INTERNATIONAL CONFERENCE ON TOPOLOGY AND ITS APPLICATIONS

28.07 – 1.08.2024, Ohrid, N. Macedonia

A B S T R A C T S

Cantor Connectedness of Uniform Spaces

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The first definition of connectedness was given by Cantor in the second half of 19th century.

We spread the Cantor definition to uniform spaces and show that it is equivalent to standard definition:

A uniformly connected space is a uniform space X such that every uniformly continuous function from X to a discrete uniform space is constant. A uniform space X is called uniformly disconnected if it is not uniformly connected.

By this, is justified to use the notion Cantor connectedness for uniform connectedness. We prove several properties of Cantor connectedness for uniform spaces, using the notion of chain.

Change of basepoint of the proximate fundamental group

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For a covering $\mathcal{V}$ of Y, the function $f : X \to Y$ between two topological spaces is said to be $\mathcal{V}$ -continuous at $x \in X$ if there exists a neighborhood U_x of x and $V \in \mathcal{V}$ such that $f(U_x) \subseteq V$. The function is said to be $\mathcal{V}$ -continuous if it is $\mathcal{V}$ continuous at each point of the domain.

For a covering $\mathcal{U}$ of the topological space X and $U \in \mathcal{U}$, the star of U is the set $\text{st}U = \cup\{x \in W \mid W \in U, W \cap U \neq \emptyset\}$. By st $\mathcal{U}$ we denote the collection of all st$U$ sets, for each $U \in \mathcal{U}$.

The st $\mathcal{U}$ -continuous function u: $I \to X$ which is $\mathcal{U}$ -continuous on ∂I is called a $\mathcal{U}$ -path in X between $x=u(0)$ and $y=u(1)$. We prove that a topological space X is connected if and only if for any covering $\mathcal{U}$ of X there exists a $\mathcal{U}$ -path between any two points in X.

We apply this result on proving the change of basepoint theorem in the case of proximate fundamental group.

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The Hurwitz space of $PSL(5, q)$

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Let q be a prime power and $g \leq 2$. In this article, we assume that G is a finite group with $PSL(5, q) \leq G \leq Aut(PSL(5, q))$ and G acts on the projective points of 4-dimensional projective geometry $PG(4, q)$. We show that G possesses no genus g group if $q > 3$. Furthermore, the connectedness of the Hurwitz space $H_r^{\text{in}}(G)$ are studied for these groups that possess genus zero and one.

Topological direct sum of subspaces

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We define and investigate a topological direct sum of subspaces of a normed space X. Using a connection between this sum and the decomposition of the identity operator, we discuss the appropriate matrix form of a bounded linear operator on X. We emphasize the cases when X is a Banach or Hilbert space. The infinite topological direct sum of subspaces is considered as a particular case.

Proximate Approximative Retracts in Compact Metric Spaces

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Retracts are fundamental concepts in topology that help in understanding the structure and properties of spaces. A retract of a topological space *X* is a subspace *A* with a continuous map (retraction) from *X* onto *A* that leaves *A* fixed. This notion is crucial as it provides insights into simplifying spaces while retaining essential topological features.

This paper introduces the concept of proximate approximative retracts (proxAR) in compact metric spaces. It discusses definitions and properties of various retraction types, including proximate retracts (PR), approximative proximate retracts (APR), weak retracts (WR), and approximative weak retracts (AWR) (for definitions, see [1]). The relationships between these retraction types and proxAR are explored.

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[1] Jacek Klisowski. A survey of various modifications of the notions of absolute retracts and absolute neighborhood retracts. Colloquium Mathematicum 46.1 (1982): 23-35.

Fuzzy SSPO-separation Axioms and a new form of fuzzy compactness

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In this paper, we introduce the concept of new separation axioms named fuzzy SSPO-separation axioms by using the fuzzy strongly semi pre-open sets and we also introduce and investigate properties of a new form of fuzzy compactness, α-SSPO compactness. We define and investigate the relation between fuzzy separation axioms, fuzzy pre-separation axioms, and different forms of fuzzy continuous mappings. We also investigate the existence of a countable base of fuzzy strongly semi pre-open sets, we define the concept of $SSPO$ separability, the concept of $\alpha - SSPO$ Lindelof sets and examine their properties. With the concepts of fuzzy strong semi pre-continuity, SSPO-irresolute continuous mappings, and other forms of fuzzy continuity, we investigate the new concept of fuzzy compactness and its properties in regard to the mentioned mappings.

