Fuel Economy Analysis

This demo is an example of performing data mining on historical fuel economy data. We have data from various cars built from year 2000 up to 2012.

Import Data into Table

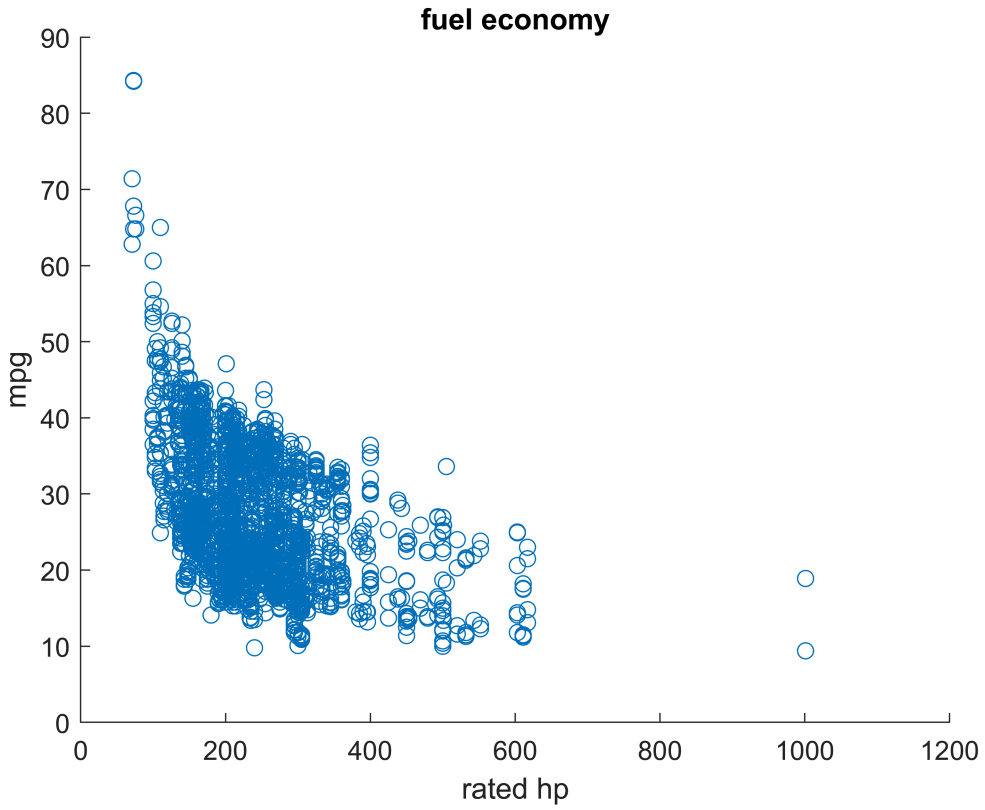
Import from Excel using modified auto-generated function from Import Tool

```
carData = importfile('2006dat.xlsx');
```

Visualize

Plot MPG versus Rated Horsepower

```
createfigure(carData.RatedHP, carData.MPG);
```



Examine Grouping Effects of Categorical Data

In order to extract all "cars":

```
carIDs = carData.Car_Truck == "car";
```

In order to extract "city" data for "trucks":

```
city_truckIDs = (carData.City_Highway == "city" & carData.Car_Truck == "truck");
```

