6th International Conference for Mathematics & Its Applications (ICMA24): Artificial Intelligent and Computational Mathematics.

IN MEMORY OF THE LATE PROF A A ASHOUR(1924-2017)

Under Auspices of

Prof. Gina Elfiki
Acting President ASRT

Prof. Ismail Abdel Ghafar
AASTMT president

Organized by
Egyptian Committee of Mathematics - ASRT
Cooperate with Arab Academy for Science, Technology and Maritime Transport
Smart Village campus, 30 November – 1 December 2024 (Hybird)

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Artificial Intelligent and Computational Mathematics.

Conference chair
Prof. Abdelshafy Obada
Prof. Alaa Abdelbary
Prof. Fayed Ghaleb

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Local Committee

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About Egyptian Committee of Mathematics

IMU is an international non-governmental and non-profit scientific organization, with the purpose of promoting international cooperation in mathematics. It is a member of the International Science Council (ISC), and the members of IMU are countries. The main objective of the IMU is to encourage international collaboration in mathematics, and all activities that will contribute to the development of mathematical sciences. The membership of Egypt has been covered through the Academy of Scientific Research and Technology (ASRT) and Egyptian Mathematical Society which represent the adhering organization and the mathematical society in Egypt. The Egyptian (National) Committee for IMU is one of the committees that belongs to ASRT ,it is the link between the mathematicians community in Egypt and IMU. It was established in the 1970's by Prof Ashour who was its chairman up to 2004 when he declined the chairmanship however he participated actively in its activities after words

An overview of the committee’s activities in the previous period

•The First National Conference on Mathematics and its Applications (NCMA14) was held during the period from December 27-29, 2014 at Dar Al-Diyafa - Ain Shams University.

•A symposium was held on “Computational Methods for Linear and Nonlinear Systems” on May 31, 2014 at the Faculty of Science - Cairo University .

•The Second International Conference on Mathematics and Applications (ICMA15) was held during the period from December 27-29, 2015 at October University of Modern Sciences and Arts .

•A symposium on mathematics and its applications was held in cooperation with the Egyptian Mathematical Society on April 14, 2016, at Assiut University.

•The Second National Conference on Mathematics and its Applications (NCMA17) was held during the period from May 13-15, 2017 at the Hospitality House - Ain Shams University.

•The Third International Conference on Mathematics and its Applications (ICMA18) was held during the period from April 5-7, 2018 at Misr University of Science and Technology (MUST .(

•Celebrating International Mathematics Day on March 14, 2019, in partnership with the Arab Academy for Science, Technology and Maritime Transport, Al-Azhar University, and Zagazig University.

•The Fourth International Conference on Mathematics and its Applications (ICMA20) was held during the period from October 7-9, 2021 in Hurghada.

•The Fifth International Conference on Mathematics and its Applications (ICMA23) was held during the period from March 14-16, 2023 at Future University .

•Holding an annual competition entitled “Mathematics Everywhere,” which was held over three seasons: March 2020, March 2022, March 2023, and 2024. The competition targets young school students under the age of 20 who are interested in mathematics and its applications, and financial prizes are awarded to the best three applicants. For the competition.

•Holding the summer/winter mathematics school in 2021 at the Arab Academy for Science, Technology and Maritime Transport in Alexandria, in 2023 at South Valley University, and in 2024 at Helwan University .

•Celebrating International Mathematics Day on March 7, 2024 at the Academy.

Upcoming activities of the committee

•Preparations are underway to hold the Sixth International Conference on Mathematics and its Applications (ICMA24), scheduled to be held in 2024.

Attia Abdel-Salam Ashour

Biodata: Attia Abdel-Salam Ashour was born in Damietta on 13-09-1924. He died peacefully at home in Cairo on 17-03-2017.
School: Ashour completed his primary school studies in 1935 in Damietta, and then moved with family to Cairo, where he completed the secondary school in Abbassia district in 1939.
University studies and career: Ashour joined the Faculty of Science at Fouad 1-st University in 1940 and graduated with the Special Degree in Mathematics with First Grade Honors in 1944. Ashour was appointed demonstrator at the Department of Pure Mathematics in the same year of graduation. Soon he was sent for PhD studies in 1945 to London University, where he met with his supervisor, the famous Albert Price, to whom the Theory of Electromagnetic Sheets is attributed. The well-known geophysicist Sydney Chapman, known as the father of Geophysics, who had close ties with the Department of Mathematics at Cairo, was behind this choice of the supervisor.
Ashour first got a Diploma in Mathematics, then a Ph.D. degree from the Imperial College in London in 1948.
Following are quotes from letters of H. Levy, the Dean of the Imperial College, about Ashour performance on Ph.D.
"Mr. Price was very pleased with Ashour's work which he considered showed good promise….Ashour would be able to do sufficient work in two years (from 1946) to obtain a Ph. D., and that it would be useful and of original value, and would begin a wide field of research." and
"… we are very impressed with his performance during his stay here …"
Shortly after return to Cairo, Ashour was appointed Lecturer in 1948 in Applied Mathematics, Assistant Professor in 1957, then full Professor in 1966 in the same Department. In 1984, Ashour was appointed Professor Emeritus and kept working in the Department until his death.
Ashour obtained a D.Sc. degree from London University in 1967 for brilliant work in Mathematics and in Geophysics.

Duties:
Ashour was Head of the Department of Applied Mathematics at Cairo University, then of the unified Department of Mathematics after 1971, during the periods
1959-1960, 1965-1969, 1971-1976, 1980-1984.

Awards:
Fouad 1-st prize in the fields of Mathematics, Physics and Astronomy in 1952.
Amin Lotfy Prize in 1954 and in 1963.
Order of Merit of Arts and Sciences of Egypt in 1976 and in 1988.
Mubarak Award in 2004.

Decorations:
Chevalier dans l' Ordre de la Palme Académique, France, 1985.

Medal of the African Mathematical Union, 1990.
Chevalier dans l' Ordre National de Mérite, France, 1995.

Scientific work:

Ashour produced 42 scientific papers, almost exclusively boundary-value problems involving orthogonal polynomials and applications in Geophysics, in particular investigations on Earth's magnetic field.

Six papers, two co-authored by Sydney Chapman, two with Albert Price, and two with Vicenzo Ferraro opened wide the road to international recognition in Geophysics in front of Attia Ashour. Technically, Ashour's work is characterized by heavy mathematics, matched only by few researchers.

Ashour co-authored the books covering the Mathematics Syllabus of the General Certificate of Education in Egypt as early as 1958. He was the Chief Editor of four books on Geophysics written specially for the scientists in the developing countries.

Internationally:

Secretary of the International Union of Geodesy & Geophysics in the period 1971-1975.
President of the International Union of Geodesy & Geophysics in the period 1975-1979.
President of the International Center for Pure and Applied Mathematics (CIMPA) in Nice, France in the period 1992-1996.

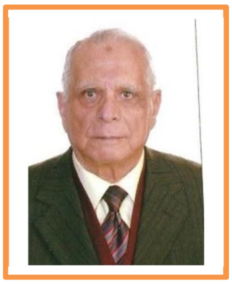
Let us end with the Closing Remarks of Uri Shamir to the General Assembly of the International Union of Geodesy & Geophysics, taken from MacTutor biography of Attia Ashour:

... it is my pleasure to present a special award, which is a surprise, to a person who has been a guiding light for the International Union of Geodesy & Geophysics since at least 1971*, when he was elected Vice President of the International Union of Geodesy & Geophysics. He was then elected President from* 1975-1979*, and then was elected to the Finance Committee in* 1983 *- a position to which he was re-elected three more times. During his last term,* 1995-1999*, he served as the President of the Finance Committee. This person can be no other than Dr Attia Ashour, a much respected and much-loved member of our community. Dr Ashour, please accept this small gift and the gratitude of the International Union of Geodesy & Geophysics for your* 22 *years of service.*

أ.د. ليلى فهمي عبدالعال (١/١٠/١٩٤٠) الي (٢٦-٤-٢٠٢٤)
الأستـاذ المتفرغ بقسم الرياضيات- كلية العلوم – جامعة القاهرة

لقد كانت أستاذتنا الغالية ليلى فهمي عبدالعال علم من أعلام الرياضيات، فى تخصص التحليل العددى بكلية العلوم جامعة القاهرة ، ويكفى ان اقول انها انشات شعبة الحاسب الالى في قسم الرياضيات بعلوم القاهرة وكانت الشعبة الوحيدة فى كليات العلوم فى هذا االوقت.

التاريخ العلمي:
بكالوريوس رياضيات من جامعة عين شمس عام ١٩٦١ بتقدير جيد جدا مع مرتبة الشرف الثانية.
ماجيستير رياضيات-جامعة لندن-كلية الملك (King's college) ١٩٦٥-انجلترا.
دكتوراه الفلسفة من كلية العلوم جامعة سسكس (Sussex University) انجلترا ١٩٦٩.
التاريخ الوظيفي:
عضو بعثة جامعة اسيوط بانجلترا من عام ١٩٦٤-١٩٦٩. معيد بعلوم اسيوط في ابريل ١٩٦٩.
معيد بعلوم القاهرة في اكتوبر ١٩٦٩.
مدرس بقسم الرياضيات- كلية العلوم – جامعة القاهرة – ديسمبر ١٩٦٩.
استاذ مساعد بقسم الرياضيات – كلية العلوم – جامعة القاهرة - ديسمبر ١٩٧٥.
استاذ بقسم الرياضيات – كلية العلوم – جامعة القاهرة - ديسمبر ١٩٨٠.
استاذ متفرغ بقسم الرياضيات – كلية العلوم – جامعة القاهرة – اغسطس ٢٠٠١.
عضو فى لجنة ترقيات الأساتذة و الأستاذة المساعدين من عام ١٩٨٠ و حتى عام ٢٠١٠
الإشراف العلمي:
عدد ٨٠ رسالة ماجيستير.و ٥٠ رسالة دكتوراه.
٢- الجوائز العلمية: جائزة الدولة التشجعية (وسام العلوم و الفنون من الدرجة الأولى)
وقد وقَّت وكفَّت بعلمها وطيبتها ودماثة أخلاقها لعقود من الزمن ومع أجيال متعاقبة دون أن تترك خدشاً في قلب قريب أو صديق . ونجم ينيرُ سماءَ قسم الرياضيات في جامعة القاهرة، بعطائها وعلمها، فلم يكن عطاءها مقتصرًا على جامعة القاهرة فقط بل تجاوز ذلك إلى جامعات مصرية وعربية أخرى، حيث تركت بصماتها البارزة في عالم البحث العلمي وفي نفوس كل من عرفها، وكانت محط أنظار الطلاب والزملاء على حد سواء بتفانيها وإخلاصها في تقديم العلم والمعرفة.
رحمك الله أستاذتنا الغالية أ.د. ليلى فهمي عبدالعال وطيب ثراكى



Mahmoud Mohammed Mostafa El-Borai
Mathematics & Computer Science Department,
Faculty of Science, Alexandria University

1979-present	Professor of Mathematics, Mathematics & Computer Science Department, Faculty of Science, Alexandria University, **Egypt**.
1987-1993	Head of the Department of Mathematics, Faculty of Science, Alexandria University **Egypt**.
1985-1987	Head of the Mathematics & Computer Science Department, Faculty of Science, Beirut Arab University, **Lebanon**.
1976-1980	Associate Professor, Faculty of Science, King Abdul-Aziz University, **Saudi Arabia**.
1974-1976	Assistant Professor in the Mathematics & Computer Science Department, Faculty of Science, Alexandria University **Egypt**.
1969-1974	Lecturer in Mathematics & Computer Science Department, Faculty of Science, Alexandria University **Egypt**.

1. RESEARCH PAPERS : Mor than 130 paper

SCIENTIFIC DEGREES OBTAINED UNDER Dr. FORS SUPREVISSION / CO-SUPERVISSION

- **Dr. ElBorai** is supervisor or co-supervisor of more than 100 Master and Ph. D. in the area of Theory of partial differential equations
- Dynamical systems and the artificial intelligence.
- Stochastic differential equations.
- Optimal control.
- Stochastic control
- The dynamics of robot.
- Abstract differential equations with fractional orders.
- Stochastic differential equations with fractional orders, (Hurst parameter).
- Dynamical systems and Cancer.
- Semi-group and integrated semi-group.

