Homework 2 : linear regression

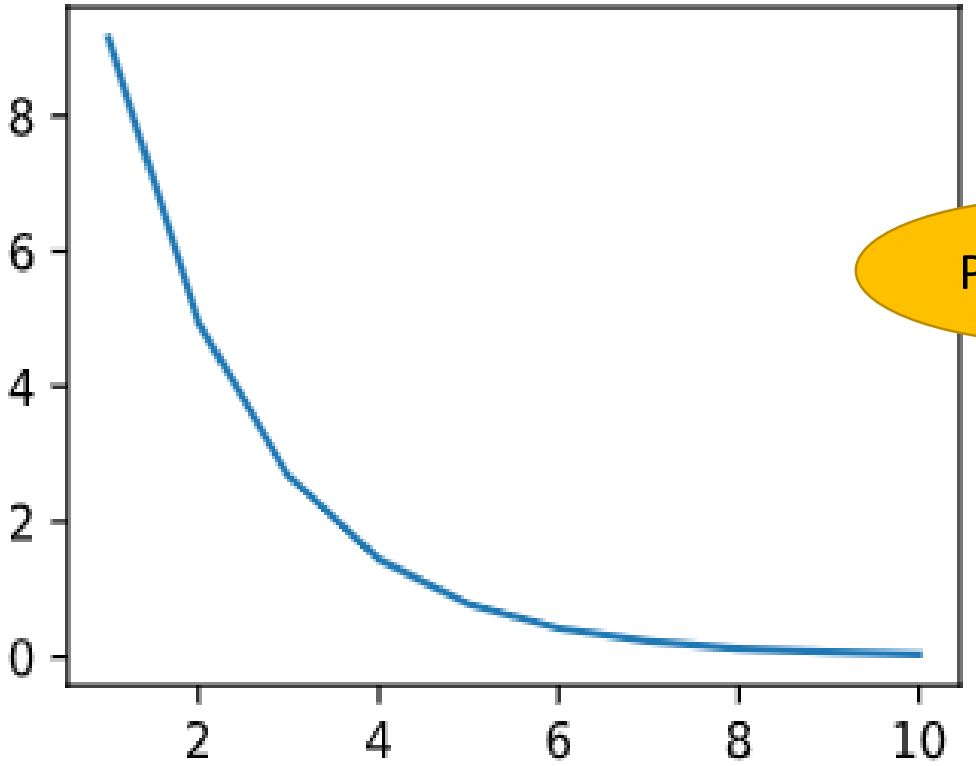
Dead line: 2019/10/1

TODO

- 1. Plot the training loss with four different learning rates.
- 2. Plot the error surface(axis x for w1, axis y for w2, axis z for loss)
- 3. Design five input nodes and one output node linear model and plot the training loss. (train on train_X1 and train_y1)
- 4. Design ten input nodes and five output nodes linear model and plot the training loss.(train on train_X2 and train_y2)
- 5. Design one hundred input nodes and one output node non linear model and record the training loss in different power.(train on train_X3 and train_y3)

1.Plot the training loss with four different learning rates.

