
Πρόλογος

Το 18^ο Πανελλήνιο Συνέδριο Μαθηματικής Ανάλυσης αποτελεί κρίκο μιας αλυσίδας συνεδρίων με ιστορία μεγαλύτερη των 30 ετών. Ένας θεσμός ο οποίος δίνει την ευκαιρία σε επιστήμονες του ευρύτερου Τομέα της Μαθηματικής Ανάλυσης, αλλά και εφαρμογών αυτού, να επικοινωνήσουν τα αποτελέσματά τους, να ενημερωθούν για τις πιο πρόσφατες εξελίξεις, να εγείρουν νέα αναπάντητα προβλήματα. Παράλληλα είναι μία ευκαιρία κοινωνικοποίησης με νέους συναδέλφους και σύσφιξης σχέσεων με παλαιότερους. Τέλος, το εν λόγω συνέδριο δίνει βήμα σε υποψήφιους διδάκτορες και μεταπτυχιακούς φοιτητές να έχουν μία πρώτη εμπειρία παρουσιάζοντας το μέχρι στιγμής ερευνητικό τους έργο.

Ιστοσελίδα Συνεδρίου

<http://pcma2024.ee.duth.gr/>

Οργανωτική Επιτροπή

Σχοινάς Χρήστος (συντονιστής)
Στεφανίδου Γεσθημανή
Χαρίσης Δημήτριος
Αβραμίδου Δέσποινα

Επιστημονική Επιτροπή

Ανούσης Μιχάλης
Γιαννόπουλος Απόστολος
Καλογηράτου Ζαχαρούλα
Κοκολογιαννάκη Χρυσή
Κουμάντος Σταμάτης
Μπαρμπάτης Γεράσιμος
Μπετσάκος Δημήτριος
Παπαδόπουλος Βασίλειος
Παπασχοινόπουλος Γαρύφαλος
Σχοινάς Χρήστος
Σταυρουλάκης Ιωάννης
Τερτίκας Αχιλλέας

Κύριος Ομιλητής

[Χριστοδούλου Δημήτριος](#)

Ομιλητές

Σταυρουλάκης Ιωάννης (ΠΣΜΑ 1990-2024)

Ανούσης Μιχάλης

Γιαννακάκης Νίκος

Γιαννόπουλος Απόστολος

Γιαννούλης Ιωάννης

Δριβαλιάρης Δήμος

Κατάβολος Αριστείδης

Κουμάντος Σταμάτης

Κουτσογιάννης Ανδρέας

Λουβαρης Μιχάλης

Μαγιάτης Χαράλαμπος

Μαριδάκης Μανούσος

Ματσούκας Αλέξανδρος

Παναγάκου Βασιλίκη

Παρασκευάς Ιωάννης

Πετροπούλου Ευγενία

Πολυχρου Γιάννης

Πούλιασης Σταμάτης

Σακκαλής Παναγιώτης

Στεφανίδου Γεσθημανή

Σχοινάς Χρήστος

Τζιρτζιλιάκης Ευστράτιος

Τζιώτζιου Ναταλία

Τσιρίβας Νικόλαος

Φραντζής Δημήτρης

Φωτιάδης Ανέστης

Χατζηνικολάου Αλέξανδρος

Συμμετέχοντες

Ανδρούτσου Ιοκάστη
Δασκάλου Δημήτριος
Κοκολογιαννάκη Χρυσή
Κοφίνας Κωνσταντίνος
Λουκαΐδης Ανδρόνικος
Μάλλιαρης Ανδρέας
Παπαδημητρίου Χρήστος
Παπασχοινόπουλος Γαρύφαλος
Σκούρας Σταμάτιος
Χαρίσης Δημήτριος
Χωρικής Θεόδωρος