2. SCIENTIFIC AND PROFESSIONAL SOCIETIES

- A Member of the Swiss Society of Mathematics.
- A Member of the American Society of difference and differential equations.
- Member researcher's promotion group of the international journals of Engineering & Sciences

الاستاذ الدكتور / حسن مصطفى العويضي

قسم الرياضيات – كلية العلوم – جامعة الازهر

التاريخ العلمى

مساعد باحث معهد ابحاث البناء ١٩٦١-١٩٦٤
عضو بعثة داخلية للحصول على بكالوريوس العلوم فى الرياضيات ١٩٦٤-١٩٦٦
مرشح لبعثة خارجية ١٩٦٦-١٩٦٩
السفر الى بعثة حكومية الى المجر للحصول على الدكتوراه ١٩٦٩-١٩٧٣
مدرس بقسم الرياضيات – كلية العوم بنين – جامعة الازهر ١٩٧٣-١٩٧٨
استاذ مساع بقسم الرياضات – كلية العوم بنين – جامعة الازهر ١٩٨٧-١٩٨٣
اعارة الى جامعة الملك عبد العزيز – المملكة العربية السعودية ١٩٧٨-١٩٨٢
استاذ بقسم الرياضيات – كلية العوم بنين – جامعة الازهر ١٩٨٣
اعارة الى جامعة صنعاء باليمن كرئيس قسم الرياضيات ١٩٨٦-١٩٩٠
استاذ بقسم الرياضيات – كلية العوم بنين – جامعة الازهر
اعارة الى جامعة الرياض للبنات ٢٠٠٣-٢٠٠٧ (الرئاسة العامة للبنات)
استاذ متفرغ – كلية العوم بنين – جامعة الازهر حتى الآن

Scientific Program

Time	Saturday November 30, 2024		
10.00-10.30	Registration		
10.30-11.00	**Opening Ceremony Hall (C)** **Prof. Alaa A Bary, Vice president of Committee** **Prof. Abdelshafy F. Obada, Conference Chairman** **Prof. Ismail Abdel Ghafar President of AASTM** **Prof. Gina Elfiki , Acting President of ASRT** Honoring the pioneers - Awards Ceremony		
11.00 - 11.40	**Hall (C) Chair Persons: Ali Hadi, Ahmed M A El-Sayed** **Prof. Alyaa Yousef, Mohamed Kholief** **Initiatives in Neurotechnology and AI Ethics in Egypt**		
11.40-12.00	**Break**		
12.00 – 14.00	**Session (1)- Conference room** **Chair Persons: Ali Wagdy Mohamed** **Mohamed Kholief,**	**Session (2)- Hall (C)** **Chair Persons: Ali Hadi** **Ahmed M A El-Sayed**	**Session (3)- Hall (3)** **Chair Persons: Khaled Mekheimer** **Samir Marzouk**
	Salwa K. Abd-El-Hafiz Some Engineering Applications of Artificial Neural Networks	**Teodor Bulboac** Nehari's inequality generalisation for the q-difference operator and applications to majorization problems	**Hager Ahmed Abd-Elhameid** Effect of Initial Stress in a Semiconductor Thermoelastic Medium Under Ramp Type Heating with Photothermal Theory
	Ahmed Younes Applications of Partial Negation in Quantum Computing	**Cemil Tunç ,** On the existence and stabilization of impulsive differential and integro-differential equations of second order	**A.A.Youssef** Nonlinear Rayleigh wave propagation in a thermoelastic structure consisting of a slab sandwiched by two half-spaces in dual-phase-lag
	N. Metwally Quantum steering via different quantum systems	**Samir H. Saker** Oscillation Theory of Delay Differential equations and Applications on Biological Models	**Ahmed Saeed Ibrahim** Thermocapillary Velocities of a Spherical Droplet Embedded in Brinkman Medium
	Ahmed Abdelhamid Ali Abdelhamid Zahia Explicit and Implicit Quantum Correlation Dynamics of Qubits Interacting with Thermal Baths	**Mohamed El-Beltagy** Basis Development of the Fractional Wiener Chaos Expansion with Applications to Systems with Fractional Brownian Motion	**Mona Mohamed Mahmoud Khalil** Synthesis of Azolo-Transition Metal Complex Films Doped with Polyvinyl Alcohol and Assessment of Their Thermal and Optical Properties
	Tarek Mohamed El-shahat On Entangling power of quantum information		**Nasser M. EL-Maghraby** The Vibration of Nano Resonators Under the Theory of Two-Temperature Generalized Thermoviscoelasticity Based on Thermomass Motion
			Nasser M. EL-Maghraby The Vibration of Nano Resonators Based on The Theory of Two-Temperature Green-Naghdi Thermoelasticity Under Consideration of Thermomass Motion
			Mohamed AbdElaal Mustafa ElQurashi Stress-Strength Reliability of Monsef Distribution for Modeling
			Abdelrahman Abdelkareem Abdellah The effect of moving heat source in DPL model on viscoelastic biological tissues during thermal treatment applications
14.00-14.10	**Break**		

	Session (4) – Conference room Chair Persons: Ahmed Younes Ahmed Refaie Ali	Session (5) Hall (C) Chair Persons: Alfaisal A. Hasan Mohamed El-Beltagy	Session (6) Hall (3) Chair Persons: Mohamed Kholief Ali Wagdy Mohamed	Session (7) Hall (4) Chair Persons: Khaled Mekheimer Elsayed . M. Abu Dahab
14.10-16.10	**Mohammed Ayfan Abdewi** Securing Sensitive Information AI-Based Encryption Solutions.	**Malak Mohammed Saleh Ba-Ali** A fixed point and its asymptotic stability of the solution of a differential equation on the real half-linE	**Radwa Ahmed Osman Mohamed** A Multi-Objective Interference Control Framework for Energy-Efficient IoT-Cellular Networks in 5G	**Ziad A. Aboulseoud** Enhanced Separation Efficiency and Reduced Pressure Drop in Multi-Inlet Cyclone Separators: A Computational Fluid Dynamics Study
	Alhussein M. Abdullah A Comprehensive Evaluation of Machine Learning Models for Pulmonary Diseases Classification	**Eman Mohammed Albarg** A constrained problem of state-dependent differential" equation subject to a state-dependent integral constraint"	**Radwa Ahmed Osman Mohamed** Enhancing AV2X Network Efficiency: An Adaptive Model Based on Hybrid Particle Swarm Optimization	**Abdelaala Ahmed** Stochastic Process of Magneto-photo-Thermoelastic Waves in Semiconductor Materials with the Change in Electrical Conductivity
	Esraa Mamdouh Hashem Navigating the Risks and Challenges of AI Implementation in Healthcare	**Shaymaa Ibrahim Nasim Khalil** On some properties and applications of the fractal derivative	**Hasnaa M. Saad** Enhanced Quantum Entanglement in Hybrid Atomic-Optomechanical Systems via Nonlinear Cross-Kerr Interactions.	**Khaled Lotfy** A Novel Hydrodynamic Semiconductor Model under The Magnetic Field Effect and Laser Pulses
	Habiba Mohamed ElGohary Artificial Intelligence in Pulmonary Disease Diagnosis: Enhancing Accuracy and Efficiency through Medical Imaging and EHR Integration	**Moamen Osama Radwan Salem** Analysis of a parametric delay functional differential equation with nonlocal integral condition	**Fatma Sherif** The influence of negative velocity feedback control on a hybrid electric vehicle subject to external force	**Shady El-Monier** The Stability of Electrostatic Waves in a Multi-Component Magnetized Plasma System
	Yusuf Fathi Mohammad Recent Trends and Innovations in Medical Image Compression Techniques	**Marwa Abdelaziz** Dynamic Analysis of Negative Derivative Feedback Controllers with Geometrically Nonlinear Damping under Harmonic Forcing	**Ibrahim Gad** Leveraging Machine Learning for Causal Inference in Water Quality Assessment"	**Hadeer Adel Azzam** Simulation study of the induced magnetic field's impact for Jeffrey fluid with a complex wavy slip boundary within a curved tube.
	Ayat Karrar Diagnosis Of Pulmonary Lung Nodules Based on a Computer Aided Diagnosis (CADx) System	**Wael M.A. Khalifa** Comparative Forecasting of Electric Load Consumption in Egypt Using Differential Equation Models	**Yasmin Gamal** Secure Privacy Preserving Banking Customer Churn Prediction Using Federated Learning and Fully Homomorphic Encryption	**Mohamed Magdy Elsayed** A Mathematical Model for Exploring Depression Diagnosis
	Habiba Aly Sayed Hussein Microbiome Biomarkers and Breast Cancer: A Machine Learning Approach	**Muhammad Aref Abdullah Arfeen** Evaluating Machine Learning Models for Cost-Effective Shipping Line Selection in Freight Forwarding	**Patrick Tenga** Survival Prediction of Breast Cancer using an Ensemble XGBoost-Deep Learning Neural Network	**Abdelaziz El-Dali** Influence of the homotopy stability perturbation on physical variations of non-local opto-electronic semiconductor materials
	Dawlat Sameh Ali A Machine Learning Framework for Fetal Arrhythmia Detection via Single ECG Electrode	**Ibrahim Abbas** A numerical investigation of the 2-D nonequilibrium DPL bio-heat model using the ADI-FD method	**Hassan Ibrahim** Detecting Malicious HTTP Requests Using Deep Learning: A BERT-Based Approach **Ahmed Nabil Attwa** Stochastic Feature Extraction in Algorithmic Trading for Enhanced Portfolio Optimization	**Emad Fali Wanas** Theoretical Investigation of Electrokinetic Flow in a Microtube Using Micropolarity, Slip Conditions, and Electrical Double Layer Dynamics
16.10	Lunch Hall (C)			

Time	Sunday December 1, 2024		
10.30-12.00	**Session (8) Conference room** **Chair Persons: Ahmed Radwan** **Ahmed M A El-Sayed**	**Session (9) Hall (C)** **Chair Persons: Wael Abbas** **N. H. Sweilam**	**Session (10) Hall (3)** **Chair Persons: Hesham A. Elkaranshawy** **Adel Refaie**
	Nashat Farid Operator ideals, s-numbers of operators and ideals constructed by means of a special space of sequences (sss) and an s-function.	**Youssri Hassan Youssri** Spectral Solutions of Differential Equations via New Orthogonal Polynomials and Special Functions	**Hesham A. Elkaranshawy** A proper mathematical model for cardiac electrical activities
	Zeinab Mansour On Lidstone expansions of entire functions	**N. H. Sweilam** A Novel Crossover Dynamics of Monkeypox Disease Mathematical Model Using Fractional Differential Equations Based on the Psi-Caputo Derivative: Numerical Treatments	**Ahmed Elsayed Mahmoud Gouda** Cluster Head Selection Algorithm Using PSO
	Ahmad Gamal Existence and stability of solutions for ρ -proportional ω-weighted ψ -Hilfer fractional differential inclusions in the presence of non-instantaneous impulses in Banach spaces	**Salah Samy** CFD Modelling for Air Distribution Systems in Industrial Control Room	**Ahmed Ayman Abdel-aal** A Tree-LSTM based Approach for Enhanced Machinery Prognostics
		Mahmoud Ahmed Mohamed Amin Behavior of reinforced concrete columns repaired by steel jackets filled with different types of concrete	**Mohamed Elsayed Mohamed**
			Esraa Reda abdel-Hady mohamed El-ziaty Unveiling Quantum Features of Time-Dependent Electron Spins influenced by Zeeman Energy and Symmetric Cross Spin
12.00-12.30	**Break**		

Time				
12.30-14.30	**Session (11) Conference room** **Chair Persons: Nashat Farid** **Zeinab Mansour**	**Session (12) Hall (C)** **Chair Persons: Alfaisal A. Hasan** **Ahmed Refaie Ali**	**Session (13) Hall (3)** **Chair Persons: Naser H. Sweilam** **Adel Refaie**	**Session (14) Hall (4)** **Chair Persons: Youssri Hassan** **Mona Fouad**
	Enas M. Shehata Hermite-Hadamard inequalities for quantum integrals: a unified approach	**Samir Abdelmageed Farag** Submaximality in Bi-Weak Structures	**Ahmed Ibrahim Mohamed Abosaied** New characterizations of weights on dynamic inequalities involving a Hardy operator	**Sara A. Mekkyy** Analysis of Contact Mechanics for Flat Stamps on Graded Coatings Using Shifted Legendre Polynomials of the First Kind
	Mohamed A. Mamon On recent trends of Geometric Function Theory	**Waheed Mohamed Ahmed Amin** Some Variants of Ĉech Δ-Normal Closure Space	**Enas Omer Mahfouth Suhail** Efficient Line-Search Modified Bat Algorithm for Solving Large-Scale Global Optimization Problem	**Mostafa Ahmed Taema** Spectral Collocation Method via Fermat Polynomials for Fredholm-Volterra Integral Equations with Singular Kernels and Fractional Differential Equations
	Asmaa O. Mohammed A Study of Extensions of Classical Summation Theorems For the Series 3F2 and 4F3with Applications	**Youssef Mahfouz** Cost optimization of reinforced concrete buildings: A comparative study	**Abdelazeem Abdelwahab** Strictly two-sided Commutative Quantal	**Esraa Magdy Abdelghany Abdullah** A Tau Approach for Solving Time-Fractional Heat Equation Based on the Shifted Sixth-Kind Chebyshev Polynomials
	Fatma Abdelatey Elgawish On inverse q-Sturm—Liouville problems	**Ahmed A. El-Deeb** Some Novel Dynamic Inequalities and their Applications on Time Scales. Theory	**Medhat A. El-Messiery** The Spatial Distribution of the Critical Fusion Frequency over the Retina	**Ahmed Gamal Atta** Advanced shifted first-kind Chebyshev collocation approach for solving the nonlinear time-fractional partial integro-differential equation with a weakly singular kernel
	Souhad Salama Almassri Multiplicative Frameworks on Fixed Point Theory and Its Applications	**A.A. Abd El-Bary** Applying a Novel (PBH) Distribution in Statistical Modeling for COVID-19 Data"	Medhat M. El-Messiery Diffusion coefficient of 3D growth of tumer cells	
	Nermeen Ashraf Shawky Structural assessment of historical masonry structures using various strengthening techniques	**Shreen El-Sapa** Time-periodic electrokinetic analysis of a micropolar fluid flow through hydrophobic microannulus	**Mohamed AbdElaal Mustafa ElQurashi** Novel Wrapped Distribution and its application	**Hanem Farouk Abdelfatah Madkour** On a Coupled System of Stochastic Integral Equations of Fractional Orders
	Naglaa Abozeid Reliability characteristics and estimation of parameters based on censored model data to extended Gompertz distribution with application		**Massoud Moustafa Aboukhalaf Massoud** Comparing Different Fractional-Order Response for Lorenz Chaotic System	**Amr Mohamed ElAgamy** Modified bond stress equation of fiber reinforced polymers bars embedded in concrete under uniaxial lateral tensile stresses using numerical analysis
	Toka Waleed Experimental Study on Concrete Performance under Partial Replacement of Normal Coarse Aggregate by Sand-Light Stone			**Sroor Maged Abdelhai Mohamed Elnady** A New Local Fractional Derivative with Applications
	Fatma N. Fouad Parameter estimation and lifetime analysis of the power-modified kies-exponential distribution under progressive Type-II censoring with application			**Nermin Saber** Using Legendre polynomials Formulas at Fresnel Integral Diffraction
14.30-15.00	**Main Hall Chair: Prof. Abdelshafy F. Obada, Prof. Alaa A Bary,** **Recommendation and Closing**			
15.00	**Lunch Hall (C)**			

Lecture

On Some Different Senses of the Stochastic Fractional-Order Derivatives and Integrals: Theory and applications

Ahmed M A El-Sayed
Faculty of science – Alexandria University
amasayed@alexu.edu.eg

Abstract
In this talk we give some different concepts of ordinary and fractional-order derivatives and integral, then we give some applications.
Contents:
Derivative and integral of mean square second order stochastic process.
Fractional-order Derivative and integral of mean square second order stochastic process.
Random differential equations with mean square second order stochastic process.
Stochastic Ito-differential and integral.
Stochastic Ito-differential equations.
Arbitrary (fractional) orders stochastic differential equations.

