NeuralNet 101

3. Logistic Regression

We have a problem..

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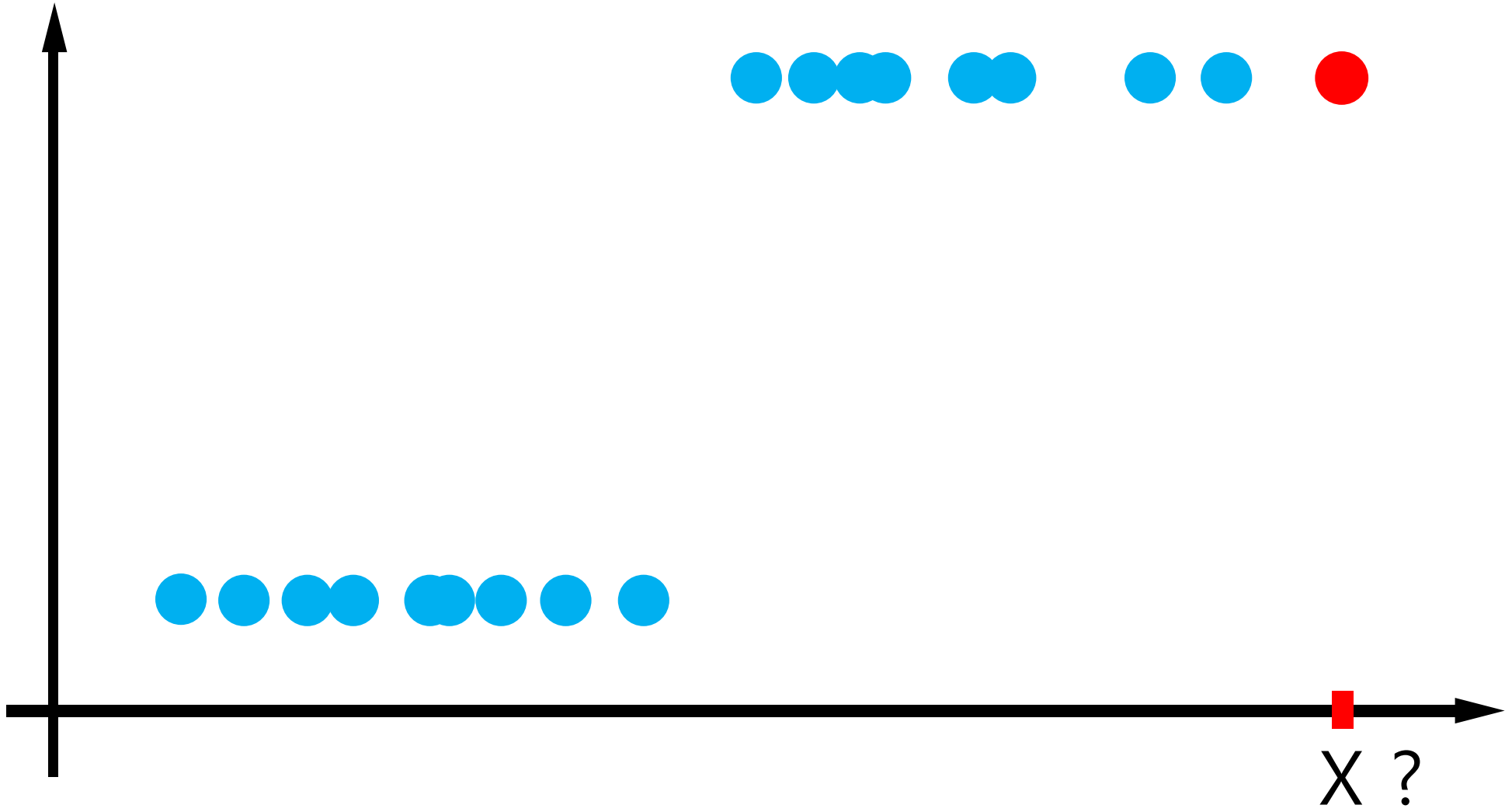

