M339G: February 9th, 2026.

Multiple Linear Regression.

predictors/explanatory r.v.s: $(X_1, X_2, ..., X_p)^T =: X$

response r.v. $\qquad$ Y

In general: $\quad Y = \boxed{f(X)} + \varepsilon \quad w/ \quad X \perp \varepsilon$

$\qquad\qquad\qquad\qquad\qquad$ and $\quad \varepsilon \sim N(0, \sigma^2)$

$$Y = \boxed{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p} + \varepsilon$$

$$\underbrace{\qquad\qquad\qquad\qquad\qquad}_{\beta \cdot X}$$

equation for a p-dimensional
(hyper)plane in a $(p+1)$-dimensional
$\qquad\qquad\qquad\qquad\qquad$ space

However, w/ interaction terms:

e.g., $\quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + \varepsilon$