 0.4106 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 468/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8670 - loss: 0.3763 - precision: 0.8828 - recall: 0.9021 - val\_accuracy: 0.8684 - val\_loss: 0.4104 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 469/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8221 - loss: 0.4072 - precision: 0.7829 - recall: 0.9029 - val\_accuracy: 0.8684 - val\_loss: 0.4102 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 470/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8651 - loss: 0.3882 - precision: 0.8572 - recall: 0.9213 - val\_accuracy: 0.8684 - val\_loss: 0.4100 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 471/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8635 - loss: 0.3878 - precision: 0.8280 - recall: 0.9440 - val\_accuracy: 0.8684 - val\_loss: 0.4098 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 472/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8584 - loss: 0.3723 - precision: 0.8547 - recall: 0.9090 - val\_accuracy: 0.8684 - val\_loss: 0.4096 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 473/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8521 - loss: 0.3980 - precision: 0.8197 - recall: 0.9191 - val\_accuracy: 0.8684 - val\_loss: 0.4094 - val\_precision: 0.8649 - val\_recall: 0.8649


Epoch 474/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8374 - loss: 0.4122 - precision: 0.8183 - recall: 0.9145 - val\_accuracy: 0.8816 - val\_loss: 0.4093 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 475/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8417 - loss: 0.4071 - precision: 0.8475 - recall: 0.8897 - val\_accuracy: 0.8816 - val\_loss: 0.4091 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 476/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8369 - loss: 0.3861 - precision: 0.8350 - recall: 0.8939 - val\_accuracy: 0.8816 - val\_loss: 0.4089 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 477/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8760 - loss: 0.3618 - precision: 0.8502 - recall: 0.9387 - val\_accuracy: 0.8816 - val\_loss: 0.4088 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 478/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8636 - loss: 0.3676 - precision: 0.8863 - recall: 0.8978 - val\_accuracy: 0.8816 - val\_loss: 0.4086 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 479/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8634 - loss: 0.3696 - precision: 0.8581 - recall: 0.9011 - val\_accuracy: 0.8816 - val\_loss: 0.4084 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 480/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8370 - loss: 0.4043 - precision: 0.8284 - recall: 0.8749 - val\_accuracy: 0.8816 - val\_loss: 0.4082 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 481/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8531 - loss: 0.3818 - precision: 0.8421 - recall: 0.9141 - val\_accuracy: 0.8816 - val\_loss: 0.4080 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 482/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8419 - loss: 0.4054 - precision: 0.8085 - recall: 0.9129 - val\_accuracy: 0.8816 - val\_loss: 0.4079 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 483/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8459 - loss: 0.4000 - precision: 0.8398 - recall: 0.8938 - val\_accuracy: 0.8816 - val\_loss: 0.4077 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 484/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8597 - loss: 0.3894 - precision: 0.8335 - recall: 0.9232 - val\_accuracy: 0.8816 - val\_loss: 0.4075 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 485/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8497 - loss: 0.3789 - precision: 0.8350 - recall: 0.8975 - val\_accuracy: 0.8816 - val\_loss: 0.4073 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 486/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8380 - loss: 0.4193 - precision: 0.7947 - recall: 0.9317 - val\_accuracy: 0.8816 - val\_loss: 0.4072 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 487/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8448 - loss: 0.3724 - precision: 0.7914 - recall: 0.9275 - val\_accuracy: 0.8816 - val\_loss: 0.4070 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 488/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8428 - loss: 0.3688 - precision: 0.8503 - recall: 0.8880 - val\_accuracy: 0.8816 - val\_loss: 0.4068 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 489/1000