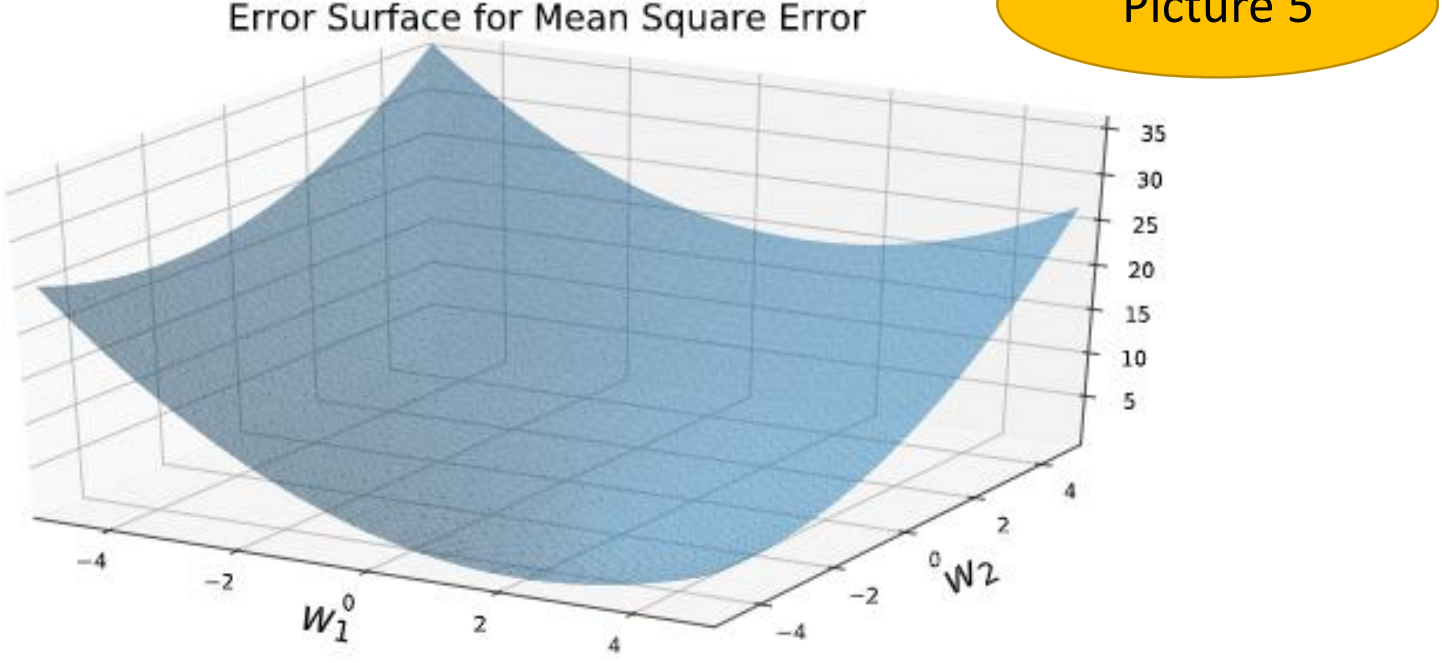
- You need to train the model in lr = 0.3, 0.03, 0.003 and 0.0003.
- Plot the training loss picture like this(10 epochs)



Picture 1-4

2.Plot the error surface(axis x for W1, axis y for W2, axis z for loss)

- You need to finish the get_least_square_loss function
- Plot the error surface picture

