TRAIN DATA

In [1]:

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

In [2]:

```
df=pd.read_csv(r"C:\Users\HP\OneDrive\Documents\Mobile_Price_Classification_train.c
df
```

Out[2]:

	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_memory	m_dep	mobile_
0	842	0	2.2	0	1	0	7	0.6	1
1	1021	1	0.5	1	0	1	53	0.7	1
2	563	1	0.5	1	2	1	41	0.9	1
3	615	1	2.5	0	0	0	10	0.8	1
4	1821	1	1.2	0	13	1	44	0.6	1
...	...	...	...	...	...	...	...	...	
1995	794	1	0.5	1	0	1	2	0.8	1
1996	1965	1	2.6	1	0	0	39	0.2	1
1997	1911	0	0.9	1	1	1	36	0.7	1
1998	1512	0	0.9	0	4	1	46	0.1	1
1999	510	1	2.0	1	5	1	45	0.9	1

2000 rows × 21 columns

In [3]:

```
1 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: 328.2 KB
```

In [4]:

```
1 df.isnull().sum()
```

Out[4]:

```
battery_power    0
blue             0
clock_speed      0
dual_sim         0
fc               0
four_g           0
int_memory       0
m_dep            0
mobile_wt        0
n_cores          0
pc               0
px_height        0
px_width         0
ram              0
sc_h             0
sc_w             0
talk_time        0
three_g          0
touch_screen     0
wifi             0
price_range      0
dtype: int64
```

In [5]:

```
1 X=df.drop('dual_sim',axis=1)
2 y=df['dual_sim']
```

In [6]:

```
1 from sklearn.model_selection import train_test_split
2 X_train,X_test,y_train,y_test = train_test_split(X,y,train_size=0.4,random_state=40
3 X_train.shape,X_test.shape
```

Out[6]:

```
((800, 20), (1200, 20))
```

In [7]:

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

Out[7]:

```
RandomForestClassifier()
```

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In [8]:

```
rf=RandomForestClassifier()
```

In [9]:

```
params = {'max_depth':[1,2,3,4,5],'min_samples_leaf':[5,10,25,50,100,200],'n_estima
```

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(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [1, 2, 3, 4, 5],
                         'min_samples_leaf': [5, 10, 25, 50, 100, 200],
                         'n_estimators': [10, 25, 30, 50, 100, 200]},
             scoring='accuracy')
```

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In [21]:

```
grid_search.best_score_
```

Out[21]:

```
0.5487500000000001
```

In [12]:

```
rf_best = grid_search.best_estimator_
print(rf_best)
```

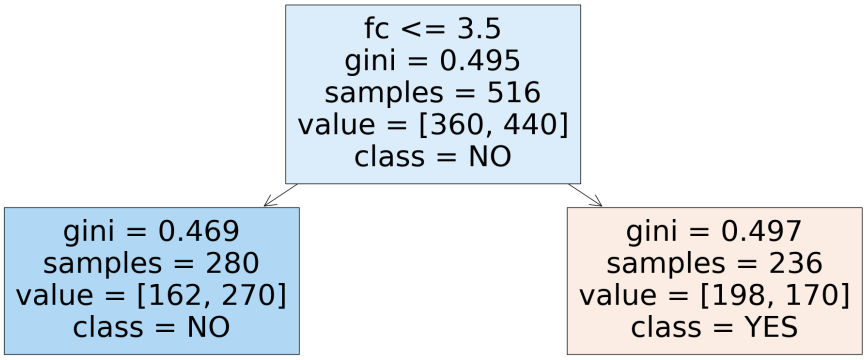
```
RandomForestClassifier(max_depth=1, min_samples_leaf=50)
```

In [25]:

```
from sklearn.tree import plot_tree
plt.figure(figsize=(30,10))
plot_tree(rf_best.estimators_[5],feature_names=X.columns,class_names=["YES","NO"],f
```

Out[25]:

```
[Text(0.5, 0.75, 'fc <= 3.5\ngini = 0.495\nsamples = 516\nvalue = [360, 4
40]\nclass = NO'),
 Text(0.25, 0.25, 'gini = 0.469\nsamples = 280\nvalue = [162, 270]\nclass
= NO'),
 Text(0.75, 0.25, 'gini = 0.497\nsamples = 236\nvalue = [198, 170]\nclass
= YES')]
```

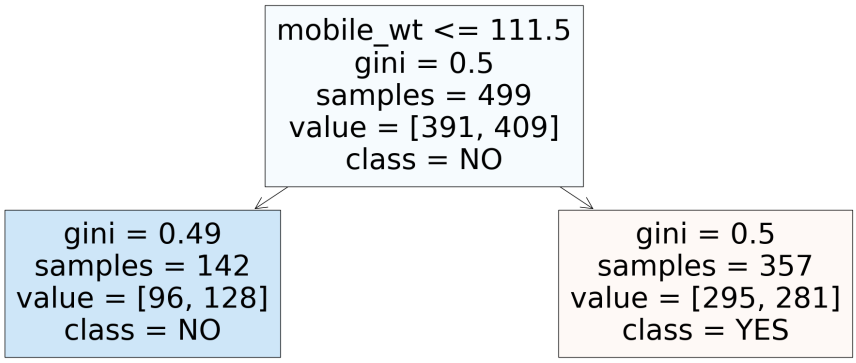


In [26]:

```
1 plt.figure(figsize=(30,10))
2 plot_tree(rf_best.estimators_[7],feature_names=X.columns,class_names=["YES","NO"],f
```

Out[26]:

```
[Text(0.5, 0.75, 'mobile_wt <= 111.5\ngini = 0.5\nsamples = 499\nvalue =
[391, 409]\nclass = NO'),
 Text(0.25, 0.25, 'gini = 0.49\nsamples = 142\nvalue = [96, 128]\nclass =
NO'),
 Text(0.75, 0.25, 'gini = 0.5\nsamples = 357\nvalue = [295, 281]\nclass =
YES')]
```



In [27]:

```
1 rf_best.feature_importances_
```

Out[27]:

```
array([0.06, 0.01, 0.05, 0.09, 0.  , 0.14, 0.08, 0.12, 0.05, 0.05, 0.04,
       0.08, 0.  , 0.12, 0.02, 0.07, 0.  , 0.  , 0.02, 0.  ])
```

In [28]:

```
1 imp_df = pd.DataFrame({"Varname":X_train.columns,"Imp":rf_best.feature_importances_
```

In [29]:

```
imp_df.sort_values(by="Imp",ascending=False)
```

Out[29]:

	Varname	Imp
5	int_memory	0.14
7	mobile_wt	0.12
13	sc_h	0.12
3	fc	0.09
11	px_width	0.08
6	m_dep	0.08
15	talk_time	0.07
0	battery_power	0.06
2	clock_speed	0.05
8	n_cores	0.05
9	pc	0.05
10	px_height	0.04
14	sc_w	0.02
18	wifi	0.02
1	blue	0.01
12	ram	0.00
4	four_g	0.00
16	three_g	0.00
17	touch_screen	0.00
19	price_range	0.00

TEST DATA

In [30]:

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

In [31]:

```
1 test_df = pd.read_csv(r"C:\Users\HP\OneDrive\Documents\Mobile_Price_Classification_
2 test_df
```

Out[31]:

	id	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_memory	m_dep	m
0	1	1043	1	1.8	1	14	0	5	0.1	
1	2	841	1	0.5	1	4	1	61	0.8	
2	3	1807	1	2.8	0	1	0	27	0.9	
3	4	1546	0	0.5	1	18	1	25	0.5	
4	5	1434	0	1.4	0	11	1	49	0.5	
...	...	...	...	...	...	...	...	...	...	
995	996	1700	1	1.9	0	0	1	54	0.5	
996	997	609	0	1.8	1	0	0	13	0.9	
997	998	1185	0	1.4	0	1	1	8	0.5	
998	999	1533	1	0.5	1	0	0	50	0.4	
999	1000	1270	1	0.5	0	4	1	35	0.1	

1000 rows × 21 columns

In [32]:

```
1 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: 328.2 KB
```

In [33]:

```
1 df.isnull().sum()
```

Out[33]:

```
battery_power    0
blue             0
clock_speed      0
dual_sim         0
fc               0
four_g           0
int_memory       0
m_dep            0
mobile_wt        0
n_cores          0
pc               0
px_height        0
px_width         0
ram              0
sc_h             0
sc_w             0
talk_time        0
three_g          0
touch_screen     0
wifi             0
price_range      0
dtype: int64
```

In [34]:

```
1 X=df.drop('dual_sim',axis=1)
2 y=df['dual_sim']
```

In [35]:

```
1 from sklearn.model_selection import train_test_split
2 X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.25,random_state=6)
3 X_train.shape,X_test.shape
```

Out[35]:

```
((1500, 20), (500, 20))
```

In [37]:

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

Out[37]:

```
RandomForestClassifier()
```

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In [40]:

```
rf=RandomForestClassifier()
```

In [43]:

```
params = {'max_depth':[2,4,6,8,10],'min_samples_leaf':[5,10,20,30,50,60],'n_estimat
```

In [44]:

```
from sklearn.model_selection import GridSearchCV
grid_search = GridSearchCV(estimator=rf,param_grid = params,cv=2,scoring = 'accurac
grid_search.fit(X_train,y_train)
```

Out[44]:

```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [2, 4, 6, 8, 10],
                         'min_samples_leaf': [5, 10, 20, 30, 50, 60],
                         'n_estimators': [10, 50, 60, 100, 200, 300]},
             scoring='accuracy')
```

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In [45]:

```
grid_search.best_score_
```

Out[45]:

```
0.52
```

In [48]:

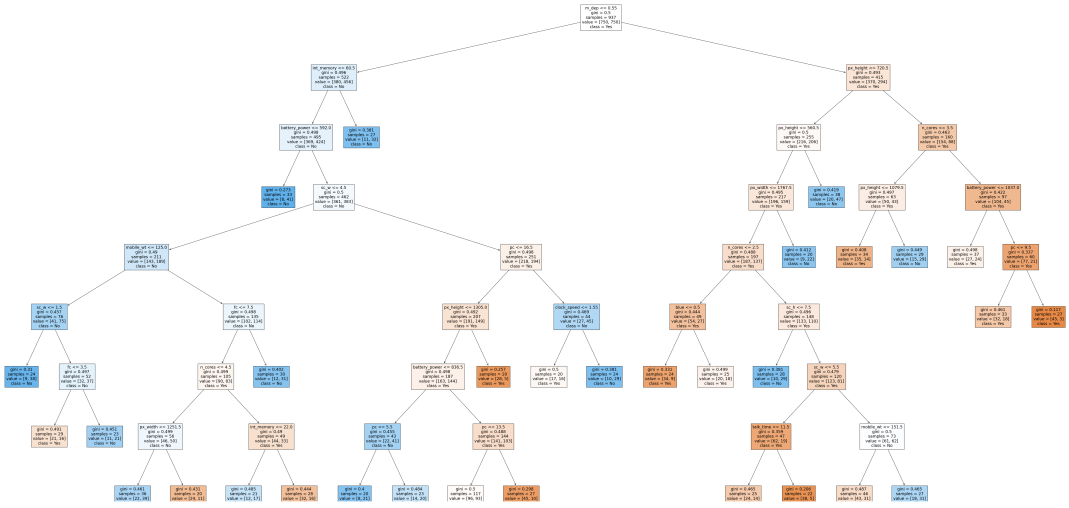
```
rf_best = grid_search.best_estimator_
print(rf_best)
```