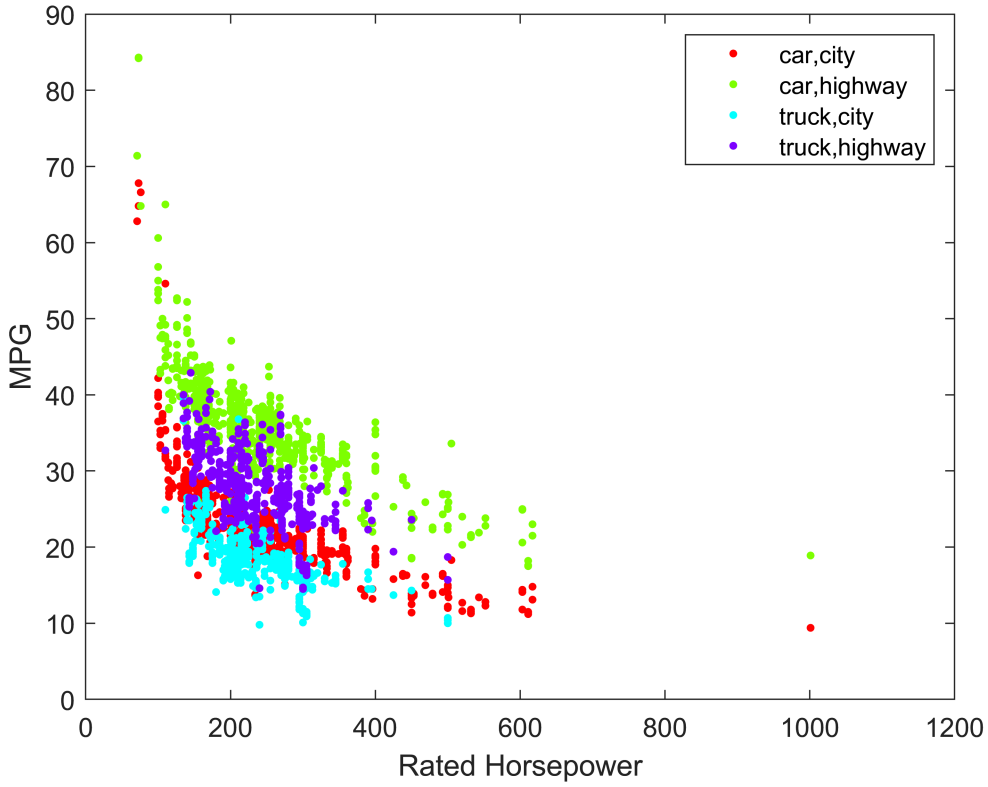
City versus Highway

```
cityIDs = carData.City_Highway == "city";
highwayIDs = carData.City_Highway == "highway";
```

Grouped Visualizations

Scatter plot by group.

```
figure
gscatter(carData.RatedHP, carData.MPG, ...
    {carData.Car_Truck, carData.City_Highway}, ...
    '', '.', 10, 'on', 'Rated Horsepower', 'MPG')
```



Extract Data for Curve Fitting

Create these variables for Curve Fitting App

```
RatedHPCity = carData.RatedHP(cityIDs);
MPGCity     = carData.MPG(cityIDs);

% Use the App to develop a curve fit.
```

Curve Fitting

Equation:

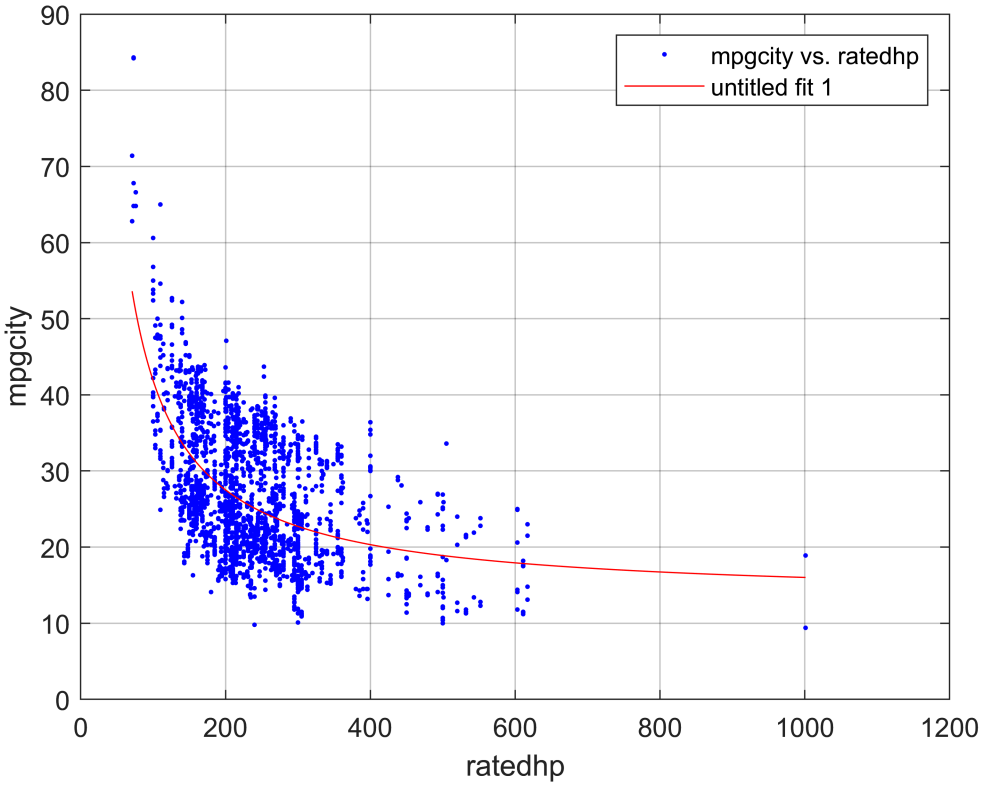
$$\mathrm{MPG} = b_1 + \frac{b_2}{\mathrm{RatedHP}}$$

