Problem staement: The model which is best for the insurance

In [78]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
from sklearn.model_selection import train_test_split
```

READ THE DATASET

In [79]:
```
df=pd.read_csv(r"C:\Users\pucha\Downloads\insurance.csv")
df
```

Out[79]:

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520
...	...	...	...	...	...	...	...
1333	50	male	30.970	3	no	northwest	10600.54830
1334	18	female	31.920	0	no	northeast	2205.98080
1335	18	female	36.850	0	no	southeast	1629.83350
1336	21	female	25.800	0	no	southwest	2007.94500
1337	61	female	29.070	0	yes	northwest	29141.36030

1338 rows × 7 columns

DATA CLEANINIG AND PREPROCESSING

In [98]:
```
df.head()
```

Out[98]:

	age	sex	bmi	children	smoker	region	charges
0	19	0	27.900	0	yes	1	16884.92400
1	18	1	33.770	1	no	3	1725.55230
2	28	1	33.000	3	no	3	4449.46200
3	33	1	22.705	0	no	2	21984.47061
4	32	1	28.880	0	no	2	3866.85520

In [80]:
```
ins={"sex":{"male":1,"female":0}}
df=df.replace(ins)
print(df)
```

```
      age  sex     bmi  children smoker     region      charges
0      19    0  27.900         0    yes  southwest  16884.92400
1      18    1  33.770         1     no  southeast   1725.55230
2      28    1  33.000         3     no  southeast   4449.46200
3      33    1  22.705         0     no  northwest  21984.47061
4      32    1  28.880         0     no  northwest   3866.85520
...   ...  ...     ...       ...    ...        ...          ...
1333   50    1  30.970         3     no  northwest  10600.54830
1334   18    0  31.920         0     no  northeast   2205.98080
1335   18    0  36.850         0     no  southeast   1629.83350
1336   21    0  25.800         0     no  southwest   2007.94500
1337   61    0  29.070         0    yes  northwest  29141.36030

[1338 rows x 7 columns]
```

In [99]:
```
df.tail()
```

Out[99]:

	age	sex	bmi	children	smoker	region	charges
1333	50	1	30.97	3	no	2	10600.5483
1334	18	0	31.92	0	no	4	2205.9808
1335	18	0	36.85	0	no	3	1629.8335
1336	21	0	25.80	0	no	1	2007.9450
1337	61	0	29.07	0	yes	2	29141.3603

In [81]:
```
r={"region":{"southwest":1,"northwest":2,"southeast":3,"northeast":4}}
df=df.replace(r)
print(df)
```

```
      age  sex     bmi  children smoker  region      charges
0      19    0  27.900         0    yes       1  16884.92400
1      18    1  33.770         1     no       3   1725.55230
2      28    1  33.000         3     no       3   4449.46200
3      33    1  22.705         0     no       2  21984.47061
4      32    1  28.880         0     no       2   3866.85520
...   ...  ...     ...       ...    ...     ...          ...
1333   50    1  30.970         3     no       2  10600.54830
1334   18    0  31.920         0     no       4   2205.98080
1335   18    0  36.850         0     no       3   1629.83350
1336   21    0  25.800         0     no       1   2007.94500
1337   61    0  29.070         0    yes       2  29141.36030