Oscillation Theory of Delay Differential equations and Applications on Biological Models

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Abstract
In this talk I will present some oscillation results of first order delay differential equations and apply the results on studying the oscillation of delay models in biology. Next, I will talk about the oscillation of second order delay differential equations by applying different techniques. Some examples will be presented for illustrations.

Quantum steering via different quantum systems

N. Metwally
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Abstract
In this talk, I shall review the concept of quantum steering process. The possibility that one partner steers his/her partner will be introduced for different quantum systems. Also, the bi- directional steering will be discussed.

Applications of Partial Negation in Quantum Computing

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Abstract
Partial negation operator is a negation operator rooted to an arbitrary nth root. Partial negation has many applications in manipulating the information contents in a qubit, for example, data encoding which is useful in quantum machine learning, quantum image processing, quantum searching and many more. The partial negation operator can also be used to read the information contents of an unknown qubit system without using sharp measurement. Sharp measurement is an irreversible operation that will cause the superposition to collapse to one of the two possible states in a probabilistic way. This talk will discuss applications of using partial negation operator and will show a quantum algorithm to read the information contents of an unknown qubit without applying sharp measurement on that qubit and so the superposition will not collapse. A quantum feedback control scheme will be shown where sharp measurement will be applied iteratively on an auxiliary qubit weakly entangled with the unknown qubit.

Spectral Solutions of Differential Equations via New Orthogonal Polynomials and Special Functions

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Abstract
Herein, we introduce innovative spectral techniques for solving various linear and fractional differential equations. Leveraging shifted fifth- and sixth-kind Chebyshev polynomials, we develop novel Galerkin, Tau, and collocation methods tailored to specific problems, including hyperbolic equations, fractional diffusion-wave models, and heat conduction problems. These methods exhibit exponential convergence with minimal computational modes, which makes them ideal for treating fractional problems, even those with non-smooth solutions. Emphasis will be placed on the flexibility and efficiency of the proposed approaches in solving practical problems, demonstrating their advantages over classical methods. The talk will conclude with insights into a fast Galerkin-based solution to the fractional Rayleigh-Stokes problem, showcasing the power of orthogonal polynomials in numerical analysis.

Nehari's inequality generalisation for the q-difference operator and applications to majorization problems

Teodor Bulboacă
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Abstract

Because the q-calculus (quantum calculus) has applications in many mathematical fields, first we gave the q-analogue generalisation of the well-known Nehari's inequality [3, p. 168] that will be used to the prove some majorisation results. Thus, if D_q represents the Jackson's q-derivative operator, then:

Theorem 1. If ω is an analytic function in D, such that $|\omega(z)| < 1$, $z \in D$, then

$$D_q(\omega(z)) \le \frac{1-\overline{\omega(zq)}\omega(z)}{1-|z|^2 q},\ z \in \mathrm{D},\ (0<q<1).$$

Taking $q \to 1-$ in the above result we obtain the Nehari's inequality.

Let denote by P the subclass of all analytic functions χ in the open unit disk D, such that χ has positive real part in D with $\chi(0) = 1$. For a given $\chi \in P$ and $q \in (0, 1)$ we define the family $S_q(\chi) \subset A$ where A represents the class of analytic functions in D usually normalized by $\chi(0) = \chi'(0) - 1 = 0$ by

$$S_q(\chi) = \left\{k \in A : \frac{zD_q k(z)}{k(z)} \prec \chi(z)\right\}.$$

Like in [1], assuming that k and h are two analytic functions in D, then k is said to be majorized by h in D, denoted by $k(z) \ll h(z)$, if there exists an analytic function μ in D such that $|\mu(z)| \le 1$ and $k(z) = \mu(z)h(z)$ for all $z \in D$.

The main result is a modified version of majorization problem for the category $S_q(\chi)$ connected with the Theorem 1.1 of [2], as follows:

Theorem 2. Let l be analytic in D with $l \not\equiv 0$, and let $h \in S_q(\chi)$. If $l(z) \ll h(z)$ in D such that $l \not\equiv c\,h$ with $|c| = 1$, and $q \in (0, 1)$, then

$$|D_q l(z)| \le |D_q h(z)|,\ |z| \le r \le r_*,$$

where r_* is the positive root of the equation

$$(1-\eta)\rho q r^2 + (1+\eta)r - (1-\eta)\rho = 0,$$

with $\eta = \eta(r, q) := \max_{|\zeta|=qr} |\mu(\zeta)|$ and $\rho = \rho(r) := \min_{|z|=r} |\chi(z)|$. The function μ is those that realize the majorization $l(z) \ll h(z)$ in D, shown in the above definition.

This theorem is followed by many interesting particular and special cases obtained for different choice of the parameters and functions.

On the existence and stabilization of impulsive differential and integro-differential equations of second order

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Abstract
This study considers some impulsive differential and integro-differential equations of second order, which have multiple time delays. In the study, the existence of solutions and exponentially stabilization in relation to the considered impulsive mathematical models are investigated. The results of the study include sufficient conditions regarding these concepts. The techniques with regard to the proofs of results depend on the Schaefer fixed point theorem, fixed impulse effects and Lyapunov– Krasovskiĭ functional approach, respectively. The outcomes of this study have new contributions to the qualitative theory of impulsive differential and impulsive integro-differential equations. They also extend and improve some results that can be found in the relevant literature.

Some Engineering Applications of Artificial Neural Networks

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Abstract

¾ Artificial neural networks (ANN) attempt to imitate the biological neural connections of the human brain, where they typically consist of a large number of elementary processing units called neurons. The tasks performed by neural networks can be classified as those requiring supervised or unsupervised learning. In supervised learning, the network is trained using data for which the inputs and the corresponding desired responses are given. On the other hand, unsupervised learning must rely on guidance obtained heuristically by the system examining different sample data or the environment. Different ANN architectures, such as feedforward neural networks (FFNN) and Hopfield neural networks (HNN), will be briefly overviewed in this presentation along with their learning mechanisms. In addition, different engineering applications of those networks will be presented including modeling and field computation in complex magnetic media, characterizing software development method, and software defect prediction

Initiatives in Neurotechnology and AI Ethics in Egypt

Alyaa Yousef, Mohamed Holier

A Novel Crossover Dynamics of Monkeypox Disease Mathematical Model Using Fractional Differential Equations Based on the Psi-Caputo Derivative: Numerical Treatments

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Abstract
A novel crossover model for monkeypox disease that incorporates Psi-Caputo fractional derivatives is presented here, where we use a simple nonstandard kernel function. We can be obtained the Caputo and Caputo-Katugampola derivatives as special cases from the proposed derivative. Four different models of variable-order, fractional order, fractal fractional, and fractional stochastic derivatives driven by fractional Brownian motion (FBM) are defined in four-time intervals for the crossover dynamics model. Psi-nonstandard finite difference method (Psi-NFDM) is constructed to solve the mathematical models of variable order, fractional order, and fractal fractional order. Also, the nonstandard modified Euler Maruyama method (NMEMM) is used to study the fractional stochastic model. Numerous numerical tests and comparisons with real data were conducted to validate the methods efficacy and support the theoretical conclusions.

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Basis Development of the Fractional Wiener Chaos Expansion with Applications to Systems with Fractional Brownian Motion

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Abstract
Many real-life processes are modeled with differential equations that include fractional derivatives in addition to fractional Brownian motion. These models still require developing techniques for their analysis and statistical quantifications. In this paper, we develop a new practical basis for processes motivated by or including fractional Brownian motion. The background theory is outlined with the conditions for existence and uniqueness. The new basis constructs a complete set based on the fractional sine and cosine functions with orthogonal property that can be used in analyzing and computing statistics of the processes modeled with fractional stochastic differential equations (SFDs). The developed basis is used to analyze some well-known models both analytically and numerically. The results show the efficiency of the fractional Wiener chaos expansion (FWCE) technique. The outlined development technique can be extended to other basis sets suitable for different applications.
Keywords: Stochastic processes, fractional differential equations, fractional Brownian motion, orthogonal basis, Fractional Wiener chaos expansion.

Operator ideals, s-numbers of operators and ideals constructed by means of a special space of sequences (sss) and an s-function.

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Abstract

Examples of operator ideals:
Normed and quasi normed operator ideals. Ideal of nuclear operators, ideal of compact operators, absolutely summing operators and ideal of p Shatten- Von-Neuman operators.
Grothendiek conjecture about the smallness of the ideal of nuclear operators. Pisier spaces.
The ideal of compact operators is not small.
The ideal of p Shatten-Von-Neuman operators is a small ideal.
Examples of s-numbers of operators:
Approximation numbers, Kolmogorov numbers, Gelfand numbers and Tikhomirov numbers.
Special space of sequences.
General way of constructing an ideal of operators by means of a special space of sequences (sss) and a sequence of s-numbers.

Lidstone expansions of entire functions

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Abstract
Lidstone expansions express an entire function f(z) in terms of the values of the derivatives of even orders at 0,1. The polynomials in the expansion are called Lidstone polynomials. They are Bernoulli polynomials; many authors introduced necessary and (or) sufficient conditions for the absolute convergence of the series in the expansion. The classical exponential function plays an essential role in deriving the Lidstone series. In the q theory, we have three q-difference operators, the Jackson q-difference operator, the symmetric q-difference operator, and the Askey-Wilson q-difference operator. Each operator is associated with a q-analog of the exponential function. In this talk, we introduce q-extensions to the Lidstone expansion associated with these operators. New three q-analogs of Bernoulli polynomials with nice properties are coming out.

Existence and stability of solutions for ρ - proportional ω-weighted ψ -Hilfer fractional differential inclusions in the presence of non-instantaneous impulses in Banach spaces

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Abstract

In this lecture, we present the notion of the p- proportional w- weighted ψ-Hilfer fractional differential operator with the lower limit at a point $a \in [0, b)$, $D_{a,x}^{\alpha,\beta,p,w,\psi}$, and some of its properties are deduced. Then, we consider a non-instantaneous impulses differential inclusion containing $D_{a,x}^{\alpha,\beta,p,w,\psi}$ of order $\alpha \in (1,2)$ and of kind $\beta \in [0,1]$ in Banach spaces, where $p \in (0,1]$, $w: [0, b] \rightarrow]0, \infty[$ and $\psi: [0, b] \rightarrow \mathbb{R}$ is strictly increasing and continuously differentiable function. We mention the relevant between any solution to the studied problem and the integral equation that correspond it, and then, by using an appropriate fixed-point theorem for multi-valued functions, we present two results for the existence of these solutions. In the first result, the compactness of the solutions set is proved. Next, we present the concept of the (p, w, ψ) -generalized Ulam- Hyers stability of solutions and, by using the properties of multi-valued weakly Picard operators, we present a result regarding the (p, w, ψ) -generalized Ulam- Hyers stability of the objective problem. Two examples to support our findings are presented.

Articles

Effect of Initial Stress in a Semiconductor Thermoelastic Medium Under Ramp Type Heating with Photothermal Theory

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Abstract
This study investigates deformations within a homogeneous semiconductor thermoplastic medium subjected to initial stress and ramp type heating employing the theoretical photothermal model. Utilizing the normal mode method, precise expressions for key distributions, such as temperature, carrier density, stresses and displacement components, are derived. Numerical computations are facilitated through Mathematica programming, focusing on a material exhibiting properties analogous to a silicon. Integrating Photothermal model, initial stress, wave number and time, the research visually portrays the impact of these factors on the considered state variables through graphical representations. The numerical and graphical results underscore the significant influence of wave number, time, and initial stress on the various field quantities. This investigation provides valuable insights into the synergistic dynamics among an initial stress constituent, semiconductor structures, and wave propagation, enabling advancements in nuclear reactors' construction, operation, electrical circuits, and solar cells.

Analysis of Contact Mechanics for Flat Stamps on Graded Coatings Using Shifted Legendre Polynomials of the First Kind.

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Abstract
This study investigates the contact mechanics of graded coatings, focusing specifically on the early fracture behavior of these materials under rigid flat stamp sliding contact loading. The problem is formulated as a weakly singular Fredholm integral equation of the second kind, in this paper we will utilize shifted Legendre polynomials of the first kind in a matrix-vector format to approximate this integral. The singularity in the kernel is addressed analytically to facilitate the analysis [1]. The primary objective of this research is to derive analytical benchmark solutions that allow us to explore the influence of numerous factors, such as material inhomogeneity constants, the coefficient of friction, and characteristic length parameters, on the critical stresses that may impact the fatigue and fracture behavior of the coatings.
Keywords: The Contact Mechanics of a Flat Stamp Graded Coatings; Fredholm integral equations; Legendre polynomials.

Securing Sensitive Information AI-Based Encryption Solutions.

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Abstract
Nowadays: Safeguarding information is paramount. With the increasing frequency and sophistication of cyber threats, traditional encryption methods are proving insufficient. Therefore, the integration of AI into encryption solutions presents a promising avenue for enhancing data security. This proposal outlines the implementation of AI-based encryption solutions to safeguard sensitive information effectively.

A fixed point and its asymptotic stability of the solution of a differential equation on the real half-line

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Abstract
This research study aims to analyze the solvability of a differential equation in two ways. The first approach involves by applying of Darbo's fixed point Theorem and the measure of noncompactness (MNC) technique, the second approach by using some fixed point theories within the space $BC(R_+)$.
Moreover, we establish the asymptotic stability of the solution and dependency on the initial data and on the some functions. Additionally, we delve into the study of Hyers-Ulam stability. Finally, some examples are provided to verify our investigation.

New characterizations of weights on dynamic inequalities involving a Hardy operator "

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6.School of Mathematics, Statistics and Applied Mathematics, National University of Ireland, Galway, Ireland.

Abstract

In this paper, we establish some new characterizations of weighted functions of dynamic inequalities containing a Hardy operator on time scales. These inequalities contain the characterization of Arino and Muckenhoupt when $\mathbb{T} = \mathbb{R}$, whereas they contain the characterizations of Bennett–Erdmann and Gao when $\mathbb{T}=\mathbb{N}$.

