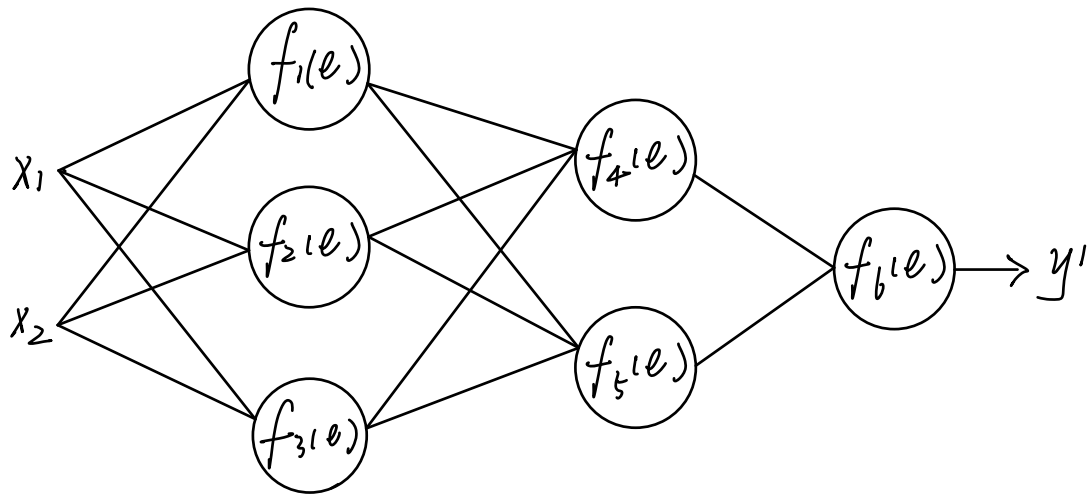


反向传播算法 (backpropagation)

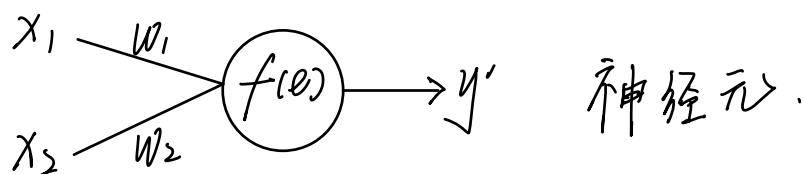
也叫BP算法, 是一种与最优化方法结合使用的, 用来训练人工神经网络的方法.

BP算法计算损失函数对网络中所有权重的梯度, 梯度值会反馈给最优化方法, 用以更新权重以最小化损失函数.

根据上述方法可知, BP算法会计算权重的梯度值, 最优化方法依据这些梯度值来更新权重.

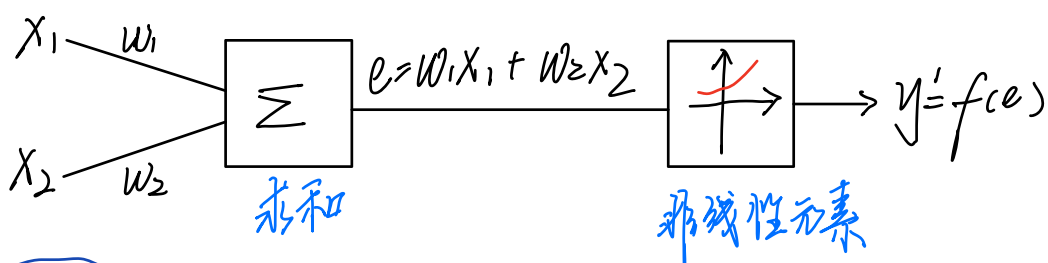


三层神经网络.