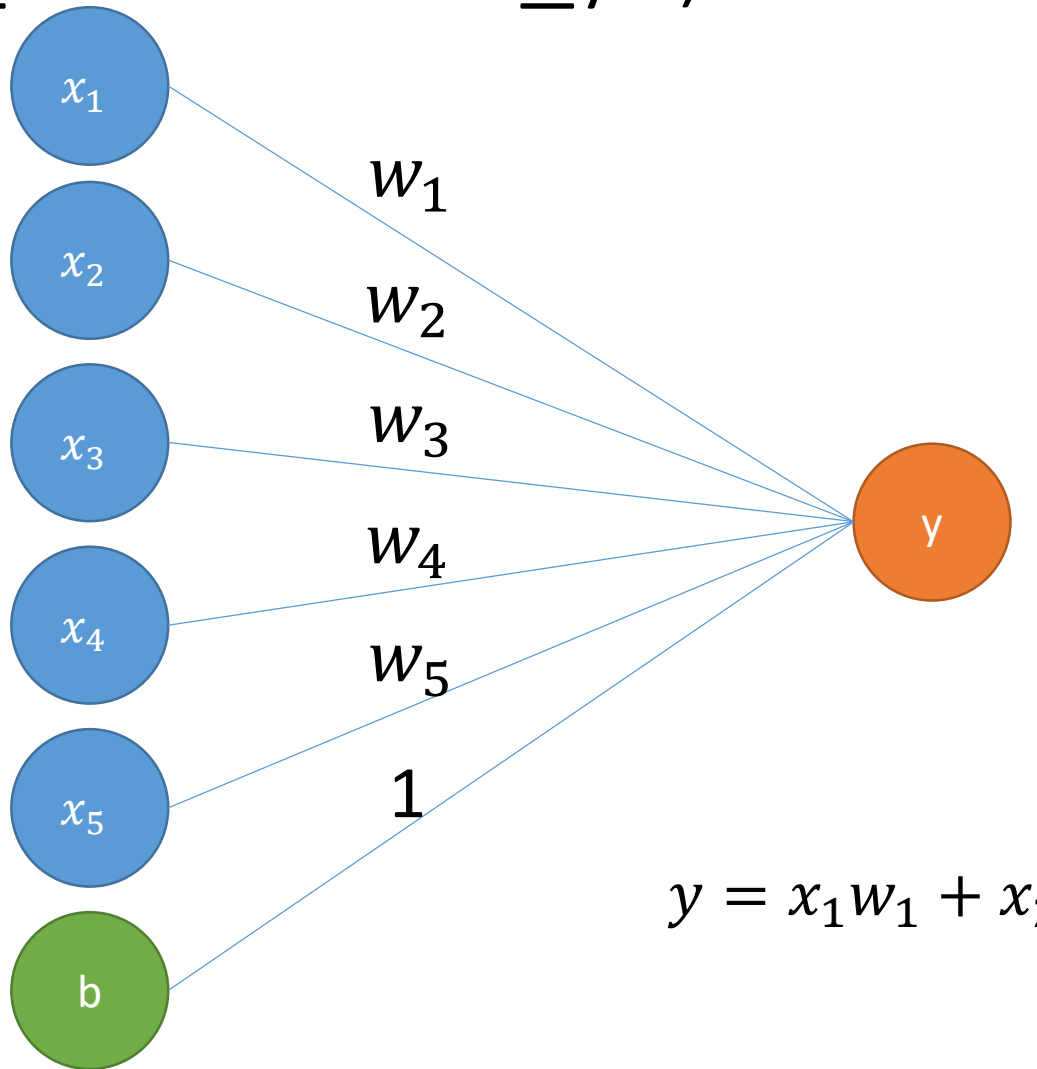


Picture 5

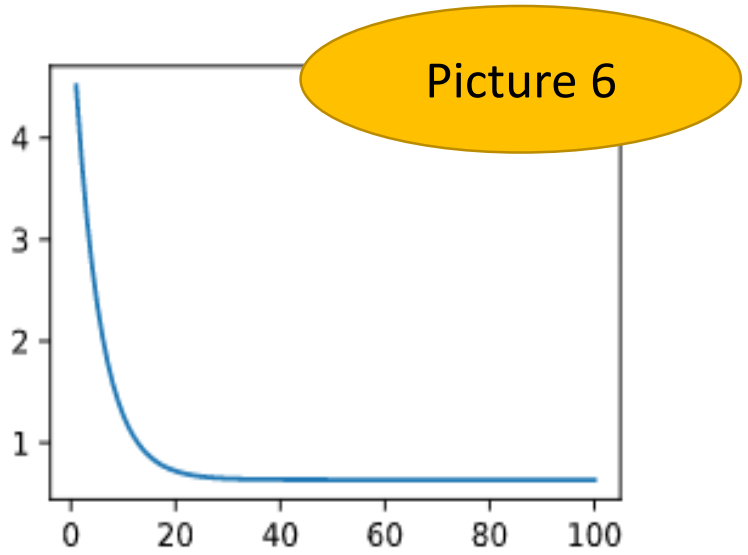
3. Design five input nodes and one output node linear model and plot the training loss.

- Design five input nodes and one output node model
- Use the train_X1.pkl and train_y1.pkl to training your model
- Save the weights and bias in weights1.pkl and bias1.pkl
- Plot the training loss picture
- I will use the test_X1.pkl and test_y1.pkl to valid your trained model (You can’t get the test_X1.pkl and test_y1.pkl)

3. Design five input nodes and one output node linear model and plot the training loss. (train on train_X1 and train_y1)



Picture 6



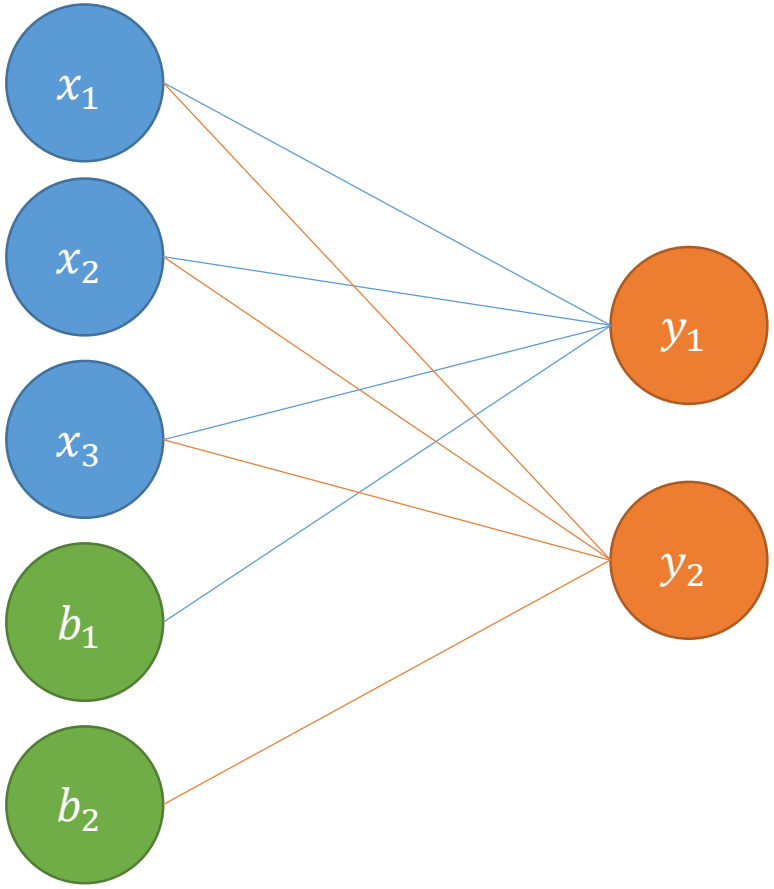
$$y = x_1w_1 + x_2w_2 + x_3w_3 + x_4w_4 + x_5w_5 + b$$

4. Design ten input nodes and five output nodes linear model and plot the training loss.(train on train_X2 and train_y2)

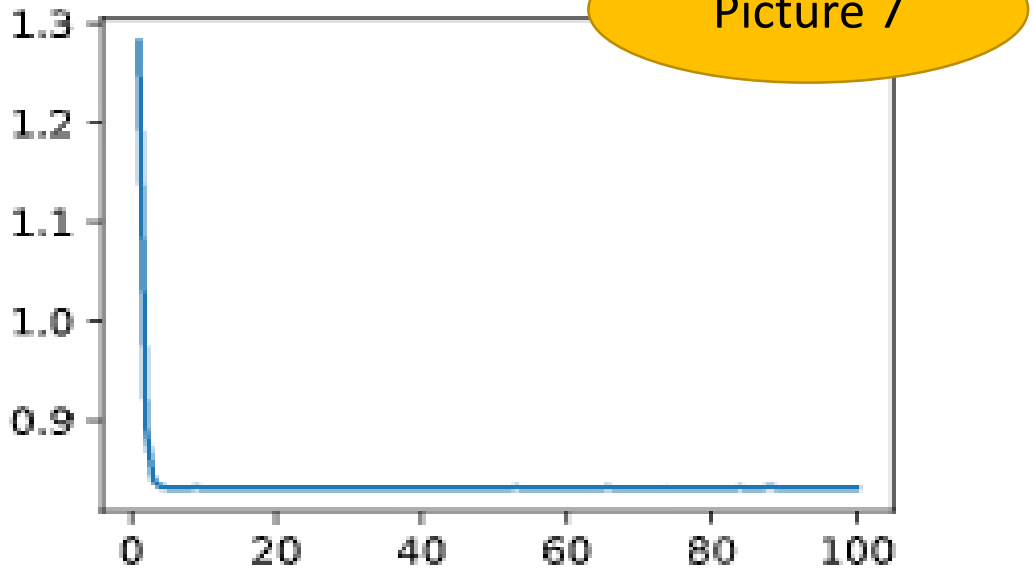
- Design ten input nodes and five output nodes linear model
- Use the train_X2.pkl and train_y2.pkl to training your model
- Save the weights and bias in weights2.pkl and bias2.pkl
- Plot the training loss picture
- I will use the test_X2.pkl and test_y2.pkl to valid your trained model (You can’t get the test_X2.pkl and test_y2.pkl)