We can solve this using the Curve Fitting Tool

`cftool(carData.RatedHP, carData.MPG)`

The following is a modified version of the auto-generated m-file from `cftool`.

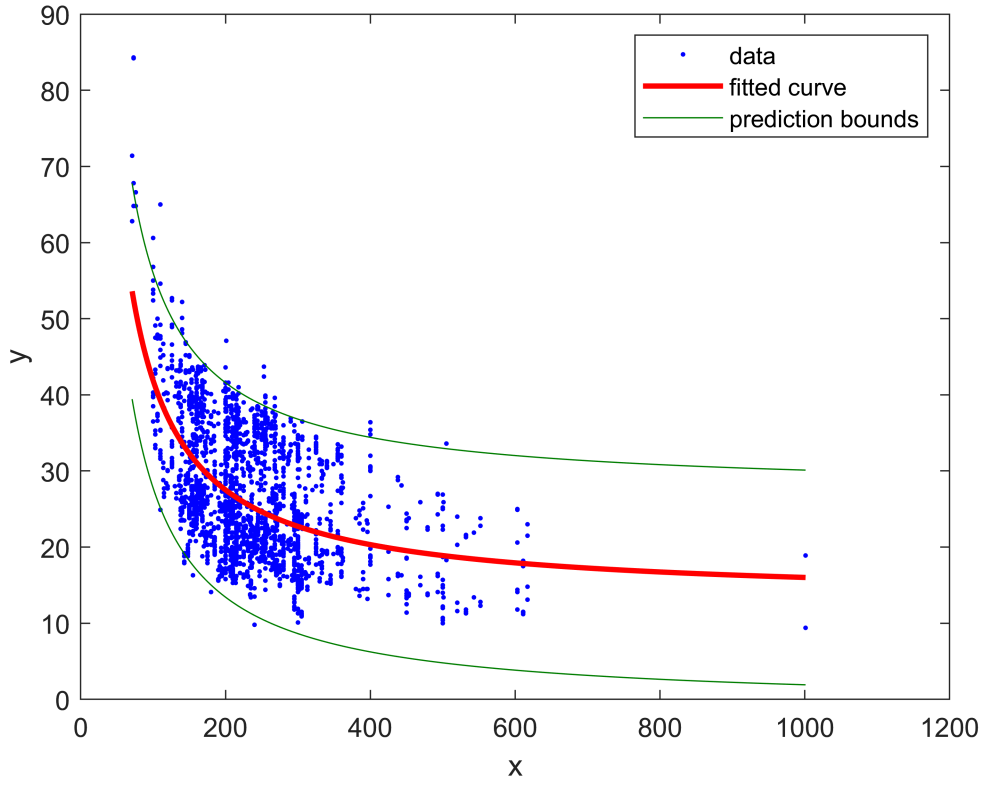
```
cf = createFit(carData.RatedHP, carData.MPG);
```



Plot Data and Model

The result from the Curve Fitting Toolbox has a `plot` method for displaying the result graphically. We can choose to display the prediction bounds for the fit.

```
figure
hh = plot(cf, 'r', carData.RatedHP, carData.MPG, 'predobs', 0.95);
hh(2).LineWidth = 2;
for ii = [3 4]
    hh(ii).LineStyle = '-';
    hh(ii).Color = [0 0.5 0];
end
```