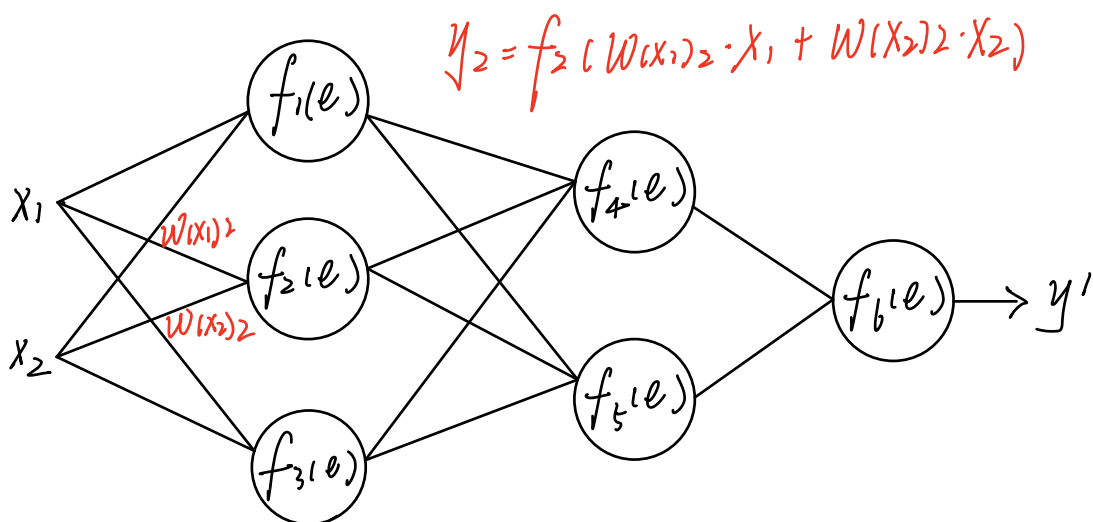
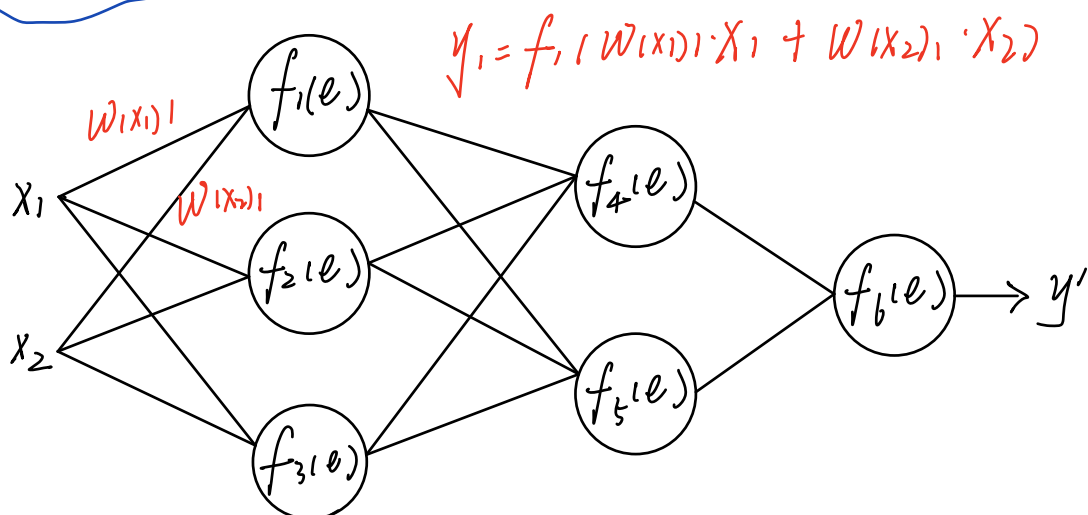
神经元.

