ASSIGNMENT 4

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Course: Machine Learning Lab
Course Code: ITIT-4107
Deadline: 18 October (11:59 PM)
Github : https://github.com/Vivek-Kamboj/ITIT-4103-2021/tree/main/Assignment-4

Objective:

1. Use a scatter plot to visualize the data, since it has only two properties to plot (profit and population).

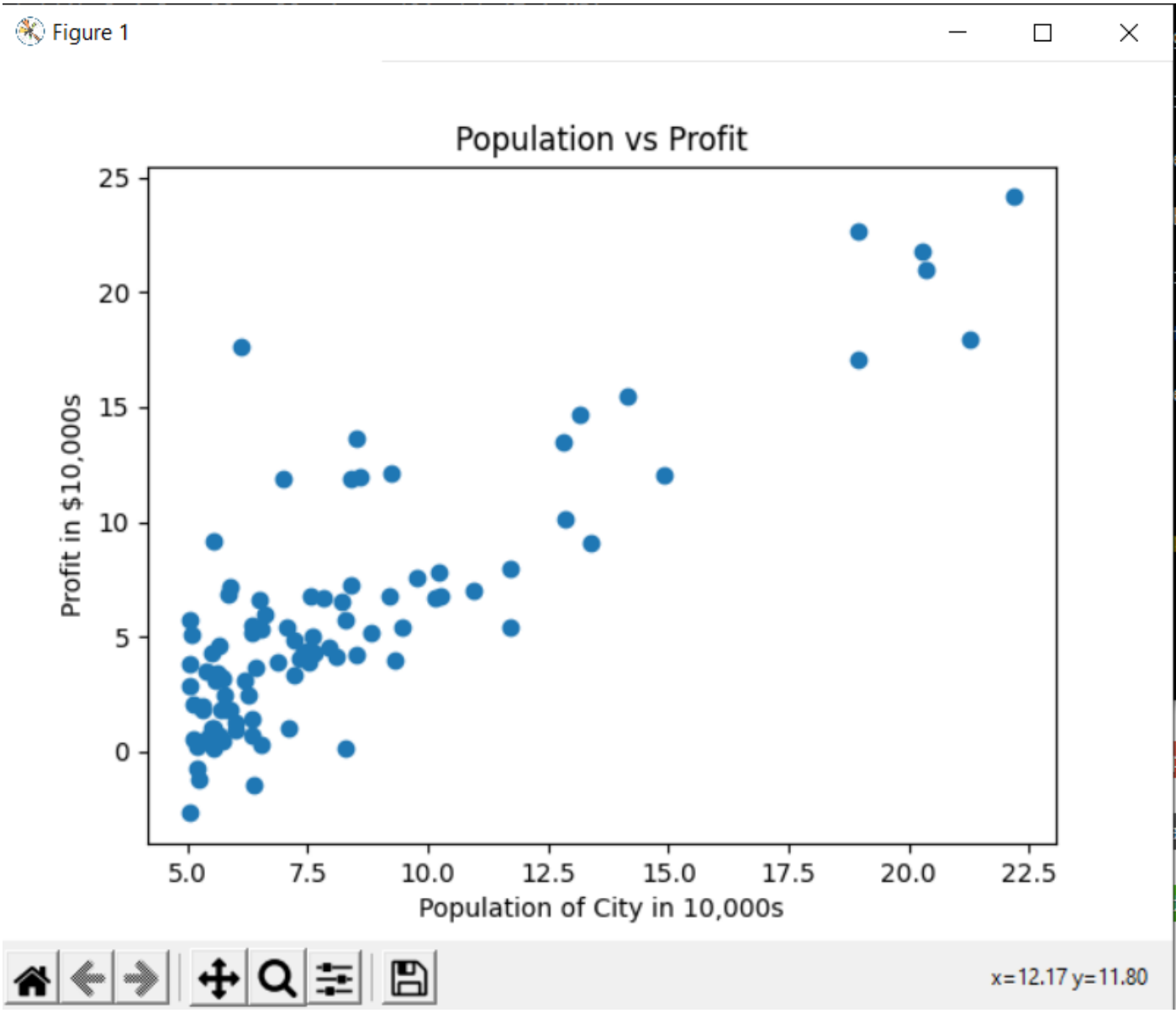
2. Consider a simple linear model with two parameters and one input variable and mean square error cost function to implement the gradient descent algorithm to find the intercepts. Assume a suitable terminating condition.