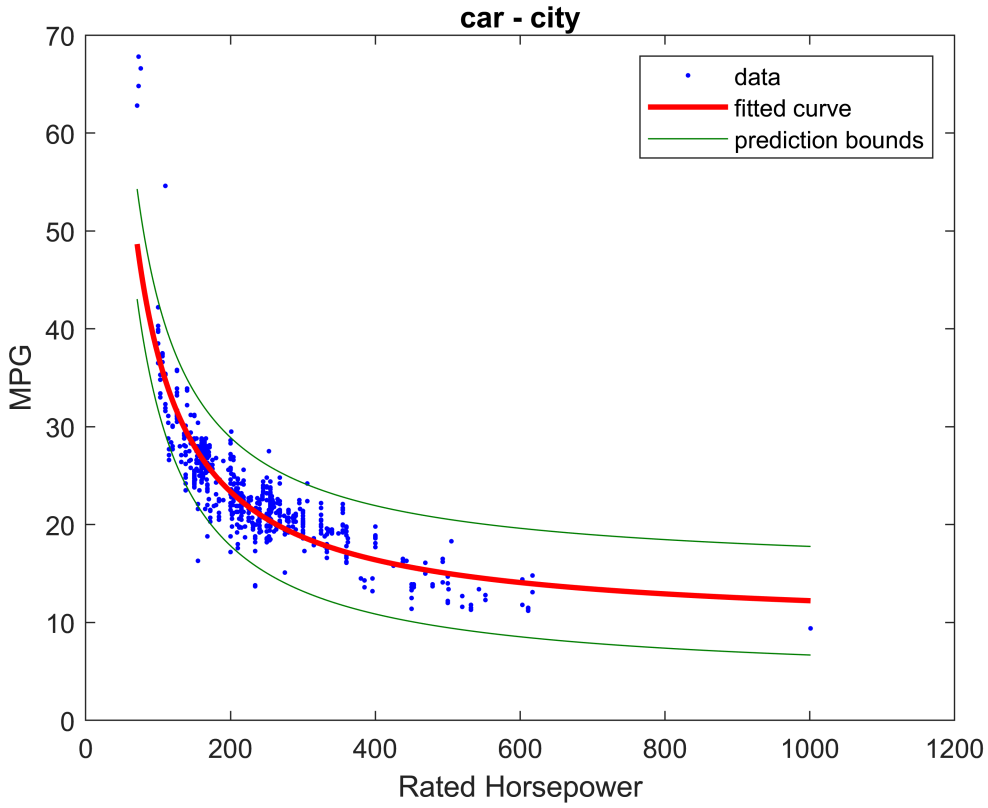


Plot of Data and Model (for different groups)

We will apply the similar modeling technique to the data for different combinations of groups (Car-Truck and City-Highway)

