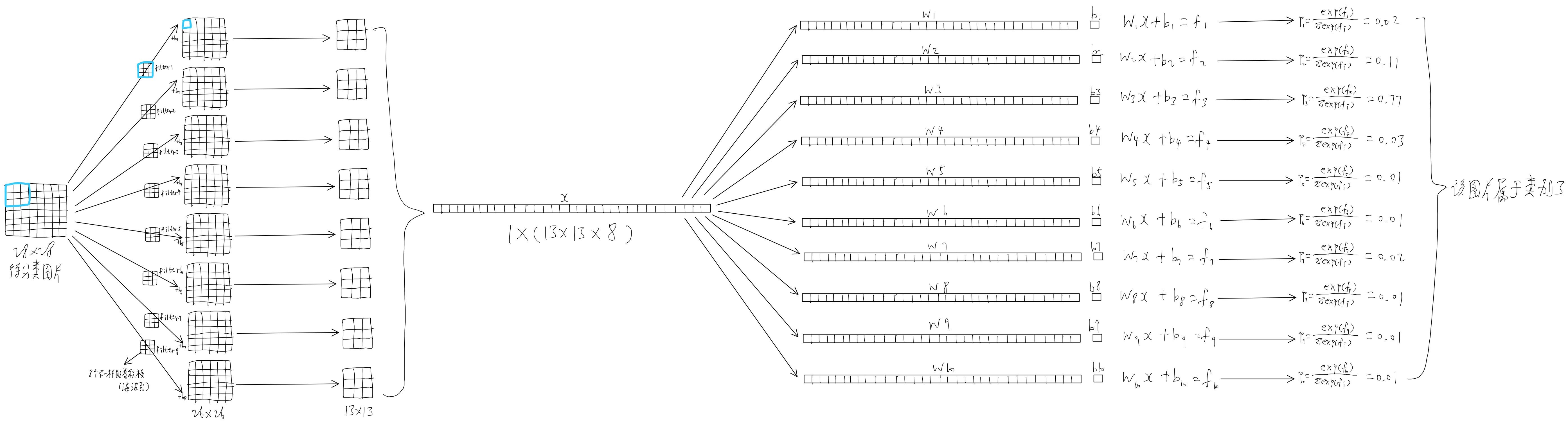
CNN

2020年8月19日 星期三　下午1:33

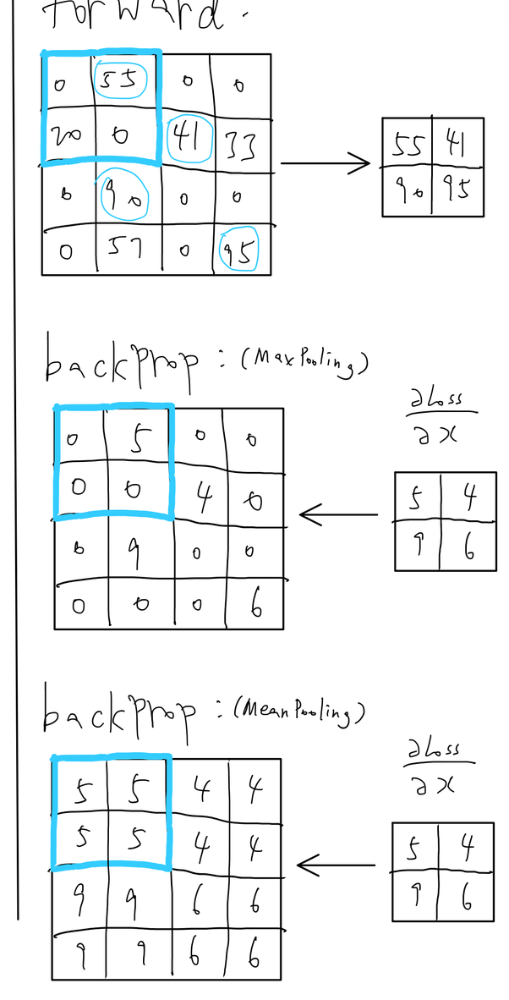
mnist: 28×28×1 (灰度图)