[1338 rows x 7 columns]
```

In [122]:
```
df.describe()
```

Out[122]:

	age	sex	bmi	children	region	charges
count	1338.000000	1338.000000	1338.000000	1338.000000	1338.000000	1338.000000
mean	39.207025	0.505232	30.663397	1.094918	2.513453	13270.422265
std	14.049960	0.500160	6.098187	1.205493	1.104915	12110.011237
min	18.000000	0.000000	15.960000	0.000000	1.000000	1121.873900
25%	27.000000	0.000000	26.296250	0.000000	2.000000	4740.287150
50%	39.000000	1.000000	30.400000	1.000000	3.000000	9382.033000
75%	51.000000	1.000000	34.693750	2.000000	3.000000	16639.912515
max	64.000000	1.000000	53.130000	5.000000	4.000000	63770.428010

FEATURE SCALLING:-Split the dataset into independent and dependent variables

Split your dataset in two catagories 1.Train data 2.Test data

In [101]:
```
x=["sex","bmi","children","region","charges"]
y=["yes","no"]
```

In [109]:
```
all_inputs=df[x]
all_classes=df["smoker"]
x_train,x_test,y_train,y_test=train_test_split(all_inputs,all_classes,train_size=0.7)
```

DECISION TREE CALSSIFIER

In [127]:
```
from sklearn.tree import DecisionTreeClassifier
```

In [128]:
```
dc=DecisionTreeClassifier()
dc.fit(x_train,y_train)
```

Out[128]:
```
DecisionTreeClassifier
DecisionTreeClassifier()
```

In [124]:
```
dc.score(x_test,y_test)
```

Out[124]:
```
0.9328358208955224
```

RANDOM FOREST CLASSIFIER

In [125]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

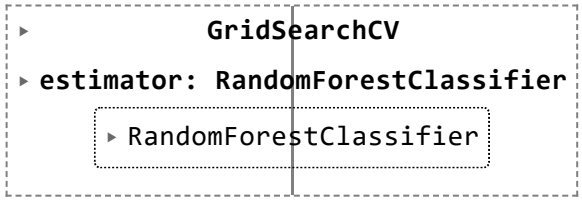
Out[125]:
```
RandomForestClassifier
RandomForestClassifier()
```

In [126]:
```
rf=RandomForestClassifier()
```

In [107]:
```
params={'max_depth':[2,3,5,1,20],
        'min_samples_leaf':[5,1,2,50,10,20],
        'n_estimators':[10,25,30,50,100,200]}
```

In [108]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rf,param_grid=params,cv=2,scoring="accuracy")
grid_search.fit(x_train,y_train)
```

Out[108]:



In [112]:
```
grid_search.best_score_
```

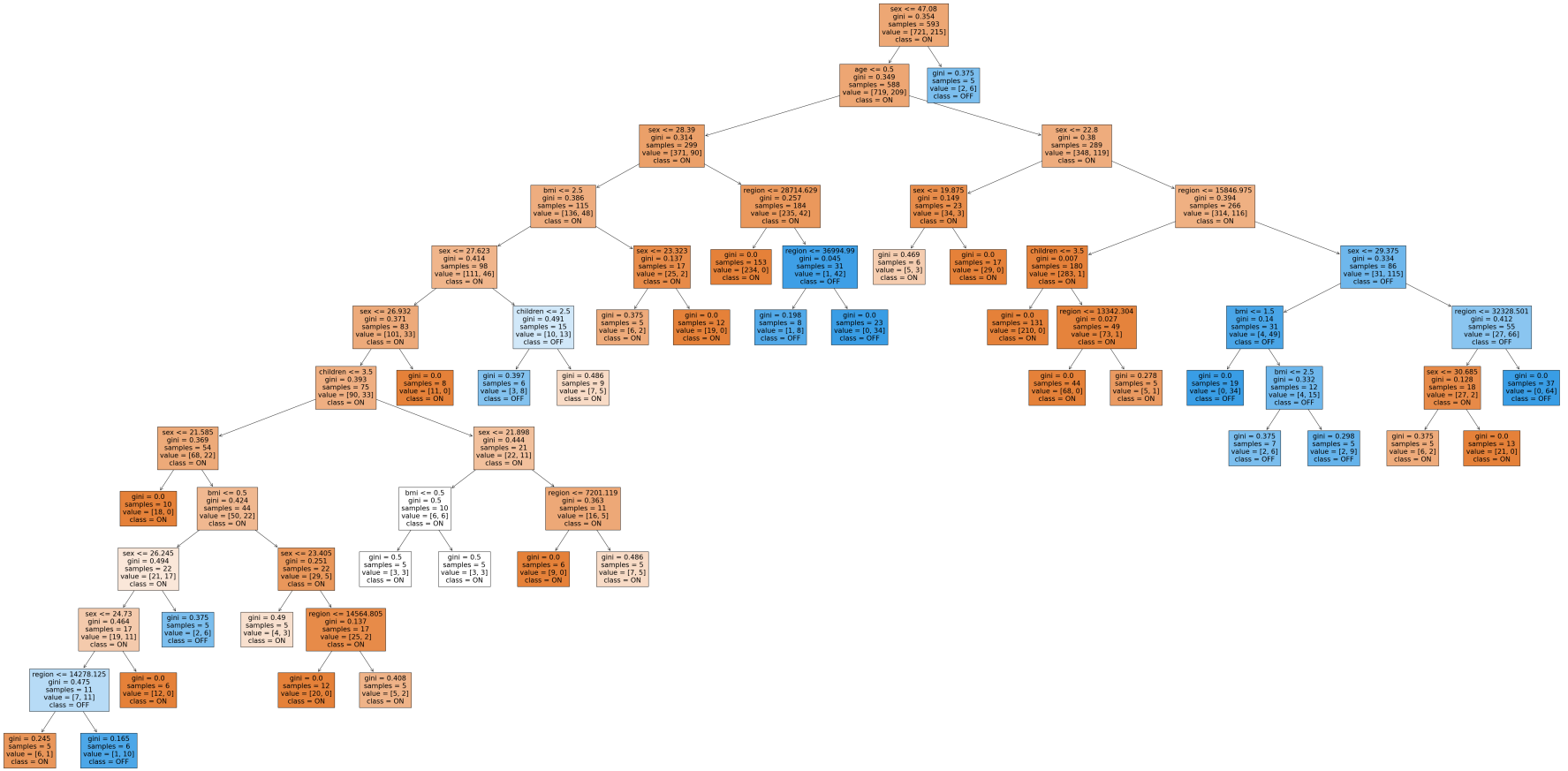
Out[112]:
```
0.9615384615384615
```

In [113]:
```
rf_best=grid_search.best_estimator_
print(rf_best)
```

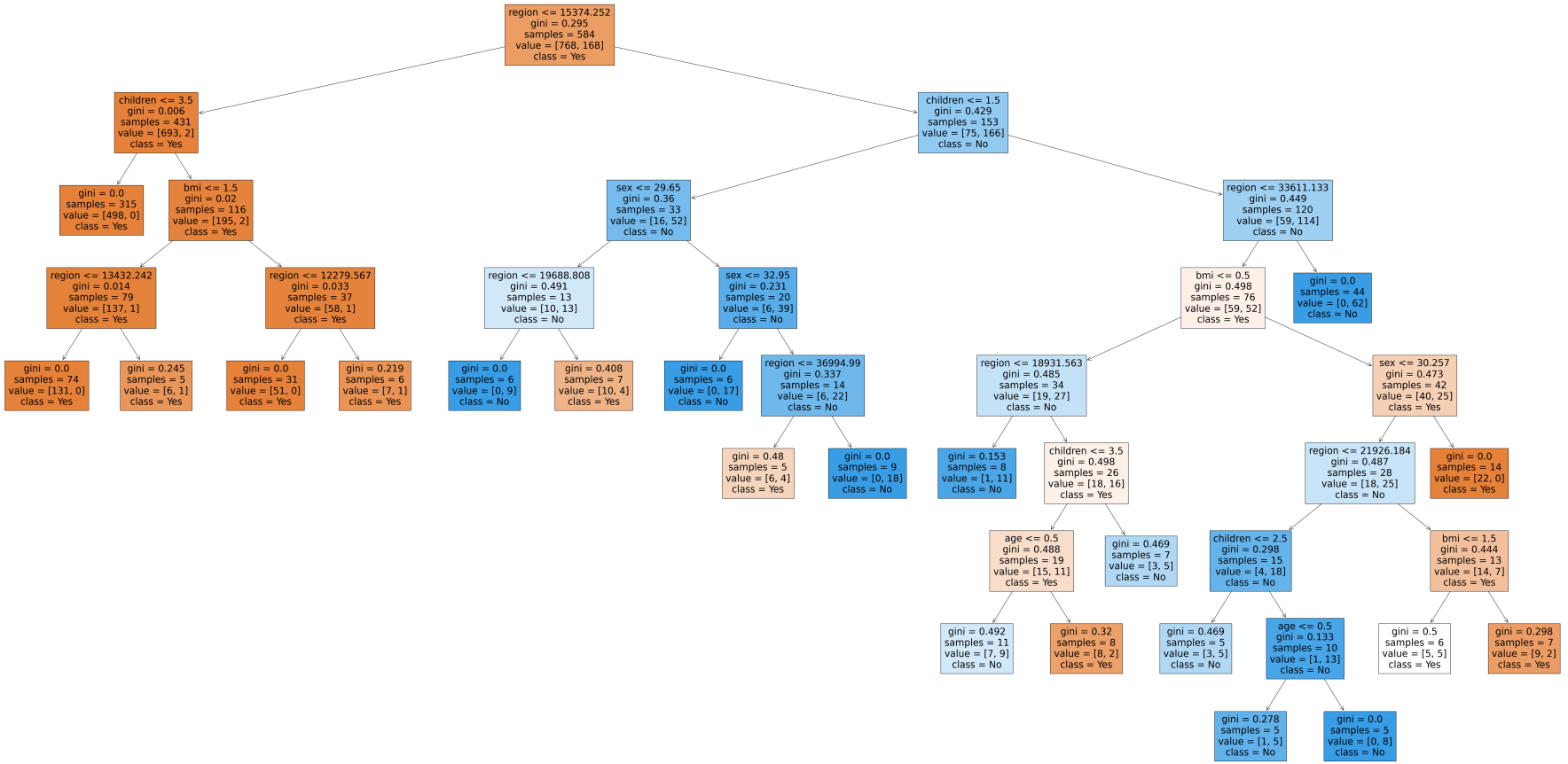
```
RandomForestClassifier(max_depth=20, min_samples_leaf=5)
```

