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ANALYTICAL STUDIES FOR A HYBRID MATHEMATICAL MODEL OF COVID-19: THE INFLUENCE OF THE PANDEMIC ON CHRONICALLY ILL PEOPLE

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ANALYTICAL STUDIES FOR A HYBRID MATHEMATICAL MODEL OF COVID-19: THE INFLUENCE OF THE PANDEMIC ON CHRONICALLY ILL PEOPLE

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Abstract

This paper discusses and provides some analytical studies for a hybrid mathematical model of COVID-19, which is a SECIRD fractional model that is concerned with the influence of the pandemic on chronically ill people. We compute and derive several stability results based on some parameters that satisfy some conditions that prevent the pandemic from occurring. The paper also investigates the problem of the existence and uniqueness of solutions for the SECIRD model. It does so by applying the properties of Schauder's and Banach's fixed point theorems.

Key words: Mathematical modeling; fractional operators; stability; existence; uniqueness.

1. INTRODUCTION AND STATEMENT OF THE PROBLEM

Mathematical modeling is a useful tool for understanding and controlling infectious diseases [1, 4], but traditional approaches are not highly accurate for modeling such diseases. Therefore, fractional differential equations have been introduced to handle these problems, with applications in various fields, including optimization problems, artificial intelligence, and medical diagnoses. Those interested in further reading on the subject can refer to books by (Samko et al. 1993 [9], Podlubny 1999 [6], Kilbas et al. 2006 [3], Diethelm 2010 [2]).

This model requires the division of the total population N into six epidemiological classes namely Susceptible S, Exposed E, Chronic illnesses C, Infected I, Recovered R, and Death class D. Parameters' definition of the SECIRD model for COVID-19 could be presented as follows:

- $\circ \psi(\mu, N)$ is a function representing the influx rate that expresses the arrival of people (i.e., birth rate and visitors from other society).
- $\circ \mu < 1$ is the rate of natural death population, also $0 < \sigma < 1 \mu$, with σ is the death rate of people with chronic illnesses other than COVID-19. We put σ in addition to accounting for natural death

because the death rate of people with chronic illnesses is usually more remarkable than any other compartment.

- $\circ \beta_1$, β_2 are the rates of contacts per person between susceptible S and infectious population C and I.
- $\circ \theta$, δ are the rates of transfer of exposed *E* to infectious population *C* and *I*.
- \circ p, q are the recovery rates from infectious population C and I.
- $\circ \kappa$, γ are the death rates of infectious population C and I due to COVID-19.
- $\circ v$ is the vaccine rate of the suspected population, and τ is the rate of transfer of recovered population R even who were vaccinated to the susceptible population S, (taking into account that Covid-19 has several versions, the vaccine is not always effective against the disease because of its mutation).

For $0 \le t \le T < \infty$, and $0 < \alpha \le 1$, we have:

$$\begin{cases} {}^{C}\mathcal{D}_{0}^{\alpha} + S(t) &= N(t)\psi(\mu, N(t)) - \left(\frac{\beta_{1}C(t) + \beta_{2}I(t)}{N(t)} + v + \mu\right)S(t) + \tau R(t) \\ {}^{C}\mathcal{D}_{0}^{\alpha} + E(t) &= \frac{\beta_{1}C(t) + \beta_{2}I(t)}{N(t)}S(t) - (\theta + \delta + \mu)E(t) \\ {}^{C}\mathcal{D}_{0}^{\alpha} + C(t) &= \theta E(t) - (p + \kappa + \sigma + \mu)C(t) \\ {}^{C}\mathcal{D}_{0}^{\alpha} + I(t) &= \delta E(t) - (q + \gamma + \mu)I(t) \\ {}^{C}\mathcal{D}_{0}^{\alpha} + R(t) &= vS(t) + pC(t) + qI(t) - (\tau + \mu)R(t) \\ {}^{C}\mathcal{D}_{0}^{\alpha} + D(t) &= \kappa C(t) + \gamma I(t). \end{cases}$$

$$(1)$$

Our main goal in this work is to determine the main properties of the solution for the system of nonlinear fractional differential equations (1). First, checking the considered model's stability necessitates establishing some existence results, determining the boundedness and computing the disease-free equilibrium points. Then, by using the fixed-point theory, we give the necessary conditions for getting at least one solution or its uniqueness.

