

BOOK OF Abstracts

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Presentation

The aims of the International Workshop of Statistics and its Applications (IWSA'23) is to promote academic exchange experiences and research results and cooperation in the field of Statistics and its applications. IWSA'23 provides an opportunity for young researchers to network, exchange ideas and present their research to the international community. The discussion on the latest results, problems and challenges they face in statistics and its applications is also encouraged. In addition, this workshop is dedicated to providing an efficient exchange platform for experts and scholars in Algeria and abroad who are engaged in related fields to share their experiences, innovative ideas, and different technologies...

The overall purpose of the first edition of this workshop is to:

- provide a forum for researchers, doctors and students to exchange new ideas and discuss about research topics and applications.
- present the latest statistical research results related to their applications in several fields: socioeconomic, biological, medical, computing,... etc.
- promote and strengthen the dialogue between different scientists in the field of statistics and other domains, in particular: biology, chemistry, medicine, computer sciences, engineering, etc.
- present the national potential in the field of research.
- organize workshops group that are great for building relationships and solving real life problems.

Invited Speakers

- Prof. Mohamed CHAOUCH, University of Qatar, Qatar. Title:Regression estimation for continuous time functional data processes with missing at random response
- Prof. Abderahmane YOUSFATE, University of Sidi Bel-Abbès- Djilali Liabes, Algeria

Title: On multivalued markovian functions of Markov chains

- Prof. Salim BOUZEBDA, University | GI Génie Informatique | LMAC France. Title:Semiparametric M-estimators and their applications in change-points.
- Prof. Vlad Stefane BARBU, University of Rouen Normandy, France. Title:Statistical inference based on divergence measures
- Prof. Karima BELAIDE, University A/Mira of Béjaia, Algeria Title:Fractional processes of order 1 with mixing errors

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Keynote Speakers

Regression estimation for continuous time functional data processes with missing at random response

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Abstract:

In this paper, we are interested in nonparametric kernel estimation of a generalized regression function based on an incomplete sample $(X_t, Y_t, \varsigma_t), t \in [0, T]$ copies of a continuous-time stationary and ergodic process (X, Y, ς) . The predictor X is valued in some infinite-dimensional space, whereas the real- valued process Y is observed when the Bernoulli process $\varsigma = 1$ and missing whenever $\varsigma = 0$. Uniform almost sure consistency rate as well as the evaluation of the conditional bias and asymptotic mean square error are established. The asymptotic distribution of the estimator is provided with a discussion on its use in building asymptotic confidence intervals. To illustrate the performance of the proposed estimator, a first simulation is performed to compare the efficiency of discrete-time and continuous-time estimators. A second simulation is conducted to discuss the selection of the optimal sampling mesh in the continuous-time case. Then, a third simulation is considered to build asymptotic confidence intervals. Finally, an application to financial time series is used to study the performance of the proposed estimator in terms of point and interval prediction of the IBM asset price log-returns.

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On multivalued markovian functions of Markov chains

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Abstract:

Problem of univalued transformation conserving the property of Markov Process $(X_t)_{t\in\mathbb{T}}$, $\mathbb{T} \subset \mathbb{R}$ is formulated by many authors since the middle of the last century. We cite Burke and Rosenblatt [2] which consider essentially aggregation on recurrent discrete states of a Markov process with an invariant measure on states. We cite also work of Kemeny and Snell [5] using the both approaches of Dynkin [3] and of Rogers-Pitman [8]. Using Kemeny and Snell studies, many other authors have developed results based on some aggregation of states also known as lumpability which consists to aggregate states under some conditions. In this work, we consider a class of homogeneous irreducible discrete states Markov process $(X_t)_{t\in\mathbb{T}}, \mathbb{T} \subset \mathbb{R}$ taking values in a partition of some topological space E. Using multivalued transformation φ , we introduce a notion of fractional state which allows to build $(\varphi(X_t))_{t\in\mathbb{T}}$ such that this transformed process remains a Markov process. The investigation is focused on expanded Markov chains resulting from $(X_t)_{t\in\mathbb{T}}$ by using split states, named fractional states. Finally, using this expansion, we give a necessary and sufficient condition under which the transformed process $(\varphi(X_t))_{t\in\mathbb{T}}$ remains still a Markov chain.

