线性回归

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线性回归基本要素

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线性回归输出是一个连续值，因此适用于回归问题。回归问题在实际中很常见，如预测房屋价格、气温、销售额等连续值的问题。与回归问题不同，分类问题中模型的最终输出是一个离散值。我们所说的图像分类、垃圾邮件识别、疾病检测等输出为离散值的问题都属于分类问题的范畴。softmax回归则适用于分类问题。

由于线性回归和softmax回归都是单层神经网络，它们涉及的概念和技术同样适用于大多数的深度学习模型。

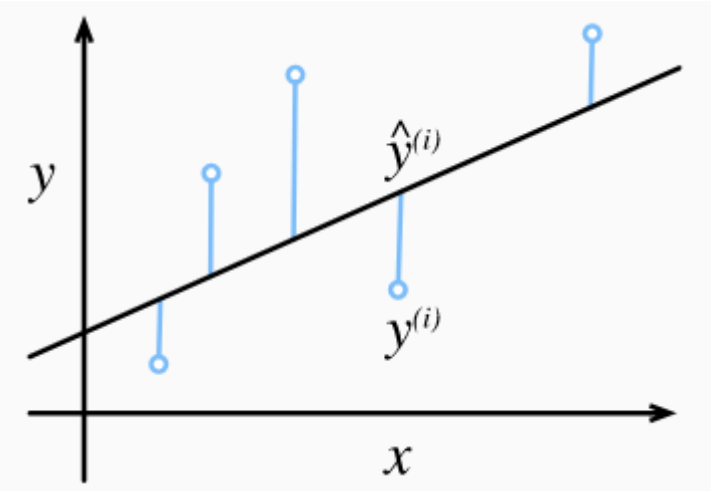
训练数据

Typically, we will use n to denote the number of samples in our dataset. We index the samples by I, denoting each input data point as $x^{(i)} = [x_1^{(i)}, x_2^{(i)}]$ and the corresponding label as $y^{(i)}$

损失函数

$$l^{(i)}(\mathbf{w}, b) = \frac{1}{2}\left(\hat{y}^{(i)} - y^{(i)}\right)^2,$$

$$L(\mathbf{w}, b) = \frac{1}{n}\sum_{i=1}^{n} l^{(i)}(\mathbf{w}, b) = \frac{1}{n}\sum_{i=1}^{n} \frac{1}{2}\left(\mathbf{w}^\top \mathbf{x}^{(i)} + b - y^{(i)}\right)^2.$$



$$\mathbf{w}^*, b^* = \underset{\mathbf{w}, b}{\operatorname{argmin}}\ L(\mathbf{w}, b).$$

优化算法

$$(\mathbf{w}, b) \leftarrow (\mathbf{w}, b) - \frac{\eta}{|\mathcal{B}|} \sum_{i \in \mathcal{B}} \partial_{(\mathbf{w}, b)} l^{(i)}(\mathbf{w}, b)$$

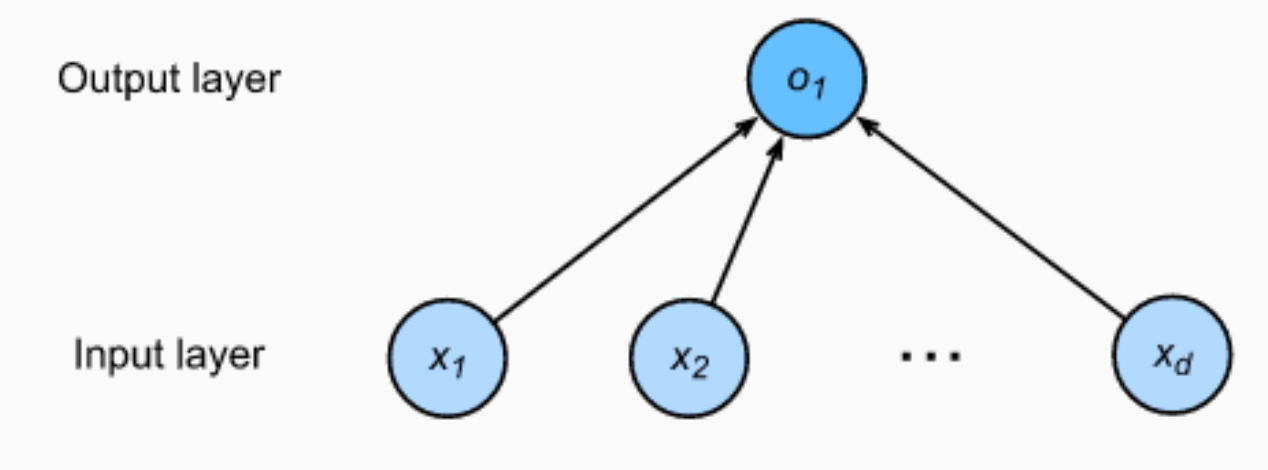
$$\begin{aligned}
\mathbf{w} &\leftarrow \mathbf{w} - \frac{\eta}{|\mathcal{B}|} \sum_{i \in \mathcal{B}} \partial_{\mathbf{w}} l^{(i)}(\mathbf{w}, b) &&= w - \frac{\eta}{|\mathcal{B}|} \sum_{i \in \mathcal{B}} \mathbf{x}^{(i)} \left(\mathbf{w}^\top \mathbf{x}^{(i)} + b - y^{(i)}\right), \\
b &\leftarrow b - \frac{\eta}{|\mathcal{B}|} \sum_{i \in \mathcal{B}} \partial_b l^{(i)}(\mathbf{w}, b) &&= b - \frac{\eta}{|\mathcal{B}|} \sum_{i \in \mathcal{B}} \left(\mathbf{w}^\top \mathbf{x}^{(i)} + b - y^{(i)}\right).
\end{aligned}$$

模型预测

$$\hat{\mathbf{w}}^\top x + \hat{b},$$

模型预测

神经网络图



Linear regression is a single-later neural network.

谢谢!

Does anyone have any questions?

Twitter: @walkercet
Blog: https://ceteongvanness.wordpress.com

资源

Dive into Deep Learning