Poisson_Distribution

December 11, 2020

There are three random variables that can be used to describe the Poisson process.
X_i - denotes the inter-arrival time, time between the $(i-1)^{st}$ and i^{th} arrival
T_n - denotes the time of the n^{th} arrival
The above two random variables are associated with each other as follows:

$$T_n = \sum_{i=1}^{n} X_i, \;\; n \in \mathbb{N}$$

(T is the partical sum process associated with X)

$$X_n = T_n - Tn - 1, \;\; n \in \mathbb{N}_+$$

N_t - denote the number of arrivals in $(0, t]$ for $t \in [0, \mathrm{inf}]$, it is the counting process.
The counting process N and the arrival time process T are inverses of one another

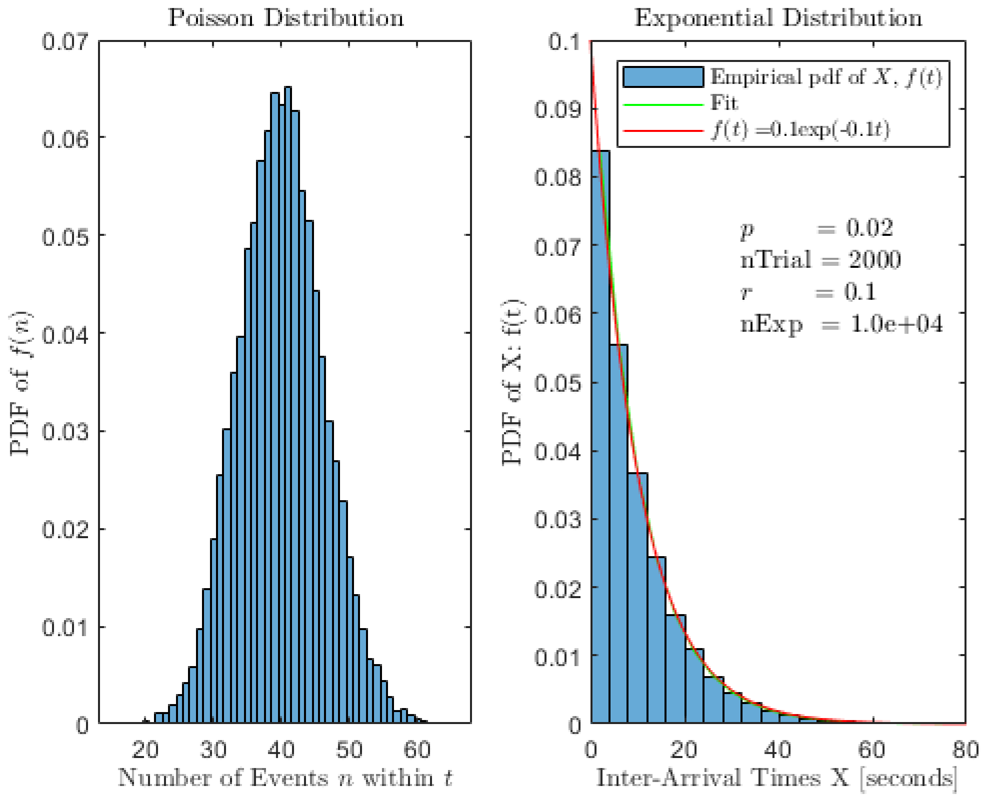
$$T_n = \min\{t \geq 0 : N_t = n\}, \;\; n \in \mathbb{N}$$
$$N_t = \max\{n \in \mathbb{N} : T_n \leq t\}, \;\; t \in [0, \mathrm{inf})$$

Running an experiment where events occur according to an underlying uniformly and identically distributied random number, with probability p.

```
Created file 'C:\Users\nithin\Documents\GitHub\energy-height-
conversion\Tools\Routines\FHI\coinflip.m'.
```

Defining r as the success rate, p as the probability of success per trial,
nTrial as the number of trials, *maxt* as the maximum time of the simulation, *repeat* or *nExp* as the number of re-runs to increase the statistics.

Generate the random number N_t, number of arrivals in time $\max(t)$ and plot the probability density function of N_t, which is a function of the number of successes n within $\max(t)$




```
mean of inter arrival times: 9.765
1/r = 10
median of inter arrival times: 6.7686
```