In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt,seaborn as sns
```

In [2]:
```
df=pd.read_csv(r"C:\Users\SASIDHAR ROYAL\Downloads\Mobile_Price_Classification_train.csv")
df
```

Out[2]:

	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_memory	m_dep	mobile_wt	n_cores	...	px_height	px_width	ram	sc_h	sc_w
0	842	0	2.2	0	1	0	7	0.6	188	2	...	20	756	2549	9	7
1	1021	1	0.5	1	0	1	53	0.7	136	3	...	905	1988	2631	17	3
2	563	1	0.5	1	2	1	41	0.9	145	5	...	1263	1716	2603	11	2
3	615	1	2.5	0	0	0	10	0.8	131	6	...	1216	1786	2769	16	8
4	1821	1	1.2	0	13	1	44	0.6	141	2	...	1208	1212	1411	8	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
995	794	1	0.5	1	0	1	2	0.8	106	6	...	1222	1890	668	13	4
996	1965	1	2.6	1	0	0	39	0.2	187	4	...	915	1965	2032	11	10
997	1911	0	0.9	1	1	1	36	0.7	108	8	...	868	1632	3057	9	1
998	1512	0	0.9	0	4	1	46	0.1	145	5	...	336	670	869	18	10
999	510	1	2.0	1	5	1	45	0.9	168	6	...	483	754	3919	19	4

)0 rows × 21 columns

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2000 entries, 0 to 1999
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   battery_power  2000 non-null   int64  
 1   blue           2000 non-null   int64  
 2   clock_speed    2000 non-null   float64
 3   dual_sim       2000 non-null   int64  
 4   fc             2000 non-null   int64  
 5   four_g         2000 non-null   int64  
 6   int_memory     2000 non-null   int64  
 7   m_dep          2000 non-null   float64
 8   mobile_wt      2000 non-null   int64  
 9   n_cores        2000 non-null   int64  
 10  pc             2000 non-null   int64  
 11  px_height      2000 non-null   int64  
 12  px_width       2000 non-null   int64  
 13  ram            2000 non-null   int64  
 14  sc_h           2000 non-null   int64  
 15  sc_w           2000 non-null   int64  
 16  talk_time      2000 non-null   int64  
 17  three_g        2000 non-null   int64  
 18  touch_screen   2000 non-null   int64  
 19  wifi           2000 non-null   int64  
 20  price_range    2000 non-null   int64  
dtypes: float64(2), int64(19)
memory usage: 328.3 KB
```

In [4]:
```
x=df.drop('blue',axis=1)
y=df['blue']
```

In [5]:
```
t={"three_g":{"Yes":1,"No":0}}
df=df.replace(t)
print(df)
```

```
      battery_power  blue  clock_speed  dual_sim  fc  four_g  int_memory  \
0               842     0          2.2         0   1       0           7
1              1021     1          0.5         1   0       1          53
2               563     1          0.5         1   2       1          41
3               615     1          2.5         0   0       0          10
4              1821     1          1.2         0  13       1          44
...             ...   ...          ...       ...  ..     ...         ...
1995            794     1          0.5         1   0       1           2
1996           1965     1          2.6         1   0       0          39
1997           1911     0          0.9         1   1       1          36
1998           1512     0          0.9         0   4       1          46
1999            510     1          2.0         1   5       1          45

      m_dep  mobile_wt  n_cores  ...  px_height  px_width   ram  sc_h  sc_w  \
0       0.6        188        2  ...         20       756  2549     9     7
1       0.7        136        3  ...        905      1988  2631    17     3
2       0.9        145        5  ...       1263      1716  2603    11     2
3       0.8        131        6  ...       1216      1786  2769    16     8
4       0.6        141        2  ...       1208      1212  1411     8     2
...     ...        ...      ...  ...        ...       ...   ...   ...   ...
1995    0.8        106        6  ...       1222      1890   668    13     4
1996    0.2        187        4  ...        915      1965  2032    11    10
1997    0.7        108        8  ...        868      1632  3057     9     1
1998    0.1        145        5  ...        336       670   869    18    10
1999    0.9        168        6  ...        483       754  3919    19     4

      talk_time  three_g  touch_screen  wifi  price_range
0            19        0             0     1            1
1             7        1             1     0            2
2             9        1             1     0            2
3            11        1             0     0            2
4            15        1             1     0            1
...         ...      ...           ...   ...          ...
1995         19        1             1     0            0
1996         16        1             1     1            2
1997          5        1             1     0            3
1998         19        1             1     1            0
1999          2        1             1     1            3

[2000 rows x 21 columns]
```

In [6]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.7,random_state=42)
x_train.shape,x_test.shape
```

Out[6]:
```
((1400, 20), (600, 20))
```

In [7]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[7]:
```
RandomForestClassifier
RandomForestClassifier()
```

In [8]:
```
rf=RandomForestClassifier()
```

In [9]:
```
params={'max_depth':[2,3,5,10,20],'min_samples_leaf':[5,10,20,50,100,200],'n_estimators':[10,25,30,50,100,200]}
```

In [10]:
```
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[10]:
```
GridSearchCV
estimator: RandomForestClassifier
RandomForestClassifier
```

