Machine Learning: Lab 1

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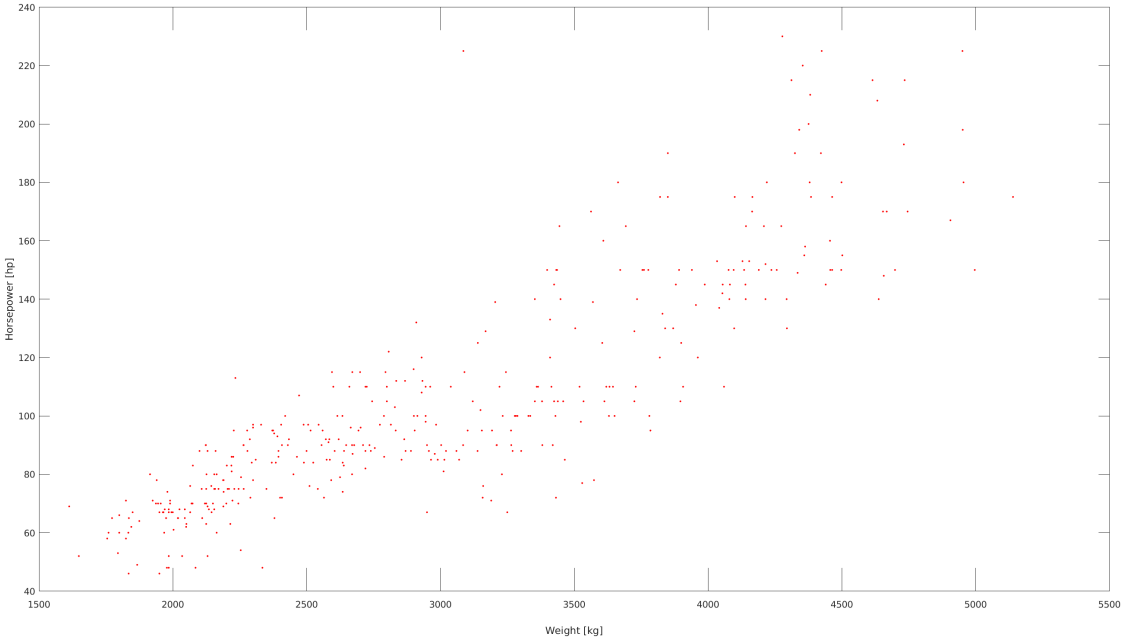
Contents

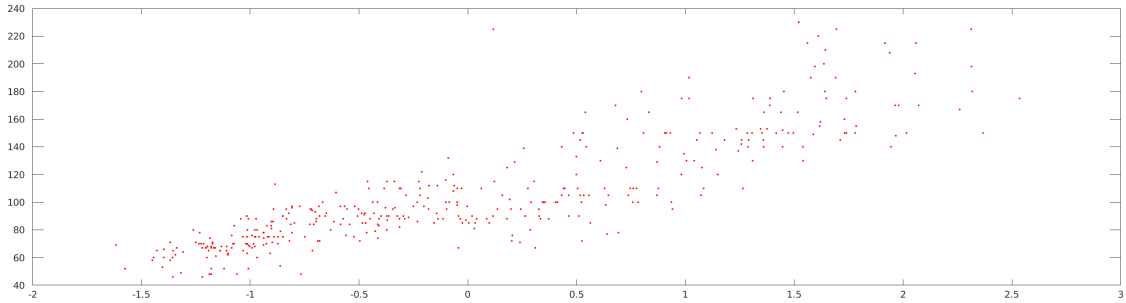
Part 1

```
% ========================== REPORT ==========================
% Present the problem and describe the data. Show a plot of the data.
%
% In this lab we have two relational data vectors, weight and
    horsepower, given the initial belief that there is a relationship
    between these two data elements we think that if we know the
    weight of the car, we will be able to predict the horsepower. To
    do this we will fit a linear model to the car data as the point
    cloud we plotted suggest that the data is roughly linear.
% ============================================================
```




```
% ========================== REPORT ==========================
% Explain why it is necessary to normalize the data.
% Hint: Try to run the gradient descent algorithm without normalizing
% the data and see what happends.
%
```

```
% Without normalization we are unable to get a proper regression of
    the data. The normalization gives the data a zero mean, moving the
     data to be centered around zero, rather than an arbitrary point,
    this normalization, while not required, gives the data a similar
    range, speeding up the gradient decent. As such in our timeframe
    the un-normalized data fails in gradient decent.
% ================================================================
```



Part 2

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% ========================= REPORT ===============================
% What value of diff did you get?
% diff: 2.393e-10
% ================================================================
```

Part 3