4. Design ten input nodes and five output nodes linear model and plot the training loss.(train on train_X2 and train_y2)

If Input node = 3, output node = 2



Picture 7



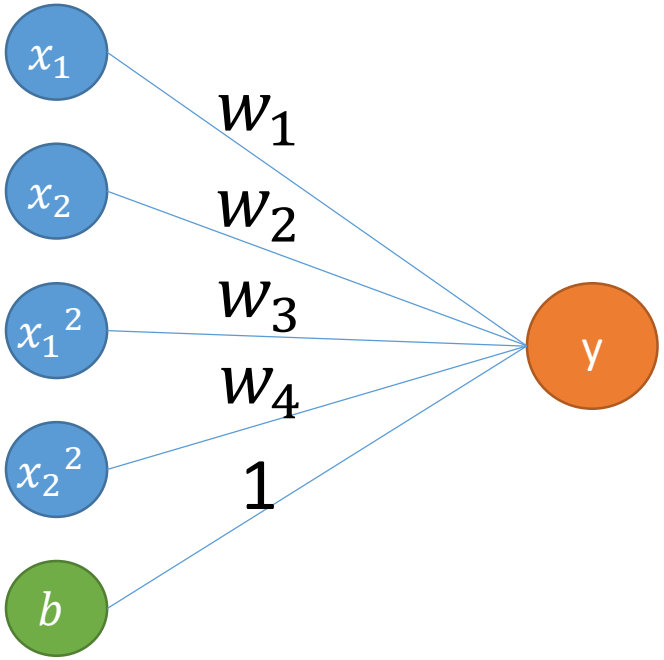
5. Design one hundred input nodes and one output node non linear model and record the training loss in different power.(train on train_X3 and train_y3)

- Design one hundred input nodes and one output node nonlinear model
- Non linear model example : $y = x_1 w_1 + x_2 w_2 + {x_1}^2 w_3 + {x_2}^2 w_4 + b$
- Use the train_X3.pkl and train_y3.pkl to train your model
- Record the training loss in different power (power=1, 10, 100, 1000)

Power	1	10	100	1000
Training loss	0.98	0.87	0.72	0.54

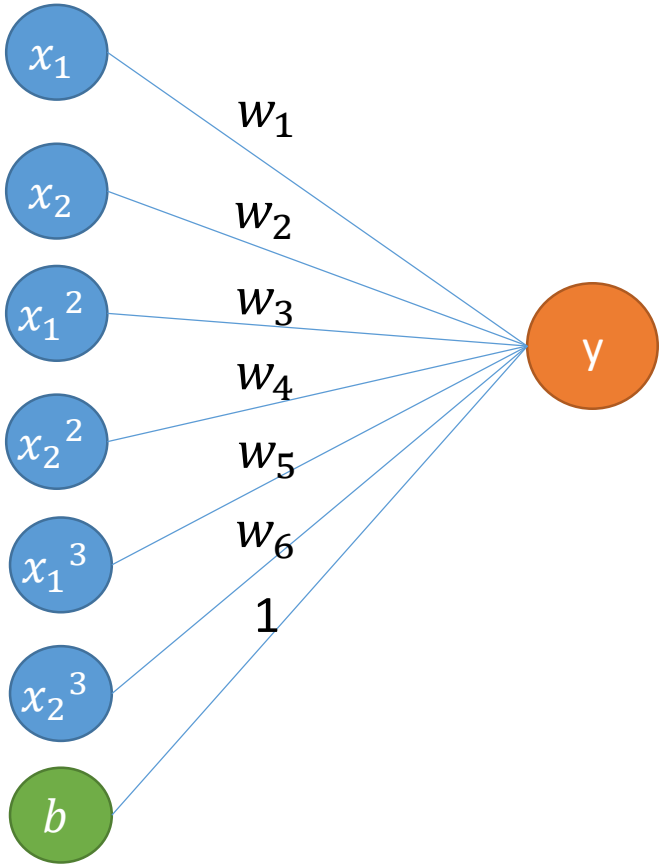
5. Design one hundred input nodes and one output node non linear model and record the training loss in different power.(train on train_X3 and train_y3)

- If Input node = 2, power = 2



$y = x_1w_1 + x_2w_2 + x_1^2w_3 + x_2^2w_4 + b$

- If Input node = 2, power = 3



$y = x_1w_1 + x_2w_2 + x_1^2w_3 + x_2^2w_4 + x_1^3w_5 + x_2^3w_6 + b$