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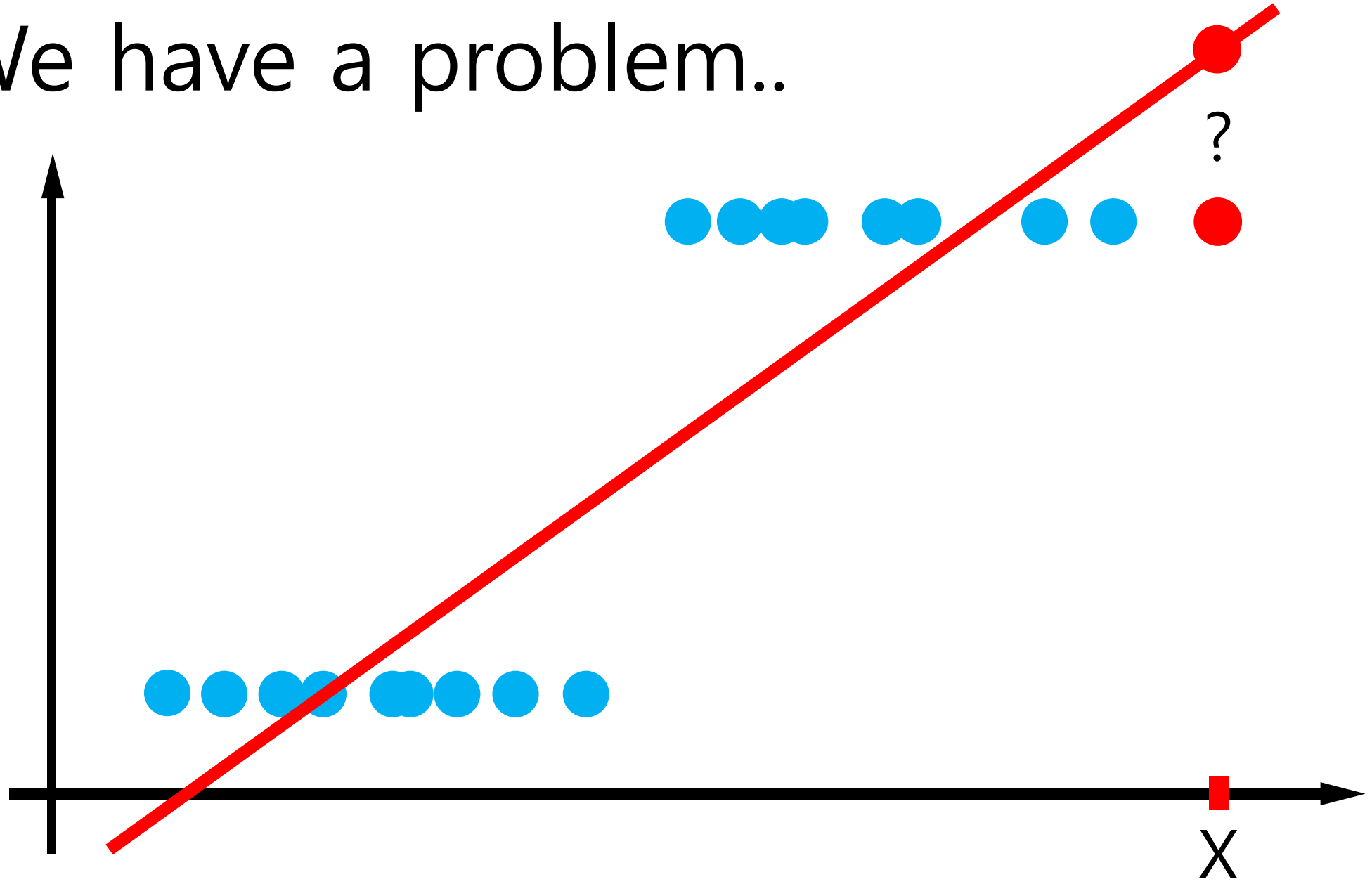

What is Logistic Regression?

