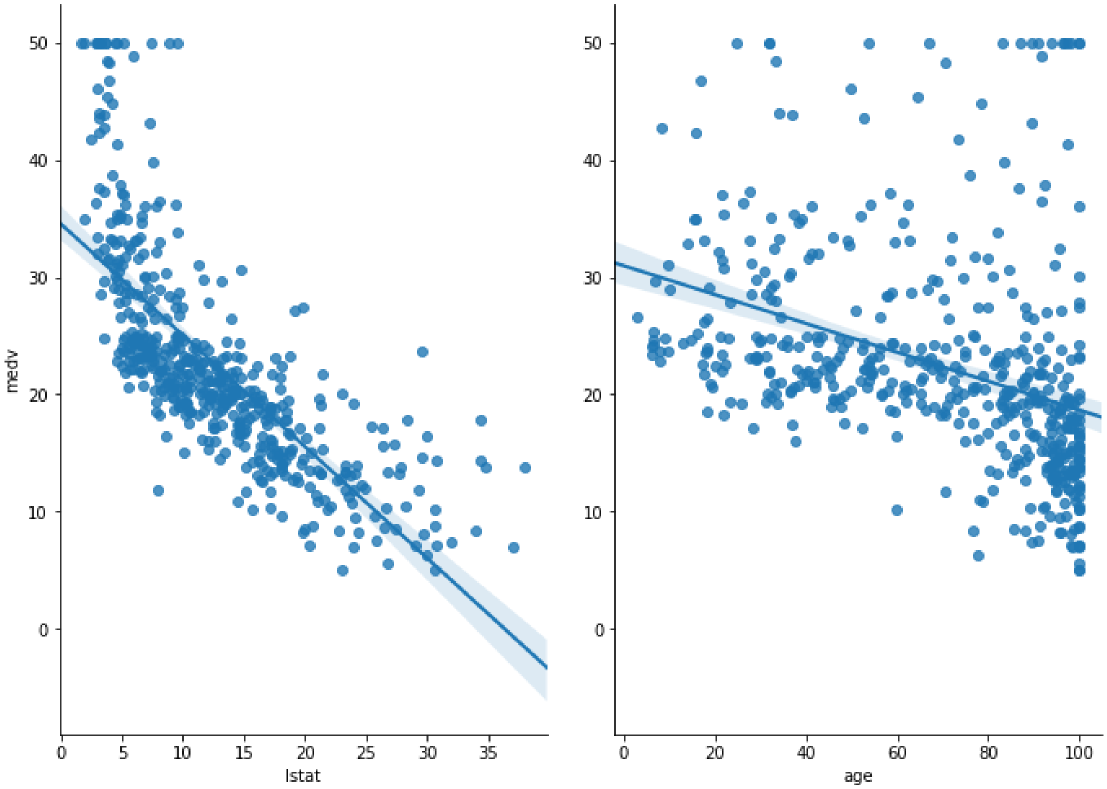
Multiple Linear Regression

May 18, 2018

```
In [5]: # conventional way to import pandas
        import pandas as pd
        # conventional way to import seaborn
        import seaborn as sns
        # conventional way to import numpy
        import numpy as np

        from sklearn import metrics
        import matplotlib.pyplot as plt

        data = pd.read_csv("https://raw.github.com/vincentarelbundock/Rdatasets/master/csv/MAS

        # create a Python list of feature names
        feature_cols = ['lstat','age']

        # use the list to select a subset of the original DataFrame
        X = data[feature_cols].values

        # select a Series from the DataFrame
        y = data['medv'].values
```

Viewing the data in seaborn to get a sense of it - MEDV Median value of owner-occupied homes in $1000's - LSTAT lower status of the population - AGE proportion of owner-occupied units built prior to 1940

```
In [6]: # visualize the relationship between the features and the response using scatterplots
        #sns.pairplot(data, x_vars=['lstat','age'], y_vars='medv', size=7, aspect=0.7, kind='r
        sns.pairplot(data, x_vars=['lstat','age'], y_vars='medv', size=7, aspect=0.7, kind='reg
        plt.show()
```

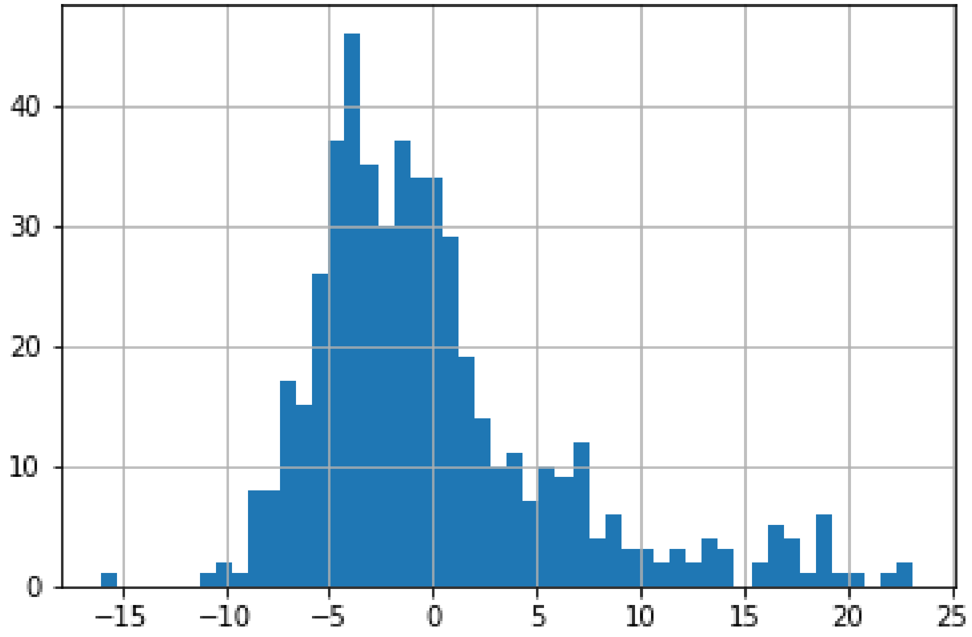


```
In [7]: # import model
        from sklearn.linear_model import LinearRegression

        # instantiate
        linreg = LinearRegression()

        # fit the model to the training data (learn the coefficients)
        linreg.fit(X, y)

        # print the intercept and coefficients
        print('intercept: \n', linreg.intercept_)

        # The coefficients
        print('Coefficients: \n', # pair the feature names with the coefficients
        list(zip(feature_cols, linreg.coef_)))

        # make predictions on the testing set
        y_pred = linreg.predict(X)

        # calculate RMSE using scikit-learn
        np.sqrt(metrics.mean_squared_error(y, y_pred))
        # Explained variance score: 1 is perfect prediction
        print('Variance score: %.2f' % metrics.r2_score(y, y_pred))
```

```
intercept:
 33.2227605318
Coefficients:
 [('lstat', -1.0320685641826013), ('age', 0.034544338571646085)]
Variance score: 0.55
```

The obtained the predictions produced by linear regression. Look at the residuals, the difference between the real target set and the predicted target set:

```
In [8]: pd.Series(y - y_pred).hist(bins=50)
        plt.show()
```



0
10
20
30
40
−15
−10
−5
0
5
10
15
20
25