

1. Record Nr.	UNINA9910805572103321
Autore	Balandin Dmitry
Titolo	Mathematical Modeling and Supercomputer Technologies : 23rd International Conference, MMST 2023, Nizhny Novgorod, Russia, November 13–16, 2023, Revised Selected Papers // edited by Dmitry Balandin, Konstantin Barkalov, Iosif Meyerov
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2024
ISBN	9783031524707 3031524705
Edizione	[1st ed. 2024.]
Descrizione fisica	1 online resource (326 pages)
Collana	Communications in Computer and Information Science, , 1865-0937 ; ; 1914
Altri autori (Persone)	BarkalovKonstantin MeyerovIosif
Disciplina	621.39 004.6
Soggetti	Computer engineering Computer networks Computer science - Mathematics Artificial intelligence Computer Engineering and Networks Mathematics of Computing Artificial Intelligence
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Organization -- Contents -- Computational Methods for Mathematical Models Analysis -- Dynamics of Honing of Deep Cylindrical Holes with Memory Effects in the Frictional Interaction -- 1 Introduction -- 2 Mathematical Model -- 3 Constructing a Mapping Function -- 4 Numerical Results -- 5 Conclusion -- References -- Application of Elastoplastic Model to the Simulation of the Low-Speed Impact on an Ice Plate -- 1 Introduction -- 2 Problem Formulation -- 3 Rheological Models -- 4 Simulation Results -- 5 Conclusion -- References -- On the Period Length Modulo D of Sequences of Numerators and Denominators of Convergents for the Square Root of a Non-square D -- 1 Introduction -- 2 Preliminaries --

3 The Main Result -- 3.1 Properties of Sequences $\{A_i\}_{i=-1}$, $\{B_i\}_{i=-1}$ for Any Non-square D -- 3.2 Properties of Sequences $\{A_i\}_{i=-1}$, $\{B_i\}_{i=-1}$ for Any Prime p -- 4 Related Works and Further Research -- 4.1 Usage in Image Processing -- 4.2 Further Research -- References -- Linearizing Algorithm for Solving a Nonlinear Initial Boundary Value Problem of Radiation Transfer in Spatially Multidimensional Domains -- 1 Introduction -- 2 Linearizing Algorithm. Theoretical Analysis -- 3 Linearizing Algorithm. Numerical Analysis -- 4 Computational Results -- References -- Empirical Analysis of the Dynamic Processes of Node Appearance and Disappearance in Temporal Networks -- 1 Introduction -- 2 Data and Methodology -- 2.1 Notations and Definitions -- 2.2 Datasets -- 2.3 Data Preparation -- 2.4 Network Reduction Mechanism -- 3 Empirical Results -- 4 Conclusions -- References -- Dynamics of a Multi-piston Vibropercussion Mechanism Equipped with a Reaction Weight -- 1 Introduction -- 2 Vibropercussion Mechanism with a Crank-Type Vibrator and a Reaction Weight -- 2.1 Mathematical Model. 3 Vibropercussion Mechanism with a Crank-Type Vibrator Without a Reaction Weight -- 3.1 Mathematical Model -- 3.2 Numerical Study of Mechanism Dynamics -- 4 Conclusion -- References -- Parametric Perturbations of a Duffing-Type Equation with Nonmonotonic Rotation -- 1 Introduction -- 2 Preliminaries -- 3 Resonances. Averaged System -- 3.1 First Approximation -- 3.2 Second Approximation -- 4 Conclusion -- References -- Competitiveness Function for the Generalized Abrams-Strogatti Model in the Case of Non-constant Community Size -- 1 Introduction -- 2 Materials and Methods -- 2.1 Mathematical Model -- 2.2 Construction of the Competitiveness Function -- 3 Results -- 3.1 Construction of a Training Sample -- 3.2 Restoring the Competitiveness Function -- 3.3 The Case of the Model with k_i , k Coefficients Other Than Zero -- 4 Conclusion -- References -- Parallel Implementation of a Computational Algorithm Based on the Explicit Iterative Scheme for Modeling Subsonic Reacting Gas Flows -- 1 Introduction -- 2 Mathematical Model -- 3 Parallel Algorithm -- 3.1 Description of the Computational Algorithm -- 3.2 Description of the Parallel Program -- 3.3 Parallel Algorithm Efficiency Analysis -- 4 Simulation Results -- 5 Conclusion -- References -- On the Theory of Fluctuations of Strongly Nonlinear (vibroimpact) Systems -- 1 Introduction -- 2 Equations of Motion -- 3 Point Mapping -- 4 Stochastic Stability -- 5 Numerical Experiment -- 6 Conclusions -- References -- A Network Evolution Model with Addition and Deletion of Nodes -- 1 Introduction -- 2 One-In and One-Out Model -- 2.1 The Model -- 2.2 Degree Distribution Analysis -- 2.3 Empirical Results -- 3 Conclusion -- References -- Quantitative Study on the Friendship Paradox in Networks with Power-Law Degree Distribution -- 1 Introduction -- 2 The Quantitative Characterization of the Friendship Paradox. 2.1 Notations -- 2.2 Configuration Model -- 2.3 The Main Result -- 2.4 Numerical Experiments on Simulated Networks with a Finite Size -- 3 The Distribution of Friendship Index in Real Networks -- 4 Conclusion -- References -- Computation in Optimization and Optimal Control -- An Algorithm for Finding the Global Extremum of a Partially Defined Function -- 1 Introduction -- 2 Problem Statement -- 3 Method for Solving the Problems with Partially Defined Objective Function -- 3.1 Global Search Algorithm -- 3.2 Approaches to the Imputation of the Objective Function Values -- 4 Results of Numerical Experiments -- 5 Conclusions -- References -- Evolutionary Global Optimization Survival of the Fittest Algorithm -- 1 Introduction -- 2 Improved Survival of the Fittest Algorithm -- 3 Results -- 3.1

