Árboles de Regresión

In [1]:
```
import pandas as pd
import numpy as np
```

In [2]:
```
data = pd.read_csv("../../Data-Sets/datasets/boston/Boston.csv")
data.head()
```

Out[2]:

	crim	zn	indus	chas	nox	rm	age	dis	rad	tax	ptratio	black	lstat	medv
0	0.00632	18.0	2.31	0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.98	24.0
1	0.02731	0.0	7.07	0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.14	21.6
2	0.02729	0.0	7.07	0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83	4.03	34.7
3	0.03237	0.0	2.18	0	0.458	6.998	45.8	6.0622	3	222	18.7	394.63	2.94	33.4
4	0.06905	0.0	2.18	0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90	5.33	36.2

In [3]:
```
data.shape
```

Out[3]:
```
(506, 14)
```

In [4]:
```
colnames = data.columns.values.tolist()
predictors = colnames[:13]
target = colnames[13]
X = data[predictors]
Y = data[target]
```

In [5]:
```
from sklearn.tree import DecisionTreeRegressor
```

In [6]:
```
regtree = DecisionTreeRegressor(min_samples_split = 30, min_samples_leaf=10, random_state=0)
```

In [7]:
```
regtree.fit(X,Y)
```

Out[7]:
```
DecisionTreeRegressor(min_samples_leaf=10, min_samples_split=30, random_state=0)
```

In [8]:
```
preds = regtree.predict(data[predictors])
```

In [9]:
```
data["Preds"] = preds
```

In [10]:
```
data[["Preds", "medv"]] #Comparamos el valor real medv con la predicción del arbol de regres
```

Out[10]:

	Preds	medv
0	22.840000	24.0
1	22.840000	21.6
2	35.247826	34.7

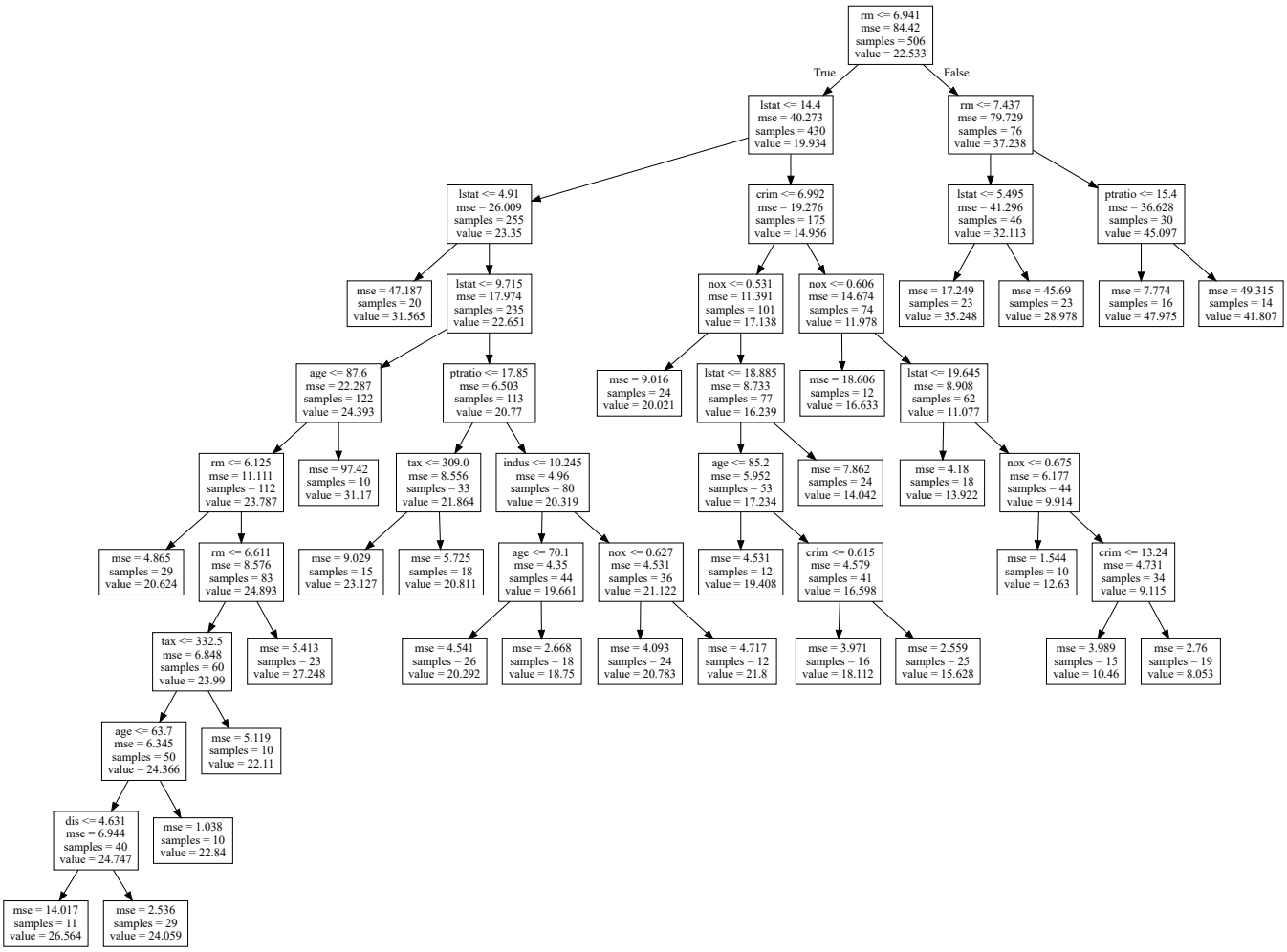
	Preds	medv
3	35.247826	33.4
4	35.247826	36.2
...	...	...
501	22.840000	22.4
502	20.624138	20.6
503	28.978261	23.9
504	31.170000	22.0
505	20.624138	11.9