**12/12**  **0s** 7ms/step - accuracy: 0.8363 - loss: 0.3951 - precision: 0.8032 - recall: 0.9097 - val\_accuracy: 0.8816 - val\_loss: 0.4066 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 490/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8739 - loss: 0.3699 - precision: 0.8730 - recall: 0.9144 - val\_accuracy: 0.8816 - val\_loss: 0.4065 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 491/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8801 - loss: 0.3589 - precision: 0.8703 - recall: 0.9335 - val\_accuracy: 0.8816 - val\_loss: 0.4063 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 492/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8395 - loss: 0.4012 - precision: 0.8232 - recall: 0.9012 - val\_accuracy: 0.8816 - val\_loss: 0.4062 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 493/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8715 - loss: 0.3671 - precision: 0.8554 - recall: 0.9312 - val\_accuracy: 0.8816 - val\_loss: 0.4060 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 494/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8399 - loss: 0.3892 - precision: 0.8284 - recall: 0.9065 - val\_accuracy: 0.8816 - val\_loss: 0.4058 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 495/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8468 - loss: 0.3879 - precision: 0.8299 - recall: 0.9124 - val\_accuracy: 0.8816 - val\_loss: 0.4056 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 496/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8183 - loss: 0.3975 - precision: 0.8218 - recall: 0.8566 - val\_accuracy: 0.8816 - val\_loss: 0.4054 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 497/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8651 - loss: 0.3763 - precision: 0.8596 - recall: 0.9092 - val\_accuracy: 0.8816 - val\_loss: 0.4053 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 498/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8384 - loss: 0.4005 - precision: 0.8249 - recall: 0.9136 - val\_accuracy: 0.8816 - val\_loss: 0.4051 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 499/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8211 - loss: 0.4049 - precision: 0.7699 - recall: 0.9112 - val\_accuracy: 0.8816 - val\_loss: 0.4050 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 500/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8674 - loss: 0.3613 - precision: 0.8671 - recall: 0.9091 - val\_accuracy: 0.8816 - val\_loss: 0.4048 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 501/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8497 - loss: 0.3777 - precision: 0.8490 - recall: 0.9028 - val\_accuracy: 0.8816 - val\_loss: 0.4046 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 502/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8333 - loss: 0.4054 - precision: 0.8221 - recall: 0.9016 - val\_accuracy: 0.8816 - val\_loss: 0.4045 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 503/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8361 - loss: 0.3714 - precision: 0.8420 - recall: 0.8755 - val\_accuracy: 0.8816 - val\_loss: 0.4043 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 504/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8506 - loss: 0.3806 - precision: 0.8099 - recall: 0.9486 - val\_accuracy: 0.8816 - val\_loss: 0.4042 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 505/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8404 - loss: 0.3904 - precision: 0.8124 - recall: 0.9180 - val\_accuracy: 0.8816 - val\_loss: 0.4040 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 506/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8394 - loss: 0.3935 - precision: 0.8193 - recall: 0.9289 - val\_accuracy: 0.8816 - val\_loss: 0.4039 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 507/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8820 - loss: 0.3651 - precision: 0.8629 - recall: 0.9312 - val\_accuracy: 0.8816 - val\_loss: 0.4037 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 508/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8484 - loss: 0.3794 - precision: 0.8420 - recall: 0.8962 - val\_accuracy: 0.8816 - val\_loss: 0.4036 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 509/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8788 - loss: 0.3704 - precision: 0.8680 - recall: 0.9305 - val\_accuracy: 0.8816 - val\_loss: 0.4035 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 510/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8420 - loss: 0.4006 - precision: 0.8327 - recall: 0.9076 - val\_accuracy: 0.8816 - val\_loss: 0.4033 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 511/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8316 - loss: 0.4054 - precision: 0.8208 - recall: 0.9046 - val\_accuracy: 0.8816 - val\_loss: 0.4032 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 512/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8495 - loss: 0.3823 - precision: 0.8717 - recall: 0.8742 - val\_accuracy: 0.8816 - val\_loss: 0.4030 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 513/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8204 - loss: 0.3967 - precision: 0.7843 - recall: 0.8838 - val\_accuracy: 0.8816 - val\_loss: 0.4029 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 514/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8270 - loss: 0.3764 - precision: 0.8275 - recall: 0.8949 - val\_accuracy: 0.8816 - val\_loss: 0.4028 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 515/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8591 - loss: 0.3893 - precision: 0.8604 - recall: 0.9004 - val\_accuracy: 0.8816 - val\_loss: 0.4026 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 516/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8376 - loss: 0.3775 - precision: 0.8176 - recall: 0.8897 - val\_accuracy: 0.8816 - val\_loss: 0.4025 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 517/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8479 - loss: 0.3735 - precision: 0.8711 - recall: 0.8928 - val\_accuracy: 0.8816 - val\_loss: 0.4024 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 518/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8165 - loss: 0.4064 - precision: 0.8128 - recall: 0.8730 - val\_accuracy: 0.8816 - val\_loss: 0.4022 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 519/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8584 - loss: 0.3750 - precision: 0.8427 - recall: 0.9143 - val\_accuracy: 0.8816 - val\_loss: 0.4021 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 520/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8604 - loss: 0.3856 - precision: 0.8617 - recall: 0.9139 - val\_accuracy: 0.8816 - val\_loss: 0.4020 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 521/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8753 - loss: 0.3640 - precision: 0.8590 - recall: 0.9209 - val\_accuracy: 0.8816 - val\_loss: 0.4018 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 522/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8377 - loss: 0.3892 - precision: 0.8411 - recall: 0.8934 - val\_accuracy: 0.8816 - val\_loss: 0.4017 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 523/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8207 - loss: 0.4048 - precision: 0.7893 - recall: 0.9091 - val\_accuracy: 0.8816 - val\_loss: 0.4016 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 524/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8376 - loss: 0.3895 - precision: 0.8246 - recall: 0.8961 - val\_accuracy: 0.8816 - val\_loss: 0.4015 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 525/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8583 - loss: 0.3675 - precision: 0.8526 - recall: 0.8992 - val\_accuracy: 0.8816 - val\_loss: 0.4013 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 526/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8314 - loss: 0.3792 - precision: 0.7746 - recall: 0.9283 - val\_accuracy: 0.8816 - val\_loss: 0.4012 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 527/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8608 - loss: 0.3540 - precision: 0.8544 - recall: 0.9018 - val\_accuracy: 0.8816 - val\_loss: 0.4011 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 528/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8331 - loss: 0.3872 - precision: 0.8196 - recall: 0.8968 - val\_accuracy: 0.8816 - val\_loss: 0.4010 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 529/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8772 - loss: 0.3585 - precision: 0.8850 - recall: 0.9099 - val\_accuracy: 0.8816 - val\_loss: 0.4008 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 530/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8435 - loss: 0.3792 - precision: 0.8354 - recall: 0.9181 - val\_accuracy: 0.8816 - val\_loss: 0.4007 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 531/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8046 - loss: 0.4131 - precision: 0.7778 - recall: 0.9002 - val\_accuracy: 0.8816 - val\_loss: 0.4006 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 532/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8225 - loss: 0.3834 - precision: 0.7997 - recall: 0.8825 - val\_accuracy: 0.8816 - val\_loss: 0.4004 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 533/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8338 - loss: 0.3711 - precision: 0.8112 - recall: 0.9030 - val\_accuracy: 0.8816 - val\_loss: 0.4003 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 534/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8472 - loss: 0.3592 - precision: 0.8213 - recall: 0.9102 - val\_accuracy: 0.8816 - val\_loss: 0.4002 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 535/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8745 - loss: 0.3555 - precision: 0.8795 - recall: 0.9245 - val\_accuracy: 0.8816 - val\_loss: 0.4001 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 536/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8687 - loss: 0.3666 - precision: 0.8768 - recall: 0.9128 - val\_accuracy: 0.8816 - val\_loss: 0.4000 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 537/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8125 - loss: 0.4062 - precision: 0.8034 - recall: 0.8999 - val\_accuracy: 0.8816 - val\_loss: 0.3998 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 538/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8480 - loss: 0.3762 - precision: 0.8230 - recall: 0.9140 - val\_accuracy: 0.8816 - val\_loss: 0.3997 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 539/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8400 - loss: 0.3748 - precision: 0.8452 - recall: 0.8876 - val\_accuracy: 0.8816 - val\_loss: 0.3996 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 540/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8457 - loss: 0.3872 - precision: 0.8528 - recall: 0.8923 - val\_accuracy: 0.8816 - val\_loss: 0.3995 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 541/1000

**12/12**  0s 3ms/step - accuracy: 0.8420 - loss: 0.3737 - precision: 0.8375 - recall: 0.8813 - val\_accuracy: 0.8816 - val\_loss: 0.3994 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 542/1000

**12/12**  0s 3ms/step - accuracy: 0.8514 - loss: 0.3633 - precision: 0.8300 - recall: 0.9339 - val\_accuracy: 0.8816 - val\_loss: 0.3993 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 543/1000

**12/12**  0s 3ms/step - accuracy: 0.8454 - loss: 0.3683 - precision: 0.8217 - recall: 0.9104 - val\_accuracy: 0.8816 - val\_loss: 0.3992 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 544/1000

**12/12**  0s 5ms/step - accuracy: 0.8643 - loss: 0.3680 - precision: 0.8792 - recall: 0.8867 - val\_accuracy: 0.8816 - val\_loss: 0.3991 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 545/1000