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Day-1 Wednesday 28th June 2023

Acces link: ... follow email

9:30-10:30	REGISTRATION Opening Ceremony	TOCATION: SENATE ROOM, GROUND FLOOR, RECTORATE BUILDING							
10:30-11:00	00 Break Plenary Lecture								
	Plenary								
11:00-11:30		Title:	The Beverton-Holt Equation						
	Room: Senat	Chair: Prof. Antonela TOMA, Prof. Emil SIMION							
		Plenary Lecture							
	Plenary	Speaker:	Prof. Dr. Mohsen RAZZAGHI - Mississippi State University, Mississippi, United S	tates					
11:30-12:00	Title: Taylor series, hybrid functions, and fractional calculus in engineering and science								
	Room: Senat	Chair: Prof. Antonela TOMA, Prof. Emil SIMION							
12:00-12:30			COFFEE	BREAK					
	Plenary Lecture Plant Description of Tacker leaves to the Lagrangian of Tacker leaves to the Company of Tacker leaves to the								
12:30-13:00	Plenary Speaker: Prof. Dr. Poom KUMAM- King Mongkut's University of Technology Thonburi, Bangkok, Thailand Title: Fixed Point Techniques for Approximating Solutions of Nonlinear Problems Beyond Normed Spaces								
	Room: Senat	Chair:	Prof. Antonela TOMA, Prof. Emil SIMION	·					
		Plenary Lecture							
	Plenary	Speaker:	Prof. Dr. Francesco VILLECCO - University of Salerno, Fisciano, Italy						
13:00-13:30	Room: Senat	Title: Chair:	Smart devices for a better life. Prof. Antonela TOMA, Prof. Emil SIMION						
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13:30-15:00			LUNCH BREAK -	Library Building	3				
	ISIM	Room 4.1, Library Building, UF	PB	ISIM	Room 4.2, Library Building, UP	В			
		Acces link: follow email			Acces link: follow email				
	Moderators	Prof. Ioana Corina BOGDAN, F Live	Prof. Octavian POSTĂVARU, Prof. Antonela TOMA	Moderators	Prof. Elena Corina CIPU, Prof. Live	Mihaela PRICOP-JECKSTADT, Prof. Antonela TOMA			
	Section 3	Authors:	¹ Adrian-Nicolae ARITON, ¹ Alexandru-Constantin ARITON, ¹ Carol-Luca GASAN, ¹ Horia MERCAN,	Section 2	Authors:	¹George-Cătălin BARBU, ²Ioan-Bogdan Toader, ¹Emil SIMION, ¹Laurențiu-Jan PREDESCU, ²Theodor			
15:00 15:15		Affiliation	² Ana Elisabeta NAGHI, ¹ Alexandru NEGRESCU		Affiliation	COSTANTEA, ³ Iulian-George ISAC, ¹ Eduard-Ștefan SANDU			
15:00-15:15	Room: 4.1	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania ² Ministry of Education, Bucharest, Romania	Room: 4.2	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania ² Military Technical Academy "Ferdinand I", Bucharest, Romania			
		Title:	Applied mathematics. From high school to faculty	_		³ "Alexandru Ioan Cuza" University of Iași, iași, Romania			
		Live			Title: Online	Enhanced DDoS attack detection using network traffic analysis and machine learning			
	Section 2	Authors:	¹Poom KUMAM, ¹Sani SALISU	Section 3	Authors:	¹ Vicente J. BEVIA, ¹ Juan-Carlos CORTES, ¹ Ana MOSCARDO, ¹ Cristina Luisovna PEREZ, ¹ Rafael-			
15:15-15:30		Affiliation: Title:	¹ King Mongkut's University of Technology Thonburi (KMUTT), Bangkok, Thailand Fixed point techniques for approximation solution of nonlinear problems beyond normed spaces		Affiliation:	Jacinto VILLANUEVA ¹ Universitat Politècnica de València, València, Spain			
