Dedicated to the 100th Anniversary of the Founding of the Republic of Türkiye

BOOK OF ABSTRACTS

7th INTERNATIONAL CONFERENCE ON COMPUTATIONAL MATHEMATICS AND ENGINEERING SCIENCES

20-21 May
2023, ELAZIĞ - TÜRKİYE

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THE SEVENTH INTERNATIONAL CONFERENCE ON COMPUTATIONAL MATHEMATICS AND ENGINEERING SCIENCES (CMES-2023), ELAZIĞ/TÜRKİYE, MAY 20-21, 2023

The **Seventh International Conference on Computational Mathematics and Engineering Sciences (CMES-2023)** will be held in Firat University from **20- to 21 May 2023 in Elazığ, Türkiye.** It provides an ideal academic platform for researchers and professionals to discuss recent developments in both theoretical, applied mathematics and engineering sciences. This event also aims to initiate interactions among researchers in the field of computational mathematics and their applications in science and engineering, to present recent developments in these areas, and to share the computational experiences of our invited speakers and participants.

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Zakia Hammouch, Ecole Normale Superierue de Meknes, Moulay Ismail University, Morocco

MESSAGE FROM THE GENERAL CHAIRS

Dear Conference Attendees,

We are honored to welcome you to the **Seventh International Conference on Computational Mathematics and Engineering Sciences (CMES-2023)** at Firat University from 20 to 21 May 2023 in Elazığ City, Türkiye.

CMES, founded in 2016 at Faculty of Science and Techniques Errachidia Moulay Ismail University Morocco is an annual intarnational conference, which was very successful in the past years by providing opportunities to the participants in sharing their knowledge and informations and promoting excellent networking among different international universities. This year, the conference includes 200 extended abstracts, several submissions were received in response to the call for papers, selected by the Program Committee. The program features keynote talks by distinguished speakers such as: **Yusif Gasimov** from Azerbaijan University, Baku, Azerbaijan, **M. S. Osman** from Umm Al-Qura University, Makkah, Saudi Arabia, **Delfim F.M. Torres** from University of Aveiro, Portugal, **M.A. Aziz-Alaoui** from University of Le Havre, Normandy, France, **Rachid Yazami** from Nanyang Technological University Singapore, **Vatan Karakaya** from Ahi Evran University, Kırşehir, Türkiye, **Ömer Akın** from TOBB ETÜ University of Economics & Technology, Ankara, Türkiye, **Fernando León Saavedra** from University of Cádiz, Spain, **Bayram Şahin** from Ege University, Türkiye and **Zulqurnain Sabir** from United Arab Emirates University, UAE. The conference also comprises contributed sessions, posters sessions and various research highlights.

We would like to thank the Program Committee members and external reviewers for volunteering their time to review and discuss submitted abstracts. We would like to extend special thanks to the Honorary, Scientific and Organizing Committees for their efforts in making CMES-2023 a successful event. We would like to thank all the authors for presenting their research studies during our conference. We hope that you will find CMES-2023 interesting and intellectually stimulating, and that you will enjoy meeting and interacting with researchers around the world.

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Zakia Hammouch,

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Applied Mathematics,
Financial Mathematics,
Control Theory,
Game Theory
Modeling of Bio-systems for Optimization and Control,
Linear and Nonlinear programming and Dynamics,
Artificial Intelligence,
Geometry and Its Applications,
Analysis and Its Applications,
Statistics and Its Applications,
Mathematics Education and Its Applications,
Algebra and Its Applications.
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Computer Science
Information technology
Electrical and Electronic Engineering
Ordinary, Partial, Stochastic and Delay Differential Equations
Chaos and Dynamical Systems
Numerical methods and scientific programming
Fractional Calculus and Applications,
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Topology and Its Application
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PLENARY & INVITED TALKS

Applications of the Nonlinear Evolution Equations: An Efficient Analytical Technique

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Abstract: Investigation of mathematical modeling and soliton concept relies mainly on the nonlinear evolution equations (NEEs) [1, 2]. Seeking exact solutions to the NEEs has emerged as one of the most intriguing and very active fields of research. The propagation of shallow-water waves, fluid dynamics, condensed matter physics, computational physics, and geophysics [3, 4] have all been extensively represented by a variety of well-known NEEs, including the nonlinear Ito integral differential equation, the nonlinear Schrödinger equation in higher dimensions, the modified KdV equation, and many others.

Our primary driving force behind this work is to look for various wave shapes for the NEEs' achieved solutions. To accomplish our objective, we use the unified method and its generalized form [5] to identify several analytical solutions, such as solitary, kink-soliton, anti-kink soliton, shock, dark-soliton, bright-soliton, elliptic wave solutions, multi-rational soliton solutions, and multi-wave solutions. Further, the diagrams of the results are additionally displayed. It's vital to note that this study is brand-new and has never been written about before, especially in relation to nonautonomous NEEs.

Keywords: Nonlinear Evolution Equations; Exact Solutions; The Unified Method; The Generalized Unified Method.

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The speed-in-action problem for the nonlinear hyperbolic equation with a nonlocal condition

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Abstract: As is known, the speed-in-action problem is one of the first problems of mathematical theory of the optimal control. As a generalization of a number of practical problems of designing optimal control systems, it has become one of the intensively studied problems. In the theory of optimal control for the processes described by ordinary differential equations, the speed-in-action problems are studied rather well [1,2,3]. But for the processes described by partial differential equations, these problems are relatively less studied. Therefore, the study of speed-in-action problem for the different non-stationary partial differential equations having different applications are actual. For the systems with distributed parameters, the study of such problems relates to number of principal difficulties, while the problem statement itself can be more diverse and contain features which are not in the case of systems given by ODEs. Note that in some papers optimal control problems with an integral boundary condition are considered [4, 5].

In the present work, we study the speed-in-action problem for the non-linear second order hyperbolic equation with a non-local condition and with a control in the coefficient of the equation for the first time. The prototype of this problem is the equation rising in relativistic quantum mechanics. A theorem on the existence of an optimal control is proved and necessary optimality condition in the form of a variational inequality is derived.

Keywords: speed-in-action problem, nonlinear hyperbolic equation, nonlocal condition, optimality condition.

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On modulated statistical and strong Cesàro convergences

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Abstract: The notions of modulated statistical convergence and modulated strong Cesàro convergences have appeared in the literature at different times and by different authors. Furthermore, there has been a great effort by different authors (for instance Et Mikail, Vinod K. Bhardwaj, Hacer Şengül,... and many others), to understand the existing structure between both notions.mIn lecture today we are going to see that there is a rich structure between both notions and that the concept of compatible module function is central to connect such structure. Finally, we will see that this circle of ideas continues to be efficient for double sequences, lacunary convergences, etc.

Keywords: Statistical convergence; Strong Cesàro convergence, modulus function, compatible modulus function.

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Comparing Some Plant Communities in a Region of Turkey via Fuzzy Similarity

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Abstract: In this talk, firstly we explain crisp similarity, fuzzy similarity and compare them. After that, we answer the question of "why we need to use fuzzy similarity?'' Furthermore, we extend the results obtained with crisp logic of'' the results obtained in forest vegetation in the research project on plant sociology conducted in Black Sea Region in Turkey)''with fuzzy similarity. To do this application, it has been evaluated with the fuzzy similarity measures approach, and the similarity relations between the plant communities (plant associations) and among the relevés (sampling areas) they cover has been investigated. Finally, we compare the results by giving tables.
Keywords: Fuzzy similarity; crisp logic; plant communities; the relevés.

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Note: This talk has been prepared By Bingöl M.Ü.(mumit1111@hotmail.com),ŞAFAK S.A.(ssafak@ankara.edu.tr, sanem.akdeniz@hotmail.com) , AKIN Ö.(omerakin@etu.edu.tr)

From Complex Systems & Interaction Networks to Real Life. Application in Neuroscience

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Abstract: After having situated, in a somewhat vulgarized way, the context, which is that of complex systems and networks, of self-organization and emergent properties, a concept of which we will give an example that is quite omnipresent in many fields, that of synchronization, we propose to study a fairly typical example in neuroscience. We will talk a bit about modeling and will recall the origin of the Hodgkin-Huxley (HH) PDE model and its reduction to the FitzHugh-Nagumo (FHN) model. We will then give some mathematical results on the asymptotic behavior of complex reaction-diffusion networks (graphs of n nodes). We show the existence of the global attractor for these networks, as well as the emergence of a fundamental property, that of synchronization. We determine analytically, for any network topology, the threshold of such synchronization. We finally illustrate these theoretical results by numerical simulations and present heuristic laws giving the minimum coupling strength necessary to achieve synchronization, as a function of the number of nodes and the network topology.

Keywords: Dynamical Systems, Complex Systems and Networks, Reaction-Diffusion Systems, Attractor, Synchronization, Neural networks.

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Spiral curves in computer aided geometric design

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Abstract: Bezier curves and surfaces are widely used in computer-aided geometric design because they have features that will provide convenience in a design. On the other hand, spiral curves are useful in the design of highway railway and satellite orbits. The reason for this is that the spiral curves behave with respect to the its arc parameter. The most well-known of these are the Clothoids. However, since Clothoids are not easy to analyze mathematically, it creates difficulties in design. In this talk, the spiral conditions of Bezier curves and their transition curves, namely from a line to circle, from a circle to a circle with S-shaped, from a circle to circle with C-shaped, from a line to a line and circle to circle where one circle lies inside the other, to be used in the design of highway, railway and satellite orbits, are discussed. In addition, the case of spiral and transition curves of Bezier-like curves, which arise due to the deficiencies of Bezier curves in defining closed curves and the property of local variation on the curve, are discussed.

Keywords: CAGD, Bezier curve, Bezier surface, Spiral, transition curves;

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Designing computational frameworks for the nonlinear singular differential models

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Abstract: The present work shows the solutions of the singular models based on the stochastic computing schemes. These investigations not only presented for the numerical results of the singular models, but the prediction, delayed, and pantograph singular models can also be handled through these stochastic paradigms. The design of the Gudermannian function is presented using the neural networks optimized with the global/local search schemes. The obtained results have been performed using the hybridization of these schemes. The exactness is approved through the comparison of the proposed and exact solutions. Moreover, the neuron analysis has been provided to authenticate the efficiency and complexity of the designed approach. For the effectiveness of the proposed approach, the absolute error performances have been performed to the singular models. For the stability of the stochastic method, the statistical performances including Theil inequality Coefficient, Variance Account For and Mean Absolute Deviation have been provided for multiple executions to solve the singular differential models. This contribution of this work is categorized in two phases as:

The Gudermannian function is designed as a neural network under the optimization of global/local search methods for the nonlinear singular differential models. In the second phase, the nonlinear higher order singular models have been solved through the global/local search techniques. The applicability and dependability of such schemes have been monitored to solve these singular models, which arises in engineering and science as well.

Keywords: Singular models, Gudermannian neural networks, Global and local search methods, Numerical solutions; Neurons analysis.

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138	Oral	Esin İlhan, Muhammed Yiğider ,Ercan Çelik, Hasan Bulut	SOME NEW SOLITON SOLUTIONS OF TIME FRACTIONAL RESONANT DAVEY-STEWARTSON EQUATIONS	Applied Mathematics
139	Oral	Olgun Durmaz, Büşra Aktaş	THE 4R PLANAR AND SPHERICAL MECHANISMS IN LORENTZIAN SPACE	Geometry and Its Applications

140	Oral	Gülcan Atıcı Turan	ON TOPOLOGICAL PROPERTIES SOME NEW MODULAR SEQUENCE SPACES	Analysis and Its Applications
141	Oral	Adem Irmak, Arzu Aykut, Sıdıka Şule Şener Kılıç	SOLITARY WAVE SOLUTIONS FOR THE CONFORMABLE TIME-FRACTIONAL EXTENDED (2+1)-DIMENSIONAL EQUATION	Applied Mathematics
142	Online	Zelal Temel, Musa Çakır	AN INNOVATIVE NUMERICAL ALGORITHM FOR SOLVING THE SINGULARLY PERTURBED VOLTERRA INTEGRO-DIFFERENTIAL PROBLEM WITH THE INTEGRAL BOUNDARY CONDITION	Applied Mathematics
143	Oral	Gülsüm Şanal, Duygu Dönmez Demir	ON N-TIMES DIFFERENTIABLE STRONGLY S-CONVEX FUNCTIONS	Applied Mathematics
144	Online	Halil Hüseyin Avcı, Halil Anaç	THE NOVEL NUMERICAL SOLUTIONS OF CONFORMABLE TIME FRACTIONAL GENERALIZED BURGERS EQUATION WITH PROPORTIONAL DELAY	Applied Mathematics
145	Oral	Nazlı Kadıoğlu Karaca, İsa Yıldırım	FIXED POINT THEOREMS FOR A NEW CLASS OF GENERALIZED NONEXPANSIVE MAPPINGS IN BANACH SPACES	Analysis and Its Applications
146	Online	Sinan Aslan	SOME NOVEL FRACTIONAL INTEGRAL INEQUALITIES FOR DIFFERENT KINDS OF CONVEX FUNCTIONS	Fractional Calculus and Applications
147	Online	Sinan Aslan	SOME NEW INTEGRAL INEQUALITIES VIA CAPUTO-FABRIZIO FRACTIONAL INTEGRAL OPERATOR	Fractional Calculus and Applications
148	Online	Ajit Barman, İnan Ünal	A PARALLEL VECTOR FIELD ON RIEMANNIAN MANIFOLDS ADMITTING SEMI-SYMMETRIC NONMETRIC CONNECTION	Geometry and Its Applications
149	Online	Ramazan Sarı, İnan Ünal	SOME CURVATURES RELATIONS ON LORENTZIAN PARA SASAKIAN MANIFOLDS	Geometry and Its Applications
150	Online	Muhammad Kashif Shaikh, Jawad Rasheed	ENHANCING WEB ACCESSIBILITY USING DEEP CONVOLUTIONAL NETWORKS AND NATURAL LANGUAGE PROCESSING TECHNIQUES	Artificial Intelligence
151	Online	Taha Ali, Jawad Rasheed	IMPROVING VIDEO INTERACTION FOR IMPAIRED PEOPLE USING CNN	Artificial Intelligence
152	Oral	Tuğba Tekin, Sezgin Akbulut	SOME FIXED POINT THEOREMS FOR MONOTONE NONEXPANSIVE MAPPINGS IN ORDERED BANACH SPACES	Analysis and Its Applications

153	Oral	Aslıhan Yıldırım, Mesut Karabacak	HISTORICAL DEVELOPMENT OF ARTIFICIAL NEURAL NETWORK	Artificial Intelligence
154	Oral	Furkan Yildirim, Hacer Cengiz	ON DIGONAL LIFTS IN THE SEMI-COTANGENT BUNDLE	Geometry and Its Applications
155	Oral	Furkan Yildirim, Merve Aydin	NOTE ON THE SEMI-TENSOR BUNDLE	Geometry and Its Applications
156	Oral	Sibel Erim, Semra Yurttançıkmaz	SOME SPECIAL ASSOCIATED CURVES IN E3-1	Geometry and Its Applications
157	Oral	Arif Salimov, Furkan Yildirim, Kürşat Akbulut ,Kübra Atasever	SOME NOTES ON ALMOST CONTACT STRUCTURE AND ALMOST PARACONTACT STRUCTURE IN SEMI-TANGENT BUNDLE T(M)	Geometry and Its Applications
158	Oral	Fatih Aydın, Mehmet Giyas Sakar, Onur Saldır	NUMERICAL SOLUTION OF TIME FRACTIONAL TRICOMI AND KELDYSH EQUATION	Applied Mathematics
159	Online	Hülya Gültekin Çitil	NOTES ON SOLUTION OF A FUZZY PROBLEM WITH FUZZY COEFFICIENTS	Applied Mathematics
160	Online	Ali Öz	INVESTIGATION OF THE MECHANICAL PROPERTIES OF GEOPOLYMER CONCRETE CONTAINING NATURAL ZEOLITE UNDER THE EFFECT OF HIGH TEMPERATURE	Engineering Sciences
161	Online	Hülya Gültekin Çitil	SOME RESULTS FOR AN EIGENVALUE PROBLEM	Applied Mathematics
162	Oral	Erhan Pişkin, Muhteşem Demir	EXPONENTIAL GROWTH OF SOLUTION FOR A COUPLE OF PARABOLIC KIRCHHOFF TYPE EQUATIONS	Applied Mathematics
163	Oral	Nebi Yılmaz, Erhan Pişkin	EXISTENCE AND NONEXISTENCE OF SOLUTIONS FOR A VISCOELASTIC-TYPE EQUATION WITH VARIABLE EXPONENTS	Applied Mathematics
164	Online	Enver Tas, Ayşe Bugatekin	CUSTOMER VALUE SEGMENTATION OF THE AGRICULTURAL WATERING SUBSCRIBER GROUP	Statistics and Its Applications
165	Oral	Ayşe Fidan,Erhan Pişkin	EXISTENCE AND ASYMPTOTIC BEHAVIOUR OF SOLUTIONS FOR A PETROVSKY EQUATION WITH A VARIABLE COEFFICIENTS	Applied Mathematics
166	Oral	Gülistan Butakın, Erhan Pişkin	NONEXISTENCE OF GLOBAL SOLUTIONS FOR A PARABOLIC-TYPE PETROVSKY EQUATION WITH VARIABLE EXPONENTS	Applied Mathematics

167	Online	Enver Tas, Ayşe Bugatekin	CUSTOMER VALUE SEGMENTATION OF THE AGRICULTURAL WATERING SUBSCRIBER GROUP	Statistics and Its Applications
168	Oral	Sibel Tarla, Resat Yilmazer	EXPLORING NEW SOLUTIONS FOR GENERALIZED POCHAMMER CHREE EQUATION USING MODIFIED SARDAR SUB-EQUATION METHODS	Applied Mathematics
169	Oral	Halil Arslan,İhsan Tolga Medeni, Tunç Durmuş Medeni	DEVELOPMENT OF ONTOLOGIES THROUGH MAINTENANCE	Computer Science
170	Oral	Tuğçem Partal	SIR EPIDEMIC MODEL FOR COVID-19 SPREAD	Applied Mathematics
171	Online	Nassira Madanı, Zakia Hammouch, Elhoussine Azroul	GLOBAL DYNAMIC OF THE FRACTIONAL ORDER SITA EPIDEMIC MODEL INCORPORATING THE IMPACT OF THE TREATMENT AND THE PREVENTION WITH OPTIMAL CONTROL	Modeling of Bio-systems for Optimization and Control
172	Online	Muhammad Ammar Khan, Ali Okatan	DIABETIC RETINOPATHY DETECTION USING META LEARNING AND DEEP LEARNING TECHNIQUES	Artificial Intelligence
173	Online	Abdülhamit Şap, Tanfer Tanrıverdi	AN APPLICATION OF THE SINE-GORDON METHOD	Applied Mathematics
174	Oral	Murat Candan	SOME PROPERTIES OF NEW SEQUENCE SPACES OBTAINED USING MOTZKIN NUMBERS	Applied Mathematics
175	Online	Muhammet Nasıf Kuru	EXPERIMENTAL AND NUMERICAL ANALYSIS OF PLATE FIN HEAT SINKS IN A SQUARE CHANNEL UNDER FORCED CONVECTION	Computational Fluids mechanics
176	Online	Hasan Bulut, Aslı Alkan, Tolga Aktürk, Öznur Engin, Nesrin Güllüoğlu	ANALYSIS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATION OF TRAVELING WAVE SOLUTIONS WITH AN EFFECTIVE METHOD	Applied Mathematics

On the implicit differential equations in Hilbert spaces

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Abstract

In this paper, we apply the general Lyapunov theorem for some degenerate (or implicit) differential equations of the form: $Ax'(t) + Bx(t) = \Phi\big(t, x(t)\big)$, where $t \in \mathbb{R}_+$, A and B are bounded operators in Hilbert spaces, Φ is a given function. The obtained results are used to study the stabilizability and the controllability of certain implicit controlled systems.

Keywords: Pencil of operators; Stability; Stabilizability; Controllability; Hilbert spaces.

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REAL ESTATE PRICE PREDICTION BASED ON MACHINE LEARNING USING HYBRID APPROACHES

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Abstract

The aim of this study is to develop real estate price prediction models based on machine learning using two different hybrid approaches. In both approaches, minimum Redundancy Maximum Relevance (mRMR) has been utilized to correctly select the features that affect the quality of real estate price prediction and then Density-Based Spatial Clustering and Application with Noise (DBSCAN) has been used to cluster the dataset. Prediction models have been developed using Light Gradient Boosting Machine (LightGBM) and Support Vector Machine (SVM). The difference between two approaches is the application of Isolation Forest (IF) for outlier detection in the second approach. The dataset has 28160 rows and includes 17 real estate attributes. The performance of the developed models has been evaluated using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE). The results show that after applying IF, the average MAPE decreased significantly for SVM-based and LightGBM-based models.

