

Adaptive Estimation of Periodic Regression Model in Short Panel Data

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Abstract

This paper proposes the use of the adaptive estimation method for estimating the periodic regression parameters in short panel data. This will go through three phases. The first phase aims to show that the periodic regression model verifies the Uniform Local Asymptotic Normality (ULAN), the second phase focuses on constructing the Locally Asymptotically Minimax (LAM) estimators, and the last phase deals with constructing the Adaptive Estimators (AE) of the periodic regression model using the results of phase one and phase two. The results obtained in the simulation show that the Adaptive Estimator is always better than the Least Squares Estimator. The AE is more efficient in the case of an asymmetric score function.

Keywords: Periodic regression model, Panel data, Uniform local asymptotic normality, Adaptive estimators.

Asymptotic behavior of the positive global solution of a stochastic model

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Abstract

In this work, we explore a stochastic model and show that this model has a unique global positive solution that belongs to a positively invariant Set. Then by stochastic Lyapunov functional methods, we deduce the free equilibrium's global asymptotical stability and exponential mean square stability. Furthermore, we investigate the asymptotic behavior of the solution around the endemic/positive equilibrium of the deterministic model.

Keywords: Asymptotically stable in the large, Stochastic Lyapunov function, Global positive solution, Stochastic perturbation

Computation of the steady-state probability of Markov chain evolving on a mixed state space

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Abstract

The partitioning algorithm is an iterative procedure that computes explicitly the steady-state probability of a finite Markov chain X . In this paper, we propose to adapt this algorithm to the case where the state space $E := C \cup D$ is composed of a continuous part C and a finite part D such that $C \cap D = \emptyset$. In this case, the steady-state probability π of X is a convex combination of two steady-state probabilities π_C and π_D of two Markov chains on C and D respectively. The obtained algorithm allows to compute explicitly π_D . If π_C cannot be computed explicitly, our algorithm approximates it by numerical resolution of successive integral equations. Some numerical examples are studied to show the usefulness and proper functioning of our proposal.

Keywords: Markov chain, steady, state probability, coupling from the past, mixed CFTP, perfect simulation.

Economic Growth and Interest Rates: Exploring the Links

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Abstract

This study focuses on potentially modeling the relationship between economic growth and interest rates based on economic data. We succinctly analyze historical trends, economic models, and empirical evidence to determine the existence and nature of this connection. The goal is to unravel whether adjustments in interest rates have a significant impact on the trajectory of economic growth.

Keywords: economic growth, interest rate.

Magnetic properties and compensation temperatures of a graphene bilayer: Monte Carlo simulations

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Abstract

The Monte Carlo simulation was used to examine the magnetic properties and compensation behavior of a graphene bilayer. The effects of exchange interactions, longitudinal crystal field, external magnetic field and temperature on the magnetization, magnetic susceptibility, phase diagrams and hysteresis loops of the graphene bilayer system were examined. Interesting results, such as compensation and multi-loop hysteresis behaviors, were obtained for specific values of the physical parameters of the system. By comparison, our results were in agreement with other theoretical investigations.

Keywords: Monte Carlo simulations, Graphene, Mixed spin, Magnetic properties.

Medical image segmentation

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Abstract

Medical image processing is a tool to help doctors diagnose the illness and describe the suitable treatment. Our work is about medical image segmentation using the classical model: Hidden Markov Chain. We apply this method to segment some brain tumor RMI images. We segment the image into three homogeneous regions: black matter, white matter, and cerebrospinal fluid. After the segmentation phase, we extract the interest region (tumor) using the threshold technique. We calculate the error rate and the PSNR to validate the performance of HMC model.

Keywords: image segmentation, HMC, RMI images, ROI keywords

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On the importance of verifiable scientific computing in Mathematical Epidemiology

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Abstract

In the talk, I will present our work which started as an attempt to verify the results of a famous paper "Dynamics of an SIR epidemic model with limited medical resources revisited" due to L. Zhou and M. Fan, concerning Hopf and Bogdanov-Takens bifurcations, in which we had spotted a strange result which turned out to be a numerical error. In the process, unlike the paper of Zhou and Fan (more than 200 citations) and several other papers which followed them, we created a Mathematica notebook offered to the reader, where he/she may recover all the results, and also modify them for analyzing similar models. Here, I will highlight the importance of digital support which lead us finally to introduce some interesting symbolic objects, which we call "Groebner eliminated traces and determinants" which seem to have appeared in our work for the first time, and are probably of independent interest.

Keywords: SIR model ; nonlinear force of infection ; bifurcation analysis ; periodic solutions ; co-dimension 1 and 2 bifurcations ; symbolic computing ; Groebner basis.

Optimal control of a Stochastic HIV infection model with the adaptive immune response and two saturated rate

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Abstract

Le but de ce travail est d'appliquer la théorie du contrôle optimal à un modèle stochastique d'infection par le VIH avec la réponse immunitaire adaptative et deux taux saturés. Les contrôles optimaux représentent l'efficacité du traitement médicamenteux pour inhiber la production virale et prévenir de nouvelles infections. Ils sont caractérisés en termes de système d'optimalité, qui est résolu numériquement à l'aide d'une méthode de différences finies semi-implicite

Keywords: Stochastic Optimal Control, Pontryagin's maximum principle, HIV model, Adaptive Immune response, Saturated rates, Therapy.

Perspectives and Experiences of Education Stakeholders: A Quantitative Study on the Adoption of Artificial Intelligence for Learning Assessment.

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Abstract

The recent increase in the use of artificial intelligence has led to fundamental changes in the development of training and teaching methods for executive education. However, the success of artificial intelligence in regional centers for teaching and training professions will depend on the acceptance of this technology by young intern executives. The aim of this article is to study the factors that affect the intentions of young intern executives to accept artificial intelligence.

Based on the unified theory of the acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), This study proposes a model to identify the factors influencing the acceptance of artificial intelligence in regional centers for teaching and training professions in Morocco. A structural equation model was used to analyze the data collected from 173 young intern executives. The results indicate that perceived ease of use, perceived usefulness, trainer influence, and personal innovativeness have an impact on the intention to use artificial intelligence.

Keywords: artificial intelligence, Acceptance of technology, Intention to use, UTAUT model, Personal Innovativeness of Young Intern Executives.

Radial basis functions method for third-kind VIEs

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Abstract

This work presents a numerical method based on Radial basis functions for solving third kind VIEs. This method is an interpolation approach where the radial basis functions are used as basis functions and there is no meshing. The formulation of the technique for suggesting equations is described. In addition, we also study the error analysis of the suggested approach. Finally, illustrative examples demonstrate the reliability and effectiveness of the new approach.

Keywords: Radial basis functions, Third kind VIEs, Meshless method, Error analysis

Stochastic analysis and simulation of a SIR model with general incidence function and immigration: case of Covid-19.

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Abstract

In this paper we propose a stochastic model of the transmission dynamics of Covid-19 epidemic with immigration and vaccination. First, we prove the existence, uniqueness and positivity of the solution of the model. Then, we show that the solution is stochastically ultimately bounded. Next, we discuss the extinction of the SIR epidemic model according to the values of R_0 . Furthermore, we investigate the persistence in the mean of the variable $I(t)$. Finally, Numerical simulations are also presented to illustrate the theoretical results.

Keywords: Covid, 19, immigration, vaccination, white noise, extinction, Persistence.