Πρόγραμμα Συνεδρίου

Παρασκευή 20-09-2024	
Έναρξη Συνεδρίου	
	Προεδρεύων: Β. Παπαδόπουλος
09:00-09:30	Εγγραφές-παραλαβή υλικού
09:30-10:00	Χαιρετισμοί Διοικητικών Αρχών ΔΠΘ
10:00-11:20	Δ. Χριστοδούλου (κύριος ομιλητής)
11:30-12:00	Διάλειμμα καφέ
	Προεδρεύων: Χρ. Σχοινάς
12:00-12:20	Ι. Σταυρουλάκης (ΠΣΜΑ 1990-2024)
12:20-12:40	Μ. Ανούσης
12:40-13:00	Στ. Κουμάντος
	Προεδρεύων: Γ. Παπασχοινόπουλος
13:00-13:20	Απ. Γιαννόπουλος
13:20-13:40	Π. Σακκαλής
13:40-14:00	Α. Κουτσογιάννης
14:00-16:00	Διάλειμμα
	Προεδρεύων: Ι. Σταυρουλάκης
16:00-16:20	Μ Μαριδάκης
16:20-16:40	Ν. Τσιρίβας
16:40-17:00	Α. Φωτιάδης
	Προεδρεύων: Αρ. Κατάβολος
17:00-17:20	Στ. Πουλιάσης
17:20-17:40	Αλ. Ματσούκας
17:40-18:00	Χ. Μαγιάτης
18:00-18:30	Διάλειμμα καφέ
	Προεδρεύουσα: Χ. Κοκολογιαννάκη
18:30-18:50	Ι. Πολυχρου
18:50-19:10	Δ. Φραντζής
19:10-19:30	Ν. Τζιώτζιου
21:00-23:00	Δείπνο συνεδρίου
Σάββατο 21-09-2024	
	Προεδρεύων: Μ. Ανούσης
09:00-09:20	Αρ. Κατάβολος
09:20-09:40	Ν. Γιαννακάκης
09:40-10:00	Ε. Τζιρτζιλιάκης
	Προεδρεύων: Απ. Γιαννόπουλος
10:00-10:20	Ε. Πετροπούλου
10:20-10:40	Ν. Παπαναστασίου
10:40-11:00	Ι. Γιαννούλης
11:00-11:30	Διάλειμμα καφέ
	Προεδρεύων: Στ. Κουμάντος
11:30-11:50	Αλ. Χατζηνικολάου
11:50-12:10	Μ. Λούβαρης
12:10-12:30	Ι. Παρασκευάς
	Προεδρεύων: Ε. Τζιρτζιλιάκης
12:30-12:50	Γ. Στεφανίδου
12:50-13:10	Δ. Αβραμίδου
13:10-13:30	Χρ. Σχοινάς
Λήξη συνεδρίου	

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9	Αβραμίδου Δ.	Asymptotic behavior of a system of max difference equations
10	Ανούσης Μ.	Norms of vector functionals
11	Γιαννακάκης Ν.	Campanato nearness and beyond
12	Γιαννόπουλος Α.	Ανισότητες για τον μετασχηματισμό Radon σε κυρτά σώματα
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16	Κουτσογιάννης Α.	Joint transitivity for linear iterates
17	Λούβαρης Μ.	Density of growth-rates of subgroups of a free group
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32	Τσιρίβας Ν.	Universal Taylor series on specific compact sets
33	Φραντζής Δ.	Θα σταλεί σύντομα
34	Φωτιάδης Α.	Harmonic diffeomorphisms between pseudo-riemannian surfaces
35	Χατζηνικολάου Α.	Operator systems, contextuality and nonlocality

The Formation of Black holes in General Relativity

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Abstract

I shall review my 2009 work which established the formation of closed trapped surfaces in general relativity in vacuum through the focusing of an incoming flux of gravitational waves. This work introduced the *short pulse* method which has since been successfully applied to other problems. I shall also discuss a subsequent result on black hole formation, which, while relying the existence theorem of my 2009 work, makes a different assumption on the incoming gravitational wave flux, giving further insight.

Keywords: Black holes, trapped surfaces, Einstein vacuum equations, non-linear systems of partial differential equations of hyperbolic type.

Asymptotic behavior of a system of max difference equations

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Abstract

In this paper we consider a system of two max difference equations. At first, we examine when the system has no solution and when the system has a unique solution under some specific conditions. In addition, we investigate the existence of an equilibrium and we study, in general, the asymptotic behavior of this system.

Keywords: Systems of Difference equations, equilibrium, stability, asymptotic behaviour.