Keywords: Real Estate Price Prediction, Machine Learning, Outlier Detection.

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A VARIETY OF ANALYTICAL SOLUTIONS FOR VARIOUS CATEGORIES OF NPDES IN OPTICAL FIBERS AND THEIR APPLICATIONS

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Abstract

In this study, we observe the nonlinear and super nonlinear traveling wave solutions of the Sharma Tasso Olver (STO) equation. The exact solution is obtained by the $(m + 1/G')$-expansion method. The wave transform is used to reduce the STO equation to an ordinary differential equation. The results obtained provide useful information about dynamic behavior.

Keywords: : (m+1/G')-expansion method, the Sharma Tasso Olver Equation, travelling wave solutions.

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WEIGHTED APPROXIMATION PROPERTIES OF THE MODIFIED *q*-SZASZ-MIRAKJAN OPERATORS

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Abstract

In this paper, we define a new generalization of the Szasz-Mirakjan operators based on the *q*-integers. We derive a recurrence formula and we give explicit formulas for the moments $\Upsilon_{n,q}(t^m,x)$ for $m=0,1,2$ and for the central moments $\Upsilon_{n,q}((t-x)^m,x)$ for $m=1,2$. We obtain a local direct estimate in terms of Lipschitz type maximal function of order α and we examine weighted approximation properties of the new modified *q*-Szasz-Mirakjan operators.

Keywords: *q*-calculus; *q*-Bernstein Operators; *q*-Szasz-Mirakjan Operators; Moments; Weighted Approximation.

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MACHINE LEARNING MODELS FOR DETERMINING THE PRICE ELASTICITY OF FLASH SALE PRODUCTS ON AN E-COMMERCE MARKETPLACE

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Abstract

E-commerce companies use promotional pricing to attract the attention of online consumers by applying a flash sale program. The flash sale aims to increase demand through a pricing strategy for a company's products. Price elasticity is a type of pricing strategy in which the company uses flexible prices that change according to market demand. Price elasticity shows the relationship between price and quantity demanded and allows an estimation of the impact of a price change on quantity demanded. In other words, it measures the response of consumers to changes in the price of a product. If a product has price elasticity, a slight change in price will result in a large change in demand for that product. This study aims determining the price elasticity of flash sale products on Trendyol.com. The main purpose is to generate price-based sales forecasts for products in order to highlight discounted products and increase sales. In this context, forecast models have been developed using Generalized Additive Models (GAM) and Linear Regression (LR). The performance of the developed models has been evaluated using Mean Squared Error (MSE) for 50 different products. Results show that the average MSE's of LR-based model and GAM -based model are 21.41 and 29.33, respectively.

Keywords: Price Elasticity, Generalized Additive Models, Linear Regression

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An Algebraic Optimization Model to Conserve Water Environment by Distributing Manure for Harvesting.

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Abstract

An overuse of manure on farmland creates a major environmental problem. When dumping more manure than the crops need as fertilizer, it causes an excess of manure in those fields. Rainwater drains these excessive amounts from the surface into the water reservoirs (rivers and lakes), where they pollute the water, nourish algae, and harm the fish. We develop an algebraic optimization model to formulate for the selection of the right field at the right time so that the environmental damage is limited. We gather instance data from a region of topologically connected reservoirs in northern Senegal and their adjacent farmlands. This mathematical problem then can be tackled by standard solvers for linear optimization problems. When applied in practice, this solution can improve the water quality by reducing the amount of manure and its main components, Nitrogen, Phosphorus, and Potassium.

Keywords: Farmland, Water Reservoirs, Manure, Mathematical Optimization Model, Linear Programming.

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A method for solving the set-covering problem over the set of stochastic efficient solutions

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I. ABSTRACT

The stochastic bi-objective set-covering problem (the probabilistic bi-objective set-covering problem) is very difficult to solve directly. Generating the set of all efficient solutions might be very expensive and unfruitful for the decision maker, because in order to meet hie preference, he has to choose the best compromised solution among a large listed. If his preference is a written as a linear combination of decision variables, one has to optimize this function over the efficient set of bi-objective set covering problem. In this paper, we consider a stochastic environment, i.e., all the parameters are issued from a discrete probability law. Once the problem is converted into a deterministic model, we use the technique presented and developed by (Chaabane and Pirlot 2010). As far as our knowledge is concerned, no similar study has been yet.

Keywords: Stochastic multi-objective optimization; Combinatorial optimization; Non-linear optimization; Probabilistic set-covering problem; Efficient solution.

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Formal languages and Pisot numbers

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Abstract

Around 1950 was develeopted the theory of automata and the theory of formal languages. This topics are closely related and form a distinct part of what is described as “computer science.” Studing these , the researchers had to use mathematical concepts, theorems, algebraic methods, verification supported in logic. There are a connections between Pisot numbers and formal languages. In this articles we are describes some of this conection. Finite automata are important for software and hardware. The central concepts of Automata theory the notions of an automaton and of a set recognized by an automaton. The sets in question are subsets of a free monoid Σ^* where Σ is a finite alphabet, $\Sigma = \{0,\ 1, \cdots, \lfloor\beta\rfloor\}$, where β is a Pisot number . The number $\beta > 1$ is called a Pisot number if all its algebraic conjugates satisfy $|\beta'| < 1$. Thus we shall be dealing with sets of words in a finite alphabet. Take the space of infinite or bi-infinite sequences of letters by alphabet, Σ, sequences (strings) find their aplications in symbolic dynamics, linguistics data-transmissions and storage and computer science . Some property of pisot of degree four I going to give at the end of this talk.

Keywords: Automata theory, Beta-integer, Alphabet, Pisot number, algebraic number.

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ESTIMATIONS OF BOUNDS FOR PARAMETERIZED SIMPSON'S TYPE INEQUALITIES USING (s, m)-DIFFERENTIABLE CONVEX FUNCTIONS VIA GENERALIZED FRACTIONAL INTEGRALS

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Abstract

In this paper, we obtain a new integral identity for differentiable functions with two parameters involving generalized fractional integral operators. By applying this as an auxiliary result, we deduce several new Simpson type inequalities for (s, m)-differentiable convex functions. For suitable choices of parameters, some special cases are given and some known results are recaptured as well. To validate the accuracy of our main results, we present some examples.

Keywords: Simpson's inequalities; (s, m)-convex functions; Generalized fractional integrals; Hölder's inequality; Power-mean inequality.

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SOME NEW TEMPERED FRACTIONAL HERMITE-HADAMARD TYPE INEQUALITIES VIA UNIFORMLY CONVEX FUNCTIONS

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Abstract

In this paper, we obtain some new tempered fractional Hermite-Hadamard type inequalities for uniformly convex functions. Moreover, using a new identity as an auxiliary result, we deduce several inequalities for uniformly convex functions pertaining to tempered fractional integrals, and some special cases are given as well. To validate the accuracy of our main results, we offer some nice examples.
Keywords: Hermite-Hadamard inequalities; Uniformly convex functions; Tempered fractional integral operators; Hölder's inequality; Power-mean inequality.

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ASYMPTOTIC STABILITY RESULT FOR A THERMOELASTIC TIMOSHENKO SYSTEM WITH DISTRIBUTED DELAY TERM

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Abstract

In this work, we consider a linear thermoelastic laminated Timoshenko beam with distributed delay, where the heat conduction is given by Cattaneoâs law. We establish the well posedness of the system. For stability results we prove exponential and polynomial stabilities of the system for the cases of equal and nonequal speeds of wave propagation.

Keywords: Global nonexistence, quasilinear wave system, viscoelasticity.

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A delayed model describing A-beta oligomers neurotoxicity

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Abstract

Alzheimer disease is a neurodegenerative incurable disease that cause irreversible damage to the brain tissue.

Although exact factors that are responsible for the disease are still being investigated, numerous studies suggest that A-beta oligomers which are small aggeragates of a protein called APP are highly neurotoxic.

A-beta oligomers are known to bind to healthy prions causing them to become pathogenic and also increase calcium concentration in the brain which can disturb communication between neurons.

In this paper, we present a model consisting of three delayed differential equations that describe A-beta oligomers, prions and calcuim concentrations respectively. Steady states and their local stability are investigated and numerical simulations are made to illustrate our results.

Keywords: Alzheimer disease; DDE; local stability.

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RADIATIVE BLOOD-BASED HYBRID COPPER-GRAPHENE NANOLIQUID FLOWS ALONG A SOURCE-HEATED LEANING CYLINDER

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Abstract

Graphenes, graphene oxides (GO) and graphene nanoplatelets (GNP) dispersed in variant blood-based copper nanoliquids over a leaning permeable cylinder are focused in this study. The non-Newtonian Sutterby hybrid nanoliquid flows are generalized within the context of Tiwari-Das model to undertake the presence of radiation and source of heating. The governed partial differential equations are reformulated into a nonlinear set of ordinary differential equations by similarity conversions. The resulting equations are further transformed into boundary value problems by means of a shooting technique followed by the implementation of a MATLAB's finite difference package. The feedbacks of constructive parameters toward the model's non-dimensional velocity and temperature delineations, reduced skin friction as well as reduced Nusselt number are then portrayed for detailed discussions. It is ascertained that Cu-Graphene/blood and Cu-GO/blood hybrid nanofluids have the lowest and highest velocity distributions for higher φ_2, γ, ς, M and H_w parameters while the opposite outcomes are noticed for the temperature distribution for all emerging parameters except for λ parameters. Decrement in the reduced skin friction and increment in the reduced Nusselt number for higher values of ϕ_1 and ϕ_2 are also reported in the present study.

Keywords: Hybrid nanoliquid; Radiative Sutterby fluid; Tiwari-Das model; Graphenes; Graphene oxides; Graphene nanoplatelets

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On the Physical Dynamics of the (2+1)-Dimensional Zoomeron equation by Rational Sine-Gordon Method

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Abstract

In this study, we examine the physical dynamics of the (2+1)-dimensional Zoomeron equation, is an important model in nonlinear optics and mathematical physics.
It is decribed as [1-3],

$$\left(\frac{u_{xy}}{u}\right)_{tt} - \left(\frac{u_{xy}}{u}\right)_{xx} + 2\left(u^2\right)_{xt} = 0.$$

For this purpose, we used an analytical method which is the rational sine-Gordon expansion method [4]. By using the proposed method, some different wave solutions are achieved. We discussed the physical dynamics of all submitted solutions with respect to graphical simulations.

Keywords: The Rational sine-Gordon expansion method; the (2+1)-dimensional Zoomeron equation; dark-bright solitary waves

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A STUDY OF THE GENERALIZED MAGNETIC CURVES ON PARA-KÄHLER MANİFOLDS

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Abstract

In this paper, we study generalized magnetic curves on para-Kähler manifolds. Also we present some examples concerning with them.

Keywords: F-planar Curve, para-Kähler Manifolds, Magnetic Curve.

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OPTIMAL CONTROL OF THE BOUNDARY CONDITION IN A PARABOLIC SYSTEM

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Abstract

In this paper, we consider the problem of optimal controlling the boundary condition in a parabolic system. Control problems for the parabolic equations were studied in a number of papers (see [1-4,6]). We prove that cost functional has a unique minimum element using the Corollary of Goebel's theorem [5]. The adjoint problem approach is employed to get the Fréchet derivative of the cost functional. We give a necessary condition for the optimal solution.

Keywords: Heat equation; Optimal control; Frechet Derivative.

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Heat Transfer Analysis of $ZnO+Al_2O_3+TiO_2$/DW Based Ternary Hybrid Nanofluid: A Fractal-Fractional Model

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Abstract

Nanofluids are used to achieve maximum thermal performance with the smallest concentration of nanoparticles and stable suspension in conventional fluids. The effectiveness of nanofluids in convection processes is significantly influenced by their increased thermophysical characteristics. However, this technology is not ended here; binary and ternary nanofluids are now used to improve the efficiency of regular fluids. Therefore, this paper aims to analyze the natural convection Newtonian ternary nanofluid flow in a vertical channel. The tri-hybridized nanoparticles of zinc oxide, Aluminum oxide, and titanium di oxide is dissolved in base fluid (distilled water) to form a homogenous suspension. The impact of thermal radiation, joule heating, and viscous dissipation are also assumed. The classical Newtonian ternary nanofluid model has been generalized by using Fractal-fractional derivative (FFD) operator. The generalized model has been discretized by using the Crank Nicolson scheme and then solved by using computational software. To analyze the behavior of fluid flow and heat distribution in fluid, the obtained solution was computed numerically and then plotted in response to different physical parameters. It is noted from the figure that when the volume fraction ϕ reaches to 0.04 (4% of the base fluid), the ternary nanofluid flow shows a significant amount of enhancement in heat transfer rate as compared to binary and unary nanofluid flows. This enhancement in the rate of heat transfer leads to improve the thermophysical characteristics such as viscosity, thermal expansion, and heat capacity etc. of the base fluid.

Keywords: Ternary nanofluid; Distilled water; Joule heating; Viscous dissipation; Fractal fractional derivative; Crank Nicolson scheme.

On spherical indsicatrix according to bishop frame

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Abstract

Many studies have been done according to different frames of the theory of curves in Euclidean Space. Many scientists have studied frames such as Frenet frame, Bishop frame, Adapted frame in this theory. These frames help us in the characterization of curves. In this study, spherical indicatrix according to bishop frame in Euclidean space are examined. For this,firstly, Type-2 Bishop frame is given in euclidean. Then new characterizations are obtained.
Keywords: Bishop frame, Frenet curves, Frenet frame, spherical indicatrix.

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Monte Carlo Simulation of Optical Antenna: A High-quality broadband wireless service

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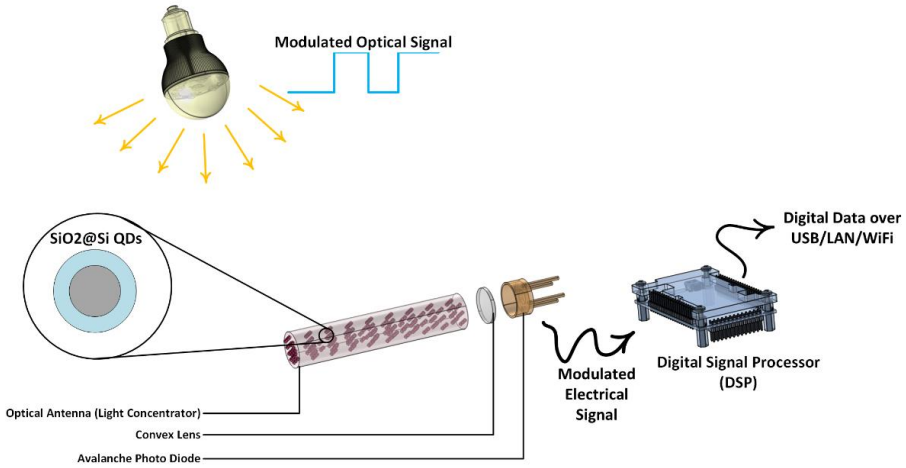
Abstract- In high-speed wireless communication, visible light communication is considered an emerging and cutting-edge technology. A light-emitting diode can serve both as an illumination source in an environment and as a data transmitter. Nevertheless, plenty of complications stand in the way of developing VLC technology, including the low response time of waveguides and detectors and the field of view dependence of such devices. To cover those challenges, one approach is to develop a superior optical antenna that does not have a low response time related to phosphorescence materials and should also support concentrating light from the surrounding with a wide field of view. This research paper presents an optimized cylindrical optical antenna with benefits, such as affordable cost, fast response time due to high-efficient nanomaterials, and a wide field of view (FOV). The proposed structure avoids the need for intricate tracking systems and active pointing to the source, but it can also be integrated into portable devices. For the analysis of nanomaterials characteristics, finite difference time domain simulations are used, and Monte-Carlo raytracing is used to study the proposed optical antenna. It was found that the antenna's optical efficiency varies from 1 to 20% depending on the size and the number of nanomaterials inside. Compared to other works, this paper shows higher efficiencies and wider FOV.



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A Neural Network-Based Method for Approximating Real and Complex Roots of Polynomials

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Abstract

Finding the roots of a polynomial equation can be a complex task, especially when dealing with higher degree polynomials. Therefore, the neural network would need to be sufficiently complex and trained on a large enough dataset to accurately predict the roots. In this study, we use two types of neural networks to Approximating Real and Complex Roots of Polynomials. In the first type of neural network, we find the real roots of polynomial rates by using a multilayer network, which is learned through the gradient reduction method. In the following, using the dynamic network, we approximate all the roots of polynomial rates, whether real or complex. In dynamic network, polynomial coefficients can also be complex numbers. The efficiency of the designed networks is checked through several examples.

Keywords: Polynomial roots; Recurrent neural networks; Multilayer networks; Neural network learning; Performance analysis.

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Numerical Solutions of High-Order Differential Equations Using Neural Networks Based on Nelder-Mead Simplex Algorithm

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Abstract

In this paper, we designed a hybrid method based on Nelder-Mead algorithm and feedforward neural network methods to solve ordinary differential equations. The idea behind using neural networks to solve differential equations is to use them as a function approximation to approximate the solution of the differential equation. Therefore, our proposed method is based on a feed-forward neural network to approximate the solution of the differential equation and optimization techniques based on the simplex Nelder-Mead algorithm to find the neural network parameters that provide the best approximation. This method does not require predetermined discretization points, making it a more efficient numerical method for solving initial-boundary value problems. Numerical examples presented in the article provide evidence of the effectiveness of the method.

Keywords: High-order ordinary differential equations; Feed forward artificial neural; Error backpropagation learning; Nelder–Mead simplex algorithm.

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INVESTIGATION OF WAVE SOLUTIONS OF NONLINEAR MATHEMATICAL MODEL

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ABSTRACT

In this article, traveling wave solutions of the Mikhailov-Novikov-Wang Equation which is a nonlinear partial differential equation, are analyzed using the modified exponential function method (MEFM). Solution functions were obtained through a mathematical program. Two-dimensional, three-dimensional, and contour graphics meaning the behavior of the traveling wave solutions representing the mathematical model were drawn by determining the appropriate parameters with the help of the Mathematica program.

Keywords: Mikhailov-Novikov-Wang Equaiton, Modified Exponential Function Method, Nonlinear Partial Differential Equations.

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ARIMA MODEL ANALYSIS OF CHERRY PRODUCTION TRENDS AND YIELD FORECAST IN TURKEY: 1980-2021 STUDY

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Abstract

This study employs the AutoRegressive Integrated Moving Average (ARIMA) time series model to analyze the trends and predict the future yields of cherry production from 1980 to 2021. The objective of this research is to provide insights into cherry production trends and to forecast future cherry production for the years to come. The research utilized a dataset comprising of the annual cherry production from 1980 to 2021. The data was cleaned, pre-processed, and visualized to gain insights into the patterns of cherry production over time. The ARIMA model was then developed to capture the observed patterns and trends and to forecast future yields. The results of the study show that cherry production has exhibited a steady increase over the past four decades, with some fluctuations observed in some years. The ARIMA (0,2,2) model successfully captured the observed patterns and provided accurate predictions for future cherry production, with a forecasted increase in yields expected in the coming years. The findings of this research have important implications for the cherry industry, as they provide useful information for farmers, policymakers, and other stakeholders involved in the production, marketing, and distribution of cherries. The study provides a framework for future research in the field, as well as a useful tool for decision-making in the cherry industry.

Keywords: Cherry Production, ARIMA Model, Time Series Analysis, Turkey, Forecasting.

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FORECASTING OF CLIMATE CHANGE BY USING BIG DATA AND MACHINE LEARNING WITH PYTHON PROGRAM

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Abstract

Climate change refers to significant, long-term changes in the global climate. Also, big data is data that contains greater variety and arrives in increasing volumes and with greater velocity. This is also known as the five Vs. The purpose of the study is to investigate carbon emissions, greenhouse gas emissions, and environmental trade data from Turkey, the USA, Germany, Iraq and China, as well as estimate correlations on air temperature, surface temperature, or weather-related disasters in those countries. In addition, the data are taken from the official website of the International Monetary Fund. Shapley Additive Explanation and a nonlinear external input autoregressive network were used to analyze the forecasting of climate change by using big data and machine learning with a Python program. The result shows that increasing the United States trade balance in low-carbon technology products by 1 unit causes an increase of 0.042 units in the mean global surface temperature variable, and increasing United States exports of environmental goods as a share of total exports by 1 unit causes an increase of 0.028 units in the mean global surface temperature variable. Germany: total trade in environmental goods A 1-unit increase in the Total trade in environmental goods variable causes an 8.745-unit decrease in the Land Cover Woody Crops variable. An increase of 1 unit in the Germany (Expenditure on Waste Water Management) variable causes an increase of 193,482 units in the Land Cover (Shrub-covered Areas) variable. According to the results of all graphs in this study, the mean global surface temperature variable was closer to the NARX model than all other variables. In this case, the model can be said to give good results.

