Schedule ICATA 2022

Location:
Faculty of Medicine
Str. Lucian Blaga, No.2A, Sibiu

Monday, September 12

08:00-9:30 Registration

9:30-10:00 Opening Ceremony

Plenary Lecture (Senate Hall)

Chairman: Gianluca Vinti

10:00-10:30 Ioan Rasa, *Analytic inequalities and stochastic orders*

10:30-11:00 Francesco Altomare, *Approximation processes and representation formulae for operator semigroups in terms of integrated means*

11:00-11:30 Coffee break

Lecture (Senate Hall)

Chairman: Stefano De Marchi

11:30-11:50 Michele Campiti, *One-sided Korovkin approximation*

11:50-12:10 Ana-Maria Acu, Margareta Heilmann, Ioan Raşa, Ancuţa Emilia Şteopoaie, *Voronovskaja type results for the Aldaz, Kounchev, Render modification of Baskakov type operators*

12:10-12:30 Mirella Cappelletti Montano, *A diffusive two predators–one prey model on periodically evolving domains*

12:30-12:50 <u>Radu Păltănea</u>, Alexandra Diana Meleșteu, *On a method for uniform summation of the Fourier-Jacobi series*

12:50-13:10 <u>Heinz-Joachim Rack</u>, Robert Vajda, *Algebraic construction of Zolotarev polynomials with interchanged parameters*

Lecture (Senate Hall)

Chairman: Mirella Cappelletti Montano

15:30-15:50 Vita Leonessa, *On a generalization of Bernstein-Durrmeyer operators with Jacobi weights* (online)

15:50-16:10 Jose A. Adell, <u>Daniel Cardenas-Morales</u>, *On the constant in a direct inequality for the Szasz-Mirakyan operator* (online)

16:10-16:30 <u>Maryam Mohammadi</u>, Mohammad Heidari, Stefano De Marchi, *On the new positive definite RBFs by using Fourier cosine transform* (online)

16:30-16:50 Benaissa Zerroudi, *Enhancing the approximation order of Shepherd operators through barycentric coordinates* (online)

16:50-17:20 Coffee break

17:20-17:40 Gabriel Prăjitură, <u>Andrei Vernescu</u>, *About uniform continuous functions which are not Lipschitz*

17:40-18:00 Voichiţa Adriana Radu, *Voronovskaja type results for inverses of certain operators*

18:00-18:20 Ana-Maria Acu, Vijay Gupta, <u>Carmen Muraru Popescu</u>, Voichiţa Radu, *Post-Widder operators of semi-exponential type*

18:20-18:40 Emilia Pop, *The intermediate point from a mean value theorem*

18:40-19:00 Nicusor Minculete, *Several inequalities related the numerical radius*

Special Session for PhD students (M 103)

Chairman: Heinz-Joachim Rack

15:30-15:50 Alexandru Mihai Bica, <u>Diana Curila (Popescu)</u>, *The Akima's Fitting Method for Quartic Splines*

15:50-16:10 Stefan Garoiu, *Voronovskaya type results for geometric series of Durrmeyer operators*

16:10-16:30 Andra Malina, *Univariate Shepard operators combined with least squares fitting polynomials*

16:30-16:50 Irina Savu, *Orbital Fuzzy Iterated Function Systems*

16:50-17:20 Coffee break

Special Session for PhD students (M 103)

Chairman: Radu Păltănea

17:20-17:40 Cristina Maria Pacurar, *On some operators appearing in fractal interpolation theory*

17:40-18:00 Vlad Paşca, *Voronovskaya type results for special sequences of operators*

18:00-18:20 Alexandru Mihai Bica, <u>Zoltan Satmari</u>, *Bernstein numerical method for solving nonlinear fractional and weakly singular Volterra integral equations of the second kind*

18:20-18:40 Bianca Ioana Vasian, *Approximation properties of some non-positive Kantorovich type operators*

18:40-19:00 Doru Dumitrescu, *Fixed point results on Jleli-Samet metric spaces*

19:30-22:00 Welcome Cocktail (Imparatul Romanilor Hotel)

Tuesday, September 13

Plenary Lecture (Senate Hall)

Chairman: Francesco Altomare

09:00-09:30 Gianluca Vinti, *A mathematical model for the study of vascular patologies*

09:30-10:00 Stefano De Marchi, *(β, γ)-Chebyshev functions and points of the interval and some extensions*

Lecture (Senate Hall)

Chairman: Michele Campiti

10:00-10:20 <u>Mirela Vinerean</u>, Niclas Bernhoff, *Normal Discrete Velocity Models for Boltzmann Equation for Mixtures*

10:20-10:40 Antonio-Jesus Lopez-Moreno, *On a conjecture of G. T. Thachev*

10:40-11:00 Gülen Başcanbaz-Tunca, *Generalized Kantorovich Operators on Multidimensional Hypercube*

11:00-11:30 Coffee break

Chairman: Antonio-Jesus Lopez-Moreno

11:30-11:50 Alexandru Mihai Bica, *Catmul-Rom quartic splines*

11:50-12:10 Marius-Mihai Birou, *New bounds for the complete elliptic integral of the first kind*

12:10-12:30 Ana Maria Acu, <u>Nursel Çetin</u>, Gancho Tachev, *Perturbed Baskakov-type operators*

12:30-12:50 <u>Nesibe Manav Mutlu,</u> **Nursel Çetin**, *On Schurer Type Complex Stancu Operators*

12:50-13:10 Adrian Girjoaba, *On the log-convexity of a Bernstein-like polynomials sequence*

Lecture (Senate Hall)

Chairman: Gülen Başcanbaz-Tunca

15:30-15:50 Dorian Popa, *On some results in Ulam stability*

15:50-16:10 Diana Otrocol, *Applications of fibre contraction principle to some classes of functional integral equations*

16:10-16:30 Alina Ramona Baias, *On the Best Ulam constant of some linear difference equations*

16:30-16:50 <u>Daniela Inoan,</u> **Daniela Marian**, *Semi-Hyers–Ulam–Rassias Stability of a Volterra Integro-Differential Equation with a Convolution Type Kernel via Laplace Transform*

16:50-17:10 George Popescu, *Rhaly Operators, Boundedness, Compactness, Zero Statistical Density*

17:10-17:30 Coffee break

Lecture (Senate Hall)

Chairman: Dorian Popa

17:30-17:50 Ariana Pitea, *Numerical reckoning of fixed points in a geometric framework*

17:50-18:10 Miruna-Stefana Sorea, *Poincaré-Reeb graphs of real algebraic domains*

18:10-18:30 Florin Felix-Nichita, *Yang–Baxter Equations, Computational Methods and Applications*

18:30-18:50 Foteini Vakouftsi, Stephanos Zaoutsos, Ana Acu, and John Kechagias, *An arithmetic approach utilizing Artificial Neural Networks for surface roughness prediction of Additive Manufacturing parts*

18:50-19:10 Florin Sofonea, Ioan Ţincu, *Characterization of p-convex sequences of higher order*

Special Session for PhD students
(M 103)

Chairman: Voichita Adriana Radu

15:30-15:50 Ioan Cristian Buscu, Ancuţa Emilia Şteopoaie , *Voronovskaja type reults for generalized Baskakov operators preserving monomials* (online)

15:50-16:10 Ioan Cristian Buscu, Andra Mihaela Seserman , *Convergence of special sequences of positive operators* (online)

16:10-16:30 Marta Enachioiu, Gabriela Denisa Motronea, *Positive solutions of algebraic systems with positive coefficients* (online)

16:30-16:50 Ionut Tudor Iancu, *Statistical convergence in a Korovkin-type theorem for monotone and sublinear operators* (online)

16:50-17:10 Alexandra Diana Meleşteu, Maria Dimitriu, *A Stancu type generalization of the Balazs operator*

17:10-17:30 Coffee break

19:30-22:00 Official Dinner (Imparatul Romanilor Hotel)

Wednesday, September 14

09:30-13:30 Excursion Balea Lake-Fagaras Mountains
(Departure from Sala Thalia, Cetății str., no. 3-5)

14:00-15:30 Lunch Brukenthal Palace (Avrig)

Abstracts ICATA 2022

Francesco Altomare

Title: APPROXIMATION PROCESSES AND REPRESENTATION FORMULAE FOR OPERATOR SEMIGROUPS IN TERMS OF INTEGRATED MEANS

Abstract. The representation/approximation formulae for strongly continuous operator semigroups (in short, C_0-semigroups) are of interest both from a theoretical point of view and from an applied one, especially when they are involved, for instance, in the numerical analysis of the partial differential equations governed by such C_0-semigroups.

Various methods and results are known in this field, often accompanied by a through study of the rate of convergence of the given representations/approximations.

The talk will be devoted to report some recent results on such a topic which are documented in the paper [1] and which has been jointly written with M. Cappelletti Montano and V. Leonessa.

Of concern are some representation formulae for C_0-semigroups on Banach spaces, in terms of integrated means with respect to a given family of probability Borel measures and other parameters.

Such representation formulae have been suggested by some recent studies devoted to new sequences of positive linear operators which, among other things, generalize both Bernstein operators as well as Kantorovich operators ([2], [3]). They extend the representation formulae which have been obtained in [4] with purely probabilistic methods.

Some estimates of the rate of convergence in terms of the rectified modulus of continuity and the second modulus of continuity will be discussed as well.

References

[1] F. Altomare, M. Cappelletti Montano, V. Leonessa, *On some representation formulae for operator semigroups in terms of inte-*

grated means, preprint, 2022.

[2] F. Altomare, M. Cappelletti Montano, V. Leonessa, I. Raşa, *A generalization of Kantorovich operators for convex compact subsets*, Banach J. Math. Anal. **11** (2017), no. 3, 591–614.

[3] F. Altomare, M. Cappelletti Montano, V. Leonessa, I. Raşa, *Elliptic differential operators and positive semigroups associated with generalized Kantorovich operators*, J. Math. Anal. Appl. **458** (2018), no. 1, 153-173.

[4] P. L. Butzer, L. Hahn, *A probabilistic approach to representation formulae for semigroups of operators with rates of convergence*, Semigroup Forum **21** (1980), 257–272.

Alina Ramona Baias

Title: On the Best Ulam constant of some linear difference equations

Abstract. An equation is called Ulam stable if for every approximate solution of it there exists an exact solution near it. In this talk, we present some stability results for the p order linear difference equation with constant coefficients

$$x_{n+p} = a_1 x_{n+p-1} + \ldots + a_p x_n.$$

For some particular cases the Best Ulam constant is also obtained.

Gülen Başcanbaz-Tunca

Title: Generalized Kantorovich Operators on Multidimensional Hypercube

Abstract. In this talk, based on the construction of Stancu's operators [1], we introduce a new generalization of Kantorovich operators acting on $L^p(Q)$, $1 \le p < \infty$, where Q is a multidimensional unit hypercube. We study approximation in L^p-norm by the sequence of such operators. And, for the rate of the approximation, we present some estimates via multivariate averaged modulus of

smoothness of the first order for functions from $L^p(Q)$ as well as from a smooth subspace of $L^p(Q)$.

References

[1] D. D. Stancu, *Approximation of functions by means of a new generalized Bernstein operator*, Calcolo 20 (1983), no. 2, 211–229.

Alexandru Mihai Bica

Title: CATMUL-ROM QUARTIC SPLINES

Abstract. The quartic degree variant of Catmul-Rom splines that interpolates on mesh points and at midpoints is defined. The error estimates are obtained providing the optimal order of convergence $O(h^5)$. The usefulness of these splines for the numerical solution of two-point boundary value problems, associated to fifth order functional differential equations, is pointed out.

Marius-Mihai Birou

Title: NEW BOUNDS FOR THE COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND

Abstract. The complete elliptic integral of the first kind has applications in mathematics, physics and engineering. A lot of researchers has attracted to obtain inequalities for this integral. In this article we give new bounds for the complete elliptic integral of the first kind.

Mirella Cappelletti Montano

Title: A DIFFUSIVE TWO PREDATORS–ONE PREY MODEL ON PERIODICALLY EVOLVING DOMAINS

Abstract. The talk deals with a diffusive two predators–one prey model with Holling-type II functional response. We assume that the density of prey and predators are spatially inhomogeneous on

a (periodically) evolving domain and are subject to homogeneous Neumann boundary conditions.

We study the asymptotic properties of the solutions of this reaction–diffusion model. More specifically, we introduce suitable conditions in order that one predator species faces extinction and the surviving predator and its prey coexist stably, showing that their density, as time increases, tends to the periodic solution of the corresponding kinetic two species predator–prey model. We also consider an autonomous model on a fixed domain.

This is a joint work with Benedetta Lisena.

Michele Campiti

Title: ONE-SIDED KOROVKIN APPROXIMATION

Abstract. We consider a Korovkin-type approximation problem which allows to distinguish between upper and lower approximation. The results are based on a classical characterization of Korovkin closures in terms of upper and lower envelopes and are exsposed both in the context of continuous than integrable functions. In this last case an analogous of the classical characterization is obtained which allows to consider Korovkin systems including integrable non continuous functions.

Jose A. Adell, <u>Daniel Cardenas-Morales</u>

Title: ON THE CONSTANT IN A DIRECT INEQUALITY FOR THE SZASZ-MIRAKYAN OPERATOR

Abstract. We are concerned with the approximation of continuous functions by the classical Szász-Mirakyan operators S_t, $t > 1$, in terms of the Ditzian-Totik modulus of smoothness ω_2^φ with step-weight function $\varphi(x) = \sqrt{x}$. Information about the rate of uniform convergence is given by the direct inequality

$$\|S_t f - f\|_{[0,\infty)} \le K_S \omega_2^\varphi\left(f; \frac{1}{\sqrt{t}}\right).$$

Here, we focus on the absolute constant K_S, and prove that it can be taken smaller than 2.5.

Ana Maria Acu, Nursel Çetin, Gancho Tachev

Title: PERTURBED BASKAKOV-TYPE OPERATORS

Abstract. This talk deals with modifications of Baskakov-type operator. Firstly, we obtain the rate of convergence by using modulus of continuity and then Voronovskaja type asymptotic formula for these operators. Finally, we consider some numerical examples which show the relevance of the results.

Alexandru Mihai Bica, Diana Curila (Popescu)

Title: THE AKIMA'S FITTING METHOD FOR QUARTIC SPLINES

Abstract. For the Hermite type quartic spline interpolating on the partition knots and at the midpoint of each subinterval, we consider the estimation of the derivatives on the knots, and the values of these derivatives are obtained by constructing an algorithm of Akima.s type. For computing the derivatives on end-points are also considered alternatives that request optimal properties near the end-points. The error estimate in the interpolation with this quartic spline is generally obtained in terms of the modulus of continuity. In the case of interpolating smooth functions, the corresponding error estimate reveal the maximal order of approximation O(h3). A numerical experiment is presented for making the comparison between the Akima.s cubic spline and the Akima.s variant quartic spline having de.ciency 2 and natural end-point conditions.

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Stefano De Marchi

Title: (β, γ)-Chebyshev functions and points of the interval and some extensions

Abstract. In this talk, we introduce the class of (β, γ)-Chebyshev functions and corresponding points, which can be seen as a family of *generalized* Chebyshev polynomials and points. For the (β, γ)-Chebyshev functions, we prove that they are orthogonal in certain subintervals of $[-1, 1]$ with respect to a weighted arc-cosine measure. In particular we investigate the cases where they become polynomials, deriving new results concerning classical Chebyshev polynomials of first kind. Besides, we show that subsets of Chebyshev and Chebyshev-Lobatto points are instances of (β, γ)-Chebyshev points. We also study the behavior of the Lebesgue constants of the polynomial interpolant at these points on varying the parameters β and γ. If time allows, we discuss their extension to the square $[-1, 1]^2$.

This is a joint work with Giacomo Elefante and Francesco Marchetti (both from UNIPD).

Doru Dumitrescu

Title: Fixed point results on Jleli-Samet metric spaces

Abstract. In the setting of Jleli-Samet metric spaces, existence and uniqueness fixed point theorems are stated and proved. We used generalized contractive operators obtained as a sum of mappings with adequate properties. As consequences, some classic results in literature are obtained.

Stefan Garoiu

Title: Voronovskaya type results for geometric series of Durrmeyer operators

Abstract. In this paper we will introduce some Voronovskaya type results concerning the operators introduce by U. Abel. Namely, we

will obtain some convergence results concerning the geometric series of Durrmeyer operators.

Adrian Girjoaba

Title: On the log-convexity of a Bernstein-like polynomials sequence

Abstract. We prove that the sequence of the sum of the squares of the Bernstein polynomials is log-convex. There are given two proofs of this result: one by relating our sequence to the Legendre polynomials sequence and one by induction. I know of this problem from Professor Ioan Rasa, Cluj-Napoca.

Ana-Maria Acu, Margareta Heilmann, Ioan Raşa, Ancuţa Emilia Şteopoaie

Title: Voronovskaja type results for the Aldaz, Kounchev, Render modification of Baskakov type operators

Abstract. For $j > 1$, $j \in \mathbb{N}$ fixed and $n \geq j$, Aldaz, Kounchev and Render [1] introduced a modification of the Bernstein operator that preserves the monomials e_0 and e_j. This operator $B_{n,j} : C[0,1] \to C[0,1]$ is constructed using the classical original Bernstein basis functions $p_{n,k}(x) = \binom{n}{k} x^k (1-x)^{n-k}$, $x \in [0,1]$ and is explicitly given by

$$(1) \qquad B_{n,j}(f;x) = \sum_{k=0}^{n} f\left(t_{n,k}^{(j)}\right) p_{n,k}(x),$$

where

$$t_{n,k}^{(j)} = \left(\frac{k(k-1)\ldots(k-j+1)}{n(n-1)\ldots(n-j+1)}\right)^{1/j}.$$

We generalize the definition to Baskakov type operators and prove a corresponding Voronovskaja type result.

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References

[1] J.M. Aldaz, O. Kounchev, H. Render, Shape preserving properties of generalized Bernstein operators on extended Chebyshev spaces, Numer. Math., 2009, 114(1), 1–25

Ionut Tudor Iancu

Title: Statistical convergence in a Korovkin-type theorem for monotone and sublinear operators

Abstract. In this paper we generalize the result on statistical uniform convergence in the Korovkin theorem for positive and linear operators in C([a, b]), to the more general case of monotone and sublinear operators. Our result is illustrated by concrete examples.

Daniela Inoan, Daniela Marian

Title: Semi-Hyers–Ulam–Rassias Stability of a Volterra Integro-Differential Equation with a Convolution Type Kernel via Laplace Transform

Abstract. We present some results regarding semi-Hyers-Ulam-Rassias stability of a Volterra integro-differential equation of order I, II and n, with a convolution type kernel. To this purpose the Laplace transform is used. The results obtained show that the stability holds for problems formulated with various functions: exponential and polynomial functions.

Foteini Vakouftsi, Stephanos Zaoutsos, Ana Acu, and John Kechagias

Title: An arithmetic approach utilizing Artificial Neural Networks for surface roughness prediction of Additive Manufacturing parts

Abstract. The present paper investigates the application of Artificial Neural Networks (ANN) to Additive Manufacturing pro-

cesses such as fused filament fabrication (FFF) and multijet (MJ) 3D printing. Accurate predictions of performance metrics such as average surface roughness and shape accuracy in advanced manufacturing processes are of utmost importance. So, the feed-forward back propagation (FFBP) ANN type, with one hidden layer, was selected and implemented between the input and output parameters of the additive manufacturing FFF and MJ 3D printing processes. The number of hidden neurons and the learning parameters are optimised according to the fractional factorial experimental design approach. It was proved that the proposed methodology is efficient and can be utilised for engineering issues such as processes and systems optimisation.

References
[1] Moza et al. (2015). Optimizing dimensional accuracy of fused filament fabrication using Taguchi design. In Proceedings of the 14th International Conference on Instrumentation, Measurement, Circuits and Systems (IMCAS-14), Salerno, Italy (pp. 27-29)
[2] Vidakis et al. (2020). Surface roughness investigation of Poly-Jet 3D printing. Mathematics, 8(10), 1758.
[3] Kechagias et al. (1997). Estimation of build times in rapid prototyping processes. In 6th European Conference on Rapid Prototyping & Manufacturing, Nottingham (pp. 137-148).
[4] Chryssolouris et al. (1999). Surface roughness modelling of the Helisys laminated object manufacturing (LOM) process. In 8th European Conference on Rapid Prototyping and Manufacturing, Nottingham (pp. 141-152).
[5] Kechagias et al. (2022). Parametric optimization of material extrusion 3D printing process: an assessment of Box-Behnken vs. full-factorial experimental approach. The International Journal of Advanced Manufacturing Technology, 121(5), 3163-3172.
[6] Fountas et al. (2022). Modeling and optimization of flexural properties of FDM-processed PET-G specimens using RSM and GWO algorithm. Engineering Failure Analysis, 138, 106340.

Vita Leonessa

Title: ON A GENERALIZATION OF BERNSTEIN-DURRMEYER OPERATORS WITH JACOBI WEIGHTS

Abstract. The aim of this talk is to present a new sequence of positive linear operators which are a generalization of the Bernstein-Durrmeyer operators with Jacobi weights. In particular, we are interested in approximation properties of these operators in different function spaces, as well as their qualitative properties. A comparison between our operators with the Bernstein-Durrmeyer ones and a suitable modification of theirs, shows that, in suitable intervals, they provide a lower approximating error estimate. All results presented are taken from the paper "A modification of Bernstein-Durrmeyer operators with Jacobi weights on the unit interval" written in collaboration with M. Cappelletti Montano and accepted for publication in Trends in Mathematics.

Antonio-Jesus Lopez-Moreno

Title: ON A CONJECTURE OF G. T. THACHEV

Abstract. In [6], for the classical Bernstein operators, B_n, Thachev formulated the following conjecture:

$$\lim_{n \to \infty} \frac{B_n((e_1 - x)^{q+1}, x)}{B_n(\mid e_1 - x \mid^q, x)} = 0,$$

for all $q \in \mathbb{N}$. In this note we give some different proofs for this conjecture that can be applied for a general class of linear positive operators. We can also offer constants for the limit involved in the conjecture. We use techniques presented by Adell, Bustamante and Quesada [1], López and Gupta [3,4], Xiang [7] and others.

References

[1] Adell, J.A., Bustamante, J. and Quesada, Sharp upper and lower bounds for the moments of Bernstein polynomials, Appl. Math. Comput., 265 (2015) 723-732.

[2] Gavrea, I., Ivan, M. An answer to a conjecture on Bernstein operators, J. Math. Anal. Appl., 390 (2012) 86–92.