**12/12**  0s 4ms/step - accuracy: 0.8511 - loss: 0.3775 - precision: 0.8138 - recall: 0.9187 - val\_accuracy: 0.8816 - val\_loss: 0.3989 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 546/1000

**12/12**  0s 6ms/step - accuracy: 0.8446 - loss: 0.3763 - precision: 0.8160 - recall: 0.9294 - val\_accuracy: 0.8816 - val\_loss: 0.3988 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 547/1000

**12/12**  0s 3ms/step - accuracy: 0.8309 - loss: 0.3988 - precision: 0.8063 - recall: 0.9077 - val\_accuracy: 0.8816 - val\_loss: 0.3987 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 548/1000

**12/12**  0s 3ms/step - accuracy: 0.8578 - loss: 0.3766 - precision: 0.8291 - recall: 0.9344 - val\_accuracy: 0.8816 - val\_loss: 0.3986 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 549/1000

**12/12**  0s 3ms/step - accuracy: 0.8286 - loss: 0.3828 - precision: 0.8419 - recall: 0.8675 - val\_accuracy: 0.8816 - val\_loss: 0.3985 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 550/1000

**12/12**  0s 5ms/step - accuracy: 0.8154 - loss: 0.4006 - precision: 0.7807 - recall: 0.9011 - val\_accuracy: 0.8816 - val\_loss: 0.3984 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 551/1000

**12/12**  0s 5ms/step - accuracy: 0.8566 - loss: 0.3867 - precision: 0.8500 - recall: 0.9054 - val\_accuracy: 0.8816 - val\_loss: 0.3983 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 552/1000

**12/12**  0s 5ms/step - accuracy: 0.8285 - loss: 0.3944 - precision: 0.8246 - recall: 0.8910 - val\_accuracy: 0.8816 - val\_loss: 0.3982 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 553/1000

**12/12**  0s 3ms/step - accuracy: 0.8518 - loss: 0.3725 - precision: 0.8710 - recall: 0.8816 - val\_accuracy: 0.8816 - val\_loss: 0.3981 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 554/1000


**12/12**  0s 6ms/step - accuracy: 0.8258 - loss: 0.3740 - precision: 0.7846 - recall: 0.9132 - val\_accuracy: 0.8816 - val\_loss: 0.3980 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 555/1000


**12/12**  0s 3ms/step - accuracy: 0.8577 - loss: 0.3761 - precision: 0.8571 - recall: 0.8926 - val\_accuracy: 0.8816 - val\_loss: 0.3979 - val\_precision: 0.8684 - val\_recall: 0.8919




Epoch 556/1000

**12/12**  0s 4ms/step - accuracy: 0.8609 - loss: 0.3878 - precision: 0.8549 - recall: 0.9081 - val\_accuracy: 0.8816 - val\_loss: 0.3978 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 557/1000

**12/12**  0s 5ms/step - accuracy: 0.7991 - loss: 0.4152 - precision: 0.7931 - recall: 0.8654 - val\_accuracy: 0.8816 - val\_loss: 0.3977 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 558/1000

**12/12**  0s 3ms/step - accuracy: 0.8451 - loss: 0.3884 - precision: 0.8222 - recall: 0.9245 - val\_accuracy: 0.8816 - val\_loss: 0.3976 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 559/1000

**12/12**  0s 4ms/step - accuracy: 0.8802 - loss: 0.3546 - precision: 0.8741 - recall: 0.9301 - val\_accuracy: 0.8816 - val\_loss: 0.3975 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 560/1000

**12/12**  0s 3ms/step - accuracy: 0.8600 - loss: 0.3590 - precision: 0.8640 - recall: 0.9081 - val\_accuracy: 0.8816 - val\_loss: 0.3974 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 561/1000

**12/12**  0s 4ms/step - accuracy: 0.8900 - loss: 0.3497 - precision: 0.8689 - recall: 0.9459 - val\_accuracy: 0.8816 - val\_loss: 0.3973 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 562/1000

**12/12**  0s 7ms/step - accuracy: 0.8723 - loss: 0.3492 - precision: 0.8586 - recall: 0.9220 - val\_accuracy: 0.8816 - val\_loss: 0.3972 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 563/1000

**12/12**  0s 3ms/step - accuracy: 0.8761 - loss: 0.3470 - precision: 0.8903 - recall: 0.9119 - val\_accuracy: 0.8816 - val\_loss: 0.3971 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 564/1000

**12/12**  0s 4ms/step - accuracy: 0.8776 - loss: 0.3683 - precision: 0.8772 - recall: 0.9156 - val\_accuracy: 0.8816 - val\_loss: 0.3970 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 565/1000

**12/12**  0s 4ms/step - accuracy: 0.8665 - loss: 0.3570 - precision: 0.8460 - recall: 0.9238 - val\_accuracy: 0.8816 - val\_loss: 0.3969 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 566/1000

**12/12**  0s 4ms/step - accuracy: 0.8665 - loss: 0.3401 - precision: 0.8431 - recall: 0.9351 - val\_accuracy: 0.8816 - val\_loss: 0.3968 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 567/1000

**12/12**  0s 3ms/step - accuracy: 0.8436 - loss: 0.3765 - precision: 0.8414 - recall: 0.9009 - val\_accuracy: 0.8816 - val\_loss: 0.3968 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 568/1000

**12/12**  0s 4ms/step - accuracy: 0.8111 - loss: 0.4128 - precision: 0.8024 - recall: 0.8850 - val\_accuracy: 0.8816 - val\_loss: 0.3966 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 569/1000


**12/12**  0s 3ms/step - accuracy: 0.8621 - loss: 0.3393 - precision: 0.8629 - recall: 0.9008 - val\_accuracy: 0.8816 - val\_loss: 0.3966 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 570/1000


**12/12**  0s 3ms/step - accuracy: 0.8563 - loss: 0.3616 - precision: 0.8361 - recall: 0.9153 - val\_accuracy: 0.8816 - val\_loss: 0.3965 - val\_precision: 0.8684 - val\_recall: 0.8919