Keywords: Forecasting, Climate change, Big data, Machine learning, Python program.

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Uniqueness Theorem for Conformable M-dertivative Sturm-Liouville Problem

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Abstract

In this study, we give a uniqueness result for the potential function in Sturm-Liouville problem with *M*-derivative. This type result known as Ambarzumyan theorem. For the classical Sturm-liouville problem it was given by Ambarzumyan [1] as *if the spectrum is* $\lambda_n = n^2$, *then the potential function* $q(x) = 0$. We will give this result for the following problem;

$$-D_\alpha^x D_\alpha^x y + q(x)y = \lambda y$$
$$D_\alpha^x y(0) - hy(0) = 0$$
$$D_\alpha^x y(\pi) + Hy(\pi) = 0$$

Here D_α^x define the conformable derivative for $0 < \alpha \leq 1$, *h* and *H* are real constants and *q(x)* is real integrable and refers to potential. [2-4]

Keywords: Sturm-liouville problem, Potential functon, Spectrum, Conformable M-derivative

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A Computational Technique For the Singularly Perturbed Parabolic Integro-Differential Equations

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Abstract

In this study, singularly perturbed parabolic integro-differential equations of Fredholm type are considered by numerically. Initially, certain analytical properties of the exact solution and its derivatives are given. Utilizing interpolating quadrature formulas and basis functions, a discrete scheme is formulated on a uniform mesh. Next, the uniform convergence and stability bounds of the suggested method are estimated in the discrete maximum norm. Finally, some numerical tests and the obtained results confirming the theory are presented.

Keywords: Boundary layer, difference scheme, parabolic integro-differential equation, singular perturbation

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Ambarzumyan Theorem for Conformable Matrix-Sturm-Liouville Problem

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Abstract

The present study consists of uniqueness results and some spectral results of conformable matrix Sturm-Liouville problem. The first result on inverse Sturm-Liouville problem which is known Ambarzumyan theorem was given in [1] as *if the spectrum is* $\lambda_n = n^2$, *then the potential function* $q(x) = 0$. We will give this result for the following problem;

$$-D_\alpha^x D_\alpha^x y + q(x)y = \lambda y$$
$$D_\alpha^x y(0) - hy(0) = 0$$
$$D_\alpha^x y(\pi) + Hy(\pi) = 0$$

Here D_α^x define the conformable derivative for $0 < \alpha \leq 1$, *h* and *H* are real constants and *q(x)* is *nxn* type real symetric matrix.[2,3]
Note that the main difference of this problem from classical Sturm-Liouville problem is that eigenvalues are not simple. That is, One eigenvalue conicides with *n* eigenfunctions. [4]

Keywords: Sturm-liouville problem, Potential functon, Spectrum, Conformable M-derivative

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A HYBRID OPTIMIZATION MODEL FOR DETERMINING THE LOCATION AND NUMBER OF SORTING CENTERS / CROSS DOCKS

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Abstract

In e-commerce marketplaces, the delivery of the product to the customer after the purchase is called the operational process. Trendyol uses various cargo companies and its own company to carry out the operational processes. The cargo companies ensure that products are received from the sellers, forwarded to a sorting center or cross dock, and then delivered to the customers. It is important to determine the number and location of sorting centers and cross docks for the operational processes of e-commerce. The rapid increase in freight volumes make it difficult to carry out this process manually. Also, there are other factors such as capacity and service area for each sorting center and cross dock that need to be considered. This study aims to develop a hybrid optimization model based on Integer Programming (IP) and Genetic Algorithm (GA) to determine the optimal location and number of sorting centers and cross docks. As a result of this study, 200 cross-docks and 6 sorting centers have been opened. Also, thanks to this study, the duration of executed processes for determining the optimal location and number of sorting centers and cross docks have been reduced from a week to a few hours.

Keywords: Optimization, Genetic Algorithm, Integer Programming

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Weighted Approximation for (*p*, *q*)- Generalization of Bernstein Operators in Kantorovich Type

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Abstract

In this paper, we investigate weighted approximation properties in new Kantorovich-type of (p,q)- Bernstein operators by using the weighted modulus of continuity, and we provide the main convergence result for the weighted approximation of these new operators, which are defined by Hayatem Hamal and Pembe Sabancigil as follows;

$$B^{*}_{n,p,q}(f,x)=\sum_{k=0}^{n} b_{n,k}(p,q,x)\int_{0}^{1} f\left(\frac{p^{n-k}\left([k]_{p,q}+q^{k}t\right)}{[n+1]_{p,q}}\right)d_{p,q}t,\ \ x\in[0,1],\ n\in\mathbb{N},$$

where $b^{p,q}_{n,k}(x)=\dfrac{1}{p^{n(n-1)/2}}\begin{bmatrix} n \\ k \end{bmatrix}_{p,q} p^{k(k-1)/2}x^{k}(1-x)_{p,q}^{\ n-k}$.

Let $B_2[0,\infty)=\left\{f:[0,\infty)\to R:|f(x)|\le M_f(1+x^2)\right\}$ where M_f is a constant depending on f, $C_2[0,\infty)=B_2[0,\infty)\cap C[0,\infty)$ and $C^{*}_2[0,\infty)=\left\{f\in C_2[0,\infty):\lim_{x\to\infty}\dfrac{f(x)}{1+x^2}<\infty\right\}$. The norm on the space $C^{*}_2[0,\infty)$ as shown $\|f(x)\|_2=\sup_{x\in[0,\infty)}\dfrac{f(x)}{1+x^2}$.

Theorem 1 Let $0<q_n<p_n<1$, $q_n\to1$ as $n\to\infty$. Then for each $f\in C^{*}_2[0,\infty)$ and all $\upsilon>0$, $\sup_{x\in[0,\infty)}\dfrac{\left|R_{n,p_n,q_n}(f,x)-f(x)\right|}{\left(1+x^2\right)^{1+\upsilon}}\to0$ as $n\to\infty$.

Keywords: (p,q)- calculus; Moments; Bernstein polynomials; weighted continuity.

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ANALYSIS OF MATHEMATICAL MODEL SOLUTIONS OF WITH AN EFFECTIVE METHOD

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ABSTRACT

In this article, wave solutions of the (3+1)-dimensional Fractional Boiti-Leon-Manna-Pempinelli equation are obtained using the Modified Exponential Function Method, which is an efficient technique. In particular, obtaining five different states according to the conditions of the method allows to find different aspects of the analysis of the behavior of the mathematical model. For this reason, after the solution functions representing the behavior of the nonlinear mathematical model were obtained, the graphs of these functions were drawn according to the appropriate parameters.

Keywords: Wave solutions, Modified Exponential Function Method, the (3+1)-dimensional Fractional Boiti-Leon-Manna-Pempinelli equation.

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Analysis of Half Wave Rectifier Circuit By Modified Nodal Equations

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Abstract

In this study, an effective method has been proposed for the analysis of flyback DC-DC converter circuit, which is widely used in power electronics circuits. The effectiveness of the method is due to proper modeling of key elements in the rectifier circuit. The transformer, which is the most basic part of the converter circuit, is modeled with dependent sources. The switching elements are modeled with the bivalent element approach. The changes in the equivalent circuit according to the positions of the switching elements are examined. Modified nodal equations method has been used for obtaining system equations that form the basis of analysis The numerical results are compared with the traditional analytical results in the steady state region, and the superiority of the proposed method is demonstrated.

Keywords: half wave rectifier, modified nodal equations

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*Abstract Submission should be prepared only **1 page**.

A Uniform Discretization for Singularly Perturbed Nonlinear Volterra Integro-Differential Equations on Piecewise-Equidistant Mesh

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Abstract

This research aims to present a uniform numerical scheme for solving singularly perturbed nonlinear Volterra integro-differential equations. Some asymptotic estimates are given and the finite differene scheme is constructed on Shishkin-type mesh. Error apprxoimations are estimated in the discrete maximum norm. The proposed method is tested on some numerical examples to validate the theory.

Keywords: Error analysis, finite difference method, Volterra integro-differential equations, singular perturbation.

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SEPARABLE HYPERSURFACES WITH APPLICATIONS TO MICROECONOMICS

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Abstract

In this paper, we study two production models in microeconomics, quasi-sum and quasi-product production models, by combining into a unique implicit equation which we call them separable production functions. Then, we completely classify the associated hypersurfaces with the separable production functions.

Keywords: Production function; Hypersurface; Gauss-Kronecker curvature.

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INVESTIGATION OF EFFECTS ON ENGINE PERFORMANCE AND EMISSIONS OF WASTE TRANSFER OIL, DIESEL AND BIODIESEL BLENDS IN A DIESEL ENGINE

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Abstract

In this study, five different fuel mixtures were prepared by mixing biodiesel, waste transformer oil and diesel fuel obtained by transesterification method from olive oil wastes in different proportions. Some important physicochemical properties (such as GC and TG/DSC analyzes) of the prepared fuel mixtures were determined and their characterizations were made. Then, the prepared fuel mixtures were tested in a single cylinder compression ignition engine and their effects on engine performance and emission characteristics were investigated. Experiments were made with 5 different fuel blends (TD30, TD30B10, TD30B20, TD30B30 and D100) at 1000, 1500, 2000 and 2500 rpm. At all speeds, the average torque produced by each fuel blend was the highest in the D100 fuel, while the lowest torque was observed in the TD30 fuel mixture. The best average torque value among fuel blends was found in TD30B10 fuel, with a decrease of 6.48% compared to D100. While the average BP (brake power) value produced by all mixtures at all engine speeds was highest in D100 fuel, it was the lowest in TD30 fuel. The results of the experiments showed a 23.98% reduction in the average NOx emissions of the TD30 fuel mixture compared to the average NOx emissions of the D100 fuel at all engine speeds. In addition, based on the TG-DSC analysis, it was determined that the TD30B10 fuel mixture exhibited good combustion performance.

Keywords: Biodiesel produced Olive Oil Wastes; Waste Transformer Oil; Diesel; Emissions; TG-DSC; FT-IR.

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LYAPUNOV-TYPE INEQUALITIES FOR A CERTAIN NONLINEAR SYSTEM INCLUDING OPERATORS

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Abstract

In this paper, we obtain new Lyapunov-type inequalities for nonlinear system including p-relativistic operator and q-prescribed curvature operator under the Dirichlet or the anti-periodic boundary condition.

Keywords: Lyapunov-type inequalities; p-relativistic operator; q-prescribed curvature operator. *Corresponding author

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Computing of $\mathcal{H}_\infty$-Norm of Transfer Functions of DAEs by Extended Balanced Singular Perturbation Method

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Abstract

In this paper, we computed $\mathcal{H}_\infty$-norm of transfer function of a linear DAE system by extended balanced singular perturbation method, which is a hybrid method consisting of balanced truncation approach and singular perturbation method. First, we utilized balanced truncation approach to reduce the order of the transfer function then we used singular perturbation method to find its $\mathcal{H}_\infty$-norm. The algorithms of both, balanced truncation approach and singular perturbation method are given with MATLAB commands, the method is applied to a numerical example and error analysis of solution is examined.

Keywords: Extended balanced singular perturbation method; $\mathcal{H}_\infty$-norm; Balanced truncation approach; Singular perturbation method; Hankel singular values.

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EFFECTS OF WASTE TRANSFER OILS AND DIESEL MIXTURE ON PERFORMANCE AND EXHAUST EMISSIONS OF A CI ENGINE

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Abstract

In this study, detailed characterizations of fuel mixtures obtained by mixing waste transformer oil, which is used as heat transfer fluid, into diesel oil in different volumetric ratios were made. (TG-DSC, FT-IR, density, viscosity, cloud point, pour point etc.). The effects of the prepared fuel mixtures on engine performance and exhaust emission parameters were investigated. Prepared fuels were tested at 1000, 1500, 2000 and 2500 rpm at full load in a single-cylinder diesel engine. During the experiments, exhaust emission values and exhaust gas temperature measurements were taken for all samples, braking power, torque and brake specific fuel consumption were obtained. The results showed that waste transformer oil has a disadvantage in terms of high viscosity, specific gravity and low calorific value, while it has an advantage in terms of low NOx and CO emissions. While the average torque and braking power values produced by each fuel at all engine speeds were highest in D100 fuel, the lowest torque and braking power values were observed in TD40 fuel. Among the TD mixtures, the lowest average BSFC value at all speeds was observed in the TD10 mixture, and the lowest average CO emissions and EGT values were observed in the TD10 fuel mixture. It was observed that NOx emissions in TD30 fuel decreased by 23.98% compared to diesel fuel.

Keywords: Waste Transformer Oil, Engine Performance, Exhaust Gas Emissions.

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THEORETICAL STUDY OF NEW CANDIDATE ORGANIC MATERIALS FOR PHOTOVOLTAIC APPLICATIONS

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Abstract

Our work consists of a theoretical prediction, through DFT and TD-DFT methods, of the electronic and optical properties of six conjugated organic compounds used as electron donor materials in BHJ solar cells, of which PCBM is the acceptor material. This study is necessary to discuss the effect of substituents (donor units) on the different properties of these compounds, and to predict promising materials in organic solar cells using the AMPS-1D simulation software. The results obtained show that all the molecules have good geometric, electronic and optical properties, thus showing an increase in the power conversion efficiency of photovoltaic cells based on these materials, which reaches a value of 17% for the molecule P-Eth-TEdotT-A.

Keywords: Organic materiel, DFT, Solar cell, Power conversion efficiency.

TAYLOR COLLOCATION METHOD FOR SOLVING DOUBLE DELAY INTEGAL EQUATIONS

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Abstract

Taylor collocation method in space of piecewise polynomials is applied to obtain the approximate solution for the linear Volterra integral equation with two constant delays. An algorithm based on the use of Taylor polynomials is developed for the numerical solution of the linear VIEs with two constant delays. Numerical tests are included to prove the validity of the presented algorithm.

The advantage of this collocation method is: This method is explicit and direct, has a convergence order, and there is no algebraic system needed to be solved, which makes the proposed algorithm very effective, easy to implement.

Keywords: Volterra integral equation with two constant delays, Collocation method, Taylor polynomials.

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A NOVEL DoA ESTIMATION METHOD BASED ON MULTILATERATION EQUATIONS

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Abstract

Acoustic localization systems created using microphone arrays utilize the arrival direction of sound to estimate the location of the sound source. Therefore, accurate and rapid detection of the arrival direction of sound is crucial. The commonly used method for determining the DoA (Direction of Arrival) is the far-field approach in the literature[1-2]. The aim of this study is to propose a new method for detecting the arrival angle and to compare its success with existing methods. We propose a new DoA detection method derived from multilateration equations using a microphone array with the same structure as that used in the far-field approach[3]. Simulation studies were conducted in MATLAB using TDOA (Time Difference of Arrival) values between microphones, both with and without Gaussian noise. The location of the sound source was varied at different distances and angles within a predefined area, and the DoA errors were recorded to demonstrate the success of our proposed method.

Keywords: Multilateration; DoA Estimation; Sound Source Localization; Acoustic Localization; Microphone Array

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Explicit formula and Prime number theorem for zeta function

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We first prove an explicit formula analogous to the Weil explicit formula, then we formulate an analogue of the prime number theorem for the zeta function for a function field K of genus g over a finite field $\mathbb{F}_q$. Furthermore, we give an upper bounds for the multiplicity of the eventual zero of the zeta function at central point $s = 1/2$ and for the height of the first zero with imaginary part different from zero.

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Key words and phrases: L-functions; standard twist; convexity bounds; distribution of zeros; nonlinear exponential sums; Selberg class.

Compact Operators for Sequence Spaces Obtained using Domain of the Matrix $\hat{\hat{B}}$

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Abstract

In this work, we characterize the matrix classes $\left(l_1, l_p\left(\hat{\hat{B}}\right)\right)$ $(1 \le p < \infty)$, in which $l_p\left(\hat{\hat{B}}\right)$ is some generalizd difference sequence spaces. We also derive estimates for the norms of the bounded linear operators $L(A)$ defined by these matrix transformations and find conditions to derive the corresponding subclasses of compact matrix operators by using the Hausdorff measure of noncompactness.

Keywords: Sequence Spaces, Compact Operators, Hausdorff Measure.

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LINEAR VIBRATION OF NANOBEAM IN THERMAL ENVIRONMENT USING MODIFIED COUPLE STRESS THEORY

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Abstract

Nanostructures are used widely in nanotechnology and nano-device in recent years and this paper presents the implementation of perturbation method for the vibration analysis of simple and fixed supported Euler-Bernoulli nanobeam in thermal environment. Considering the thermal loading, the equations of motion of the Euler-Bernoulli nanobeam are obtained using modified couple stress theory. The effect of thermal loadings on the linear vibration of the Euler-Bernoulli nanobeam is presented. Hamilton's principle is employed for obtaining differential equation of motion of nanobeam in cooperation with suitable boundary conditions. An approximate solution of the presented system is developed considering the method of multiple scales, which is one of the perturbation techniques. The effects of temperature (ΔT) and the effect of the material length scale parameter (h/l), as well as effects of the simple-simple and clamped-clamped boundary conditions on the vibrations are determined and presented numerically and graphically.

Keywords: Vibration; Nanobeam; Modified couple stress theory; Temperature effect

LINEAR VIBRATION OF NANOBEAM IN THERMAL ENVIRONMENT USING NONLOCAL ELASTICITY THEORY

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Abstract

The linear vibrations of a Euler-Bernoulli nanobeam under the thermal effect are investigated based on nonlocal elasticity theory. The governing equation is proposed by Hamilton's principle considering geometric nonlinearity due to stretching effect. The method of multiple scales is applied to the governing equation to evaluate the linear fundamental frequencies and mode shapes. In the analyses, simple-simple (S-S) and clamped-clamped (C-C) are considered as boundary condition types of nanobeam. The influence of the small scale parameter (γ) and temperature change parameter (ΔT) as well as effects of different boundary conditions on vibrational frequency are investigated numerically and presented graphically.

Keywords: Vibration; Nanobeam; Nonlocal elasticity theory; Thermal environment

Theoretical Study of New Conjugated Compounds for Organic Solar Cells

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Abstract

In This theoretical study focused on a series of new narrow band conjugated compounds for use in heterojunction solar cells. Quantum chemical calculations based on DFT and TD-DFT methods were performed, as well as a performance simulation using the AMPS-1D program. The studied compounds are based on a triphenylamine donor and a phenylenevinylene conjugate bridge, combined with different π, 3, 4-ethylenedioxythiophene (EDOT), carbazole and thiophene systems. The electron acceptor group used is cyanoacrylic acid. The calculated optimized geometries indicate that these compounds all have coplanar structures. The HOMO (most occupied molecular orbital), LUMO (least occupied molecular orbital) levels, band gap energy (EHOMO-ELUMO), absorption spectrum wavelength (λmax) as well as several quantum properties such as open circuit voltage (Voc), ionization potential (IP), electron affinity (EA) have also been calculated and discussed in detail in the paper. The short circuit current densities (Jsc), form factors (FF), energy conversion efficiencies (η), series resistances (Rs) and shunt resistances (Rsh) were obtained using the AMPS-1D program. All these properties indicate that these compounds are promising candidates for use in organic solar cells.

Keywords: Donor-Acceptor; Organic Solar cells; PCBM; Efficiency.

A Discussion on the Regional Boundary Observability for Fractional Evolution Equations with the Caputo Fractional Derivative

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Abstract

The main goal of this work is to examine the regional boundary observability for a class of time-fractional systems involving the Caputo fractional derivative. To be more specific, the aim is to locate and reconstruct the initial state of the fractional system under consideration on a suitable or desired subregion of the evolution domains' boundary. The reconstruction problem is converted into a solvability problem with the form AX = b using an adaptation of the Hilbert uniqueness method (HUM) introduced by J. L. Lions. For the purpose of demonstrating the effectiveness of the suggested strategy, some successful numerical examples were simulated and provided at the end.

Keywords: Fractional Evolution Systems; Regional Observability; Control Theory.

