



## Non-homogeneous Poisson process with nonparametric frailty

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### Abstract

The common way to describe unobserved heterogeneity for repairable systems following a non-homogeneous Poisson process is to multiply the basic rate of occurrences of failures by a random variable with a specified distribution. Since the modeled heterogeneity is unobservable, the choice of the distribution of the unobserved effects is a problematic part of using these models as well as other necessary computations related to the estimation of these models which have to be done numerically in most cases. The main purpose of this paper is to develop a method for estimation of the parameters of a non-homogeneous Poisson process with unobserved heterogeneity without having to make parametric assumptions about the heterogeneity and which avoids the frequently encountered numerical problems associated with using standard models with unobserved heterogeneity. The main idea of the presented approach is that the individual frailties are treated as unknown parameters and are estimated directly from the given data without any restrictive assumption about their distribution. This approach is illustrated on an example with the power law process.

**Keywords:** non-homogeneous Poisson process, unobserved heterogeneity, non-parametric estimation, power law process.