Nonlinear Rayleigh wave propagation in a thermoelastic structure consisting of a slab sandwiched by two half-spaces in dual-phase-lag

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2-School of Engineering and Applied Sciences, Nile University, Giza 12588, Egypt.
3- Department of Mathematics, Faculty of Science, Cairo University, Giza 12613, Egypt.

Abstract
The propagation of nonlinear Rayleigh waves is investigated in a thermoelastic structure consisting of a slab sandwiched between two similar half-spaces within dual-phase-lag. Nonlinearity is induced by the dependence on temperature of the thermal conductivities. The present configuration models a thin interface between two similar media, when the external agents can be neglected. Numerical results are provided and discussed

constrained problem of state-dependent differential" equation subject to a state-dependent integral constraint"

Eman Mohammed Mohammed Albarg
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Abstract
Our main objectives in this paper are to investigate the existence of solution of state dependent differential equation with state dependent integral constraint. The uniqueness of the solution and the continuous dependence of the unique solution will be proved. Moreover the Hyres-Ulam stability of our problem will be studied. Some special cases and examples will be introduced

On some properties and applications of the fractal derivative

Shaymaa I. Nasim and Ahmed M. A. El-Sayed
Faculty of Science, Alexandria University, Alexandria, Egypt

Abstract
In this paper, we give some properties of the fractal derivative and study some problems of fractal differential equations.

Efficient Line-Search Modified Bat Algorithm for Solving Large-Scale Global Optimization Problem

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Abstract
An efficient line-search modified bat algorithm (EMBA) is proposed. A balance between exploration and exploitation abilities is achieved by regulating the step of a particle position towards the global optimum. Firstly, a line search to an accurate step size of a particle towards the global optimum is presented. The generated step size depends on the proximity of the particle to the global optimum and it is directly proportional to the dimension of a problem. This proportion makes EMBA capable to handle the high probability of an explosion in the initial values of objective functions in high-dimensional optimization problems. Secondly, the velocity of a particle is clamped within pre-defined boundaries and penalized, if necessary, to make sure that both velocity and position of a particle are within their corresponding boundaries. These modifications combined make EMBA able to converge to the global optimum in few iterations in different-dimensional optimization problems. The performance of EMBA is experimented using several benchmark functions. The numerical results show that EMBA is a strong competitor when comparing with other well-established algorithms.

Explicit and Implicit Quantum Correlation Dynamics of Qubits Interacting with Thermal Baths

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Abstract

This paper investigates quantum entanglement, steering, and Local Quantum Uncertainty (LQU) in a system of two qubits, each coupled to a separate, isolated circular bath modeled as spin-star configurations. Despite no direct inter-bath interactions, significant quantum correlations arise under specific parameter conditions. The study highlights the importance of symmetric conditions and balanced atomic populations for achieving robust steering and strong quantum correlations. Bath coupling enhances atomic entanglement, as quantified by negativity, while deviations reduce correlations. Indirect couplings between baths through the atomic system lead to robust entanglement and steering. LQU analysis shows that balanced conditions minimize uncertainty and strengthen correlations, while imbalances increase LQU. These findings provide insights for optimizing quantum control and enhancing quantum information processing performance.

Analysis of a parametric delay functional differential equation with nonlocal integral condition

Ahmed M. A. El-Sayed, Moamen Osama Radwan *, Hanaa R. Ebead

Abstract

This paper analyzes a nonlocal problem of a delay functional-differential equation with parameters. We confirm that there is at least one solution $x \in AC[0,T]$ to the problem. Furthermore, we provide the hypotheses that must be fulfilled for the solution’s uniqueness. The analysis also implements the Hyers-Ulam stability of the problem and the continuous dependence of the unique solution on some parameters. We provide some exceptional cases and examples to illustrate our findings.

Spectral Solutions of Differential Equations via New Orthogonal Polynomials and Special Functions

Author: Youssri Hassan Youssri
Cairo University , Egypt University of Informatics , The American University in Cairo

Abstract
Herein, we introduce innovative spectral techniques for solving various linear and fractional differential equations. Leveraging shifted fifth- and sixth-kind Chebyshev polynomials, we develop novel Galerkin, Tau, and collocation methods tailored to specific problems, including hyperbolic equations, fractional diffusion-wave models, and heat conduction problems. These methods exhibit exponential convergence with minimal computational modes, which makes them ideal for treating fractional problems, even those with non-smooth solutions. Emphasis will be placed on the flexibility and efficiency of the proposed approaches in solving practical problems, demonstrating their advantages over classical methods. The talk will conclude with insights into a fast Galerkin-based solution to the fractional Rayleigh-Stokes problem, showcasing the power of orthogonal polynomials in numerical analysis.

Spectral Collocation Method via Fermat Polynomials for Fredholm-Volterra Integral Equations with Singular Kernels and Fractional Differential Equations

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3 Faculty of Petroleum and Mining Engineering, Suez University, Suez, Egypt., Faculty of Engineering, King Salman International University, El-Tur, Egypt

Abstract
This study presents a new approach to solving integral equations, fractional differential equations (FDEs), and Fredholm-Volterra integral equations with singular kernels. A truncated series of Fermat polynomials is used to approximate the answer, and a quadrature formula is used to discretize the integral. Next, the collocation spectral technique is used to find the unknown expansion coefficients. The suggested approach offers a methodical framework for solving integral equations including difficult single kernels. The correctness and efficiency of the procedure are demonstrated by numerical examples, complemented by comparisons with analytical solutions.

A Tau Approach for Solving Time-Fractional Heat Equation Based on the Shifted Sixth-Kind Chebyshev Polynomials

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Abstract

The time-fractional heat equation governed by nonlocal conditions is solved using a novel method developed in this study, which is based on the spectral tau method. There are two sets of basis functions used. The first set is the set of non-symmetric polynomials, namely, the shifted Chebyshev polynomials of the sixth-kind (CPs6), and the second set is a set of modified shifted CPs6. The approximation of the solution is written as a product of the two chosen basis function sets. For this method, the key concept is to transform the problem governed by the underlying conditions into a set of linear algebraic equations that can be solved by means of an appropriate numerical scheme. The error analysis of the proposed extension is also thoroughly investigated. Finally, a number of examples are shown to illustrate the reliability and accuracy of the suggested tau method.

Keywords: time fractional heat equation; Chebyshev polynomials of the sixth-kind; tau method; partial differential equations; error analysis

Advanced shifted first-kind Chebyshev collocation approach for solving the nonlinear time-fractional partial integro-differential equation with a weakly singular kernel

A. G. Atta and Y. H. Youssri

Abstract

This research apparatuses an approximate spectral method for the nonlinear time-fractional partial integro-differential equation with a weakly singular kernel (TFPIDE). The main idea of this approach is to set up a new Hilbert space that satisfies the initial and boundary conditions. The new spectral collocation approach is applied to obtain precise numerical approximation using new basis functions based on shifted first-kind Chebyshev polynomials (SCP1K). Furthermore, we support our study by a careful error analysis of the suggested shifted first-kind Chebyshev expansion. The results show that the new approach is very accurate and effective.

Hermite-Hadamard inequalities for quantum integrals: a unified approach

Enas M. Shehata

Menoufia University

Abstract

Let β be a strictly increasing continuous function defined on an interval $I \subset R$. Hamza et al. introduced the quantum operator $D_\beta g(t) = \frac{g(\beta(t))-g(t)}{\beta(t)-t}, t \neq s_0$, $D_\beta g(s_0) = g'(s_0)$, where s_0 is a fixed point of the function β. For specific choices of β one obtains the known Jackson q-operator, D_q, as well as the Hahn quantum operator $D_{q,w}$. Regarding its inverse operator, the β-integral, we established the corresponding β-Hermite-Hadamard inequalities. Among others, we also obtained the Hermite-Hadamard type inequalities for the Jackson q-integral, the N\"orlund integral and for the Jackson-Thomae (or Jackson-N\"orlund) q, w -integral.

Multiplicative Frameworks on Fixed Point Theory and Its Applications

Nashat Faried, Sahar Mohamed Ali Abou Bakr, Hany Abd El-Ghaffar and Souhad Salama Almassri

Abstract

A metric sort distance, convergence structures and some more topological inquiries in multiplicative partial cone metric spaces over Banach algebras are contemplated. We set up the idea for defining these generalizations of metric locations by supplanting the arrangement of Banach space by an arranged multiplicative Banach algebra. In theory of distance spaces, a large body of the framed metric fixed point theorems are not real generalizations. During the axiomatic study of our generalized space, we, undoubtedly, manifest the novelty essence of our fixed point theory approaches. We stretch out Banach's contraction mapping theory for fixed points of contractions to such spaces. Supporting non-trivial counter-example to the main theorem and some illustrative examples are additionally given. One of our results is an exceptionally significant instrument in solving a system of non-linear integral equations.

Mathematics Subject Classification (2010). Primary 47H09; Secondary 47H10.

Keywords. multiplicative partial cone metric spaces over Banach algebras; multiplicative algebra cones; fixed points.

On a Coupled System of Stochastic Integral Equations of Fractional Orders

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Abstract:
In this paper, we study the coupled system of stochastic integral equations of fractional orders. We are concerned with the existence of a unique mean square continuous solution of coupled system of stochastic integral equations of fractional orders. The uniqueness theorem of the solution is proved. As an application, we study the existence of a unique mean square continuous solution for some coupled systems of stochastic differential equations of fractional orders.

Modified bond stress equation of fiber reinforced polymers bars embedded in concrete under uniaxial lateral tensile stresses using numerical analysis

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Abstract
The last two decades have seen substantial advancements in experimental research of bond behaviour of Fiber reinforced polymer FRP deformed bars embedded in concrete. Lack of comprehensive knowledge has been noticed concerning bars bond under confinement cases, which has a significant impact on design specifications. Extensive examination of bonding behaviour of deformed FRP bars embedded in concrete exposed to lateral confinement stress was conducted. This paper proposes numerical analysis finite element model in rib scale, this model implements precise modelling with full geometric characteristics, including the concrete keys in the contact zone and the FRB bar rib reinforcement. The contact method is surface to surface contact with tie limitation are employed to ignore the chemical adhesion between the reinforcement bar and the concrete to prevent separating or sliding between surfaces. Four distinct FRP types were modelled, resulting in a total of 44 case studies. To validate the model, experimental data for both steel bars under confinement stress and FRP bars under pullout conditions were compared. The model exhibited exceptional agreement with these experimental findings. The study revealed a substantial 42% reduction in bond strength due to lateral tensile confinement stress, accompanied by a notable alteration in failure mode. Based on these results, a predictive equation of bond strength of FRP bars under lateral tensile stress is proposed.
Keywords:FRP bars bond behaviour, Pullout test, lateral tensile stress, Nonlinear finite element modelling

A Comprehensive Evaluation of Machine Learning Models for Pulmonary Diseases Classification

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Abstract
pulmonary diseases, particularly degenerative conditions such as tuberculosis, sarcoidosis, proteinosis, and fibrosis, pose significant health challenges globally. Early and accurate detection through chest X-ray imaging can substantially improve patient outcomes. Despite advancements in medical imaging and machine learning, there remains a need for robust, high-accuracy models capable of distinguishing between normal and abnormal pulmonary conditions, as existing models often lack the precision and reliability required for clinical application. This study aims to develop and evaluate a comprehensive suite of machine learning models for the binary classification of normal and degenerative pulmonary diseases using chest X-ray images. We utilized a dataset comprising nine categories of pulmonary diseases, focusing on two categories: normal and degenerative pulmonary diseases. Various machine learning algorithms (SVM, KNN, logistic regression, random forest, bagging, adaboost, light GBM, and a stacking model) were deployed. Performance metrics such as recall, precision, F1 score, and accuracy were used to evaluate the models. Among the machine learning models, the stacking model (SVM, KNN, logistic regression) achieved the highest performance with metrics of 99% (recall), 98% (precision), 98% (F1 score), and 98% (accuracy). Logistic regression demonstrated strong performance with an accuracy of 96%, alongside slightly lower precision and F1 scores. The results indicate that advanced machine learning models can significantly enhance the accuracy of pulmonary disease classification from chest X-ray images. The stacking model, in particular, shows promise for clinical application, potentially leading to more reliable and early diagnosis of degenerative pulmonary diseases.

Keywords—pulmonary diseases, sarcoidosis, tuberculosis, chest x-ray, machine learning

Navigating the Risks and Challenges of AI Implementation in Healthcare

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Abstract

The rapid adoption of Artificial Intelligence (AI) in healthcare presents both opportunities and challenges. While the benefits of this technology are numerous, including increased efficiency, cost-effectiveness, and accessibility, there are also concerns around data privacy, security, and potential biases in algorithmic decision-making. Artificial intelligence (AI) in healthcare has the potential to provide solutions to some of the problems that healthcare systems throughout the world are currently facing. In addition to improving the quality of human life, AI-based technologies are also reported to ensure a safer and more productive work environment. However, there are also significant risks associated with it.

This review aims to explore distinct genres of AI risks prevalent in healthcare by academic articles, categorizing them into three primary areas: technical risks ,clinical data risks, and socio-ethical risks. The problem of AI-related risks can be effectively addressed by developing evidence-based approaches that address these challenges. Healthcare leaders and clinical staff will become more effective in implementing AI in healthcare by identifying and addressing the barriers that are preventing its adoption and implementation.

Keywords — Artificial intelligence, healthcare, technical risks, clinical data risks, and socio-ethical risks

A Study of Extensions of Classical Summation Theorems For the Series 3F2 and 4F3with Applications

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Abstract

In 2018, Masjed-Jamei & Koepf [Some summation theorems for generalized hypergeometric functions, Axioms, 7, 38, doi:10.3390/axioms 7020038] established some summation theorems for the generalized hypergeometric functions. The aim of this talk is to establish extensions of some of their summation theorems in the most general form. As an application, several Eulerian-type and Laplace-type integrals have also been given. Results earlier obtained by Jun et al. and Koepf et al. follow special cases of our main findings.

On Inverse q-Sturm-Liouville Problems

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Abstract

We establish the uniqueness theorems for the Inverse q-Sturm–Liouville problems. The first uniqueness theorem employs the method of transformation operators to provide a q-analog of the Levinson-Marchenko uniqueness theorem. The second uniqueness theorem is a q-analog of the Ashrafyan uniqueness theorem. Therefore, We study the inverse q-Sturm-Liouville problems. In other words, we recovered the potential function of the q-Sturm-Liouville problems from it's spectral data by using an algorithm which is illustrated with an example.

