In [32]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
from sklearn.preprocessing import Imputer
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import OneHotEncoder
```

In [20]:

```
df = pd.read_excel('1553768847_housing.xlsx')
```

In [21]:

```
df.head()
```

Out[21]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	households
0	-122.23	37.88	41	880	129.0	322	126
1	-122.22	37.86	21	7099	1106.0	2401	1138
2	-122.24	37.85	52	1467	190.0	496	177
3	-122.25	37.85	52	1274	235.0	558	219
4	-122.25	37.85	52	1627	280.0	565	259

In [22]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20640 entries, 0 to 20639
Data columns (total 10 columns):
longitude             20640 non-null float64
latitude              20640 non-null float64
housing_median_age    20640 non-null int64
total_rooms           20640 non-null int64
total_bedrooms        20433 non-null float64
population            20640 non-null int64
households            20640 non-null int64
median_income         20640 non-null float64
ocean_proximity       20640 non-null object
median_house_value    20640 non-null int64
dtypes: float64(4), int64(5), object(1)
memory usage: 1.6+ MB
```

In [23]:

```
imputeForNumericColumn = Imputer(missing_values='NaN',
                strategy='mean',
                axis=0)
```

```
/Users/subhasishbiswas/anaconda3/lib/python3.7/site-packages/sklearn/u
tils/deprecation.py:58: DeprecationWarning: Class Imputer is deprecate
d; Imputer was deprecated in version 0.20 and will be removed in 0.22.
Import impute.SimpleImputer from sklearn instead.
  warnings.warn(msg, category=DeprecationWarning)
```

In [66]:

```
dataArray = df.values
```

In [67]:

```
dataArray[:,[4]] = imputeForNumericColumn.fit_transform(dataArray[:,[4]])
```

In [68]:

```
encoderPurchased = LabelEncoder()
dataArray[:,8] = encoderPurchased.fit_transform(dataArray[:,8])
```

In [69]:

```
oheOceanProximity = OneHotEncoder(categorical_features=[8])
dataArray = oheOceanProximity.fit_transform(dataArray).toarray()
```

```
/Users/subhasishbiswas/anaconda3/lib/python3.7/site-packages/sklearn/p
reprocessing/_encoders.py:371: FutureWarning: The handling of integer
data will change in version 0.22. Currently, the categories are determ
ined based on the range [0, max(values)], while in the future they wil
l be determined based on the unique values.
If you want the future behaviour and silence this warning, you can spe
cify "categories='auto'".
In case you used a LabelEncoder before this OneHotEncoder to convert t
he categories to integers, then you can now use the OneHotEncoder dire
ctly.
  warnings.warn(msg, FutureWarning)
/Users/subhasishbiswas/anaconda3/lib/python3.7/site-packages/sklearn/p
reprocessing/_encoders.py:392: DeprecationWarning: The 'categorical_fe
atures' keyword is deprecated in version 0.20 and will be removed in
0.22. You can use the ColumnTransformer instead.
  "use the ColumnTransformer instead.", DeprecationWarning)
```

In [39]:

```
df1=pd.DataFrame(dataArray)
```

In [70]:

```
features = df1.iloc[:,[0,1,2,3,4,5,6,7,8,10,11,12]].values
label = np.log(df1.iloc[:,[13]].values)
```

In [71]:

```
''' Finding Optimal Value

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
for i in range(1,20640):
    X_train,X_test,y_train,y_test = train_test_split(features,
                                                     label,
                                                     test_size=0.2,
                                                     random_state=i)
    model = LinearRegression()
    model.fit(X_train,y_train)

    train_score=model.score(X_train,y_train)
    test_score=model.score(X_test,y_test)

    if test_score > train_score:
        print("Testing: {} Training: {} Seed: {}".format(test_score,train_score,i))
'''
```

Out[71]:

```
'\nfrom sklearn.model_selection import train_test_split\nfrom sklearn.
linear_model import LinearRegression\nfor i in range(1,20640):\n    X_
train,X_test,y_train,y_test = train_test_split(features,\n
label,\n                                                    test_size=0.
2,\n                                                 random_state=i)\n
model = LinearRegression()\n    model.fit(X_train,y_train)\n    \n
train_score=model.score(X_train,y_train)\n    test_score=model.score(X
_test,y_test)\n    \n    if test_score > train_score:\n        print
("Testing: {} Training: {} Seed: {}".format(test_score,train_score,i))
\n'
```

In [61]:

```
#Create train test split 80-20 rule
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(features,
                                                 label,
                                                 test_size=0.2,
                                                 random_state=1420)
```

In [62]:

```
#Create the model(Training the model)
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X_train,y_train)
```

Out[62]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None,
         normalize=False)
```

In [63]:

```
train_score=model.score(X_train,y_train)
test_score=model.score(X_test,y_test)
```

In [64]:

```
train_score
```

Out[64]:

```
0.6599903593077241
```

In [65]:

```
test_score
```

Out[65]:

```
0.6775097303360913
```

In [203]:

```
from sklearn.tree import DecisionTreeRegressor
model = DecisionTreeRegressor()
model.fit(X_train,y_train)
```

Out[203]:

