ON ESTIMATION OF POISSON INTENSITY FUNCTIONS

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Abstract. Under the presence of only one realization, we consider a computationally simple algorithm for estimating the intensity function of a Poisson process with exponential quadratic and cyclic of fixed frequency trends. We argue that the algorithm can successfully be used to estimate any Poisson intensity function provided that it has a parametric form.

Key words and phrases: Poisson process, point process, linear Poisson process, modulated Poisson process.

1. Introduction

Let X be a Poisson point process on the Borel measurable space $(\mathbf{R}^d, \mathbf{B}^d)$, $d \in \mathbf{N}$, with unknown locally integrable intensity function

$$(1.1) \qquad \lambda \in L^1_{loc}(\mathbf{R}^d),$$

that is, λ is an integrable function on every compact subset of $\mathbf{R}^d$. For mathematical foundations of point processes theory we refer, for example, to Daley and Vere–Jones (1972, 1988), Ripley (1976), Kallenberg (1983), Kingman (1993), Reiss (1993).

Motivated by Helmers (1995), we assume throughout that only one realization of the process X is available. Furthermore, we assume that X is observed only in a bounded Borel set (called window) $W \subset \mathbf{R}^d$ that depends on a parameter N and expands when $N \to \infty$. We also assume throughout that

$$(1.2) \qquad \int_{\mathbf{R}^d} \lambda(x)dx (= \mathbf{E}X(\mathbf{R}^d)) = \infty$$

(cf., for example, Subsection 6.3 on pp. 136–137 of Rathbun and Cressie (1994) for a discussion concerning the necessity of assumption (1.2) in this context).

Intensity Estimation For Poisson Processes

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Intensity Estimation For Poisson Processes:

  Statistical Inference for Spatial Poisson Processes Yu A. Kutoyants,2012-12-06 This work is devoted to several problems of parametric mainly and nonparametric estimation through the observation of Poisson processes defined on general spaces Poisson processes are quite popular in applied research and therefore they attract the attention of many statisticians There are a lot of good books on point processes and many of them contain chapters devoted to statistical inference for general and partic ular models of processes There are even chapters on statistical estimation problems for inhomogeneous Poisson processes in asymptotic statements Nevertheless it seems that the asymptotic theory of estimation for nonlinear models of Poisson processes needs some development Here nonlinear means the models of inhomogeneous Pois son processes with intensity function nonlinearly depending on unknown parameters In such situations the estimators usually cannot be written in exact form and are given as solutions of some equations However the models can be quite fruitful in en gineering problems and the existing computing algorithms are sufficiently powerful to calculate these estimators Therefore the properties of estimators can be interesting too   **Introduction to the Statistics of Poisson Processes and Applications** Yury A. Kutoyants,2023-09-04 This book covers an extensive class of models involving inhomogeneous Poisson processes and deals with their identification i e the solution of certain estimation or hypothesis testing problems based on the given dataset These processes are mathematically easy to handle and appear in numerous disciplines including astronomy biology ecology geology seismology medicine physics statistical mechanics economics image processing forestry telecommunications insurance and finance reliability queuing theory wireless networks and localisation of sources Beginning with the definitions and properties of some fundamental notions stochastic integral likelihood ratio limit theorems etc the book goes on to analyse a wide class of estimators for regular and singular statistical models Special attention is paid to problems of change point type and in particular cusp type change point models then the focus turns to the asymptotically efficient nonparametric estimation of the mean function the intensity function and of some functionals Traditional hypothesis testing including some goodness of fit tests is also discussed The theory is then applied to three classes of problems misspecification in regularity MiR corresponding to situations where the chosen change point model and that of the real data have different regularity optical communication with phase and frequency modulation of periodic intensity functions and localization of a radioactive Poisson source on the plane using K detectors Each chapter concludes with a series of problems and state of the art references are provided making the book invaluable to researchers and students working in areas which actively use inhomogeneous Poisson processes   **An Estimation Problem with Poisson Processes** STANFORD UNIV CA DEPT OF STATISTICS.,Alan E. Gelfand,1982 This paper considers an estimation problem involving n independent Poisson processes such that the i th process has intensity function lambda intensity t delta intensity p t alpha It is of interest to estimate p t alpha Two estimation procedures are developed one using the exact arrival times of observations the second

using categorical arrival times of observations Two specific instances of p t an exponential and a bilinear form are investigated further An example applying the methodology to the active life of a judicial opinion is described Author