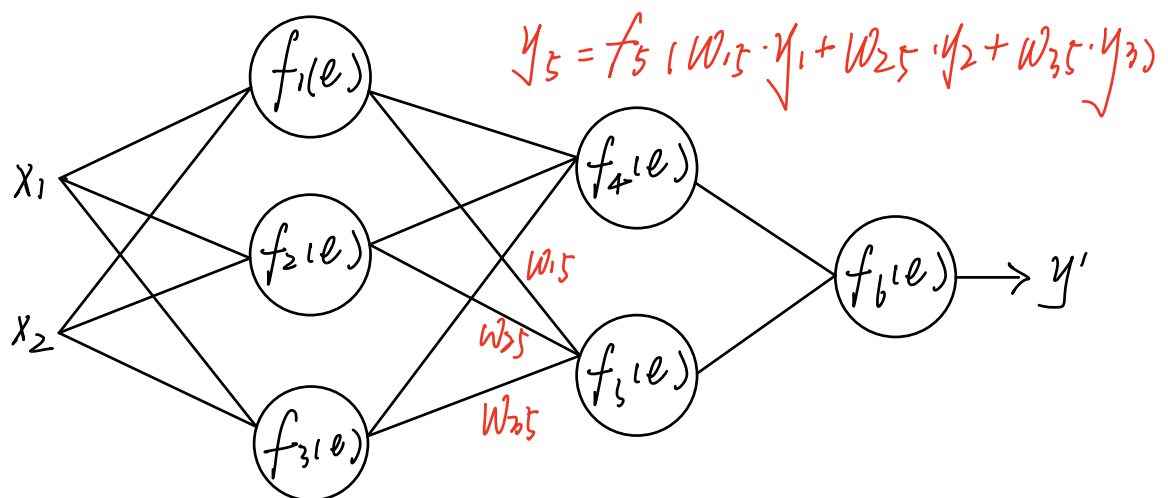
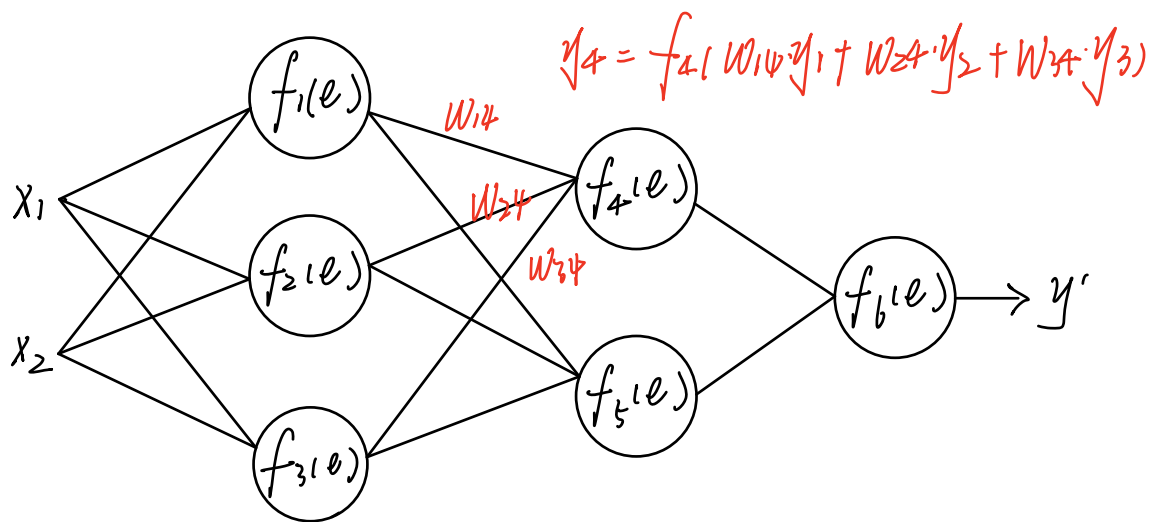