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Eigenfunctions Expansions of Discrete Dirac System by Laplace and Putzer's Technique

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Abstract

In the study, the classical Dirac boundary value problem is solved by Laplace transform and matrix transform. Then, discrete Dirac boundary value problem is defined and its basic spectral properties are expressed. Eventually, the discrete Dirac problem is handled and solved using discrete Laplace transform and Putzer's Algorithm techniques.

Keywords: Discrete analysis, Discrete Dirac problem.

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Solutions of Time Fractional Mathematical Model with Effective Techniques

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ABSTRACT

In this article, the Time Fractional Clannish Random Walker's Parabolic Equation traveling wave solutions, a non-linear partial differential equation, is analyzed using the modified exponential function method (MEFM) and Kudrashov Method. In this way, the solution functions of the mathematical model were obtained through a mathematical program with the help of two effective methods. Two-dimensional, three-dimensional, contour graphics simulating the behavior of this non-linear mathematical model were drawn with the help of the program under appropriate parameters.

Keywords: the Time Fractional Clannish Random Walker's Parabolic Equation, Modified Exponential Function Method, Kudrashov Method.

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Dynamic behavior and semi-analytical solution of nonlinear fractional order some partial differential equation

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Abstract

In this paper, the fractional homotopy perturbation transform method (FHPTM) and using the initial and boundary condition,we solved the nonlinear fractional order some partial differential equation(PDEs). For alternative initial circumstances, we give a semi-analytical investigation of the fractional order PDEs. The equation exhibits a rich variety of dynamic behaviors, including stable and unstable solutions, traveling waves, and chaotic behavior. The basic concepts for fractional derivatives are defined in Caputo Fabrizio. An existence and uniqueness analysis of the considered mathematical model is provided. To present the physical representation, several cases are given, and the findings are illustrated by certain surface plots. It is an important model for understanding the fundamental principles of pattern formation, turbulence, and chaos, and has been used in a wide range of applications, including combustion, fluid mechanics, and material science. The fractional order PDEs provides a simple yet powerful tool for studying the dynamics of complex physical systems and has had a significant impact on our understanding of nonlinear dynamics and chaotic behavior.

Keywords: fractional homotopy perturbation transform method ; PDEs ; semi-analytical solutions; Existence and Uniqueness analysis.

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MINKOWSKI DIFFERENCE OF PARABOLAS IN THE PLANE

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Abstract

Minkowski addition and subtraction of sets are geometrically meaningful operations that have applications in many areas of robotics, differential games, data analysis, and manufacturing. Methods for finding the Minkowski sum and difference of given bounded sets in the plane and in space are described in works [3]-[4]. In works [1],[2] results on finding the Minkowski difference and sum of straight lines and planes are given. In this work, the problem of finding the Minkowski sum and difference of the unbounded sets given in the plane, especially the parts of the plane divided by the parabola, is solved.

A given parabola in a plane divides the plane into two unbounded parts. One of these parts is a convex set, and the other is a non-convex set. The part where the focus of the parabola is located is convex. In this work, the Minkowski difference of parabolas is understood as the Minkowski difference of the convex sets separated by these parabolas in the plane.

Keywords: Exponential method; Kundu-Eckhaus; Complex exponential.

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Ensuring Data Security in The Blockchain Based Smart Home Network

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Abstract

Smart home systems are frequently preferred today because they bring the standard of living to higher levels. The variety of Internet of Things (IoT) devices used in smart homes is also increasing. With this increased demand and variety, there has been an increase in processing power and amount of storage, thus raising several security concerns. The heterogeneous use of blockchain technology is proposed to ensure transparency, privacy, and security of user data. Since blockchain technology is a distributed database in the network, it provides a homogeneous network structure to the IoT technology. Thanks to the immutability, transparency, authorization, authentication, and decentralization features of blockchain technology, data obtained from smart home devices and added to the chain become securely stored. In this study, an exemplary application has been carried out to ensure security, transparency, and privacy in the smart home network using blockchain technology. In this application, 1 gateway, 1 DHT11 temperature and humidity sensor, 1 MQ2 gas sensor, and 4 NodemCU ESP8266 cards are used. NodemCU ESP8266 card is preferred as the gateway. The gateway was used to transmit the data received from the sensors to the blockchain. Local storage and cloud storage were used for storage in the blockchain.

Keywords: Blockchain; Privacy; Security; Smart home; Transparency.

THE KIRCHHOFF-TYPE EQUATION WITH TIME DELAY: EXISTENCE, DECAY AND BLOW UP

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Abstract

In the eighteenth century, the first equations with delay were considered by brothers Leonard Euler and Bernoulli. By A. Myshkis and R. Bellman, systematical study started at the 1940s. Since 1960, there have been appeared many surveys on the subject. In the middle of 1990s, robust control of systems with uncertain delay was started and led to the `'delay bloom" in the begining of the twenty-first century. Time-delay systems are also named systems with aftereffect or dead-time, equations with deviating argument, hereditary systems, or differential-difference equations. They belong to the class of functional differential equations which are infinite-dimensional, as opposed to ordinary differential equations. In this paper, we deal with the Kirchhoff-type equation with time delay. Under some appropriate conditions, we obtain the existence, decay and blow up of solutions.

Keywords: Kirchhoff-type equation; Existence; Decay; Blow up.

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THE P(X)-LAPLACIAN EQUATION WITH DELAY TERM: BLOW UP AND DECAY

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Abstract

In the eighteenth century, the first equations with delay were considered by brothers Leonard Euler and Bernoulli. By A. Myshkis and R. Bellman, systematical study started at the 1940s. Since 1960, there have been appeared many surveys on the subject. In the middle of 1990s, robust control of systems with uncertain delay was started and led to the `'delay bloom" in the begining of the twenty-first century. Time-delay systems are also named systems with aftereffect or dead-time, equations with deviating argument, hereditary systems, or differential-difference equations. They belong to the class of functional differential equations which are infinite-dimensional, as opposed to ordinary differential equations. In this paper, we consider the p(x)-Laplacian equation with delay term. Under suitable conditions, we prove the blow up and decay of solutions.

Keywords: p(x)-Laplacian equation; Blow up; Decay.

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A radial basis deep neural network process using the Bayesian regularization optimization for the monkeypox transmission model

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Abstract: In this study, the numerical performances of the monkeypox transmission mathematical model have been presented by using a novel deep neural network process with eleven and twenty-two numbers of neurons in the first and second hidden layers. The deep neural network stochastic process is presented to find more accurate solutions of the monkeypox transmission mathematical system. A radial basis activation function is applied in both hidden layers for solving the monkeypox transmission mathematical model. The optimization is performed through the Bayesian regularization. The mathematical dynamical model is presented in two categories, human and rodent. The human dynamics is classified into five classes, susceptible, exposed, infectious, clinically ill human and recovered individuals. Whereas the rodent is divided into three forms, susceptible, exposed, and infected. A dataset is presented by applying the Adam scheme that is further processed using the training, testing, and certification procedure by taking the data as 0.13, 0.12 and 0.15. The correctness is observed through the matching of the results and the statistical plots are also provided in the form of regression, state transition, error histograms and correlation.

Keywords: Deep neural network; Monkeypox; Radial basis activation function; Bayesian regularization; hidden layers.

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SOLUTION OF Q-INTEGRO-DIFFERENTIAL EQUATIONS USING Q-DIFFERENTIAL TRANSFORM METHOD

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Abstract

The differential transform method (DTM) was introduced in [1]. The method is convenient for solving linear and significantly non-linear equations and is based on Taylor series expansion. The q-calculus is based on defining the classical derivative with a difference ratio without limit. The q-analog of DTM, which is q-DTM, is defined in [2] and [3], respectively. Their applications on linear and non-linear equations, such as the q-Riccati type equation, q-fractional equation, q-Lane Emden equation, q-Schrödinger equation and q-wave equation are examined in many works. In this paper, we will examine the solution of problems involving linear or non-linear q-integro- differential equations with the q-DTM. By definition of the q-derivative ($q \in (0,1)$), the problems studied here and their solutions are reduced to their classical counterparts in [4] for $q \to 1$.

Keywords: q-differential transform method; q-integro-differential equation.

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A second-order finite difference scheme for the singularly perturbed delay parabolic problems

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Abstract

In this paper, we deal with the initial-boundary value problems of singularly perturbed delay parabolic differential equations. Initially, asymptotic features on analytical solution are given. Next, the finite difference scheme is generated on layer-adapted mesh. The stability bounds and error approximations are estimated in the discrete maximum norm. Finally, two numerical examples are solved to clarify the theoretical foundations.

Keywords: Delay parabolic problem, finite difference method, initial-boundary value problem, singular perturbation, uniform convergence.

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EDUCATIONAL MATHEMATICS COMPUTER GAME IN CLASSROOM GAMING

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Abstract

In order for the learning process to be carried out efficiently and effectively, the use of technology in the education and training process is of great importance. It can be said that technological learning methods are very useful in many ways such as providing different experiences, supporting the person in cognitive sense and gaining different skills. It can be said that the gamification method has attracted a lot of attention especially in recent years. The aim of the research conducted in this direction is to play the games with evaluation by teachers and students that include the achievements of the 5th grade math fractions on the "https://www.mathplayground.com/ and https://matematik.eba.gov.tr/" websites for gifted students. In the study, in which case study based on qualitative research method is used, observation form and semi-structured opinion form will be used as data collection tools. The data obtained will be subjected to descriptive and content analysis. The study group of the research is a total of 20 5th grade students in the 2022-2023 academic spring semester studying at Elazığ Science and Art Education Center in the Eastern Anatolia Region in Turkey. It is thought that the views of the teachers and students about the educational mathematics computer game are important in terms of mathematics education. The results of the analysis of the data obtained in the research will be presented in the conference.

Keywords: Mathematics education, Computer game, Gifted students.

New Optical Soliton Solutions of the NLS Equation via Two Expansion Methods

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Abstract

Nonlinear Schrödinger equation plays a significant role in the description of propagation of light in nonlinear optical fibers. In this presentation optical soliton solutions are extracted for the proposed equation using the Jacobi elliptic function expansion technique and (G′/ G) -expansion technique. To better comprehend the dynamic characteristics of the retrieved solutions their graphical visualization are provided.

Keywords: Jacobi elliptic function expansion method; Soliton; Optical Soliton; (G'/G)-expansion method.

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Offshore Wind Farms Connection Topologies

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Abstract

The scope of this research, it is aimed to investigate offshore wind farm plants. It has been mentioned that what are the offshore wind farm classifications. It has been tried to examine the advantages and disadvantages of Offshore Wind Farm Plants. Along with these, the materials used in Offshore / Offshore Wind Power Plants are mentioned, and then the way the power plants are connected to each other is discussed. In addition, the definitions of the types of connection to the network are briefly explained. A summary was prepared by making cost analysis according to connection types.

Keywords: Exponential method; Kundu-Eckhaus; Complex exponential.

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Optical Soliton Solutions of the NLS Equation with Sine-Gordon Expansion Method

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Abstract

In this presentation, we study (1+1)-dimensional d-NLSE equation. The sine-Gordon expansion method is used to obtain the soliton solutions of the governing equation. As a result, dark, bright and singular optical solitons are obtained and the necessary conditions for solitons to exist are founded.

Keywords: Sine-Gordon expansion method; Soliton; Optical Soliton; d-NLS equation.

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DRONE SYSTEM DESIGN FOR WAREHOUSE AND SHELF CONTROL

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Abstract

Inventory counting operations, which are currently performed manually in warehouse operations, are carried out at long intervals based on human power, and the operation is completely stopped during the period. With the use of drones, it is foreseen that the stocktaking will be carried out within minutes without the need to stop the operation. Since the warehouse environment is a closed area, indoor navigation systems and their features are examined. In this study, it is aimed to develop the design of the drone and its subsystems, which will provide feedback by checking the warehouse and shelf indoors. Position control in the closed warehouse environment will be done with the Marvelmind kit and navigation will be provided. Chemical products belonging to various hazard classes are widely available in the warehouses of Alisan Logistics, which is located in the sector leader position in chemical logistics. In this context, physical deterioration in pallets and warehouse shelves will be determined by developing image processing algorithms thanks to the camera on the drone. With the chemosensors to be placed on the drone, possible leak and fault controls will be able to be monitored instantly. The hardware architecture of the system to realize the mentioned scenario has been developed. All system consists of three basic parts as indicated below:

1. Ground station: Communicates with onboard avionics to acquire real-time status data and send control commands via radio or Bluetooth telemetry

2. Avionic systems: Flight control unit, sensors systems (Marvelmind ultrasonic sensor, altitude sensor Lidar, chemosensor for leak gas detector, company computer/microcontroller, camera system, actuators (brushless DC motors and electronic speed controllers)

3. External tools: Marvelmind fixed pointers, RC remote control, LiPo battery

Keywords: Indoor navigation; Drone; Marvelmind; Warehouse stock control

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IMAGE PROCESSING BASED CAMERA SABOTAGE AND ANGLE CHANGE DETECTION SYSTEM

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Abstract

The camera sabotage and angle change detection systems include image review and reporting of the detected situations to detect the problems in the camera. In the proposed architecture, there are basically three different situations. The first is when the incoming image is completely corrupted or the image cannot be retrieved. When this situation is detected, a "Video Loss" warning is issued, indicating that the problem should be fixed with the camera. In the second case, the control section detects situations such as closing or blocking the camera's field of view. When this is detected, a "video tampering" or "tampering" warning is issued. In the third case, the field of view is not closed, but an attempt is made to determine the situations created by changing the angle of the shot. In this case, a "scene change" warning is issued. The method provided for angle change is based on SIFT. The method is subjected to the SIFT algorithm separately by subtracting parts of different reference points on the image. In various tests for scene changes, angle changes were detected with an accuracy rate of 88% for angle changes greater than 10°. The Local Binary Pattern (LBP) method was used to detect video sabotage situations. The LBP histogram obtained from the reference and test image was converted, and then a comparison was made between the histograms. When there is a significant difference between the Local Binary Pattern (LBP) histogram of the sabotaged image and the reference image, specifically below a predetermined threshold value, a "video sabotage" warning is issued. This was because the detected patterns were noticeably different in situations where the image was obstructed by an object or hand, indicating a potential sabotage. For video loss situations, exceptions occurring in the system when there were no pixels in the current frame or the image could not be processed were used to issue a video loss warning.

Keywords: Computer Vision, Image Processing, Image Matching

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THE UNIQUENESS SOLUTION OF M-STURM-LIOUVILLE PROBLEM WITH COULOMB POTENTIAL

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Abstract

In this study, the uniqueness theorem of solution of M-Sturm-Liouville problem having Coulomb potential is shown, Moreover, the representation of solution of M-Sturm-Liouville problem with Coulomb potential is obtained under the given initial conditions using Laplace transform.

Keywords: M-Derivative; Sturm-Liouville Problem; Laplace Transform.

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REPRESENTATION OF SOLUTION M-STURM-LIOUVILLE PROBLEM WITH N-TRANSFORM

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Abstract

Let us denote the Sturm-Liouville problem for the M-derivative as follows:

$$-D_M^{\alpha,\gamma} D_M^{\alpha,\gamma} y(x) + [q(x)y(x)] = \lambda y(x) \qquad (1)$$

Our aim in this study, we obtain representation of solution for the M-Sturm Liouville problem using natural transform.

Keywords: M-derivative; Sturm-Liouville problem; Natural transform.

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The Solution of Nonlinear Chemical Akzo Nobel Problem Modeled as Differential-Algebraic Equations(DAEs) with Laplace-Padé Series Method

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Abstract:

In this paper, we apply Laplace-Padé method to solve nonlinear Chemical Akzo Nobel Problem Modeled as differential-algebraic equations(DAEs). Firstly, The basic properties of the Laplace-Padé method are given. Secondly, we calculate Power series of the given equations system, then transform it into Laplace-Padé series form, which gives an arbitrary order for solving differential-algebraic equations(DAEs). Then, the nonlinear Chemical Akzo Nobel Problem are solved by Laplace-Padé method. This means that Laplace-Padé method is a powerful tool for solving nonlinear differential-algebraic equations(DAEs).

Keywords: Differential-Algebraic Equations(DAEs), Power series, Laplace-Padé method, Nonlinear Chemical Akzo Nobel Problem

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BIGEOMETRIC LAPLACE TRANSFORM AND ITS APPLICATIONS

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Abstract

In this article, we describe a new integral transform in bigeometric analysis, which is one of the non-Newtonian analysis. We call this transform the bigeometric Laplace integral transform (BGLIT). The basic definitions and theorems of this new transform were given and some of its properties were investigated. Also, the solutions of some bigeometric linear differential equations with BGLIT are examined.

Keywords: Bigeometric analysis; Integral transform; Bigeometric Laplace integral transform.

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Partial Differential Equations with Variable Coefficients Solved by Collocation Method

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Abstract

This paper gives an approximate solution for the Goursat problem in hyperbolic linear partial differential equations with variable coefficients. A convergent algorithm based on Taylor polynomials is developed to construct a collocation solution, and the error with the maximum norm is estimated. Numerical examples are included to illustrate the validity and accuracy of the proposed method.

Keywords: Partial differential equations; Collocation method; Taylor polynomials.

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INVESTİGATİON OF DRİNFEL'D-SOKOLOV SYSTEM İN TRUNCATED M-FRACTİONAL DERİVATİVE VİA THE SARDAR SUB-EQUATİON METHOD

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Abstract

In this study, we investigate the Drinfel'd-Sokolov system (DS system), which is a nonlinear model including some special forms of lax pairs. This system is written in Truncated M-fractional derivative form. Soliton solutions of this newly formed system are obtained by the Sardar sub-equation method. In addition, 2D plots, 3D plots and contour plots of the obtained solutions are drawn according to the appropriate parameter values.

Keywords: the DS System, Truncated M-fractional derivative, Sardar sub-equation method, Soliton solutions.

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MULTIPARAMETER EIGENVALUE PROBLEMS ON TIME SCALES

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Abstract

The main aim of this study is to redefine the multiparameter eigenvalue problems on time scale. In particular, the focus will be on the two-parameter eigenvalue problem in dynamical equations. Firstly, this equation is reduced to a one-parameter partial dynamical equation. Secondly, some spectral properties (orthogonality, realness and self-adjoint) of the two-parameter eigenvalue operator are investigated. As a result, some integral relations are given.

References [1-6] form the basis of our study, and quality and effective results have been carried out from these studies in recent years.

Keywords: Delta Integral, Delta Derivative, Multiparameter Eigenvalue Problems, Time Scales.

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A VARIETY OF ANALYTICAL SOLUTIONS FOR VARIOUS CATEGORIES OF NPDES IN OPTICAL FIBERS AND THEIR APPLICATIONS

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Abstract

In this study, we observe the nonlinear and super nonlinear traveling wave solutions of the Sharma Tasso Olver (STO) equation. The exact solution is obtained by the $(m + 1/G')$-expansion method. The wave transform is used to reduce the STO equation to an ordinary differential equation. The results obtained provide useful information about dynamic behavior.

Keywords: : (m+1/G')-expansion method, the Sharma Tasso Olver Equation, travelling wave solutions.

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ANALYSIS OF THE TRAVELLING WAVE SOLUTIONS OF BURGERS-FISHER EQUATION

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Abstract

In this study, we use the $(m+1/G')$-expansion method to obtain the travelling wave solutions of the Burgers-Fisher equation. The three dimensional graphs and corresponding contour graphs of the obtained results are drawn and analyzed. The results obtained show that the presented method is powerful, useful, practical and suitable for investigating the model.

Keywords: $(m+1/G')$-expansion method, the Burgers-Fisher Equation, travelling wave solutions.

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A NEW METHOD OF CRYPTOGRAPHY USING MELLIN TRANSFORM OF HYPERGEOMETRIC FUNCTIONS

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Abstract

Secure communication requires the use of encryption techniques to protect user-generated plain text. Cryptography provides a mathematical framework for achieving such encryption. In this study, we generate a unique key to be used in decrypting encrtypted texts. Specifically, we apply the Mellin transform of hypergeometric functions to plaintext to achieve encryption, and apply the inverse Mellin transform to ciphertext for decryption. To measure the security level of our approach, we conduct statistical tests. For these tests, as well as for encryption and decryption processes, we employ the Python programming language.

Keywords: Cryptology; Data encryption; Hypergeometric Functions; Mellin Transform.