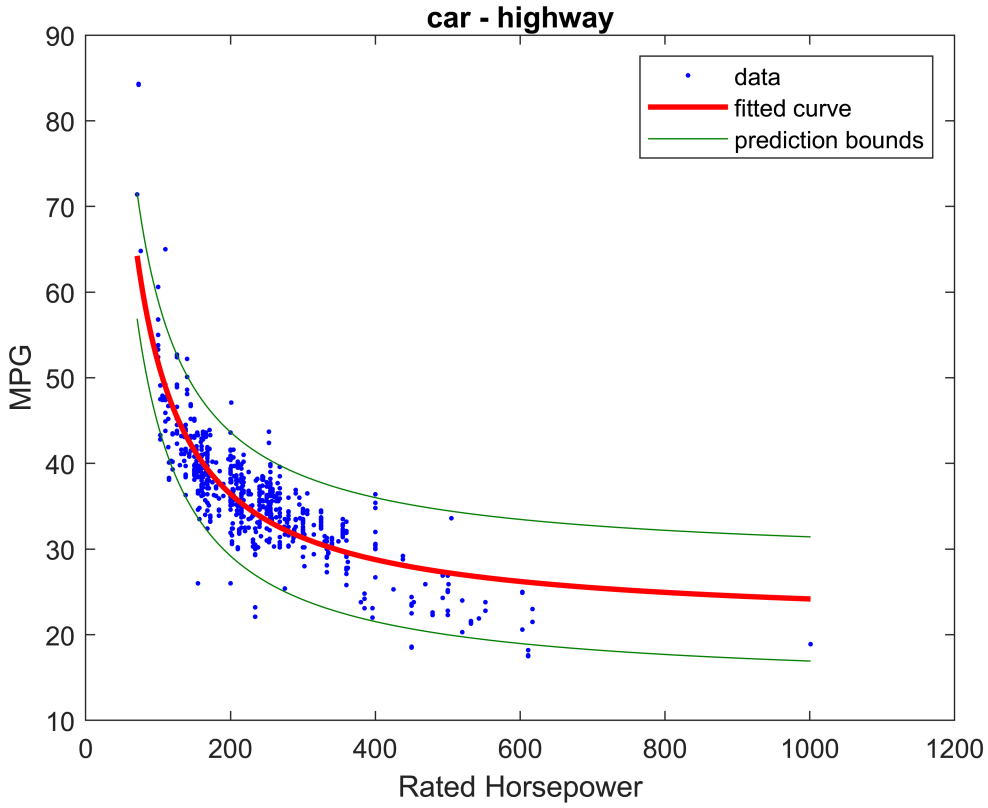
Model different combinations:

```
[mdl,gof] = modelMPG(carData, 'car', 'city')
```



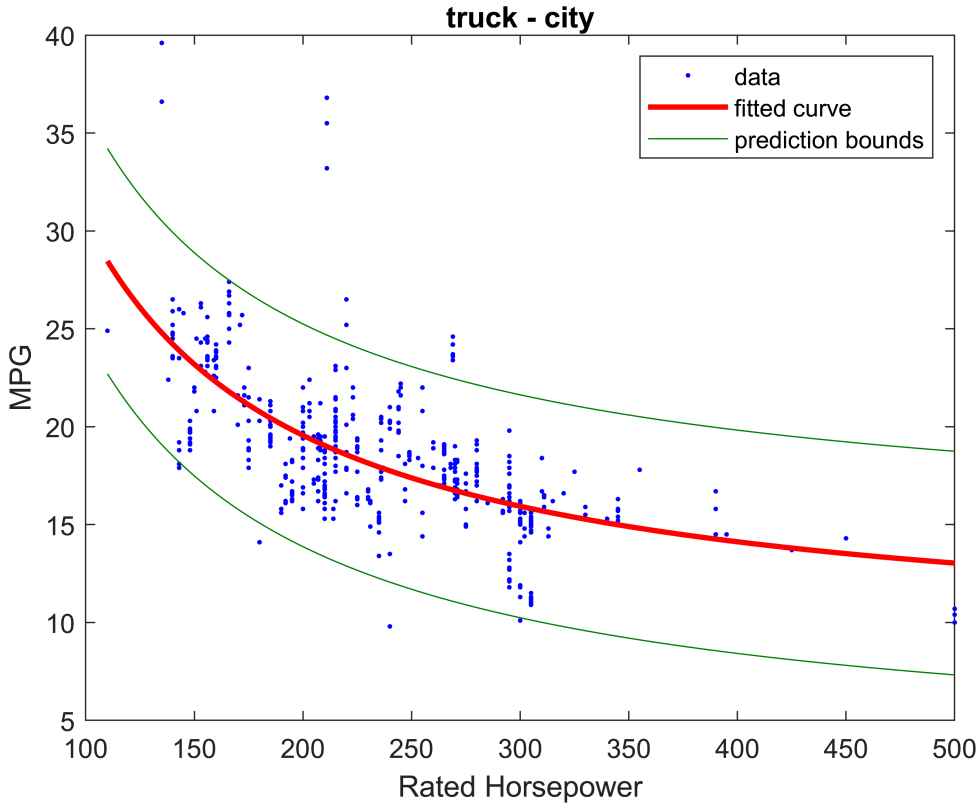

```
mdl =
     Linear model:
     mdl(x) = a + b*1/x
     Coefficients (with 95% confidence bounds):
       a =       9.443  (8.874, 10.01)
       b =        2784  (2675, 2894)
gof = struct with fields:
           sse: 5.7126e+03
       rsquare: 0.7763
           dfe: 721
    adjrsquare: 0.7760
          rmse: 2.8148
```

```
[mdl,gof] = modelMPG(carData, 'car', 'highway')
```



