In [1]:

```
!pip install tensorflow-gpu
```

```
Requirement already satisfied: tensorflow-gpu in c:\users\abc\anaconda3\lib
\site-packages (2.8.0)
Requirement already satisfied: tensorboard<2.9,>=2.8 in c:\users\abc\anacond
a3\lib\site-packages (from tensorflow-gpu) (2.8.0)
Requirement already satisfied: absl-py>=0.4.0 in c:\users\abc\anaconda3\lib
\site-packages (from tensorflow-gpu) (1.0.0)
Requirement already satisfied: termcolor>=1.1.0 in c:\users\abc\anaconda3\li
b\site-packages (from tensorflow-gpu) (1.1.0)
Requirement already satisfied: gast>=0.2.1 in c:\users\abc\anaconda3\lib\sit
e-packages (from tensorflow-gpu) (0.4.0)
Requirement already satisfied: wrapt>=1.11.0 in c:\users\abc\anaconda3\lib\s
ite-packages (from tensorflow-gpu) (1.11.2)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\us
ers\abc\anaconda3\lib\site-packages (from tensorflow-gpu) (0.24.0)
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\abc\anaconda3
\lib\site-packages (from tensorflow-gpu) (0.2.0)
Requirement already satisfied: protobuf>=3.9.2 in c:\users\abc\anaconda3\lib
\site-packages (from tensorflow-gpu) (3.19.1)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\abc\anaconda3
\lib\site-packages (from tensorflow-gpu) (1.42.0)
Requirement already satisfied: keras-preprocessing>=1.1.1 in c:\users\abc\an
aconda3\lib\site-packages (from tensorflow-gpu) (1.1.2)
Requirement already satisfied: six>=1.12.0 in c:\users\abc\anaconda3\lib\sit
e-packages (from tensorflow-gpu) (1.15.0)
Requirement already satisfied: flatbuffers>=1.12 in c:\users\abc\anaconda3\l
ib\site-packages (from tensorflow-gpu) (2.0)
Requirement already satisfied: h5py>=2.9.0 in c:\users\abc\anaconda3\lib\sit
e-packages (from tensorflow-gpu) (2.10.0)
Requirement already satisfied: numpy>=1.20 in c:\users\abc\anaconda3\lib\sit
e-packages (from tensorflow-gpu) (1.22.4)
Requirement already satisfied: tf-estimator-nightly==2.8.0.dev2021122109 in
c:\users\abc\anaconda3\lib\site-packages (from tensorflow-gpu) (2.8.0.dev202
1122109)
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\abc\anac
onda3\lib\site-packages (from tensorflow-gpu) (3.7.4.2)
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\abc\anaconda3\l
ib\site-packages (from tensorflow-gpu) (3.3.0)
Requirement already satisfied: setuptools in c:\users\abc\anaconda3\lib\site
-packages (from tensorflow-gpu) (49.2.0.post20200714)
Requirement already satisfied: astunparse>=1.6.0 in c:\users\abc\anaconda3\l
ib\site-packages (from tensorflow-gpu) (1.6.3)
Collecting keras<2.9,>=2.8.0rc0
  Using cached keras-2.8.0-py2.py3-none-any.whl (1.4 MB)
Requirement already satisfied: libclang>=9.0.1 in c:\users\abc\anaconda3\lib
\site-packages (from tensorflow-gpu) (12.0.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\abc\anaconda3
\lib\site-packages (from astunparse>=1.6.0->tensorflow-gpu) (0.34.2)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in c:\u
sers\abc\anaconda3\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow
-gpu) (0.6.1)
Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\abc\anacond
a3\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gpu) (2.3.3)
Requirement already satisfied: werkzeug>=0.11.15 in c:\users\abc\anaconda3\l
ib\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gpu) (1.0.1)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\abc\anaconda3
\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gpu) (2.27.1)
Requirement already satisfied: markdown>=2.6.8 in c:\users\abc\anaconda3\lib
```

```
\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gpu) (3.3.6)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in c:\users
\abc\anaconda3\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gp
u) (0.4.6)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in c:\users\abc
\anaconda3\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow-gpu)
(1.8.0)
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\abc\anaconda3\lib\s
ite-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow-
gpu) (4.8)
Requirement already satisfied: pyasn1-modules>=0.2.1 in c:\users\abc\anacond
a3\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>=2.8->ten
sorflow-gpu) (0.2.8)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in c:\users\abc\anacon
da3\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>=2.8->te
nsorflow-gpu) (4.2.4)
Requirement already satisfied: requests-oauthlib>=0.7.0 in c:\users\abc\anac
onda3\lib\site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard<
2.9,>=2.8->tensorflow-gpu) (1.3.0)
Requirement already satisfied: importlib-metadata>=4.4 in c:\users\abc\anaco
nda3\lib\site-packages (from markdown>=2.6.8->tensorboard<2.9,>=2.8->tensorf
low-gpu) (4.8.2)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\abc\anacond
a3\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tenso
rflow-gpu) (1.26.9)
Requirement already satisfied: idna<4,>=2.5 in c:\users\abc\anaconda3\lib\si
te-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow-gp
u) (2.10)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\abc\anaconda3
\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorf
low-gpu) (2022.5.18.1)
Requirement already satisfied: charset-normalizer~=2.0.0 in c:\users\abc\ana
conda3\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->t
ensorflow-gpu) (2.0.12)
Requirement already satisfied: zipp>=0.5 in c:\users\abc\anaconda3\lib\site-
packages (from importlib-metadata>=4.4->markdown>=2.6.8->tensorboard<2.9,>=
2.8->tensorflow-gpu) (3.1.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\users\abc\anaconda
3\lib\site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tens
orboard<2.9,>=2.8->tensorflow-gpu) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in c:\users\abc\anaconda3\lib
\site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.
4.1->tensorboard<2.9,>=2.8->tensorflow-gpu) (3.1.1)
Installing collected packages: keras
  Attempting uninstall: keras
    Found existing installation: keras 2.7.0
    Uninstalling keras-2.7.0:
      Successfully uninstalled keras-2.7.0
Successfully installed keras-2.8.0


ERROR: pip's dependency resolver does not currently take into account all th
e packages that are installed. This behaviour is the source of the following
dependency conflicts.
tensorflow 2.7.0 requires keras<2.8,>=2.7.0rc0, but you have keras 2.8.0 whi
ch is incompatible.
WARNING: There was an error checking the latest version of pip.
```

In [2]:

```
import tensorflow as tf
```

In [3]:

```
print(tf.__version__)
```

```
2.8.0
```

In [4]:

```
# Importing the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

In [6]:

```
# Importing the dataset
dataset = pd.read_csv('Churn_Modelling.csv')
X = dataset.iloc[:, 3:13]
y = dataset.iloc[:, 13]
```

In [7]:

```
#Create dummy variables
geography=pd.get_dummies(X["Geography"],drop_first=True)
gender=pd.get_dummies(X['Gender'],drop_first=True)
```

In [8]:

```
## Concatenate the Data Frames

X=pd.concat([X,geography,gender],axis=1)

## Drop Unnecessary columns
X=X.drop(['Geography','Gender'],axis=1)

# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, random_state = 0
```

In [9]:

```
# Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

In [10]:

```
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LeakyReLU,PReLU,ELU
from keras.layers import Dropout
```

In [11]:

```
# Initialising the ANN
classifier = Sequential()
```

In [12]:

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

In [13]:

```
classifier.add(Dense(units=6,activation='relu'))
```

In [14]:

```
classifier.add(Dense(units=1,activation='relu'))
```

In [15]:

```
classifier.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy'])
```

In [16]:

```
model_history=classifier.fit(X_train,y_train,validation_split=0.33,batch_size=10,epochs=50)
```

```
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 45/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 46/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 47/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 48/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 49/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
Epoch 50/50
536/536 [==============================] - 1s 1ms/step - loss: 3.1431 - ac
curacy: 0.7962 - val_loss: 3.1539 - val_accuracy: 0.7955
```