Estimating the relationship in multi variable data with Logistic function

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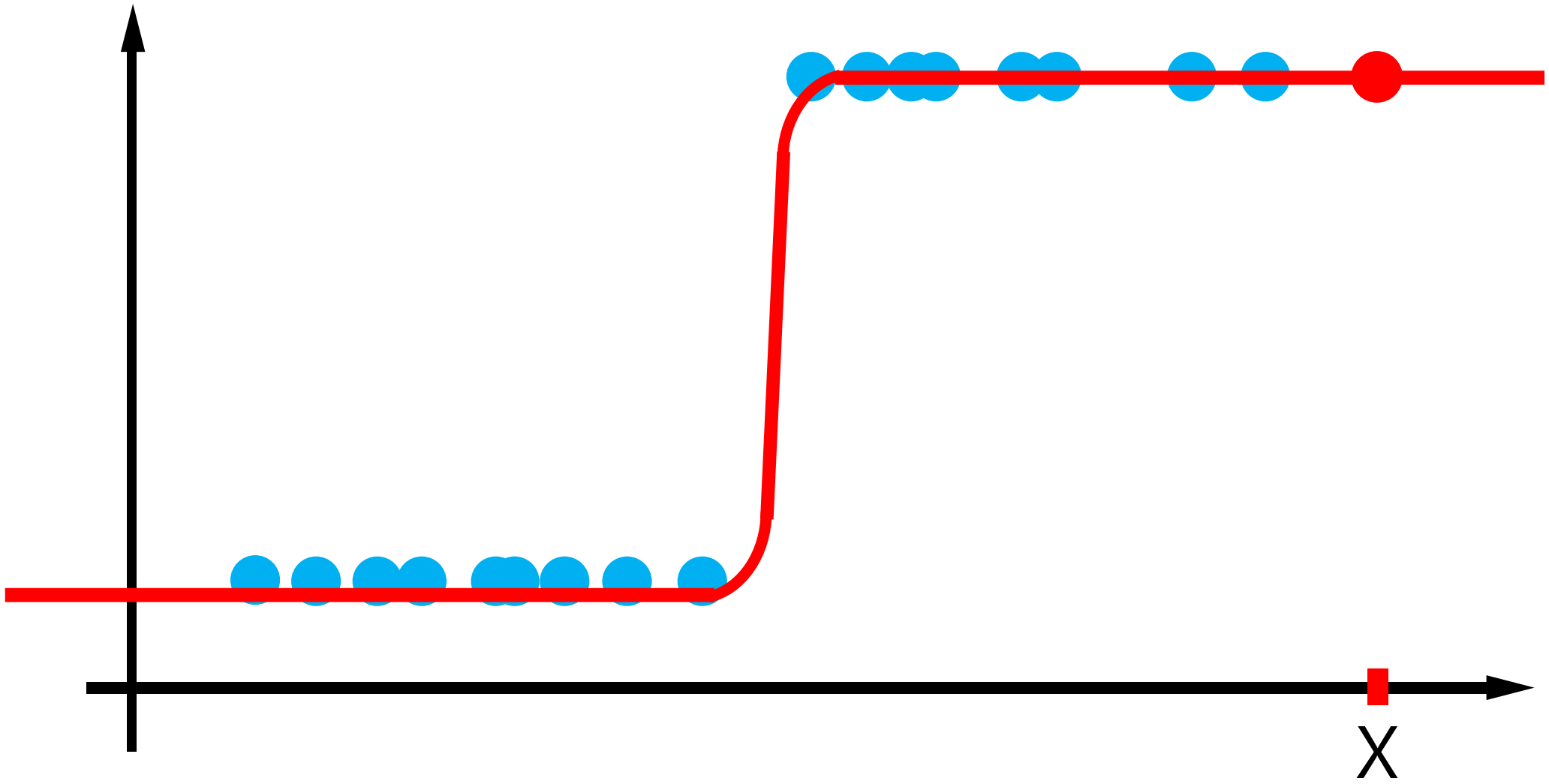
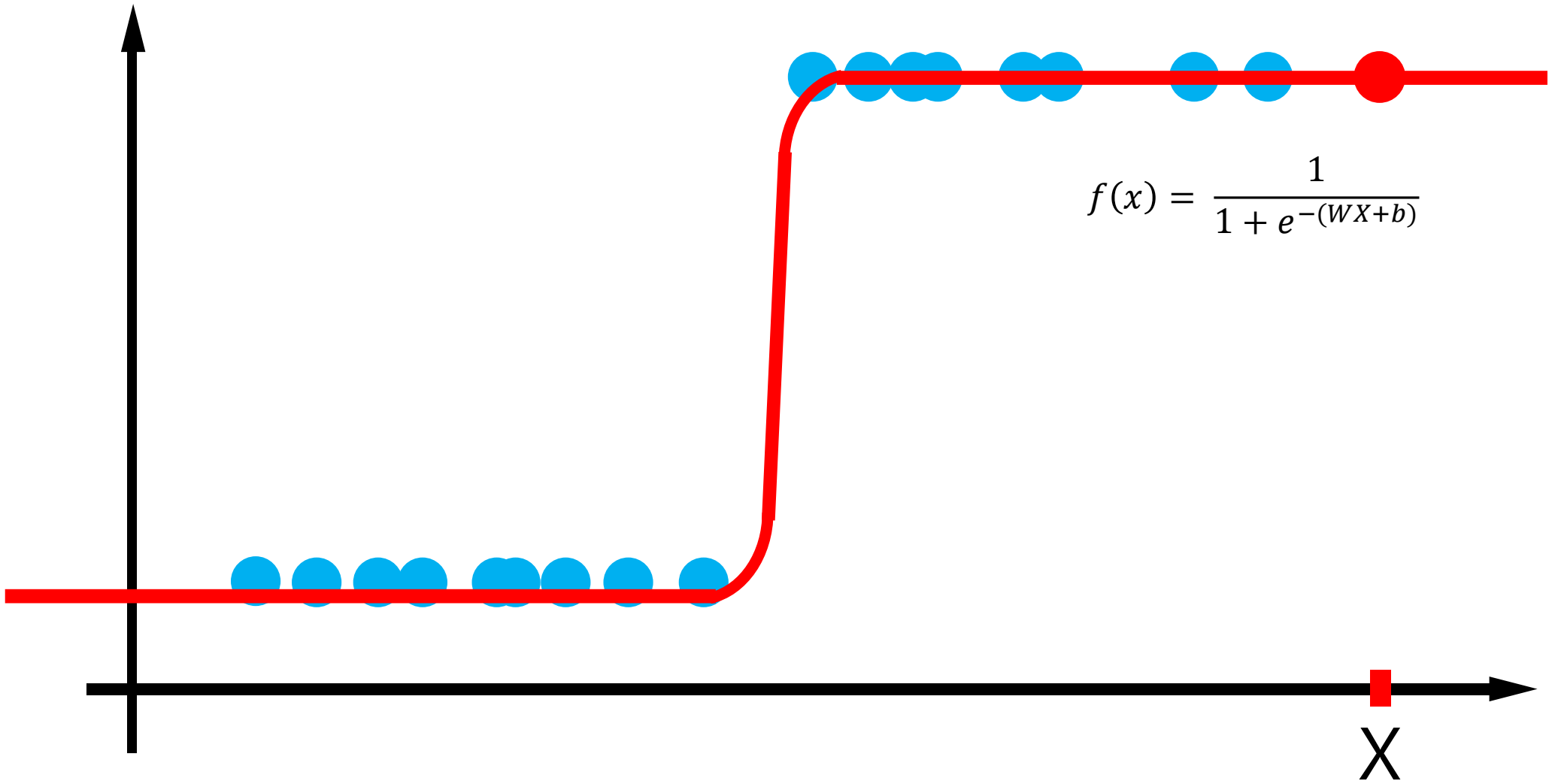
Estimating the relationship in multi variable data with Logistic function