On recent trends of Geometric Function Theory

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Abstract

Geometric Function Theory (GFT) is a field of complex analysis that focusses on the geometric properties of harmonic and analytic functions. It is strongly linked to special functions. The application of special functions plays a major role in the GFT approach, as shown by de Branges' proof of the Bieberbach conjecture. This conjecture is a critical topic in the field of univalent functions defined on the open unit disk. This significant event has led to the development of various methodologies for solving problems in GFT and special functions, which play a crucial role in both pure and applied mathematics.

The Taylor-Maclaurin coefficients estimation problem is useful in studying the conformal mapping from a geometric approach; therefore, some recent studies of this problem related to the are shown. In addition, the applications associated with Fekete-Sezgo and Hankel determinant problems are pointed out.

Furthermore, by using the admissible functions approach, the appropriate criteria for starlik- ness, univalence, and convexity as applied to the normalised formula of some special functions are investigated. In addition, the conditions under which these functions could be considered to be close-to-convex relative to certain convex functions are introduced. Finally, the necessary conditions for these functions to be members of the Hardy space Hq are introduced..

Artificial Intelligence in Pulmonary Disease Diagnosis: Enhancing Accuracy and Efficiency through Medical Imaging and EHR Integration

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Abstract
Pulmonary diseases, including chronic obstructive pulmonary disease (COPD), lung cancer, asthma, pneumonia, and sarcoidosis, pose ongoing health challenges worldwide. Early and accurate diagnosis is essential for effective treatment and improved patient outcomes. In recent years, artificial intelligence (AI) techniques have shown promise in transforming the diagnostic landscape, enhancing the accuracy and efficiency of diagnosing respiratory diseases through the analysis of medical images, spirometry data, and electronic health records (EHRs). This review examines the state-of-the-art applications of AI across various pulmonary diseases, particularly advancements in imaging diagnostics through convolutional neural networks (CNNs) and the integration of diverse datasets to improve diagnostic precision.
Despite these advancements, significant challenges remain, including data quality, model interpretability, and the need for validation across varied populations. Ethical considerations, such as data privacy and algorithmic transparency, are also critical for broader clinical adoption. This review identifies current gaps and suggests future directions, emphasizing the development of explainable AI (XAI), integration of multi-modal data sources, and stronger collaboration between AI developers and healthcare professionals. With continued innovation and thorough validation, AI holds potential to revolutionize pulmonary disease diagnosis, enabling earlier detection, personalized treatment, reduced healthcare costs, and improved patient care.

Keywords: Artificial Intelligence, Pulmonary Diseases, Diagnosis, Electronic Health Records

Trends and Innovations in Medical Image Compression Techniques

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Abstract
With the exponential growth in diagnostic imaging data, efficient medical image compression techniques have become essential. Traditional methods, such as wavelet-based and object-based models, have shown limited efficiency in handling high-resolution volumetric data and adapting to medical applications. Recent advancements have introduced algorithms leveraging deep learning, hybrid transformations, and adaptive context-driven approaches. New methods like LFC-UNet use neural networks for lossless compression with residual probability estimation, improving efficiency and maintaining processing speeds. Hybrid techniques, combining discrete wavelet transforms (DWT) with steganography, enhance data security and storage. For example, a hybrid model using steganography with the Knight Tour algorithm and DWT improves compression ratios without compromising quality. Adaptive approaches have also been developed for critical scenarios like CT angiography, applying lossless compression to diagnostically relevant regions while compressing less critical areas with higher loss tolerance. New 3D transform methods like the discrete Hartley transform (DHT) offer low-complexity approximations for efficient compression of volumetric data. These advancements have significantly improved the compression and storage of high-resolution datasets, from MRI and CT. enabling targeted preservation of diagnostically relevant features and enhancing applications in telemedicine. Deep learning-based algorithms achieve high compression ratios while preserving diagnostic information, outperforming traditional methods by enabling efficient compression with minimal loss of image quality. Future research should prioritize refining deep learning architectures and exploring hybrid models to optimize compression efficiency and clinical applications.

Keywords: Medical image compression, deep learning, hybrid models, 3D image compression, medical compression.

Diagnosis Of Pulmonary Lung Nodules Based on a Computer Aided Diagnosis (CADx) System

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Abstract
Lung cancer is one of the most serious cancers in the world with the minimal survival rate. Pulmonary nodules may be isolated from (solitary) or adjacent to (juxta pleural) other structures in the lungs such as blood vessels or the pleura. The localization diagnosis of pulmonary nodules enhances the survival rate because it accomplishes diagnostic and therapeutic quality assurance. In this work, a Computer Aided Diagnosis (CADx) system is proposed to classify solitary nodules and juxta pleural nodules in the lungs. Two segmentation techniques, (thresholding + K-means clustering) and (thresholding + morphology) are proposed then a combination of first- order and second-order features are extracted. The higher fifteen ranks of the feature set are selected using the fisher score ranking. Due to the limited and imbalanced data, 10-fold cross-validation and random oversampling are used to achieve a high-performance measure. In the classification stage artificial neural network (ANN) plays an important role in classifying lung cancer tissue. For the diagnosis of juxta pleural nodule, the ANN achieved sensitivity, specificity, accuracy, and AUC of 96 %, 90 %, 93% and 95.8% respectively. This CAD system showed promising results compared to other published studies.
Keywords: Computer-aided diagnosis (CADx), CT scans, K-means clustering, Random oversampling, Artificial neural network.

Strictly two-sided Commutative Quantale

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Abstract
In this paper, we give a comment of the concept of complete resituated lattice [Pavelka (1979),Ying (1993)]. Furthermore, we prove that the concept of strictly two- sided commutative quantale [H¨ohle (1999)], Rosenthal (1990)] and the concept of complete resituated lattice are equivalent notions.
Keywords: complete MV- algebra; complete residuated lattice, concept of strictly two-sided commutative quantale

The Spatial Distribution of the Critical Fusion Frequency over the Retina

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Abstract
The average value of the critical fusion frequency (CFF) of the human eye is not only essential for the modern technological applications but also to the psychophysics of image recognition. The present work introduces a non-invasive technique that can scan the hemispherical visual field determining the CFF response to either white or monochromatic light sources. The proposed design is an automated one, such that a 3-D retinal scan is produced, hence obtaining a retinal spatial distribution over the retina (RSD) of the CFF. It implements ALTERA FPGA Cyclone IV DE2-115 board. The produced data is electronically stored, analysed and plotted. The results obtained, show that the CFF for the white light source; is almost independent on the image location on the retina. On the other hand, the CFF values of monochromatic sources namely (red, green and blue) show strong dependence on the spatial position of the image on the retina. The dependence of CFF on the gender is insignificant while the its average values drop significantly with age.

Keywords: 3-D retinal scan, critical fusion frequency (CFF), CFF measurement, chromatic effect, mechatronic device, retinal spatial distribution (RSD), field programmable gate array (FPGA).

Diffusion coefficient of 3d growth of tumer cells

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Abstract

In the present work the problem of biological cellular growth is studied as a Diffusion Process. Despite of the differences between the diffusion mechanism of living cells and other phases of matters yet both of them are a random walk process.

The present work introduces a computer model simulating the growth of biological cells in a nutrient media considering the stochastic nature of the growth. employed to simulate a virtual model of cell growth. The model follows the actual cytokinetics rules of normal growth. Hence the diffusion coefficient of normal and tumor cells was calculated as a function of time and loss factor.

The present work aims is to build a realistic 3D computer simulation model of tumor growth which helps in examining the method of tumor growth, also clarifying the role of different factors affecting the cell kinetics of normal and tumor growth. The goal of the model is to calculate the biological diffusion coefficient which indicates the cells growth rate

Performing this task cell-cycle computer simulation model for living cells has been developed. Moreover, rules describing the cell-cell interactions have been formulated for both normal and tumor cells.

A proper mathematical model for cardiac electrical activities

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Abstract

Cardiac diseases are a major health concern in modern society. Taken together, they represent the first leading cause of death worldwide. Mathematical models of cardiac electrophysiology are important in understanding real processes taking place in healthy and diseased hearts. In this paper, a proper mathematical model for cardiac electrical activities in the form of a system of nonlinear ordinary differential equations is developed. The model can capture the dynamics of the electrical conduction system for the human heart, including main pacemakers and heart muscles. The electrocardiogram (ECG) as a combined signal of atrial and ventricular muscles is formed. To illustrate the accuracy and the effectiveness of the suggested model, synthetic ECGs for normal and for many pathological rhythms are acquired. Simulation results are compared with normal and pathological ECGs. The model can explain the key processes that contribute to the generation of the ECG waveform. It is believed that this model provides a valuable approach for revealing physiological insight.

Keywords. mathematical model, heart dynamics, cardiac electrical activities, Van der Pol oscillator, Aliev-Panfilov equations

Microbiome Biomarkers and Breast Cancer: A Machine Learning Approach

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Abstract
Breast cancer is one of the most common diseases affecting women globally and significantly contributes to mortality rates worldwide, with risk factors including genetic mutations, family history, age, obesity, breastfeeding habits, and lifestyle choices. Recent research highlights a strong association between the microbiome and various cancers, particularly breast cancer. Microbial dysbiosis, defined as imbalances in the microbial community within the breast tissue has been linked to carcinogenesis, cancer progression, and treatment outcomes. Studies have identified distinct microbiome compositions in healthy individuals compared to those with breast cancer. Thus, characterizing the exact microbial players implicated with breast cancer is of utter importance. Machine learning techniques has long been used in breast cancer research, enhancing predictions for recurrence, diagnosis, prognosis, treatment response and personalized treatment. In this study, a machine learning application is presented for breast cancer, employing a classifier based on microbiome biomarkers to differentiate between breast cancer (BC) samples and controls. Two independent studies were utilized to train and validate the classifier, further elucidating the main microbial species associated with breast cancer. The model's ability to predict sample type based on microbiome abundance was demonstrated.

Keywords Breast cancer, Tissue microbiome, Tissue biomarker, Machine learning, Prediction

Thermocapillary Velocities of a Spherical Droplet Embedded in Brinkman Medium

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Abstract
An analytical study is presented for thermocapillary migration of a spherical fluid droplet embedded in a porous medium. The porous medium is assumed to be homogeneous, isotropic and the solid matrix is in thermal equilibrium with the fluid through the voids of the medium. A constant prescribed temperature gradient parallel to an adiabatic plane is maintained in the porous medium. The Peclet number is assumed to be small, so that the temperature distribution is governed by Laplace equation. Also, Reynolds number is assumed to be small so that the fluid flow inside the droplet is described by Stokes equation and the flow inside the porous medium is described by Brinkman equation. Expression for thermocapillary velocities and forces are obtained. The effect of the Brinkman number characterizing the permeability of the medium is investigated as functions of the thermal properties of the porous medium and droplet. The limiting cases of Stokes and Darcy's flows are discussed.

On Entangling power of quantum information

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Abstract

The capability that Anti-Jaynes-Cummings model (AJCM) to generate quantum correlation between finite and infinite dimensional subsystems has investigated. This idea has clarified by assuming that an atom with different dimensions interacts with a cavity mode prepared in different initial states. It has been shown that, entangling power of the AJCM and consequently the entanglement can be maximized if the cavity mode, which is prepared in a coherent or squeezed vacuum states, interacts locally with a three or four dimensional atom. By increasing the mean photons number inside the cavity, the entangling power and the amount of entanglement between the subsystems can be improved. There is a harmonious behavior between the entangling power and the entanglement measure, where the sudden /gradual and constantly behaviors have predicted at the same interaction time. Keywords: Two level atom, Three-level atom, Four-level atom, Entangling power, Anti-
Jaynes-Cummings Model.

Structural assessment of historical masonry structures using various strengthening techniques

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Abstract
Structural analysis of heritage buildings is essential to recognize their true characteristics and to ensure their conservation against deterioration over time. The improvement in accuracy in the geometric survey operations is essential to obtain accurate results. This paper presents an assessment of the Wikala of Sultan Qaytbay by following a structural global analysis approach for performance evaluation of the building due to lateral displacement of walls. In this respect, the building was surveyed using laser scan to obtain exact geometrics then studied by using finite-element analyses. The building was subjected to a 2 cm out-of-plane displacement in order to determine the global structural behavior and to avoid localized effects. FRP strips, shotcrete, and steel plates were the chosen strengthening techniques in relation to their impact on global stability, the structural performance of the building and the distribution of loads within the structure. It can be seen from the analysis that global repair strategies which in this case involves the use of steel strips has the highest enhancement of the toughness and stiffness of the structure. Shotcrete and FRP also increased the absorbed energy of the building.
Keywords Heritage Buildings; 3D laser scan; masonry walls; FEM; displacement; strengthening

Reliability characteristics and estimation of parameters based on censored model data to extended Gompertz distribution with application

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Abstract
This article explores the estimation of parameters and lifetime indices of the extended Gompertz distribution under progressively Type-II censored schemes. The study employs maximum likelihood, Bayes, and two parametric bootstrap methods for parameter estimation, alongside the computation of reliability and hazard rate functions. Additionally, approximate confidence intervals and an asymptotic variance-covariance matrix are derived. The Markov chain Monte Carlo technique, specifically the Gibbs sampler within the Metropolis-Hastings algorithm, is utilized to generate samples from posterior density functions. Bayesian estimates are computed using both symmetric and asymmetric loss functions. Through Monte Carlo simulations, the efficacy of these methods is evaluated using metrics such as mean squared errors, average interval lengths, and coverage probabilities. Finally, a real dataset is analyzed to demonstrate the practical application of the developed inferential procedures.