3. Plot the model alongside the scatterplot to show the fit model.

4. Perform steps 1,2,3 in batch mode for varying values of alpha, learning rate and plot the results.

5. For each of the experiments performed above in steps 1,2,3,4 with varying learning rates visualize the cost function as a contour plot as well as plot the values of parameters to visualize the stepwise traversion of the parameters on this contour plot.

- Read data using panda
- Plot x and y –



- Mean square error cost

$$J(\theta) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

- Linear regression model

$$h_\theta(x) = \theta^T x = \theta_0 + \theta_1 x_1$$

- We build gradient descent model using the equation

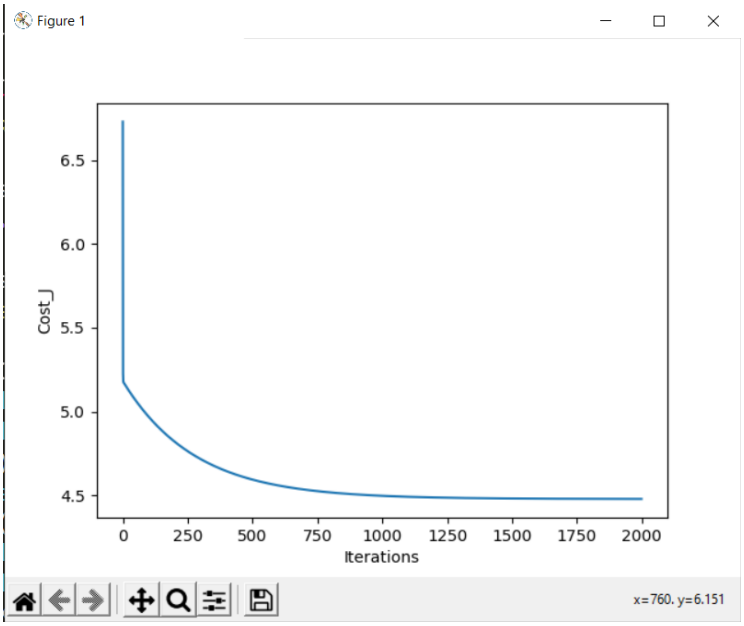
$$\theta_j = \theta_j - \alpha \frac{1}{m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right) x_j^{(i)} \qquad \text{simultaneously update } \theta_j \text{ for all } j$$

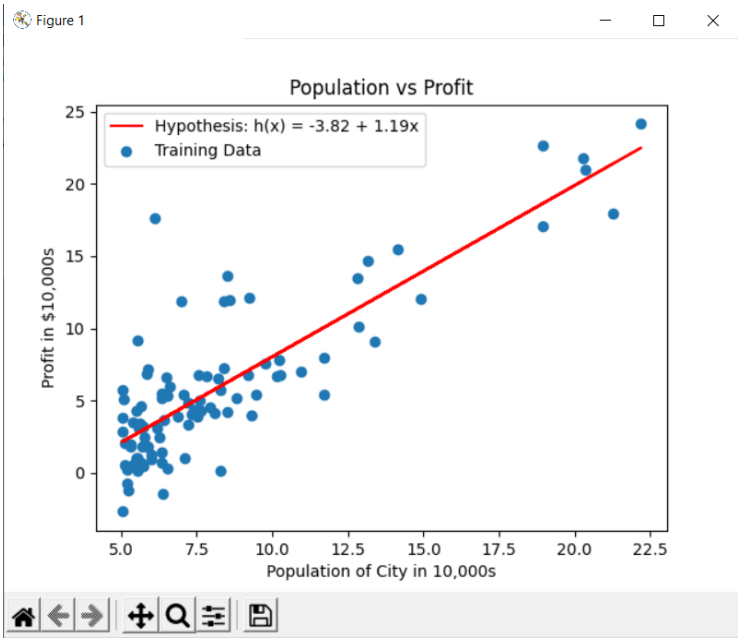
Do this for tita0 tita1 for n steps n=2000