	Room: 4.1	Title:	rixed point techniques for approximation solution of nonlinear problems beyond normed spaces	Room: 4.2		A random model for the dynamics of allelopathy			
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	Section 1	Live Authors:	¹ Vasile POP, ² Alexandru NEGRESCU	ISWIM Moderators	Room 4.2, Library Building, UP Prof. Elena Corina CIPU, Prof.	Mihaela PRICOP-JECKSTADT, Prof. Antonela TOMA			
		Affiliation:	¹ Technical University of Cluj-Napoca, Cluj-Napoca, Romania	0 11 4	Live	1a de como acaba su acaba de de de describidad de la como de la como de como d			
15:30-15:45		Title:	² University Politehnica of Bucharest, Bucharest, Romania <i>Linear Matrix Equations Deduced from Matrix Equivalents</i>	Section 1	Authors: Affiliation:	¹ Andra-Cristiana MARIA-FULAȘU, ¹ Vlad-Andrei CHIRA, ¹ Mihai REBENCIUC, ¹ Antonela TOMA, ² Cătăli ¹ University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1			Room: 4.2		² The Electroacoustic Music and Multimedia Center of the National University of Music, Bucharest, R			
		Live			Title:	Multifractal analyses of music pieces			
	Section 1	Authors:	¹Ioan-Lucian POPA, ²Traian CEAUȘU, ²Larisa Elena BIRIȘ	Section 1	Authors:	¹Andra-Cristiana MARIA-FULAȘU, ¹Vlad-Andrei CHIRA, ¹Mihai REBENCIUC, ¹Antonela TOMA			
15:45-16:00		Affiliation:	1`1 Decembrie 1918` University of Alba Iulia, Alba Iulia, Romania	D 4.2	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1	Title:	² West University of Timișoara, Timișoara, Romania On Tempered Exponential Dichotomy for Random Semi-Dynamical Systems	Room: 4.2	Title:	Multifractal comparison of a poem in two languages			
	Section 1	Live Authors:	¹Octavian POSTĂVARU, ¹Antonela TOMA	Section 2	Live Authors:	¹Iulia-Nela NĂSTASE (ANGHELACHE), ¹Simona MOLDOVANU, ¹Luminita MORARU			
16:00-16:15		Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania		Affiliation:	¹ University Dunărea de Jos of Galați, Galați, Romania			
	Room: 4.1	Title:	Generalized fractional-order hybrid of block-pulse functions for solving fractional delay differential equations	Room: 4.2	Title:	Data analysis for precise semantic breast images segmentation			
		Live			Live				
16:15-16:30	Section 3	Authors: Affiliation:	¹ Adrian SANDOVICI, ¹ Marcel ROMAN ¹ `Gheorghe Asachi`, Technical University of Iaşi, Iaşi, Romania	Section 2	Authors: Affiliation:	¹ Ana-Alexandra BUNEA, ¹ Alexandru-Dragoş GEORGESCU, ¹ Simona Mihaela BIBIC ¹ University Politehnica of Bucharest, Bucharest, Romania			
16.15-16.30	Room: 4.1	Title:	Multivalued Linear Operator Equation $$A^{*}A = lambda A^{n}$$	Room: 4.2	Title:	Secure Wireless Power Transfer			
16:30-17:00			COFFEE	BREAK					
	ISIM	Room 4.1, Library Building, UF	PB	ISWIM	Room 4.2, Library Building, UP	В			
	Moderators	Acces link: follow email	Prof. Octavian POSTAVARU, Prof. Laurențiu PREDESCU	Moderators	Prof Flora Carina CIRLL Brof	Mihaela PRICOP-JECKSTADT, Prof. Laurentiu PREDESCU			
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47.00 17 17	Section 4	Authors:	¹Cristina HREȚCANU	Section 4	Authors:	¹Wiyada KUMAM			