[3] Vijay Gupta and A.-J. Lopez-Moreno, Phillips operators preserving arbitrary exponential functions, e^{at}, e^{bt}, Filomat 32(14) (2018), 5071-5082.

[4] Lopez-Moreno, A.-J., Expressions, Localization Results, and Voronovskaja Formulas for Generalized Durrmeyer Type Operators, Mathematical Analysis I: Approximation Theory, (Neokant Deo at al. eds), Springer Proceedings in Mathematicas & Statistics, Volume 36, Springer Nature Singapore, 2020.

[5] Mourad E. H. Ismail and C. Ping May, On a family of approximation operators, J. Math. Anal. Appl., 63, (1978) 446-462.

[6] Tachev, G, T. The complete asymptotic expansion for Bernstein operators, J. Math. Anal. Appl., 385 (2012) 1179–1183.

[7] Xiang, J. X., Expansion of moments of Bernstein polynomials, J. Math. Anal. Appl. 476 (2019) 585-594.

Andra Malina

Title: UNIVARIATE SHEPARD OPERATORS COMBINED WITH LEAST SQUARES FITTING POLYNOMIALS

Abstract. We construct three new univariate Shepard operators using linear, quadratic and cubic polynomials in order to improve the approximation results of the Shepard method. The polynomials are constructed such that they fit the interpolation data in a weighted least squares approximation way.

Nesibe Manav Mutlu, Nursel Çetin

Title: ON SCHURER TYPE COMPLEX STANCU OPERATORS

Abstract. In this work, we examine some approximation properties of complex Stancu-Schurer operators. We obtain a quantitative

upper estimate for the simultaneous approximation and a qualitative Voronovskaja type result. Finally, we obtain the exact order of approximation by these operators attached to analytic functions in closed disks.

Alexandra Diana Meleșteu, Maria Dimitriu

Title: A STANCU TYPE GENERALIZATION OF THE BALAZS OPERATOR

Abstract. In this paper we investigate certain properties of Stancu type generalization of the Balazs operator.

Nicusor Minculete

Title: SEVERAL INEQUALITIES RELATED THE NUMERICAL RADIUS

Abstract. The aim of this presentation is to give new upper bounds of $\omega(T)$, which denotes the numerical radius of an operator T on a Hilbert space $(\mathcal{H}, \langle \cdot, \cdot \rangle)$. Next, we give certain inequalities about radius $\omega(S^*T)$.

Maryam Mohammadi, Mohammad Heidari, Stefano De Marchi

Title: ON THE NEW POSITIVE DEFINITE RBFs BY USING FOURIER COSINE TRANSFORM

Abstract. In this article, we introduce a new family of infinitely smooth positive definite (PD) radial basis functions (RBFs) by using the Fourier cosine transform of the squared of a completely monotone function. These bases are represented in terms of positive Borel measures and their Fourier transforms are also given. The proposed theory is used for reconstructing the well-known Matérn

RBF and presenting a new positive definite RBF. Numerical results show an accurate reconstruction of functions in which both the Runge and Gibbs phenomena are substantially mitigated.

Marta Enachioiu, <u>Gabriela Denisa Motronea</u>

Title: Positive solutions of algebraic systems with positive coefficients

Abstract. We consider a special family of nonlinear algebraic systems of equations with positive coefficients and investigate the existence of positive solutions. The uniqueness of a positive solution is also studied.

Ana-Maria Acu, Vijay Gupta, <u>Carmen Muraru Popescu</u>, Voichiţa Adriana Radu

Title: Post-Widder operators of semi-exponential type

Abstract. In the present work we deal with the Post-Widder operators of semi-exponential type. We provide an alternate simple approach of Laplace transform to capture such operators. We estimate some direct results and also consider a modification of these operators, so as to preserve linear functions.

Florin Felix-Nichita

Title: Yang–Baxter Equations, Computational Methods and Applications

Diana Otrocol

Title: Applications of fibre contraction principle to some classes of functional integral equations

Abstract. By a new variant of fibre contraction principle we give existence, uniqueness and convergence of successive approximations results for some functional integral equations. In the case of ordered Banach space, Gronwall-type and comparison-type results are also given.

Cristina Maria Pacurar

Title: On some operators appearing in fractal interpolation theory

Abstract. In this paper we study some operators that appear in fractal interpolation theory. Firstly, we present operators that are more general compared to the classical case, as the scaling in the y-coordinate is replaced by a non-linear contraction. Moreover, we study smooth operators that provide differentiable interpolation functions.

Vlad Paşca

Title: Voronovskaya type results for special sequences of operators

Abstract. The aim of this work is twofold. First, we present Voronovskaya type formulas that can be "differentiated" and other ones which are associated with operators preserving two prescribed functions. Then the Bernstein-Schnabl type operators L_n are considered. This sequence of positive linear operators was studied in the literature; we provide new properties of it. In particular, its Voronovskaya formula can be "differentiated" and each L_n is invariant under the Kantorovich type modification. The moments of each operator L_n form a sequence of Appell polynomials, while the central moments are constant functions. This is a joit work with A.M. Acu, M. Heilmann, I. Rasa and M. Dancs.

Radu Păltănea, Alexandra Diana Meleșteu

Title: ON A METHOD FOR UNIFORM SUMMATION OF THE FOURIER-JACOBI SERIES

Abstract. We point out that there is a matrix method of summation of Fourier-Jacobi series attached to all continuous functions, which is given by the representation of Durrmeyer operators with Jacobi weight. It is shown that this method of summation is stronger than the Cesaro methods of summation of all orders.

Ariana Pitea

Title: NUMERICAL RECKONING OF FIXED POINTS IN A GEOMETRIC FRAMEWORK

Abstract. Numerical schemes for the reckoning of fixed points with adequate properties are presented, regarding three step independent iterative procedures. Convergence results are established. A qualitative study is made, from the point of view of T-stability and data dependence.

Emilia Pop

Title: THE INTERMEDIATE POINT FROM A MEAN VALUE THEOREM

Abstract. In this paper we consider two continuous functions $f, g : [a, b] \to \mathbb{R}$ and we study for these ones, under which circumstances the intermediate point function is four order differentiable at the point $x = a$ and we calculate its derivate.

Dorian Popa

Title: ON SOME RESULTS IN ULAM STABILITY

Abstract. In this talk I will present some results in Ulam stability for some functional equations, differential operators and positive linear operators from the papers written in collaboration with Ioan Rasa.

George Popescu

Title: Rhaly Operators, Boundedness, Compactness, Zero Statistical Density

Abstract. We present a study upon Rhaly operators on Hilbert spaces, that is operators defined by "terraced matrices". We prove a necessary condition for a terraced matrix to define a bounded Rhaly operator, or a compact operator, involving subsequences with zero statistical density. We show that boundedness and compactness of Rhaly operators are reduced to study the Rhaly operators defined by subsequences of the reciprocal of natural numbers. This leads to study the reduced operators of the Cesaro operator and investigate harmonic series defined by subsequences of natural numbers with zero statistical density.

Heinz-Joachim Rack, Robert Vajda

Title: Algebraic construction of Zolotarev polynomials with interchanged parameters

Abstract. The inverse polynomial image (IPI) under the monic proper aka hard-core Zolotarev polynomial $Z(x;s)$ of degree $n > 1$, with prescribed parameter s, consists of $[-1, 1]$ and $[\alpha, \beta]$, and there is a point $\gamma(1 < \gamma < \alpha)$ at which the first derivative of $Z(x;s)$ vanishes. The four occurring parameters are interrelated by $(\alpha + \beta) = 2 * (\gamma + s)$ and $Z(x;s)$ was originally represented in terms of elliptic functions, see [1]-[5] for details. In [5] the problem is solved to construct by algebraic means the related Zolotarev polynomial $Z(x;\beta)$, with prescribed β. This amounts to determine the compatible α to retain the said IPI with a corresponding

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new $s = s_0$, say. We obtain here solutions for the two analogous problems: To construct by algebraic means $Z(x; \alpha)$ and $Z(x; \gamma)$, which amounts to determine the compatible β respectively α and β. Advantage is taken of reduced relation curves and the CAS Mathematica. This is joint work with Robert Vajda.

References

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Voichiţa Adriana Radu

Title: Voronovskaja type results for inverses of certain operators

Abstract. Inverses of certain positive linear operators have been investigated in several papers, in connection with problems like decomposition of classical operators, representation of Lagrange-type operators, asymptotic formulas of Voronovskaja type.

Motivated by such researches, we give some representations for the inverses of certain positive linear operators, as Bernstein, Beta, Bernstein - Durrmeyer, genuine Bernstein - Durrmeyer and Kantorovich operators.

Moreover, some Voronovskaja type formulas for the inverses of these operators are obtained.

Ioan Rasa

Title: Analytic inequalities and stochastic orders

Abstract. The talk is devoted to a family of analytic inequalities

connected with positive linear operators and stochastic orders. The results are formulated in analytic terms and/or probabilistic terms. This is a joint work with Ana Maria Acu.

Alexandru Mihai Bica, <u>Zoltan Satmari</u>

Title: Bernstein numerical method for solving nonlinear fractional and weakly singular Volterra integral equations of the second kind

Abstract. We will show a method of approximation for a fractional nonlinear Volterra integral equation. This method is based on Banach's Fixed Point Theorem. At each iteration step of this method, we will apply a Bernstein polynomial approximation of the functions involved in the integral. At the end of the article, we will demonstrate our results, providing some numerical examples.

Irina Savu

Title: Orbital Fuzzy Iterated Function Systems

Abstract. In this paper we introduce the concept of orbital fuzzy iterated function system and prove that the fuzzy operator associated to such a system is weakly Picard. An example is provided.

Ioan Cristian Buscu, <u>Andra Mihaela Seserman</u>

Title: Convergence of special sequences of positive operators

Abstract. Some modified sequences of positive linear operators converge to other positive linear operators. We present a general result in this direction and illustrate it by several examples.

Miruna-Stefana Sorea

Title: POINCARÉ-REEB GRAPHS OF REAL ALGEBRAIC DOMAINS

Abstract. An algebraic domain is a closed topological subsurface of a real affine plane whose boundary consists of disjoint smooth connected components of real algebraic plane curves. We study the non-convexity of an algebraic domain by collapsing all vertical segments contained in it: this yields a Poincaré-Reeb graph, which is naturally transversal to the foliation by vertical lines. Using an adapted version of a Weierstrass-type approximation theorem, we show that any transversal graph whose vertices have only valencies 1 and 3 and are situated on distinct vertical lines can be realized as a Poincaré-Reeb graph. This talk is based on joint work with Arnaud Bodin and Patrick Popescu-Pampu.

Ioan Cristian Buscu, Ancuța Emilia Şteopoaie

Title: VORONOVSKAJA TYPE RESULTS FOR GENERALIZED BASKAKOV OPERATORS PRESERVING MONOMIALS

Abstract. We consider generalized Baskakov operators preserving the constant function 1 and a monomial x^j. For them we establish Voronovskaja type results.

Florin Sofonea, Ioan Țincu

Title: CHARACTERIZATION OF P-CONVEX SEQUENCES OF HIGHER ORDER

Abstract. In this work is described a procedure that generates p-convex sequences of higher order.

Bianca Ioana Vasian

Title: APPROXIMATION PROPERTIES OF SOME NON-POSITIVE

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Kantorovich type operators

Abstract. In this paper we will establish a convergence result for some operators which are obtained as a Kantorovich modification of Szasz-Mirakjan operators. The operators obtained this way are not positive on the entire domain of definition.

Gabriel Prăjitură, <u>Andrei Vernescu</u>

Title: About uniform continuous functions which are not Lipschitz

Abstract. To approximate a function, some simpler functions are used: simpler as definitory structure (formula) and also as regularity, continuity and/or smoothness. Any Lipschitz function is a uniformly continuous function, but conversely it not always true. We add to the usual examples some other, especially of the class of differentiable functions.

<u>Mirela Vinerean</u>, Niclas Bernhoff

Title: Normal Discrete Velocity Models for Boltzmann Equation for Mixtures

Abstract. Discretization methods for Boltzmann equation (BE) have been developed on the idea of replacing the original equation by a finite set of nonlinear hyperbolic PDEs corresponding to the densities linked to a suitable finite set of velocities. Making a transition from the BE to its discrete version, we often gain some unphysical (spurious) conservation laws. The well-known theorem of uniqueness of collision invariants for the continuous velocity space R^d very often does not work for a finite set of discrete velocities. One open problem related to the discrete BE is the construction of normal (fulfilling only physical conservation laws) discrete velocity models (DVMs). In many papers on DVMs, authors postulate from the beginning that a finite velocity space with such properties is given and after that they study the discrete BE. Our aim is not

to study the equations for DVMs, but to discuss possible choices of finite sets of velocities satisfying this type of restrictions. In this presentation, we will address ways of constructing DVMs for mixtures.

Gianluca Vinti

Title: A MATHEMATICAL MODEL FOR THE STUDY OF VASCULAR PATOLOGIES

Abstract. I will present a mathematical model based on the study of some sampling type operators whose approximation results lead to applications to the reconstruction and the enhancement of digital images. These, in turn, will allow to solve a diagnostic problem, concerning vascular pathologies, studied within the CARE project.

Benaissa Zerroudi

Title: ENHANCING THE APPROXIMATION ORDER OF SHEPHERD OPERATORS THROUGH BARYCENTRIC COORDINATES

Abstract. This paper presents a new approach to constructing approximation operators, with cubic and quartic approximation order, which interpolates functional values on a set of scattered data. We based on a combination of multinodes Shepard basis functions with rational interpolants based on set of nodes. Numerical results show the efficiency and accuracy of the proposed operators and are implemented by fast algorithms that are useful in multiple applications.

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