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THE NECESSARY OPTIMALITY CONDITION ON A CONTROL PROBLEM FOR THE SCHRODINGER EQUATION

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Abstract

We consider an optimal control problem with the boundary functional for a Schrödinger equation that includes a specific gradient term. By using the existence of the optimal control, we explore the necessary optimality condition for the control problem. First, we prove the existence and uniqueness theorems for the adjoint problem. Then, we demonstrate the differentiability of the objective functional and get a formula for its gradient. Finally, we give a necessary optimality condition for the control problem.

Keywords: Optimal control; Schrödinger equation; boundary functional.

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ON STATISTICAL BOUNDEDNESS IN FUZZY SEQUENCES

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Abstract

In this study, we generalized the concept of statistical boundedness of order β for sequences of fuzzy numbers using an difference operator Δ^m for m∈ N and a non-decreasing sequence of positive real numbers (λ_n) which tends toward infinity such that $\lambda_1 = 1,\ \lambda_{n+1} \leq \lambda_n + 1$ and give some inclusion relations..

Keywords: Fuzzy number, Statistical boundedness, Statistical convergence

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ON LACUNARY STATISTICAL CONVERGENCE IN FUZZY SEQUENCES

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Abstract

In this study, we generalized the concept of lacunary statistical convergence and strong lacunary summability for sequences of fuzzy numbers using a modulus function f and difference operator Δ and give some inclusion relations.

Keywords: Statistical convergence, fuzzy sequence, lacunary sequence, modulus function, difference operator.

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TIME SERIES BASED REVENUE FORECAST MODELS

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Abstract

Financial planning is the process of developing a strategy to help organizations manage their financial resources as effectively as possible. It involves analyzing an organization's current financial situation, setting its financial goals and developing a plan to achieve those goals. This study aims to develop revenue forecasting models using univariate time series methods. For this purpose, deep learning based Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU) and Convolutional Long Short-Term Memory (ConvLSTM) have been used. The performance of the developed models has been evaluated using Mean Absolute Percentage Error (MAPE). The dataset includes 113 rows of total revenue data in weekly format from June 1st, 2020 to July 31st, 2022. Forecast models have been developed for two different weeks and months randomly selected from the dataset. The MAPE's obtained with LSTM, GRU and ConvLSTM varied from 1.23% to 4.67% for different weeks and from 9.9% to 13.86% for different months. The results show that LSTM based models yield superior performance for both weekly and monthly revenue forecasting.

Keywords: Time Series, Machine Learning, Financial Planning, Revenue Forecasting

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Some Novel Topological Sequence Spaces and Further Properties

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Abstract

Examination of spaces in the field of functional analysis, especially revealing their topological and algebraic structures, is very important in terms of forming a basis for studies in the field of pure mathematics and applied sciences. In this context, topology, which was widely used only in the field of geometry at the beginning, gave a solid foundation to the fields in which it was used by causing methodological changes in all branches of mathematics over time. Frechet-Coordinate space (FK space) is a concept that has a functional role on the fields such as topological sequence spaces and summability. Basically, topological vector spaces are described as linear spaces defined by a topology that provides continuous vector space operations. If this vector space has a complete metric space structure, it is called Frechet space, and if it has a topology with continuous coordinate functions, it is called Frechet-Coordinate (FK) space. The theory of FK spaces has gained more importance in recent years and has found applications in various fields thanks to the efforts of many researchers. If the topology of an FK space can be derived from the norm, this space called as a BK space. In this study, $cs_0^{\lambda}(\Delta), cs^{\lambda}(\Delta), bs^{\lambda}(\Delta)$ difference sequence spaces are defined, and it is revealed that these spaces are BK spaces. In addition, considering the topological properties of these spaces, some spaces that are isomorphic and their duals have been determined.

Keywords: BK spaces; difference sequence spaces; Frechet-Coordinate spaces; Schauder basis; topological sequence spaces.

A CONFORMABLE INVERSE PROBLEM WITH CONSTANT DELAY

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Abstract

In this research work we gave some results about the solution of some inverse Sturm-Liouville problem with constant delay using conformable derivative operator under a mixed boundary condition. For this problem, the asymptotics of the eigenvalues are obtained and the solutions were extended to Regge-type boundary value problem. The uniqueness theorem is proved in some different cases. The results in the classical case of this problem can be obtained at $\alpha = 1$.

Keywords: Conformable derivative, fractional Sturm-Liouville problem, spectrum,constant delay

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CUSTOMER CHURN PREDICTION USING SUPERVISED LEARNING FOR E-COMMERCE

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Abstract

With the developments in artificial intelligence, better insights about customers can be gained by using machine learning techniques. In order to develop efficient and effective customer retention strategies, it is necessary to create a data-driven model to predict customer churn. The aim of this study is to develop customer churn prediction models based on supervised machine learning algorithms for the e-commerce sector. The prediction models have been developed using Support Vector Machine (SVM), Extreme Gradient Boosting (XGBoost), Random Forest (RF) and Deep Neural Network (DNN). Minimum Redundancy Maximum Relevance (mRMR) has been used to correctly select the attributes that affect the quality of customer churn models. The data has been collected from Inveon's customers. The dataset consists of 4407 rows and includes 17 attributes. The performance of the developed models has been evaluated using Accuracy and F-score by utilizing 5-fold cross-validation on the dataset. The accuracies of SVM-based, XGBoost-based, RF-based and DNN-based models without feature selection are 0.66, 0.83, 0.81 and 0.68 and the accuracies of SVM-based, XGBoost-based, RF-based and DNN-based models with feature selection are 0.83, 0.85, 0.84 and 0.85, respectively. Results show that mRMR feature selection algorithm improves the performance of the models.

Keywords: Customer Churn, Supervised Learning, Machine Learning, E-commerce.

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Δ^m – STATISTICAL BOUNDEDNESS

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Abstract

In this study, we define Δ^m – statistical boundedness in sequences of fuzzy real numbers and give some inclusion theorems between Δ^m – statistical boundedness and Δ^m – statistical convergence.

Keywords: Fuzzy number, Statistical boundedness, Statistical convergence, Statistical Cauchy sequence, Difference operator.

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THE HOMOGENEOUS SECOND-ORDER NUMERICAL SCHEME FOR A SINGULARLY PERTURBE MIXED INTEGRO-DIFFERENTIAL EQUATIONS WITH INTEGRAL BOUNDARY CONDITION

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Abstract

The aim of this paper is to established a second-order numerical technique for linear first order singularly perturbed Volterra-Fredholm integro-differential equation with integral boundary condition. First, some properties of the exact solution and its derivative are given. Then, a fitted finite numerical scheme is constructed on a piecewise uniform mesh using appropriate interpolating quadrature rules and exponantial basis function for differential part, and a composite trapezoidal rule in both; in the integral parts of equation and in the initial condition. It is shown that the proposed scheme is second order uniform convergence with respect to perturbation parameter in the discrete maximum norm. Finally, numerical examples are given yo provide the theoretical results.

Keywords: Singular perturbation; Integro-differential equation; Finite difference methods; Piecewise uniform mesh; Uniform convergent.

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ON APPROXIMATION OF MODIFIED GAMMA OPERATOR BY GENERALIZED TWO PARAMETERS GAMMA FUNCTION

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Abstract

In this study, with the aid of the generalized two parameter gamma function we introduce a modified gamma operator. We prove Voronovskaya type theorem and rate of convergence. Lastly, numerical examples obtain by MATLAB have been provided to show its approximation properties.

Keywords: Rate of convergence; Gamma operator; Voronovskaya type theorem.

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f −STATISTICAL CONVERGENCE IN TOPOLOGICAL GROUPS

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Abstract

In this research study, we explore the concepts of f − statistical convergence and f − lacunary statistical convergence in topological groups through the use of unbounded modulus functions. Additionally, we give some inclusion theorems.

Keywords: Topological groups; Statistical convergence; Lacunary statistical convergence.

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VAN PROVINCE IMMIGRATED TO ACCESS A BETTER LIFE

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Abstract

Migration is the movement of individuals or social groups to another place by leaving their place of residence for various reasons. Migration, an event as old as human history, leaves deep traces in social science. In general terms, migration is a phenomenon that occurs as a result of people's dissatisfaction with the region they live in. This concept of movement, which sees the place where people are located as a solution to go to a place where they seek a safe place of shelter for security, social, economic, political and legal reasons, or has been forced to do so, appears as a problem. It has been the subject of research to examine which reasons the effect of the decisiveness on the province of Van, which was chosen in order to reach a better life in the past, which is one of the reasons for migrating to Van, is more explanatory.The methods used are Poisson Regression, which is used when the arithmetic mean and standard deviation are equal in discrete data, and a kind of conditional kernel regression that uses a spatial weighting function to estimate spatial changes in regression parameters. The Geographical Weighted Poisson Regression (GWPR) method, which is formed by adding coordinates and localizing the Poisson regression, was used. The research takes its data from the snowball sampling method presented to 440 people who migrated from 11 provinces (Ağrı, Batman, Bitlis, Erzurum, Iğdır, Hakkari, Kars, Mardin, Muş, Siirt and Şırnak). The comparison of global and local regression methods is interpreted statistically as a result of the analysis of the migration tendency of Van province in the past with GWPR methods. According to the results of the analysis, the places where the immigrants in Van, who chose Van as a better life center, migrated in the past, were analyzed and supported with graphics. According to the R^2 values obtained from the analysis results, while the Poisson regression explains the relationship with the value of 0.679, the GWPR increases to the value of 0.766 and concludes that the local functions are more effective in the model.

Keywords: Migration, Poisson Regression, Geographically Weighted Poisson Regression

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THE EFFECT OF CLIMATE AND GEOGRAPHICAL CONDITIONS ON MIGRATIONS TO VAN PROVINCE

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Abstract

Migration means that people move away from their current living spaces, their familiar social structures, their current economic opportunities and other social elements, or move away from them to new living spaces. In this process, individuals or communities may seek and find new settlements in line with their preferences or obligations. In this study, local values related to the migrations of Van province from neighboring provinces will be obtained by snowball sampling from face-to-face survey method and analyzed by Geographical Weighted Regression (GWR) method. The aim of our study is to see the effect of climate and geographical conditions and how much is explained by the independent variables of the migrations to Van. In our study, it will be obtained by comparing which method gives more reliable results by using Ordinary Least Squares (OLS) and GWR methods. At the same time, R^2will be used for performance evaluations. As a result, the methods were compared in the analysis and the GWR method gave more reliable results. R^2 is explained increasing from 0.345 to 0.718. Our findings and methodology will be able to help other provinces' immigration status and guide them by developing a special province-specific strategy.

Keywords: Least Squares Method; Geographical Weighted Regression; Migration; Climate and Geographical Conditions

Acknowledgements: This work is supported by TÜBİTAK 3005-Innovative Solutions in Social and Human Sciences Research Projects with the number 122G128.

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Schwarz-Christoffer Mapping with Conformable Derivative

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Abstract

The present study consists of some results about Schwarz-Christoffer mapping with conformable derivative. These type mapping is defined as [1,2];

$$\frac{dw}{dz} = K(z\text{-}a_1)^{\frac{\alpha_1}{\pi}-1}(z\text{-}a_2)^{\frac{\alpha_2}{\pi}-1}...(z\text{-}a_n)^{\frac{\alpha_n}{\pi}-1}$$

Where $a_1, a_2, ..., a_n$ are the corners of a polygon with n sides and $\alpha_1, \alpha_2, ..., \alpha_n$ are the angles formed in these vertices. This mapping is a kind of conformal mapping and is based on the angular change. It also maps the inside region of a polygon in the complexZ-plane into the upper half plane of the W-plane. These type mappings have many application in engineering. [3,4]
Note that we will study this mapping in the conformable derivative case.

Keywords: Schwarz Christoffer mapping, differential equation, conformable derivative

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A New Approach to Investigating the Associations Between Moving Curves and Integrable Equations

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Abstract

We define a new approach for establishing possible connections between the geometry of three distinct moving curves and the integrable equations by using Hasimoto-type functions in 3-dimensional space.

Keywords: Soliton equation; Curve flow; Hasimoto map.

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A COMPARATIVE ANALYSIS BASED ON MACHINE LEARNING FOR SUICIDE AND DEPRESSION DETECTION

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Abstract

People can feel hopeless, sad, and helpless at some point in their lives, and this normal situation can become quite dangerous over time. While many people show symptoms of depression in their daily lives and learn to live with them, the more critical issue of 'suicidal ideation' can take over. This is a very serious problem considering the worldwide suicide rate. Artificial intelligence methods are used in addition to traditional methods to detect and solve this problem. These methods can make inferences about people's psychological states by using the data they obtain from various internet media. Online social networks such as Twitter, Facebook, and Instagram, which have become very popular in recent years, provide very useful and large-scale information for the early detection and prevention of depression and suicidal thoughts. In this study, a machine learning-based text classifier was created to detect suicidal thoughts of depressed people and predict whether they will commit suicide or not. For this purpose, suicidal ideation prediction models were created using machine learning algorithms such as Naive Bayes, Logistic Regression, K-nearest Neighbors, Random Forest, and Decision Tree, and the results were compared using various metrics. According to the experimental results, the Logistic Regression method was the most successful model.

Keywords: Artificial intelligence; Suicide and depression prediction; Machine learning

Deep Learning Based Brain Tumor Detection

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Abstract

Artificial intelligence is systems that make it possible for machines to perform various tasks, learn from experience, and adapt to new inputs, similar to humans. With artificial intelligence, it is basically aimed to develop human competencies and contribute to them. Because artificial intelligence can identify meaningful relationships in raw data, it can be used to support diagnosis, treatment, and predictions in many medical conditions. With the rapidly developing image processing and artificial intelligence technologies, many technologies are being developed for the diagnosis and diagnosis of diseases to be defined more automatically, faster and more accurately. The use of artificial intelligence in medical diagnosis systems is being developed to provide many benefits to patients, healthcare professionals and healthcare institutions, such as early diagnosis of the disease, quality of treatment, and cost reduction. In this study, a diagnostic system was developed for the diagnosis of brain tumors from MRI images using the DenseNet121 model. The dataset used consists of 7022 MRI images with glioma, meningioma, no tumor and pituitary labels. Experimental results showed that the developed DenseNet121 model has 94.51% accuracy in brain tumor detection.

Keywords: artificial intelligence; deep learning; brain tumor; DenseNet121

Machine Learning in Geographically Weighted Regression

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Abstract

Geographically Weighted Regression (GWR) is a spatial statistical analysis technique used to investigate geographical differences in the influence of one or more predictor variables on a response variable. Empirical research and studies have shown that local correlation between explanatory variables can result in highly correlated estimated regression coefficients in GWR, a condition known as multicollinearity. It ultimately leads to a large standard error on estimated regression coefficients, making it difficult to draw conclusions about the relationships between variables. Methods of machine learning for GWR are able to handle spatial heterogeneity and local multicollinearity in spatial data sets. In this presentation, we demonstrate the use of GWR machine learning algorithms using immigration data. The outcomes of employing machine learning methods for GWR indicate that it stabilizes regression coefficients in the presence of multicollinearity and yields lower prediction and estimation errors for the response variable than GWR does.

Keywords: Spatial Regression; Machine Learning; Migration Data.

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The Suborbital Graphs Obtained by Submodular Group $\Gamma^0(N)$

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Abstract

The modular group and its subgroups have been studied inclusively in recent years. Especially, the modular group has been used to define action formed with Möbius transform on extended rational number set and upper half plane of complex space. Then, graphs are compose of this action. In literature, submodular group $\Gamma_0(N)$ and suborbital graphs obtained with this group have been comprehensively scrutinized, where N is natural number. Readers can be refer to [1-5] for related studies. In this paper, we examine submodular group $\Gamma^0(N)$, on the aboves. The vertices, edges and, path directed right and left are obtained. The relevant vertices are associated with generalized Fibonacci numbers. In addition, the values converged of path have been obtained. The providing of minimal length condition between consecutive vertices has been proved.

Keywords: Modular group; Suborbital graph; Fibonacci numbers; Minimal length condition.

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INVESTIGATION OF THE SPACE HARMONIC EFFECTS OF DIFFERENT NUMBERS OF ROTOR SLOTS FOR A 2-POLE INDUCTION MOTOR HAVING 72 STATOR SLOTS

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Abstract

The non-sinusoidal air-gap mmf related to the motor geometry and winding distribution create harmonic components, known as "space harmonics," which can have detrimental effects such as torque ripple, additional loss, noise, and vibration during various operating conditions. The interaction between stator and rotor space harmonics determines the resultant effect. This effect can be extremely negative to prevent the motor even from rotating. Although the most of the slot combinations for different numbers of stator slots and poles were analyzed thoroughly, seldomly used number of stator slots and pole combinations needs further attention. In this study, the effect of different numbers of rotor slots on the performance of a 3-phase, 2-pole induction motor accommodating 72 stator slots was analyzed by using finite element method while the stator core and winding design, rotor slots shape, rated power and speed were kept unchanged for all rotor slot numbers. Since the shape of the rotor slot is out of concern, rotor was chosen to be double-cage and slot dimensions were optimized for all cases in order to equalize the motor performance for a reliable comparison. Primarily, known disadvantageous calculated numbers of rotor slots given by equations were omitted. Resultant harmonic components of the air-gap mmf and torque ripple were compared. Specifically, the best 5 rotor slots number were obtained and their performance is presented in comparison.

Keywords: Induction Motor; Space Harmonic; Rotor Slot Number; Torque Ripple

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INVESTIGATION OF β −CONFORMABLE DERIVATIVE MODIFIED WITH k −GAMMA FUNCTION BY SUB-EQUATION METHOD

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Abstract

In this article, we investigate the exact travelling wave solutions of fractional space-time equations to demonstrate the validity of the sub-equation method under the β-conformable derivative of Atangana. In obtaining the solutions, the β-conformable fractional derivative was used by modifying it with the k −Gamma function. For the special case where $\beta = 1$, we obtain the same previously known solutions. However, we find new exact solutions for fractional β values showing new significant differences studies. The conformable derivative of Atangana is an excellent option for solving nonlinear coherent problems that arise in soliton theory and other fields.

Keywords: β-conformable Fractional Derivative of Atangana, Sub-equation Method, k −Gamma function

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A NUMERICAL METHOD BASED ON RADIAL BASIS FUNCTIONS FOR SOME REACTION-DIFFUSION EQUATIONS

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Abstract

In this study, we suggest a numerical method to solve some nonlinear partial differential equations (PDEs) of reaction-diffusion type. A finite difference method is used for discretization of time variable of considered PDE. For space discretization radial basis functions are used. Two tes problems are solved via suggested method. Obtained numerical solutions are compared with exact solutions and with some methods available in literature. From the comparisons, accuracy and feasibility of the suggested method are proved

Keywords: Radial basis functions;Reaction-diffusion PDE; Numerical method.

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*Abstract Submission should be prepared only **1 page**.

ENHANCING SECURITY WITH TWO-FACTOR AUTHENTICATION USING BOTH PIN AND IOT DEVICE INTERACTION

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Abstract

Technology has become an important part of our modern life. With the advancement of the Internet of Things, people can communicate with devices through a global network using computers and smartphones. However, with technological progress come concerns about potential vulnerabilities and risks. To protect individuals and prevent risks, cybersecurity is crucial. One common method of device protection is the use of Personal Identification Numbers (PINs) for user authentication. Enhancing security is an important aspect of modern technology. Two-factor authentication (2FA) is a widely used method to enhance security, and it requires the user to provide two different types of authentication to access a system or service. In this context, a new paper proposes a 2FA method that utilizes a personal identification number (PIN) in combination with an Internet of Things (IoT) device interaction to generate a one-time password (OTP). This approach provides an extra layer of security to the authentication process and is both secure and user-friendly. The paper goes on to discuss the implementation of this proposed method, highlighting its advantages over traditional 2FA methods. The proposed system offers flexibility, scalability, and adaptability to various application scenarios, ultimately minimizing the risk of unauthorized access and data breaches. It utilizes a hybrid code that is manually generated and incorporates mathematical relationships that the user selects in advance. This unique approach ensures security while allowing for customization to meet specific user needs.

Keywords: Two-factor authentication; PIN; OTP; IoT; cybersecurity; Security; 2FA.

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Limit-point classification of Sturm-Liouville operators with beta-derivatives

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Abstract

In this study, the singular beta Sturm-Liouville operator defined as

$$\Omega(y) = -T_\beta(f(t)T_\beta y(t)) + g(t)y(t) \text{ on } [0,\infty),$$

is considered. Here; f(t) and g(t) are real-valued functions such that provides the following conditions:

i. $g(t) \in {}_{L_\beta}{}^2[0, b]$ for all $b > 0$,

ii. $f(t)$ is absolutely continuous on $[0, b]$ for all $b > 0$,

iii. $f(t) > 0$ for all $t \in [0,\infty)$.