Keywords: Expanded Markov chain, fractional state, Markov chain, multivalued transformation.

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Semiparametric M-estimators and their applications in change-points

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Abstract:

In this presentation, we are concerned with the semiparametric models. These models have success and impact in mathematical statistics due to their excellent scientific utility and intriguing theoretical complexity. In the first part of the talk, we consider the problem of the estimation of a parameter 'theta', in Banach spaces, maximizing some criterion function that depends on an unknown nuisance parameter h, possibly infinite-dimensional. We show that in a general setting, the m out of n bootstrap is weakly consistent under conditions similar to those required for weak convergence of the non-smooth M-estimators. The second part of the talk is devoted to the statistical models with multiple changepoints. The main purpose of this part is to investigate the asymptotic properties of semiparametric M-estimators with non-smooth criterion functions of the parameters of multiple change-points model for a general class of models in which the form of the distribution can change from segment to segment and in which, possibly, there are parameters that are common to all segments. Consistency of the semiparametric M-estimators of the change-points is established and the convergence rate is determined. The asymptotic normality of the semiparametric M-estimators of the parameters of the within-segment distributions is established under quite general conditions. We finally extend our study to the censored data framework. We investigate the performance of our methodologies for small samples through simulation studies.

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Statistical inference based on divergence measures

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Abstract:

This presentation is concerned with statistical methodology based on divergence measures. Divergence measures are of great importance in statistical inference. Equally important are their limiting versions, known as divergence rates. In the first part of our presentation, we focus on generalized divergence measures for Markov chains. We consider generalizations of Alpha divergence measure (Amari and Nagaoka, 2000) and Beta divergence measures (Basu et. al, 1998) and investigate their limiting behaviour. We also study the corresponding weighted generalized divergence measures and the associated rates (Belis and Guiasu, 1968; Guiasu, 1971; Kapur, 1994). Special attention is paid to the generalized form of the popular Cressie and Read power divergence class of measures. Illustrative 2-state and 3-state Markov chain examples are furnished and analyzed. In the second part of our presentation, we focus on a goodness of fit tests associated with a test of homogeneity between two samples and we study their performance. This type of tests constructed based on a particular type of discrepancy measures called weighted divergences. These measures allow us to focus on specific subsets of the support without, at the same time, losing the information of the others. With this method we achieve a significantly more sensitive test than the classical ones but with comparable error rates. We end our presentation with some elements of test statistics based on the family of weighted f-divergences for general order Markov chains. A weight matrix treats the issue of the presence (or not) of prior information on the transitions of the system. That methodology could be adapted in the framework of homogeneity or goodness-of-fit for Markov chains. The appropriate asymptotic theory is presented according with Monte Carlo simulations for assessing the performance of the proposed test statistics.

Keywords: Divergence measures, weighted divergence measures, entropy, Markov processes, hypotheses testing.

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Fractional processes of order 1 with mixing errors

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Abstract:

The first part of this work is devoted to the study of the main properties of fractional autoregressive models of order 1 with mixing errors. Two models will be presented. We present the asymptotic behavior of the auto-covariance function and the auto-correlation function. The second part is devoted to the study of the local asymptotic normality property (LAN) of the two models considered, we will give the quadratic decomposition of the log likelihood ratio function and its asymptotic distribution.

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Oral presentations

1. Local linear modelling of the conditional cumulative distribution function: functional ergodic data case

Somia Ayad & Saâdia Rahmani University of Saida, Algeria ayadsomia18@gmail.com

Abstract:

In this work, we consider the problem of the local linear estimation of the conditional distribution function when the regressor is valued in an infinite dimensional space, the response is a scalar and the data are observed as ergodic functional time series. We build under this dependence structure a local linear estimator of the conditional distribution function, and we establish under a general assumptions the uniform almost complete convergence (with rate). The relevance of the proposed estimator is verified through a simulation study.

Keywords: Ergodic data, functional data, local linear estimator, conditional distribution function, nonparametric estimation and asymptotic properties.

- 1. Ayad, S., Laksaci, A., Rahmani, S. and Rouane, R. (2020). On the local linear modelization of the conditional density for functional and ergodic data. METRON, 78, 237-254.
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- 3. Bouanani, O., Rahmani, S. and Ait-Hennani, L. (2019). Local linear conditional cumulative distribution function with mixing data. Arabian Journal of Mathematics, 1-19.
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2. Nonparametric estimation of the mean hitting times for semi-Markov processes

<u>Chafiâa Ayhar</u>, Vlad Stefan Barbu, Fatiha Mokhtari & Saâdia Rahmani University of Saida, Algeria ayharchafiaa@yahoo.com

Abstract:

We consider a semi Markov process with a finite state space. We use the kernel method to introduce the nonparametric estimators of some indicators of technical systems, such as the mean up time (MUT) and the mean down time (MDT) of an arbitrary finite semi-Markov process. Strong consistency and asymptotic normality are proved for the constructed estimators, as the time interval of observation becomes large.

Keywords: Semi-Markov processes, kernel estimator, mean time to failure, mean up time, consistency, asymptotic normality.

- 1. Ayhar, C., Barbu, V.S., Mokhtari, F., Rahmani, S. (2022). On the asymptotic properties of some kernel estimators for continuous-time semi-Markov processes. Journal of Nonparametric Statistics, 34(1), 1-21.
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3. Robust estimation of the conditional Mode in functional statistics

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Abstract:

In this paper, we consider a new estimator of conditional mode of a scalar response variable given a functional random variable in i.i.d. case. This estimate technique boosts the robustness of conditional mode estimation and broadens its use to supervised classification challenges. We establish under standard assumptions the almost complete consistency of this estimator.

Keywords: Mode estimation, quantile regression, nonparametric estimators.

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4. Exponential inequalities for Mann's Stochastic Scheme with Random Errors

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Abstract:

This work deals with the Mann's stochastic iteration under functional random errors. At first, we establish an exponential inequality of Brenstien-Frechet that enable us to prove the almost complete convergence to the fixed point. Then, we specify the rate of convergence of this algorithm.

Keywords: Fixed point iteration; exponential inequality; rate of convergence.

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5. Vector error correction model (VECM) estimate in long-term relationship studies with application

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Abstract:

Vector Error Correction Model is a cointegrated VAR model. We analyze the long-term relationship inference in (VECM), which comprises of an error-correction term derived from the known estimated long term relationship, and a VAR model of the order P on the differences of the variables. A VECM creates a short-term relationship between the variations while optimizing for differences in the long term. The data used in this work relate to the production of crud oil of the OPEC member countries, and the exports of these countries over a period of 5 years, the observations are monthly from January 2003 to January 2008, by using statistical software R.

Keywords: The maximum eigenvalue, VAR, Johansen's procedure, VECM, causality

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6. Strong uniform consistency rate of a relative regression function estimator for left truncated and right censored data under α -mixing condition

Nassima Bayarassou, F. Hamrani & E. Ould Said U.S.T.H.B., Algeria bayarassounassima@gmail.com

Abstract:

In this work, we propose a nonparametric estimator of the regression function and study its asymptotic properties when the response variable is subject to both left truncation and right censoring. The estimator is constructed by minimizing a loss function based on the mean squared relative error. Under α - mixing hypothesis, we establish its strong uniform consistency with a rate over a compact set. A large simulation study with one and bi-dimensional regressor is conducted to show the good behavior of our estimator.

Keywords: Kernel estimate, relative error regression, strong mixing condition, truncated-censored data, uniform almost sure consistency.

- 1. Bey, S., Guessoum, Z., Tatachak, A. (2022). Kernel regression estimation for LTRC and associated data. Communications in Statistics Theory and Methods, 1-26.
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7. Asymptotic properties of regression operator in local linear estimation with missing at random data

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Abstract:

In this paper, we consider the problem of the co-variability analysis between a functional variable X and a scalar response variable Y which is not totally observed. We use the local linear approach to model this relationship by constructing a local linear estimator of the regression operator when missing data occur in the response variable. Asymptotic results, in term of the pointwise almost complete consistencies, is established for the constructed estimator.

keywords: Local linear method, missing data, regression operator, almost complete convergence.

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8. Asymptotic normality of a kernel estimator of conditional cumulative distribution function via the functional single index structure

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Abstract:

The main of this paper is to treat the estimation of conditional distribution function for functional data. We defined the L1 norm estimator. Under some assumption in functional data analysis the asymptotic normality of estimator is established.

