In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:
```
df=pd.read_csv(r"c7_used_cars.csv")
df
```

Out[3]:

| | Unnamed: 0 | model | year | price | transmission | mileage | fuelType | tax | mpg | engineSize | Make |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | T-Roc | 2019 | 25000 | Automatic | 13904 | Diesel | 145 | 49.6 | 2.0 | VW |
| **1** | 1 | T-Roc | 2019 | 26883 | Automatic | 4562 | Diesel | 145 | 49.6 | 2.0 | VW |
| **2** | 2 | T-Roc | 2019 | 20000 | Manual | 7414 | Diesel | 145 | 50.4 | 2.0 | VW |
| **3** | 3 | T-Roc | 2019 | 33492 | Automatic | 4825 | Petrol | 145 | 32.5 | 2.0 | VW |
| **4** | 4 | T-Roc | 2019 | 22900 | Semi-Auto | 6500 | Petrol | 150 | 39.8 | 1.5 | VW |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **99182** | 10663 | A3 | 2020 | 16999 | Manual | 4018 | Petrol | 145 | 49.6 | 1.0 | Audi |
| **99183** | 10664 | A3 | 2020 | 16999 | Manual | 1978 | Petrol | 150 | 49.6 | 1.0 | Audi |
| **99184** | 10665 | A3 | 2020 | 17199 | Manual | 609 | Petrol | 150 | 49.6 | 1.0 | Audi |
| **99185** | 10666 | Q3 | 2017 | 19499 | Automatic | 8646 | Petrol | 150 | 47.9 | 1.4 | Audi |
| **99186** | 10667 | Q3 | 2016 | 15999 | Manual | 11855 | Petrol | 150 | 47.9 | 1.4 | Audi |

99187 rows × 11 columns

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99187 entries, 0 to 99186
Data columns (total 11 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Unnamed: 0    99187 non-null  int64  
 1   model         99187 non-null  object 
 2   year          99187 non-null  int64  
 3   price         99187 non-null  int64  
 4   transmission  99187 non-null  object 
 5   mileage       99187 non-null  int64  
 6   fuelType      99187 non-null  object 
 7   tax           99187 non-null  int64  
 8   mpg           99187 non-null  float64
 9   engineSize    99187 non-null  float64
 10  Make          99187 non-null  object 
dtypes: float64(2), int64(5), object(4)
memory usage: 8.3+ MB
```

In [5]:
```
df=df.dropna()
```

In [6]:
```
df.isnull().sum()
```

Out[6]:
```
Unnamed: 0      0
model           0
year            0
price           0
transmission    0
mileage         0
fuelType        0
tax             0
mpg             0
engineSize      0
Make            0
dtype: int64
```

In [7]:
```
df.describe()
```

Out[7]:

| | Unnamed: 0 | year | price | mileage | tax | mpg | engineSize |
|---|---|---|---|---|---|---|---|
| **count** | 99187.000000 | 99187.000000 | 99187.000000 | 99187.000000 | 99187.000000 | 99187.000000 | 99187.000000 |
| **mean** | 6294.413532 | 2017.087723 | 16805.347656 | 23058.914213 | 120.299838 | 55.166825 | 1.663280 |
| **std** | 4265.588536 | 2.123934 | 9866.773417 | 21148.523721 | 63.150926 | 16.138522 | 0.557646 |
| **min** | 0.000000 | 1970.000000 | 450.000000 | 1.000000 | 0.000000 | 0.300000 | 0.000000 |
| **25%** | 2755.000000 | 2016.000000 | 9999.000000 | 7425.000000 | 125.000000 | 47.100000 | 1.200000 |
| **50%** | 5591.000000 | 2017.000000 | 14495.000000 | 17460.000000 | 145.000000 | 54.300000 | 1.600000 |
| **75%** | 9420.000000 | 2019.000000 | 20870.000000 | 32339.000000 | 145.000000 | 62.800000 | 2.000000 |
| **max** | 17964.000000 | 2060.000000 | 159999.000000 | 323000.000000 | 580.000000 | 470.800000 | 6.600000 |

In [8]:
```
df.columns
```

Out[8]:
```
Index(['Unnamed: 0', 'model', 'year', 'price', 'transmission', 'mileage',
       'fuelType', 'tax', 'mpg', 'engineSize', 'Make'],
      dtype='object')
```

In [12]:
```
df['transmission'].value_counts()
```

Out[12]:
```
Manual       56445
Semi-Auto    22677
Automatic    20056
Other            9
Name: transmission, dtype: int64
```

In [13]:
```
g1={"transmission":{'Other':0,'Manual':1,'Semi-Auto':2,'Automatic':3}}
df=df.replace(g1)
print(df)
```