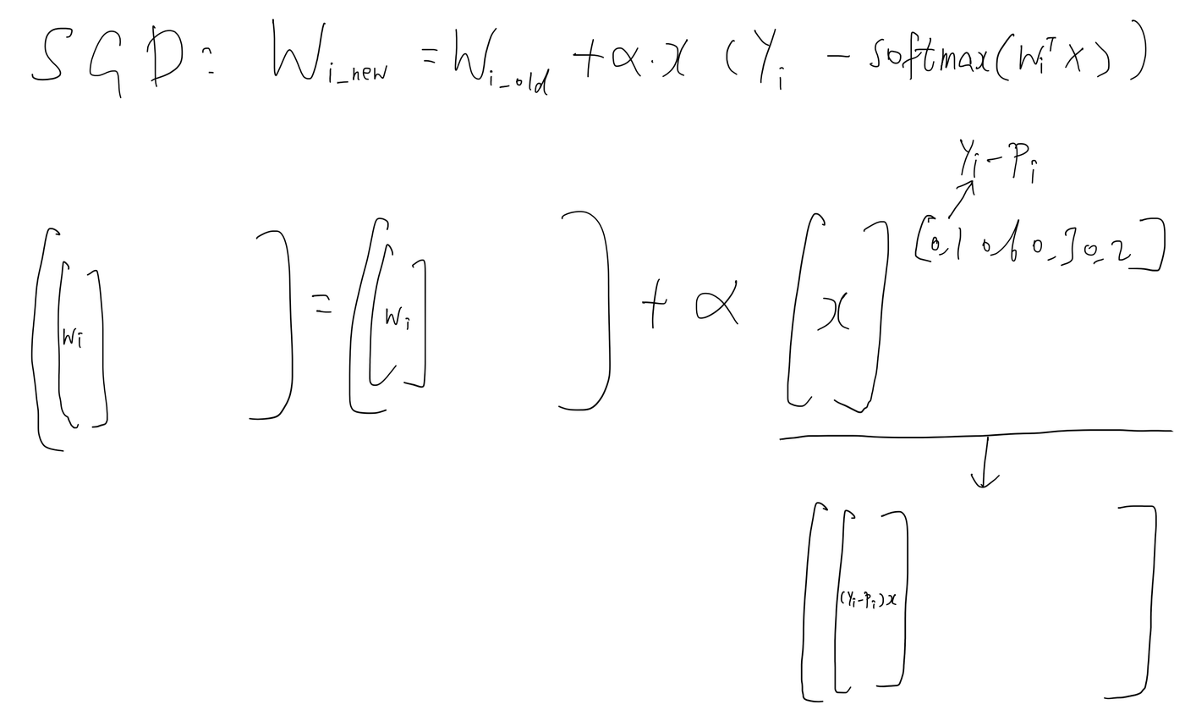
卷积层
Conv

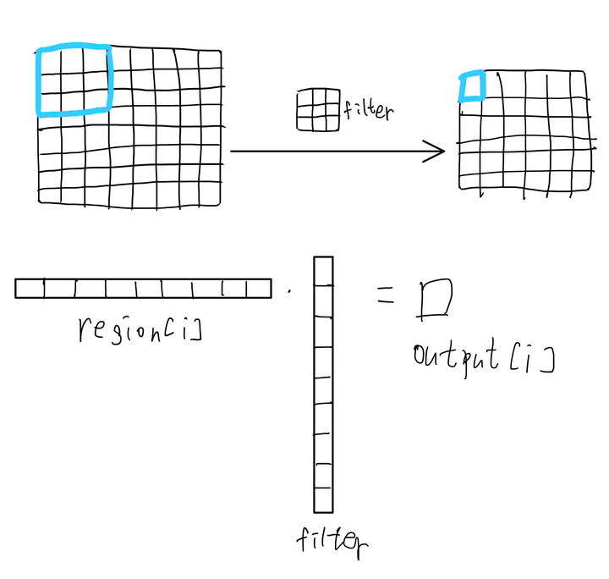
池化层/汇聚层/采样层
Pooling
(MaxPooling)

全连接层
Dense
(Softmax)



