

Deep Learning

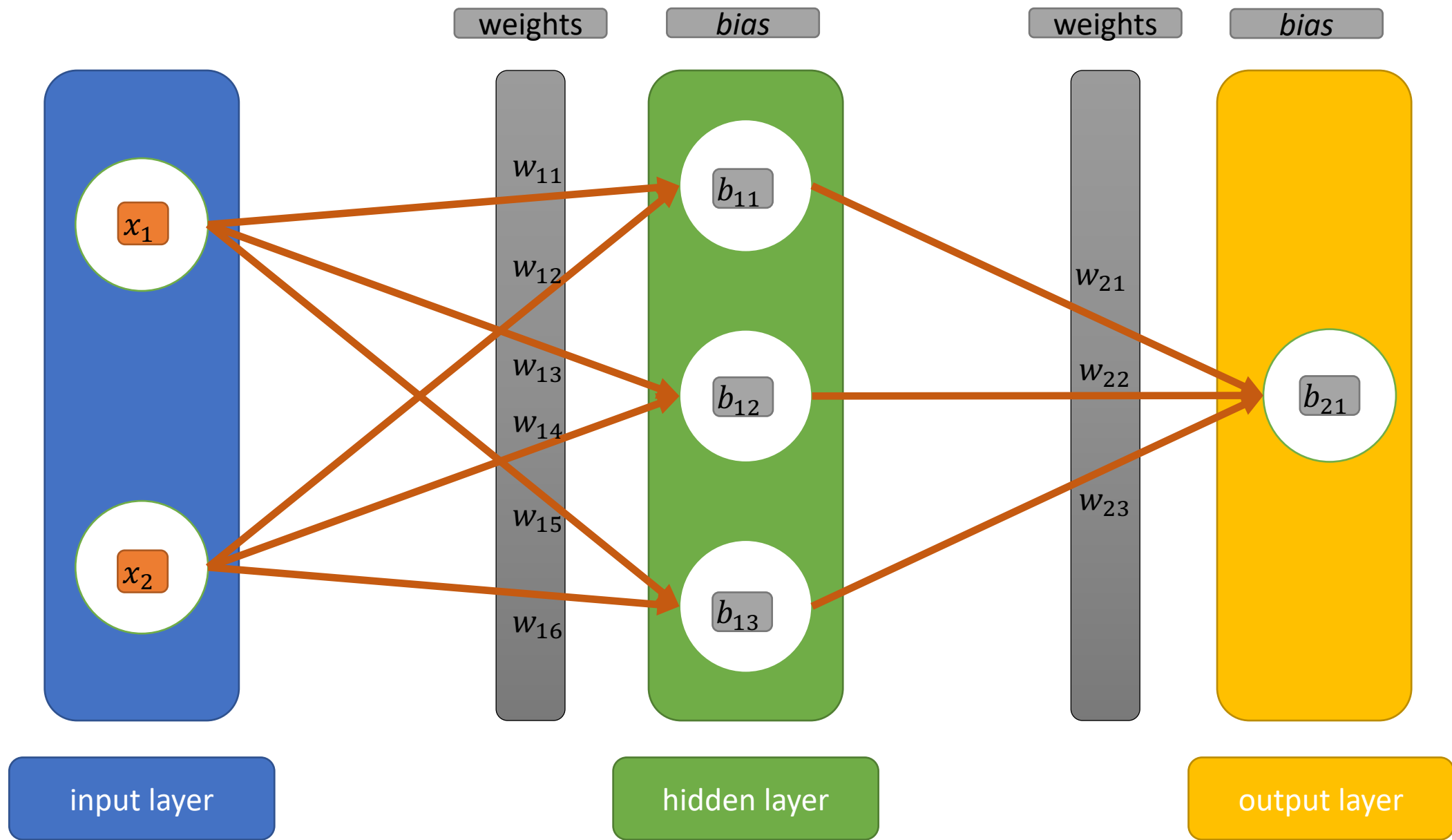


