Introduction

For logistic regression we are attempting to model $P(y = 1|\mathbf{x})$. In other words we are attempting to solve

$$Pr(y_i = 1) = logit^{-1}(X_i, \beta) \tag{1}$$

The logit function preserves the following equality

$$logit^{-1}(x) = \frac{e^x}{1 + e^x} = \frac{1}{1 - e^{-x}} = \frac{1 + \tanh(\frac{x}{2})}{2} \tag{2}$$