

simulation_demo

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Poisson process

We will simulate Poisson process by first principle.

Algorithm 1: Simulation of event times of a Poisson process with rate λ until time T

Result: Write here the result

Input : Tmax or Nmax, λ

Output: $S(t)$

1 **Initialization** $t = 0, k = 0, S = 0$.

2 **while** $t < Tmax$ **do**

3 **Draw** $r \sim U(0, 1)$.

4 $t = t - \ln(r)/\lambda$.

5 $k = k + 1, S(k) = t$

6 **end**

```
rpoisson <- function(Tmax = NULL, Nmax = NULL, lambda) {  
  
  # we can have both NULL or both set at the same time.  
  if ( !xor(is.null(Tmax), is.null(Nmax)) ) stop("Need to set one (and only one) of Nmax or Tmax")  
  
  t = 0  
  k = 0  
  S = vector()  
  
  while (T) {  
    r <- runif(1)  
    t <- t - log(r) / lambda  
    k <- k + 1  
    S <- c(S, t)  
  
    if (!is.null(Tmax) && (t >= Tmax)) break;  
    if (!is.null(Nmax) && (length(S) >= Nmax)) break;  
  }  
  
  (S)  
}
```

```
#r1<-rpoisson(Tmax=10, lambda=1)  
tmax=100  
r1<-rpoisson(Tmax=tmax, lambda=1)  
#t_series <- seq(0,max(r1), by = max(r1)/tmax)  
t_series <- seq(0,length(r1)-1,1)  
plot(t_series,r1)
```

