

The Ziggurat algorithm

The Ziggurat algorithm is an efficient method to generate random numbers from a given probability distribution.

Description:

- 1) Partition of the density function in K layers of same area A . The layer widths, $w_i = A / f(x_i)$ are computed recursively.
 - 2) Definition of the tail region for densities with infinite support (e.g. Normal) using an exponential function, such as
$$T(x) = c e^{-\lambda x}, \quad x > x_K$$
 - 3) select a layer
 - 4) Generate a candidate sample as
$$x = x_i + U \cdot w_i, \quad U \sim U_{[0,1]}$$
 - 5) Accept or reject the candidate
Acceptance if $x \leq x_{i-1}$
 - 6) Check for acceptance
 - 7) Handle the tail region : if $i = K$, sample from the tail using inverse transform sampling : $x = x_K - \frac{1}{\lambda} \ln(U)$
 - 8) Repeat until a sample is accepted
- See: Marsaglia and Tsang, 2000