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1.

(a)

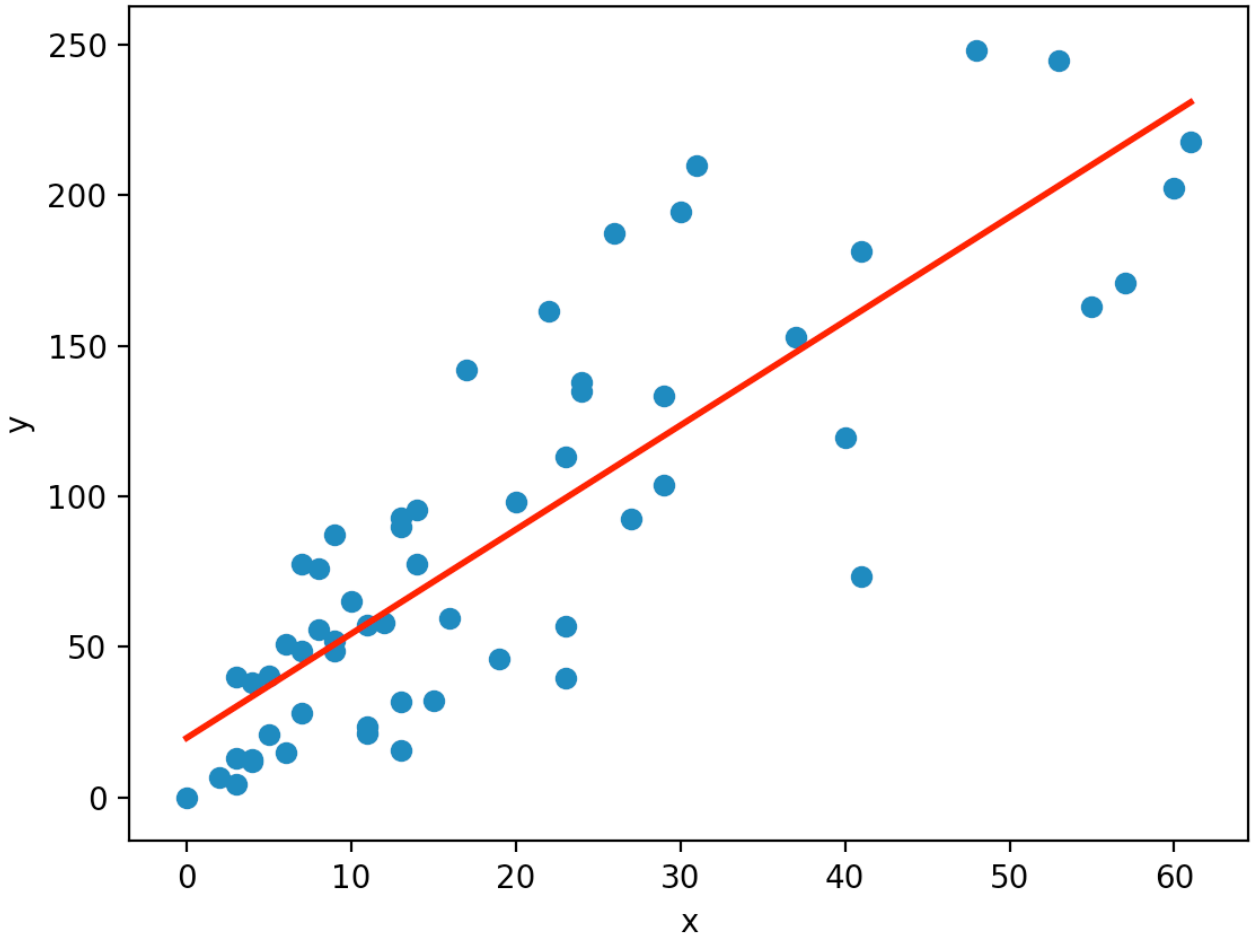
Initialize (w0, w1) as (0, 0), running 10000 iteration and the learning rate is 0.00155

Result: Weight (w0, w1) = (19.7669, 3.4598)

(b)

When x = 45, the predicted value will be 175.5

When x = 25, the predicted value will be 106.3



2.

(a)

Initialize w as [0.0, 0.0, 0.0, 0.0, 0.0], running 20000 iteration and the learning rate is 0.000022

Result: Weight (w0, w1, w2, w3, w4) = (0.2021, 0.634, 0.0334, 0.1497, 0.3157)

(b)