Keywords: Asymptotic normality, functional data, single index model, conditional cumulative distribution function.

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9. Estimation in functional autoregressive models with random coefficients

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Abstract:

This work is concerned with autoregressive models in which the coefficients are assumed to be non constant but rather subject to random perturbations, so we are considering the class of first-order Random Coefficients Hilbertian Autoregressive models (RCHA(1)). For this models, we derive limit theorems: strong law of large numbers, exponential bounds with convergence rate and central limit theorem. Next, we deal with estimators of the mean of random operators ruling a functional autoregressive process equation. Under mild conditions on the decay rate of the regularizing parameter and using the martingale approaches, the estimates are shown to be strongly consistent and the asymptotic normality is also ensured. We then develop a full-fledged estimation theory for term variance of the correlation and show its convergence. These results extend and improve those that have been established in the frameworks of standard functional AR processes. Simulated and real data examples are used to illustrate the performance of the associated predictors and showing competitive results.

keywords: AR process; covariance operators; random coefficients; resolvent estimators.

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10. On the nonparametric estimation of conditional Kendall's tau with functional covariate

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Abstract:

This article deals with the conditional dependence measure, conditional Kendall's tau estimation when the covariate is functional taking value in some abstract spaces. We study nonparametric estimator of conditional Kendall's tau. We prove the consistency and the asymptotic law of the proposed nonparametric estimator.

Keywords: Conditional Kendall's tau; functional covariates; kernel smoothing.

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11. Crude oil import and product forecasting based on long memory-ARFIMA model

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Abstract:

We study the time series of the production and importation of crude oil. We fitted an Autoregressive Fractionally-Integrated Moving-Average Model to the measured data using monthly records covering January 1986 to January 2005. Hurst method is used to estimate the process ARFIMA. Forecasts based on Long Memory-ARFIMA Model are performed.

Keywords: Time Series, ARFIMA, production, import, crude oil.

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12. Shrinkage estimation for some fractional Brownian motion models

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Abstract:

We consider the problem of efficient estimation for the drift parameter $\theta \in \mathbb{R}$ d in the linear model $Z_t := \theta_t + \sigma_1 B^{H_1}(t) + \sigma_2 B^{H_2}(t), t \in [0, T]$. Where B^{H_1} and B^{H_2} are two independent d-dimensional fractional Brownian motions with Hurst indices H_1 and H_2 such that $\frac{1}{2} \leq H_1 < H_2 < 1$. The main goal is to provide a sufficient condition for the James-Stein type estimators of θ , which dominate the maximum likelihood estimator.

Keywords: Maximum likelihood estimator, fractional Brownian motions, drift parameter, Stein estimation.

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13. Estimation of kernel conditional density function under long range dependence

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Abstract:

For nonparametric statistics, the conditional density function plays a significant role. It is used to characterize the relationship between two phenomena in various applied areas. In this work, we study the nonparametric conditional density estimation for long range dependent linear process co-variable, from which we establish some asymptotic results .

Keywords: Conditional density, long range dependence, stationary process, ergodic property.

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14. Nonparametric estimation of the stationary distribution for the discrete and continuous time for semi-Markov process

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Abstract:

The aim of this work is to present a nonparametric estimator of the stationary distribution for discrete and continuous time for semi-Markov process. We present empirical estimators of the stationary distribution of the embedded Markov chain and of the mean sojourn time. The key results presented here are the asymptotic characteristics of these estimators as the strong consistency and the asymptotic normality.

Keywords: Semi-Markov chain, semi-Markov processes, empirical estimator, limit distribution, Markov chain, mean sojourn time, consistency, asymptotic normality.

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15. Extropy-based goodness of fit tests

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Abstract:

The extropy measure is a complementary dual function of Shannon entropy which was proposed by Lad et. al. (2015). This measure of uncertainty have received a considerable attention in the last few years. In this work, we developed a goodness-of-fit tests for uniformity based on a new extropy estimators. Two methods of estimation for the extropy measures based a progressively Type-II censored data are derived. Extropy-based tests of uniformity are proposed. The power values of the proposed tests are simulated and studied under various alternatives to see the effectiveness of the proposed tests.

Keywords: Extropy, uniformity, goodness-of-fit test, nonparametric statistics, Monte Carlo simulation.

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16. The almost sure convergence of the recursive kernel estimate of the conditional hazard function form censored functional erogdic data

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Abstract:

In this paper, we propose a nonparametric estimator of the conditional hazard function weighted on the recursive kernel method given a explanatory variable taking values in a semi-metric space when the scalar response is a censored. Under ergodicity condition, we establish the almost surely convergence rate of this estimator.

Keywords: Conditional hazard function, censored data, functional ergodic data, recursive kernel estimate.

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17. Asymptotic analysis of a kernel estimator for parabolic stochastic partial differential equations driven by sub-fractional Brownian motion

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Abstract:

The main objective of this paper is to investigate the problem of estimating the time-varying coefficient in a stochastic parabolic equation driven by a sub fractional Brownian motion. The equation is assumed diagonalizable, that is, all the operators have a common system of eigen-functions. Based on the existence and uniqueness of the solution, we then obtain a kernel estimator of time-varying coefficient and the convergence rates.

Keywords: Sub-fractional Brownian motion, kernel estimator, stochastic partial differential equations, nonparametric estimation.

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18. On parameter estimation for stochastic differential equations with small noise

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Abstract:

We deal with one-dimensional parametric delay estimation for nonlinear processes of diffusion type:

$$dX_t = S(X_{t-\theta})dt + \varepsilon dW_t, \quad 0 \le t \le T,$$
(1)

$$X_s = x_0, \quad s \le 0 \tag{2}$$

where $S(\Delta)$ is a given regular function, the parameter to be estimated is $\theta \in (0, T), x_0$ is fixed and W_t is a Brownian motion. We propose to estimate the parameter θ from observations of complete trajectories $X^{\varepsilon} = \{X_t, 0 \leq t \leq T\}$ over the fixed time interval the fixed time interval [0, T], and to study the asymptotic properties asymptotic properties of the maximum likelihood estimator of the parameter in the framework of small diffusions We show that this estimator is consistent, asymptotically normal and asymptotically efficient. The particularity of this model can be illustrated as follows. If we write (1) in integral form and change the variables $t \to t - \theta$, then for $t \geq \theta$ we obtain the representation

$$X_{t-\theta} = x_0 + \int_0^{t-\theta} (X_{s-\theta}) ds + \varepsilon W_{t-\theta}$$

Therefore the drift $S(X_{s-\theta})$ in the equation (1) has no even the first derivative w.r.t. t.

Keywords: Delayed SDE, parametric estimation, uniform asymptotic normality, Fisher information, maximum likelihood estimator

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19. Fixed-effects models

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Abstract:

In statistics, fixed effect is a statistical regression model in which the intercept of the regression model is allowed to vary freely across individuals or groups. It is often applied to panel data in order to control for any individual-specific attributes that do not vary across time. This model have been used in many applications including in political science, econometrics, bio statistics, sociology, finance and marketing. The objective of this work is to provide a general introduction to some of the basic issues of panel data analysis; we describe the fixed effect model, application using R software to show the manageability of the model.

Keywords: Fixed effects, panel data, R software, regression model.

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20. Period determination using robust regression for unevenly spaced time series

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Abstract:

In this paper we consider the problem of spectral analysis for unevenly spaced time series. We extend the result of quantile periodogram developed in [2] for unevenly sampling. The ultimate goal of this study is to investigate the asymptotic property of the quantile periodogram for unevenly spaced time series. We demonstrate the usefulness of the proposed periodogram in detecting the hidden frequency from the time series with big gaps and outliers. We evaluate the performance of our periodogram function using simulations.

Keywords: Quantile regression, periodicity, unevenly spaced, time series analysis.

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21. Some results on quadratic credibility premium using the balanced loss function

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Abstract:

This paper generalizes the quadratic framework introduced by LE COURTOIS(2016) and SUMPF(2018), to obtain new credibility premiums in the balanced case, i.e. under the balanced squared error loss function. More precisely, we construct a quadratic credibility framework under the net quadratic loss function where premiums are estimated based on the values of past observations and of past squared observations under the parametric and the non-parametric approaches, this framework is useful for the practitioner who wants to explicitly take into account higher order (cross) moments of past data.