Co-authors: G. Papaschinopoulos, C. J. Schinas, G. Stefanidou

Norms of vector functionals

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Abstract

We examine the question of when, and how, the norm of a vector functional on an operator algebra can be controlled by the invariant subspace lattice of the algebra. We introduce a related operator algebraic property, and show that it is satisfied by all von Neumann algebras and by all CSL algebras. We exhibit examples of operator algebras that do not satisfy the property or any scaled version of it.

Keywords: Operator algebra, invariant subspace lattice, vector functional.

Co-authors: N. Osawa, I. G. Todorov,

Campanato nearness and beyond

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Abstract

Nearness of an operator A to an operator B , which was introduced by Campanato, yields existence and uniqueness results for operator equations involving A exploiting the solvability of the same equations for B . In this talk we will try to present the origins of nearness, its main ideas and some recent developments.

Keywords: Cordes condition, nearness, strong solutions

Co-authors: D. Drivaliaris, Y. Karagiorgos

Inequalities for the Radon transform on convex sets

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Abstract

We discuss two proofs of the following inequality that unifies previous works on the properties of the Radon transform on convex bodies. Let K and L be star bodies in \mathbb{R}^n , let $0 < k < n$ be an integer, and let f, g be non-negative continuous functions on K and L , respectively, so that $\|g\|_\infty = g(0) = 1$. Then

$$\frac{\int_K f}{(\int_L g)^{\frac{n-k}{n}} |K|^{\frac{k}{n}}} \leq \frac{n}{n-k} (d_{\text{ovr}}(K, \mathcal{BP}_k^n))^k \max_H \frac{\int_{K \cap H} f}{\int_{L \cap H} g},$$

where $|K|$ stands for volume of proper dimension, the maximum is taken over all $(n-k)$ -dimensional subspaces of \mathbb{R}^n , and $d_{\text{ovr}}(K, \mathcal{BP}_k^n)$ is the outer volume ratio distance from K to the class of generalized k -intersection bodies in \mathbb{R}^n .

Keywords: Convex bodies; Sections; Radon transform; Intersection bodies.

Co-authors: A. Koldobsky, A. Zvavitch

Higher order corrections to the approximation of the 2d dual semi-geostrophic equation by the Euler vorticity equation

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Abstract

The dual semi-geostrophic equation is a coupled transport/Monge-Ampère system, while the 2d Euler equation in vorticity form is a coupled transport/Poisson system, which possesses smooth solutions globally in time. G. Loeper showed in 2006 that solutions of the former can be approximated by solutions of the latter up to an error of order $O(\varepsilon)$, $0 < \varepsilon \ll 1$, on time scales T/ε for any $T > 0$. We present recent results of ongoing work concerning the derivation and justification of equations describing the dynamics of higher order corrections to this leading order approximation up to any order $O(\varepsilon^k)$, $k \in \mathbb{N}$, thus refining the result of Loeper. This is joint work with Vasileios Kalivopoulos in the framework of a project financed by HFRI (ΕΛΙΔΕΚ).

Keywords: semi-geostrophic equation, Euler equation, higher order approximation, rigorous justification.

Co-authors: Vasileios Kalivopoulos.

Interaction of harmonic analysis with operator algebra theory: synthesis and related properties

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Abstract

A closed subset E of a locally compact group G is called a *set of synthesis* if every function f in the Fourier algebra $A(G)$ which vanishes on E can be approximated, in the norm of $A(G)$, by functions in $A(G)$ vanishing *near* E ; it is called a *set of local synthesis* if this approximation property holds for functions f of compact support.

These properties have analogous formulations in terms of linear spaces of operators on $L^2(G)$ which are bimodules over $L^\infty(G)$.

Given a continuous homomorphism $\alpha : G \rightarrow H$ between locally compact groups, we study the questions of *preservation*, by α or α^{-1} , of sets of synthesis and of local synthesis.

Our basic method is to express these properties in terms of operator bimodules over the L^∞ algebras of the groups. This *transfers* such preservation questions to questions of equivalence, in an appropriate sense, between the corresponding operator bimodules.

Our work belongs to the circle of ideas around the interaction of harmonic analysis with operator algebra theory initiated by Arveson. Some of our results extend or complement existing results of Ludwig, Shulman, Todorov and Turowska.

Keywords: Group homomorphism, Fourier algebras, Spectral synthesis, Operator synthesis, MASA bimodule.