17:00-17:15	Room: 4.1	Affiliation: Title:	¹ Ștefan cel Mare University, Suceava, Romania On the geometry of metallic Riemannian manifolds	Room: 4.2	Affiliation: Title:	¹ Rajamangala University of Technology Thanyaburi (RMUTT), Pathum Thani, Thailand Fermatean fuzzy divergences and their applications to decision-making and pattern recognition			
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	Section 3	Live Authors:	¹Fouzia SHILE, ¹Mohamed SADIK	Section 3	Live Authors:	¹Silviu BĂLĂNESCU, ¹Mircea CIMPOEAȘ			
17:15-17:30		Affiliation:	¹ Ibn Zohr University, Faculty of Sciences, Agadir, Morocco	oceanon 3	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1	Title:	Efficient meshless method for modeling random groundwater flow in heterogeneous porous	Room: 4.2	Title:	Depth and Sdepth of powers of the path ideal of a cycle graph			
		Online			Online				
17:30-17:45	Section 1	Authors: Affiliation:	¹Ioana Corina BOGDAN, ¹Fabian Pavel VELICEA ¹Transilvania University of Braşov, Braşov	Section 3	Authors: Affiliation:	¹ Juan Carlos CORTÉS, ¹ Elena Lopez NAVARRO, ¹ Jose Vicente ROMERO, ¹ Maria Dolores ROSELLO ¹ Universitat Politècnica de València, València, Spain			
17.50-17:45	Room: 4.1	Title:	Biological barcodes for engineering and medical applications	Room: 4.2	Title:	Probabilistic analysis of a random nonlinear oscillator via the random perturbation technique			
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				ISIM	Room 4.2, Library Building, UP Acces link: follow email				
				Moderators	Prof. Elena Corina CIPU, Prof.	Mihaela PRICOP-JECKSTADT, Prof. Laurentiu PREDESCU			
	Section 1	Online Authors:	¹ Akhtar Munir KHAN	Section 3	Online Authors:	¹Carlos ANDREU-VILARROIG			
17:45-18:00		Affiliation:	¹ Kohat University of Science Technology (KUST), Khyber Pakhtunkhwa, Pakistan	Jeetion 3	Affiliation:	¹ Universitat Politècnica de València, València, Spain			
	Room: 4.1	Title:	Adaptive penalty function methods employed in decomposition based multi-	Room: 4.2	Title:	A New Epidemiological Compartmental Model Including Seasonality and Immunity			
		Online	objective evolutionary algorithms		Online				
	Section 1	Authors:	¹ Silviu Alin JECU, ¹ Andreea Georgiana DEMETER, ¹ Ioana Corina BOGDAN	Section 3	Authors:	¹Ruochen YANG, ¹Paul BOGDAN			
18:00-18:15	Poom: 4.1	Affiliation: Title:	¹ Transilvania University of Brașov, Brașov	Poom: 4.2	Affiliation: Title:	¹ University of Southern California, Los Angeles, United States Modeling higher-order relationships in complex networks			
	Room: 4.1	Title.	Vital parameters monitoring using a portable device	Room: 4.2	TILLE.	intouching higher-order relationships in complex hetworks			
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18:15-18:30	Section 1	Authors: Affiliation:	¹ Djillali BOUAGADA, ¹ Kamel BENYETTOU ¹ Abdelhamid Ibn Badis University Mostaganem, Mostaganem, Algeria	Section 3	Authors: Affiliation:	¹ Karim AMIN, ¹ Samia MRAD ¹ Lebanese International University, Bekaa, Lebanon			
_5.25 15.50	Room: 4.1	Title:	On the admissibility of fractional singular roesser models	Room: 4.2	Title:	A model for cell evolution in malaria			
18:30 - 20:00			DINI	NER					