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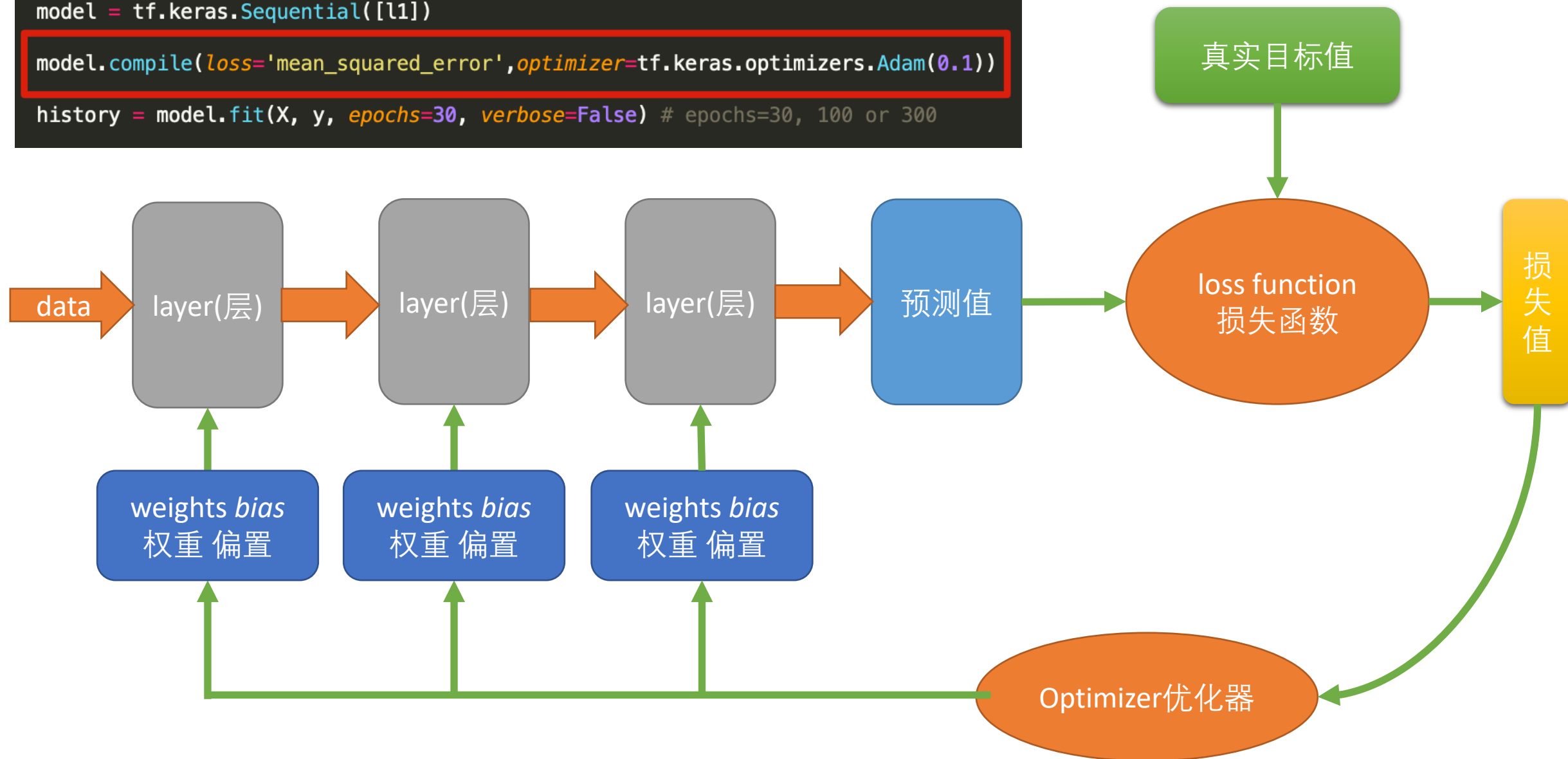