Co-authors: M. Anoussis, D.K. Eleftherakis.

Higher order Thorin-Bernstein functions

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Abstract

Motivated by examples such as incomplete gamma and beta functions we introduce the class \mathcal{B}_λ of generalized Bernstein functions of positive order λ .

A function f defined on the positive half-line belongs to \mathcal{B}_λ if $x^{1-\lambda}f'(x)$ is a completely monotonic function, i.e. is a smooth function g defined on the positive half-line for which $(-1)^n g^{(n)}$ is positive for all $n \geq 0$.

We investigate fundamental properties of the classes \mathcal{B}_λ including their relation to generalized Stieltjes functions of order λ and approximating results. We study subclasses of generalized Bernstein functions related to complete Bernstein and Thorin-Bernstein functions. Representations in terms of incomplete beta and gamma as well as hypergeometric functions are presented. Several special cases and examples are discussed.

Keywords: Laplace transform, completely monotonic function, generalized Stieltjes function, generalized Bernstein function, Thorin-Bernstein function.

Co-authors: S. Koumandos, H. L. Pedersen

Joint transitivity for linear iterates

A. Koutsogiannis

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Abstract

In this talk we will establish sufficient and necessary conditions for the joint transitivity of linear iterates in a minimal topological dynamical system with commuting transformations. This result provides the first topological analogue of the classical Berend and Bergelson joint ergodicity criterion in measure-preserving systems.

Keywords: Joint transitivity, topological dynamics, transitivity, proximal relations.

Co-authors: S. Donoso (University of Chile), W. Sun (Virginia Tech)

Density of growth-rates of subgroups of a free group and the non-backtracking spectrum of the Configuration model

M. Louvaris

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Marne-la-Vallee

Abstract

In this talk we will prove that the set of growth-rates of subgroups of a rank r free group is dense in $[1, 2r - 1]$. Our main technical contribution is the probabilistic method. Specifically we prove a concentration result for the leading eigenvalue of the non-backtracking matrix in the configuration model, i.e. the uniform distribution amongst all graphs with a given degree sequence.

Keywords: Growth of groups, free groups, random graphs, random matrices, non-backtracking matrix, configuration model.

Co-authors: Daniel T. Wise, Gal Yehuda

Compact elements and the hypocompact radical of crossed products

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Abstract

We characterize the compact elements and the hypocompact radical of a crossed product $C_0(X) \times_{\phi} \mathbb{Z}$, where X is a locally compact metrizable space and $\phi : X \rightarrow X$ is a homeomorphism, in terms of the corresponding dynamical system (X, ϕ) .

Keywords: crossed products, compact elements, hypocompact radical.

Co-authors: M. Anoussis

A localization theorem for Dirac operators

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Abstract

We study perturbed Dirac operators of the form $D_s = D + s\mathcal{A} : \Gamma(E^0) \rightarrow \Gamma(E^1)$ over a compact Riemannian manifold (X, g) with symbol c and special bundle maps $\mathcal{A} : E^0 \rightarrow E^1$ for $|s| \gg 0$. Under a simple algebraic criterion on the pair (c, \mathcal{A}) , solutions of $D_s\psi = 0$ concentrate as $|s| \rightarrow \infty$ around the singular set $Z_{\mathcal{A}}$ of \mathcal{A} . We prove a spectral separation property of the deformed Laplacians $D_s^*D_s$ and $D_sD_s^*$, for $|s| \gg 0$. As a corollary we prove an index localization theorem.

Keywords: Dirac operator, asymptotic behaviour, spectral separation, concentration property, index localization.

THE DOUBLE-PHASE PROBLEM WITH A LINEAR GROWTH TERM

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Abstract

In recent years, the interest for double-phase problems was revived and they have become the focus of extensive research. The terminology double-phase problems is used in the literature to describe problems driven by a differential operator of the form

$$-\Delta_p u - \Delta_q^a u = -\operatorname{div} (|\nabla u|^{p-2} \nabla u + a(x) |\nabla u|^{q-2} \nabla u)$$

where $1 \leq p < q < N$ and the weight function $a \in L^\infty(\Omega)$ is $a \geq 0$ a.e. and not separated from 0. Double-phase problems enjoy the interesting feature of obeying to non-standard growth conditions of (p,q)-type.