Epoch 571/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8261 - loss: 0.3824 - precision: 0.8170 - recall: 0.8937 - val\_accuracy: 0.8816 - val\_loss: 0.3964 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 572/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8576 - loss: 0.3558 - precision: 0.8347 - recall: 0.9303 - val\_accuracy: 0.8816 - val\_loss: 0.3963 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 573/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8540 - loss: 0.3634 - precision: 0.8303 - recall: 0.9145 - val\_accuracy: 0.8816 - val\_loss: 0.3962 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 574/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8458 - loss: 0.3706 - precision: 0.8183 - recall: 0.9236 - val\_accuracy: 0.8816 - val\_loss: 0.3961 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 575/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8745 - loss: 0.3676 - precision: 0.8606 - recall: 0.9107 - val\_accuracy: 0.8816 - val\_loss: 0.3960 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 576/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8500 - loss: 0.3573 - precision: 0.8504 - recall: 0.8935 - val\_accuracy: 0.8816 - val\_loss: 0.3959 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 577/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8474 - loss: 0.3650 - precision: 0.8373 - recall: 0.9178 - val\_accuracy: 0.8816 - val\_loss: 0.3958 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 578/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8420 - loss: 0.3584 - precision: 0.7913 - recall: 0.9046 - val\_accuracy: 0.8816 - val\_loss: 0.3957 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 579/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8260 - loss: 0.3897 - precision: 0.8100 - recall: 0.8965 - val\_accuracy: 0.8816 - val\_loss: 0.3957 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 580/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8056 - loss: 0.4064 - precision: 0.7780 - recall: 0.9025 - val\_accuracy: 0.8816 - val\_loss: 0.3956 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 581/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8533 - loss: 0.3529 - precision: 0.8412 - recall: 0.9090 - val\_accuracy: 0.8816 - val\_loss: 0.3955 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 582/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8342 - loss: 0.3712 - precision: 0.8078 - recall: 0.9073 - val\_accuracy: 0.8816 - val\_loss: 0.3954 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 583/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8493 - loss: 0.3622 - precision: 0.8353 - recall: 0.9031 - val\_accuracy: 0.8816 - val\_loss: 0.3953 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 584/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8542 - loss: 0.3613 - precision: 0.8514 - recall: 0.9035 - val\_accuracy: 0.8816 - val\_loss: 0.3952 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 585/1000


**12/12**  **0s** 7ms/step - accuracy: 0.8863 - loss: 0.3387 - precision: 0.8647 - recall: 0.9387 - val\_accuracy: 0.8816 - val\_loss: 0.3951 - val\_precision: 0.8684 - val\_recall: 0.8919

Epoch 586/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8510 - loss: 0.3595 - precision: 0.8424 - recall: 0.9186 - val\_accuracy: 0.8816 - val\_loss: 0.3950 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 587/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8410 - loss: 0.3759 - precision: 0.8405 - recall: 0.9056 - val\_accuracy: 0.8816 - val\_loss: 0.3950 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 588/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8307 - loss: 0.3860 - precision: 0.8103 - recall: 0.9047 - val\_accuracy: 0.8816 - val\_loss: 0.3949 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 589/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8626 - loss: 0.3640 - precision: 0.8344 - recall: 0.9234 - val\_accuracy: 0.8816 - val\_loss: 0.3948 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 590/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8407 - loss: 0.3798 - precision: 0.8405 - recall: 0.8973 - val\_accuracy: 0.8816 - val\_loss: 0.3947 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 591/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8686 - loss: 0.3574 - precision: 0.8423 - recall: 0.9285 - val\_accuracy: 0.8816 - val\_loss: 0.3946 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 592/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8582 - loss: 0.3465 - precision: 0.8343 - recall: 0.9191 - val\_accuracy: 0.8816 - val\_loss: 0.3945 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 593/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8672 - loss: 0.3422 - precision: 0.8601 - recall: 0.9095 - val\_accuracy: 0.8816 - val\_loss: 0.3945 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 594/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8810 - loss: 0.3434 - precision: 0.8589 - recall: 0.9446 - val\_accuracy: 0.8816 - val\_loss: 0.3944 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 595/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8345 - loss: 0.3647 - precision: 0.8275 - recall: 0.8921 - val\_accuracy: 0.8816 - val\_loss: 0.3944 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 596/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8618 - loss: 0.3637 - precision: 0.8406 - recall: 0.9235 - val\_accuracy: 0.8816 - val\_loss: 0.3943 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 597/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8167 - loss: 0.4004 - precision: 0.7975 - recall: 0.8867 - val\_accuracy: 0.8816 - val\_loss: 0.3942 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 598/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8389 - loss: 0.3822 - precision: 0.8090 - recall: 0.9163 - val\_accuracy: 0.8816 - val\_loss: 0.3942 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 599/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8597 - loss: 0.3777 - precision: 0.8390 - recall: 0.9333 - val\_accuracy: 0.8816 - val\_loss: 0.3941 - val\_precision: 0.8684 - val\_recall: 0.8919  
Epoch 600/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8507 - loss: 0.3683 - precision: 0.8415 - recall: 0.9101 - val\_accuracy: 0.8816 - val\_loss: 0.3940 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 601/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8580 - loss: 0.3691 - precision: 0.8345 - recall: 0.9360 - val\_accuracy: 0.8816 - val\_loss: 0.3940 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 602/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8592 - loss: 0.3736 - precision: 0.8383 - recall: 0.9316 - val\_accuracy: 0.8816 - val\_loss: 0.3939 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 603/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8834 - loss: 0.3317 - precision: 0.8637 - recall: 0.9357 - val\_accuracy: 0.8816 - val\_loss: 0.3938 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 604/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8565 - loss: 0.3571 - precision: 0.8506 - recall: 0.8954 - val\_accuracy: 0.8816 - val\_loss: 0.3937 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 605/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8600 - loss: 0.3598 - precision: 0.8541 - recall: 0.9110 - val\_accuracy: 0.8816 - val\_loss: 0.3936 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 606/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8500 - loss: 0.3742 - precision: 0.8303 - recall: 0.9133 - val\_accuracy: 0.8816 - val\_loss: 0.3936 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 607/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8321 - loss: 0.3669 - precision: 0.8291 - recall: 0.8827 - val\_accuracy: 0.8816 - val\_loss: 0.3935 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 608/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8571 - loss: 0.3561 - precision: 0.8290 - recall: 0.9387 - val\_accuracy: 0.8816 - val\_loss: 0.3934 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 609/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8313 - loss: 0.3882 - precision: 0.8055 - recall: 0.9220 - val\_accuracy: 0.8816 - val\_loss: 0.3933 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 610/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8841 - loss: 0.3384 - precision: 0.8907 - recall: 0.9074 - val\_accuracy: 0.8816 - val\_loss: 0.3933 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 611/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8552 - loss: 0.3482 - precision: 0.8408 - recall: 0.9103 - val\_accuracy: 0.8816 - val\_loss: 0.3932 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 612/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8376 - loss: 0.3652 - precision: 0.8349 - recall: 0.8810 - val\_accuracy: 0.8816 - val\_loss: 0.3931 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 613/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8287 - loss: 0.3656 - precision: 0.8378 - recall: 0.8565 - val\_accuracy: 0.8816 - val\_loss: 0.3931 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 614/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8394 - loss: 0.3753 - precision: 0.8332 - recall: 0.9054 - val\_accuracy: 0.8816 - val\_loss: 0.3930 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 615/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8377 - loss: 0.3624 - precision: 0.8069 - recall: 0.9134 - val\_accuracy: 0.8816 - val\_loss: 0.3929 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 616/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8423 - loss: 0.3814 - precision: 0.8061 - recall: 0.9303 - val\_accuracy: 0.8816 - val\_loss: 0.3929 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 617/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8122 - loss: 0.3824 - precision: 0.7792 - recall: 0.9038 - val\_accuracy: 0.8816 - val\_loss: 0.3928 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 618/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8677 - loss: 0.3524 - precision: 0.8438 - recall: 0.9367 - val\_accuracy: 0.8816 - val\_loss: 0.3927 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 619/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8375 - loss: 0.3689 - precision: 0.8189 - recall: 0.8994 - val\_accuracy: 0.8816 - val\_loss: 0.3927 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 620/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8161 - loss: 0.3914 - precision: 0.8007 - recall: 0.8943 - val\_accuracy: 0.8816 - val\_loss: 0.3926 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 621/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8735 - loss: 0.3356 - precision: 0.8653 - recall: 0.9322 - val\_accuracy: 0.8816 - val\_loss: 0.3926 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 622/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8518 - loss: 0.3671 - precision: 0.8464 - recall: 0.9046 - val\_accuracy: 0.8816 - val\_loss: 0.3925 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 623/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8499 - loss: 0.3505 - precision: 0.8374 - recall: 0.9162 - val\_accuracy: 0.8816 - val\_loss: 0.3924 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 624/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8536 - loss: 0.3462 - precision: 0.8244 - recall: 0.9310 - val\_accuracy: 0.8816 - val\_loss: 0.3924 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 625/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8646 - loss: 0.3401 - precision: 0.8385 - recall: 0.9161 - val\_accuracy: 0.8816 - val\_loss: 0.3923 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 626/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8311 - loss: 0.3925 - precision: 0.7888 - recall: 0.9270 - val\_accuracy: 0.8816 - val\_loss: 0.3923 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 627/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8670 - loss: 0.3614 - precision: 0.8546 - recall: 0.9322 - val\_accuracy: 0.8816 - val\_loss: 0.3922 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 628/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8308 - loss: 0.3835 - precision: 0.8385 - recall: 0.8684 - val\_accuracy: 0.8816 - val\_loss: 0.3922 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 629/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8526 - loss: 0.3779 - precision: 0.8319 - recall: 0.9280 - val\_accuracy: 0.8816 - val\_loss: 0.3921 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 630/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8739 - loss: 0.3362 - precision: 0.8739 - recall: 0.8991 - val\_accuracy: 0.8816 - val\_loss: 0.3921 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 631/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8472 - loss: 0.3703 - precision: 0.8054 - recall: 0.9377 - val\_accuracy: 0.8816 - val\_loss: 0.3920 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 632/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8700 - loss: 0.3420 - precision: 0.8507 - recall: 0.9388 - val\_accuracy: 0.8816 - val\_loss: 0.3920 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 633/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8352 - loss: 0.3793 - precision: 0.8017 - recall: 0.8922 - val\_accuracy: 0.8816 - val\_loss: 0.3919 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 634/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8275 - loss: 0.3575 - precision: 0.8172 - recall: 0.9083 - val\_accuracy: 0.8816 - val\_loss: 0.3919 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 635/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8500 - loss: 0.3622 - precision: 0.8360 - recall: 0.9137 - val\_accuracy: 0.8816 - val\_loss: 0.3918 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 636/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8856 - loss: 0.3387 - precision: 0.8802 - recall: 0.9320 - val\_accuracy: 0.8816 - val\_loss: 0.3918 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 637/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8542 - loss: 0.3439 - precision: 0.8543 - recall: 0.9101 - val\_accuracy: 0.8816 - val\_loss: 0.3918 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 638/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8366 - loss: 0.3782 - precision: 0.8335 - recall: 0.8963 - val\_accuracy: 0.8816 - val\_loss: 0.3918 - val\_precision: 0.8684 - val\_recall: 0.8919