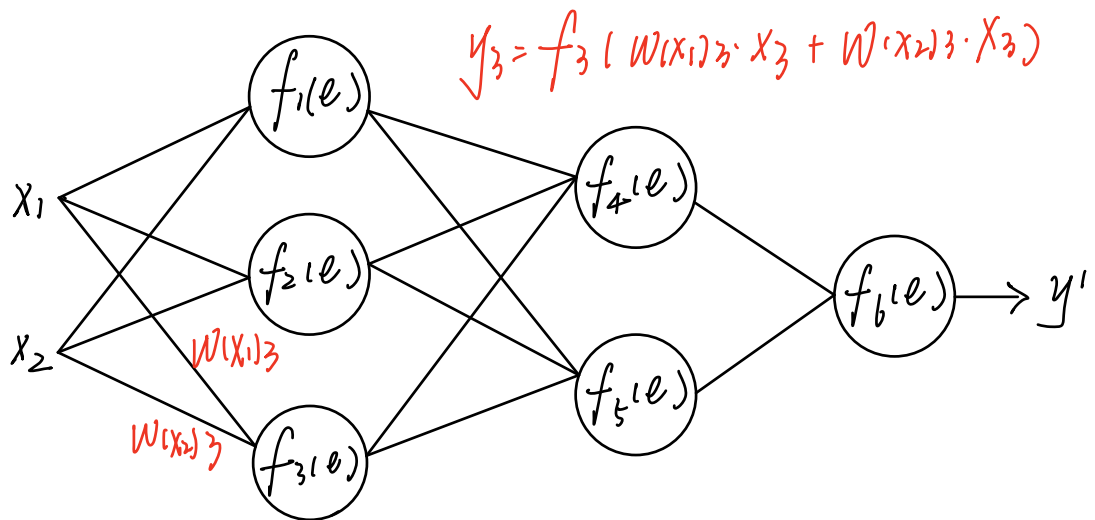
等价于