Although, there is by now a rich literature dealing mostly with the case when $p > 1$, the development of a well-posedness theory for the limiting case $p=1$ remains so far elusive. The aim of this talk is to discuss some recent progress made in this direction.

Based on joint work with Nikos Yannakakis and on ongoing work with Michał Łasica and Wojciech Górny.

Keywords: BV functions, generalized Orlicz growth, double-phase problem, characterization of the subdifferential

Exhaustive Families of Functions

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Abstract

The notion of continuity of a function is very important in Mathematical Analysis. In the middle of 19th century Weierstrass and Heine introduced the strict definition of the continuity. Since the assertion "that the pointwise limit of a sequence of continuous functions is a continuous function" was false a question arise: When a limit function of a sequence of continuous functions is continuous? and in a more general setting: When a limit function of a sequence of arbitrary functions is continuous? We will give a complete answer of this question using the notion of exhaustiveness. Also we give a characterization of a pseudocompact space using the new notion of B-exhaustiveness.

Fock covariance for product systems and the Hao–Ng isomorphism problem

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20/09/2024

Abstract

We provide a characterisation of equivariant Fock covariant injective representations for product systems. We square this characterisation with established results concerning Fock covariance, on compactly aligned product systems over right LCM semigroups and on product systems with one-dimensional fibers. Using our characterisation we resolve the reduced Hao–Ng isomorphism problem for generalised gauge actions by discrete groups.

Keywords: Product systems, Fock space, Crossed products of operator algebras.

Co-authors: Evgenios Kakariadis

Bounds for functions involving ratios of modified Struve functions

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Abstract

Several bounds are given for the functions $s_\nu(x) = \frac{L_{\nu-1}(x)}{xL_\nu(x)}$, $g_\nu(x) = \frac{L'_\nu(x)}{L_\nu(x)}$ and $f_\nu(x) = \sum_{n=1}^{+\infty} \frac{2}{x^2 + h_{\nu,n}^2}$ where $h_{\nu,n}$ is the n th positive zero of the Struve function $H_\nu(x)$ and $L_\nu(x)$ is the modified Struve function of the first kind. The results are obtained using the Mittag-Leffler expansion for the modified Struve functions.

Keywords: Modified Struve functions, ratios, bounds, inequalities.

Co-authors: D. A. Frantzis, C. G. Kokologiannaki

Exact solutions of the Sinh-Gordon type equations

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Abstract

We study a sinh-Gordon type equation. By suitable choice of the constants, this equation turns into the hyperbolic and elliptic versions of the sine-Gordon and sinh-Gordon equations on the real plane. We construct solutions to this equation via the method of functional separation. We prove that these are the only families that have the property of functional separation and so we obtain a classification. To this end, we construct new families of solutions for the hyperbolic and elliptic versions of both sine and sinh Gordon equations in a unified way. Also, we construct an Auto-Bäcklund transformation to construct new solutions. Finally, we apply the Hirota method to obtain the soliton solutions for this equation.

Keywords: sinh-Gordon equation, sine-Gordon equation, Bäcklund transformation, Auto Bäcklund transformation, Hirota method.

Joint work with: A. Fotiadis

Dirichlet spaces with superharmonic weights

S. Pouliasis

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Abstract

The topic of this talk will be Dirichlet spaces D with superharmonic weights of holomorphic functions on the unit disc and the Möbius invariant spaces $M(D)$ generated by them. We will give norm estimates depending on the total Riesz mass of the superharmonic weight and characterize the cases where equality occurs. Also, we will discuss the relation of the spaces $M(D)$ with classical Möbius invariant spaces and describe some classes of inner functions contained in them.

Keywords: Dirichlet spaces, superharmonic weights, Carleson measures, composition operators, inner functions.

Co-authors: G. Bao, N. G. Goguss, J. Mashreghi, and H. Wulan.