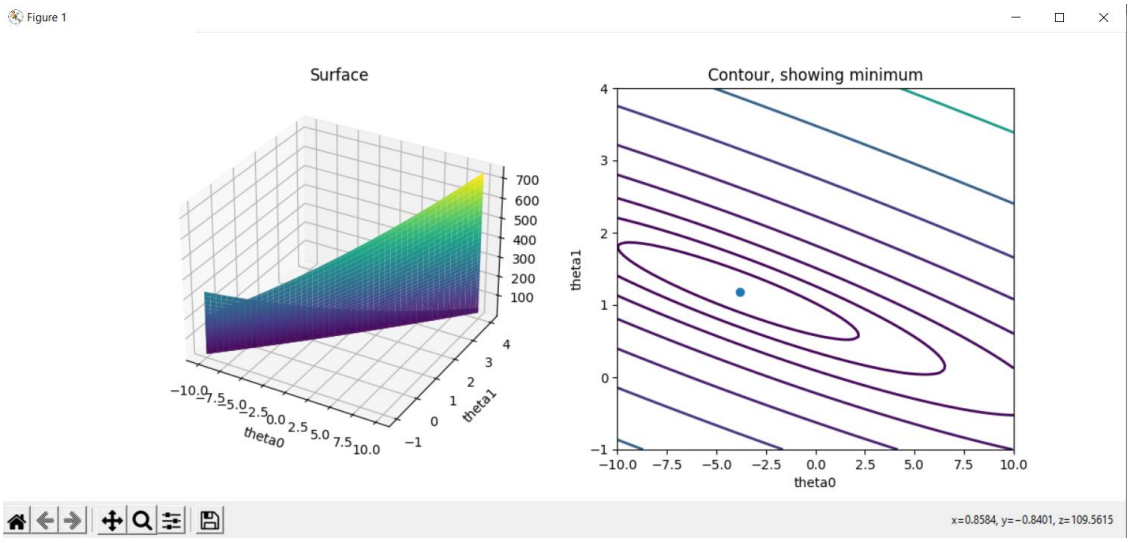
- Contour built using matplotlib plt contour function
- For tita 0 from range -10,10 and tita 1 from range -1,4 cost is calculated and these 3 variables are passed to contour function

