



# Logistic Regression

logit link function and log odds

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1$$

$$\begin{aligned}
 p &= \frac{e^{\beta_0 + \beta_1 x_1}}{1 + e^{\beta_0 + \beta_1 x_1}} = \text{[a little algebra]} \\
 &= \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1)}}
 \end{aligned}$$



odds

$$y = X\beta$$

$$y = g^{-1}(X\beta)$$





logit link function

# Logistic Regression

logit link function and log odds

$$y = X\beta$$

$$y = g^{-1}(X\beta)$$

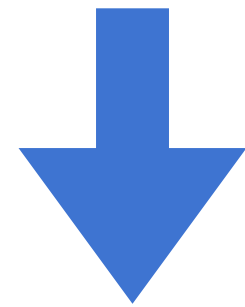
$$\log \underbrace{\left( \frac{p}{1-p} \right)}_{\text{odds}} = \beta_0 + \beta_1 x_1$$

  
logit link function

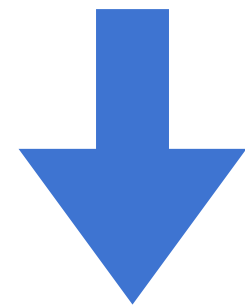
$$p = \frac{e^{\beta_0 + \beta_1 x_1}}{1 + e^{\beta_0 + \beta_1 x_1}} = \text{[a little algebra]}$$
$$= \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1)}}$$

# Redefining The Response

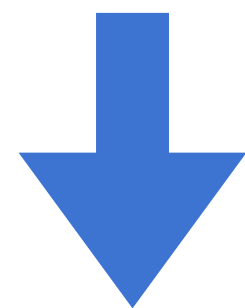
original  $Y$



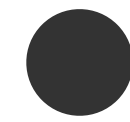
$Y$  as probability



odds of  $Y$



$Y' \in (-\infty, \infty)$



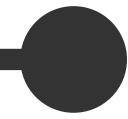
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1



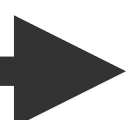
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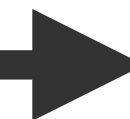
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$\infty$



$-\infty$



$\infty$