In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import StandardScaler
```

In [2]:

```
from sklearn.linear_model import LogisticRegression
```

In [3]:

```
df=pd.read_csv("bmi.csv").dropna()
df
```

Out[3]:

	Gender	Height	Weight	Index
0	Male	174	96	4
1	Male	189	87	2
2	Female	185	110	4
3	Female	195	104	3
4	Male	149	61	3
...	...	...	...	...
495	Female	150	153	5
496	Female	184	121	4
497	Female	141	136	5
498	Male	150	95	5
499	Male	173	131	5

500 rows × 4 columns

In [4]:

```
df.head()
```

Out[4]:

	Gender	Height	Weight	Index
0	Male	174	96	4
1	Male	189	87	2
2	Female	185	110	4
3	Female	195	104	3
4	Male	149	61	3

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 500 entries, 0 to 499
Data columns (total 4 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   Gender  500 non-null    object
 1   Height  500 non-null    int64 
 2   Weight  500 non-null    int64 
 3   Index   500 non-null    int64 
dtypes: int64(3), object(1)
memory usage: 19.5+ KB
```

In [6]:
```
df.describe()
```

Out[6]:

	Height	Weight	Index
count	500.000000	500.000000	500.000000
mean	169.944000	106.000000	3.748000
std	16.375261	32.382607	1.355053
min	140.000000	50.000000	0.000000
25%	156.000000	80.000000	3.000000
50%	170.500000	106.000000	4.000000
75%	184.000000	136.000000	5.000000
max	199.000000	160.000000	5.000000

In [7]:
```
df.columns
```

Out[7]:
```
Index(['Gender', 'Height', 'Weight', 'Index'], dtype='object')
```

In [8]:
```
feature_matrix = df[['Height','Weight']]
target_vector = df[['Index']]
```

In [9]:
```
fs=StandardScaler().fit_transform(feature_matrix)
logr=LogisticRegression()
logr.fit(fs,target_vector)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63: Da
taConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples, ), for example using ravel().
  return f(*args, **kwargs)
```

Out[9]:
```
LogisticRegression()
```

In [10]:
```
observation=[[1,2]]
```

In [11]:

```
prediction=logr.predict(observation)
print(prediction)
```

```
[5]
```

In [12]:

```
logr.classes_
```

Out[12]:

```
array([0, 1, 2, 3, 4, 5], dtype=int64)
```

In [13]:

```
logr.predict_proba(observation)[0][0]
```

Out[13]:

```
5.5956697582538237e-11
```

In [14]:

```
logr.predict_proba(observation)[0][1]
```

Out[14]:

```
6.059900360819463e-10
```

Random Forest

In [15]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [17]:

```
df=pd.read_csv("bmi.csv")
```

In [18]:

```
df['Gender'].value_counts()
```

Out[18]:

```
Female    255
Male      245
Name: Gender, dtype: int64
```

In [19]:

```
x=df[['Height','Weight']]
y=df['Gender']
```

In [20]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.70)
```

In [21]:

```
from sklearn.ensemble import RandomForestClassifier
rfc =RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[21]:

```
RandomForestClassifier()
```

In [22]:
```
parameters={'max_depth':[1,2,3,4,5],
            'min_samples_leaf':[5,10,15,20,25],
            'n_estimators':[10,20,30,40,50]
           }
```

In [23]:
```
from sklearn.model_selection import GridSearchCV
grid_search =GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="acc
grid_search.fit(x_train,y_train)
```

Out[23]:
```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [1, 2, 3, 4, 5],
                         'min_samples_leaf': [5, 10, 15, 20, 25],
                         'n_estimators': [10, 20, 30, 40, 50]},
             scoring='accuracy')
```

In [24]:
```
grid_search.best_score_
```

Out[24]:
```
0.5485714285714286
```

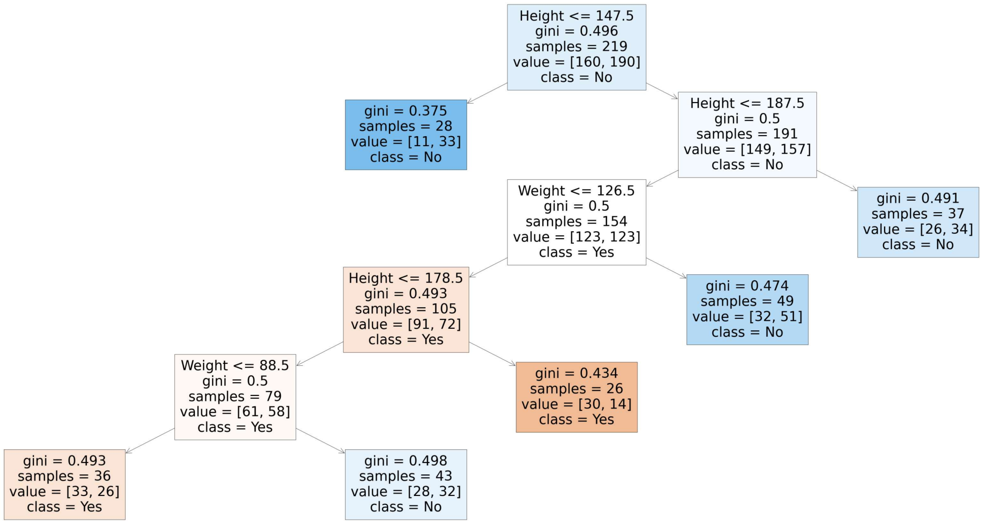
In [25]:
```
rfc_best=grid_search.best_estimator_
```

In [26]:

```
from sklearn.tree import plot_tree
plt.figure(figsize=(89,40))
plot_tree(rfc_best.estimators_[5],feature_names=x.columns, class_names=["Yes",'
         )
```

Out[26]:

```
[Text(2837.828571428571, 1993.2, 'Height <= 147.5\ngini = 0.496\nsamples = 21
9\nvalue = [160, 190]\nclass = No'),
 Text(2128.3714285714286, 1630.8000000000002, 'gini = 0.375\nsamples = 28\nva
lue = [11, 33]\nclass = No'),
 Text(3547.2857142857138, 1630.8000000000002, 'Height <= 187.5\ngini = 0.5\ns
amples = 191\nvalue = [149, 157]\nclass = No'),
 Text(2837.828571428571, 1268.4, 'Weight <= 126.5\ngini = 0.5\nsamples = 154
\nvalue = [123, 123]\nclass = Yes'),
 Text(2128.3714285714286, 906.0, 'Height <= 178.5\ngini = 0.493\nsamples = 10
5\nvalue = [91, 72]\nclass = Yes'),
 Text(1418.9142857142856, 543.5999999999999, 'Weight <= 88.5\ngini = 0.5\nsam
ples = 79\nvalue = [61, 58]\nclass = Yes'),
 Text(709.4571428571428, 181.19999999999982, 'gini = 0.493\nsamples = 36\nval
ue = [33, 26]\nclass = Yes'),
 Text(2128.3714285714286, 181.19999999999982, 'gini = 0.498\nsamples = 43\nva
lue = [28, 32]\nclass = No'),
 Text(2837.828571428571, 543.5999999999999, 'gini = 0.434\nsamples = 26\nvalu
e = [30, 14]\nclass = Yes'),
 Text(3547.2857142857138, 906.0, 'gini = 0.474\nsamples = 49\nvalue = [32, 5
1]\nclass = No'),
 Text(4256.742857142857, 1268.4, 'gini = 0.491\nsamples = 37\nvalue = [26, 3
4]\nclass = No')]
```



In [ ]: