RESEARCH CENTER FOR APPLIED MATHEMATICS IN ENGINEERING SCIENCES

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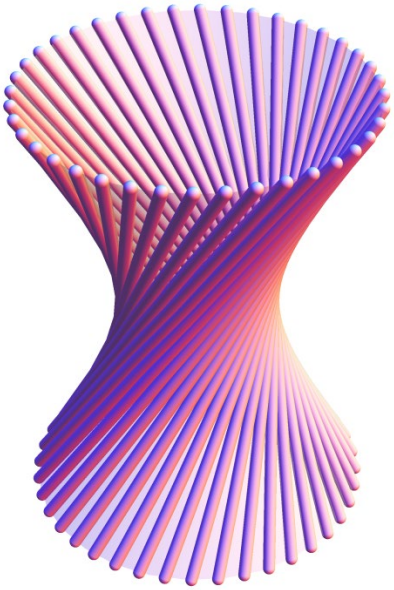

Areas of expertise

Numerical Analysis
-New methods and tools in Approximation Theory; Application of *MATHEMATICA*'s approximation subroutines; High degree quadrature formulas; New algorithms for energy-minimizing curves and surfaces
Functional, Differential, and Integral Equations and Calculus of Variations
-Existence and representation of single-valued and multivalued solutions. Hyers-Ulam stability of equations in algebraic and topological structures; Applications to the stability and perturbations of Dynamical Systems.
-Generalized equations of Euler-Lagrange and Euler-Gauss type used in the theory of 2D and 3D deformable models
Geometry
-Geometry of image formation in stereo vision, different camera models, calibration, systems of multiple lenses and mirrors of a specific type; Manifold learning and pattern recognition
Operator theory and Special functions
-Multivalued operator theory, which is about the investigation of the fixed point properties of special multivalued operators; Investigating the properties of special functions, Riemann zeta, Hurwitz zeta, and Polylogarithm functions
Modelling
-Ultrasound echocardiography; Computer-aided surgery (Prosthetic medicine); Dynamic image-based modelling
Nonlinear and Convex Analysis and Mathematical Programming/Optimization
-Equilibrium problems; Optimization; Variational inequalities; Numerical Optimization; Numerical Optimization

Team

Prof. Mircea Ivan; Prof. Ioan Gavrea; Prof. Ioan Raşa; Prof. Alexandru Ioan Mitrea; Prof. Dorian Popa; Prof. Daniela Rosca; Prof. Ioan Radu Peter; Assoc. Prof. Daniela Inoan; Prof. Math Alina Sîntămărian; Assoc. Prof. Dalia Cimpean; Prof. Bogdan Ionuţ Gavrea; Assoc. Prof. Adela Novac; Assoc. Prof. Mircea Dan Rus; Assoc. Prof. Ovidiu Furdui; Assoc. Prof. Adrian Holhos; Assoc. Prof. Adela Capătă; Assoc. Prof. Alina Ramona Baias; Assoc. Prof. Diana Otrocol; Assist. Prof. Vicuta Neagos.

Representative projects

DynAPSNeur, "Dynamics Analysis of Parallel Simulations of Biological Neural Microcircuits", FP7 "Research Infrastructures" action (January 1 - December 30, 2013)
http://www.hp-see.eu/hp-see-pilot-call-awarded-applications
MoDef, "Modelling using advanced methods and techniques based on the theory of deformable surfaces with applications in computer-assisted surgery and other modelling procedures of anatomic structures", PNII Partnership, http://dicomge.utcluj.ro/modef (2007-2010)
"Advanced Methods and Algorithms of Mathematics related to the Theory of Deformable Models, with applications in image processing and medicine", CNCSIS, (2006-2008)
"Denoising and compression of data on high-dimensional manifolds", Deutsche Forschung Gemeinschaft, Bilateral cooperation Germania – Romania PL 170/14-1, Georg Austin University, Göttingen, (January 1 - December 31, 2011)
"Denoising and compression of spherical data", *Deutsche Forschung Gemeinschaft* (2007 –2010),

DESPED, **"Stereo Based Object Tracking and Pedestrian Recognition in Traffic and Environments"**, *Wolkswagen AG*, Germania (2006-2007) , (coord. professor Sergiu Nedevschi).
CRIOLAPSIM, **"Laparoscopic Cryosurgical Treatment of the renal tumours individualized using simulations on 3D reconstructed model"**, *CEEX* (2006-2008) director TUCN prof. eng. Sergiu Nedevschi (in cooperation with "Institutul Clinic de Urologie şi Transplant Renal" Cluj-Napoca