Polynomials and degrees of maps in real normed algebras

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August 3, 2024

Abstract

Let \mathcal{A} be the algebra of quaternions \mathbb{H} or octonions \mathbb{O} . In this talk an elementary proof will be given, based on ideas of Cauchy and D' Alembert, of the fact that an ordinary polynomial $f(t) \in \mathcal{A}[t]$ has a root in \mathcal{A} . As a consequence, the Jacobian determinant $|J(f)|$ of f is always **non negative** in \mathcal{A} . Moreover, using the idea of the topological degree we show that a regular polynomial $g(t)$ over \mathcal{A} has also a root in \mathcal{A} . Finally, utilizing multiplication $(*)$ in \mathcal{A} , we prove various results on the topological degree of products of maps. In particular, if S is the unit sphere in \mathcal{A} and $h_1, h_2 : S \rightarrow S$ are smooth maps, it is shown that $\deg(h_1 * h_2) = \deg(h_1) + \deg(h_2)$.

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**ΠΑΝΕΛΛΗΝΙΑ ΣΥΝΕΔΡΙΑ ΜΑΘΗΜΑΤΙΚΗΣ ΑΝΑΛΥΣΗΣ:
1990-2024
PAN-HELLENIC CONFERENCES ON MATHEMATICAL ANALYSIS**

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ΠΕΡΙΛΗΨΗ, ABSTRACT

*Παρουσιάζεται μία, όσο το δυνατόν, ακριβής ιστορική αναδρομή των Πανελληνίων
Συνεδρίων Μαθηματικής Ανάλυσης από το 1990 μέχρι σήμερα.*

*A historical review of all Pan-Hellenic Conferences on Mathematical Analysis
since 1990 is presented.*

On a generalized cyclic-type system of difference equations with maximum

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Abstract

In this paper we investigate the behaviour of the solutions of the following k -dimensional cyclic system of difference equations with maximum:

$$x_i(n+1) = \max\left\{A_i, \frac{x_i^p(n)}{x_{i+1}^q(n-1)}\right\}, \quad i = 1, 2, \dots, k-1,$$
$$x_k(n+1) = \max\left\{A_k, \frac{x_k^p(n)}{x_1^q(n-1)}\right\}$$

where $n = 0, 1, \dots$, $A_i > 1$, for $i = 1, 2, \dots, k$, whereas the exponents p, q and the initial values $x_i(-1), x_i(0)$, $i = 1, 2, \dots, k$ are positive real numbers.

Keywords: difference equations with maximum, cyclic system, equilibrium, eventually equal to equilibrium.

Co-authors: G. Papaschinopoulos

Stability and flip bifurcation of a three dimensional exponential system of difference equations

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Abstract

In this paper, we study the stability of the zero equilibrium and the occurrence of flip bifurcation of the following system of difference equations:

$$x_{n+1} = a_1 \frac{y_n}{b_1 + y_n} + c_1 \frac{x_n e^{k_1 - d_1 x_n}}{1 + e^{k_1 - d_1 x_n}},$$

$$y_{n+1} = a_2 \frac{z_n}{b_2 + z_n} + c_2 \frac{y_n e^{k_2 - d_2 y_n}}{1 + e^{k_2 - d_2 y_n}},$$

$$z_{n+1} = a_3 \frac{x_n}{b_3 + x_n} + c_3 \frac{z_n e^{k_3 - d_3 z_n}}{1 + e^{k_3 - d_3 z_n}}$$

where a_i, b_i, c_i, d_i, k_i , for $i = 1, 2, 3$, are real constants and the initial values x_0, y_0 and z_0 are real numbers. We study the stability of this system in the special case when one of the eigenvalues is equal to -1 and the remaining eigenvalues have absolute value less than 1, using center manifold theory.

Keywords: Difference equations, stability, flip bifurcation, center manifold, dynamical systems, discrete dynamics.

Co-authors: C. Mylona, G. Papaschinopoulos

2D Channel Flow Machine–Learning Modelling

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Abstract

The integration of Artificial Neural Networks (ANNs) has garnered significant interest, capitalizing on their ability to discern intricate patterns within data. Focused on enhancing computational efficiency, this article explores the application of ANNs in modelling the benchmark problem of 2D channel fluid flow. This flow problem, albeit simplified, is governed by a coupled non–linear system of PDEs along with corresponding boundary conditions. Thus, the minimum but sufficient problem complexity is assured. The utilization of a Multi-layer Perceptron (MLP) as the chosen ANN architecture showcased its ability to capture intricate patterns and relationships within the fluid dynamics of various settings of the studied fluid flow. Trained with numerically–generated data, the MLP demonstrated its capacity to serve as a fast and accurate surrogate for conventional numerical simulations, both for interpolation and extrapolation estimations and for various grid resolutions.

