

Lecture 7: Maximum likelihood estimation for logistic regression

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Recall: Newton's method

Newton's method for logistic regression

Example

Suppose that $\log \left(\frac{p_i}{1 - p_i} \right) = \beta_0 + \beta_1 X_i$, and we have

$$\beta^{(r)} = \begin{bmatrix} -3.1 \\ 0.9 \end{bmatrix}, \quad U(\beta^{(r)}) = \begin{bmatrix} 9.16 \\ 31.91 \end{bmatrix},$$

$$\mathbf{H}(\beta^{(r)}) = - \begin{bmatrix} 17.834 & 53.218 \\ 53.218 & 180.718 \end{bmatrix}$$

Use Newton's method to calculate $\beta^{(r+1)}$ (you may use R or a calculator, you do not need to do the matrix arithmetic by hand).

Checking the solution is a unique maximum