CSC411 Assignment 1

Yue Guo

September 28, 2017

1 Learning basics of regression in Python

1.1 Describe and summarize the data

1.1.1 data points, dimensions, target

The target is the house price. The data points have a dimension of

1.1.2 weighted least square problem and analytic solution proof

Since the matrix A is diagonal and $\hat{y} = A^T x$ and $L(w) = \frac{1}{2}\Sigma a^{(i)}(y^{(i)} - W^T x^{(i)})^2 + \frac{\lambda}{2}\|W\|^2$
$L(w) = \frac{1}{2}A[(y - W^T x)(y - W^T x)] + \frac{\lambda}{2}\|W\|^2$
$L(w) = \frac{1}{2}A(y^T y + W^T X^T XW - 2W^T X^T y) + \frac{\lambda}{2}\|W\|^2$
$\frac{\partial}{\partial w} = \frac{1}{2} \times 2A[X^T XW^* - X^T y] + \lambda\|W\|^2 = 0$
$AX^T XW^* - X^T Ay + \lambda W^* = 0$
$(AX^T X + \lambda)W^* = X^T Ay$
$W^* = X^T Ay(AX^T X + \lambda I)^{-1}$