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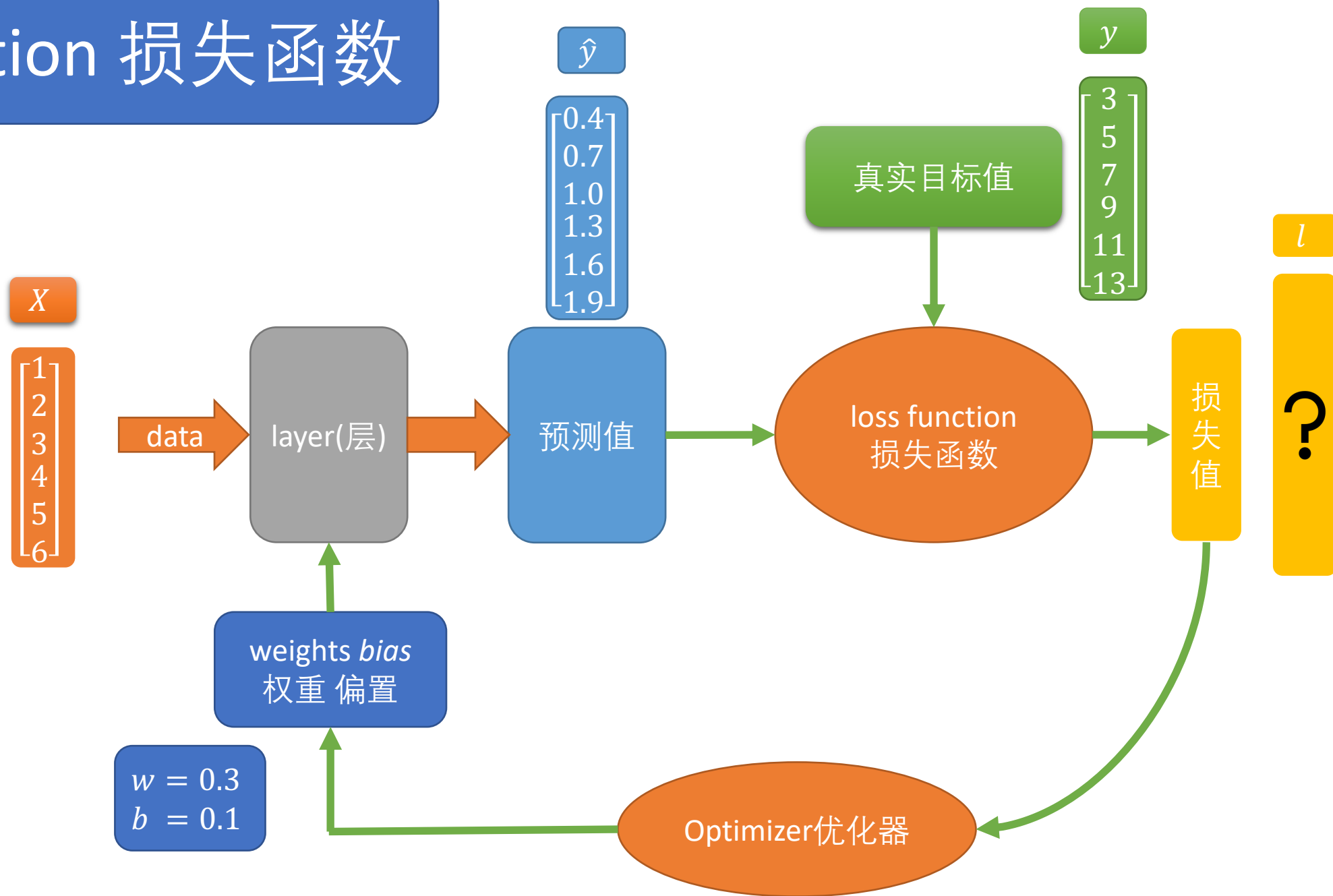