2nd Edition • International Symposium & International Student Workshop on Interdisciplinary Mathematics in the CiTi areas

Day-2 Thursday 29th June 2023

Acces link: ... follow email

9:00-9:25	Plenary Room: Senat	Title: Some tools for Studying Random Differential Equations with Applications to Real-World Problems					
9:25-9:50	Plenary Room: Senat	Title: Modeling the relationship between Antibody-Dependent Enhancement and disease severity in dengue infection					
9:50-10:15	Plenary Room: Senat	Title: Generalised fractional operators with real world applications					
10:15-10:45				COFFEE BREA	(
10:45-11:10	Plenary Room: Senat	Plenary Lecture Speaker: Title: Chair:	Prof. Dr. Thorsten HOHAGE - Georg-August Universität Göttingen, G Inverse problems in helioseismology Prof. Andrei HALANAY, Prof. Savin TREANȚĂ	Sermany			
11:10-11:35	Plenary Room: Senat	Plenary Lecture Speaker: Title: Chair:	Prof. Dr. Suthep SUANTAI - Chiang Mai University, Chiang Mai, Thai Accelerated Algorithms for Convex Bilevel Optimization Problems and Prof. Andrei HALANAY, Prof. Savin TREANȚĂ		n Data Science		
11:35-12:00	Section 3 Room: Senat	Plenary Lecture Speaker: Title: Chair: Prof. Dr. Paul BOGDAN - University of Southern California, Los Angeles, United States From Biological Intelligence to Artificial General Intelligence: Challenges, Opportunities and Method Prof. Andrei HALANAY, Prof. Savin TREANŢĂ					
12:00-12:25	Plenary Room: Senat	Plenary Lecture Speaker: Title: Chair:	Prof. Dr. Francesco VILLECCO - University of Salerno, Fisciano, Italy Smart devices for a better life. Prof. Andrei HALANAY, Prof. Savin TREANȚĂ				
12:30-14:00			LUNCH	BREAK - Library	Building		
	ISIM Moderators	Room 4.1, Library Building, UPB Acces link: follow email			ISWIM Room 4.2, Library Building, UPB Acces link: follow email Moderators Prof. Elena Corina CIPU, Prof. Mihaela PRICOP-JECKSTADT, Prof. Mariana Mirela STĂNESCU		
14:00-14:15	Section 1 Room: 4.1	Live Authors: Affiliation: Title:	¹Clara BURGOS, ¹Juan Carlos CORTÉS LÓPEZ, ²Laura VILLAFUERTE, ¹Rafael J. VILLANUEVA MICÓ ¹Universitat Politècnica de València, València, Spain ²University of Texas at Austin, Texas, United States Extending laplace transform in random fractional framework to solve a fractional second order differential equation with uncertainty	Section 4 Room: 4.2	Live Authors: Affiliation: Title:	¹ Mihai REBENCIUC, ¹ Vlad-Andrei CHIRA, ² Nicolai GĂITAN ¹ University Politehnica of Bucharest, Bucharest, Romania ² Military Technical Academy "Ferdinand I", Bucharest, Romania Vectors, multivectors and rectangular matrices versus square matrices (with Python implementations)	
14:15-14:30	Section 3 Room: 4.1	Live Authors: Affiliation: Title:	¹ Mircea CIMPOEAȘ ¹ University Politehnica of Bucharest, Bucharest, Romania A note on the actions of the Hecke group H(2)	Section 3 Room: 4.2	Online Authors: Affiliation: Title:	¹ Vicente J. BEVIA, ¹ Juan C. CORTÉS, ¹ Rafael J. VILLANUEVA ¹ Instituto de Matemática Multidisciplinar, UPV, València, Spain Boundary Value Problems for a class of random differential equations	
14:30-14:45	Section 2 Room: 4.1	Live Authors: Affiliation: Title:	¹ Emil SIMION, ¹ Elena Corina CIPU ¹ University Politehnica of Bucharest, Bucharest, Romania Applications of Hybrid Statistical Models and Quantum Computing in Data Security	Section 2 Room: 4.2	Live Authors: Affiliation: Title:	¹ Vasile NĂSTĂSESCU, ¹ Silvia MARZAVAN ¹ Military Technical Academy `Ferdinand I`, Bucharest, Romania On the calculation of functionally graded plates	
14:45-15:00	Section 3 Room: 4.1	Live Authors: Affiliation: Title:	¹Monica BURLICĂ ¹`Gheorghe Asachi` Technical University of Iași, Iași, Romania On directional subregularity of mappings	Section 2 Room: 4.2	Live Authors: Affiliation: Title:	¹ Eduard-Ştefan SANDU ¹ University Politehnica of Bucharest, Bucharest, Romania Revealing the cyberattacks: phishing	
	Section 1	Live Authors:	¹ Sani SALISU, ¹ Poom KUMAM, ¹ Songpon SRIWONGSA, ² Wiyada KUMAM	Section 2	Live Authors:	¹Iulia-Florentina DARIE, ²Ștefan Răzvan ANTON, ¹Mirela PRAISLER	