A Machine Learning Framework for Fetal Arrhythmia Detection via Single ECG Electrode

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Abstract
Fetal arrhythmia is an abnormal heart rhythm caused by a malfunction with the fetal heart's electrical system.
Monitoring fetal ECG is crucial for providing valuable information about the fetus's status. Acute fetal arrhythmia can cause cardiac collapse or death. Therefore, early diagnosis of fetal arrhythmia is crucial. Current methods for obtaining the mother's abdominal ECG use many electrodes, which might be irritating. ECG signals might be difficult to extract because to noise and artifacts from breathing and muscle contractions.
This work develops a machine learning approach for detecting fetal arrhythmias. The model suggested utilizes just one abdominal ECG. It includes a variety of filtering algorithms to eliminate noise and artifacts. It also extracts a number of essential properties from other domains, including time and time-frequency.
Finally, the method employs four machine learning classifiers to detect arrhythmia.

Synthesis of Azolo-Transition Metal Complex Films Doped with Polyvinyl Alcohol and Assessment of Their Thermal and Optical Properties

Mona M.Khalil, E.F. Wanas

Abstract

This study presents the synthesis of azo-transition metal complex films doped with polyvinyl alcohol (PVA) through a casting method, yielding two samples with distinct properties. The chemical composition of the samples was charac terized by Energy Dispersive X-ray Spectroscopy (EDX), while thermal proper ties were assessed using Differential Thermal Analysis (DTA) and Thermogravi metric Analysis (TGA). Additionally, the electrical and dielectric properties of the films were examined over a frequency range of 100 Hz to 100 kHz and a temperature range of 300 K to 460 K. This work highlights the films' suitabil ity for light management in renewable energy and optoelectronic applications, combining thermal stability, tunable optical properties, and complex dielectric behavior

Experimental Study on Concrete Performance under Partial Replacement of Normal Coarse Aggregate by Sand-Light Stone

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Abstract
Lightweight concrete has been widely used due to its precious characteristics. It has many applications according to its strength. For instance, it can be used as an insulating material, for soundproofing and fireproofing, bridge decking, and casting structural elements. In this paper, crushed sand-light stone (SLS) was used as a coarse aggregate to produce structural lightweight concrete mixtures. Crushed sand-light stones have partially replaced normal coarse aggregate by 50% in two concrete mixtures. As lightweight aggregates are considered a porous material, they absorb water according to the absorption percentage of each type of lightweight aggregate. In addition, normal weight concrete (0% of lightweight coarse aggregate) functioned as a control mix. To determine the performance of normal weight aggregate and lightweight aggregate, the mechanical properties were examined through sieve analysis, specific gravity, bulk density, and water absorption tests. Furthermore, the compressive strength was tested for the three concrete mixtures after 3 days, 7 days, 28 days, respectively, to assess its suitability for producing structural lightweight concrete. Based on the test findings, lightweight concrete using sand light stones as a lightweight aggregate to the concrete did not achieve the constraints for being structural lightweight concrete and could not be used in structures or buildings.

Novel Wrapped Distribution and its application

Mohamed AbdElaal Mustafa ElQurashi

Abstract

This study introduces the wrapped Monsef distribution, a unique circular distribution characterized by a single parameter derived from the wrapping method. We look at how changing the values of the parameters affects the density function and come up with formulas for its characteristic function, trigonometric moments, and other useful descriptive metrics. Maximum likelihood estimation is the method used to estimate parameters. We performed a simulation analysis to illustrate the reliability of the generated maximum likelihood (ML) estimator. The proposed model is additionally evaluated using two real-world datasets. Its performance can be compared with that of the wrapped weighted exponential distribution. Contained within Lindley's exponential distribution, A new wrapped exponential distribution and a wrapped exponential distribution

A New Local Fractional Derivative with Applications

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Abstract
In this paper, we introduce a new local fractional derivative (NLFD), establishing a refined framework for local fractional calculus. This derivative is formulated to uphold classical properties of integer-order calculus, including linearity, the product rule, and the quotient rule. We rigorously demonstrate that the NLFD satisfies fractional extensions of both Rolle's theorem and the mean value theorem, underscoring its mathematical robustness and compatibility with foundational calculus principles. The proposed definition provides a unique fractional derivative applicable without violating essential conditions. To illustrate its practicality, we apply the NLFD to solve fractional linear ordinary differential equations (FLODEs) in an RC electrical circuit model. Additionally, we use the NLFD to analyze the Chaotic Fractional Liu System (CFLS). Our findings reveal that the NLFD not only serves as a powerful modeling and analysis tool in these domains but also broadens the scope of potential applications in modern fractional calculus.
Keywords: Fractional calculus, Local fractional derivative, Conformable FD, MFD, Beta FD, Deformable FD, Fractional order ODEs, Chaotic systems.

CFD Modelling for Air Distribution Systems in Industrial Control Room

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Abstract
Maintaining optimal environmental conditions is crucial for the efficient and reliable operation of industrial control rooms, where high heat loads from equipment can cause temperature imbalances. This study evaluates and compares the performance of three air distribution methods ceiling, wall mounted, and underfloor used to maintain thermal conditions in accordance with ASHRAE Thermal Guidelines for Data Processing Environments [1,2]. The study was conducted in a control room at an industrial plant located in Alexandria, Egypt. Using Computational Fluid Dynamics simulations via DesignBuilder V7 software [3], temperature distributions were assessed at supply air temperatures of 12°C, 14°C, and 16°C. The results indicate that both wall mounted and underfloor air distribution systems at 16°C offer superior cooling compared to ceiling air distribution at 12°C. Wall mounted air distribution at 16°C showed an 11% improvement in cooling air distribution efficiency, achieving an average room temperature of 22.06°C and a maximum of 27.34°C. The underfloor system at 16°C demonstrated a 7% improvement. Based on these findings, wall mounted air distribution at 16°C is recommended for industrial control rooms, as it provides better performance, ensures compliance with ASHRAE Thermal Guidelines [1,2], and offers a safety margin to protect equipment from overheating.

Keywords: Temperature control; CFD; Energy efficiency; control rooms; Air distribution systems

The Vibration of Nano Resonators Based on The Theory of Two-Temperature Green-Naghdi Thermoelasticity Under Consideration of Thermomass Motion

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Abstract

In this paper, a new model of a nanobeam of silicon nitride in the context of the generalized thermoelasticity of Green-Naghdi theory based on thermomass motion has been applied. Ramp-type heat conduction is thermally loaded on a simply supported thermoelastic nanobeam. The governing equations of the model have been constructed and solved by using the Laplace transform domain. The inversions of the Laplace transform have been calculated by using Tzou's iteration method. The numerical results have been represented in figures to stand on the effects of the drift velocity, and ramp-time heat parameters on the vibration of the nanobeam. The drift velocity and ramp-time heat parameters have significant effects on the vibration, deformation, stress, and energy density functions.

Keywords: Nanobeam; Green-Naghdi; Thermomass Motion; Drift velocity; Ramp-Type Heat.

The Vibration of Nano Resonators Under the Theory of Two-Temperature Generalized Thermoviscoelasticity Based on Thermomass Motion

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Abstract

In this paper, a new model of a nanobeam of silicon nitride in the context of the generalized thermoviscoelasticity theory based on thermomass motion is applied. Ramp-type heat conduction is thermally loaded on a simply supported viscothermoelastic nanobeam. The governing equations have been constructed and solved in the Laplace transform domain. The numerical results have been represented in figures to show the effects of the mechanical relaxation time, drift velocity, and ramp-time heat parameters on the vibration of the nanobeam. Mechanical relaxation time has a significant impact on the mechanical wave. Moreover, the drift velocity and ramp-time heat parameters have significant effects on all the studied functions.

Keywords: Nanobeam; Silicon Nitride; Thermoviscoelasticity; Thermomass Motion; Drift velocity; Ramp-Type Heat.

Behavior of reinforced concrete columns repaired by steel jackets filled with different types of concrete

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Abstract

Reinforced concrete (RC) columns are essential structural components in buildings and infrastructure, providing vertical load support and stability. However, over time, these columns can undergo degradation due to various factors, such as environmental exposure, seismic events, and increased loading demands. As a result, the need for effective and reliable column strengthening techniques arises to ensure the safety, durability, and longevity of structures. The main objective of this study is to investigate how fully strengthening damaged columns affects load-bearing capacity and overall structural performance. This study looked into how well short steel jackets worked. The experimental program will test thirteen reinforced concrete (R.C.) columns. The original dimensions of these columns were 150 * 150 * 1200 mm. One specimen served as a control, while the remaining twelve underwent strengthening and enlargement to measure (250 * 250 * 1200) mm. These specimens varied in stirrup spacing, reinforcing materials such as glass fiber and reinforced steel rebar, and concrete compressive strengths. The main parameters analyzed were the load bearing capacity ratio, strain characteristics, and buckling. In the end, the experimental results were examined, contrasted, and showed enhancements on RC columns. The National Research Centre for Housing and Building is in charge of producing and hosting this initiative.

Keyword: Concrete; Steel jackets; Repaired; Reinforced; Columns

Theoretical Investigation of Electrokinetic Flow in a Microtube Using Micropolarity, Slip Conditions, and Electrical Double Layer Dynamics

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Abstract
This paper presents a theoretical analysis of the electrokinetic flow of micropolar fluids within a circular microtube using the Eringen micropolar fluid model. The study uses a linear Poisson-Boltzmann equation and the DebyeHückel approximation for small Zeta potentials to investigate how velocity and spin velocity on the surface of microtubes affect fluid flow and energy transport. The main physical quantities, such as volume flow rate, flowing potential, and flowing current, are calculated to show how micropolar properties and sliding conditions influence electrokinetic interactions and liquid transport. Further analysis of cut-up stress and viscous dispersion reveals energy losses in the system, whereas energy transport efficiency quantifies the impact of micropolar effects. Furthermore, the study looks into how Debye length and electrical double layer (EDL) overlap influence flow behaviour, combining theoretical insights with existing literature data. The graphic analysis of parameter variations emphasizes the importance of micropolarity, slip conditions, and EDL dynamics in shaping microtube flow and energy transport properties.

Key words: Electrokinetic, Micropolar fluid, Slip and spin slip, Microtube, Electrical double layer (EDL).

Stress-Strength Reliability of Monsef Distribution for Modeling

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Abstract
The investigation of the reliability of any component tested in the field of life model is a challenge. Without a doubt, one of the most critical concerns is "stress "$\boldsymbol{s}$" strength "$\boldsymbol{S}$" reliability". This paper aims to discuss how the stress-strength coefficient $R = P(Y < X)$ from any statistical literature Can be estimated. System reshaping is subjected to a random force X in such a way that the system fails if the stress exceeds the force. The reliability of stress resistance is examined in this study when force X has a Monsef distribution "$\boldsymbol{ME}$" and stress $(Y_1, Y_2, Y_3, Y_4, Y_5, and\ Y_6)$ has an $\boldsymbol{ME}$ distribution, Lindley distribution "$\boldsymbol{Lin}$"a Rayleigh distribution "$\boldsymbol{Ray}$", Exponential distribution "$\boldsymbol{Exp}$", Half-Normal distribution"$\boldsymbol{HN}$" and Rayleigh Half-Normal distribution"$\boldsymbol{RHN}$" respectively. Explicitly obtaining the maximum probability estimator for the unknown parameter is also possible. Additionally, the maximum likelihood estimation of "$\boldsymbol{MLE}$s" asymptotic distribution obtained which can be used to construct a confidence interval for $\boldsymbol{R}$. The proposed model is compared with other existence models using simulations, and an illustrative data analysis was performed. Finally, we determined that the maximum product of the spacing method yielded the best results.

Enhanced Separation Efficiency and Reduced Pressure Drop in Multi-Inlet Cyclone Separators: A Computational Fluid Dynamics Study

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Abstract
Multi-inlet separators provide many advantages over single-inlet designs. The present work develops Computational fluid dynamics (CFD) simulations using the Reynolds stress turbulence model (RSM) to study the multi-inlet cyclone separator flow field and provide insights into the mechanisms that lead to the separation of particles. The effect of different inflow rates on separation efficiency and pressure drop is investigated. The findings demonstrate that multi-inlet setups yield reductions in pressure drops and offer a smaller cut-off diameter, both of which can promote the separation of particles, especially from the finer ones. The cut-off diameter decreased from 1.53µm for the single inlet to 1.49µm for the multi-inlet optimal design configuration. Analysis shows a reduced number of recirculation zones and more uniform distribution of flow in the case of the multi-inlet design in comparison to the single-inlet case. The results highlight that multi-inlet cyclone separators have great promise for realizing enhanced cyclonic performance across different industrial settings of relevance. Directions for future research are optimizing inlet configurations, further study of particle-laden flows with non-spherical particles, and experimental validations of CFD simulations to enhance the design and operation of these simple and efficient separation devices.

Keywords: Multi-inlet cyclone separator, Computational fluid dynamics simulations, Reynolds stress turbulence model (RSM), Discrete phase modeling, Performance metrics (collection efficiency and pressure drop)

The effect of moving heat source in DPL model on viscoelastic biological tissues during thermal treatment applications

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Abstract
The moving thermal source of the constant heat is analyzed mathematically in this study in terms of biological heat transfer in elastic skin tissues, which have different delay times and adhere to the Dual-Phase-Lag (DPL) thermal conduction model. One needs to comprehend the heat transfer mechanisms as well as thermal-mechanical interactions to perform thermal treatments optimally. This is an area that remains under-researched despite the significance of different parameters on thermal delay times. Therefore, the influence of those parameters upon displacement, temperature distribution, and thermal stresses in living tissues is studied. With the help of Laplace transforms, a more precise estimation of these distributions and their graphical representation aimed at improving treatment results via a better understanding of the behaviour of living tissues in a thermal environment is achieved.

Comparing Different Fractional-Order Response for Lorenz Chaotic System

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Abstract

The paper presents a comparative study of two fractional derivative definitions applied to the Lorenz chaotic system: the Grunwald-Letnikov (GL) derivative with a singular kernel and the Caputo-Fabrizio (CFG) derivative with a non-singular Gaussian kernel. By implementing both fractional derivatives within the Lorenz system framework, we explore their effects on system dynamics, focusing on the distinct behaviors induced by the singular and non-singular kernel characteristics. Numerical simulations highlight differences in stability, convergence, and chaos intensity under each derivative type, revealing insights into the roles of kernel properties in fractional chaotic systems. This comparison provides a foundation for selecting appropriate fractional derivative formulations in complex dynamical system modeling.