目的: 计算出每一层的权重 w 以及 偏置 b

```
l1 = tf.keras.layers.Dense(units=1, input_shape=[1])  
model = tf.keras.Sequential([l1])  
model.compile(loss='mean_squared_error', optimizer=tf.keras.optimizers.Adam(0.1))  
history = model.fit(X, y, epochs=30, verbose=False) # epochs=30, 100 or 300
```



loss function 损失函数



loss function 损失函数

mean squared error 均方误差

$$\begin{array}{c} X \\ \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{bmatrix} \end{array} \cdot \begin{array}{c} w \\ [0.3] \end{array} + \begin{array}{c} b \\ [0.1] \end{array} = \begin{array}{c} \hat{y} \\ \begin{bmatrix} 0.4 \\ 0.7 \\ 1.0 \\ 1.3 \\ 1.6 \\ 1.9 \end{bmatrix} \end{array} \quad \begin{array}{c} y \\ \begin{bmatrix} 3 \\ 5 \\ 7 \\ 9 \\ 11 \\ 13 \end{bmatrix} \end{array}$$

$$mse = \frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2$$

越小越好

$$\begin{aligned} mse &= \frac{1}{6} \sum_{i=1}^6 ((3 - 0.4)^2 + (5 - 0.7)^2 + (7 - 1.0)^2 + (9 - 1.3)^2 + (11 - 1.6)^2 + (13 - 1.9)^2) \\ &= 55.35 \end{aligned}$$

Optimizer优化器

$w = 0.3$
 $b = 0.1$

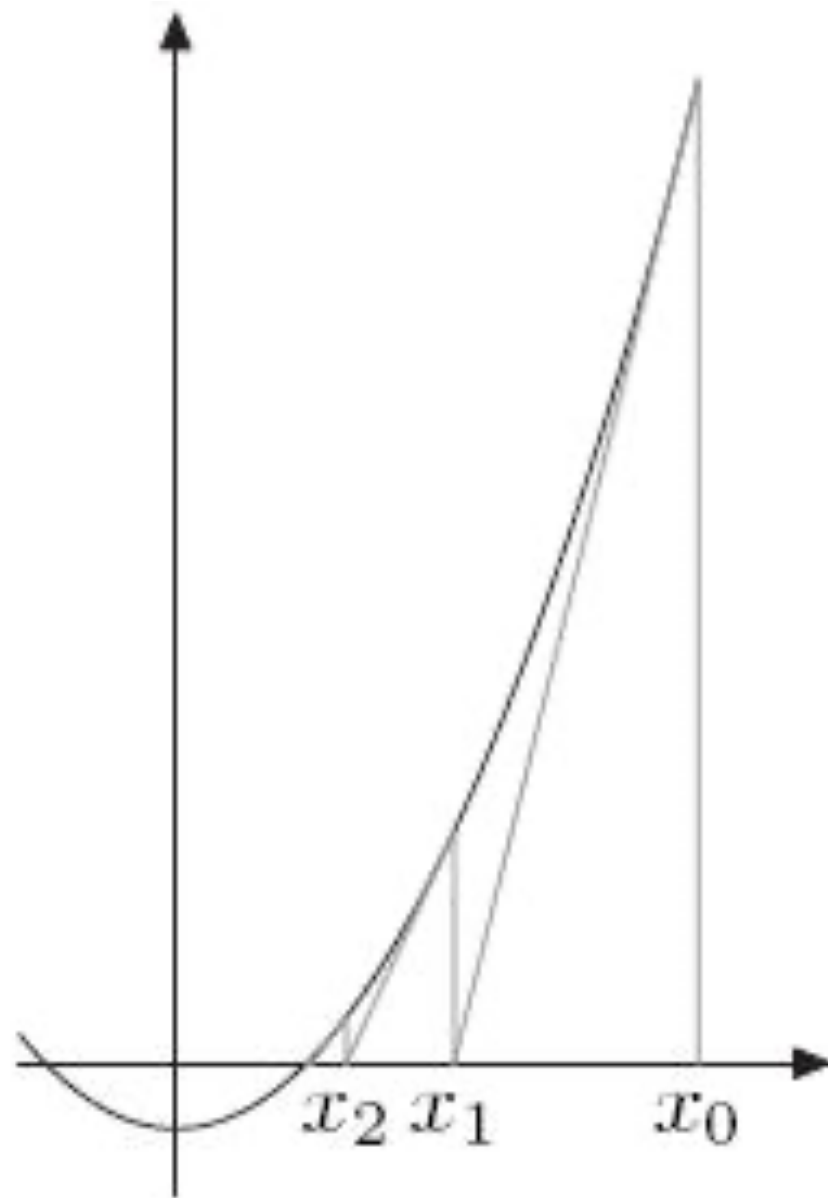
$$w' = w + \eta$$

$$b' = b + \gamma$$

w 增加还是减少, 增加或减少多少?
 b 增加还是减少, 增加或减少多少?