```
% ========================= REPORT ===============================
% Include the plot of J_history and the plot of the linear fit.
    Discuss the
% plots. Is the number of iterations in the gradient descent
    sufficient to
% find a good solution? How would a different value of alpha
    influence the
% found optimal values of theta and the speed of convergence?
% FOR PASS WITH DISTINCTION: Implement momentum and show a plot of
% J_history with and without momentum in the same plot with different
% colors. Include a legend.
%
%
% ================================================================
```

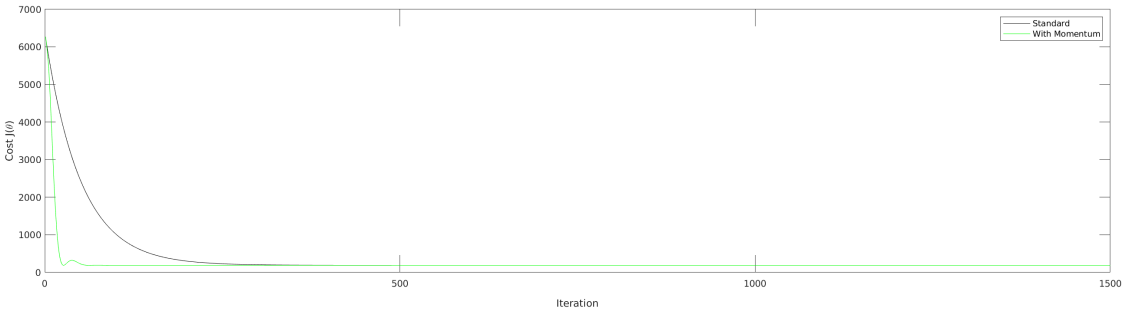

Figure 1: Gradient decent

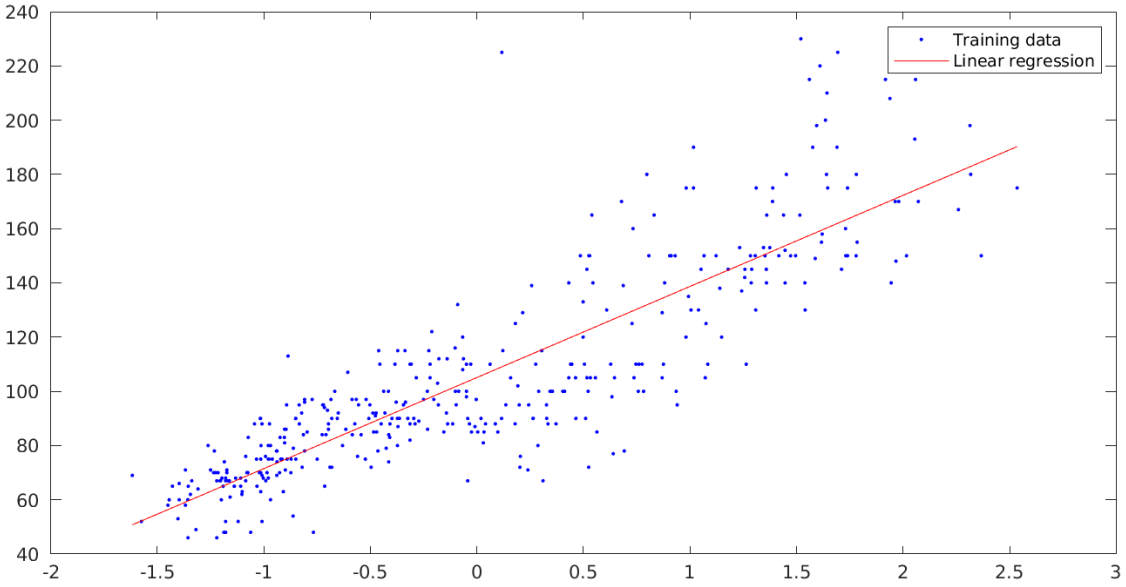

Figure 2: Linear regression

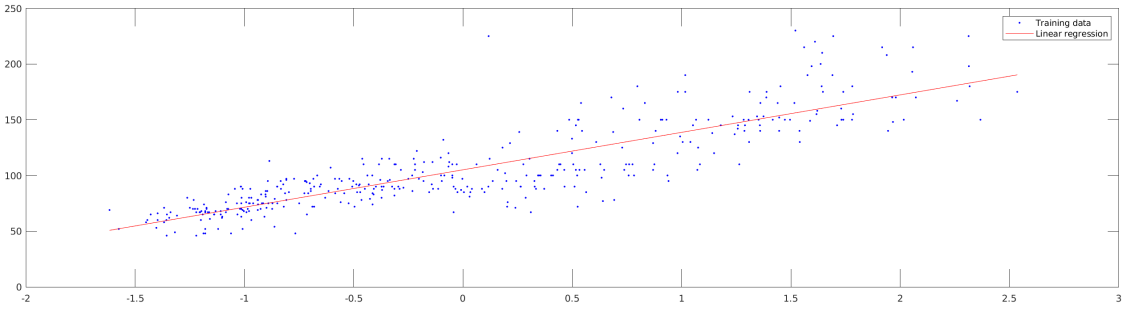

Figure 3: Linear regression with momentum