Keywords: Quadratic credibility, loss function, credibility premium, parametric approach, nonparametric approach.

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22. On the robust nonparametric regression estimation: complete and censored data cases.

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In this work, we investigate a nonparametric robust estimation of the regression function based on a kernel method. when the interest random variable T is completely or not completely observed. Among incomplete data models we are interested in right-censoring. Furthermore, the covariates takes values in an infinite dimensional space. So, under some mild assumptions, the strong consistency (with rate) and the asymptotic normality of the estimator is stated and without any use of traditional mixing conditions.

Keywords: Robust estimation, censored data, Kaplan-Meier estimator, nonparametric regression, functional data, asymptotic normality.

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23. The k-nearest neighbors method in single index regression model

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Abstract:

In the present work, we consider the k-Nearest Neighbors method in single index regression model when the explanatory variable is valued in functional space, and under the quasi-association dependence condition. The main result of this work is the establishment of the asymptotic properties of the k-NN kernel single index estimator.

Keywords: Asymptotic properties, k-nearest neighbors (k-NN), single functional index model, weak dependence.

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24. Exact quadratic error of the local linear regression operator estimator for functional covariates

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Abstract:

In this work, it is studied the asymptotic behavior of the nonparametric local linear estimation of the regression operator when the covariates are curves. Under some general conditions we give the exact expression involved in the leading terms of the quadratic error of this estimator.

Keywords: Local linear estimation; functional data analysis; regression operator.

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25. On inference and forecasting in periodic generalized integer-valued AR(p) models

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Abstract:

This contribution proposes a periodic integer-valued autoregressive model, based on generalized thinning operator (hereafter referred to

as P-GINAR(p), to analyze the number of certain arrivals in a fixed time interval with seasonal behavior. We provide four statistical inference procedures, namely: three estimation methods including the conditional least squares (CLS) method, the conditional maximum likelihood (CML) method, and the local asymptotic minimax (LAM) method as well as a test procedure to test the periodicity. Moreover, The asymptotic properties of the estimators are established. For the forecasting issue, we propose: the conditional expectation forecast method, the conditional median forecast method, and the efficient probabilistic forecast method. Further, both the exact and the approximate h-step ahead conditional distribution of the model will be given using some parametric and non-parametric representations. The performances of the obtained inference procedures and predictors will be evaluated via an intensive simulation study and application on real data cases.

Keywords: Periodic GINAR (p) model, efficient estimators, conditional expectation and median forecast, efficient probabilistic forecasts, optimal test.

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26. Testing for equal predictability of a stationary two dimensionally indexed autoregressive moving average model

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Abstract:

This paper deals with a measure of predictability of a random field following a stationary twodimensionally indexed autoregressive moving-average (2-D ARMA). Our purpose is to give a characterization of equal predictability processes by providing necessary and sufficient conditions, which highlight the role of the coefficients of the moving average (MA) and the equivalent autoregressive (EAR) representations and implement a procedure allowing to carry out a test of equal predictability. A simulation study and an application to real data of wheat yield are giving to illustate the validity of our result.

Keywords: Stationary random fields, 2-D ARMA model, moving average representation, autoregressive representation, predictability.

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27. A hybrid model for forecasting Carbon Dioxide emissions in Algeria

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Abstract:

The main objective of this paper is to implement hybrid models for forecasting time series. We have dealt with CO2 emission in Algeria since 1916 to 2020 using hybrid technique, linear and nonlinear models. We decompose the time series using singular spectrum analysis then we treat the results using Auto Regressive Integrated Moving Average model and Support Vector Machine.

Keywords: Forecast, autoregressive integrated moving average, support vector machine, singular spectrum analysis, hybrid model.

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28. On the nonparametric estimation of the conditional empirical process with functional ergodic data

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Abstract:

The purpose of this paper is to establish the invariance principle for the conditional set-indexed empirical process formed by functional ergodic random variables. The limit theorems, discussed in this paper, are key tools for many further developments in functional data analysis involving empirical process techniques. These results are proved under some standard structural conditions on the Vapnik-Chervonenkis classes of functions and some mild conditions on the model.

Keywords: Conditional distribution, Nadaraya-Watson regression estimator, empirical process, ergodic, functional data, semi-metric space, small ball probability.