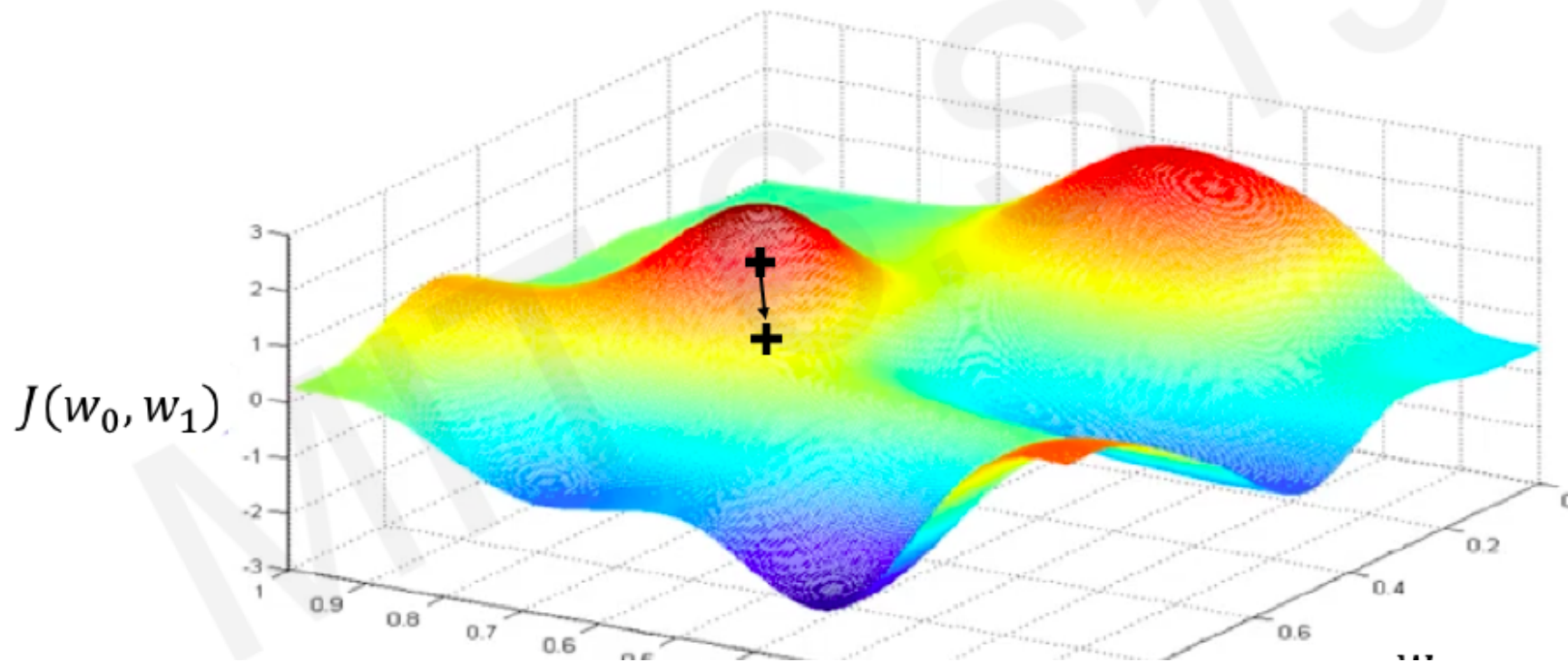
增加还是减少, 学习方向问题
增加或减少多少, 学习速率问题

Optimizer 优化器

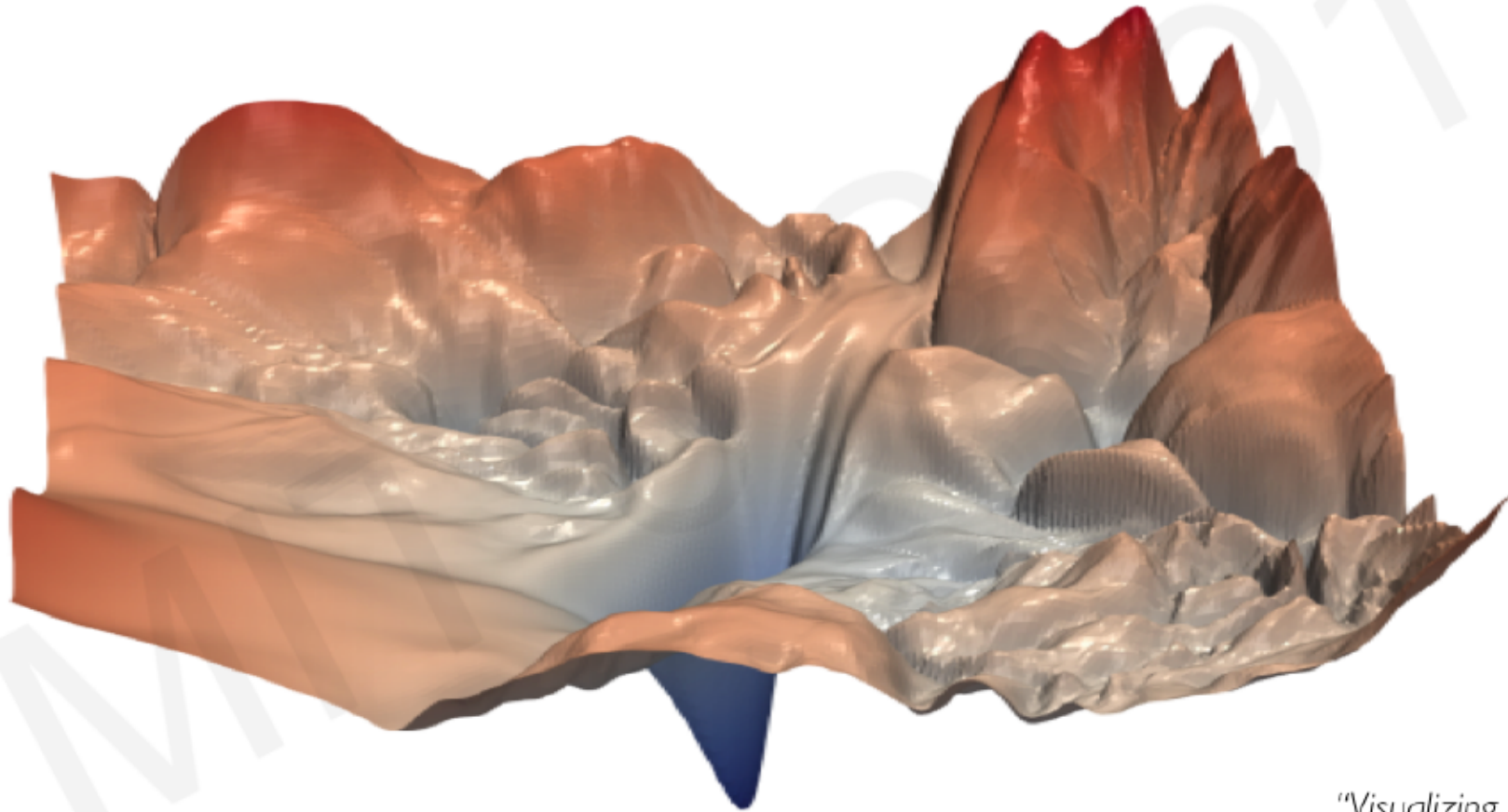


Loss Optimization

Take small step in opposite direction of gradient



Training Neural Networks is Difficult



"Visualizing the loss landscape of neural nets". Dec 2017.