 		Affiliation:	¹ King Mongkut`s University of Technology Thonburi, Bangkok, Thailand		Affiliation:	¹ University `Dunărea de Jos` Galaţi, Galaţi, Romania			
15:00-15:15			² Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand			² University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1	Title:	Nonexpansive-type Mappings with Viscosity Iteration in Hadamard Spaces	Room: 4.2	Title:	Drug detection using K-nearest neighbors algorithm			
		Live			Live				
15:15-15:30	Section 3	Authors: Affiliation:	¹ Elena Corina CIPU, ¹ Cosmin Dănuț BARBU ¹ University Politehnica of Bucharest, Bucharest, Romania	Section 3	Authors: Affiliation:	¹ Ștefan Cătălin PETRESCU, ¹ Simona Mihaela BIBIC ¹ University Politehnica of Bucharest, Bucharest, Romania			
13,13 13,00	Room: 4.1	Title:	New applications for NLEEs based on Estimation Methods	Room: 4.2	Title:	Advanced Optimization Techniques for Unbalanced Allocation Problems using the Modified Hungarian			
15:30-16:00				COFFEE BREA	FEE BREAK				
	ISIM	Room 4.1, Library Buildin	-	ISWIM	Room 4.2, Library Building, U Acces link: follow email	PB			
	Moderators		u .	Moderators		Mihaela PRICOP-JECKSTADT, Prof. Mariana Mirela STĂNESCU			
	Section 2	Live Authors:	¹Cătălin-lonuţ MOLDOVAN, ¹Bogdan SEBACHER	Section 1	Live Authors:	¹Larisa Georgiana UNGUREANU, ¹Narcisa VOINEA, ¹Elena Corina CIPU, ¹Cosmin Dănuţ BARBU			
15:30-15:45	30000012	Affiliation:	¹ Military Technical Academy "Ferdinand I", Bucharest, Romania	3000011	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1	Title:	Image reconstruction with a convolutional autoencoder as support for a data assimilation model	Room: 4.2	Title:	Applications of Laplace and Sumudu Transforms in Mechanical Engineering			
		Live		6	Live	Ind. C. CONCTANTINECCU ICI			
15:45-16:00	Section 3	Authors: Affiliation:	¹ Paul-Florinel CĂSĂNDROIU, ¹ Luciana MOROGAN ¹ Military Technical Academy "Ferdinand I", București, Romania	Section 3	Authors: Affiliation:	¹ Maria CONSTANTINESCU, ¹ Simona Mihaela BIBIC ¹ University Politehnica of Bucharest, Bucharest, Romania			
	Room: 4.1	Title:	A new variant of a multimodal romanian voice emotion detection	Room: 4.2	Title:	Solving optimization problems through duality			
	Section 3	Live Authors:	¹Daniela ROŞU	Section 3	Live Authors:	¹Patrik KOVÁŘ			
16:00-16:15		Affiliation:	¹ Gheorghe Asachi Technical University of Iași, Iași, Romania		Affiliation:	¹ Czech Technical University in Prague, Prague, Czech Republic			
	Room: 4.1	Title:	Existence results for a class of nonlinear evolution systems with delay and nonlocal initial data	Room: 4.2	Title:	Scalable activation function employment in physics informed higher order neural networks for initial value problem approximation			
		Live			Online				
	Section 3	Authors: Affiliation:	¹ Petcharaporn YODJAI, ¹ Poom KUMAM, ² Wiyada KUMAM ¹ King Mongkut's University of Technology Thonburi, Bangkok, Thailand	Section 3	Authors: Affiliation:	¹ Usman RIAZ ¹ University of Peshawar, Peshawar, Pakistan			
16:15-16:30		Anniation.	² Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand		Title:	Global Existence and Finite Time Blow-Up in a New Class of Non-Linear Viscoelastic Wave Equation			
		Title:	Image completion using automatic structure propagation and the modified exampla						
	Room: 4.1	Live	-based inpainting with two-stage structure-tensor and image sparse representation	Room: 4.2	Online				
	Section 3	Authors:	¹Radu STRUGARIU	Section 1	Authors:	¹Nicolai GĂITAN			
