Lecture-10

$$s = T(r)$$

CDF :- $G_s = P_s(S \leq s) = P_s(T(r) \leq s)$

$$= P_s(r \leq T^{-1}(s))$$

$$= F_R[T^{-1}(s)]$$

PDF :- $g_s = \frac{dG_s}{ds} = f_r[T^{-1}(s)] \frac{d}{ds}[T^{-1}(s)]$

$$p_s(s) = p_R(r)\frac{dr}{ds} \quad — ①$$

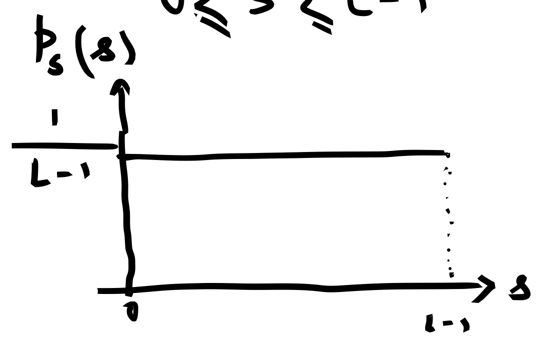
$$\frac{ds}{dr} = \frac{dT(r)}{dr} = \frac{d}{dr}\left[(L-1)\int_0^r p(w)\,dw\right]$$

$$\frac{ds}{dr} = (L-1)p_R(r) \quad — ②$$

Use Eq.(2) in Eq.(1) :-

$$p_s(s) = p_R(r) \cdot \frac{1}{(L-1)p_R(r)}$$

$$p_s(s) = \frac{1}{L-1} \qquad 0 \leq s \leq L-1$$



1.

$$p_R(r) = \begin{cases} \dfrac{2r}{(L-1)^2} & \text{for } 0 \le r \le L-1 \\ 0 & \text{otherwise.} \end{cases}$$

$$s = T(r) = (L-1)\int_0^r p_R(w)\,dw$$

$$= (L-1)\int_0^r \frac{2w}{(L-1)^2}\,dw$$

$$= \frac{r^2}{L-1}$$

$$p_s(s) = p_R(r)\frac{dr}{ds} = \frac{2r}{(L-1)^2}\left[\frac{ds}{dr}\right]^{-1}$$

$$= \frac{2r}{(L-1)^2}\cdot\frac{(L-1)}{2r}$$

$$= \frac{1}{L-1}$$

Discrete Domain...

$$p_R(r_k) = \frac{n_k}{MN}$$

$$s_k = T(r_k) = (L-1)\sum_{j=0}^{k} p_R(r_j)$$

$k = 0, 1, \ldots, L-1$

$$s_k = \frac{L-1}{MN}\sum_{j=0}^{k} n_j$$