In this context, first of all, the basic concepts of beta calculus are given. Later, a criterion will be obtained for the Weyl's limit point state of the Beta-Sturm-Liouville operators.

Keywords: Limit-point case, singular Sturm-Liouville operator.

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SPECTRAL SINGULARITIES OF THE VECTOR-VALUED STURM-LIOUVILLE OPERATORS WITH NON-STANDARD WEIGHT FUNCTION AND DIAGONAL POTENTIAL

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Abstract

In this study the spectrum of the non-self-adjoint singular matrix-valued Sturm-Liouville operator with a negative weight function is analyzed. We present the sets of spectral singularities and discrete spectrum by using the hyperbolic type representations of the fundamental solutions. Analytic properties of the functions have been used to prove the finiteness of the spectral singularities and the eigenvalues of the operator.

Keywords: Eigenvalues; Matrix Sturm-Liouville operators; Spectral singularities; Weight function.

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A STUDY ON LACUNARY STATISTICAL CONVERGENCE ACCORDING TO A COMPOSITE MODULUS FUNCTION

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Abstract

In this article, we study a new generalization on the lacunary statistically convergent sequences and introduce the concept of the lacunary statistical convergence according to f^k, for sequences of complex (or real) numbers, where $f^k = f \circ f \circ \ldots \circ f$ (k times) represents a composite modulus function. In addition, with the use of f^k we create some sequence sets such as $S_\theta(f^k)$ and $S_\theta(f^{k,m})$, where for instance

$$S_\theta(f^k) = \left\{(x_i) : \lim_{r\to\infty} \frac{1}{f^k(h_r)} f^k(|i \in I_r : |x_i - \ell| \geq \varepsilon|) = 0 \text{ for some } \ell \in \mathbb{C}\right\}$$

and

$$S_\theta(f^{k,m}) = \left\{(x_i) : \lim_{r\to\infty} \frac{1}{f^m(h_r)} f^k(|i \in I_r : |x_i - \ell| \geq \varepsilon|) = 0 \text{ for some } \ell \in \mathbb{C}\right\}.$$

After that, we establish the connection of S_θ to the sets $S_\theta(f^k)$ and $S_\theta(f^{k,m})$. Moreover, we investigate several properties of this generalization.

Keywords: Sequence space, Modulus function, Lacunary sequence, Lacunary statistical convergence.

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A Robust Quintic Hermite Collocation technique for One-Dimensional Heat Conduction Equation

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Abstract

This article is going to deal with the numerical solutions about the most vital problem arising in nature; namely the heat conduction equation given in one-dimension. For this aim, we are going to use Quintic Hermite spline finite elements based on collocation method. Then, the algorithm of the method has been produced and the stability analysis has also been examined via Fourier stability method. Furthermore, a comparative study between the approximate and exact solutions has been used to demonstrate the accuracy and efficiency of the proposed scheme. The newly obtained results clearly show that the present scheme is a reliable and accurate one and may even be used successfully to find approximate solutions of numerous nonlinear problems encountering widely in many applied sciences.

Keywords: Quintic Hermite Collocation Method (QHCM), Finite Element Method (FEM), Heat Conduction Equation, Stability Analysis.

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A Robust Septic Hermite Collocation technique for Dirichlet Boundary Condition Heat Conduction Equation

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Abstract

In the present article, we are going to deal with the numerical solutions about the most vital problem arising in nature; namely the heat conduction equation given in one-dimension. For this aim, we are going to use Septic Hermite spline finite elements based on collocation method. Then, the algorithm of the method has been produced and the stability analysis has also been examined via Fourier stability method. Furthermore, a comparative study between the approximate and exact solutions has been used to demonstrate the accuracy and efficiency of the proposed scheme. The newly obtained results clearly show that the present scheme is a reliable and accurate one and may even be used successfully to find approximate solutions of numerous nonlinear problems encountering widely in many applied sciences.

Keywords: Septic Hermite Collocation Method (SHCM), Finite Element Method (FEM), Heat Conduction Equation, Stability Analysis.

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A Limit-circle criterion for the Beta-Sturm-Liouville operator

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Abstract

Limit-point/Limit-circle theory, first developed by Herman Weyl in the early 1900s, has become increasingly important in solving various singular quadratic Sturm-Liouville problems. In this study, the singular beta Sturm-Liouville operator defined as

$$\Omega(y) = -T_\beta(f(t)T_\beta y(t)) + g(t)y(t) \text{ on } [0,\infty)$$

is considered, where f(t) and g(t) real-valued fonctions. In this context, first of all, the basic concepts of beta calculus are given. Later, a criterion will be obtained for the Weyl's limit circle case of the Beta-Sturm-Liouville operators.

Keywords: Limit-circle case. singular Sturm-Liouville operator.

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COMPARING THE EFFICIENCY OF ASYMMETRIC ENCRYPTION ALGORITHMS BASED ON THE INTEGER FACTORIZATION PROBLEM

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Abstract

The number used in encryption and decryption processes in encryption algorithms is called the key, and encryption algorithms are divided into two basic classes as symmetric (single key) and asymmetric (double key) according to the way this key is used. In symmetric encryption, the same key is used for encryption and decryption, while in asymmetric encryption the encryption and decryption keys are different. Today, the security of many asymmetric encryption algorithms is based on the factorization of integers or the discrete logarithm problem. There are some studies in the literature that examine the performance of some asymmetric algorithms, and in this study, the performance comparison of asymmetric encryption algorithms based on the factorization problem will be examined among themselves, taking into account their algorithmic complexity.

Keywords: Cryptology; Asymmetric Algorithms; Algorithmic Complexity.

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INVESTIGATION OF WORK EFFECT IN THE POST-MIGRATION ADAPTATION PROCESS BY GEOGRAPHICALLY WEIGHTED POISSON REGRESSION: THE CASE OF VAN*

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Abstract

Migration is a social change process that includes the geographical displacement of people in order to settle from one settlement unit to another for a permanent or temporary period in order to spend all or part of their future life. Due to Turkey's geopolitical position, being at the migration crossing point also increases the migration to Turkey. The rapid internal migration in Turkey has created striking differences in the rural-urban population ratio. The province of Van is among our provinces that receive immigration due to its geopolitical location and level of development. In order for immigrants to normalize their relationship with the settled population over time, that society needs to adapt. Due to the work done after the migration, individuals are in constant communication with the society, so it is thought that the work done in the adaptation process has a significant impact. In this study, the effect of the work done in the post-immigration adaptation process of the province of Van from the provinces with first and second degree borders was analyzed using Poisson and Geographically Weighted Poisson Regression methods. The aim of the study is to determine the relationship between the contribution of the work done in the post-migration adaptation process and the independent variables and to analyze which of the models used for analysis gives stronger results. In the study, Geographical Weighted Poisson Regression method gave stronger results compared to the AIC, AICc and R^2 values in the analysis results. In addition, the effect of the relationship between independent variables and dependent variables according to provinces and districts and their significance were visualized and tested on maps.

Keywords: Adaptation process; Geographically Weighted Poisson Regression; Migration.

*: This study is supported as the TUBITAK Project with the number "122G128" within the scope of the 3005 – Innovative Solutions Research Projects Support Program in Social and Human Sciences.

ANALYZING THE AIR POLLUTION DATA FROM HATAY, TÜRKİYE BY USING THE STATISTICAL DISTRIBUTIONS

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Abstract

Air pollution is a severe environmental issue that has harmful effects on both human health and the environment. Natural disasters, industrialization, and frequent use of low-quality fuels may cause intense air pollution. There are several studies on air quality employing different methods and using various air pollutants (carbon monoxide, nitrogen oxides, ground-level ozone, and particle pollution) in the related literature. Statistical distributions have been frequently utilized to model air pollutant levels in various studies; e.g., the lognormal distribution stands out in modeling air pollutant levels. In this study, a concentration of 10 micrometers or smaller size of air pollutants (PM_{10}) in Hatay province modeled which has one of the biggest steel and iron factories in Türkiye. Unfortunately, the region is faced two devastating earthquakes most recently that may cause the release of dust and toxic gases from the ground contributing to air pollution. Due to these reasons, the air quality may be higher than the limits set by regulations. Therefore, the PM_{10} levels of Hatay are modeled by using the lognormal, and Burr type XII distributions. In estimating unknown parameters of the lognormal, and Burr type XII distributions the Maximum Likelihood method is used. Information and goodness of fit criteria are used to compare considered distributions' modeling performances. According to the results, the Burr Type XII distribution performed better than the lognormal distribution in modeling the PM_{10} concentrations in Hatay.

***Keywords*:** Air pollution, log-normal distribution, Burr type XII distribution.

GENERALIZATION OF LAGUERRE-BASED APPELL POLYNOMIALS AND SOME PROPERTIES

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Abstract

In this study, we present the new generalization of Laguerre-based Appell polynomials via Appell convolutions. We obtain their explicit representation, recurrence relation, determinantal representation, lowering operator, ıntegro-partial raising operator and integro-partial differential equation. In addition, the applications of this new family are investigated using Euler and Bernoulli polynomials. We also state their corresponding characteristic properties.

Keywords: Laguerre-Based Appell polynomials; Reccurence relation; Shift operators; Differential equation.

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PARAMETRIC KINDS OF THE HERMITE BASED APPELL POLYNOMIALS

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Abstract

In this research, we define the parametric kinds of the Hermite based Appell polynomials with the help of the Euler formula. We obtain the explicit represantations, recurrence relations, lowering and raising operators, differential equations, integro-partial lowering operators, integro-partial raising operators and integro-partial differential equations. We also introduce the families of new poynomials using Bernoulli and Euler polynomials in special cases. Finally, we examine the properties of these families.

Keywords: Hermite polynomials; Hermite based Appell polynomials; Hermite based Bernoulli polynomials; Hermite based Euler polynomials.

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ON THE GENERALIZATION OF DEGENERATE BELL TYPE POLYNOMIALS

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Abstract

In this study, we present a new generalization of degenerate Bell type polynomials. We obtain explicit formula, recurrence relation, determinantal representation, shift operators and difference equation for these polynomials. In special cases of new degenerate Bell type polynomials, we introduce new families of polynomials including degenerate Bernoulli and Euler polynomials. Lastly, we give the properties of the degenerate Bell type Bernoulli and Euler polynomials.

Keywords: Bell polynomials; Degenerate Bell polynomials; Bernoulli polynomials; Euler polynomials.

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Couplings mechanisms in simultaneous band gaps

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Abstract

We have studied the acousto-optic couplings mechanisms in photonic and phononic crystals with simultaneous band gaps theoretically. We concentrate our calculations on a structure where the holes and the supporting plate are respectively made of Air and Sapphire. For our investigations, we have focused on the acousto-optic couplings inside a phoXonic cavity by taking into account two coupling mechanisms, the photo-elastic effect [1] and effect of movement of the interfaces [2]. We discuss the importance of the symmetry of modes to distinguish those that don't interfere in an efficient way. We calculate the modulation of the frequency of the photonic mode during a period of acoustic oscillations.

Keywords: PhoXonic cavity, photo-elastic effect, movement of the interfaces.

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GENERALIZATION OF HERMITE-BASED APPELL POLYNOMIALS AND SOME PROPERTIES

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Abstract

In this paper, we introduce the new generalization of Hermite-based Appell polynomials. We prove an equivalence theorem and obtain determinantal represantation of the generalization of Hermite-based Appell polynomials. Also, we present the recurrence relation, shift operators and differential equation.

Keywords: Hermite-based Appell polynomials; Recurrence relation; Shift operators; Differential equations.

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A MACHINE LEARNING ASSISTED MONITORING SYSTEM FOR EARLY DETECTION OF MELANOMA

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Abstract

The gradual depletion of the ozone layer poses a serious threat to human health, especially the environment. The risk of skin rises with increasing exposure to ultraviolet rays. Although skin cancer, also known as melanoma, can have fatal consequences, it can be treated if it can be diagnosed early with strict follow-up. Thus, deaths associated with this disease, which is becoming increasingly common in the world, can be prevented at a high rate. In this study, we propose an artificial intelligence-supported detection system using modern machine learning techniques for effective follow-up of nevi that can cause melanoma. A dataset containing a total of 8598 images was utilized for the development of the system. Training and tests were performed on this dataset using the VGG16 network model, which is prominent in the modern literature. At the end of the training and testing procedures, an accuracy of 83% was achieved with the VGG16 model. The proposed detection system can assist qualified healthcare facilities in healthcare institutions, and in future studies, it is planned to develop a mobile application and a desktop application for various operating systems so that this system can be easily used in the home environment.

Keywords: Deep learning; Skin cancer, Dermoscopy, Image processing; Artificial intelligence.

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HYBRID STOCHASTIC DIFFERENTIAL MODELING CONSIDERING CHANGE POINT ANALYSIS FOR CUSHING, OKLAHOMA WTI FOB CRUDE OIL DATA

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Abstract

Crude oil is known as the lifeblood of an economy, therefore, fluctuations in oil prices have significantly affected many countries around the world, especially in the last few years, due to various global effects. For this reason, in this study, the WTI Cushing, Oklahoma FOB crude oil closing data between 01.03.2019 and 13.03.2023 are considered with SDE modeling as they follow a trajectory in the form of the standard Wiener process. First, the WTI dataset is modeled with the GBM SDE and the CIR SDE equations which are widely used in finance, without considering the change point (CP) estimation. Then, the GBM SDE and the CIR SDE models were reconstructed considering the CP estimation. Finally, a Hybrid SDE model is proposed, which is compatible with WTI data, again considering the CPs. To obtain a hybrid model, the GBM SDE and the CIR SDE models were used. The parameters in the model were estimated by the quasi-maximum likelihood estimation method and the approximate solution of each established SDE model was obtained with the Euler-Maruyama numerical solution. To determine the best model for the data set among the established models, AIC, BIC, RMSE, and MAPE criteria were used. Accordingly, the most suitable model for the data set according to the RMSE and the MAPE criterion is the Hybrid SDE model. Unlike the other models, this model explained the sudden ups and downs in the data set better.

Keywords: Change point estimation, Cox-Ingersoll-Rose (CIR), Geometric Brownian motion (GBM), Euler-Maruyama (EM) approximation method, quasi-maximum likelihood estimation method.

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DIFFERENCE SEQUENCE SPACES OF FRACTIONAL ORDER GENERATED BY TRIBONACCI-LUCAS NUMBERS

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Abstract

In this paper, we introduce Tribonacci-Lucas difference sequence spaces of fractional order α, $\ell_p\left(V^{(\alpha)}\right)$ defined by the composition of the fractional order difference operator $\Delta^{(\alpha)}$ and the Tribonacci-Lucas matrix $\tilde{V} = (\tilde{v}_{nk})$. We give some topological properties, Schauder basis and $\alpha-, \beta-, \gamma-$duals of the newly defined spaces. We characterize certain matrix classes related to the space $\ell_p\left(V^{(\alpha)}\right)$. Finally, we examine certain classes of compact operators on $\ell_p\left(V^{(\alpha)}\right)$ using Hausdorff measure of non-compactness.

Keywords: Tribonacci-Lucas numbers; Difference operator; Köthe-Toeplitz duals; Matrix transformations; Hausdorff measure of non-compactness.

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Schizophrenia Classification via Brain Tissues Obtained Anatomical MR Images

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Abstract

The clinical value of machine learning techniques for distinguishing psychiatric patients from healthy control groups has gained significant momentum, particularly in neuroimaging-based studies such as anatomic and functional magnetic resonance (MR) imaging. Schizophrenia is a neurological and psychiatric disorder that often begins in youth, with varying courses and outcomes among patients, manifesting symptoms and signs in all areas of the mental state, with an etiology not yet fully determined, and causing significant functional impairment [1]. In this study, a total of 120 anatomical MR images and the clinical and demographic information of 60 control subjects and 60 schizophrenia patients were obtained from the open-source COBRE dataset [2]. Subjects with neurological disorders, loss of consciousness, severe head trauma, substance use, or addiction within the last 12 months were excluded during dataset creation. Schizophrenia diagnosis was made using the Structured Clinical Interview (SCID) for DSM-IV Disorders. Psychopathological findings were graded using the Positive and Negative Symptom Scale (PANSS). Preprocessing steps on raw anatomical MR images were performed using FSL software [3]. In these steps, non-brain tissues were removed using the BET module, and MR images were separated into gray matter (GM), white matter (WM), and cerebrospinal fluid (CSF) parts using the FAST module. The data was arranged according to the 350x350 resolution size and converted to jpeg format. These three images belonging of each individual were applied as input into the AlexNet based CNN architecture with Python. Classifications were performed in the randomly generated dataset using Keras library with 70%-30% training-test ratio. Accuracy values were used as performance criteria in the classification made with deep learning. The classified GM, WM and CSF accuracy results were obtained as 98.0, 97.62 and 95.24, respectively. As a result of the comparison, it was observed that schizophrenia could be classified with high success using anatomic MR images, with an accuracy rate of 98%. Overall, our GM data achieved classification with high accuracy. It is emphasized that even in the absence of a distinct anatomical pathology in psychiatric disorders, such as schizophrenia, individuals' anatomical brain MR images have the potential to contribute to the understanding of disease etiology.

Keywords: Schizophrenia; Brain Tissue; Classification.

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ON CONTROL INTERVALS OF CHAOS WITH FRÉCHET DERIVATIVE OF CERTAIN ITERATIONS AS DISCRETE DYNAMICAL SYSTEM IN BANACH SPACES

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Abstract

Dynamical systems are one of the interesting concepts where iteration algorithms and chaos can be considered together. In iteration algorithms, one of the basic concepts of fixed point theory, it is well known that the behaviour of the iteration mechanism is chaotic if the original transformation is taken as chaotic. In this paper, we first consider an iteration class defined on Banach spaces, which is prominent in the literature in terms of both speed and convergence rate. Then, we consider the transformation constituting the iteration class as chaotic and obtain the stability and instability behaviours of the iterations according to the operator norm by using Gâteaux and Fréchet derivatives representing the direction-dependent derivative. In addition, analytical proofs are followed by computer simulations of parameter-dependent control intervals considering the logistic operator with a chaotic structure. Finally, the periodic behaviour of the iteration algorithms used in our study is illustrated by the Lyapunov exponent with parameter-dependent control intervals according to operator norm.

This work was supported by the Yildiz Technical University Scientific Research Projects Coordination Unit. Project Number: FDK-2018-3348.

Keywords: Control of chaos; Discrete dynamical system; Fixed point; Iteration methods; Norm of the operator with Fréchet.

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Prediction of Global Solar Radiation Intensity of Elazığ City with Artificial Neural Network

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Abstract

In order to benefit from solar energy, which is one of the renewable energy sources, the solar potential of the region must first be determined. The most important factor in determining the solar potential is the global solar radiation intensity. Global solar radiation is either measured directly or calculated according to some parameters that are measured. In addition, it is very important to predict the future values of global solar radiation intensity for the economic analysis of solar energy systems planned to be established in a region. For this purpose, in this study, the prediction of global solar radiation for the Elazığ city is carried out using the artificial neural network (ANN). Solar radiation values are taken from the Meteorological Service of Turkish State for this city. Monthly average daily solar radiation data of 2017-2021 are used as training data, and the data of 2022 are used as testing data for the model. The model is obtained by changing the number of hidden layers and the number of neurons in each layer. The R2 value of the model is 96.6% and the mean absolute error (MAE) value is 3.9%. Thus, a model that can be used in the economic analysis of solar energy systems for the Elazığ city has been presented in this study.

Keywords: Global Solar radiation; Artificial Neural Network; Elazığ.

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Lyapunov Stability Analysis and Control of Affine Nonlinear Systems using Neural Networks

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Abstract

This paper presents an approach to the analysis and control of a class of an affine nonlinear systems using neural networks. The proposed method combines the strengths of Lyapunov theory and neural network control to design a stable control law for a class of nonlinear systems that can be described by affine models and guarantees the asymptotic stability of the system under certain conditions. In this study, we employs steepest descent method and the unconstrained optimization method to update the weights of the networks. The performance of the proposed approach is evaluated through simulation studies on benchmark systems, and the results demonstrate the effectiveness and efficiency of the method. This work contributes to the development of new methods for control of nonlinear systems, and has potential applications in various fields such as robotics, aerospace, control engineering, power systems and automation.

Keywords: Lyapunov stability analysis; Neural networks; Multilayer feed forward neural network; Affine nonlinear systems.

