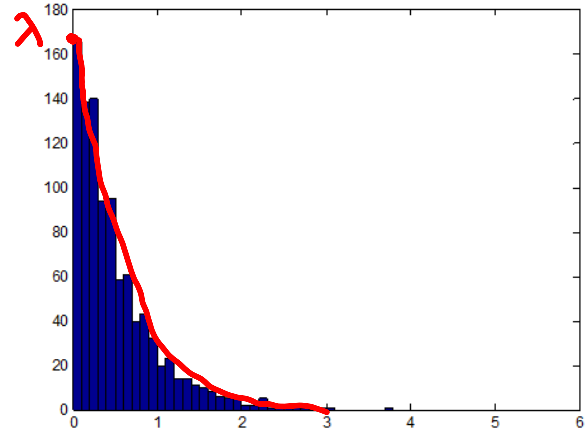
m_i : $\text{Edge}(i) \le m_i < \text{Edge}(i+1)$

$N = [m_1 \quad m_2 \quad m_3 \quad \ldots\ldots]$



$f(x) = \lambda e^{-\lambda x} \qquad x \in [0, \infty)$

$f(0) = \lambda$

$$\begin{tikzcd} & b \\ a \arrow[ur, "\lambda"] \arrow[dr, "2\lambda"'] & \\ & c \end{tikzcd}$$

$T_b \sim \exp(\lambda)$

$T_c \sim \exp(2\lambda)$

if $T_b < T_c$ then jump to b

if $T_c < T_b$ " " " c

1 $\Longrightarrow$

$T_{stay} \sim \exp(3\lambda)$

2 $\Longrightarrow$

$T_b \sim \exp(\lambda)$ if $T_b < T_c$, then $T_{stay} = T_b$, and jump to b

$T_c \sim \exp(2\lambda)$ if $T_c < T_b$, " $T_{stay} = T_c$, " " " c

$$E[X] = \sum_{i=0}^{\infty} P(X=x_i) \cdot x_i \qquad E[G(x)] = \sum_{i=0}^{\infty} P(X=x_i) \cdot G(x_i)$$

$$G_X(z) = \sum_{k=0}^{\infty} (1-p)p^k z^k = \frac{1-p}{1-pz},$$

$$\hookrightarrow (1-p)\sum_{k=0}^{\infty}(pz)^k = (1-p) \cdot \frac{1}{1-pz} \quad \text{if } pz < 1$$

$$= \quad e^{-\lambda} \sum_{k=0}^{\infty} (\lambda z)^k / k!$$

$$\hookrightarrow e^{\lambda z} = e^{-\lambda + \lambda z}$$

$$G_X(z) = \sum p_k z^k \qquad \underline{\frac{dG_X(z)}{dz} = \sum_{k=1}^{\infty} k p_k z^{k-1}}$$

$$\left.\frac{d^2 G_X(z)}{dz^2}\right|_{z=1} = E[X^2] - E[X]$$

$$\hookrightarrow \frac{d\left(\sum_{k=1}^{\infty} k p_k z^{k-1}\right)}{dz} = \left.\sum_{k=1}^{\infty} (k-1) \cdot k\, p_k\, z^{k-2}\right|_{z=1} = \sum_{k=1}^{\infty}\left(k^2 p_k - k p_k\right)$$

$$= \sum_{k=1}^{\infty} k^2 p_k - \sum_{k=1}^{\infty} k p_k = E[X^2] - E[X]$$

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

X: dice 1 number

Y: dice 2 number

U: number of both dices

$p(X=1) = 0.2$, ...

$p(Y=1) = 0.15$, ...

$U = X + Y$

$p(U=2) = p(x=1) + p(y=1)$

$p(U=3) =$ 2 scenarios

$p(U=4) = (1,3), (2,2), (3,1)$ ← 3 scenarios