```
RandomForestClassifier(max_depth=8, min_samples_leaf=20)
```

In [51]:

```
from sklearn.tree import plot_tree
from sklearn.tree import DecisionTreeClassifier
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[5],feature_names=X.columns,class_names=['Yes','No'],f
```

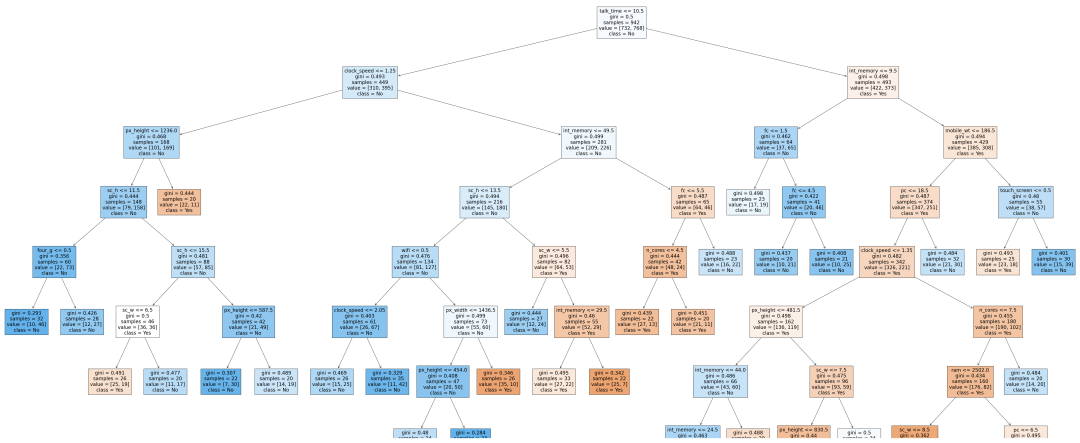
```
33\nvalue = [32, 18]\nclass = Yes'),
 Text(0.9743589743589743, 0.3888888888888889, 'gini = 0.117\nsamples =
27\nvalue = [45, 3]\nclass = Yes')]
```



In [53]:

```
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[7],feature_names=X.columns,class_names=['Yes','No'],f
```

```
ni = 0.48\nsamples = 55\nvalue = [38, 57]\nclass = No'),
 Text(0.9230769230769231, 0.5, 'gini = 0.493\nsamples = 25\nvalue = [2
3, 18]\nclass = Yes'),
 Text(0.9743589743589743, 0.5, 'gini = 0.401\nsamples = 30\nvalue = [1
5, 39]\nclass = No')]
```



In [54]:

```
1 rf_best.feature_importances_
```

Out[54]:

```
array([0.10392769, 0.01476017, 0.05275833, 0.03242578, 0.01083849,
       0.05951906, 0.05022448, 0.09871062, 0.02637821, 0.04426562,
       0.08860137, 0.09012254, 0.11746061, 0.05019014, 0.05154751,
       0.06270661, 0.00375218, 0.00980958, 0.01330517, 0.01869583])
```

In [57]:

```
1 imp_df = pd.DataFrame({"Varname":X_train.columns,"Imp":rf_best.feature_importances_
```

In [56]:

```
1 imp_df.sort_values(by="Imp",ascending=False)
```

Out[56]:

	Varname	Imp
12	ram	0.117461
0	battery_power	0.103928
7	mobile_wt	0.098711
11	px_width	0.090123
10	px_height	0.088601
15	talk_time	0.062707
5	int_memory	0.059519
2	clock_speed	0.052758
14	sc_w	0.051548
6	m_dep	0.050224
13	sc_h	0.050190
9	pc	0.044266
3	fc	0.032426
8	n_cores	0.026378
19	price_range	0.018696
1	blue	0.014760
18	wifi	0.013305
4	four_g	0.010838
17	touch_screen	0.009810
16	three_g	0.003752

In [ ]:

```
1
```