Epoch 639/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8214 - loss: 0.3772 - precision: 0.8188 - recall: 0.8884 - val\_accuracy: 0.8684 - val\_loss: 0.3917 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 640/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8393 - loss: 0.3790 - precision: 0.8303 - recall: 0.9023 - val\_accuracy: 0.8684 - val\_loss: 0.3917 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 641/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8434 - loss: 0.3653 - precision: 0.8375 - recall: 0.8906 - val\_accuracy: 0.8684 - val\_loss: 0.3916 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 642/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8326 - loss: 0.3792 - precision: 0.8135 - recall: 0.9117 - val\_accuracy: 0.8684 - val\_loss: 0.3915 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 643/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8277 - loss: 0.3912 - precision: 0.8079 - recall: 0.9253 - val\_accuracy: 0.8684 - val\_loss: 0.3915 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 644/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8882 - loss: 0.3159 - precision: 0.8794 - recall: 0.9398 - val\_accuracy: 0.8684 - val\_loss: 0.3915 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 645/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8379 - loss: 0.3743 - precision: 0.8220 - recall: 0.9245 - val\_accuracy: 0.8684 - val\_loss: 0.3914 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 646/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8458 - loss: 0.3497 - precision: 0.8307 - recall: 0.9251 - val\_accuracy: 0.8684 - val\_loss: 0.3914 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 647/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8479 - loss: 0.3671 - precision: 0.8347 - recall: 0.9147 - val\_accuracy: 0.8684 - val\_loss: 0.3913 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 648/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8489 - loss: 0.3672 - precision: 0.8226 - recall: 0.9338 - val\_accuracy: 0.8684 - val\_loss: 0.3913 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 649/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8338 - loss: 0.3749 - precision: 0.8157 - recall: 0.9367 - val\_accuracy: 0.8684 - val\_loss: 0.3913 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 650/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8325 - loss: 0.3780 - precision: 0.8271 - recall: 0.9077 - val\_accuracy: 0.8684 - val\_loss: 0.3912 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 651/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8477 - loss: 0.3352 - precision: 0.8220 - recall: 0.9291 - val\_accuracy: 0.8684 - val\_loss: 0.3912 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 652/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8487 - loss: 0.3445 - precision: 0.8566 - recall: 0.8866 - val\_accuracy: 0.8684 - val\_loss: 0.3911 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 653/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8241 - loss: 0.3699 - precision: 0.8066 - recall: 0.8997 - val\_accuracy: 0.8684 - val\_loss: 0.3911 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 654/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8450 - loss: 0.3683 - precision: 0.8081 - recall: 0.9258 - val\_accuracy: 0.8684 - val\_loss: 0.3910 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 655/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8564 - loss: 0.3396 - precision: 0.8232 - recall: 0.9465 - val\_accuracy: 0.8684 - val\_loss: 0.3910 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 656/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8276 - loss: 0.3476 - precision: 0.8050 - recall: 0.9066 - val\_accuracy: 0.8684 - val\_loss: 0.3910 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 657/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8794 - loss: 0.3201 - precision: 0.8545 - recall: 0.9507 - val\_accuracy: 0.8684 - val\_loss: 0.3909 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 658/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8290 - loss: 0.3642 - precision: 0.7912 - recall: 0.9341 - val\_accuracy: 0.8684 - val\_loss: 0.3909 - val\_precision: 0.8462 - val\_recall: 0.8919

