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**ON THE DYNAMICS OF A DEFORMED VERSION  
OF THE SHIMIZU-MORIOKA SYSTEM**

**Cristian LĂZUREANU, Jinyoung CHO**

**Abstract.** In this paper, we construct a family of integrable deformations of the Shimizu-Morioka chaotic model. We discuss the stability of a particular deformed system which belongs to this family and we emphasize its chaotic behavior. We also perform some numerical simulations in order to show the transition to chaos and the deformation of the chaotic attractor.

*Keywords and phrases:* Hamilton-Poisson systems, integrable deformation, stability, chaotic systems.

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**THE DYNAMICS OF AN UNEMPLOYMENT  
MODEL WITH DISCRETE TIME DELAY  
AND OPTIMAL CONTROL**

**Loredana Flavia VESA**

**Abstract.** The purpose of this paper is to analyze a mathematical model of three ordinary differential equations which describe the unemployment incorporating a discrete time delay and optimal control. The model's investigation focuses on assessing the stability analysis of the equilibrium point as well as the optimal control. Theoretical statements are supported by conducting numerical simulations.

*Keywords and phrases:* unemployment model, stability properties, optimal control.

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## SOME APPLICATIONS OF MONTE CARLO METHOD IN MEDICINE

**Theodora CARTIANU**

**Abstract.** Simulation currently affects our daily lives through our interactions with the automotive industry, airlines, and entertainment. The use of simulation in drug development is relatively new, but its usage is increasing in line with the speed of modern computers. A well-known example of simulation in drug development is molecular modeling. Another use of simulation that has recently been observed in drug development is Monte Carlo simulation in clinical studies. Monte Carlo simulation differs from traditional simulation in that the model parameters are treated as stochastic or random variables rather than fixed values. The purpose of this paper is to provide a brief introduction to Monte Carlo simulation methods. Computer simulation in the pharmaceutical industry is used in the discovery of new drugs, optimization of chemical processes, and most recently, the design of clinical trials. What most people consider "simulation" are models that build or design physical "things". Examples of this type of simulation include the use of computer-aided design (CAD) technology in designing a commercial product such as a car or an airplane, or molecular modeling of drug-receptor interactions. Often, with this class of simulations, the term "modeling" is used interchangeably, such as molecular modeling. For our purposes, models will be differentiated from simulations in that models are built upon data and look back in time, while simulations are based on models and look forward in time.

*Keywords and phrases:* Monte Carlo simulation method, modeling, clinical studies

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## APPLICATION OF R SOFTWARE TO THE DATA OF THE COMPARATIVE STUDY INTRALESIONAL IMMUNOTHERAPY AND CRYOTHERAPY IN THE TREATMENT OF WARTY LESIONS

**Emilia SOUCA**

**Abstract.** For the R software application we have taken two datasets "Immunotherapy" and "Cryotherapy" obtained in comparative study between Intralesional Immunotherapy and Cryotherapy (2) from the database <https://achieve.ics.uci.edu/datasets.php>. This study was conducted in dermatology clinic "Ghaem Hospital", Mashad, Iran. The study enrolled 180 patients diagnosed with verrucous lesions. The selection of the patients for the application of the treatment method was randomized. The patients were included in two treatment groups in equal number, 90 patients received intralesional immunotherapy treatment with Candida antigen, 90 patients received cryotherapy treatment using liquid nitrogen. In this article the data obtained from this study are analysed as a single dataset by aggregating the two data sets, the study authors analysing them individually. Also the statistical analysis was performed using R software unlike the study authors who performed the analysis using a rule-based fuzzy logic system. The results of the statistical analysis, by evaluating the predicted probabilities, showed that Immunotherapy is more effective than Cryotherapy in treating warty lesions. The values of these probabilities are 0.60 for Cryotherapy treatment and 0.89 for Immunotherapy treatment.

*Keywords and phrases:* multiple linear regression, Wald test, Akaike's Informational Criterion

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# SPECTRAL MAPPING THEOREM FOR GENERALIZED EVOLUTION SEMIGROUPS

**Nicolae LUPA**

**Abstract.** In the paper N. Lupa, L. H. Popescu, Generalized evolution semigroups and general dichotomies, Results Math. 78 (2023): 112] the authors introduced a special class of real semiflows in order to associate evolution semigroups to not necessarily exponentially bounded evolution families, called as generalized evolution semigroups. We give a direct proof of the spectral mapping theorem for generalized evolution semigroups.

*Keywords and phrases:* Evolution families, evolution semigroups, spectral mapping theorem

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