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A Recurrent Neural Network-based Approach for a Class of Nonlinear Convex Programming Problems

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Abstract

In this paper, we propose an approach to solving nonlinear convex programming problems using recurrent neural networks (RNNs). Our method leverages the ability of RNNs to capture temporal dependencies and exploit the structure of the optimization problem to obtain efficient solutions. We show that by formulating the problem as a sequence-to-sequence learning problem, RNNs can be trained to generate optimal solutions. We demonstrate the effectiveness of our approach on various benchmark problems. In summary, our work demonstrates the potential of RNNs as a promising approach for solving nonlinear convex programming problems, and opens up new avenues for further research in this area.

Keywords: Convex programming; Nonlinear optimization; Recurrent neural networks.

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ON THE DARBOUX FRAME OF THE POLE INDICATRIX CURVE OF THE SPACELIKE SALKOWSKI CURVE WITH SPACELIKE BINORMAL IN LORENTZIAN 3-SPACE

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Abstract

In this study, the Darboux frame, the normal and geodesic curvatures, the geodesic torsion, the Darboux frame equations and the Darboux vector of the pole indicatrix curve on the Lorentzian sphere $\mathbb{S}_1^2$ of the spacelike Salkowski curve with spacelike binormal in Lorentzian 3-space $\mathbb{E}_1^3$ are obtained. Also, the relationships between Frenet and Darboux vectors and between Frenet and Darboux frames are given.

Keywords: Salkowski curve; Darboux frame; geodesic curvature.

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A Novel Approach to Stabilizing Nonlinear Control Systems using Neural Networks and Optimization

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Abstract

In this paper, we propose a hybrid method for stabilizing nonlinear control systems based on a combination of neural network and optimization techniques. Nonlinear systems are known to be difficult to control due to their complex and often unpredictable behavior. Our method is based on the combination of neural networks and optimization techniques to design a controller that stabilizes the system. An optimization algorithm is then used to find a control input that stabilizes the system by minimizing a suitable cost function. To ensure stability, we introduce a Lyapunov function that guarantees the asymptotic stability of the closed-loop system. Simulation results are presented to demonstrate the effectiveness of the proposed approach in stabilizing a nonlinear system.

Keywords: Feed forward neural networks; nonlinear control; Optimization methods.

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NONLINEAR LEAST SQUARES METHOD AND ITS APPLICATIONS

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Abstract

In this study, numerical properties of Newton-Rapson, Gradient Descent, Gauss-Newton and Levenberg-Marquardt iterative methods used for solving nonlinear least squares problems used to minimize the sum of squares of nonlinear functions are discussed. The methods used belong to the class of iterative descent methods. To compare the methods used, examples are shown on the two implementations as well as explaining the mathematical steps of each method. For these methods used, the selection of the initial values of the parameters is very important. The calculation and selection of the initial values of the parameters and the advantages and disadvantages of the methods used are given.

Keywords: Least squares method, Parameter estimation, Nonlinear functions.

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UTILIZING ARTIFICIAL GORILLA TROOPS ALGORITHM AT TRAINING OF MULTI-LAYER PERCEPTRON

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Abstract

The solution of multidimensional non-linear problems causes a lot of time and information costs. In this regard, with its multi-layer perceptron (MLP) architecture, which is a part of the artificial neural network, it provides a more efficient use of problem solving time and information. Traditional methods were preferred in the early days when optimizing the MLP architecture for the classification of big and complex data sets. However, one of the most powerful algorithms that has come to the forward in recent years has been the metaheuristic algorithms. The balance between the exploration and exploitation phases of metaheuristic algorithms, the technique of searching for a solution to the problem with a random set at the beginning, and the fact that they do not use derivatives in the solution have made metaheuristic algorithms more advantageous than traditional methods. The aim of this study is to provide the most optimal classification of the iris flower data set by establishing the MLP architecture through the artificial gorilla troops algorithm (GTO). GTO and different metaheuristic algorithms in the literature have been compared by statistical results such as best and worst values, standard error, convergence curves and box-plot graphs. In the result, GTO has been found that the lowest mean square error (MSE) and best classification rate were achieved then the other algorithms.

Keywords: Multi-layer perceptron, Artificial gorilla troops algorithm, Optimization.

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NEW ESTIMATES ON THE SOLUTIONS OF NONLINEAR NEUTRAL SYSTEMS WITH VARIABLE DELAY COMPONENTS BASED ON LYAPUNOV-KRASOVSKII FUNCTIONALS

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Abstract

This paper investigates the qualitative behaviors of solutions of nonlinear neutral systems with variable delay components. By constructing an appropriate Lyapunov-Krasovskii functional, some new solution estimates are produced for the considered system. Then, using this estimates obtained based on Lyapunov-Krasovskii functionals, it is evaluated whether the solutions are stable or not. The Lyapunov- Krasovskii functional approach is useful as a basic tool to prove the main results of this study. Numerical examples are given to demonstrate the effectiveness of the presented approach on current theoretical results.

Keywords: Variable delay, Neutral systems, Estimate, Stability.

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Approximate Solution of Coupled System of Fractional Order Partial Differential Equations with Variable Coefficients

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Abstract

This paper describes a method for approximating smooth solutions to a system of coupled fractional order partial differential equations with variable coefficients. The proposed approach involves using operational matrices of shifted Legendre polynomials to replace the product of fractional derivatives and variable coefficients. This conversion allows for the fractional order partial differential equations with variable coefficients to be expressed as easily solvable algebraic equations. We utilized the Matlab platform to solve the algebraic system of equations and present numerical results in the form of tables and graphs to validate the effectiveness of the proposed method. Additionally, the paper provides a detailed discussion of the application of this method for approximating smooth solutions subject to initial conditions.

Keywords: Legendre Polynomials; Operational Matrices; Fractional Calculus; Computational scheme.

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A method for solving the set-covering problem over the set of stochastic efficient solutions

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I. ABSTRACT

The stochastic bi-objective set-covering problem (the probabilistic bi-objective set-covering problem) is very difficult to solve directly. Generating the set of all efficient solutions might be very expensive and unfruitful for the decision maker, because in order to meet hie preference, he has to choose the best compromised solution among a large listed. If his preference is a written as a linear combination of decision variables, one has to optimize this function over the efficient set of bi-objective set covering problem. In this paper, we consider a stochastic environment, i.e., all the parameters are issued from a discrete probability law. Once the problem is converted into a deterministic model, we use the technique presented and developed by (Chaabane and Pirlot 2010). As far as our knowledge is concerned, no similar study has been yet.

Keywords: Stochastic multi-objective optimization; Combinatorial optimization; Non-linear optimization; Probabilistic set-covering problem; Efficient solution.

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INVESTIGATION OF THE CHARACTERISTICS OF AA6060 ALLOY UNDER THREE-POINT BENDING USING EXPERIMENTAL AND NUMERICAL METHODOLOGIES

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Abstract

In this study, the deformation behavior of 6060 aluminum alloy profile structure under threepoint bending load was investigated experimentally and numerically. In this purpose, the use of crash-critical profile structures, which are used to increase safety against collisions, especially in automobiles, are examined. Within the scope of the paper, three-point bending tests were carried out using AA6060 alloy, which has elliptical cross-section geometry with 100 mm and 200 mm span distances and 5mm punch radius has been obtained experimentally. As a result of the experimental studies, it has been determined that the force required for bending of the material is less when the distances beetwen the spans increase. In the second step of the study, finite element analyzes were performed using σ-based Hill-48 and r-based Hill-48 plasticity models, and force-elongation curves, thickness values and shaped product forms were compared with the experimental results. σ-based Hill-48 and r-based Hill-48 plasticity models, and force-elongation curves, thickness values and shaped product forms were compared with the experimental results. As a result of the comparisons, it was determined that the force-elongation curves and product forms were compatible with the experimental results.

Keywords: Profiles; Three-point bending; Aluminum alloy, Finite element analyses.

BETA REGRESSION MODEL FOR PREDICTING FUNDAMENTAL CHARACTERISTICS OF LIGHTWEIGHT AGGREGATE CONCRETE

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Abstract

Lightweight Aggregate Concrete (LWAC) uses in construction for its specific properties such as light density, suitable compressive strength in different ages and apt handling. Due to numerous parameters affect these LWAC characteristics and also nonlinear interaction between mix design components and desirable features. Proper estimation of its properties is a complex challenge for civil engineering researches. The main aim of these research is establishing accurate beta regression relationship between independent data (mix design component contains coarse and fine aggregates, binder, water and super plasticizer) and dependent data (properties such as unit weight, compressive, strength and slump of LWAC) base on 113 mix designs that was made in S.U.T concrete lab. Our research shows bets regression model's potential as a suitable tool for this predict.

Keywords: Beta regression, Slump, Compressive strength, Lightweight Aggregate Concrete.

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Solutions of Partial Diferential Equations with Hosoya Neural Network

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Abstract

In this article we have improved an effective method with the Hosoya neural network's help to solve the fractional-order reaction-diffusion equation. The Hosoya neural network architecture occurs input layer with one perceptron, hidden layer with perceptron and output layer with one perceptron. We used varying degrees used to Hosoya polynomial as a training function for hidden layer. Then the fractional order diffusion equation transform to into a non-constrained optimization problem. In the next step, The correctness of the problem was investigated on the examples with Marquardt's method. Then we obtained approximate solutions and graphics with python programming language. In the last, this study was found to be an effective method with our work..

Keywords: Neural Network; Hosoya Polynomial; Partial Diferential Equations.

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NUMERICAL SOLUTION OF INTEGRO-DİFFERENTIAL EQUATION

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Abstract

In our study, the Adomian decomposition method (ADM) was preferred to solve the singular perturbed Fredholm integro-differential equation. With our method, high accuracy and reliable analytical approaches have been obtained. In the first step, the integral operator is applied to the whole equation. After arranging the found results, approximate serial solutions were found. An example application is made by using theoretical information.

Keywords: Singularly perturbed equation; Integro differential equation;ADM

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A COMPARATIVE ANALYSIS ON OPTIMAL CONTROL OF A SPACE-TIME DIFFUSION PHENOMENON

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Abstract

The main goal of this study is to present a comparison on the advantages or disadvantages of the Grünwald-Letnikov and Diethelm's Predictor-Corrector methods in solving an optimal control problem constructed on a space-time diffusion process. For this purpose, an anomalous diffusion equation equipped with fractional Laplacian-space and Caputo-time operators in one-dimensional space is discussed. The importance of the study is to realize that there are still a limited number of numerical methods for solving fractional optimal control problems, and moreover, they have different application difficulties. Numerical simulations of various comparisons are achieved by Matlab software.

Keywords: Space-time diffusion; Anomalous diffusion; Fractional Laplacian; Optimal control; Diethelm's Predictor-Corrector method.

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OPTIMAL PSYCHOTHERAPEUTIC TREATMENT TO PREVENT ONLINE GAMING ADDICTION AMONG A GROUP OF UNIVERSITY STUDENTS

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Abstract

In this study, an online game addiction problem represented by the SEIRS (Suspected-Exposed-Infected-Recovered-Suspected) model is discussed. We aim to save the students from being addicted by providing an optimal psychotherapeutic treatment for the infected group. For this purpose, a Lagrange-type optimal control problem is solved by Pontryagin's maximum principle. Finally, some numerical simulations have been made using the Matlab program to support the theoretical results of the study. The simulations show that the effectiveness of the control strategy for quitting online gaming addiction.

Keywords: Online game addiction, Optimal control, SEIRS model, Pontryagin's maximum principle.

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MALTHUSIAN GROWTH MATHEMATICAL MODEL WITH M-DERIVATIVE

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Abstract

In this study, Malthusian growth mathematical model is considered by the newly defined M-derivative. Analytical solutions of the modeling problem are found and shown by figures comparatively with M-derivative. Laplace transform is be used as method [1-3].

Keywords: M-derivative; Mathematical Model; Laplace transform.

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SOME NEW STATISTICALLY CONVERGENT SEQUENCES

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Abstract

In this study we will define some new statistically convergent sequence spaces and give inculison theorems using the difference sequence and unbounded modulus functions.

Keywords: Modulus function, Difference sequence, Statistical convergence.

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ASYMPTOTIC STABILITY RESULT FOR A THERMOELASTIC TIMOSHENKO SYSTEM WITH DISTRIBUTED DELAY TERM

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Abstract

In this work, we consider a linear thermoelastic laminated Timoshenko beam with distributed delay, where the heat conduction is given by Cattaneoâs law. We establish the well posedness of the system. For stability results we prove exponential and polynomial stabilities of the system for the cases of equal and nonequal speeds of wave propagation.

Keywords: Global nonexistence, quasilinear wave system, viscoelasticity.

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FOR NATURAL HERITAGE AREAS AUGMENTED REALITY DESIGN EXAMPLE

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Abstract

The term augmented reality can be defined as the combination of real-world images with 3D models created by sound, text, graphics, or computer. This concept, which emerged in the 1990s, was originally intended only for academic studies, but with the widespread use of mobile devices it has begun to attract the interest of people from all walks of life.

Augmented Reality studies for natural heritage sites are a valuable topic in terms of preserving and passing on natural heritage to future generations. In particular, the damaged structure of some areas has caused these natural areas to be irreversibly damaged. Augmented Reality aims to virtually display natural areas that have been damaged or are not always accessible. In this thesis, a location-based augmented reality application and a remote augmented reality system are proposed. By doing so, the use of an existing method in a new field of study is particularly aimed at foreseeing problems that may arise in fields such as education, tourism, agriculture, transportation.

Keywords: Augmented Reality, Natural Heritage, Geolocation, GPS.

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Dynamics of solitary wave solutions to the (3+1)-dimensional generalized shallow water wave equation

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Abstract

Our focus is on analyzing the dynamic behavior of the nonlinear water wave equation, specifically the (3+1)- dimensional generalized shallow water wave equation. When the horizontal length scale of the fluid is much greater than the vertical length scale, the shallow water equations are typically suitable. By using a proposed Ricatti equation mapping method, we have obtained novel solitary wave and soliton solutions of various kinds in explicit and general forms. To gain a deeper understanding of the physical phenomena described by this dynamic equation, we have presented some of these solutions in 3D graphical form. The results obtained through our computational efforts demonstrate the effectiveness and efficiency of our proposed technique, which can be useful for solving a variety of other nonlinear problems arising in mathematical physics and engineering.

Keywords: (3+1)-dim generalized shallow water wave model, solitary wave solutions, Ricatti equation mapping approach.

THE IMPLEMENTATION OF THE CRE METHOD TO NONLINEAR DIFFERENTIAL EQUATIONS

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Abstract

In this paper, we apply the consistent Riccati expansion (CRE) method to the some nonlinear differential equations. The method is based on the well-known Riccati equation and homogeneous balance princple. We find the solutions of the given equations with auxiliary solutions without reducing them to ordinary differential equations.

Keywords: Consistent Riccati expansion (CRE) method; nonlinear differential equations; Riccati equation

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THE VARIATIONAL FORMULATION OF AN OPTIMAL BOUNDARY CONTROL FOR A PARABOLIC EQUATION

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Abstract

This paper is devoted to solving the problem of controlling the boundary function in a one-dimensional parabolic equation. We prove the existence and uniqueness of the optimal solution for the optimal control problem under consideration and Fréchet differentiability of the cost functional on the set of the admissible controls. We give a necessary condition to the optimal solution in the form of the variational inequality via the solution of the adjoint problem.

Keywords: Parabolic equation; Optimal control; Adjoint Problem.

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Some New Soliton Solutions of Time Fractional Resonant Davey-Stewartson Equations

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Abstract

In this study, via the Bernoulli sub-equation method (BS-EM), the traveling wave solution of the (2+1)-dimensional resonant Davey-Stewartson system is investigated. The nonlinear partial differential equation of the (2+1)-dimensional resonant Davey-Stewartson system is transformed into a nonlinear ordinary differential equation using a wave transformation, and then solved using the BS-EM approach. Some new solutions have been built successfully. The (2+1)-dimensional time-fractional resonant Davey-Stewartson equation is satisfied by all of the discovered solutions in this research. For all of the computations and graphic plottings in this investigation, we used Wolfram Mathematica 12 software.

Keywords: The Bernoulli Sub-Equation Method (BS-EM),The Fractional Riemann-Liouville derivative, Resonant Davey-Stewartson Equation.

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The 4R Planar and Spherical Mechanisms in Lorentzian Space

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Abstract

In this paper, using the structure equations and constraint manifolds of 2R planar and spherical open chains in Lorentz space, we compute the structure equations and constraint manifolds of 4R planar and spherical closed chains in Lorentz space. Besides, we make some geometric comments about these constraint manifolds obtained.

Keywords: Planar closed chain, spherical closed chain, structure equation, constraint manifold.

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ON TOPOLOGICAL PROPERTIES SOME NEW MODULAR SEQUENCE SPACES

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Abstract

In this paper, we introduce some new classes of sequence spaces using Modular sequence spaces. We study some of their properties, like linear space, total paranorm, solidity, symmetricity etc. We obtain some relations between these spaces.

Keywords: Sequence spaces; Orlicz function; solid space; symmetric space.

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SOLITARY WAVE SOLUTIONS FOR THE CONFORMABLE TIME-FRACTIONAL EXTENDED (2+1)-DIMENSIONAL EQUATION

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Abstract

In this study, the modified exp(−Ω(ξ))-expansion function approach is utilized in constructing various wave solutions. We obtain hyperbolic and trigonometric functions solutions are successfully reported. We observed that when the founded solutions in this study are compared new solution successfully then the existing in literature. Under the choice of suitable values of the parameters involved, the 3D and 2D to the obtained solutions are successfully plotted.

Keywords: modified exp(−Ω(ξ))-expansion function method; FRACTIONAL PARTIAL DIFFERENTIAL EQUATIONS, conformable derivative.

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AN INNOVATIVE NUMERICAL ALGORITHM FOR SOLVING THE SINGULARLY PERTURBED VOLTERRA INTEGRO-DIFFERENTIAL PROBLEM WITH THE INTEGRAL BOUNDARY CONDITION

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Abstract

In the present study, we take the initial value problem into account for the singularly perturbed Volterra integro-differential equation with integral boundary condition. Setting up and analyzing a numerical method with uniform convergence in accordance with perturbation parameter ε is the major goal. Applying the composite right-side rectangle rule for an integral component and implicit difference rules for the differential part, the numerical solution of the issue under consideration is discretized on a uniform mesh. It is also shown that the method has first-order uniform convergence in the perturbation parameter. The effectiveness and practicality of the suggested approach are finally demonstrated through the study of numerical experiments.

Keywords: Singularly perturbed problem, Numerical solution, Boundary layer, Uniform convergence.

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On n-Times Differentiable Strongly s-Convex Functions

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Abstract

In this study, some new inequalities for n-times differentiable strongly s-convex functions are introduced. These inequalities are obtained via the perturbed trapezoid inequality. We have get a better bound for the mentioned inequalities with the strongly s-convex functions. nth derivatives of absolute values of considered functions are strongly s-convex. Finally, the theorems presented for strongly s-convex functions are reduced to the ones given for s-convex functions when the constant from strongly s-convexity vanishes.

Keywords: s-convex function; Strongly s-convex function; Perturbed trapezoid inequalities.

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THE NOVEL NUMERICAL SOLUTIONS OF CONFORMABLE TIME FRACTIONAL GENERALIZED BURGERS EQUATION WITH PROPORTIONAL DELAY

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Abstract

Two new methods, the conformable fractional q-Mohand homotopy analysis transform method and the conformable Mohand Adomian decomposition method, are used to investigate the conformable time-fractional generalized Burgers equation with proportional delay. The numerical solutions to this equation are graphed. Numerical simulations show that the proposed techniques are effective and trustworthy.

Keywords: Conformable time fractional generalized Burgers equation, conformable q-Mohand homotopy analysis transform method, proportional delay.

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FIXED POINT THEOREMS FOR A NEW CLASS OF GENERALIZED NONEXPANSIVE MAPPINGS IN BANACH SPACES

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Abstract

In this paper, firstly, we introduce a new class of generalized nonexpansive mappings, which is wider than the classes satisfying the condition (C). Also, we propose a new iteration process to approximate fixed points of such mapping. Then, we give some convergence theorems for these mappings in Banach spaces. A numerical example is produced in support of our main theorem.

Keywords: Fixed point, generalized nonexpansive mappings, uniformly convex Banach space.

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SOME NOVEL FRACTIONAL INTEGRAL INEQUALITIES FOR DIFFERENT KINDS OF CONVEX FUNCTIONS

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Abstract

In this paper, some novel integral inequalities for different kinds of convex functions have been proved by using Caputo-Fabrizio fractional integral operators. The findings includes several new integral inequalities for $h-$convex functions, $s-$convex functions in the first and second sense. We have used the properties of Caputo-Fabrizio fractional operator, definition of different kinds of convex functions and elemantery analysis methods.