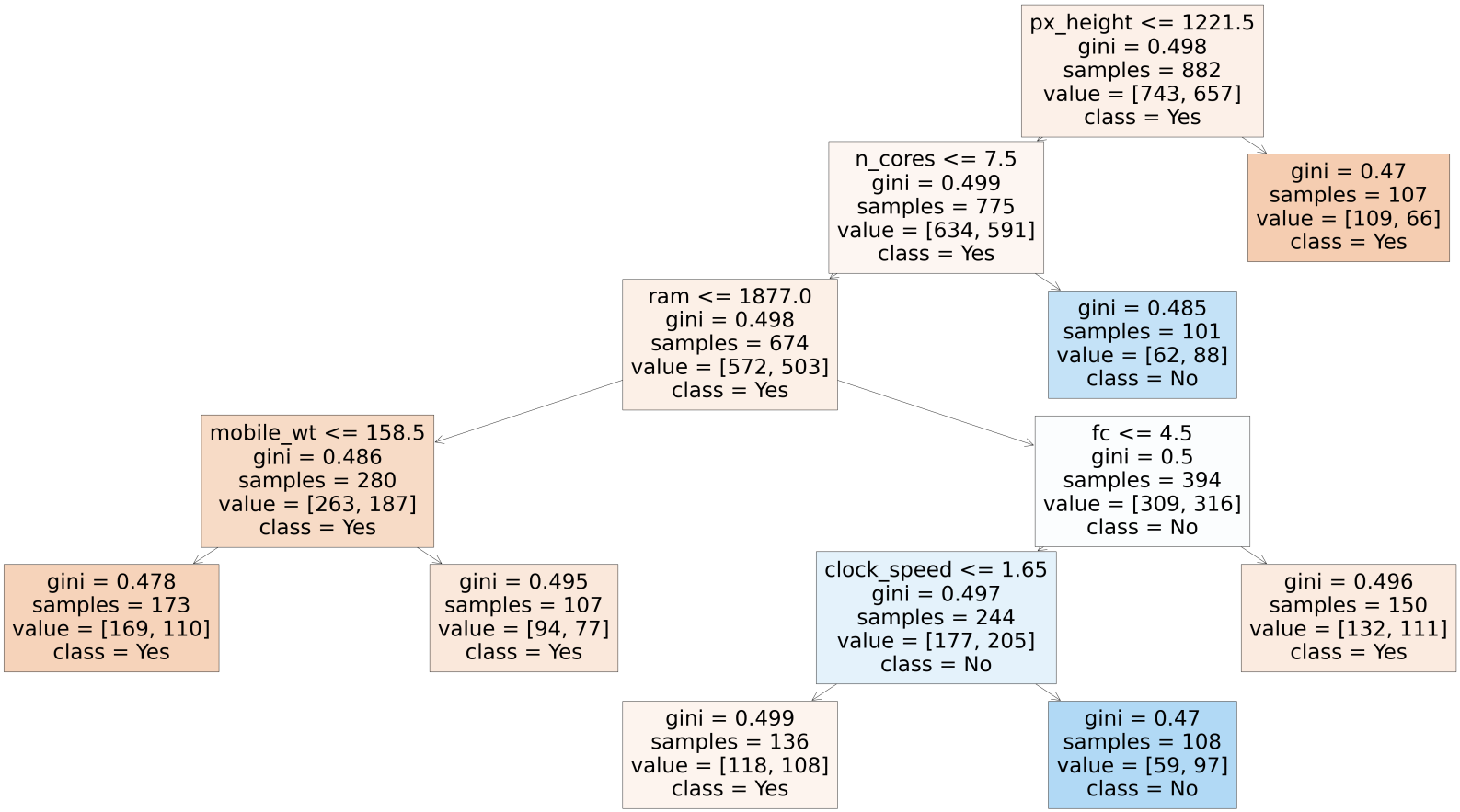
In [11]:
```
grid_search.best_score_
```

