simulation_demo

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Poisson process

We will simulate Poisson process by first principle. Algorithm taken from epfl

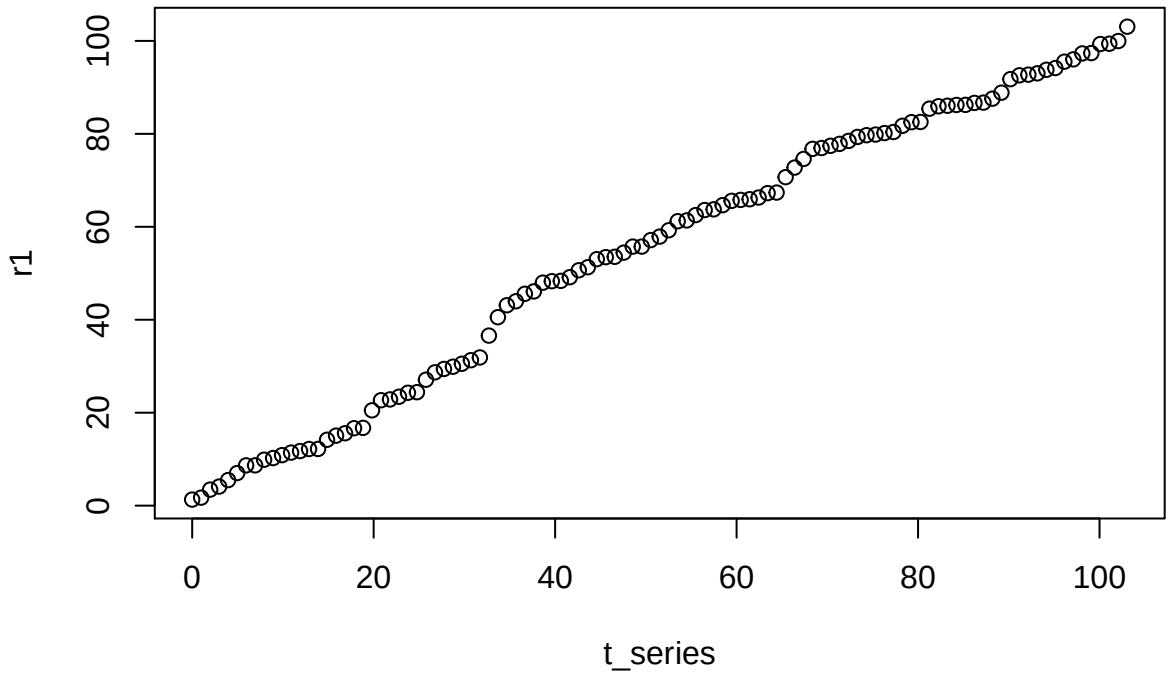
Algorithm 1: Simulation of event times of a Poisson process with rate λ until time T

Result: Write here the result
Input : Tmax or Nmax, λ
Output: $S(t)$

Initialization $t = 0$, $k = 0$, $S = 0$.
while $t<Tmax$ **do**
  Draw $r \sim U(0, 1)$.
  $t = t - \ln(r)/\lambda$.
  $k = k + 1$, $S(k) = t$
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), length=length(r1))
#t_series <- seq(0,length(r1)-1,1)
plot(t_series,r1)
```


r1
0
20
40
60
80
100
0
20
40
60
80
100
t_series