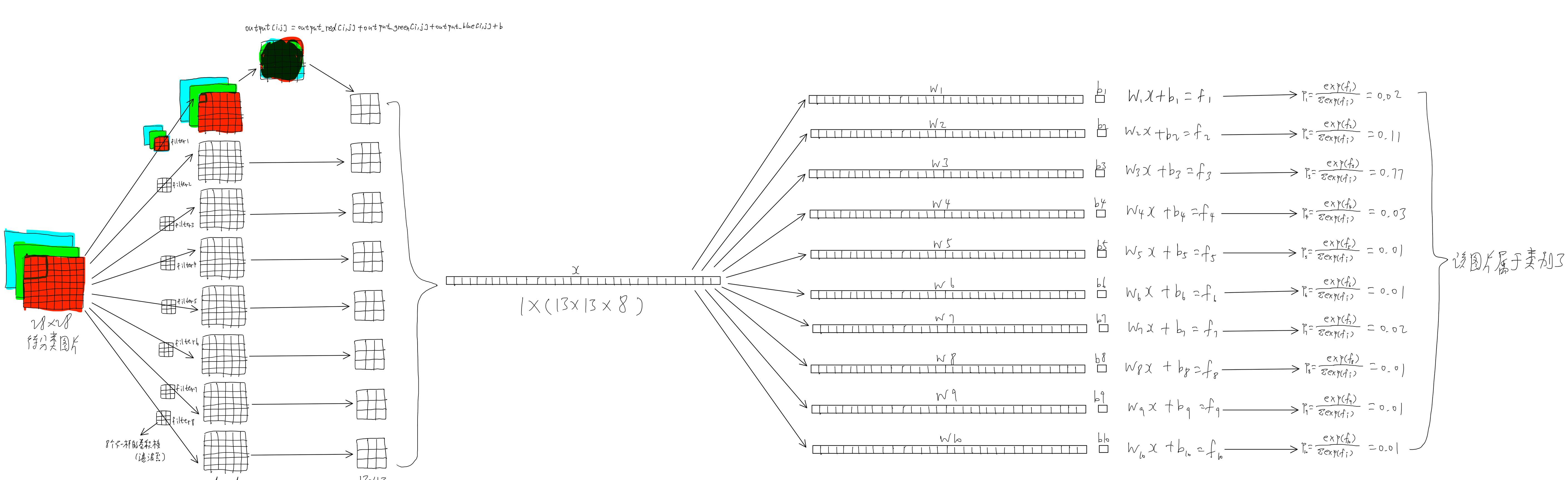
SGD: $W_{i\_new} = W_{i\_old} + \alpha \cdot x\,(Y_i - \overset{p_i}{softmax(W_i^T x)})$ (增/减) ，$\frac{\partial loss}{\partial x} = -(Y-P).T * W$





$$\frac{\partial loss}{\partial filter} = \frac{\partial loss}{\partial output[i]} \cdot \frac{\partial output[i]}{\partial filter}$$
$$= \frac{\partial loss}{\partial output}[i] \cdot region[i]$$
$$filter_{new} = filter_{old} - \alpha \frac{1}{N}\sum_{i=1}^{N} \frac{\partial loss}{\partial output}[i] \cdot region[i]$$

RGB图:



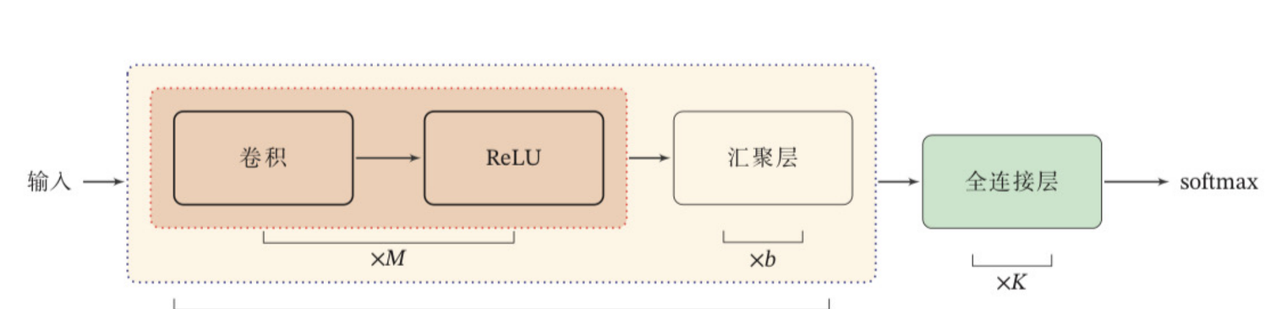


图 5.9 常用的卷积网络整体结构

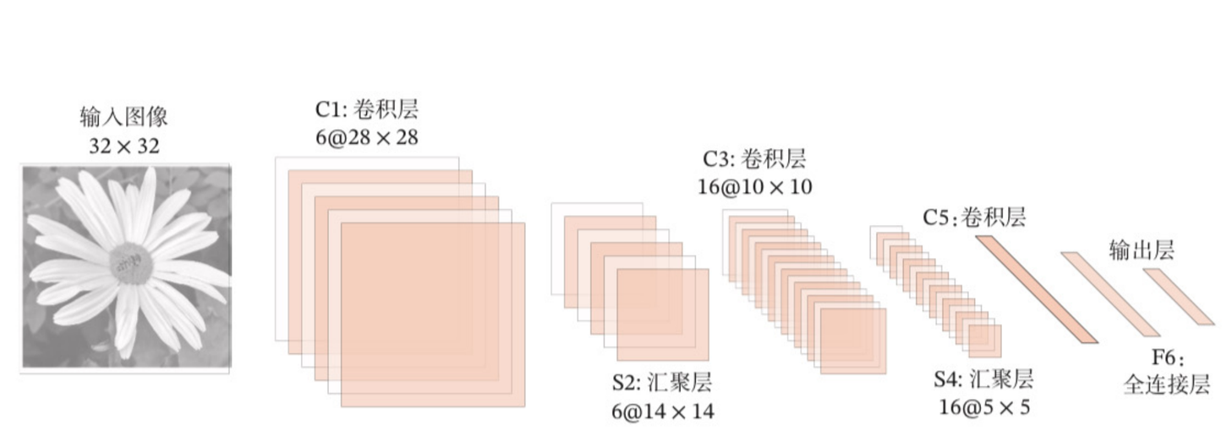
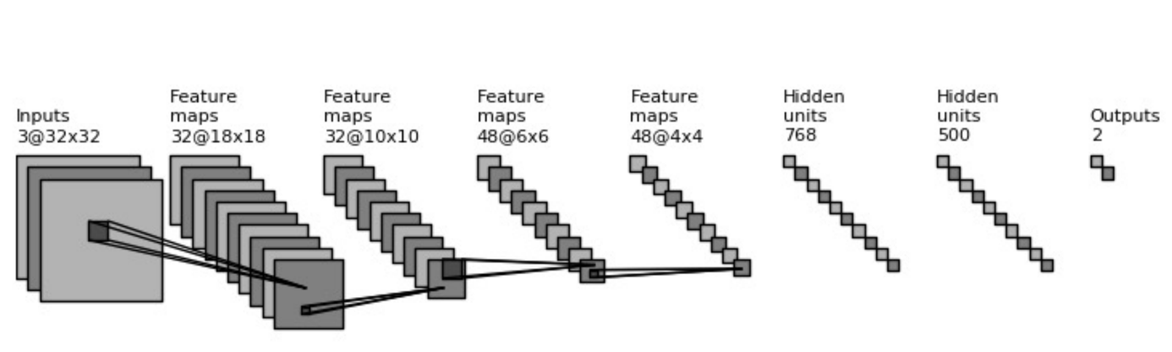


图 5.10 LeNet-5 网络结构（图片根据[LeCun et al., 1998]绘制）



互相关：$(I \otimes K)_{ij} = \sum_{m=0}^{k_1-1}\sum_{n=0}^{k_2-1} I(i+m, j+n)K(m,n)$

卷积：$(I * K)_{ij} = \sum_{m=0}^{k_1-1}\sum_{n=0}^{k_2-1} I(i-m, j-n)K(m,n)$
$= \sum_{m=0}^{k_1-1}\sum_{n=0}^{k_2-1} I(i+m, j+n)K(-m,-n)$

互相关=不翻转的卷积

步长stride，零填充zero padding

窄卷积：步长s=1，两端各补p=0个零
宽卷积：步长s=1，两端各补p=k-1个零（k：卷积大小）　k-1=3-1=2
等宽卷积：步长s=1，两端各补$p=\frac{k-1}{2}$个零　$\frac{k-1}{2}=\frac{3-1}{2}=1$