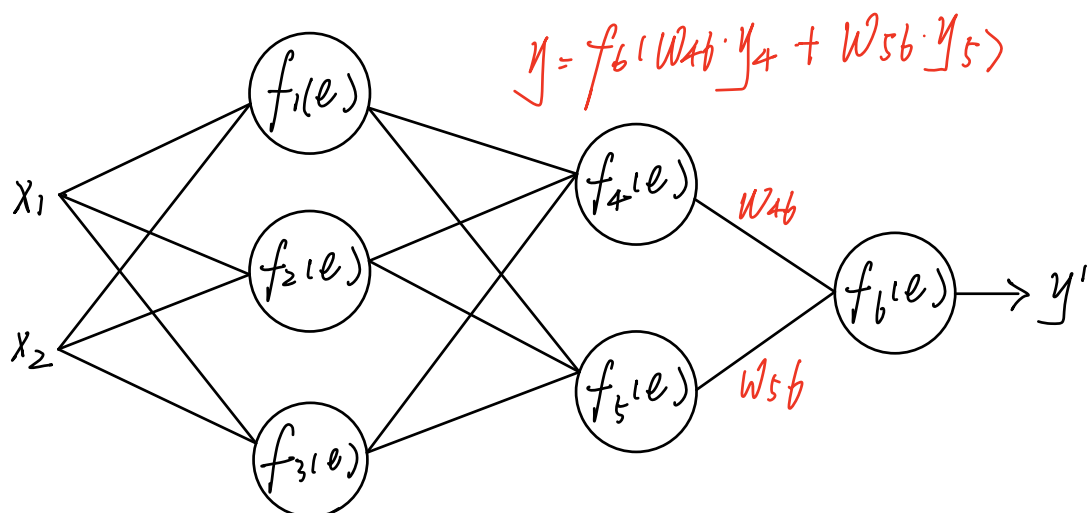


正向传播

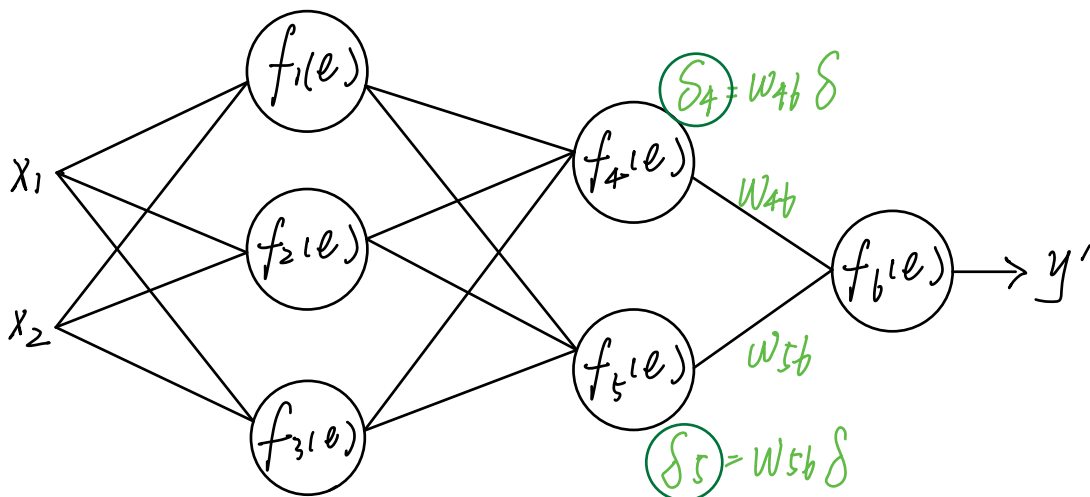
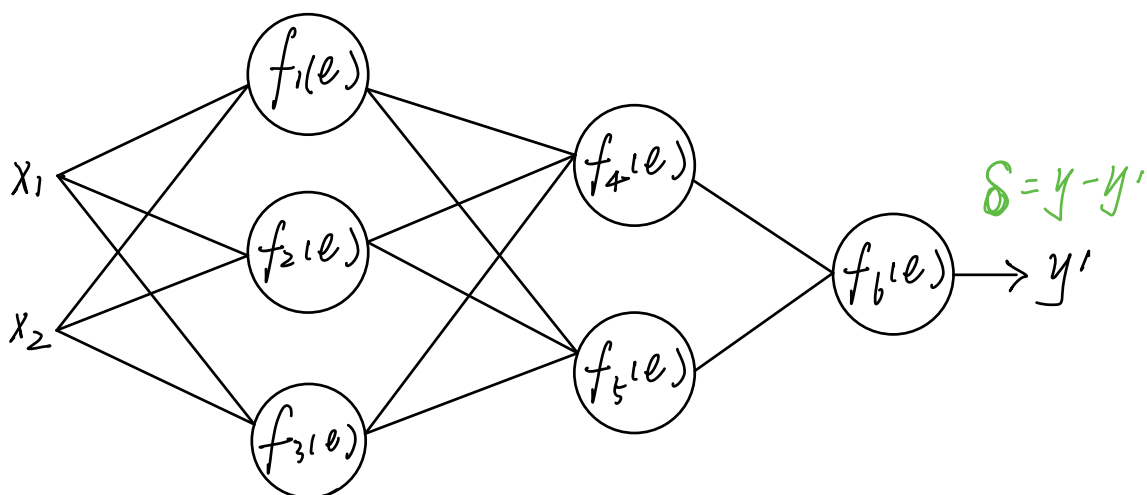
根据输入数据计算神经元激活值