Significant results

The most representative publications of the last years

1. Baias, A.R., Popa, D., Rassias, M. Th.: Set-valued solutions of an equation of Jensen type, Quaest. Math. 8(1), doi: 10.2989/16073606.2022.2072249, (2022).
2. Baias, A.R., Popa, D.: On the best Ulam constant of a higher order linear differ- ence equation, Bull. Sci. Math., 166, art no. 102928, https://doi.org/10.1016/j.bulsci.2020.102928, (2021).
3. Ivan, M., Neagos, V., A representation of the interpolation polynomial, Numerical Algorithms 88 (2021), 1215—1231, https://doi.org/10.1007/s11075-021-01072-2
4. Holhoș, A., On the Approximation by Balázs–Szabados Operators. Mathematics (2021) 9 (14), 1588, 12 pp. doi: 10.3390/math9141588
5. Gupta, V., Holhoș, A., Approximation with Arbitrary Order by Baskakov-Type Operators Preserving Exponential Functions. Bulletin of the Malaysian Mathematical Sciences Society (2021) 44, 2567-2576. doi: 10.1007/s40840-020-01063-x
6. A. Holhoș, D. Roșca, Orhonormal Wavelet Bases on The 3D Ball Via Volume Preserving Map from The Regular Octahedron. Mathematics (2020) 8 (6), 994, 15 pp. doi: 10.3390/math8060994
7. Ana Maria Acu, Ioan Raşa, Rekha Srivastava, Modified operators interpolating at endpoints, Mathematics 2021, 9(17), 2021; https://doi.org/10.3390/math9172051
8. Ana Maria Acu, Gülen Başcanbaz-Tunca, Ioan Rasa, Voronovskaja type quantitative results for differences of positive linear operators, Symmetry 2021, 13(8), 1392; https://doi.org/10.3390/sym13081392
9. Ulrich Abel, Dany Leviatan and Ioan Rasa, On the q-monotonicity preservation of Durrmeyer-Type operators, Mediterranean Journal of Mathematics volume 18, Article number: 173 (2021) , https://doi.org/10.1007/s00009-021-01823-4
10. Capătă, A, Existence of solutions of bilevel strong vector equilibrium problems and their applications, J Nonlinear Var Anal (2021), 5 (3), 371-389, doi: 10.23952/jnva.5.2021.3.03
11. Novac, A., Otrocol, D. & Popa, D. Ulam Stability of a Linear Difference Equation in Locally Convex Spaces. Results Math 76, 33 (2021). https://doi.org/10.1007/s00025-021-01344-2
12. Veronica Ilea, Adela Novac, Diana Otrocol, Radu Precup, Solutions with a prescribed interval of positivity for differential systems with nonlocal conditions, Applied Mathematics and Computation 375, 125092, https://doi.org/10.1016/j.amc.2020.125092.
13. Cimpean, D.S., Sheremet, M.A., Pop, I., Mixed convection of hybrid nanofluid in a porous trapezoidal chamber, International Communications in Heat and Mass Transfer, ISSN: 0735-1933, 116 (2020) 104627, https://doi.org/10.1016/j.icheatmasstransfer.2020.104627
14. V. Ilea, A. Novac, D. Otrocol, R. Precup, Nonlinear alternatives of hybrid type for oneself vector-valued maps and application, Fixed Point Theory, 24(2023), No. 1, 221-232, DOI: 10.24193/fpt-ro.2023.1.11, https://www.math.ubbcluj.ro/~nodeacj/volumes/2023-No1/231-ile-nov-otr-pre.php, ISSN: 1583-5022
15. Cimpean, D.S., Pop, I., Entropy generation of a nanofluid in a porous cavity with sinusoidal temperature at the walls and a heat source bellow, International Journal of Numerical Methods for Heat & Fluid Flow, (2021)Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/HFF-10-2020-0654.
16. AR Baias, F Blaga, D Popa, Best Ulam constant for a linear difference equation, Carpathian J Math., 35 (2019), No. 1, 13 – 22.
17. Baias, A.R., Popa, D.: On Ulam stability of a linear difference equation in Banach spaces. Bull. Malays. Math. Sci. Soc. (2019). https://doi.org/10.1007/s40840-019-00744-6, 16
18. Capata, A. Optimality conditions for ϵ -quasi solutions of optimization problems via ϵ -upper convexificators with applications. Optim. Lett. 13, 857-873 (2019) doi: 10.1007/s11590-018-1287-117
19. Capata, A. Optimality for weakly ϵ -efficient solutions of vector optimization problems with applications. Numer.Funct. Anal. Optim.. 40, 726-741 (2019) doi:10.1080/01630563.2019.1571510
20. Cimpean Dalia Sabina, Pop Ioan, Free convection in an inclined cavity filled with a nanofluid and with sinusoidal temperature on the walls: Buongiorno's mathematical model, International journal of numerical methods for heat & fluid flow, Volume: 29 Issue: 12 Pages: 4549-4568, DOI: 10.1108/HFF-04-2019-0317, Published: DEC 2 2019

The offer addressed to the economic environment

Research & development	Development of original solutions for modelling dynamic 3D environments; Development of real-time perception systems for structured or unstructured 3D environments, applied to drive assistance systems, autonomous robots, space observation, or computer-assisted medical diagnosis.
Consulting	Consulting, designing, and researching pattern recognition and machine learning for industrial and scientific fields.
Training	Image processing basics: Image processing algorithms and techniques, pattern recognition, machine learning, kernel methods with applications in different fields (computer vision, neuroscience, medical, speech recognition); Numerical optimization algorithms, time stepping schemes for rigid body systems with applications to robotics, autonomous navigation, and granular materials.

Last update on January 2024