506 rows × 2 columns

In [11]:

```
from sklearn.tree import export_graphviz
with open("../../Data-Sets/notebooks/resources/boston_rtree.dot", "w") as dotfile:
    export_graphviz(regtree, out_file=dotfile, feature_names=predictors)
    dotfile.close()
import os
os.environ["PATH"] += os.pathsep + r'C:\Program Files\Graphviz\bin'
from graphviz import Source
file = open("../../Data-Sets/notebooks/resources/boston_rtree.dot", "r")
text = file.read()
Source(text)
```

Out[11]:



In [12]:

```
from sklearn.model_selection import cross_val_score
from sklearn.model_selection import KFold
```

In [13]:
```
cv = KFold(n_splits=10, shuffle=True, random_state=1)
```

In [14]:
```
scores = cross_val_score(regtree, X, Y, scoring="neg_mean_squared_error", cv=cv, n_jobs=1)
score = np.mean(scores)
```

In [15]:
```
score
```

Out[15]:
```
-20.107307036443846
```

In [20]:
```
for i in range(1,11):
    regtree = DecisionTreeRegressor(min_samples_split = 30, min_samples_leaf=10, random_state
    regtree.fit(X,Y)
    cv = KFold(n_splits=10, shuffle=True, random_state=1)
    scores = cross_val_score(regtree, X, Y, scoring="neg_mean_squared_error", cv=cv, n_jobs=1
    score = np.mean(scores)
    print("Score para i= " , i , "es de", score)
```

```
Score para i=  1 es de -54.64005096884788
Score para i=  2 es de -29.560344516775093
Score para i=  3 es de -23.929017292685447
Score para i=  4 es de -22.335323294283935
Score para i=  5 es de -20.54926189262014
Score para i=  6 es de -20.110616775207475
Score para i=  7 es de -20.068113350080786
Score para i=  8 es de -20.123136845099417
Score para i=  9 es de -20.11405771239422
Score para i=  10 es de -20.107307036443846
```

Podemos ver que el error medio cuadrado es mejor mientras más bajo es, por lo que con una profundidad de i=5 se estabiliza el error en -20.