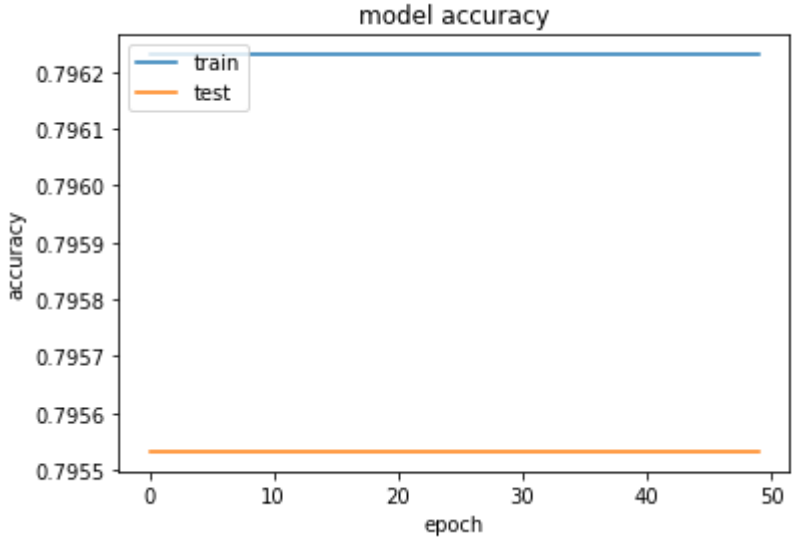
In [17]:

```
print(model_history.history.keys())
```

```
dict_keys(['loss', 'accuracy', 'val_loss', 'val_accuracy'])
```

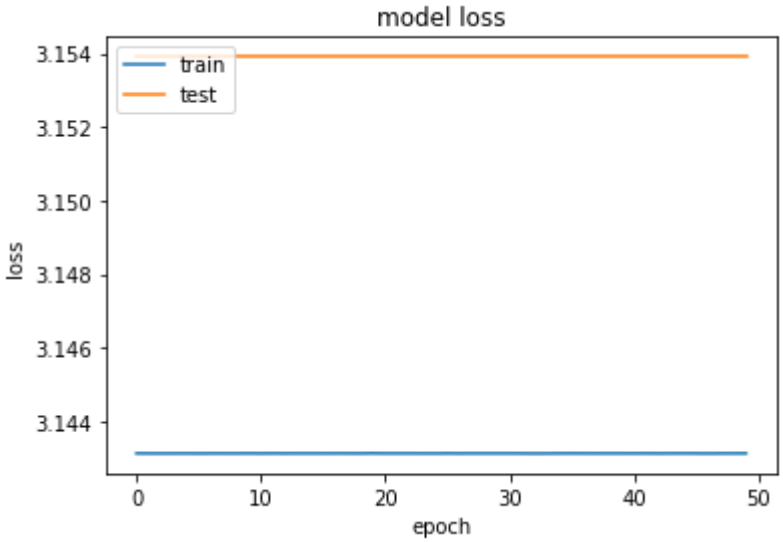
In [21]:

```
# summarize history for accuracy
plt.plot(model_history.history['accuracy'])
plt.plot(model_history.history['val_accuracy'])
plt.title('model accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



In [22]:

```
# summarize history for loss
plt.plot(model_history.history['loss'])
plt.plot(model_history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



In [28]:

```
# Part 3 - Making the predictions and evaluating the model

# Predicting the Test set results
y_pred = classifier.predict(X_test)
y_pred = (y_pred > 0.5)
```

In [29]:

```
# Making the Confusion Matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
cm
```

Out[29]:

```
array([[1595,    0],
       [ 405,    0]], dtype=int64)
```

In [30]:

```
# Calculate the Accuracy
from sklearn.metrics import accuracy_score
score=accuracy_score(y_pred,y_test)
```

In [31]:

```
score
```

Out[31]:

```
0.7975
```

In [ ]:

```

```