

HW1: Eric cj593

Theory:

1. a)  $\theta = \text{np.linalg.inv}(X_{\text{avg}}^T @ X_{\text{avg}}) @ (X_{\text{avg}}^T @ Y)$

$$\theta_0 = 1.02858919$$

$$\theta_1 = -0.41267868$$

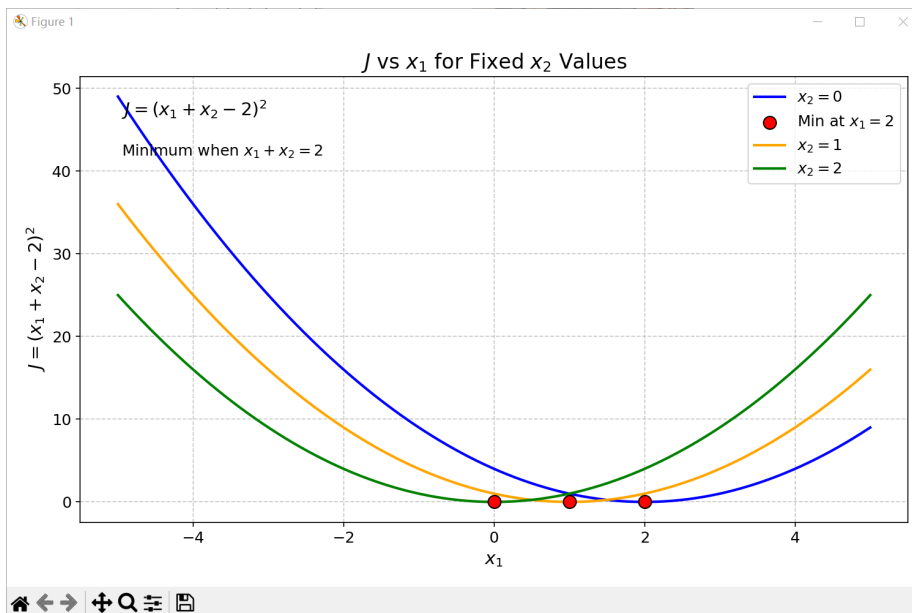
b)  $\theta_0 = 1.0285891858297078$

$$\theta_1 = -0.41267868$$

2(a)  $J = (x_1 + x_2 - 2)^2 \Rightarrow \frac{\partial J}{\partial x_1} = 2(x_1 + x_2 - 2)$

$$\frac{\partial J}{\partial x_2} = 2(x_1 + x_2 - 2)$$

(b)



c) to make  $x_1 + x_2 - 2 = 0$  , so.  $x_1 + x_2 = 2$ .

$$(x_1, x_2) = 2 \Rightarrow (2, 0), (1, 1), (0, 2)$$

$$\text{Minimum } J = 0$$

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Closed Form Linear Regression

$$y = 3273.6667 + 1079.1547x_1 - 254.9691x_2$$

$$\text{RMSE} = 601.9303$$

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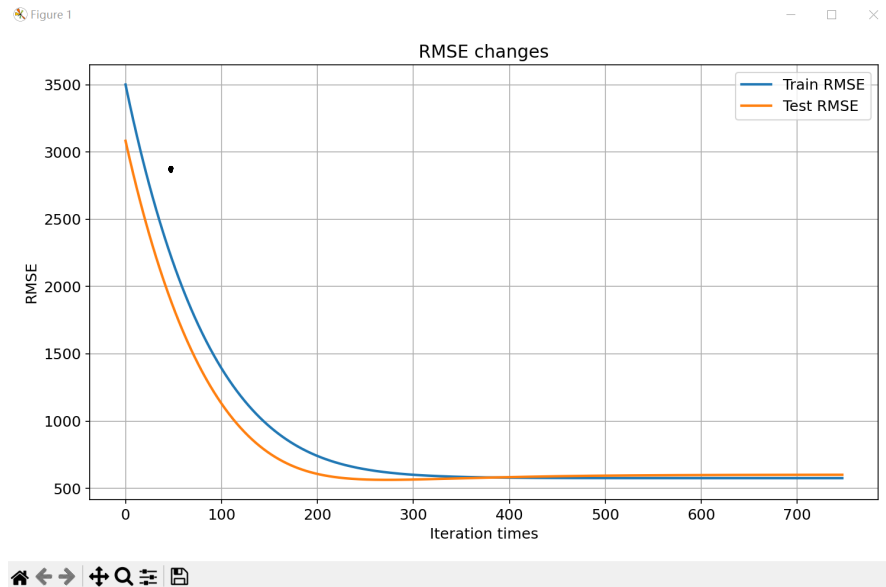
Locally - Weighted Linear Regression

$$\text{RMSE} = 308.0661$$

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# Gradient Descent:

RMSE = 601.9303



Final model:  $y = 3273.8689 + 1078.4294x_1 - 254.5283x_2$