Generalized Linear Models (GLM)

Wednesday, September 8, 2021 11:12 AM

- Framework
  - Learn

$$Y = f(X) + \varepsilon$$

  - Given

$X_1 \dots X_p \rightarrow Y$ ← follows a certain dist.!

- Models:
  - Linear Regression

$$E[Y \mid X_1 \dots X_p] = \beta_0 + \beta_1 X_1 + \dots \beta_p X_p$$

* $Y \rightarrow$ Gaussian/Normal (errors) $\eta(\mu) = \mu$

  - Logistic Regression

$$E[Y \mid X_1 \dots X_p] = P_r(Y = 1 \mid X_1 \dots X_p)$$

$$= \frac{e^{\beta_0 + \beta_1 X_1 + \dots \beta_p X_p}}{1 + e^{\beta_0 + \beta_1 X_1 + \dots \beta_p X_p}}$$

* $Y \rightarrow$ Bernoulli/Binomial $\eta(\mu) = \log \frac{\mu}{1-\mu}$

  - Poisson Regression

$$E[Y \mid X_1 \dots X_p] = \lambda(X_1 \dots X_p)$$

$= e^{\beta_0 + \beta_1 x_1 \cdots \beta_p x_p}$

* $Y \rightarrow$ Poisson $\quad \eta(\mu) = \log \mu$

- Distribution Family
  - Exponential Dist $\rightarrow$ Link function: $\eta(\mu)$