```
       Unnamed: 0   model  year  price  transmission  mileage fuelType  tax  \
0               0   T-Roc  2019  25000             3    13904   Diesel  145
1               1   T-Roc  2019  26883             3     4562   Diesel  145
2               2   T-Roc  2019  20000             1     7414   Diesel  145
3               3   T-Roc  2019  33492             3     4825   Petrol  145
4               4   T-Roc  2019  22900             2     6500   Petrol  150
...           ...     ...   ...    ...           ...      ...      ...  ...
99182       10663      A3  2020  16999             1     4018   Petrol  145
99183       10664      A3  2020  16999             1     1978   Petrol  150
99184       10665      A3  2020  17199             1      609   Petrol  150
99185       10666      Q3  2017  19499             3     8646   Petrol  150
99186       10667      Q3  2016  15999             1    11855   Petrol  150

        mpg  engineSize  Make
0      49.6         2.0    VW
1      49.6         2.0    VW
2      50.4         2.0    VW
3      32.5         2.0    VW
4      39.8         1.5    VW
...     ...         ...   ...
99182  49.6         1.0  Audi
99183  49.6         1.0  Audi
99184  49.6         1.0  Audi
99185  47.9         1.4  Audi
99186  47.9         1.4  Audi

[99187 rows x 11 columns]
```

In [16]:
```
x=df[['Unnamed: 0','year','price','mileage','tax','mpg','engineSize']]
y=df["transmission"]
```

In [17]:
```
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 [18]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[18]:
```
RandomForestClassifier()
```

In [19]:
```
parameters={'max_depth':[1,2,3,4,5],
            'min_samples_leaf':[5,10,15,20,25],
            'n_estimators':[10,20,30,40,50]}
```

In [20]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="accuracy")
grid_search.fit(x_train,y_train)
```

Out[20]:
```
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 [21]:
```
grid_search.best_score_
```

Out[21]:
```
0.7316289788275961
```

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]:
```
rfc_best=grid_search.best_estimator_
```

In [24]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rfc_best.estimators_[5],feature_names=x.columns,class_names=['Other','Manual','Semi-Auto','Automatic
```

Out[24]:
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```
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2234, 8875, 5585]\nclass = Semi-Auto'),
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lass = Semi-Auto'),
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\nclass = Automatic'),
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\nclass = Automatic'),
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i-Auto'),
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Auto')]
```

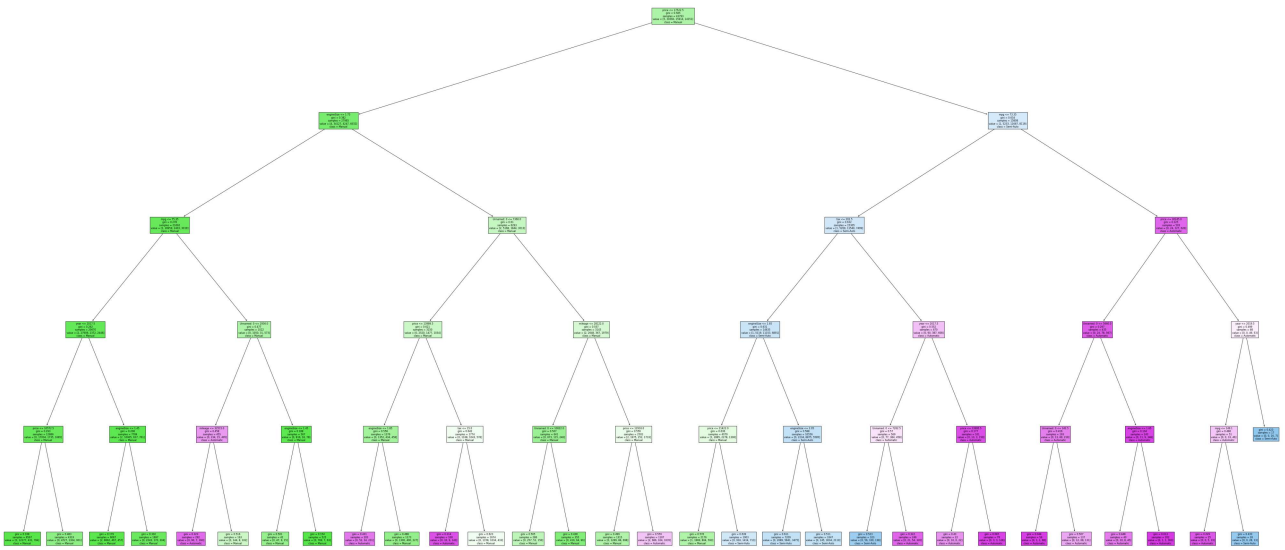

In [ ]: