In [1]:
```
import numpy as np
import pandas as pd
import tensorflow as tf
```

In [2]:
```
data=pd.read_csv("C:\\Users\\Admin\\Downloads\\assignment 9\\forestfires.csv")
data
```

Out[2]:

	month	day	FFMC	DMC	DC	ISI	temp	RH	wind	rain	...	monthfeb	monthjan	monthjul	monthjun	monthmar	monthmay	m
0	mar	fri	86.2	26.2	94.3	5.1	8.2	51	6.7	0.0	...	0	0	0	0	1	0	
1	oct	tue	90.6	35.4	669.1	6.7	18.0	33	0.9	0.0	...	0	0	0	0	0	0	
2	oct	sat	90.6	43.7	686.9	6.7	14.6	33	1.3	0.0	...	0	0	0	0	0	0	
3	mar	fri	91.7	33.3	77.5	9.0	8.3	97	4.0	0.2	...	0	0	0	0	1	0	
4	mar	sun	89.3	51.3	102.2	9.6	11.4	99	1.8	0.0	...	0	0	0	0	1	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
512	aug	sun	81.6	56.7	665.6	1.9	27.8	32	2.7	0.0	...	0	0	0	0	0	0	
513	aug	sun	81.6	56.7	665.6	1.9	21.9	71	5.8	0.0	...	0	0	0	0	0	0	
514	aug	sun	81.6	56.7	665.6	1.9	21.2	70	6.7	0.0	...	0	0	0	0	0	0	
515	aug	sat	94.4	146.0	614.7	11.3	25.6	42	4.0	0.0	...	0	0	0	0	0	0	
516	nov	tue	79.5	3.0	106.7	1.1	11.8	31	4.5	0.0	...	0	0	0	0	0	0	

517 rows × 31 columns

In [3]:
```
X=data.iloc[:,3:-9].values
```

In [4]:
```
Y=data.iloc[:,-11].values
```

In [5]:
```
from sklearn.preprocessing import LabelEncoder
LE1=LabelEncoder()
```

```
X[:,2]=np.array(LE1.fit_transform(X[:,2]))
```

In [6]:
```
from sklearn.compose import ColumnTransformer
from sklearn.preprocessing import OneHotEncoder
ct=ColumnTransformer(transformers=[('encoder',OneHotEncoder(),[1])],remainder="passthrough")
```

In [7]:
```
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 [8]:
```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
X_train=sc.fit_transform(X_train)
X_test=sc.transform(X_test)
```

In [9]:
```
ann=tf.keras.models.Sequential()
```

In [10]:
```
ann.add(tf.keras.layers.Dense(units=6,activation="relu"))
```

In [11]:
```
ann.add(tf.keras.layers.Dense(units=1,activation="sigmoid"))
```

In [12]:
```
ann.compile(optimizer="adam",loss="binary_crossentropy",metrics=['accuracy'])
```

In [13]:
```
ann.fit(X_train,Y_train,batch_size=20,epochs=100)
```

```
Epoch 1/100
21/21 [==============================] - 4s 16ms/step - loss: 0.8644 - accuracy: 0.2978
Epoch 2/100
21/21 [==============================] - 0s 5ms/step - loss: 0.7888 - accuracy: 0.3753
Epoch 3/100
21/21 [==============================] - 0s 4ms/step - loss: 0.7224 - accuracy: 0.5061
Epoch 4/100
21/21 [==============================] - 0s 2ms/step - loss: 0.6642 - accuracy: 0.5981
Epoch 5/100
21/21 [==============================] - 0s 3ms/step - loss: 0.6115 - accuracy: 0.6925
```

```
Epoch 6/100
21/21 [==============================] - 0s 2ms/step - loss: 0.5651 - accuracy: 0.7554
Epoch 7/100
21/21 [==============================] - 0s 2ms/step - loss: 0.5231 - accuracy: 0.8160
Epoch 8/100
21/21 [==============================] - 0s 2ms/step - loss: 0.4839 - accuracy: 0.8596
Epoch 9/100
21/21 [==============================] - 0s 2ms/step - loss: 0.4483 - accuracy: 0.8644
Epoch 10/100
21/21 [==============================] - 0s 2ms/step - loss: 0.4151 - accuracy: 0.8910
Epoch 11/100
21/21 [==============================] - 0s 2ms/step - loss: 0.3846 - accuracy: 0.9007
Epoch 12/100
21/21 [==============================] - 0s 2ms/step - loss: 0.3560 - accuracy: 0.9153
Epoch 13/100
21/21 [==============================] - 0s 2ms/step - loss: 0.3292 - accuracy: 0.9395
Epoch 14/100
21/21 [==============================] - 0s 2ms/step - loss: 0.3041 - accuracy: 0.9613
Epoch 15/100
21/21 [==============================] - 0s 2ms/step - loss: 0.2805 - accuracy: 0.9782
Epoch 16/100
21/21 [==============================] - 0s 2ms/step - loss: 0.2583 - accuracy: 0.9879
Epoch 17/100
21/21 [==============================] - 0s 2ms/step - loss: 0.2379 - accuracy: 0.9927
Epoch 18/100
21/21 [==============================] - 0s 2ms/step - loss: 0.2191 - accuracy: 0.9927
Epoch 19/100
21/21 [==============================] - 0s 2ms/step - loss: 0.2018 - accuracy: 0.9952
Epoch 20/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1859 - accuracy: 0.9976
Epoch 21/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1714 - accuracy: 0.9976
Epoch 22/100
21/21 [==============================] - 0s 3ms/step - loss: 0.1578 - accuracy: 0.9976
Epoch 23/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1454 - accuracy: 0.9976
Epoch 24/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1340 - accuracy: 0.9976
Epoch 25/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1236 - accuracy: 0.9976
Epoch 26/100
21/21 [==============================] - 0s 2ms/step - loss: 0.1141 - accuracy: 1.0000
Epoch 27/100
21/21 [==============================] - 0s 3ms/step - loss: 0.1055 - accuracy: 1.0000
Epoch 28/100
```

