

Lab 4

CSC 5930/9010 - Computer Vision

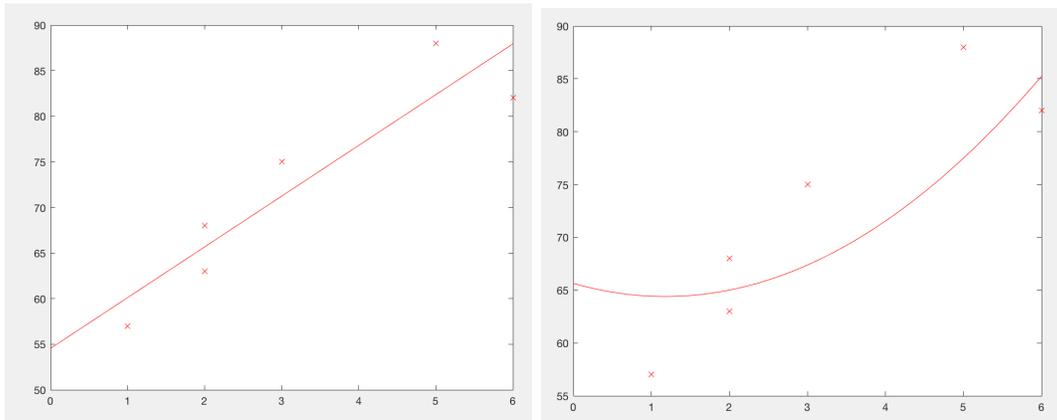


Figure 1: Visualization of a linear regression based upon the number of hours studying for an exam and the grade obtained. The plot on the left uses a line, the plot on the right uses a quadratic polynomial.

Description: In this lab you will practice Least Squares Linear regression. You should begin with the following files and libraries.

Step 1 - Look at the data provided. This is a relationship between the number of hours that a student studies and the corresponding grade on an exam. The data looks like the following, student

1 = (6 hrs grade 82), student 2 = (2 hrs grade 63), student 3 = (1hr, 57), student 4 = (5hrs, 88), student 5 = (2hrs, 68), student 6 = (3hrs, 75)

A plot of the points looks like the following,

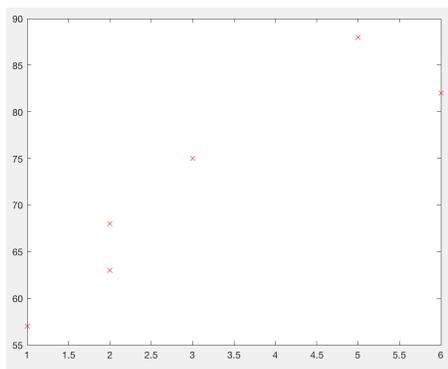


Figure 2: Visualization of plot of points where the axes are number of hours studying for an exam and the grade obtained.

Create a matrix A that stores the coefficients of the equation, $mx + b$. Create a vector b that stores the grades.

Step 3 - Use matlab to compute the pseudo inverse of A, e.g. the projection, of the vector b onto the column space of A. Remember the equation for the pseudo inverse is,

$$\hat{x} = (A^T A)^{-1} A^T b \quad (1)$$

where \hat{x} is a vector that contains the slope and yintercept of the least squares line.

Step 4 - Use the slope and y intercept to draw a line of best fit with x1, y1.

x1 should be the domain e.g. x1 = 0:0.1:6

y1 should be the result of $y1 = ax1 + b$, where a and b are $\hat{x}(1)$ and $\hat{x}(2)$.

Repeat the following, except fit a quadratic function. Can you fit any number polynomial to the function?