Keywords: 2D Fluid Flow, Artificial Neural Networks, Machine Learning

Co–authors: T. Aravanis, G. Chrimatopoulos, M. Xenos

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Inequalities for sections and projections of log-concave functions

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We provide extensions of geometric inequalities about sections and projections of convex bodies to the setting of integrable log-concave functions. Namely, we consider suitable generalizations of the affine and dual affine quermassintegrals of a log-concave function f and obtain upper and lower estimates for them in terms of the integral $\|f\|_1$ of f , we give estimates for sections and projections of log-concave functions in the spirit of the lower dimensional Busemann-Petty and Shephard problem, and we extend to log-concave functions the affirmative answer to a variant of the Busemann-Petty and Shephard problems, proposed by V. Milman.

Keywords: log-concave functions, sections and projections, affine and dual-affine quermassintegrals.

Universal Taylor series on specific compact sets

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Abstract

It is well known that there exist holomorphic functions f on the open unit disc \mathbb{D} for which the sequence $(S_n(f))$ of partial sums of its Taylor series with center 0 approximate all the polynomials on *all* compact subsets $K \subset \mathbb{C} \setminus \mathbb{D}$ with connected complement and this result fails, if we consider the sequence of the weighted partial sums $(2^n S_n(f))$ instead of $(S_n(f))$. In the present talk we show that there exist holomorphic functions f on \mathbb{D} for which the sequence $(2^n S_n(f))$ approximate all the polynomials on *only some specific compact sets* K . The geometry of K plays a crucial role. We also generalize these results for weights other than 2^n and on arbitrary simply connected domains.

Keywords: Universal series, Universality, Bernstein-Walsh Theorem, over-convergence, asymptotic convergence factor.

On the zeros of derivatives of Bessel functions

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Abstract

In this paper the positive zeros of $J_\nu'''(x)$ and $J_\nu^{(n+1)}(x)$ are studied by using classical analysis and the properties of $J_\nu(x)$. It is proved that $J_\nu'''(x)$ has a unique zero in specific intervals. Regarding $J_\nu^{(n+1)}(x)$, it is proved that its positive zero $j_{\nu,m}^{(n+1)}$ is an increasing function with respect to ν , for $\nu > n$. Moreover, the first two Rayleigh sums for $j_{\nu,m}^{(n)}$ are calculated. The obtained results extend and complement previously known results and also answer an open problem regarding the monotonicity of $j_{\nu,m}^{(n)}$. As a consequence of these results, a lower bound for $j_{\nu,1}^{(n+1)}$ is deduced, as well as an inequality between $j_{\nu,1}^{(n+1)}$ and $j_{\nu,1}^{(n)}$.

Keywords: Bessel functions, derivatives, zeros, location, monotonicity.

Co-authors: Chrysi G. Kokologiannaki, Eugenia N. Petropoulou

Harmonic diffeomorphisms between pseudo-riemannian surfaces

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Abstract

We study locally harmonic maps between pseudo-Riemannian surfaces. These maps are classified by the classification of the solutions of a generalized sine-Gordon equation. We then study the one-soliton solutions of this equation and we find the corresponding harmonic maps in a unified way. Finally, we discuss a Backlund transformation of the harmonic map equations that provides a connection between the solutions of two sineGordon type equations.

Keywords: Harmonic maps, pseudo-Riemannian surfaces, generalized sine-Gordon equation.

Operator systems, contextuality and nonlocality

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Abstract

Nonlocality and contextuality are arguably some of the most interesting phenomena of quantum mechanics. Nonlocality has been studied extensively during the past decade via the setup of nonlocal games, uncovering connections between operator algebras and quantum information theory, among which being the equivalence of Connes's embedding problem with Tsirelson's problem. We show how operator algebraic constructions and methods can be used to describe several features of contextuality. This approach generalises many of the well known results in nonlocal games. Also, we provide equivalences of Connes's embedding problem in terms of tensor products of operator systems and C^* -algebras arising from contextuality scenarios.

Co-authors: M. Anoussis, I. G. Todorov