

Recap

PMF:

$$1) f(x_i) \geq 0$$

$$2) \sum f(x_i) = 1$$

$$3) f(x_i) = P(X = x_i)$$

CDF:

$$F(x_i) = P(X \leq x_i)$$

$$0 \leq F(x) \leq 1$$

$$\text{if } x \leq y \rightarrow F(x) \leq F(y)$$

Expected Value:

$$E(x) = E[X] = EX = \mu_x = \sum_{i=1}^n x_i \cdot f(x_i)$$

Variance:

$$\begin{aligned}\sigma^2 &= V(x) = \text{Var}(x) \\ &= \sum x_i^2 \cdot f(x_i) - (E(x))^2 \\ &= E[X^2] - (E[X])^2\end{aligned}$$

Standard Deviation:

$$\sqrt{\sigma^2} = \sigma = \sqrt{E[X^2] - (E[X])^2}$$

$$\begin{array}{l} \textcircled{1}: 5.6 \\ \textcircled{2}: 1.6 \\ \textcircled{3}: 10.4 \\ \textcircled{4}: 2.6 \\ \textcircled{5}: 0.6 \end{array} \left. \vphantom{\begin{array}{l} \textcircled{1} \\ \textcircled{2} \\ \textcircled{3} \\ \textcircled{4} \\ \textcircled{5} \end{array}} \right\} \frac{\text{sum}}{n} = 4.16$$

$$\frac{185 + 181 + 169 + 182 + 180}{5} = 179.4$$

Variance is not linear:

$$\text{Var}(aX+b) = a^2 \cdot \text{Var}(X)$$

Expectation is linear:

$$E(aX+b) = a \cdot E(X) + b$$

CDF vs. SF

$$P(X \leq 4) = P(X=0) + P(X=1) + \dots + P(X=4)$$

$$P(X \geq 4) = 1 - P(X \leq 3)$$

$$\text{cdf}(4) + \text{sff}(4) = 1$$

$$\text{sff} + \text{CDF} = 1 \quad \downarrow$$
$$P(X \leq 4) + (1 - P(X \leq 4))$$



CDF includes x

SF does not include x .