Tutorial

1. Calculate the output y of a three-input neuron with bias. The input feature vector is (x_1, x_2, x_3) = (0.8, 0.6, 0.4), and the weight values are [w_1, w_2, w_3, b] = [0.1, 0.3, -0.2, 0.35]. Use binary Sigmoid function as activation function?

   $z = (w_1x_1) + (w_2x_2) + (w_3x_3) + b$

   $z = 0.16 + 0.06 - 0.12 + 0.35 = 0.45$

   $$f(z) = \frac{1}{1 + e^{-z}}$$

   $$f(z) = \frac{1}{1 + e^{-0.45}}$$

   $$f(z) = 0.6106$$

2. Overfitting occurs when a model learns too much detail (including noise and random fluctuations) from the training data. It performs very well on training data but poorly on new or unseen data.
   Very low training error, high testing error, poor generalization ability (model is too complex), too little training data, and training for too many epochs.

   Underfitting occurs when a model is too simple to capture the underlying data patterns. It performs poorly on both the training and test data.
   High training error, high testing error, poor generalization ability (model is too simple), and insufficient training

3. Initialize weights of perceptron randomly
   For a sample input, compute an output
   If the prediction does not match the output, change the weights
   Go to the next batch of dataset

4. The network does not converge because the error rate becomes erratic and explodes.