Q1. Use linear regression to fit a straight line to the given database. Set your learning rate to 0.5. What are the cost function value and learning parameters values after convergence? Also, mention the convergence criteria you used. **

- Cost Function Change Threshold: The algorithm checks the absolute difference between the current cost and the previous cost. If this difference is less than a specified tolerance value (10^-6 in this case), the algorithm considers that convergence has been achieved.
- Maximum Iterations: The algorithm runs for a maximum of num_iterations (1000 in this case). If convergence is not achieved within these iterations, the loop stops.

Convergence Criteria in the Code:

```
tolerance = 1e-6  # Cost function change threshold
num_iterations = 1000  # Maximum iterations

if i > 0 and abs(previous_cost - cost) < tolerance:
    print(f'Convergence achieved at iteration {i}')
    break
```

Q2. The cost function that we are using in this assignment is different than the one we used in class. Can you think of the advantage of averaging the cost?

- Averaging the cost function normalizes the error, making it independent of the dataset size. It ensures more stable convergence and balanced parameter updates.

Q3. Plot cost function v/s iteration graph for the model in question 1 for first 50 iterations.

- Code in github link

Q4. Plot the given dataset on a graph and also print the straight line you obtained in question 1 to show how it fits the data.

- Code in github link

Q5. Test your regression model with the learning rates lr = 0.005, lr = 0.5, lr = 5, For each learning rate, plot a graph showing how the cost function changes for the first 50 iterations and write your observation.

- Code in github link

Q6. Choose a suitable learning rate, then implement stochastic and min-batch gradient descent, plot the cost function against iteration, and observe how your cost function changes compared to batch gradient descent.

- Code in github link

https://github.com/KrishNatrium/AI_Lab3 (https://github.com/KrishNatrium/AI_Lab3)