Homework 1

Jian Huang

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Task 1: Using the random search algorithm to minimize $(x)^2$

Results of the **weight_history** and **cost_history** when using [-2] as the w0:

```
# Random search finished with K=5 iterations
weight_history [array([-2]), array([-1.]), array([0.]), array([0.]), array([0.]),
    array([0.])]
cost_history [array([4]), array([1.]), array([0.]), array([0.]), array([0.]), array
    ([0.])]
```

Task 2: Using the random search algorithm to minimize $g(w_0, w_1) = 100 * (w_1 - w_0^2)^2 + (w_0 - 1)^2$

Pre-defined Hyperparameters:

- Number of samples each step: 1000
- Maximum iterations: 50
- Learning rate (α): 1
- Initial parameters: $w_0 = -2; w_1 = -2$

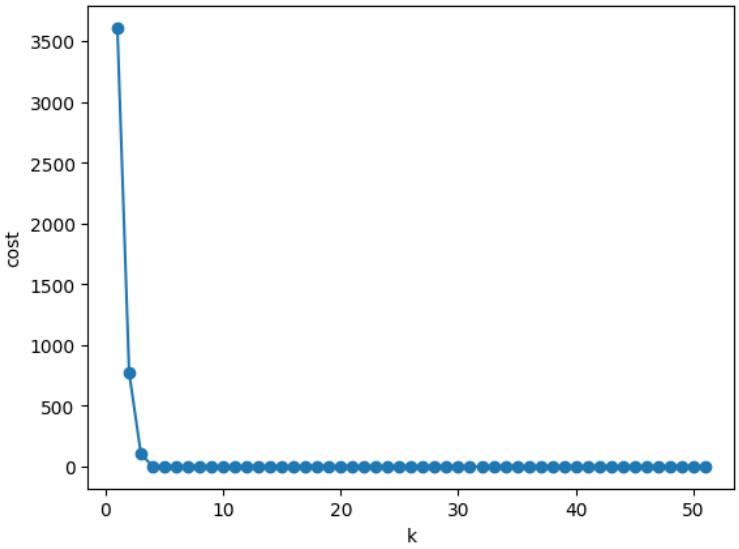

Figure 1: Cost history

Task 3: Compare fixed learning rate and diminishing learning rate

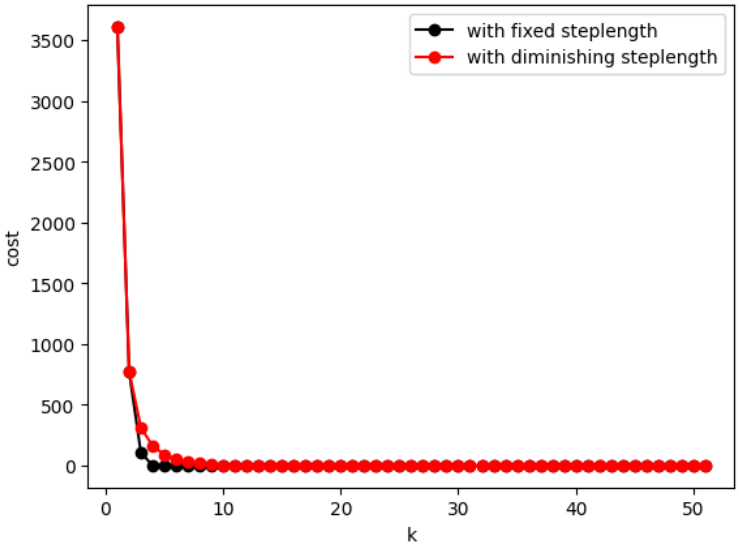

Figure 2: Cost history using the whole 50 iterations

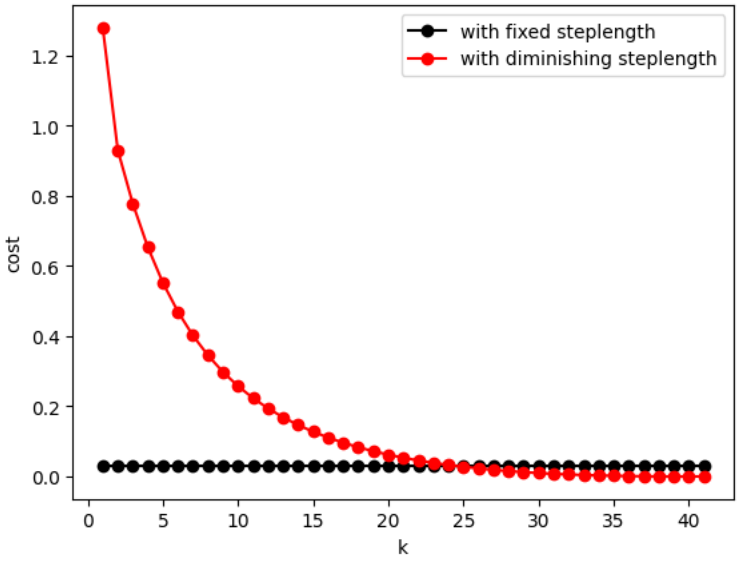

Figure 3: Cost history after the first 10 iterations

Final cost of using a fixed steplength: 0.028663876907508132.
Final cost of using a diminishing steplength: 3.0852400842983204e-05.