16:30-16:45	Room: 4.1	Affiliation: Title:	¹ Gheorghe Asachi` Technical University of Iași, Iași, Romania Generalized differentiation for set-valued maps and applications	Room: 4.2	Affiliation: Title:	¹ Military Technical Academy "Ferdinand I", Bucharest, Romania Specific Methods in Digital Image Processing and Computer Vision. Background, implementations,			
	NOOH: 4.1	Title.	deneralized differentiation for set valued maps and applications	1100111. 4.2		variations, and connections			
	Section 3	Live Authors:	¹Geetika GEETIKA, ¹Izhar UDDIN, ²Barahan ALMARRI	Section 2	Live Speaker:	¹Ruxandra Ioana CIPU, ¹Stefania Maria MICHNEA, ¹Elena Corina CIPU			
16:45-17:00		Affiliation:	¹ Department of Mathematics, Jamia Millia Islamia, New Delhi, India		University:	¹ University Politehnica of Bucharest, Bucharest, Romania			
201.10 27.100	Room: 4.1	Title:	² College of Sciences, Princess Nourah Bint Abdulrahman University, Saudi Arabia Convergence analysis and of fixed poin iterative process under	Room: 4.2	Title:	A Beam of Hope: Modelling Approach of Proton Therapy as Cancer Treatment			
	1100111. 4.1	Title.	operators with property (E)	1100111. 4.2					
17:00-17:30		COFFEE BREAK							
	Continu 2	Live	1Coorgate CDETU	Continu 2	Live	1Dody. His HEDECANIII			
17:30-17:35	Section 3	Authors: Affiliation:	¹ Georgeta CREȚU ¹ Gheorghe Asachi Technical University of Iași, Iași, Romania	Section 3	Authors: Affiliation:	¹ Radu-Ilie HEREŞANU ¹ Military Technical Academy Ferdinand I, Bucharest, Romania			
	Room: 4.1	Title:	Finslerian Version of Beltrami`s Theorem	Room: 4.2	Title:	Specialized action system commanded with voice signal			
	Section 1	Live Authors:	¹Natthaya BOONYAM, ¹Poom KUMAM, ¹Parin CHAIPUNYA	Section 1	Live Authors:	¹Ştefan Răzvan ANTON, ¹Octavian POSTĂVARU, ¹Antonela TOMA			
		Affiliation:	¹ King Mongkut's University of Technology Thonburi, Bangkok, Thailand	1000011	Affiliation:	¹ University Politehnica of Bucharest, Bucharest, Romania			
17:45-18:00	Room: 4.1	Title:	Ekeland's Variational Principle on Non-Triangular Metric	Room: 4.2	Title:	Fractional unmatched back projector for Richardson-Lucy deconvolution			
		Online	12 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		Live				
18:00-18:15	Section 3	Authors:	¹ Carlos ANDREU VILARROIG, ¹ Juan Carlos CORTÉS LÓPEZ, ² Ana NAVARRO-QUILES, ¹ Sorina Mădălina SFERLE	Section 1	Speaker: University:	¹ Mircea-Răzvan LAZA, ¹ Simona Mihaela BIBIC ¹ University Politehnica of Bucharest, Bucharest, Romania			
10.00 10.13			¹ Universitat Politècnica de València, València, Spain	Room: 4.2	Title:	The study of the evolution in time of a species using the game theory			
		Affiliation: Title:	² Universitat de València, València, Spain Probabilistic study of the stochastic solution of the pseudo-n order kinetic model						
	Room: 4.1	Tiue.	applied to a real case						
	Section 3	Online Authors:	¹Wajahat ALI	Section 1	Online Authors:	¹ Nisrine MILIANI, ¹ Djillali BOUAGADA, ¹ Kamel BENYETTOU			
10,45 40,00	Section 3	Affiliation:	¹ University of Ostrava, Ostrava, Czech Republic	Section 1	Affiliation:	¹ Abdelhamid Ibn Badis University Mostaganem, Mostaganem, Algeria			
18:15-18:30	Room: 4.1	Title:	The Global Dynamics of HIV Latency Model Including Cell-to-Cell Viral Transmission	Room: 4.2	Title:	On the positivity analysis of the three-dimensional fractional conformable Fornasini-Marchesini models			
	NOOHI. 4.1					i ornasini-iviai alesiili ilioaeis			
		Online Authors:	¹Chonjaroen CHAIRATSIRIPONG, ²Anantachai PADCHAROEN, ³Ovidiu BAGDASAR,		Online				
			¹ Tanakit THIANWAN		Authors:	¹Mihaela-Cristina STRÎMTOREANU, ¹Mirela-Violeta MANEA, ¹Mariana-Mirela			
	Section 1	Affiliation:	¹ University of Phayao, Phayao, Thailand	Section 3	I	STĂNESCU, ¹Simona Mihaela BIBIC			