In [114]:
```
x=df.drop("smoker",axis=1)
y=df["smoker"]
```

In [115]:
```
from sklearn.tree import plot_tree
from sklearn.tree import DecisionTreeClassifier
import matplotlib.pyplot as plt
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[5],feature_names=x.columns,class_names=['ON','OFF'],filled=True);
```



In [116]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[7],feature_names=x.columns,class_names=['Yes','No'],filled=True);
```



In [117]:
```
rf_best.feature_importances_
```

Out[117]:
```
array([0.00799748, 0.09304862, 0.01537871, 0.0113572 , 0.87221798])
```

In [120]:
```
imp_df=pd.DataFrame({"varname":x_train.columns,"Imp":rf_best.feature_importances_})
```

In [121]:
```
imp_df.sort_values(by="Imp",ascending=False)
```

Out[121]:

	varname	Imp
4	charges	0.872218
1	bmi	0.093049
2	children	0.015379
3	region	0.011357
0	sex	0.007997

CONCLUSION:-

FROM THE ABOVE DATASET I HAVE TO DEFINE THAT WHICH MODEL HAS THE BEST ACCURACY FROM THE AMONG MODELS

STEP:-1. IMPORT THE LIBRARY
STEP:-2. I HAVE TO READ THE DATASET
STEP:-3. TAKE DATA CLEANING AND PREPROCESSING
STEP:-4. SPLITING THE DATASET INTO TRAIN DATA AND TEST DATA
STEP:-5. IMPORTING THE DECISIONTREECLASSIFIER
STEP:-6. IMPORTING THE RANDOMFORESTCLASSIFIER

FROM THE DATASET DECISIONTREECLASSIFIER I GOT THE ACCURACY: 0.9328358208955224 AND
RANDOMFORESTCLASSIFIER I GOT THE ACCURACY: 0.9615384615384615.

FINALLY I CONCLUDED THAT RANDOMFORESTCLASSIFIER HAS GOT MORE ACCURACY THAN DECISIONTREECLASSIFIER.
SO THE RANDOMFORESTCLASSIFIER THE BEST FIT MODEL FOR THE INSURANCE DATASET

In [ ]:
```
```