Epoch 659/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8285 - loss: 0.3559 - precision: 0.8036 - recall: 0.9090 - val\_accuracy: 0.8684 - val\_loss: 0.3909 - val\_precision: 0.8462 - val\_recall: 0.8919

Epoch 660/1000


**12/12**  **0s** 4ms/step - accuracy: 0.8586 - loss: 0.3549 - precision: 0.8408 - recall: 0.9120 - val\_accuracy: 0.8684 - val\_loss: 0.3909 - val\_precision: 0.8462 - val\_recall: 0.8919




Epoch 661/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8356 - loss: 0.3771 - precision: 0.8197 - recall: 0.9122 - val\_accuracy: 0.8684 - val\_loss: 0.3908 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 662/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8221 - loss: 0.3679 - precision: 0.8039 - recall: 0.9323 - val\_accuracy: 0.8684 - val\_loss: 0.3908 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 663/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8431 - loss: 0.3423 - precision: 0.8193 - recall: 0.9126 - val\_accuracy: 0.8684 - val\_loss: 0.3908 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 664/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8601 - loss: 0.3329 - precision: 0.8491 - recall: 0.9250 - val\_accuracy: 0.8684 - val\_loss: 0.3908 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 665/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8460 - loss: 0.3540 - precision: 0.8099 - recall: 0.9385 - val\_accuracy: 0.8684 - val\_loss: 0.3907 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 666/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8314 - loss: 0.3958 - precision: 0.7945 - recall: 0.9282 - val\_accuracy: 0.8684 - val\_loss: 0.3907 - val\_precision: 0.8462 - val\_recall: 0.8919


Epoch 667/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8283 - loss: 0.3771 - precision: 0.8241 - recall: 0.8825 - val\_accuracy: 0.8553 - val\_loss: 0.3907 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 668/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8808 - loss: 0.3379 - precision: 0.8565 - recall: 0.9533 - val\_accuracy: 0.8553 - val\_loss: 0.3906 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 669/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8326 - loss: 0.3565 - precision: 0.8378 - recall: 0.8648 - val\_accuracy: 0.8553 - val\_loss: 0.3906 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 670/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8436 - loss: 0.3495 - precision: 0.8181 - recall: 0.9343 - val\_accuracy: 0.8553 - val\_loss: 0.3906 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 671/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8785 - loss: 0.3451 - precision: 0.8766 - recall: 0.9234 - val\_accuracy: 0.8553 - val\_loss: 0.3906 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 672/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8740 - loss: 0.3278 - precision: 0.8636 - recall: 0.9327 - val\_accuracy: 0.8553 - val\_loss: 0.3905 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 673/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8658 - loss: 0.3281 - precision: 0.8326 - recall: 0.9468 - val\_accuracy: 0.8553 - val\_loss: 0.3905 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 674/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8191 - loss: 0.3681 - precision: 0.8119 - recall: 0.8683 - val\_accuracy: 0.8553 - val\_loss: 0.3905 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 675/1000


**12/12**  **0s** 3ms/step - accuracy: 0.8500 - loss: 0.3565 - precision: 0.8407 - recall: 0.9196 - val\_accuracy: 0.8553 - val\_loss: 0.3904 - val\_precision: 0.8421 - val\_recall: 0.8649




Epoch 676/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8253 - loss: 0.3669 - precision: 0.8105 - recall: 0.9034 - val\_accuracy: 0.8553 - val\_loss: 0.3904 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 677/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8831 - loss: 0.3302 - precision: 0.8623 - recall: 0.9487 - val\_accuracy: 0.8553 - val\_loss: 0.3904 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 678/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8501 - loss: 0.3477 - precision: 0.8405 - recall: 0.9188 - val\_accuracy: 0.8553 - val\_loss: 0.3904 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 679/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8412 - loss: 0.3588 - precision: 0.8361 - recall: 0.9134 - val\_accuracy: 0.8553 - val\_loss: 0.3903 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 680/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8536 - loss: 0.3650 - precision: 0.8348 - recall: 0.9214 - val\_accuracy: 0.8553 - val\_loss: 0.3903 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 681/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8578 - loss: 0.3300 - precision: 0.8247 - recall: 0.9403 - val\_accuracy: 0.8553 - val\_loss: 0.3902 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 682/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8676 - loss: 0.3416 - precision: 0.8520 - recall: 0.9338 - val\_accuracy: 0.8553 - val\_loss: 0.3903 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 683/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8313 - loss: 0.3779 - precision: 0.8396 - recall: 0.8810 - val\_accuracy: 0.8553 - val\_loss: 0.3902 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 684/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8139 - loss: 0.3825 - precision: 0.8239 - recall: 0.8797 - val\_accuracy: 0.8553 - val\_loss: 0.3902 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 685/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8418 - loss: 0.3562 - precision: 0.8367 - recall: 0.9022 - val\_accuracy: 0.8553 - val\_loss: 0.3902 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 686/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8479 - loss: 0.3433 - precision: 0.8021 - recall: 0.9457 - val\_accuracy: 0.8553 - val\_loss: 0.3902 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 687/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8466 - loss: 0.3280 - precision: 0.8277 - recall: 0.9342 - val\_accuracy: 0.8553 - val\_loss: 0.3901 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 688/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8374 - loss: 0.3458 - precision: 0.8225 - recall: 0.9130 - val\_accuracy: 0.8553 - val\_loss: 0.3901 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 689/1000


**12/12**  **0s** 4ms/step - accuracy: 0.8889 - loss: 0.2960 - precision: 0.8725 - recall: 0.9386 - val\_accuracy: 0.8553 - val\_loss: 0.3901 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 690/1000