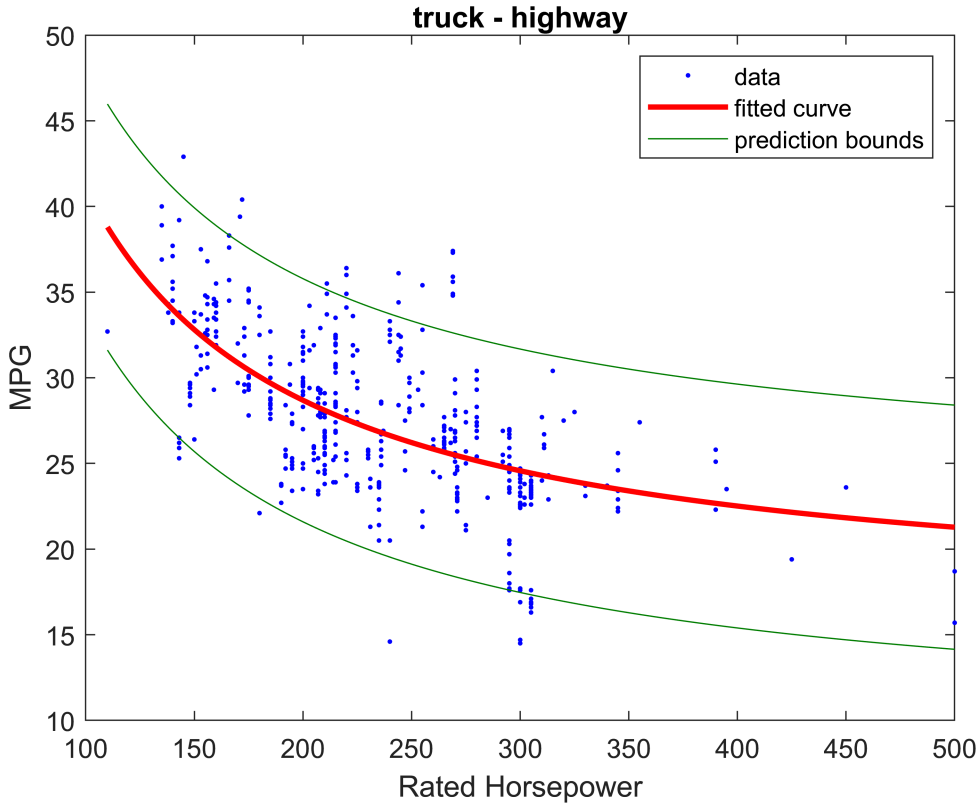

```
mdl =
     Linear model:
     mdl(x) = a + b*1/x
     Coefficients (with 95% confidence bounds):
       a =       21.12  (20.37, 21.86)
       b =        3061  (2918, 3205)
gof = struct with fields:
           sse: 9.6775e+03
       rsquare: 0.7108
           dfe: 715
    adjrsquare: 0.7104
          rmse: 3.6790
```

```
[mdl,gof] = modelMPG(carData, 'truck', 'city')
```




```
mdl =
     Linear model:
     mdl(x) = a + b*1/x
     Coefficients (with 95% confidence bounds):
       a =       8.685  (7.729, 9.641)
       b =        2175  (1977, 2373)
gof = struct with fields:
           sse: 4.4074e+03
       rsquare: 0.4689
           dfe: 527
    adjrsquare: 0.4679
          rmse: 2.8919
```

```
[mdl,gof] = modelMPG(carData, 'truck', 'highway')
```




```
mdl =
     Linear model:
     mdl(x) = a + b*1/x
     Coefficients (with 95% confidence bounds):
       a =       16.34  (15.13, 17.54)
       b =        2471  (2221, 2721)
gof = struct with fields:
           sse: 6.8494e+03
       rsquare: 0.4176
           dfe: 526
    adjrsquare: 0.4165
          rmse: 3.6086
```