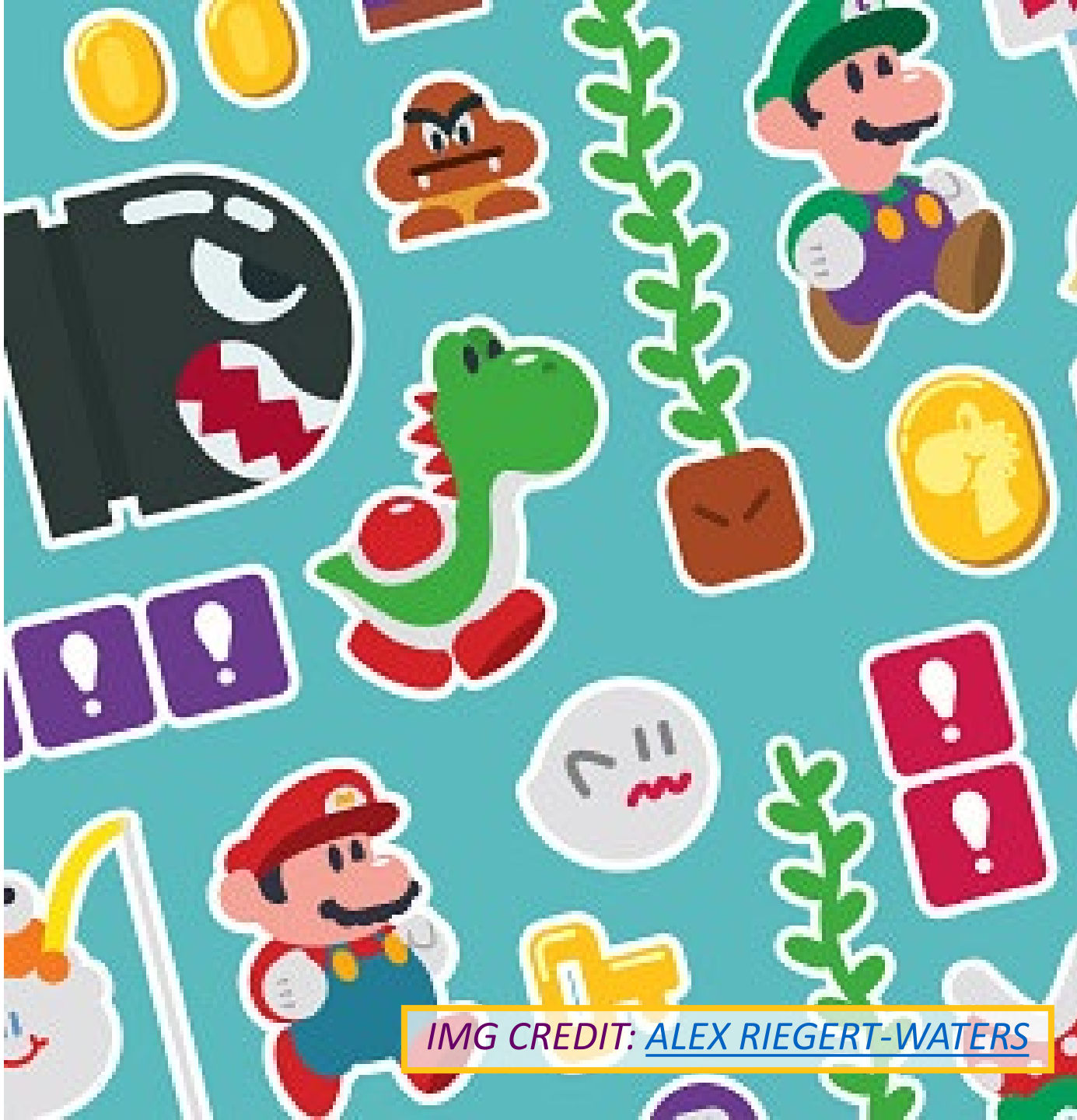
Multiple Linear Regression Model

READING:	3.1
EXERCISES:	NONE
ASSIGNED:	HW 7
PRODUCER:	DR. MARIO



IMG CREDIT: ALEX RIEGERT-WATERS

Motivation

- Simple Linear Regression Model in Real Life is **Unrealistic**
- Why? *Suppose we wanted to predict number of incoming students at UNC in Fall 2024? (Call this variable Y)*
- Question: *What variables may help us predict Y?*

Multiple Linear Regression Model

- General Linear Regression Model:

$$\mu_Y = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k + \epsilon$$

- Conditions are Identical to Simple Linear Regression Model

- Model has *k+2* Unknown Parameters We Need to Estimate
  - Slopes/Coefficients: $\hat{\beta}_0, \hat{\beta}_1, \ldots, \hat{\beta}_k$
  - Standard Error of the Regression: $\hat{\sigma}_\epsilon$

- Use **lm()** Function: $lm(y \sim x_1 + x_2 + \cdots + x_k, data = ?)$

Standard Error of Regression

- Interpretation of $\hat{\sigma}_\epsilon$ is Identical
- Formula is **Almost** Identical:

$$\hat{\sigma}_\epsilon = \sqrt{\frac{\sum(y_i - \hat{y})^2}{n-k-1}} = \sqrt{\frac{SSE}{n-k-1}}$$

- Degrees of Freedom Depends on *n* and *k*

$$df = n - k - 1 = n - (k+1)$$

Thank You

Make Reasonable Decisions