```
DecisionTreeRegressor(criterion='mse', max_depth=None, max_features=No
ne,
           max_leaf_nodes=None, min_impurity_decrease=0.0,
           min_impurity_split=None, min_samples_leaf=1,
           min_samples_split=2, min_weight_fraction_leaf=0.0,
           presort=False, random_state=None, splitter='best')
```

In [204]:

```
train_score=model.score(X_train,y_train)
test_score=model.score(X_test,y_test)
```

In [ ]:

```
train_score
test_score
```

In [119]:

```
from sklearn.ensemble import RandomForestRegressor
model = RandomForestRegressor(max_depth=2, random_state=0,n_estimators=3)
model.fit(X_train,y_train)
```

```
/Users/subhasishbiswas/anaconda3/lib/python3.7/site-packages/ipykernel
_launcher.py:3: DataConversionWarning: A column-vector y was passed wh
en a 1d array was expected. Please change the shape of y to (n_sample
s,), for example using ravel().
  This is separate from the ipykernel package so we can avoid doing im
ports until
```

Out[119]:

```
RandomForestRegressor(bootstrap=True, criterion='mse', max_depth=2,
           max_features='auto', max_leaf_nodes=None,
           min_impurity_decrease=0.0, min_impurity_split=None,
           min_samples_leaf=1, min_samples_split=2,
           min_weight_fraction_leaf=0.0, n_estimators=3, n_jobs=None,
           oob_score=False, random_state=0, verbose=0, warm_start=Fals
e)
```

In [120]:

```
train_score=model.score(X_train,y_train)
test_score=model.score(X_test,y_test)
```

In [121]:

```
train_score
```

Out[121]:

```
0.5369837810400864
```

In [122]:

```
test_score
```

Out[122]:

```
0.5612986248870013
```

In [132]:

```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20640 entries, 0 to 20639
Data columns (total 14 columns):
0     20640 non-null float64
1     20640 non-null float64
2     20640 non-null float64
3     20640 non-null float64
4     20640 non-null float64
5     20640 non-null float64
6     20640 non-null float64
7     20640 non-null float64
8     20640 non-null float64
9     20640 non-null float64
10    20640 non-null float64
11    20640 non-null float64
12    20640 non-null float64
13    20640 non-null float64
dtypes: float64(14)
memory usage: 2.2 MB
```

In [182]:

```
features = np.log(df1.iloc[:,[12]].values)
label = np.log(df1.iloc[:,[13]].values)
```

In [183]:

```
#Create train test split 80-20 rule
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(features,
                                                 label,
                                                 test_size=0.2,
                                                 random_state=38)
```

In [184]:

```
#Create the model(Training the model)
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X_train,y_train)
```

Out[184]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None,
         normalize=False)
```

In [185]:

```
features
```

Out[185]:

```
array([[2.11928706],
       [2.11642418],
       [1.98202164],
       ...,
       [0.53062825],
       [0.62443998],
       [0.87070742]])
```

In [186]:

```
train_score=model.score(X_train,y_train)
test_score=model.score(X_test,y_test)
```

In [187]:

```
train_score
```

Out[187]:

```
0.4480852059372842
```

In [188]:

```
test_score
```

Out[188]:

```
0.4751691332024489
```

In [189]:

```
mdIncome = float(input("Enter House median_income: "))
expmdIncome = np.array([[mdIncome]])
prediction = model.predict(expmdIncome)
print("House Price for median_income {} is USD {}".format(mdIncome,prediction))
```

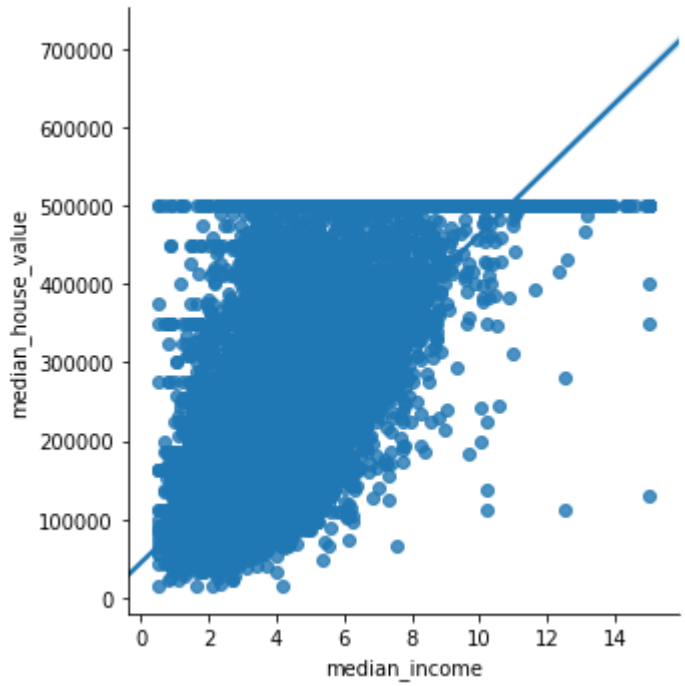
```
Enter House median_income: 8.234
House Price for median_income 8.234 is USD [[17.76337709]]
```

In [171]:

```
sns.lmplot(x='median_income',y='median_house_value', data=df)
```

Out[171]:

```
<seaborn.axisgrid.FacetGrid at 0x1a1c494cf8>
```



In [ ]:

```

```

In [ ]:

```

```