1 Convoluted Neural Network (CNN)

1.1 Forward Propagation

Convolution Layer:

$$\boldsymbol{a_{i+1}} = \varphi(\boldsymbol{w_i} * \boldsymbol{a_i} + \boldsymbol{b_i}) \tag{1}$$

Pooling Layer:

$$\boldsymbol{a_{i+1}} = pool(\boldsymbol{z_i}) \tag{2}$$

Fully-Connected and Softmax Layer:

$$\boldsymbol{y} = softmax(\boldsymbol{w_l a_l} + \boldsymbol{b_l}) \tag{3}$$

1.2 Multivariate Discrete Convolution

Assume that $\boldsymbol{t}$ is defined on $\mathcal{D}^n \in \mathbb{R}^n$

$$(f * g)[\boldsymbol{t}] := \sum_{\boldsymbol{\tau}=min(\mathcal{D})}^{max(\mathcal{D})} f[\boldsymbol{\tau}] g[\boldsymbol{t} - \boldsymbol{\tau}] \tag{4}$$

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