Keywords: Fractional Derivatives, Chaotic Systems, Lorenz System, Singular Kernel, CFG

Parameter estimation and lifetime analysis of the power-modified kies-exponential distribution under progressive Type-II censoring with application

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Abstract

This paper focuses on estimating parameters for the power-modified Kies-exponential distribution and various lifetime indices, such as reliability and hazard rate functions, under progressive type-II censoring. It explores the use of maximum likelihood, two-parametric bootstrap, and Bayesian methods for estimating these parameters and characteristics. The study constructs approximate confidence intervals and highest posterior density credible intervals using the asymptotic distribution of maximum likelihood estimators and the Markov chain Monte Carlo technique respectively. Additionally, the delta method is employed to calculate variances for reliability and hazard functions, and two bootstrap methods are used to create confidence intervals. Bayes inference is derived using squared error loss functions. Finally, extensive simulation studies are conducted to assess the performance of these methods and provide a real data analysis to demonstrate their practical application.

A Multi-Objective Interference Control Framework for Energy-Efficient IoT-Cellular Networks in 5G

Radwa Ahmed Osman Mohamed and Nourhan Mamdouh
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Abstract

The Internet of Things (IoT) represents a transformative model for enabling extensive connectivity among machines and devices within future communication networks, enhancing our awareness of the world and improving daily life. IoT devices (IoTDs) connect to an IoT base station (IoTBS) or IoT gateway (IoTG) by utilizing the resources of other cellular users (CUEs). However, due to spectral efficiency loss, interference arises between IoTG and base station (BS) caused by interactions among CUEs and IoTDs. This paper introduces a novel framework, the interference control model, which aims to manage interference between IoTG and BS by employing a hybrid particle swarm optimization algorithm. This approach reduces interference while maximizing energy efficiency and reliability in IoT and cellular networks within fifth-generation (5G) systems. Initially, we formulate a multi-objective optimization problem to guide the proposed model's objectives. Based on this optimization strategy, we derive closed-form expressions for key quality-of-service (QoS) metrics, including system reliability, throughput, and energy efficiency. Finally, we evaluate the proposed algorithm through various assumptions and simulation scenarios. The results demonstrate the effectiveness and accuracy of our proposed model, highlighting notable improvements in the performance of IoT and cellular networks.

Enhancing AV2X Network Efficiency: An Adaptive Model Based on Hybrid Particle Swarm Optimization

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Associate Professor at Arab Academy for Science, Technology and Maritime Transport

Abstract
Recent autonomous intelligent transportation systems increasingly rely on vehicular communication. Efficient communication between autonomous vehicles and everything (AV2X) is essential to ensure road safety by reducing traffic congestion, providing emergency vehicle alerts, and aiding in low-visibility conditions. This paper proposes a new adaptive AV2X model that utilizes a hybrid particle swarm optimization algorithm to improve the connectivity of vehicular networks. The model optimizes the positioning of inter-vehicles to facilitate direct communication with autonomous vehicles (AVs) or to relay information across the network. Based on the system's quality-of-service (QoS), a decision is made on whether the transmitting AV communicates directly with the destination or via cooperative communication. To meet these objectives, the optimal positioning of the relay vehicle is mathematically formulated as a constrained optimization problem to enhance AV2X communication under various environmental conditions. The effectiveness of the proposed model is demonstrated by considering factors such as vehicle distribution, density, mobility, and speed. Simulation results show that the proposed model outperforms previous models, improving system performance in terms of throughput (S), packet loss rate (PLR), packet delivery ratio (PDR), and average delivery latency (DL).

Cluster Head Selection Algorithm Using PSO

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Abstract

One of the best methods for reducing the energy consumption of wireless sensor networks (WSNs) is the clustering. However, because of the extra effort required to receive and aggregate data from their member sensor nodes and send the aggregated data to the base station (BS), cluster heads (CHs) in a hierarchical cluster-based WSN use more energy. As a result, choosing the optimum CHs is essential to preserving sensor node energy and extending WSN lifetime. In this paper, we proposed a cluster algorithm for selecting cluster head based on the particle swarm optimization (PSO). The objective function of selecting the optimum CHs is depending on many parameters distance between CHs and ordinary nodes in their cluster, distance between CHs and BS, residual energy of each CH, node centrality, and node degree. Each node select its cluster depending on the potential function based on node degree, residual energy, and two terms of distance. Comparing our proposed model with various approaches for measuring performance depending on various metrics.

Stochastic Process of Magneto-photo-Thermoelastic Waves in Semiconductor Materials with the Change in Electrical Conductivity

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Abstract.
The main aim of this work is to use photo-thermoelasticity theory to investigate the stochastic type plasma-mechanical-elastic distribution at the boundary of an elastic half-space in a semiconductor medium. The stochastic simulation was introduced to a two-dimensional (2D) electromagnetic problem using the electron-hole interaction model. Taking into consideration the varied thermal conductivity parameter and the electrical conductivity which is dependent on the temperature. The simulation was carried out using a silicon (Si) material. As white noise is more common than others, it was chosen to be the basic function of randomness. The normal mode analysis technique is employed to obtain comprehensive deterministic and stochastic wave behavior of all main physical variables under consideration for short times. The procedure entails producing three distinct trajectories to estimate the difference between the stochastic and deterministic distributions. The results of the study were numerically analyzed and represented graphically.
Keywords: Stochastic process; Magnetic field; Electrical conductivity; White noise; Thermal conductivity; Photo-excitation.

A Novel Hydrodynamic Semiconductor Model under The Magnetic Field Effect and Laser Pulses

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Abstract
This study explores the influence of an external magnetic field on a hydro-elastic semiconductor model based on the framework of photo-thermelasticity theory in two dimensions (2D). The research aims to understand how the magnetic field affects the coupled interactions between thermal, mechanical, and electronic fields in a fluid-saturated porous-silicon semiconductor. By applying normal mode analysis, the governing equations for wave propagation are derived, and the behavior of non-dimensional temperature, displacement, mechanical stresses, carrier density, and excess pore water pressure in response to the magnetic field is analyzed. Practical boundary conditions are included to simulate real-world scenarios, uncovering complex interactions between the electromagnetic, thermal, and mechanical fields. The findings emphasize the magnetic field's significant role in altering the material's behavior, with potential applications in developing magneto-sensitive semiconductor devices. Additionally, the results offer valuable insights for fields such as geophysics and biomedical engineering, where the interaction between multiple fields is critical. Comparative plots further illustrate the magnetic field's effect on the wave propagation properties

Keywords: Hydrodynamic; Silicon; Porosity; Laser Pulse; Magnetic field; Semiconductors.

Enhanced Quantum Entanglement in Hybrid Atomic-Optomechanical Systems via Nonlinear Cross-Kerr Interactions.

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Abstract
This study proposes a simple method to generate the quantum entanglement in an op- tomechanical system interacting with a single-mode cavity field under cross-Kerr and damp- ing effects. It analyzes how coupling strength, detuning, and external field interactions impact entanglement measures such as negativity, algebraic tangle, and geometric tangle. The re- search derives the effective Hamiltonian and examines the temporal evolution of the output density state, focusing on the interactions between the movable mirror, the atom, and the cavity field. Findings reveal that stronger coupling and optimal detuning enhance entangle- ment. The study also explores how these interactions affect the system's behavior and state evolution, offering valuable insights for advancing quantum state control in optomechanical systems with potential applications in quantum information processing.
Keywords: Cavity optomechanical system, Effective Hamiltonian, Entanglement generation

The Stability of Electrostatic Waves in a Multi-Component Magnetized Plasma System

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Abstract
Theoretical research has been conducted on multi-component magnetized plasmas consisting of ions, electrons, and positrons. The reductive perturbation approach was applied to evaluate the nonlinearity of the plasma system, while the small-k expansion perturbation method was used to analyze the stability of ion-acoustic structures propagating at oblique angles. The current study shows that the solitary wave structures depend on the concentration and temperature of electrons and ions. Furthermore, a comparative study of energy and instability growth rate behaviour with respect to system parameters reveals that higher energy and lower instability growth rates occur at larger ion density, velocity, or higher electron temperatures. Our research may be useful in understanding the dynamics of electron-positron-ion plasmas in astrophysical environments.

Simulation study of the induced magnetic field's impact for Jeffrey fluid with a complex wavy slip boundary within a curved tube.

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Abstract

This paper focuses on the complex wavy flow of a Jeffrey fluid with the impact of induced magnetic field in a curved tube. Given the broad range of applications of curved geometry in various industrial and physiological flow situations, the study examines how this flow is influenced by an induced magnetic field and second-order slip boundary conditions. The problem's resulting equations are solved using the Mathematica program and the ND Solve command. Under the assumptions of a small Reynolds number and the extended wavelength approximation, we derived so lutions for the velocities of both the fluid and particulate phases. This includes the impacts of the second slip boundaries and induced magnetic field. We also examined the axial pressure gradient along the length of the channeland the wall shear stress, considering the influence of dimensionless curvature. Explicit formulations have been provided for` various aspects, including current density, magnetic force func tion, induced magnetic field, wall shear stress, pressure rise, and stream function. A graphical presentation was utilized to illustrate and describe the effects of the em bedded parameters. The primary finding of this research is that non-dimensional curvature results in heightened pressure gradient, wall shear stress, and magnetic field function. This analytical framework holds significant importance for examining fluid dynamics in curved biological structures.

Keywords: Induced magnetic field, slip boundary conditions, curved tube, Jeffrey fluid, peristaltic flow.

A Tree-LSTM based Approach for Enhanced Machinery Prognostics

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Abstract

In recent years, machinery prognostics has received significant attention in research due to its essential role in various industries such as manufacturing and renewable energy. The increasing adoption of data-driven techniques, particularly recurrent neural networks (RNNs) and convolutional neural networks, has been motivated by their potential to accurately extract the influential features for estimating the remaining useful life (RUL) of operational machinery. However, the inherent complexity of machinery systems, distinguished by the non-stationarity and non-linearity of the acquired signals, presents substantial challenges to accurate prognostics. This paper proposes a novel hierarchical recurrent neural network (RNN) based on the long short-term memory model called (H-LSTM) approach to address the limitations of conventional RNNs, which rely solely on information from the immediately preceding time step for sequential data learning. In contrast, the H-LSTM model incorporates a hierarchical structure, where multiple preceding time steps influence the learning at each current time step. Evaluation of the proposed approach on the FEMTO benchmark bearing dataset under different operational conditions shows up to fourfold performance improvements over state-of-the-art methods, particularly on signals featured by low signal-to-noise ratio (SNR).

Keywords: Machinery prognostics, deep learning, recurrent neural networks, remaining useful life

The influence of negative velocity feedback control on a hybrid electric vehicle subject to external force

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Abstract

This paper aims to identify the stability domain of hybrid electric vehicles powertrain under various drive mode with multiple excitation sources, including irregular internal excitation (engine and motor), external excitation (road) which can cause torsional vibration and even lead to shaft failure. To achieve the goal, the simplified two-mass nonlinear dynamic model of second order for the hybrid elective vehicles powertrain (HEVP) is developed and solved using the multiple scale technique (MSPT) to obtain the approximate solution. HEVP is studied on the existence of external force at super harmonic resonance case ($\omega_0 \cong 2\omega$). The negative velocity feedback control (NVF) is used to control the amplitude of HEVP vibration. The mathematically derived frequency response equation is used in the numerical solutions that obtained using Rung-Kutta procedure. Comprehensive comparison of the amplitudes is served by using the time history program before and after the control of NVF. In addition, stability analysis for this scheme is derived using Lyapunov first (indirect) form and Routh-Huriwitz criterion. Response curves for frequency (angular speed) were studied at specific system coefficients that were both controlled and uncontrolled. The influence of various system parameters on the stability behavior are discussed.

Keywords Hybrid electric vehicle powertrain - Negative velocity feedback - Multiple scale technique - Time history – Frequency response.

Evaluating Machine Learning Models for Cost-Effective Shipping Line Selection in Freight Forwarding

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Abstract

This research assesses the predictive efficacy of four machine learning models for cost-effective shipping line selection in freight forwarding, namely: Random Forest (RF), Decision Trees (DT), K-Nearest Neighbor (KNN) and Support Vector Machines (SVM). Based on a dataset of 983 shipment records from 37 Egyptian freight forwarding companies, the study shows that Random Forest and Decision Trees gave better performance with accuracy rates of 83% and 80% respectively. The top three most important features were: service cost, port of discharge and importer countries. The results give freight forwarders data-based ideas to select the right shipping line, making its operations work better.

Keywords: Freight Forwarding, Machine Learning, Shipping Line Selection, Random Forest, and Decision Trees.

Unveiling Quantum Features of Time-Dependent Electron Spins influenced by Zeeman Energy and Symmetric Cross Spin

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Abstract
We study quantum correlations between a pair of spin-1/2 represented by an XYZ-Heisenberg chain under time-dependent symmetric cross-spin, magnetic dipole-dipole interactions and external time-dependent homogeneous magnetic field. Entanglement, steering, and steered quantum coherence are quantified through concurrence, 3-steering functions, and ℓ_1 norm measure of coherence, respectively. Quantum correlation controlling via the interaction direction for dipole-dipole along x-axis or z-axis and symmetric with Zeeman energy along z-axis or x-axis. The maximal bounds of all three quantifiers obtain by increasing the frequency of the time dependant and symmetric coupling parameters. Maximal bounds are enhanced for symmetric and Zeeman interaction along x-axis but for perpendicular case the maximally entangled state happen.