Estimation in Poisson Processes Pratap Narain Misra,1973 Estimation of the Intensity of a Filtered Poisson Process and Its Application to Acoustic Assessment of Marine Organisms John E. Ehrenberg,1973 *Estimation of the Intensity of the Non-homogeneous Poisson Process* Lakshmi Nilakantan,1988 **Spatial Point Process Modelling and Its Applications** Adrian Baddeley,2004 Este libro de proceedings se edita para ponerlo a disposici n de los asistentes a la Internacional Conference on Spatial Pont Process Modelling and its Applications SPPA realizada en Benic ssim en abril de 2004 **Asymptotics** Eric Alexander Cator,2007 **Consistent Estimation of the Intensity Function of a Cyclic Poisson Process** Roelof Helmers,I Wayan Mangku,Ričardas Zitikis,Centrum voor Wiskunde en Informatica (Amsterdam, Netherlands),1999 *Applied Spatial Statistics for Public Health Data* Lance A. Waller,Carol A. Gotway,2004-07-29 While mapped data provide a common ground for discussions between the public the media regulatory agencies and public health researchers the analysis of spatially referenced data has experienced a phenomenal growth over the last two decades thanks in part to the development of geographical information systems GISs This is the first thorough overview to integrate spatial statistics with data management and the display capabilities of GIS It describes methods for assessing the likelihood of observed patterns and quantifying the link between exposures and outcomes in spatially correlated data This introductory text is designed to serve as both an introduction for the novice and a reference for practitioners in the field Requires only minimal background in public health and only some knowledge of statistics through multiple regression Touches upon some advanced topics such as random effects hierarchical models and spatial point processes but does not require prior exposure Includes lavish use of figures illustrations throughout the volume as well as analyses of several data sets in the form of data breaks Exercises based on data analyses reinforce concepts Multiscale Modeling and Estimation of Poisson Processes with Applications to Emission Computed Tomography Klaus Edmond Timmermann,2000 **Advances in Nuclear Architecture** Niall M. Adams,Paul S. Freemont,2010-10-17 This book provides a snapshot of the state of the art in the study of mammalian cell nuclear architecture and features a diverse range of chapters written by top researchers A key aspect is an emphasis on precise and repeatable quantitative analysis and simulation in addition to the more familiar biological perspective The fusion of such material frames the future of the discipline Quantitative contributions stress reproducible and robust 3D analysis using a variety of tools ranging from point pattern analysis to shape registration methods Biological insights include the role of nuclear subdomains in cancer nuclear molecular motors and a holistic view of gene transcription

Estimation of Selected Parameters in Non-Homogeneous Poisson Processes Douglas E. Huffman,Paul T. Holmes,CLEMSON UNIV S C DEPT OF MATHEMATICAL SCIENCES.,1975 Estimates are found for the intensity function and other related parameters in a non homogeneous Poisson process Asymptotic results are also obtained A More Efficient

Interval Estimation of the Intensity in a Poisson Process Urban Hjorth,1977 **Nonlinear Analysis, Geometry and Applications** Diaraf Seck,Kinvi Kangni,Philibert Nang,Marie Salomon Sambou,2022-10-09 This book gathers twenty two papers presented at the second NLAGA BIRS Symposium which was held at Cap Skirring and at the Assane Seck University in Ziguinchor Senegal on January 25 30 2022 The five day symposium brought together African experts on nonlinear analysis and geometry and their applications as well as their international partners to present and discuss mathematical results in various areas The main goal of the NLAGA project is to advance and consolidate the development of these mathematical fields in West and Central Africa with a focus on solving real world problems such as coastal erosion pollution and urban network and population dynamics problems The book addresses a range of topics related to partial differential equations geometric analysis geometric structures dynamics optimization inverse problems complex analysis algebra algebraic geometry control theory stochastic approximations and modelling **Journal of the American Statistical Association** ,2006 A scientific and educational journal not only for professional statisticians but also for economists business executives research directors government officials university professors and others who are seriously interested in the application of statistical methods to practical problems in the development of more useful methods and in the improvement of basic statistical data Advances in Nondestructive Evaluation Seung Seok Lee,Dong Jin Yoon,Joon Hyun Lee,Sekyung Lee,2004-08-15 Proceedings of the 11th Asian Pacific Conference on Nondestructive Testing Jeju Island Korea 3 7 November 2003 *New Trends in Functional Statistics and Related Fields* Germán Aneiros,Enea G. Bongiorno,Aldo Goia,Marie Hušková,2025-05-23 This volume gathers peer reviewed contributions presented at the 6th International Workshop on Functional and Operatorial Statistics IWFOS 2025 held in Novara Italy June 25 27 2025 Covering a broad spectrum of topics in functional and operatorial statistics and related fields including high dimensional statistics and machine learning the contributions tackle both fundamental theoretical challenges and practical applications A variety of features of statistics for functional data are addressed such as estimation of functional features exploration and pre processing of functional data methodologies for functional regression and forecasting problems unsupervised and supervised classification and testing procedures Nonstandard functional data and situations which go beyond the pattern of samples of independent variables are investigated and a link to the field of artificial intelligence is presented Interesting real data applications to medicine health economics and the natural environmental and social sciences are featured throughout Initiated at the University of Toulouse in 2008 the series of IWFOS workshops fosters discussion and international collaboration on theoretical advancements methodological innovations and applications in functional and operatorial statistics and related fields Chapter 42 is available open access under a Creative Commons Attribution 4 0 International License via link springer com **Nonparametric Estimation of the Generating Function of the Intensity Function Process of a Doubly Stochastic Poisson Process** Kuang-Hua Daphne Chou,2002 **Proceedings of the 1998 IEEE International Conference on Acoustics, Speech,**

and Signal Processing ,1998

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