18:30-18:45	Room: 4.1	Title:	² Rambhai Barni Rajabhat University, Chanthaburi, Thailand ³ University of Derby, Derby, United Kingdom On some new inertial viscosity fixed point algorithms with applications to convex minimization, image restoration, and polynomiography		Affiliation: Title:	¹ University Politehnica of Bucharest, Bucharest, Romania Mathematical Approaches for Biosignals and Applications
18:45-19:00	Section 3 Room: 4.1	Online Authors: Affiliation: Title:	¹ Nacer MERIEM ¹ Brothers Mentouri Constantine 1, Constantine, Algeria A boosted Salp Swarm optimization algorithm through the employment of Chaos Theory	Section 3	Online Authors: Affiliation: Title:	¹ Rawan ABDULLAH ¹ University Politehnica of Bucharest, Bucharest, Romania A Mathematical Model for Allergic Reactions Induced by the Therapy of HIV
19:00-21:00				DINNER		

Day-3 Thursday 30th June 2023

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	ISIM	Bud lite pappages - 1	Acutana Nativala CTĂNITCCII	ISWIM	Duraf Index Damparation To Co.	Marriana Minala CTĂNICCU
9:00-9:15	Moderators	Prof. Irina BADRALEXI, Prof. N	viariana iviireia STANESCU	Section 3	Prof. Irina BADRALEXI, Prof. Online Authors: Affiliation: Title:	Mariana Mirela STANESCU Mohammed Nadjib BENAMAR, 2Mohammed Amine GHEZZAR, 1Djillali BOUGADA 1 Abdelhamid Ibn Badis University of Mosyaganem, Mostaganem, Algeria 2 National Higher School of Mathematics, Mahelma, Algeria Controller synthesis for positive fractional 2D continuous-discrete linear system
9:15-9:30				Section 3	Online Authors: Affiliation: Title:	¹ Amina FARAOUN, ¹ Djillali BOUGADA ¹ Abdelhamid Ibn Badis University of Mosyaganem, Mostaganem, Algeria Analysis of stability and superstability of positive conformable singular continuous time linear systems
9:30-9:45				Section 3	Online Authors: Affiliation: Title:	¹ Ariana GAINA, ¹ Rovana BORUG! ¹ West University of Timișoara, Timișoara, Romania Some criteria for uniform dichotomy of skew-evolution cocycles in Banach spaces
9:45-10:00				Section 1	Online Authors: Affiliation: Title:	¹ Bilal BASTI, ² Maroua Amel BOUBEKEUR ¹ Department of Mathematics, Ziane Achour University of Djelfa, Djelfa, Algeria ² Laboratory of Pure and Applied Mathematics, University of Mostaganem, Mostaganem, Algeria Analytical studies for a hybrid mathematical model of COVID-19: the influence of the pandemic on chronically ill people
10:00-10:15				Section 1	Online Authors: Affiliation: Title:	¹ Sara HAMAIZIA ¹ Universidad Politécnica de Madrid, Madrid, Spain Characterizing chaos in a fractional duffing equation
10:15-10:30				Section 1	Online Authors: Affiliation: Title:	¹ Kamel BENYETTOU, ¹ Djillali BOUAGADA, ² Ghezzar MOHAMMED AMINE ¹ Abdelhamid Ibn Badis University Mostaganem, Mostaganem, Algeria ² National Higher School of Mathematics, Mahelma, Algeria On the analysis of the influence of discretization step on the positivity of conformable fractional Roesser models and the Darboux equation
10:30-10:45				Section 3	Online Authors: Affiliation: Title:	¹ Lynda MEZGHICHE, ¹ Rabah KHEMIS, ¹ Ahlème BOUAKKAZ ¹ LAMAHIS Laboratory, University of 20 Aout 1955, Skikda, Algeria The existence for neutral iterative single-species population growth model with harvesting effort
10:45-11:00	Section 1	Online Authors: Affiliation: Title:	¹Souad SALMI, ¹Djillali BOUGADA ¹Abdelhamid Ibn Badis University Mostaganem, Mostaganem, Algeria On the stability radius of a fractional generalized multidimensional state-space systems			
11:00-11:15	Section 1	Online Authors: Affiliation: Title:	¹ Shahid SAIFULLAH, ¹ Sumbel BEGUM, ¹ Akbar ZADA, ² Ioan-Lucian POPA ¹ Department of Mathematics, University of Peshawar, Peshawar, Pakistan ² Exact Science and Engineering, 1 Decembrie 1918 University of Alba Iulia, Alba Iulia, Roma Random Hadamard- type fractional differential equation in generalized spaces with retarded and advanced arguments			
11:15-11:30	Section 1	Online Authors: Affiliation: Title:	¹Idris AHMED, ²Ali AKGUL, ³Kamsing NONLAOPON,⁴Fahd JARAD ¹Sule Lamido University, Kafin Hausa, Jigawa, Nigeria ²Siirt University, Siirt, Turkey ³Khon Kaen University, Khon Kaen, Thailand ⁴Cankaya University, Ankara, Turkey A Caputo-Fabrizio fractional-order cholera model and its sensitivity analysis			
11:30-11:45	Section 3	Online Authors: Affiliation: Title:	¹ Mansouria SAIDANI ¹ Abdelhamid Ibn Badis University Mostaganem, Mostaganem, Algeria Growth of solutions of lenear differential equations with entire coefficients of [P,Q]- Φ order			
11:45-13:00	Room: CE 304, FIIR	Feedback, discussions and networking activitiesRound Table: DiscussionsLibrary Building, UPB				