逻辑回归

数据：$(X,Y), X \in R^n, Y \in \{0,1\}$

模型：$P_1 = P(y_i = 1|x_i) = \frac{1}{1+e^{-Wx_i}}$

$P_0 = P(y_i = 0|x_i) = \frac{e^{-Wx_i}}{1+e^{-Wx_i}}$

$P(y_i|x_i) = P_1^{y_i} P_0^{1-y_i}$

MLE求解：

$$\begin{aligned}\hat{w} &= \arg\max_w logP(Y|X) \\ &= \arg\max_w log\prod P(y_i|x_i) \\ &= \arg\max_w \sum logP(y_i|x_i) \\ &= \arg\max_w \sum logP_1^{y_i} P_0^{1-y_i} \\ &= \arg\max_w \sum (y_i logP_1 + (1-y_i)P_0)\end{aligned}$$

得到交叉熵损失：

$loss = -\sum(y_i logP_1 + (1-y_i)P_0)$