```
21/21 [==============================] - 0s 3ms/step - loss: 0.0975 - accuracy: 1.0000
Epoch 29/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0903 - accuracy: 1.0000
Epoch 30/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0836 - accuracy: 1.0000
Epoch 31/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0776 - accuracy: 1.0000
Epoch 32/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0721 - accuracy: 1.0000
Epoch 33/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0669 - accuracy: 1.0000
Epoch 34/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0623 - accuracy: 1.0000
Epoch 35/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0581 - accuracy: 1.0000
Epoch 36/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0542 - accuracy: 1.0000
Epoch 37/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0506 - accuracy: 1.0000
Epoch 38/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0473 - accuracy: 1.0000
Epoch 39/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0442 - accuracy: 1.0000
Epoch 40/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0415 - accuracy: 1.0000
Epoch 41/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0389 - accuracy: 1.0000
Epoch 42/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0365 - accuracy: 1.0000
Epoch 43/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0344 - accuracy: 1.0000
Epoch 44/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0324 - accuracy: 1.0000
Epoch 45/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0304 - accuracy: 1.0000
Epoch 46/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0287 - accuracy: 1.0000
Epoch 47/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0271 - accuracy: 1.0000
Epoch 48/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0256 - accuracy: 1.0000
Epoch 49/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0242 - accuracy: 1.0000
Epoch 50/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0229 - accuracy: 1.0000
```

```
Epoch 51/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0217 - accuracy: 1.0000
Epoch 52/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0206 - accuracy: 1.0000
Epoch 53/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0196 - accuracy: 1.0000
Epoch 54/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0186 - accuracy: 1.0000
Epoch 55/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0177 - accuracy: 1.0000
Epoch 56/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0169 - accuracy: 1.0000
Epoch 57/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0161 - accuracy: 1.0000
Epoch 58/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0154 - accuracy: 1.0000
Epoch 59/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0147 - accuracy: 1.0000
Epoch 60/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0140 - accuracy: 1.0000
Epoch 61/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0134 - accuracy: 1.0000
Epoch 62/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0129 - accuracy: 1.0000
Epoch 63/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0123 - accuracy: 1.0000
Epoch 64/100
21/21 [==============================] - 0s 5ms/step - loss: 0.0118 - accuracy: 1.0000
Epoch 65/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0113 - accuracy: 1.0000
Epoch 66/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0109 - accuracy: 1.0000
Epoch 67/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0105 - accuracy: 1.0000
Epoch 68/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0101 - accuracy: 1.0000
Epoch 69/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0097 - accuracy: 1.0000
Epoch 70/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0093 - accuracy: 1.0000
Epoch 71/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0090 - accuracy: 1.0000
Epoch 72/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0086 - accuracy: 1.0000
Epoch 73/100
```

```
21/21 [==============================] - 0s 4ms/step - loss: 0.0083 - accuracy: 1.0000
Epoch 74/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0080 - accuracy: 1.0000
Epoch 75/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0078 - accuracy: 1.0000
Epoch 76/100
21/21 [==============================] - 0s 5ms/step - loss: 0.0075 - accuracy: 1.0000
Epoch 77/100
21/21 [==============================] - 0s 6ms/step - loss: 0.0072 - accuracy: 1.0000
Epoch 78/100
21/21 [==============================] - 0s 5ms/step - loss: 0.0070 - accuracy: 1.0000
Epoch 79/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0068 - accuracy: 1.0000
Epoch 80/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0066 - accuracy: 1.0000
Epoch 81/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0063 - accuracy: 1.0000
Epoch 82/100
21/21 [==============================] - 0s 4ms/step - loss: 0.0061 - accuracy: 1.0000
Epoch 83/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0060 - accuracy: 1.0000
Epoch 84/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0058 - accuracy: 1.0000
Epoch 85/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0056 - accuracy: 1.0000
Epoch 86/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0054 - accuracy: 1.0000
Epoch 87/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0053 - accuracy: 1.0000
Epoch 88/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0051 - accuracy: 1.0000
Epoch 89/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0050 - accuracy: 1.0000
Epoch 90/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0048 - accuracy: 1.0000
Epoch 91/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0047 - accuracy: 1.0000
Epoch 92/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0046 - accuracy: 1.0000
Epoch 93/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0044 - accuracy: 1.0000
Epoch 94/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0043 - accuracy: 1.0000
Epoch 95/100
21/21 [==============================] - 0s 2ms/step - loss: 0.0042 - accuracy: 1.0000
```

```
Epoch 96/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0041 - accuracy: 1.0000
Epoch 97/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0040 - accuracy: 1.0000
Epoch 98/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0039 - accuracy: 1.0000
Epoch 99/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0038 - accuracy: 1.0000
Epoch 100/100
21/21 [==============================] - 0s 3ms/step - loss: 0.0037 - accuracy: 1.0000
```

Out[13]:
```
<keras.callbacks.History at 0x18aedaf7a30>
```

In [14]:
```
scores=ann.evaluate(X,Y)
print("%s: %0.2f%%" % (ann.metrics_names[1], scores[1]*100))
```

```
17/17 [==============================] - 0s 3ms/step - loss: 3.1419 - accuracy: 0.9826
accuracy: 98.26%
```

In [ ]:
```

```