But it used to predict discontinuous data (0,1)

Logistic Regression



Logistic Regression



When do we use Logistic Regression?

https://youtu.be/UlyH4d0H-JE

Logistic Function
- Bernoulli Distribution

$$\log \frac{p}{1-p} = WX + b$$

Logistic Function

$$p = f(x) = \frac{1}{1 + e^{-(WX+b)}}$$

Error Function - MSE?

$$L(w,b) = \frac{1}{2m}\sum_{i=0}^{m}(f(x_i) - y_i)^2$$

Error Function – Binary Cross Entropy

$$l(b, W) = \prod_{i=1}^{n} p(x_i)^{y_i}(1 - p(x_i))^{1-y_i}$$

Error Function – Binary Cross Entropy

$$L(b, W) = \log(l(b, W)) = \log(\prod_{i=1}^{n} p(x_i)^{y_i}(1 - p(x_i))^{1-y_i})$$

Error Function – Binary Cross Entropy

$$L(b, W) = \sum_{i=1}^{n} y_i \log(p(x_i)) + (1 - y_i) \log(1 - p(x_i))$$

$$p = \frac{1}{1 + e^{-(WX+b)}}$$

Error Function – Binary Cross Entropy

$$L(b, W) = \sum_{i=1}^{n} -\log\left(1 + e^{X_i \cdot W_i + b_i}\right) + \sum_{i=1}^{n} y_i (X_i \cdot W_i + b_i)$$

Gradient Descent (Last Lecture)

$$x_{n+1} = x_n - \alpha f'(x_n)$$

Differential

$$\frac{\partial}{\partial W} L(b, W) = -\sum_{i=1}^{n} \frac{1}{1 + e^{X_i \cdot W_i + b_i}} e^{X_i \cdot W_i + b_i} X_i + \sum_{i=1}^{n} y_i X_i$$

Differential

$$\frac{\partial}{\partial W} L(b, W) = \sum_{i=1}^{n} (y_i - \frac{1}{1 + e^{-(X_i \cdot W_i + b_i)}}) X_i$$

Gradient Descent (Last Lecture)

$$w_{n+1} = w_n - \alpha \sum_{i=1}^{n} (y_i - \frac{1}{1 + e^{-(X_i \cdot W_i + b_i)}}) X_i$$

Logistic regression

https://youtu.be/SE625OGwzoI

Lab Session

vlab-kaist/NN101_23S/lab/week3