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29. Estimation and simulation of the conditional cumulative distribution function

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Abstract:

We consider estimation of the conditional cumulative distribution function of a scalar response variable Y given a Hilbertian random variable X when the observations are linked via a single-index structure in the quasi-associated framework. A kernel type estimator is proposed and the pointwise and uniform almost complete convergence (with the rate) is proved. A simulation is given to illustrate the good behavior in the practice of our methodology.

Keywords: Kernel estimator, single-functional index model, conditional cumulative distribution function, functional random variable, quasi-association.

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30. Parametric uncertainty propagation for financial models

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Abstract:

In this work, we propose a numerical method, based on the Taylor series expansion, to calculate the uncertainty of the financial model due to the epistemic uncertainties of its parameters. More precisely, we consider the Black-Scholes-Merton model where we assume that the parameters are derived from a finite number of observations, they will themselves have an epistemic uncertainty associated to them. In order to illustrate the applicability of the proposed method, a numerical example is discussed and the results obtained are compared to the corresponding Monte Carlo simulations (MCS).

Keywords: Parametric uncertainty, financial model, Taylor series expansion, Monte Carlo simulations.

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Poster presentations

1. Hurst index estimation for the Rosenblatt process

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Abstract:

The Rosenblatt process is the simplest non-Gaussian Hermite process. It's self similar process and it shares the same covariance function as fractional Brownian motion. The statistical estimation of the Hurst index is one of the fundamental problems in the literature of long-range dependent and selfsimilar processes. In this work we construct an estimator for the self-similarity parameter of Rosenblatt process.

Keywords: Rosenblatt process, quadratic variation, self-similarity, parameter estimation, hurst index.

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2. Recursive nonparametric estimation of the conditional distribution function: left truncated data under α -mixing condition

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Abstract:

In this work, we discuss a question that is often asked repeatedly in the context of statistical studies, namely the presence of incomplete data in the dataset. Therefore, our goal is to study the recursive nonparametric estimation of the conditional distribution function of a vectorial response valued variable Y explained by a Hilbertian random variable X = x, based on the double-kernel approach. And because we are always looking for more credible methods that are in line with the research methodology, then, it is well known that the recursive methods are more efficient than its nonrecursive rival. Whereas, the variable of interest Y is left truncated by another variable T, that is, the random variables Y and T are observed if and only if $Y \ge T$; otherwise nothing is observed if Y < T. Under general mixing conditions, we first establish its strong uniform consistency from which we deduce the ones of the conditional quantile function estimator.

Keywords: Nonparametric recursive estimate, conditional distribution, left truncation, conditional quantile, functional data, α -mixing, uniform almost sure convergence.

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3. Comparative study of forecasting models on survey data

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Abstract:

The purpose of this research is to evaluate forecasting models based on decision trees, logistic regression and for the realization of a decision support system on data and to compare their performance. The users of such a decision support system will be decision makers, mostly experts in financial analysis, or credit risk managers in banks, or bank supervisors or doctors looking for a diagnosis. In our case, we will be interested in some of the diseases described in the TAHINA survey conducted in 2007 by the National Institute of Public Health and the possible causal relationships between them, such as possible causal relationships between them as suggested by specialists. We will be interested in some diseases that can be predicted from the symptoms found.

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4. Estimation of the self-similarity parameter of Q-sub-fractional Brownian motion

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Abstract:

The aim of this work is to analyze the asymptotic behavior of the adjusted quadratic variation for a sub-fractional Brownian motion. We apply our results to construct strongly consistent statistical estimators for the self-similarity of Q-subfractional Brownian motion with Malliavin calculus.

Keywords: Sub-fractional Brownian motion, Q-sub-fractional Brownian motion, self similarity, Hilbert-Schmidt operator, Malliavin calculus.

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5. Sensitivity analysis of classical risk model based on multivariate probability bounds

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Abstract:

Sensitivity analysis in risk models is a method of evaluating the impact that variations in the inputs of a model have on the output, or risk estimate. This helps to determine how sensitive the risk estimate is to changes in specific parameters or variables and can be used to identify key drivers of risk. The aim of sensitivity analysis in classical risk models is to determine the robustness of the risk estimate and identify any parameters or variables that may signi?cantly impact the overall risk outcome. This information can then be used to improve the accuracy of the risk model or to make informed decisions about risk management.

