Digital Communication Assignment

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I. Problem

1) Generate

$$T = U_1 + U_2$$

2) Find the CDF of T.
3) Find the PDF of T.
4) Find the theoretical expressions for the PDF and CDF of T.
5) Verify your results through a plot.

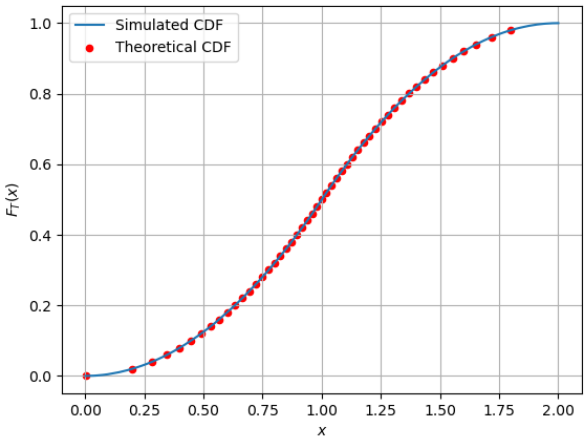
II. Solution

Let $U1$ and $U2$ are independent uniform random variable between 0 and 1.
CDF of T is given as

$$F_T(x) = \Pr(T \leq x) \tag{1}$$
$$= \Pr(U1 + U2 \leq x) \tag{2}$$
$$F_T(x) = \begin{cases} 0 & 0 < x \\ \frac{x^2}{2} & 0 \leq x < 1 \\ \frac{-x^2}{2} + 2x - 1 & 1 < x \leq 2 \\ 1 & x > 2 \end{cases} \tag{3}$$

The following code generates samples and plots the CDF of T.

https://github.com/nikhilnair90/FWC/tree/main/Module–II/Digital_Comm/6.4/Code/6_4_cdf.py



PDF of T is given as

$$\Pr(T = x) = \begin{cases} 0 & 0 < x \\ x & 0 \leq x < 1 \\ 2 - x & 1 < x \leq 2 \\ 1 & x > 2 \end{cases} \tag{4}$$

The following code plots the PDF of T.

https://github.com/nikhilnair90/FWC/tree/main/Module–II/Digital_Comm/6.4/Code/6_4_pdf.py