loss function 损失函数

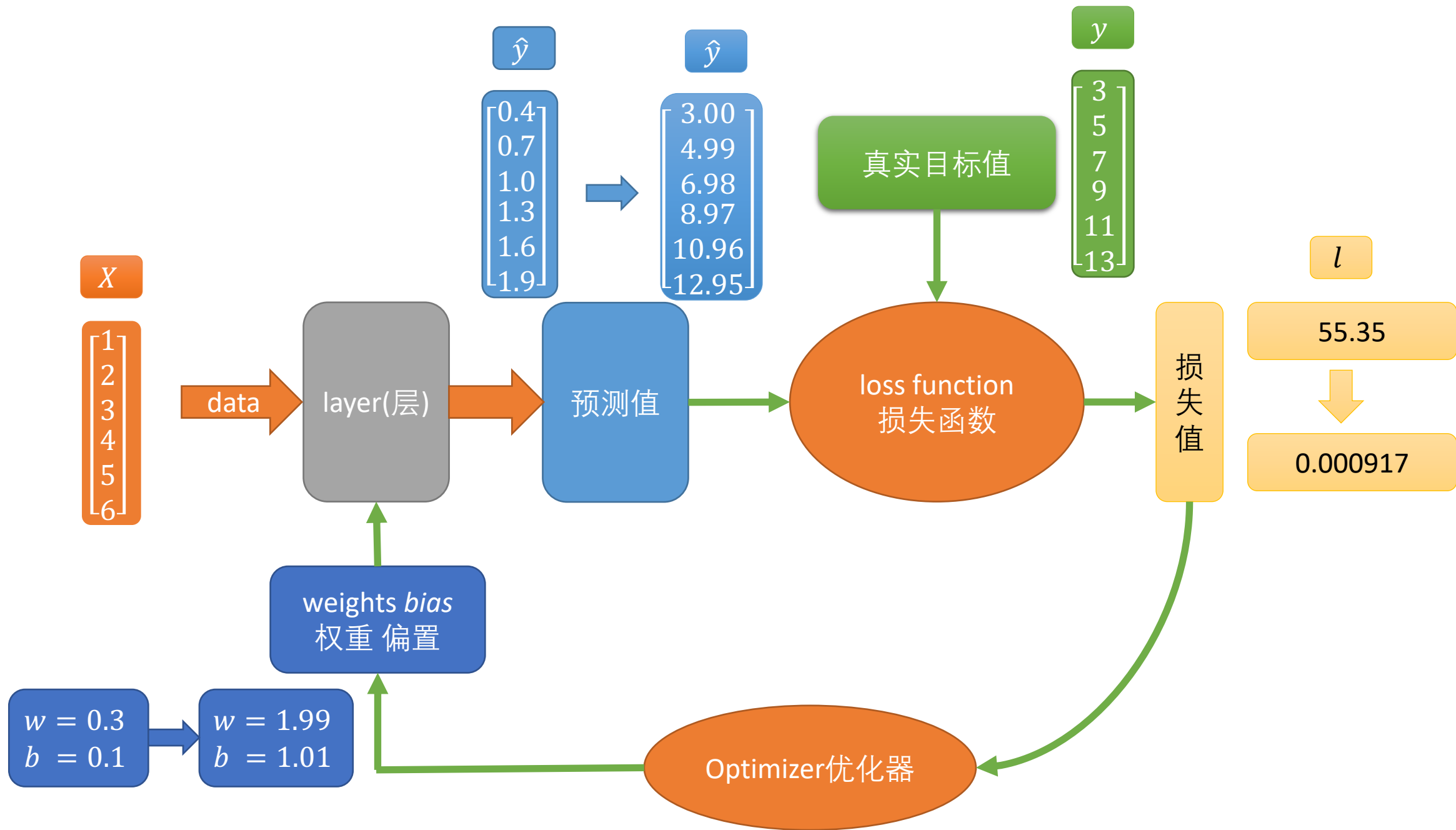


衡量预测值与真实目标值差距

Optimizer 优化器



改变神经网络的权重，使预测值与真实目标值差距不断缩小



END



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