**12/12**  **0s** 4ms/step - accuracy: 0.8609 - loss: 0.3415 - precision: 0.8459 - recall: 0.9271 - val\_accuracy: 0.8553 - val\_loss: 0.3900 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 691/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8360 - loss: 0.3470 - precision: 0.8001 - recall: 0.9264 - val\_accuracy: 0.8553 - val\_loss: 0.3900 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 692/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8553 - loss: 0.3648 - precision: 0.8242 - recall: 0.9517 - val\_accuracy: 0.8553 - val\_loss: 0.3900 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 693/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8364 - loss: 0.3654 - precision: 0.8464 - recall: 0.8806 - val\_accuracy: 0.8553 - val\_loss: 0.3899 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 694/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8788 - loss: 0.3161 - precision: 0.8779 - recall: 0.9300 - val\_accuracy: 0.8553 - val\_loss: 0.3899 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 695/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8448 - loss: 0.3473 - precision: 0.8209 - recall: 0.9186 - val\_accuracy: 0.8553 - val\_loss: 0.3899 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 696/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8328 - loss: 0.3420 - precision: 0.8371 - recall: 0.8960 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 697/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8087 - loss: 0.3869 - precision: 0.8006 - recall: 0.8972 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 698/1000  
12/12 ————— 0s 3ms/step - accuracy: 0.8506 - loss: 0.3507 - precision: 0.8259 - recall: 0.9458 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 699/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8643 - loss: 0.3394 - precision: 0.8575 - recall: 0.9195 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 700/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8320 - loss: 0.3730 - precision: 0.8094 - recall: 0.9136 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 701/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8518 - loss: 0.3431 - precision: 0.8141 - recall: 0.9338 - val\_accuracy: 0.8553 - val\_loss: 0.3898 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 702/1000  
12/12 ————— 0s 6ms/step - accuracy: 0.8342 - loss: 0.3586 - precision: 0.8088 - recall: 0.9218 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 703/1000  
12/12 ————— 0s 5ms/step - accuracy: 0.8299 - loss: 0.3631 - precision: 0.7890 - recall: 0.9367 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 704/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8594 - loss: 0.3349 - precision: 0.8186 - recall: 0.9592 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649  
Epoch 705/1000  
12/12 ————— 0s 4ms/step - accuracy: 0.8806 - loss: 0.3399 - precision: 0.8697 - recall: 0.9413 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 706/1000

12/12  0s 3ms/step - accuracy: 0.8400 - loss: 0.3559 - precision: 0.8035 - recall: 0.9325 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 707/1000

12/12  0s 3ms/step - accuracy: 0.8659 - loss: 0.3529 - precision: 0.8500 - recall: 0.9370 - val\_accuracy: 0.8553 - val\_loss: 0.3897 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 708/1000

12/12  0s 7ms/step - accuracy: 0.8403 - loss: 0.3552 - precision: 0.8396 - recall: 0.9034 - val\_accuracy: 0.8553 - val\_loss: 0.3896 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 709/1000

12/12  0s 5ms/step - accuracy: 0.8668 - loss: 0.3364 - precision: 0.8210 - recall: 0.9458 - val\_accuracy: 0.8553 - val\_loss: 0.3896 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 710/1000

12/12  0s 4ms/step - accuracy: 0.8474 - loss: 0.3437 - precision: 0.8428 - recall: 0.9147 - val\_accuracy: 0.8553 - val\_loss: 0.3896 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 711/1000

12/12  0s 4ms/step - accuracy: 0.8719 - loss: 0.3304 - precision: 0.8521 - recall: 0.9389 - val\_accuracy: 0.8553 - val\_loss: 0.3896 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 712/1000

12/12  0s 5ms/step - accuracy: 0.8463 - loss: 0.3590 - precision: 0.8408 - recall: 0.9042 - val\_accuracy: 0.8553 - val\_loss: 0.3896 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 713/1000

12/12  0s 4ms/step - accuracy: 0.8501 - loss: 0.3449 - precision: 0.8358 - recall: 0.9152 - val\_accuracy: 0.8553 - val\_loss: 0.3895 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 714/1000

12/12  0s 5ms/step - accuracy: 0.8524 - loss: 0.3217 - precision: 0.8324 - recall: 0.9324 - val\_accuracy: 0.8553 - val\_loss: 0.3895 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 715/1000

12/12  0s 3ms/step - accuracy: 0.8407 - loss: 0.3665 - precision: 0.8171 - recall: 0.9243 - val\_accuracy: 0.8553 - val\_loss: 0.3895 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 716/1000

12/12  0s 3ms/step - accuracy: 0.8255 - loss: 0.3917 - precision: 0.7886 - recall: 0.9182 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 717/1000

12/12  0s 4ms/step - accuracy: 0.8570 - loss: 0.3508 - precision: 0.8509 - recall: 0.9242 - val\_accuracy: 0.8553 - val\_loss: 0.3895 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 718/1000

12/12  0s 4ms/step - accuracy: 0.8377 - loss: 0.3625 - precision: 0.8193 - recall: 0.9010 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 719/1000

12/12  0s 4ms/step - accuracy: 0.8729 - loss: 0.3180 - precision: 0.8612 - recall: 0.9298 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 720/1000

12/12  0s 4ms/step - accuracy: 0.8537 - loss: 0.3382 - precision: 0.8356 - recall: 0.9189 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 721/1000

**12/12**  **0s** 6ms/step - accuracy: 0.8653 - loss: 0.3412 - precision: 0.8418 - recall: 0.9228 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 722/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8638 - loss: 0.3403 - precision: 0.8352 - recall: 0.9357 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 723/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8454 - loss: 0.3383 - precision: 0.8034 - recall: 0.9352 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 724/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8742 - loss: 0.3026 - precision: 0.8340 - recall: 0.9529 - val\_accuracy: 0.8553 - val\_loss: 0.3894 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 725/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8832 - loss: 0.3097 - precision: 0.8712 - recall: 0.9392 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 726/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8549 - loss: 0.3528 - precision: 0.8486 - recall: 0.9089 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 727/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8086 - loss: 0.3581 - precision: 0.7935 - recall: 0.8834 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 728/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8339 - loss: 0.3694 - precision: 0.8183 - recall: 0.9311 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 729/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8512 - loss: 0.3195 - precision: 0.8297 - recall: 0.9171 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 730/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8669 - loss: 0.3171 - precision: 0.8595 - recall: 0.9311 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 731/1000

**12/12**  **0s** 7ms/step - accuracy: 0.8287 - loss: 0.3594 - precision: 0.8145 - recall: 0.9097 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 732/1000