Keywords: Caputo-Fabrizio fractional integral operator, $h-$convex functions, $s-$convex functions.

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SOME NEW INTEGRAL INEQUALITIES VIA CAPUTO-FABRIZIO FRACTIONAL INTEGRAL OPERATOR

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Abstract

In this note, we have established some new integral inequalities for product of two integrable functions by using Hölder and Young inequality with a well-known classical inequality via Caputo-Fabrizio fractional integral operators. Then, we have given some special cases of the main findings. The main results have potential to usage in inequality theory.

Keywords: Caputo-Fabrizio fractional integral operator, Young inequality, Hölder inequality.

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A PARALLEL VECTOR FIELD ON RIEMANNIAN MANIFOLDS ADMITTING SEMI-SYMMETRIC NON-METRIC CONNECTION

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Abstract

In this paper, we study Riemannian manifolds admitting a type of semi-symmetric non-metric connection. By taking the characteristic vector field of this connection as a parallel vector field via the LeviCivita connection, we examine some curvature properties of Riemannian manifolds. We discuss Ricci-semi symmetry and we consider the conformal curvature tensor. Finally, we study hypersurfaces of Riemanninan manifolds admitting a type of semi-symmetric non-metric connection with a parallel characteristic vector field. We take an example of a Riemannian manifold and we apply our results.

Keywords: A parallel vector field, Ricci-semi-symmetric manifold, semi-symmetric non-metric connection, Levi Civita connection..

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SOME CURVATURES RELATIONS ON LORENTZIAN PARA SASAKIAN MANIFOLDS

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Abstract

In this paper, we investigate some properties of semi-invariant submanifolds of a Lorentzian para Sasakian space form whose φ−sectional curvature is constant. Then, we study on curvature properties and Einstein conditions of distributions involved in the definition of semi-invariant submanifolds. Moreover, we consider curvature of semi-invaraiant product of a Lorentzian para Sasakian manifold.

Keywords: Lorentzian para Sasakian manifold, Lorentzian para Sasakian Space Forms, semi-invariant submanifold

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ENHANCING WEB ACCESSIBILITY USING DEEP CONVOLUTIONAL NETWORKS AND NATURAL LANGUAGE PROCESSING TECHNIQUES

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Abstract

About one billion individuals have a disability that could limit their ability to utilize the internet. The frequency of disabilities is higher in developing nations, and between 110 million and 190 million persons worldwide, or about one-fifth of the projected total, have serious disabilities. Visual impairment is a serious issue that affects a significant percentage of people worldwide. For most people, including print-impaired users (blind, partially sighted, and dyslexic users), being able to access websites is an essential component of daily life. Technology, on the other hand, may provide VI people with a wide range of alternatives for a more reliable and contentious service. Refreshable Braille screens, which allowed the VI to type and view text, were early examples. The screen reader, a form of text-to-speech application, is another option. Deep learning is a term used to describe machine learning techniques for training and using 'deep' artificial neural networks, such as deep neural networks (DNN), convolutional neural networks (CNN), and recurrent neural networks (RNN). By improving a better comprehension of the human language for linguistically based human-computer communication, natural language processing (NLP) contributes to the empowerment of intelligent machines. Due to the substantial advancements made possible by the application of deep learning techniques in fields like Computer Vision, Automatic Speech Recognition, and particularly NLP, the use of data-driven strategies is now widespread. In this study, multiple pre-trained deep learning networks (DenseNet121, DenseNet169, ResNet50, ResNet101, Xception, InceptionV3, MobileNetV2, EfficientNetB0, and VGG16) were used. For the evaluation of performance, BLEU and WER metrics were used. The data was run on seven images and successful results were obtained.

Keywords: NLP; DenseNet121; ResNet50; Xception; BLEU; WER.

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IMPROVING VIDEO INTERACTION FOR IMPAIRED PEOPLE USING CNN

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Abstract

There exist different types and levels of severity for disabilities, which limit the capabilities of a person to perform daily chores, regardless of whether they develop later in life, are present at birth, or were brought on by an accident. Every disability that may impede access to the internet is included in web accessibility. This includes but is not limited to, impairments in the areas of speech, hearing, cognition, and neurological function. This study is useful for both blind and deaf users and makes it simple for developers to save time when writing captions for a movie; for the writing captions element, this automated method with the assistance of artificial intelligence would save time. The purpose of this project is to improve the accessibility of video for people with a diverse range of hearing and sight abilities, and it can also be useful for websites and companies that provide video hosting. A system plug-in was developed for auto-captioning for any type of video and audio of the video using artificial intelligence CNN and OCR. We used two pre-trained models i.e., Vid2seq and Bark. Three distinct datasets to train the model were used, i.e., Flickr8K, Flickr30K, and the MSCOCO Dataset. COCO is a large-scale dataset for object identification, segmentation, and annotation. Two videos were tested for blind and deaf individuals, respectively, and the trained model achieved successful results.

Keywords: CNN; OCR; Flickr8k.

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Some Fixed Point Theorems for Monotone Nonexpansive Mappings in Ordered Banach Spaces

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Abstract

In this study, we prove some existence theorems of fixed points of a monotone nonexpansive mapping T in a Banach space E with the partial order $' \leq '$ where a such mapping may be discontinuous. In particular, in finite dimensional spaces, such a mapping T has a fixed point in E if and only if the sequence $\{T^n 0\}$ is bounded in E. In the order to find a fixed point of such a mapping T, we prove the weak convergence of the Mann, Ishikawa ve Noor iteration scheme under the condition.

Keywords: Ordered Banach space, fixed point, monotone nonexpansive mapping.

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HISTORICAL DEVELOPMENT OF ARTIFICIAL NEURAL NETWORK

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Abstract

Artificial neural networks are mathematical models that mimic the nerve cells of the human brain. Artificial neural networks are used in many different fields today. These fields include engineering, finance, accounting, geology and marketing. In this study, the development process of artificial neural networks from past to future is discussed from a wide perspective. The historical development process is emphasized and the developments during the process are examined. The current usage areas of artificial neural networks and the areas expected to be used in the future are mentioned.

Keywords: Artificial neural networks; Biological neural network.

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On Digonal Lifts in The Semi-Cotangent Bundle

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Abstract. The aim of the present paper is to study diagonal lift problems of tensor fields of type (1,1) from tangent bundle T(Mn) to semi-cotangent (pull-back) bundle t*(Mn).

Keywords. Vector field, diagonal lift, horizontal lift, pull-back bundle, cross-section, semi-cotangent bundle.
Mathematics Subject Classification. 53A45, 53C55, 55R10.

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Note on the Semi-Tensor Bundle

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Abstract

In this paper the horizontal lifts of some tensorfieldsto semi-tensor bund leand their lift problemsareinvestigated.

Keywords: Vectorfield, horizontal lift, pull-back bundle, semi-tensorbundle.

Mathematics Subject Classification. 53A45, 55R10, 57R25

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SOME SPECIAL ASSOCIATED CURVES IN E_1^3

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Abstract

In this paper, we have researched some special non-lightlike associated curves in 3-dimensional Minkowski space. Further, we gave definition of osculating, normal and rectifying direction curves and their donor curves.

Keywords: Associated curves; Osculating direction curve; Normal direction curve; Rectifying direction curve; donor curves.

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Some Notes on Almost Contact Structure and Almost Paracontact Structure in Semi-Tangent Bundle t(M)

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Abstract: In this paper, we study covarient derivates of almost contact structure and almost paracontact structure with respect to ${}^{cc}X$ and ${}^{vv}X$ on semi-tangent bundle tM.

Keywords: Complete lift, Projectable linear connection, Pull-back bundle**,** Semi-tangent bundle, Covarient Derivative, Almost contact structure, Almost paracontact structure.

Mathematics Subject Classification: 53A45, 53B05, 53C05, 53C15, 55R10, 55R65, 57R25.

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Numerical Solution of Time Fractional Tricomi and Keldysh Equation

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Abstract

In this study, the numerical solution of the linear time fractional Tricomi and Keldysh equation is obtained by using the finite element approach based on the cubic B-splines collocation. The fractional derivatives are taken as Caputo sense. Caputo's fractional derivative is discretized by using the finite difference, and the spatial derivative is discretized by using cubic B-spline collocation. The Von-Neumann stability analysis is demonstrated that the proposed scheme is conditionally stable. The method is employed on a few test samples, and the numerical results are compared.

Keywords: Cubic B-spline, Caputo derivative, Time fractional Tricomi and Keldysh equation, Collocation method, Von-Neumann stability

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NOTES ON SOLUTION OF A FUZZY PROBLEM WITH FUZZY COEFFICIENTS

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Abstract

In this paper, we discuss solution of a fuzzy problem with fuzzy coefficients. The problem is solved under the generalized Hukuhara differentiability. The problem is illustrated with examples.

Keywords: Fuzzy problem; Fuzzy arithmetic; generalized Hukuhara differentiability.

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INVESTIGATION OF THE MECHANICAL PROPERTIES OF GEOPOLYMER CONCRETE CONTAINING NATURAL ZEOLITE UNDER THE EFFECT OF HIGH TEMPERATURE

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Abstract

The use of traditional portland cement-based concrete is quite common in today's construction industry. Geopolymer concrete has been proposed as an alternative to Portland cement concrete due to the energy consumption caused by cement consumption in the world and environmental pollution as a result of high greenhouse gas effect. In this study, metakaolin and ground blast furnace slag were preferred as binder materials. In addition, it is aimed to determine the ratio of natural zeolite to be replaced at the optimum rate without reducing the flexural and compressive strengths of the concrete by using natural zeolite in different proportions instead of ground blast furnace slag used as a binder in geopolymer concrete. In this direction, in order to examine the effect of natural zeolite on the mechanical properties of geopolymer concrete, four mixtures were designed by replacing the total amount of binder by 10%, 15% and 20% and with a reference mixture that does not contain natural zeolite. The mixtures were subjected to thermal curing at 80 degrees for 8 hours. Metakaolin, aggregate and alkali activator contents as binders in the mixtures were also kept constant. According to the test results, it was shown that the mixture containing 10% natural zeolite reached 71.31 MPa by increasing the compressive strength by 7.52% compared to the reference mixture, and reaching 8.38 MPa by increasing the flexural strength by 12.41%. In addition, it has been observed that the compressive strength of the mixtures containing natural zeolite is decreased compared to the reference samples when exposed to high temperature. As a result, the use of 10% of natural zeolite had a positive effect on the strength development and mechanical properties of geopolymer concrete without losing its mechanical properties such as high flexural and compressive strengths.

Keywords: Gepolimer Concrete; Natural Zeolite; High temperature.

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SOME RESULTS FOR AN EIGENVALUE PROBLEM

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Abstract

In this work, we study on an eigenvalue problem. We find the eigenvalues and the eigenfunctions of the problem, give some properties of the problem and obtain some results for the problem.

Keywords: Eigenvalue problem; Eigenvalue; Eigenfunction.

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EXPONENTIAL GROWTH OF SOLUTION FOR A COUPLE OF PARABOLIC KIRCHHOFF TYPE EQUATIONS

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Abstract

In this work, we consider a couple of parabolic Kirchhoff type equations. We prove the exponential growth of solutions.

Keywords: Exponential growth, Kirchhoff type equation, parabolic equation.

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EXISTENCE AND NONEXISTENCE OF SOLUTIONS FOR A VISCOELASTIC-TYPE EQUATION WITH VARIABLE EXPONENTS

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Abstract

In this work, we investigate a viscoelastic-type equation with variable exponents. This type problem occurs in many mathematical models of applied science, such as electrorheological fluids, population dynamics, heat transfer, chemical reactions. We prove the existence and nonexistence of solutions.

Keywords: Existence, nonexistence, viscoelastic-type equation, variable exponents.

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*Abstract Submission should be prepared only **1 page**.

Customer Value Segmentation of the Agricultural Watering Subscriber Group

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Abstract

Producing and using electrical energy in the world is a key place for the energy industry. However, the use of unconscious energy or the use of stray electricity is largely a waste of time. There are many ways to avoid this waste or statistical methods are used to generate customer id cards by consumer. There are very few studies in the literature and no new methods have been developed. The customer id cards obtained in this study will identify the consumer profile and shape their approach to the consumer.

Keywords: Segmentation, Chi-square test, agricultural irrigation, K-Means

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Existence and asymptotic behaviour of solutions for a Petrovsky equation with a variable coefficients

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Abstract

In this work, we investigatea Petrovsky equation with a variable coefficients.Problems about the mathematical behavior of solutions for PDEs with time delay effects have become interesting for many authors mainly because time delays often appear in many practical problems such as chemical, physical,thermal, biological,economic phenomena, electrical engineering systems, mechanical applications and medicine. We prove the global existence and asymptotic behaviourof solutions.

Keywords: Global existence, asymptotic behaviour, variable coefficients.

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NONEXISTENCE OF GLOBAL SOLUTIONS FOR A PARABOLIC-TYPE PETROVSKY EQUATION WITH VARIABLE EXPONENTS

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Abstract

In this work, we investigate a parabolic-type Petrovsky equation with a variable exponents. This type problem occurs in many mathematical models of applied science, such as electrorheological fluids, population dynamics, heat transfer, chemical reactions. We prove the nonexistence of global solutions.

Keywords: Nonexistence, parabolic-type equation, variable exponents.

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*Abstract Submission should be prepared only **1 page**.

Customer Value Segmentation of the Agricultural Watering Subscriber Group

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Abstract

Producing and using electrical energy in the world is a key place for the energy industry. However, the use of unconscious energy or the use of stray electricity is largely a waste of time. There are many ways to avoid this waste or statistical methods are used to generate customer id cards by consumer. There are very few studies in the literature and no new methods have been developed. The customer id cards obtained in this study will identify the consumer profile and shape their approach to the consumer.

Keywords: Segmentation, Chi-square test, agricultural irrigation, K-Means

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Exploring new solutions for generalized Pochammer Chree equation using modified Sardar sub-equation methods

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Abstract

This research explores a modified version of the Sardar sub-equation method to discover new exact solutions for the generalized Pochhammer Chree equation. The solutions obtained using these methods are represented by hyperbolic, trigonometric, and exponential functions.

Keywords: a modified version of the Sardar sub-equation method; the generalized Pochhammer Chree equation; exact solutions.

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Development of Ontologies Through Maintenance

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Abstract

In computing and information sciences, complex representational relationships in concepts make the process challenging for scientists and engineers. Conceptual knowledge provides solutions to systems that require interaction between teams, thanks to its ability to successfully discover relationships between concepts. Conceptual knowledge, whose discovery continues manually, is often inadequate because it involves subjective interpretations and judgments, is time-consuming, and has scalability problems. With the transition to automated systems, it can contribute to accelerating processes and minimizing conceptual complexity. Ontologies have an important role in managing and modeling conceptual relationships. Ontology systems realize digital reflections of physical entities, domains and relationships. Artificial intelligence technologies (machine learning methods) contribute to the automatization of these reflections. Systems need maintenance and renewal for their sustainability. The idea of ontology maintenance has emerged due to the fact that institutions and organizations are affected by environmental changes. In this study, the requirements of maintenance are examined through the BIHAP ontology of the Turkish Ministry. In the study, the process of determining the ontology tasks and requirements in a collective working environment by collaborating with participants such as software developers, system analysts, system developers, end-users, government officials was carried out through academic reviews and technical approaches. The study is measured by qualitative study. As a result of the approaches, the basic requirements of the ontology maintenance phase were revealed. The results emphasize the importance of ontology maintenance in ontology tasks.

Keywords: Ontology Maintenance, Artificial Intelligence, Machine Learning

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SIR EPIDEMIC MODEL FOR COVID-19 SPREAD

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Abstract

In this paper we introduce and analyse the epidemiological mathematical model of the spread of epidemic diseases. Our goal is apply the susceptible-infected-recovered (SIR) model to the new coronavirus illness 2019 (COVID-19) in Turkey. The model consists of a system of three coupled non-linear ordinary differential equations. Based on this model the spread of COVID-19 in Turkey is handled with the SIR model in this study. Also, we carried out the numerical simulations to validate the analytical results and supported our results with graphs.

Keywords: Differential equation system, SIR model, epidemic modelling

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Global Dynamic of the fractional order SITA epidemic model incorporating the impact of the treatment and the prevention with optimal control

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Abstract

The aim of this article is to produce a new epidemic model of HIV/AIDS transmission, we take into consideration the individuals who don't know of their infection. In this paper, we propose a Caputo-Fabrizio order fractional model for HIV/AIDS, the analysis of local stability about the equilibrium is investigated. Furthermore, we cited the fractional optimal control problem associated with the control strategies. Numerical simulation to illustrate the stability of equilibria and the behavior of the obtained solutions is also discussed.

Keywords: Caputo-Fabrizio derivative, Dynamical systems, Stability analysis, Basic reproduction number.

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DIABETIC RETINOPATHY DETECTION USING META LEARNING AND DEEP LEARNING TECHNIQUES

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Abstract

In the world, diabetic retinopathy is a prevalent ocular disease that can lead to vision loss if not detected and treated early. This study presents a few-shot learning approach for automatic diagnosis and referral of ocular anomalies using the aptos-2019 dataset. By combining pre-trained convolutional neural networks (CNNs) with an unsupervised probabilistic model, our method effectively detects rare conditions. With an accuracy of 86%, our approach demonstrates the potential of few-shot learning in addressing data scarcity and improving the early detection of sight-threatening pathologies. Furthermore, when compared with other deep learning models commonly used in ocular anomaly detection, our method showcases its efficacy in surpassing the challenges posed by data scarcity. These findings highlight the significance of our approach as a computer-aided diagnosis tool for ocular anomalies, providing valuable insights for further research in the field. This research contributes to the advancement of screening and prevention of visual impairment through improved computer-aided diagnosis tools.

Keywords: Meta learning; Deep learning; retinopathy detection; diabetic retinopathy.

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An application of the sine-Gordon method

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Abstract

In this paper, Approximating solutions to a certain nonlinear partial differential equation will be invastigated by using sine-Gordon expansion method.

Keywords: sine-Gordon method; Approximating solutions.

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Some Properties of New Sequence Spaces Obtained Using Motzkin Numbers

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Abstract

In this study, we consider a new generalized matrix containing Motzkin numbers, playing an important role in number theory, in addition some properties of the new sequence spaces obtained using the domain of the matrix are brought to light.

Keywords: Sequence Spaces, Matrix Trasformations, Köthe-Toeptlitz Duals

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EXPERIMENTAL and NUMERICAL ANALYSIS OF PLATE FIN HEAT SINKS in a SQUARE CHANNEL under FORCED CONVECTION

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Abstract

Plate Fin Heat Sinks (PFHSs) are the most used equipment to remove heat from a surface to surrounding fluid. So, it is important to analyze PFHSs detailly in order to reduce operating temperature, pumping power, sound of fan, volume and weight of the device. In this study, a PFHS is placed in the direction of the flow and perpendicular to the flow in a square channel where the width and length of the PFHS is 100 mm, the fin height (H_{fin}) is 15 mm, number of fins (N) is 20, thickness of the fin (t_{fin}) is 1.5 mm and Reynolds number based on the channel's hydraulic diameter varies between 10300 and 73900. Full-scale models are investigated numerically using Computational Fluid Dynamics (CFD) method. Furthermore, experimental system of square channel having 150 mm x 150 mm cross-section and length of 3.7 m is designed and constructed where the two type of heat sinks are tested. Base plate temperature, pressure drop, velocity/pressure/temperature contours of PFHSs are investigated using numerical methods, pressure drop values are also obtained experimentally. It is shown that PFHS located in the flow direction has lower base plate temperature and lower pressure drop values as compared to perpendicular direction placement.

Keywords: plate fin heat sink, experimental, CFD, base plate temperature, pressure drop

ANALYSIS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATION OF TRAVELING WAVE SOLUTIONS WITH AN EFFECTIVE METHOD

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ABSTRACT

In this article, wave solutions of (2+1)-dimensional generalized Hirota–Satsuma–Ito equation are obtained using Modified Exponential Function Method. Obtaining different solution functions under various conditions according to the method allows the analysis of the behavior of the linear mathematical model to be analyzed from different aspects. Therefore, after the solution functions representing the behavior of the nonlinear mathematical model were obtained, the graphs of these functions were drawn under the appropriate parameters.

Keywords: The (2+1)-dimensional generalized Hirota–Satsuma–Ito equation, Modified Exponential Function Method, Traveling wave solutions.

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