



# Probability Methods in Engineering

CSE-209

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Lecture 20



# Expected Value of Continuous RV

- The expected value of discrete RV  $X$

$$E[X] = \sum_{k=1}^{\infty} x_k p_X(x_k)$$

- The expected value of continuous RV  $X$

$$E[X] = \int_{-\infty}^{\infty} t f_X(t) dt$$



# Examples (cont.)

- Find the mean of a uniform random variable given by

$$f_X(x) = \begin{cases} \frac{1}{b-a} & a \leq x \leq b \\ 0 & x < a \text{ and } x > b \end{cases}$$



# Examples (cont.)

- The time  $X$  between customer arrivals at a service station has an exponential distribution. Find the mean interarrival time.



# Variance of Continuous RV

- The variance of continuous RV  $X$

$$VAR[X] = E[(X - E[X])^2] = E[X^2] - E^2[X]$$

- The standard deviation of continuous RV  $X$

$$STD[X] = \sqrt{VAR[X]}$$



# Examples (cont.)

- Find the variance of a uniform random variable given by

$$f_X(x) = \begin{cases} \frac{1}{b-a} & a \leq x \leq b \\ 0 & x < a \text{ and } x > b \end{cases}$$



# Examples (cont.)

- The time  $X$  between customer arrivals at a service station has an exponential distribution. Find the variance of interarrival time.