Convergence Proof for Improved SoFa -- 3.2 Comparison of the Improved SoFa Efficiency for Various Parameters -- 3.3 Comparison of the Improved SoFa with Other Methods -- 4 Summary -- References -- Path Tracking Control of a Spherical Robot with Pendulum-Like Driver -- 1 Introduction -- 2 Derivation of Equations of Motion -- 3 Motion Control of the Spherobot -- 4 Optimal Control of Maximal Output Deviations over a Finite Horizon -- 4.1 Maximal Output Deviations -- 4.2 Synthesis of the Optimal Control -- 5 Computer Simulation of Spherobot Dynamics -- 6 Conclusion -- References -- Mathematical Model of Processing Batches of Raw Materials Taking into Account Ripening Process -- 1 Introduction -- 2 Mathematical Model and Auxiliary Statements -- 2.1 Mathematical Model -- 2.2 Auxiliary Lemmas -- 3 Basic Results. Optimal Strategies in the Ripening Process -- 3.1 The Necessary Conditions for an Optimal Schedule -- 3.2 Thrifty/Greedy Strategy -- 3.3 CTG - Optimal Schedule -- 3.4 CTG-Strategy -- 4 Numerical Results and Discussion -- 5 Conclusion -- A Appendix -- References. Artificial Intelligence and Supercomputer Simulation -- Isolation of ECG Sections Associated with Signs of Cardiovascular Diseases Using the Transformer Architecture -- 1 Introduction -- 2 Solutions Overview -- 3 Problem Statement -- 3.1 Method for Solving the Problem -- 3.2 Model Quality Metrics -- 4 Experimental Results -- 4.1 Premature Contraction of the Ventricles -- 4.2 Inferior Myocardial Infarction -- 4.3 Anterior Septal Myocardial Infarction -- 4.4 Left Ventricular Hypertrophy -- 5 Conclusion -- References -- Synchronous Activity in Small Ensembles of Inhibitory Coupled Phi-Neurons -- 1 Introduction -- 2 Two Coupled Non-identical Elements -- 2.1 The Model -- 2.2 Maps of Temporal Patterns -- 2.3 Bifurcation Transitions -- 3 Three Coupled Non-identical Elements -- 3.1 The Model -- 3.2 Symmetrical Couplings -- 3.3 Asymmetrical Couplings -- 4 Conclusion -- References -- The Concept of Hippocampal Activity Restoration Using Artificial Intelligence Technologies -- 1 Introduction -- 2 The Concept of Restoration the Hippocampal Functions -- 2.1 The Structure and Functions of Hippocampus -- 2.2 Advanced Hippocampal Prostheses: A Quick Review -- 2.3 Proposed Approach to Hippocampal Signals Restoring -- 3 Hippocampal Signals Data -- 3.1 Data Collection -- 3.2 Data Preprocessing -- 4 DNN Architecture -- 5 Results -- 6 Conclusion -- References -- Numerical Modeling of Water Ice Impact Destruction -- 1 Introduction -- 2 Material Model and Numerical Method -- 3 Ball-Shaped Impactor -- 3.1 Problem Statement -- 3.2 Numerical Results -- 4 Shock Unloading -- 4.1 Problem Statement -- 4.2 Numerical Results -- 5 Conclusion -- References -- Dilated W-Net for Geological Inversion Problems -- 1 Introduction -- 1.1 Data -- 2 Methods -- 2.1 Network Architecture -- 2.2 Network Tuning Methods -- 2.3 Training Method -- 2.4 Training Pipeline -- 2.5 Metrics for Evaluation. 3 Numerical Experiments -- 3.1 Results for Padding -- 3.2 Results for Dilated W-Net -- 3.3 Architectures Comparison -- 3.4 Training Nuances -- 4 Conclusions -- References -- The Choice of Evaluation Metrics in the Prediction of Epileptiform Activity -- 1 Introduction -- 2 EEG Data -- 2.1 Data Source -- 2.2 Data Preprocessing -- 3 The Model -- 3.1 LSTM Architecture -- 3.2 Measures for the Observational Error -- 4 Results -- 5 Discussion -- 6 Conclusion -- References -- Astrocyte Controlled SNN Dynamic Induced by Sensor Input -- 1 Introduction -- 2 The Model -- 3 Results -- 4 Conclusion -- References -- Experimental Data Compression for GPU-Based Solution of Inverse Coefficient Problem for Vibrational Testing Data -- 1 Introduction -- 2 Mathematical Model -- 2.1 Forward Problem -- 2.2 Inverse Problem -- 3 Results and Discussion -- 3.1 Forward Problem

Solution -- 3.2 Inverse Problem Solution -- 4 Conclusions --
References -- Spiking Reservoir Neural Network for Time Series
Classification -- 1 Introduction -- 2 Preliminaries -- 2.1 Echo State
Network -- 2.2 Liquid State Machine -- 3 Proposed Model -- 3.1
Spiking Reservoir Neural Network -- 3.2 Spiking Neuron Models -- 3.3
Spike Encoding -- 4 Experiment -- 4.1 ECG Heartbeat Categorization --
5 Conclusion -- References -- Author Index.

Sommario/riassunto

This book constitutes selected and revised papers from the 23rd International Conference on Mathematical Modeling and Supercomputer Technologies, MMST 2023, held in Nizhny Novgorod, Russia, during November 13–16 2023. The 18 full papers and 7 short papers presented in the volume were thoroughly reviewed and selected from the 45 submissions. They are organized in topical sections as follows: computational methods for mathematical models analysis; computation in optimization and optimal control; artificial intelligence and supercomputer simulation.