A Mathematical Model for Exploring Depression Diagnosis

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Abstract
A mathematical model, comprising a system of differential equations, is developed to integrate biological, psychological, social, and emotional factors, thereby suggesting that depression in young women represents a multidimensional construct. This construct includes two distinct levels of vulnerability: high and low. Upon entering the system, peer pressure facilitates transitions between these levels. Utilizing compartmental modeling, the model examines the dynamics of flow between these two vulnerability levels, while also considering the effects of treatment and recovery, through the application of a nonlinear system of differential equations. It is hypothesized that young people initially occupy the high-vulnerability compartment. Numerical analysis is employed in this study to examine the existence and stability of equilibrium points within the system

Influence of the homotopy stability perturbation on physical variations of non-local opto-electronic semiconductor materials

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Abstract
In the current work, we investigate a novel technique specialized in stability perturbation theory to analyze the primary variations such as thermal, carrier, elastic, and mechanical waves in photothermal theory. The interface of the non-local semiconductor material is utilized to study the stability analysis. The problem is established using a 1D opto-electronic-thermoelastic deformation in the context of the photo-thermoelasticity PTE framework. The Laplace transform method is used to convert the system from the time domain into the frequency domain, and the boundary conditions for the thermal, elastic, and plasma waves are applied to the interface of the medium. The homotopy perturbation method was used as an innovative approach to analyze the stability of the non-local silicon's primary physical fields. The numerical inversion method is applied, yielding many graphs focusing on important numerical factors such as non-local effects, thermo-energy, and thermo-electric coupling parameters. Investigating dual solutions between stable and unstable regions for critical parameters like thermo-electric and thermo-energy coupling factors demonstrates that the homotopy perturbation technique can effectively analyze the stability analysis. The comparison between silicon and germanium is illustrated graphically. Utilizing the homotopy perturbation technique, we can effectively examine the stability of the primary physical variations with the effect of some values for eigenvalues approaches.

Keywords: Homotopy perturbation method; Opto-electronic deformation; Laplace transform; Non-local excitation; Bifurcation solutions; Stability perturbation.

Submaximality in Bi-Weak Structures

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Abstract
We introduce and examine the concept of weak-submaximal structures, providing a detailed analysis of their key characteristics. Our discussion further explores related structures, including weak-door structures and weak-extremely disconnected structures, with an emphasis on their interrelationships with weak-submaximal structures. In addition, we extend the topological notion of submaximality to the bi-weak setting and prove the corresponding characteristics theorem for bi-weak submaximal structures.

Some Variants of Ĉech Δ-Normal Closure Space

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Abstract
This manuscript is devoted to study several generalized notions of Ĉech normality in Ĉech Closure space. This work examines different kinds of Ĉech normality that are located between the Ĉech Δ-normal and Ĉech κ-normal spaces. The relations between these distinctions of Ĉech normality are established, and some of examples are provided to support it. By using Ĉech β-normal space, novel normality decompositions are obtained.
Keywords: Ĉech closure space; Ĉech δ- closed set; Ĉech π-closed set; Ĉech Δ-normal (Ĉech weakly Δ-normal) spaces.

Dynamic Analysis of Negative Derivative Feedback Controllers with Geometrically Nonlinear Damping under Harmonic Forcing

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Abstract

This research investigates the mitigation of vibrations caused by geometrically nonlinear damping in a system subjected to harmonic forcing. The study focuses on using a negative derivative feedback controller to achieve this vibration reduction. Recognizing the widespread use of nonlinear vibration absorbers in various engineering fields, the researchers highlight Centrifugal Pendulum Vibration Absorbers as a prime example. These absorbers utilize centrifugal forces on a pendulum to create a nonlinear restoring force, effectively suppressing vibrations at specific frequencies by adjusting the pendulum's geometry and mass. The study models the controlled system as a two-degree-of-freedom (2-DOF) system and employs the average method to approximate the GND system's solution. This approach helps identify various resonance cases, with a particular emphasis on the most challenging scenario: simultaneous resonance. To obtain a numerical solution, the researchers utilize the fourth-order Runge-Kutta technique. They analyze the system's time histories before and after implementing the NDF controller at the worst resonance case. The influence of all system parameters is thoroughly explored numerically. The study's findings demonstrate a strong correlation between the numerical solutions derived from time histories and the approximate solutions obtained through perturbation analysis. This close agreement validates the effectiveness of the proposed NDF controller in mitigating vibrations caused by GND under harmonic forcing.

Keywords: Geometrically Nonlinear Damping and Combined Stiffness; Average method; NDF; vibration control; resonance case; stability

Leveraging Machine Learning for Causal Inference in Water Quality Assessment"

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Abstract
The increasing complexity of water quality data needs advanced analytical techniques for determining causal relationships between environmental factors and water quality outcomes. This study investigates the application of machine learning models to infer causal relationships in water quality assessment. By employing algorithms such as causal forests, Random Forest and Decision Tree, we analyze multi-dimensional datasets that encompass various water quality indicators, climatic conditions, and anthropogenic influences. The proposed approach combines feature selection, causal discovery, and model validation to enhance the reliability of inferred causal relationships. The findings demonstrate that machine learning can effectively uncover hidden patterns and interactions in water quality data, providing valuable insights for policymakers and environmental managers.

A numerical investigation of the 2-D nonequilibrium DPL bio-heat model using the ADI-FD method

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Abstract

Here, a two-dimensional nonequilibrium heat transfer model in living tissue was developed by performing volume averaging on the local instantaneous energy equations for blood and tissues. The dual-phase lag bioheat equations, with tissue temperature as the sole unknown, were derived by eliminating the blood temperature from the nonequilibrium model. Through this model, the thermal properties of living tissues, as well as the temperature distribution in living tissues, and the estimated resulting thermal damage due to laser irradiation are studied. The effects of delay times, blood perfusion, metabolism, and laser parameters on the spread of heat in the body and the resulting thermal damage are studied. The used numerical method is the alternating direction implicit finite difference (ADI-FD) method. The proposed ADI finite difference scheme is unconditionally stable. The results have been presented graphically and discussed in detail.

Keywords: ADI finite difference; Relaxation times; Laser radiation; Thermal damage; Nonequilibrium DPL bioheat transfer; Porous medium.

Applying a Novel (PBH) Distribution in Statistical Modeling for COVID-19 Data

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Abstract
Pandemic modeling plays a crucial role in understanding and controlling the spread of infectious diseases. This research introduces a new and highly adaptable extension of the asymmetric unit Burr-Hatke distribution, called the power Burr-Hatke distribution (PBH), and thoroughly explores its mathematical properties. Several parameter estimation methods are applied, and their asymptotic behavior is assessed through simulation experiments. These estimation methods are compared to determine the most effective approach for estimating the model's parameters. To illustrate the PBH model's practical application and benefits, a case study was conducted using a sample from the COVID-19 dataset, and its performance was compared with other well-established models. The results demonstrate that the PBH model is an excellent fit for the COVID-19 dataset and is a valuable tool for accurately modeling real-world pandemics.

Cost optimization of reinforced concrete buildings: A comparative study

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Abstract
Designing reinforced concrete (RC) buildings involves balancing structural performance, material efficiency, and cost. Traditional methods tend to be less optimized, potentially resulting in inefficient use of materials and higher costs due to their iterative and manual nature. This led to increased interest in optimization techniques that can refine RC designs by minimizing material waste and construction costs while ensuring that safety, functionality, and economic constraints are met. This paper aims to investigate the optimal design of reinforced concrete buildings of two floor systems (solid slab and flat slab) under the Euro and Egyptian codes of practice. Two cases of loading were considered: gravity loads (Case 1) and lateral loads (Case 2). The study considers two structural floor systems—solid and flat slabs—designed to satisfy the ultimate and serviceability limit state criteria in accordance with the code of practice utilized. To achieve this, a four-story RC residential building was optimized based on specific parameters under the influence of both loading cases. A comparison with the Egyptian code of practice was also made to determine which code results in the lower optimum cost for both floor system and columns. It was found that the optimal total cost of floor systems in Case 1 did not differ from that in Case 2, while the dimensions of the columns in both systems increased. Additionally, the total optimal cost of columns increased in Case 2 by 36.84% and 21.82 for solid and flat slab columns respectively.
Keywords: Reinforced concrete; cost optimization; evolutionary algorithm; material efficiency ; Excel solver; code comparison

Secure Privacy Preserving Banking Customer Churn Prediction Using Federated Learning and Fully Homomorphic Encryption

Yasmin Gamal

Abstract

Banking domain is interested in customer churn prediction applications due to the rising competition with financial technologies (FinTech). This fierce competition is impacting banks market share, and it was found that it's much easier and less costly to keep existing customer rather than acquiring new customers to the bank. Secure privacy preserving Customer Churn Prediction is a challenging and interesting area for research. Federated Machine Learning (FedML) has been proposed to resolve privacy problem, by using federated learning (FL) to apply Machine Learning (ML) prediction at banks locally and was proven to be one of the most effective solutions for this challenge. However, some gaps are identified for using federated machine learning (FedML) like the security attacks targeting the aggregation server or communication with the clients. Accordingly, this research proposes securing FedML vulnerabilities using Fully Homomorphic Encryption (FHE) encryption through a secure privacy preserving framework for customer churn prediction. The proposed framework guarantees the privacy preserving of customer data using Federated Machine Learning (FedML) while securing the aggregation and communication against vulnerabilities by a (FHE) provably secure algorithm. The proposed solution is demonstrated using a public dataset to predict the customer churn of 3 bank clients in different locations. FedML is applied to ensure data privacy for each client by training the model locally while only sharing the updates. FHE is used to encrypt all the updates, model aggregation and model prediction. Prediction accuracy is compared for the global model, the FedML without encryption and the FedML with FHE encryption using neural network binary classifiers. The proposed framework achieved high prediction accuracy, very close to the baseline, in addition to providing privacy and security safeguards that are mandated in banking domain.

Some Novel Dynamic Inequalities and their Applications on Time Scales. Theory

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Abstract

Natural nonlinear phenomena maybe observed in many areas. Precisely, in physics, nonlinearity is presented in fluid dynamics, nonlinear optics and so on. As we know, in some situations it is not necessary to obtain exact solutions of the initial value problems which model the natural phenomena, but it is sufficint to have enough knowledge and information about the qualitative properties of the solutions, also on the other hand, in other situations, analytically, we cannot get the exact solutions for our problem, so the dynamic inequalities like Hardy inequality, Ostrowski inequality , Opial inequality and Gronwall inequality involving functions of one and more than one independent variables, which provide explicit bounds on unknown functions, play a fundamental role in the development of qualitative theory, and can be used as handy tools in the study of existence, uniqueness, oscillation, stability and other qualitative properties of the solutions of certain dynamic equations on time scales.

Currently, the applications of dynamic inequalities on time scales is a subject of strong interest. Theefore, the main aim of this talk is to focus on all new aspcts of the recent developments on the theory of dynamic inequalities and fractional calculus on time scales and the applications of inequalities in the field of dynamic equations on time scales.

It is the purpose of this talk to collate original and significant results dealing with inequalities on time scales and its applications to dynamic equations. We also present some related works and recent results.

Using Legendre polynomials Formulas at Fresnel Integral Diffraction

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Abstract

Many advanced scientific phenomena of optics, light, and physics can be represented mathematically in the form of Volterra integral equations. In this paper, we studied the diffraction phenomena of the light beam. Since the most important category of scalar diffraction theories is the Fresnel diffraction integral. These integrals have been used in numerous studies on the propagation effects of structured light beams. These scalar diffraction theories have been widely utilized in studying the propagation of structured light. finally, we applied first-kind shifted Legendre polynomials to find the interpolate solutions of weakly singular Volterra integral equations of the second kind, where the Fresnel integral of diffraction will be involved. Numerical examples have been included in order to show the efficiency of the presented method. The exact solution of the represented example is compared to the approximate solution and the absolute error is calculated to illustrate the efficiency of the proposed method.

Keywords: Volterra Integral equations; Fresnel diffraction integral; Diffraction theory; Legendre polynomials

Comparative Forecasting of Electric Load Consumption in Egypt Using Differential Equation Models

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Abstract

This paper investigates electric load consumption in Egypt using different nonlinear differential equation models (NODE). The main aim is to forecast future load trends and allow policymakers to make data-informed decisions for energy management. Historical recorded data is used in estimating the parameters of each model and evaluating the performance of each model based on the statistical metrics. Based in these statistical metrics, comparative analysis shows that the logistic model and the linear model are the best models to capture the growth trend. Hence, they are used to forecast the electric load consumption up to year 2035. Results shows that the NODE models are convenient and compatible for energy forecasting.

Time-periodic electrokinetic analysis of a micropolar fluid flow through hydrophobic microannulus

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Abstract
The oscillating aspects of pressure-driven micropolar fluid flow through a hydrophobic cylindrical microannulus under the influence of electroosmotic flow are analytically studied. The study is based on a linearized Poisson–Boltzmann equation and the micropolar model of Eringen for microstructure fluids. An analytical solution is obtained for the distributions of electroosmotic flow velocity and microrotation as functions of radial distance, periodic time, and relevant parameters. The findings of the present study demonstrate that, unlike the decrease in flow rate resulting from the micropolarity of fluid particles, velocity slip and spin velocity slip, when contrasted with Newtonian fluids, act as a counteractive mechanism that tends to enhance the flow rate. Additionally, the findings indicate that a square plug-like profile in electroosmotic velocity amplitude is observed when the electric oscillating parameter is low and the electrokinetic width is large, for both Newtonian and micropolar fluids. Moreover, in cases where there is a wide gap between the cylindrical walls and a high-frequency parameter, the electroosmotic velocity and microrotation amplitudes tend to approach zero at the center of the microannulus across all ranges of micropolarity and zeta potential parameters. Furthermore, it has been observed that the amplitude of microrotation strength rises as slip and spin slip parameters increase. Across the entire spectrum of micropolarity, the zeta potential ratio influences both the dimension and direction of the electroosmotic velocity profiles within the electric double layer near the two cylindrical walls of the microannulus. The study emphasizes the physical quantities by presenting graphs for various values of the pertinent parameters juxtaposing them with existing data in the literature and comparing them with the Newtonian fluids.

المؤتمر الدولى السادس للرياضيات وتطبيقاتها
في ذكرى الأستاذ الراحل عطية عاشور (١٩٢٤-٢٠١٧)
(ICMA24)

تحت رعاية

الاستاذ الدكتور / جينا الفقي

القائم باعمال رئيس اكاديمية البحث العلمي والتكنولوجيا

الاستاذ الدكتور / اسماعيل عبد الغفار

رئيس الاكاديمية العلربية للعلوم والتكنولوجيا والنقل البحري

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والتكنولوجيا والنقل البحرى ومقرر اللجنة

ينظمه

اللجنة الوطنية للرياضيات بأكاديمية البحث العلمي والتكنولوجيا
والاكاديمية العربية للعلوم والتكنولوجيا والنقل البحري
خلال الفترة من ٣٠ نوفمبر - ١ ديسمبر ٢٠٢٤