Out[11]:
```
0.5364285714285715
```

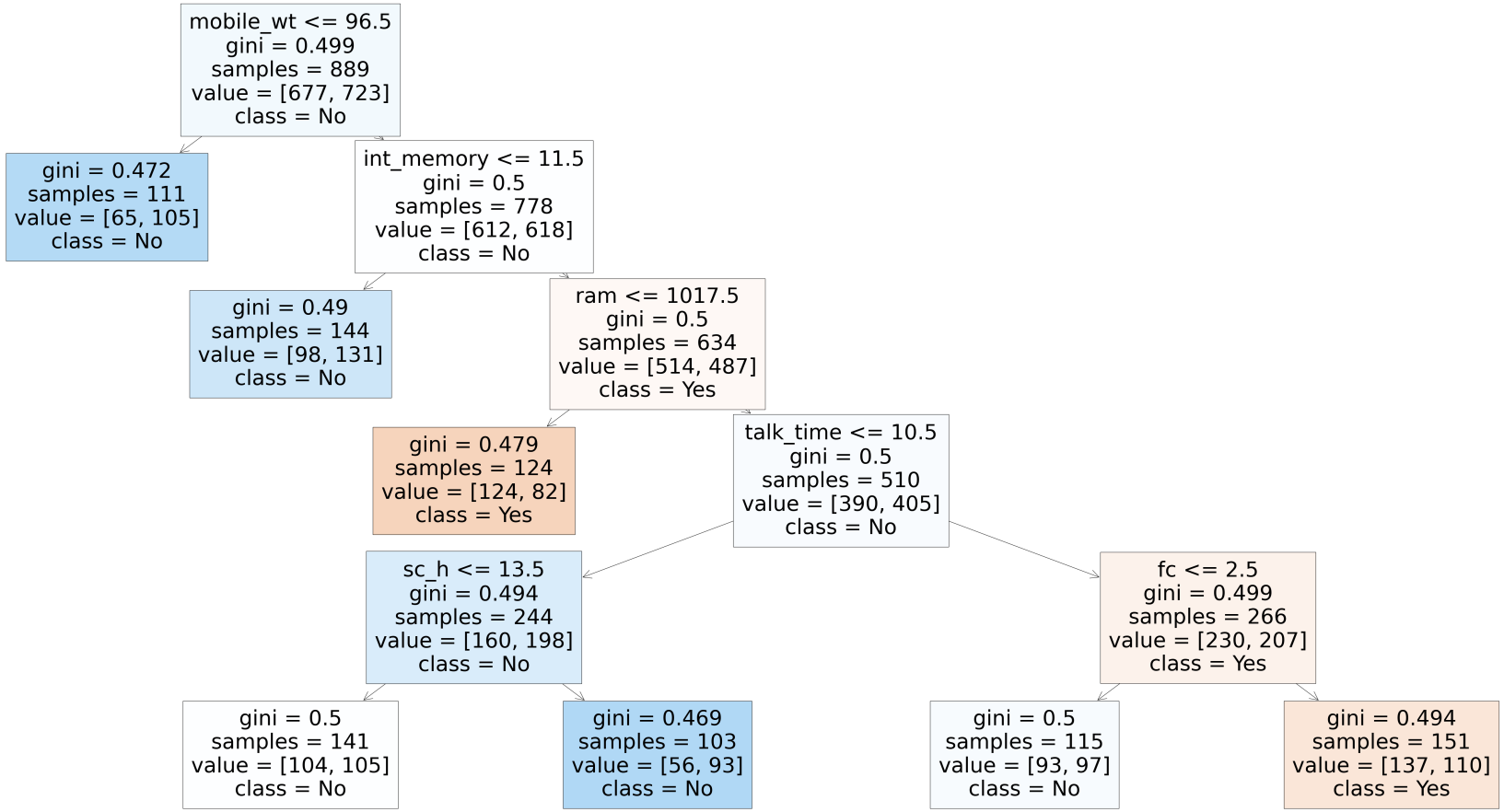
In [12]:
```
rf_best=grid_search.best_estimator_
print(rf_best)
```

```
RandomForestClassifier(max_depth=20, min_samples_leaf=100, n_estimators=30)
```

In [13]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[5],feature_names=x.columns,class_names=["Yes","No"],filled=True);
```



In [14]:
```
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 [15]:
```
rf_best.feature_importances_
```

Out[15]:
```
array([0.11505021, 0.0733561 , 0.01468286, 0.07053421, 0.01729881,
       0.11712097, 0.07411121, 0.07676443, 0.05037934, 0.03578947,
       0.07619111, 0.05351856, 0.08817483, 0.01732954, 0.03832682,
       0.03229431, 0.01137491, 0.0128924 , 0.00719067, 0.01761924])
```

In [16]:
```
imp_df=pd.DataFrame({"varname":x_train.columns,"imp":rf_best.feature_importances_})
imp_df.sort_values(by="imp",ascending=False)
```

Out[16]:

	varname	imp
5	int_memory	0.117121
0	battery_power	0.115050
12	ram	0.088175
7	mobile_wt	0.076764
10	px_height	0.076191
6	m_dep	0.074111
1	clock_speed	0.073356
3	fc	0.070534
11	px_width	0.053519
8	n_cores	0.050379
14	sc_w	0.038327
9	pc	0.035789
15	talk_time	0.032294
19	price_range	0.017619
13	sc_h	0.017330
4	four_g	0.017299
2	dual_sim	0.014683
17	touch_screen	0.012892
16	three_g	0.011375
18	wifi	0.007191