Result

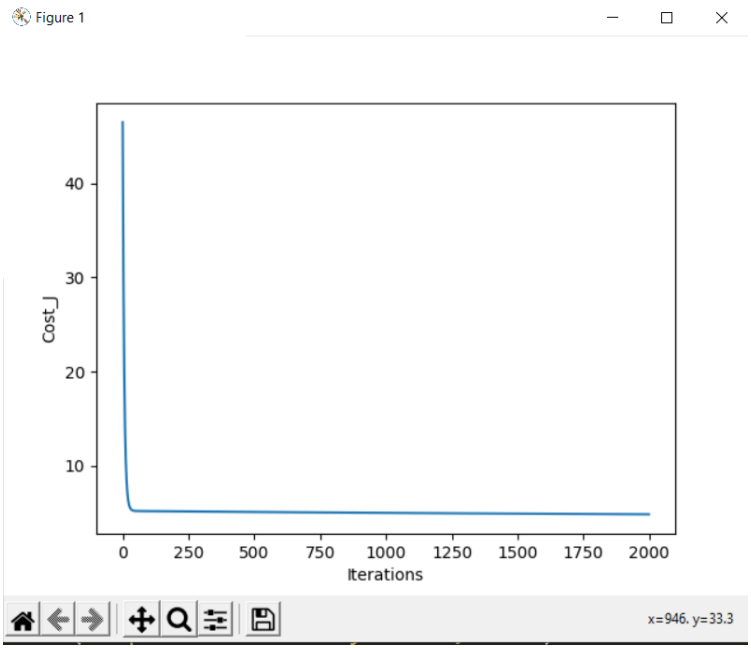
- Learning rate 0.01

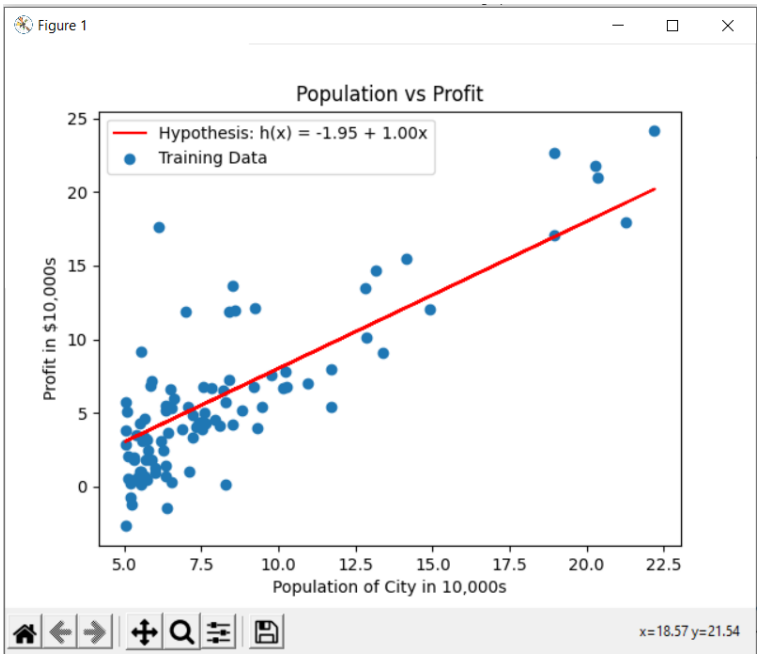


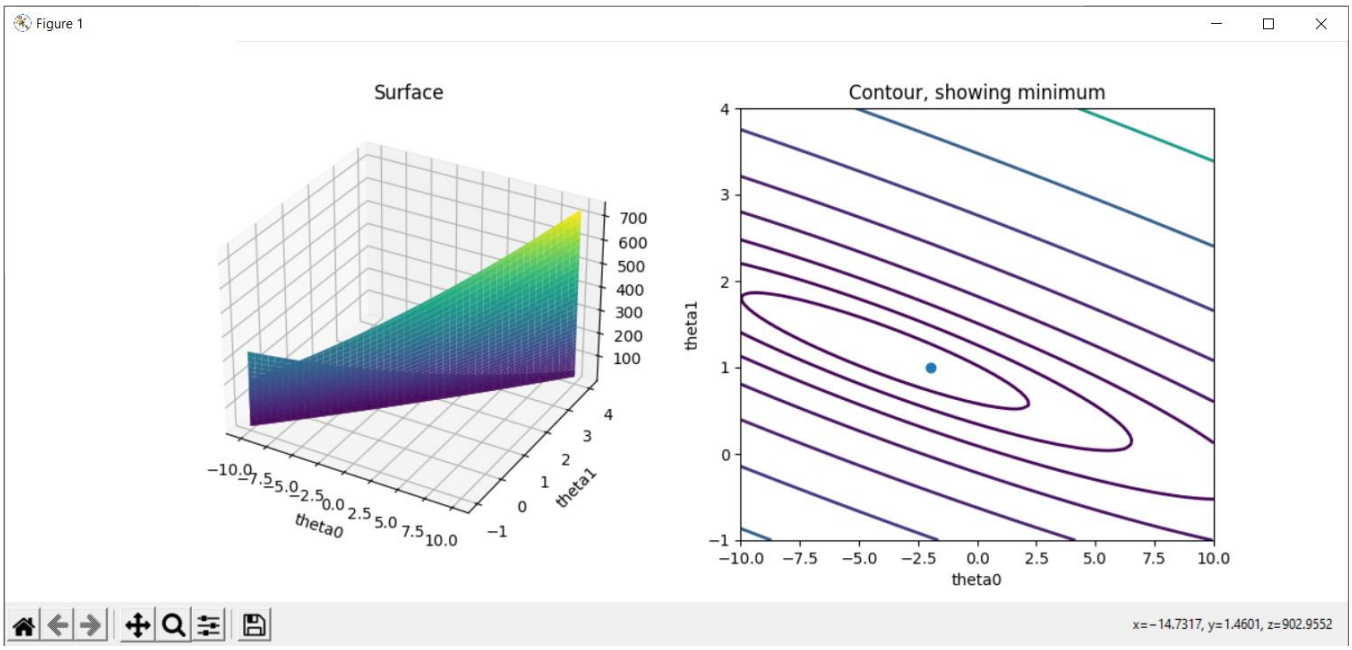




- Learning rate 0.001







- Learning rate 0.0001