Keywords: Risk, sensitivity analysis, multivariate Taylor-series expansions, Monte Carlo simulation.

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6. On the volatility estimation via the Girsanov formula

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Abstract:

In order to estimate the volatility, we determine the price of European Call in the Black-Sholes model via the Girsanov's theorem which allows us to transit the objective probability towards the neutral risk probability and the representation of Faynman-kac that's valued the European Call as a conditional expectation in the risk neutral world.

Keywords: Brownian motion, probability measure, estimation, stochastic processus.

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7. On the estimation of the derivative and the maximum of the conditional hazard function

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Abstract:

The maximum of the conditional hazard function is a parameter of great importance in seismicity studies, because it constitutes the maximum risk of occurrence of an earthquake in a given interval of time. using the kernel nonparametric estimates of the first derivative of the conditional hazard function, we establish uniform convergence properties and asymptotic normality of an estimate of the maximum in the context of strong mixing dependence.

Keywords: Strong mixing processes, conditional distribution, conditional density, conditional hazard function, functional data, nonparametric estimation.

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8. Statistical models of chaotic systems

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Abstract:

Chaotic systems are highly complex and often exhibit unpredictable behavior that is difficult to model mathematically. They are especially interesting for several reasons. First of this definition, any system with random elements will be a chaotic system. Secondly, chaotic systems have emergent behavior that cannot be predicted by its individual components. However, there are several statistical models that have been developed to describe chaotic systems and used to better understand and predict their behavior. Statistical models are mathematical models that use probability distributions and statistical methods to analyze chaotic systems. They can be used to identify patterns, make predictions, and analyze the behavior of chaotic systems. Some of the most well-known statistical models of chaotic systems are: Lyapunov exponents, Fractal dimension, Correlation dimension, Kolmogorov-Sinai entropy, and Probabilistic cellular automata. In this poster we will give an overview to this interesting topic in order to clear the next steps for future works.

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9. The uniform almost complete convergence of the conditional quantile in the functional single-index

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Abstract:

In this paper, we study the almost complete uniform convergence of the conditional quantile estimator obtained by the kernel method in the functional model.

Keywords: Conditional quantile, conditional cumulative distribution.

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10. Estimation and prediction of functional autoregressive processes with random coefficients

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Abstract:

We study the statistical prediction and estimation of continuous time stochastic process, admitting a functional autoregressive random coefficient representation and we generalize the results obtained by Bosq, Mourid and Pumo for an Hilbertian autoregressive and C-valued processes. In order to predict a continuous time process on an entire-time interval, we introduce the C[0, 1]-valued autoregressive process of first order with random coefficient. We propose an estimator of this coefficient by projecting data on a finite dimensional subspace and under mild regularity conditions, we show that the predictor based upon his random coefficient converges in probability.

Keywords: Hilbert space, autoregressive process, continuous time process, prediction.

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11. M-regression function estimate for continuous time stationary and ergodic data

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Abstract:

In this paper, we present some asymptotic properties results of the M-regression function kernel estimate in the setting of continuous times stationary and ergodic data. Such dependence structure is an alternative to strong mixing conditions usually assumed in functional time series analysis. More precisely, considering the kernel type estimator of the robust regression function built upon continuous time stationary and ergodic data $(X_t, Y_t)_{t\geq 0}$, the almost sure pointwise consistency (with rates) of this estimator is stated. Useful application to prediction is given.

Keywords: Ergodic data, continuous time processes, M-regression, rate of convergence.

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12. Statistical analysis of a single-server Markovian feedback queueing model with balking

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Abstract:

We consider a single-server Markovian queueing model with Bernoulli feedback and balked customers. If the service is incomplete and/or unsatisfactory, each customer may return to the system as a Bernoulli feedback customer to receive another regular service. Otherwise, he leaves the system definitively with a complementary probability. In addition, on arrival, customers, based on queue length and the state of the system, may enter the queue with some probability or quit the system with complementary probability. An estimator of the traffic intensity of the proposed queue is presented. Then, confidence intervals and testing hypotheses are discussed.

Keywords: Queueing models, balking, Bernoulli feedback, traffic intensity, confidence interval, hypothesis testing.

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