

EXERCISE SHEET WEEK 1

Familiarise yourself with the iPython notebooks I shared on the online companion.

Exercise 1.1. If U_1, \dots, U_{12} are independent $\text{Unif}(0,1)$, what (approximately) will be the distribution of

$$X = \left[\sum_{i=1}^{12} U_i - 6 \right]$$

and why? (Remind yourself a famous theorem). Implement this sampler by sampling U_i using Python's function and plotting the histogram of X . Recall that you need to repeat this procedure many times, so that you get $\{X_j\}_{j=1}^N$ and plot its histogram.

Exercise 1.2. Use a function (appropriately chosen based on your answer to Exercise 1.1) from `scipy.stats` module to plot the PDF of the density and compare your samples obtained in Exercise 1.1 to the PDF.

Exercise 1.3. Derive the distribution of $X = -\lambda^{-1} \log U$ by deriving the CDF $F_X(x)$. Implement this sampler by $U_i \sim \text{Unif}(0, 1)$ and making the above transformation to compute X_i and plot the histogram. Use $\lambda = 1$.