When (x1, x2, x3, x4) = 6.8, 210, 0.402, 0.739, the predicted value will be 11.8

When (x1, x2, x3, x4) = 6.1, 180, 0.415, 0.713, the predicted value will be 10.4

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Initialize w as [ 0.0, 0.0, 0.0, 0.0, 0.0 ],
 running 20000 iteration and the learning rate is 0.000022
[500/20000] W(w0, w1, w2, w3, w4) = (0.0058, 0.0193, 0.0085, 0.004, 0.0086), Err = 135.0989
[1000/20000] W(w0, w1, w2, w3, w4) = (0.0115, 0.0384, 0.0155, 0.0079, 0.0172), Err = 105.6624
[1500/20000] W(w0, w1, w2, w3, w4) = (0.0172, 0.0572, 0.0212, 0.0118, 0.0257), Err = 85.1475
[2000/20000] W(w0, w1, w2, w3, w4) = (0.0229, 0.0759, 0.0259, 0.0157, 0.0342), Err = 70.8466
[2500/20000] W(w0, w1, w2, w3, w4) = (0.0285, 0.0943, 0.0298, 0.0196, 0.0426), Err = 60.8740
[3000/20000] W(w0, w1, w2, w3, w4) = (0.034, 0.1125, 0.0328, 0.0235, 0.051), Err = 53.9163
[3500/20000] W(w0, w1, w2, w3, w4) = (0.0396, 0.1306, 0.0353, 0.0274, 0.0594), Err = 49.0586
[4000/20000] W(w0, w1, w2, w3, w4) = (0.0451, 0.1484, 0.0373, 0.0313, 0.0677), Err = 45.6639
[4500/20000] W(w0, w1, w2, w3, w4) = (0.0505, 0.1661, 0.0388, 0.0351, 0.076), Err = 43.2884
[5000/20000] W(w0, w1, w2, w3, w4) = (0.0559, 0.1836, 0.04, 0.039, 0.0842), Err = 41.6228
[5500/20000] W(w0, w1, w2, w3, w4) = (0.0613, 0.2009, 0.0409, 0.0428, 0.0924), Err = 40.4519
[6000/20000] W(w0, w1, w2, w3, w4) = (0.0666, 0.218, 0.0416, 0.0466, 0.1006), Err = 39.6258
[6500/20000] W(w0, w1, w2, w3, w4) = (0.0719, 0.2349, 0.0421, 0.0504, 0.1087), Err = 39.0399
[7000/20000] W(w0, w1, w2, w3, w4) = (0.0772, 0.2517, 0.0424, 0.0542, 0.1168), Err = 38.6217
[7500/20000] W(w0, w1, w2, w3, w4) = (0.0824, 0.2683, 0.0425, 0.058, 0.1249), Err = 38.3202
[8000/20000] W(w0, w1, w2, w3, w4) = (0.0876, 0.2848, 0.0426, 0.0618, 0.1329), Err = 38.1004
[8500/20000] W(w0, w1, w2, w3, w4) = (0.0927, 0.301, 0.0425, 0.0656, 0.1409), Err = 37.9375
[9000/20000] W(w0, w1, w2, w3, w4) = (0.0978, 0.3172, 0.0424, 0.0693, 0.1488), Err = 37.8144
[9500/20000] W(w0, w1, w2, w3, w4) = (0.1029, 0.3331, 0.0422, 0.0731, 0.1568), Err = 37.7193
[10000/20000] W(w0, w1, w2, w3, w4) = (0.1079, 0.3489, 0.0419, 0.0768, 0.1646), Err = 37.6438
[10500/20000] W(w0, w1, w2, w3, w4) = (0.113, 0.3646, 0.0416, 0.0805, 0.1725), Err = 37.5820
[11000/20000] W(w0, w1, w2, w3, w4) = (0.1179, 0.38, 0.0413, 0.0843, 0.1803), Err = 37.5300
[11500/20000] W(w0, w1, w2, w3, w4) = (0.1229, 0.3954, 0.0409, 0.088, 0.1881), Err = 37.4850
[12000/20000] W(w0, w1, w2, w3, w4) = (0.1278, 0.4106, 0.0405, 0.0917, 0.1958), Err = 37.4450
[12500/20000] W(w0, w1, w2, w3, w4) = (0.1327, 0.4256, 0.0401, 0.0954, 0.2036), Err = 37.4085
[13000/20000] W(w0, w1, w2, w3, w4) = (0.1375, 0.4405, 0.0397, 0.0991, 0.2113), Err = 37.3748
[13500/20000] W(w0, w1, w2, w3, w4) = (0.1423, 0.4552, 0.0393, 0.1027, 0.2189), Err = 37.3430
[14000/20000] W(w0, w1, w2, w3, w4) = (0.1471, 0.4698, 0.0389, 0.1064, 0.2265), Err = 37.3127
[14500/20000] W(w0, w1, w2, w3, w4) = (0.1519, 0.4842, 0.0384, 0.1101, 0.2341), Err = 37.2837
[15000/20000] W(w0, w1, w2, w3, w4) = (0.1566, 0.4985, 0.038, 0.1137, 0.2417), Err = 37.2555
[15500/20000] W(w0, w1, w2, w3, w4) = (0.1613, 0.5127, 0.0375, 0.1173, 0.2492), Err = 37.2282
[16000/20000] W(w0, w1, w2, w3, w4) = (0.1659, 0.5267, 0.0371, 0.121, 0.2567), Err = 37.2016
[16500/20000] W(w0, w1, w2, w3, w4) = (0.1706, 0.5406, 0.0366, 0.1246, 0.2642), Err = 37.1755
[17000/20000] W(w0, w1, w2, w3, w4) = (0.1752, 0.5543, 0.0361, 0.1282, 0.2716), Err = 37.1500
[17500/20000] W(w0, w1, w2, w3, w4) = (0.1797, 0.568, 0.0357, 0.1318, 0.279), Err = 37.1250
[18000/20000] W(w0, w1, w2, w3, w4) = (0.1843, 0.5814, 0.0352, 0.1354, 0.2864), Err = 37.1005
[18500/20000] W(w0, w1, w2, w3, w4) = (0.1888, 0.5948, 0.0348, 0.139, 0.2938), Err = 37.0764
[19000/20000] W(w0, w1, w2, w3, w4) = (0.1932, 0.608, 0.0343, 0.1426, 0.3011), Err = 37.0526
[19500/20000] W(w0, w1, w2, w3, w4) = (0.1977, 0.621, 0.0339, 0.1462, 0.3084), Err = 37.0293
[20000/20000] W(w0, w1, w2, w3, w4) = (0.2021, 0.634, 0.0334, 0.1497, 0.3157), Err = 37.0064
Result: Weight (w0, w1, w2, w3, w4) = (0.2021, 0.634, 0.0334, 0.1497, 0.3157)
When (x1, x2, x3, x4) = 6.8, 210, 0.402, 0.739, the predicted value will be 11.8
When (x1, x2, x3, x4) = 6.1, 180, 0.415, 0.713, the predicted value will be 10.4
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