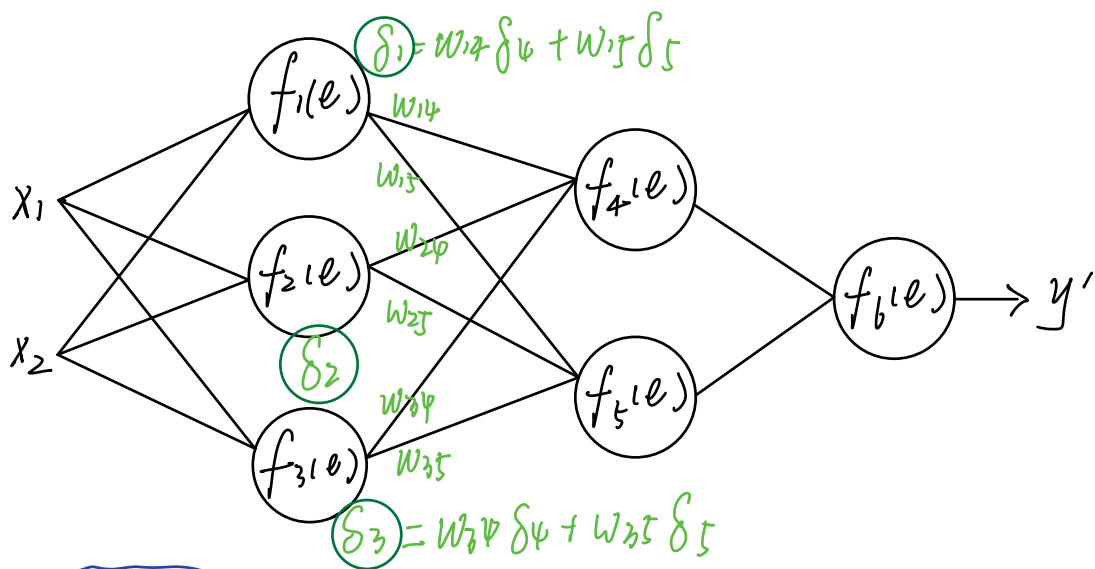






反向传播 传播误差信号到所有的神经元

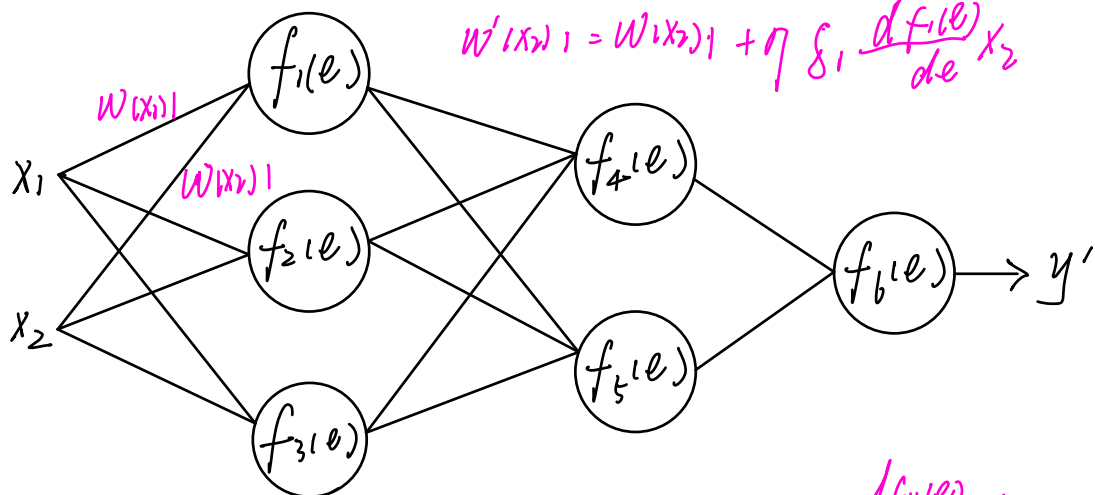




更新权重

$$w'_{(x_1)_1} = w_{(x_1)_1} + \eta \delta_1 \cdot \frac{df_1(e)}{de} x_1$$

$$w'_{(x_2)_1} = w_{(x_2)_1} + \eta \delta_1 \cdot \frac{df_1(e)}{de} x_2$$



$$w'_{14} = w_{14} + \eta \delta_4 \cdot \frac{df_4(e)}{de} \cdot y_1$$

$$w'_{24} = w_{24} + \eta \delta_4 \cdot \frac{df_4(e)}{de} \cdot y_2$$

