Math 342W/642/742W

Recitation – Day #18 (4.22.25)

I. Bias & Variance

(i) In words, what is ***bias***?

(ii) In words, what is ***variance***?

(iii) In words, what is ***noise***?

(iv) Give an example, could be non-technical, that encapsulates what it means for a **tradeoff** between two quantities/ideas/phenomena to exist.

(v) Mathematically express **bias**, **variance**, and **noise**:

(vi) Give two illustrations: (1) for the bias-variance tradeoff as a function of complexity, and (2) the interplay between bias and variance

II. Decomposition of Generalization Error

(i) Derive the average MSE of the model g over any future prediction, a.k.a. the General Bias-Variance Tradeoff/Decomposition for Regression.

(ii) How does the decomposition of the generalization error help in understanding the "*tradeoff*" that exists between the **bias** and **variance** of a model's generalizing capabilities?