In [22]:
```
regtree = DecisionTreeRegressor(min_samples_split = 30, min_samples_leaf=10, random_state=0,
regtree.fit(X,Y)
list(zip(predictors, regtree.feature_importances_))
```

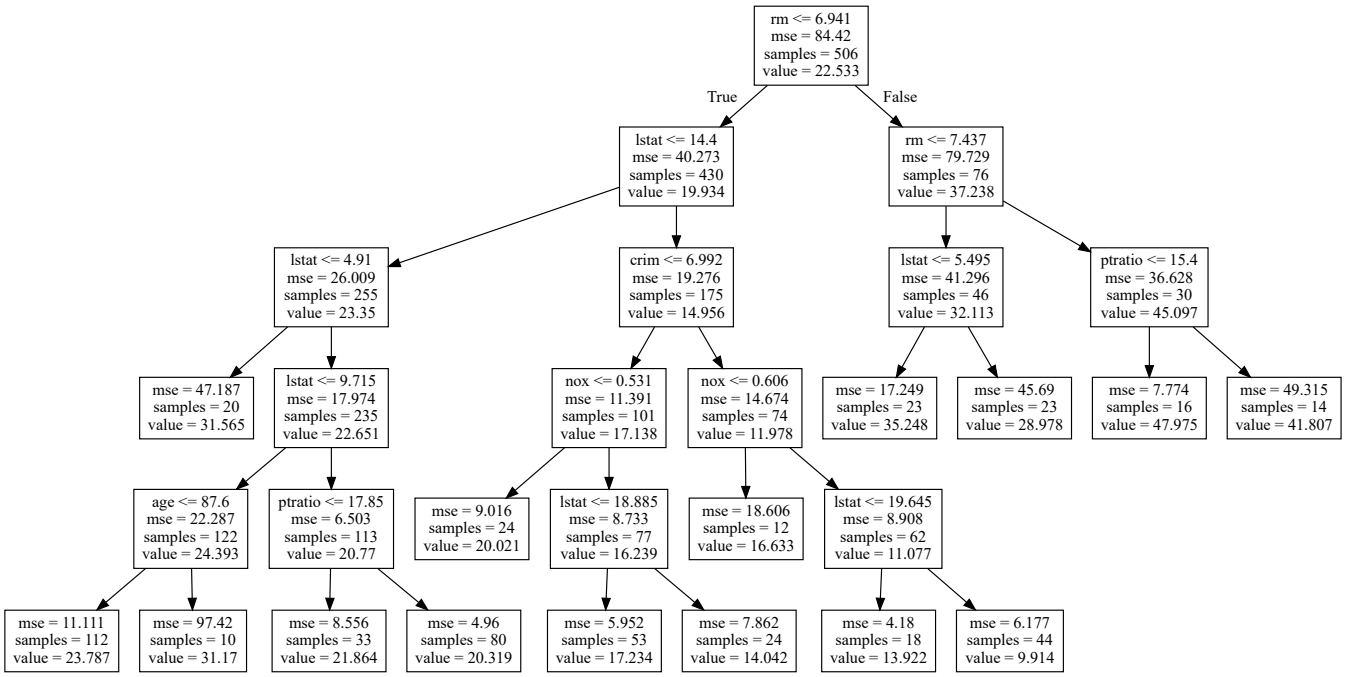
Out[22]:
```
[('crim', 0.032184533425691254),
 ('zn', 0.0),
 ('indus', 0.0),
 ('chas', 0.0),
 ('nox', 0.016195328299152056),
 ('rm', 0.6341876193016562),
 ('age', 0.014165271650613091),
 ('dis', 0.0),
 ('rad', 0.0),
 ('tax', 0.0),
 ('ptratio', 0.009620458196377114),
 ('black', 0.0),
 ('lstat', 0.2936467891265104)]
```

La variable más importante es **rm**, que es el número de habitaciones promedio por alquiler que tiene una importancia del 63% luego está **lstat** con una importancia del 29% y luego siguen las otras variables predictoras.

In [23]:
```
from sklearn.tree import export_graphviz
with open("../../Data-Sets/notebooks/resources/boston_rtree.dot", "w") as dotfile:
    export_graphviz(regtree, out_file=dotfile, feature_names=predictors)
    dotfile.close()
import os
os.environ["PATH"] += os.pathsep + r'C:\Program Files\Graphviz\bin'
```

```
from graphviz import Source
file = open("../../Data-Sets/notebooks/resources/boston_rtree.dot", "r")
text = file.read()
Source(text)
```

Out[23]:



In [ ]: