Lecture 2 Outline:
Textbook Reading: ISL Chapters 2-3 & ESL Chapters 2-3.

1. Review:
   • $K$-Nearest Neighbors.
   • Model complexity & training and test error.

2. Modeling continuous responses:
   • MSE, Squared Error Loss & Bias-Variance Decomposition.
   • Bias & Variance in Model Complexity.

3. Linear Regression Framework:
   • Model.
   • Intercept.

4. Solving RSS.
   • $\hat{\beta}$ solves gradient equation.
   • The “hat” or projection matrix.
   • $O(p^3)$ for dense matrices; $O(np^2)$ for others.

   • MLE and unbiased estimates of $\hat{\sigma}^2$.
   • Normal distributional assumptions.
   • No distributional assumptions.
     – Gauss-Markov Theorem & BLUE (Best Linear Unbiased Estimator).

6. Discrete variables & relation to ANOVA.

7. Least squares when $p > n$ or when $X$ is not full rank.
   • Zero training error when $p > n.$