In [1]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.ensemble import GradientBoostingClassifier
from sklearn import metrics
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.metrics import f1_score, recall_score, precision_score
from sklearn.datasets import make_classification
from sklearn.model_selection import KFold
from sklearn.model_selection import cross_val_score
from sklearn.metrics import accuracy_score
```

In [2]:
```python
Data = pd.read_csv("P2_Data.csv") # Upload the data
```

In [3]:
```python
Data
```

Out[3]:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	...	F28	F29	F30	F31	F32	F33	F34	F35	F36	Target
0	854.04	-15267.84	193.04	12132.20	464.22	-19.81	920.42	11.84	-38.02	8.35	...	-100.43	10497.32	8	-46.22	91.89	-41.70	-849.78	-5.12	4261.68	609.09
1	1748.76	-4299.45	439.72	18046.14	540.36	-8.55	1913.78	11.28	122.02	-8.83	...	-97.41	16792.88	4	51.24	-450.34	-75.30	-1801.59	-0.16	2737.58	232.66
2	834.44	-18927.93	-85.86	18533.56	611.34	-15.88	1956.90	10.00	-24.26	-54.33	...	-135.59	-5647.94	6	40.93	-471.02	-55.50	-2529.75	8.50	3696.64	480.01
3	1429.36	3653.73	-59.69	31314.52	408.45	-9.67	1628.18	11.59	90.88	-38.87	...	-85.77	6869.46	2	-9.19	-290.45	-67.86	-2915.34	9.76	2919.54	1685.20
4	188.80	-3932.07	128.70	22837.34	530.22	-14.93	1218.16	9.55	-93.78	-61.95	...	-75.76	16974.08	2	100.86	-850.10	-64.95	-2154.12	13.42	2693.48	617.96
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1495	987.12	4369.68	-223.67	25595.70	395.58	-14.05	2503.50	13.57	10.14	-36.93	...	-95.59	9304.98	10	-7.54	-845.24	-71.10	-1960.50	9.02	3062.52	1057.77
1496	966.92	-12845.01	-735.65	25065.72	613.14	-15.62	859.76	11.04	43.12	-69.32	...	-129.22	16906.02	10	16.42	-360.75	-60.21	-753.06	-1.60	4167.22	1232.01
1497	860.70	-641.70	-393.30	31577.66	577.62	-9.49	617.64	5.80	-63.68	-89.18	...	-201.85	4687.12	10	-60.35	-477.90	-60.36	-1749.51	20.26	4466.74	2037.64
1498	428.82	-16169.43	-84.49	26820.44	555.30	-11.96	1631.22	9.80	-172.42	-27.69	...	-133.37	9937.10	8	-16.85	-458.68	-42.75	-1714.83	8.90	3599.06	-27.86
1499	753.78	10536.00	-238.10	34668.58	557.04	-17.71	2344.28	25.30	97.58	-101.30	...	-65.15	21663.04	2	0.39	-620.86	-59.76	-3509.94	15.88	4241.28	1012.31

1500 rows × 37 columns

In [4]:
```python
# Map strings to integers
Data["F20"] = Data["F20"].map({"Low": 99, "Very low": 100, "High": 101, "Very high": 102, "Medium": 103})
Data["F27"] = Data["F27"].map({"USA":5,"UK": 6,"Europe":7,"Rest":8})
```

In [5]:
```python
X = Data.drop('Target', axis = 1) # Excluding target variable
```

In [6]:
```python
y = Data['Target'] # target variable
```

In [7]:
```python
test = pd.read_csv("P2_test.csv")  # Upload the test data
new_P2test = test.drop('Target', axis = 1) # Excluding target variable from the test data
```

In [8]:
```python
# Map strings to integers in test data
test["F20"] = test["F20"].map({"Low": 99, "Very low": 100, "High": 101, "Very high": 102, "Medium": 103})
test["F27"] = test["F27"].map({"USA":5,"UK": 6,"Europe":7,"Rest":8})
```

In [9]:
```python
# define input
new_input = []

for i in range(1500):
    new_input.append([test["F1"][i],test["F2"][i],test["F3"][i],test["F4"][i],test["F5"][i],test["F6"][i],test["F7"][i],test["F8"][i],test["F9"][i]
```

In [10]:
```python
# Apply ExtraTrees Regressor to predict target values
from sklearn.ensemble import ExtraTreesRegressor
reg = ExtraTreesRegressor(n_estimators=100, random_state=0).fit(X,y)
reg.fit(X, y)
y_predict = reg.predict(new_input)
rs = []
for i in range(len(new_input)):
    rs.append(y_predict[i])

print(rs)
```

```
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```

In [11]:
```python
new_P2test.insert(36, "Target", rs) # Insert target variable in the new_test data
```

In [12]:
```python
new_P2test
```

Out[12]:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	...	F28	F29	F30	F31	F32	F33	F34	F35	F36	Target
0	1209.10	-6727.56	-417.86	29985.68	483.00	-12.62	599.56	14.63	35.44	-47.63	...	-126.65	12004.34	14	-2.26	-865.92	-70.83	-3121.86	0.06	2486.18	274.8500
1	1027.20	1509.39	-152.59	23458.60	575.37	-17.69	1801.36	7.33	52.02	-106.12	...	-104.42	3227.10	12	-71.25	-111.20	-58.05	-870.39	6.68	2835.52	-438.5012
2	1146.04	367.26	-93.47	18350.24	511.86	-18.92	1621.66	10.80	29.78	-52.25	...	-161.15	4538.24	10	-31.63	-270.24	-64.47	-2605.53	6.78	2280.94	52.6929
3	452.64	-14607.60	73.16	23934.94	671.04	-14.73	2311.62	9.61	-24.52	-93.10	...	-111.41	10655.60	12	5.77	5.01	-58.74	-1270.80	6.04	1538.68	-219.8476
4	861.74	-16186.68	-781.53	26840.00	556.98	-11.88	1207.46	10.89	13.58	-53.09	...	-110.52	11975.04	6	-6.67	-110.19	-42.33	-941.19	6.92	4284.04	2445.9197
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1495	1001.14	-2342.88	32.18	29789.80	536.97	-14.78	737.76	12.54	26.76	-38.02	...	-119.03	967.94	14	-22.38	-498.90	-66.69	-1236.69	7.12	2967.42	868.7256
1496	997.58	-7178.82	-621.48	23500.68	401.94	-5.30	1778.78	7.25	-9.60	-64.93	...	-115.96	435.06	10	-30.15	-191.69	-47.19	-506.79	-2.44	3168.16	1797.4742
1497	796.92	-34710.06	-161.06	34887.90	1027.95	-15.11	3654.64	10.60	-23.58	-77.70	...	-134.42	-4194.08	8	-11.38	288.10	-57.24	-1439.67	14.16	4200.94	2312.0235
1498	-122.68	-30784.80	-377.58	18080.04	452.40	-13.53	2480.44	11.20	-1.80	-106.35	...	-94.15	802.88	8	-136.07	-808.77	-61.44	-1507.38	3.94	3467.08	675.2966
1499	685.04	-26168.04	30.00	32428.70	576.84	-14.53	1417.88	12.70	48.06	-73.48	...	-174.87	28864.06	10	-19.56	-281.11	-46.77	-1311.48	8.08	2947.04	346.3755

1500 rows × 37 columns

In [13]:
```python
# Calculate coefficient of determination
from sklearn.metrics import r2_score
y_true = Data['Target'] # True values of dependent variable
y_predicted = new_P2test['Target'] # Predicted values of independent variable
r2 = r2_score(y_true, y_predicted)
print('r2 score for perfect model is', r2)
```

```
r2 score for perfect model is -0.508438795850954
```