Homework Assignment 2

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1. The distance function of logistic regression was defined as

$$D(M^*(\mathbf{x}), M, \mathbf{x}) = -(M^*(\mathbf{x}) \log M(\mathbf{x}) + (1 - M^*(\mathbf{x})) \log(1 - M(\mathbf{x}))).$$

Derive its gradient with respect to the weight vector $\mathbf{w}$ step-by-step.

2. After replacing the label set from $\{0, 1\}$ to $\{-1, 1\}$, we introduced the log loss

$$D_{\log}(y, \mathbf{x}; M) = \frac{1}{\log 2} \log(1 + \exp(-s(y, \mathbf{x}; M))),$$

as an alternative to the logistic regression distance function above. Show that these two are equivalent up to a constant multiplication for logistic regression.

3. PROGRAMMING ASSIGNMENT