**12/12**  **0s** 4ms/step - accuracy: 0.8280 - loss: 0.3586 - precision: 0.7925 - recall: 0.9225 - val\_accuracy: 0.8553 - val\_loss: 0.3892 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 733/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8417 - loss: 0.3622 - precision: 0.8421 - recall: 0.8938 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 734/1000

**12/12**  **0s** 5ms/step - accuracy: 0.8278 - loss: 0.3422 - precision: 0.7889 - recall: 0.9297 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649


Epoch 735/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8275 - loss: 0.3754 - precision: 0.7682 - recall: 0.9417 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 736/1000

**12/12**  **0s** 3ms/step - accuracy: 0.8522 - loss: 0.3363 - precision: 0.8171 - recall: 0.9498 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649

Epoch 737/1000

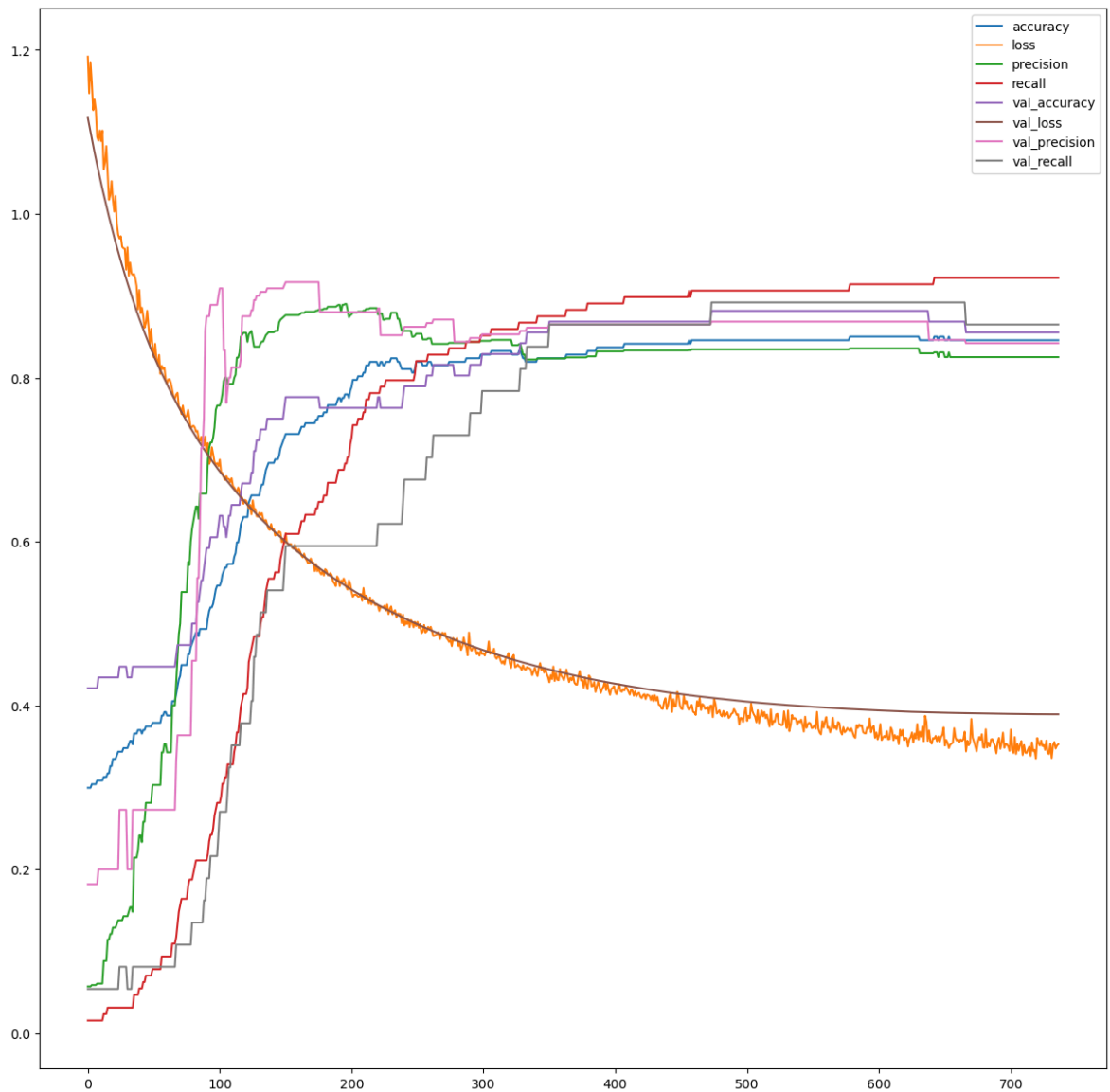
**12/12**  **0s** 3ms/step - accuracy: 0.8769 - loss: 0.3149 - precision: 0.8343 - recall: 0.9611 - val\_accuracy: 0.8553 - val\_loss: 0.3893 - val\_precision: 0.8421 - val\_recall: 0.8649

```
In [97]: y_pred = modelo(x_test[0:10])  
y_pred
```

```
Out[97]: <tf.Tensor: shape=(10, 1), dtype=float32, numpy=  
array([[0.95323694],  
       [0.3079901 ],  
       [0.7318971 ],  
       [0.5762318 ],  
       [0.08155684],  
       [0.9495489 ],  
       [0.24825497],  
       [0.03990092],  
       [0.6352273 ],  
       [0.12149031]], dtype=float32)>
```

```
In [99]: pd.DataFrame(historia.history).plot(figsize=(15,15))
```

```
Out[99]: <Axes: >
```



```
In [100... a=modelo.evaluate(x_test,y_test)
a
```

3/3 ————— 0s 0s/step - accuracy: 0.8612 - loss: 0.3881 - precision: 0.8426 - recall: 0.8865

```
Out[100... [0.39173030853271484,
0.8552631735801697,
0.8421052694320679,
0.8648648858070374]
```

```
In [102... y_pred = modelo(x_test[0:10])
y_pred
```

```
Out[102... <tf.Tensor: shape=(10, 1), dtype=float32, numpy=
array([[0.95323694],
       [0.3079901 ],
       [0.7318971 ],
       [0.5762318 ],
       [0.08155684],
       [0.9495489 ],
       [0.24825497],
       [0.03990092],
       [0.6352273 ],
       [0.12149031]], dtype=float32)>
```

In [103... `y_test[0:10]`

Out[103... 

16	1
212	0
57	1
103	1
264	0
134	1
239	0
257	0
13	1
244	0

  
Name: output, dtype: int64

In [ ]: