EECS 126 — 1.28 Lecture 4

Variance

$$\text{Var}(X) := \mathbb{E}[(X-\mathbb{E}[X])^2] \qquad \text{spread of } x \text{ around expectation}$$
$$= \sum_x (x-\mathbb{E}[X])^2 p_X(x)$$
$$= \sum x^2 p_X(x) - 2\mathbb{E}[X] \sum x p_X(x) + \mathbb{E}[X]^2$$
$$= \underbrace{\mathbb{E}[X^2]}_{\text{second moment}} - \mathbb{E}[X]^2$$

If X, Y are independent, then $\text{Var}(X+Y) = \text{Var}(X) + \text{Var}(Y)$

($\mathbb{E}[XY] = \mathbb{E}[X]\mathbb{E}[Y]$)

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