Directional Stockwell transform and its desingularization formula

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In this paper, we introduce and study the directional Stockwell transform (DST) as a hybrid of the directional short-time Fourier transform and the ridgelet transform. We prove an extended Parseval identity and a reconstruction formula for this transform, as well as results for the continuity of both the DST and its synthesis transform on the appropriate space of test functions. We also develop a distributional framework for the DST on the Lizorkin space of distributions. Additionally, a connection of the DST with the Stockwell transform and the Radon transform is established and a desingularization formula is provided.

The vector equilibrium problem for posets

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By using the notions of upper and lower order preserving set-valued mappings we establish some fixed point theorems in partially ordered sets equipped with the hull-kernel topology. Then we provide a solution of the vector equilibrium problem. The main results of this article can be viewed as the set-valued versions of some theorems of Tarski.

On sequence convergence in (3,j)-metric spaces, j∈{1,2}

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In this article, we show that a convergent sequence in (3,2)-metric spaces has a unique limit. We give several examples in (3,1,ρ)-metric spaces and (3,1)-metric paces in which a convergent sequence has more than one limit. We obtain sufficient conditions for a sequence in (3,1)-metric space to have a unique limit.

A Measure-Theoretic Perspective on Almost Periodicity

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In this talk, we explore various classes of multi-dimensional almost periodic type functions and their generalizations in general measure, delving into their structural insights and applications. We introduce new classes of multi-dimensional $(\rho,m')-$ almost periodic type functions, highlighting their structural properties and practical applications in abstract Volterra integro-differential inclusions within Banach spaces. Additionally, we discuss their applications in semilinear Volterra integro-differential inclusions, providing a comprehensive overview of their significance in mathematical analysis and beyond.

Chain connetedness in a family of sets

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In [1] the notion of a chain connected set in a topological space is given. In [2] the notion of a chain connected set in a family coverings space i.e. a space that consists of a set and a family of coverings of the set, is introduced.

In this paper we will define chain connectedness of a family of sets. If the union of the elements of the sets is considered as a set X, and family of the sets as a covering of the sets X, we obtain an one covering space. Two sets are chain connected in the family, if they contain two elements, respectivelly, which are chain-related in the one covering space.

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Higher order proximate groups

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Using the intrinsic definition of shape based on proximate sequences for compact and all topological spaces based on proximate nets indexed by open coverings in the paper Shekutkovski et all. [1], we define proximate fundamental group. In this paper the proximate groups of higher order will be introduced.

References:

[1] N. Shekutkovski, A. Velkoska, One Invariant of Intrinsic Shape, Filomat 29:10 (2015), 2185–21

Relations among G-metric spaces and (3,j)-metric spaces and [3,Δ,j]-metric spaces, j$\in${1,2}

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We examine the relations among G-metric spaces and (3,j)-metric spaces and [3,Δ,j]-metric spaces, for j$\in${1,2}. We show that a G-metric is a 3-metric and and is a [3,Δ,1]-metric, and that a G-symmetric is a [3,Δ,2]-metric. We give examples of: a G-metric that is not a [3,Δ,2]-metric; a [3,Δ,2]-metric that is not a G-metric; and a [3,Δ,1]-metric that is not a G-metric.

Optimized Graphene Production and Layer Determination Using Machine Learning-Enhanced Electrochemical Methods

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Graphene, a revolutionary material, has attracted significant interest for its amazing properties and potential applications. This research aims to design, develop, and optimize cost-effective, high-quality graphene production through electrochemical methods and determine its number of layers. Graphene samples were produced by electrolysis in molten salts using nonstationary current regimes.
The study focuses on optimizing graphene production by electrolysis in molten salts, utilizing constant and reversing cell voltage, as well as constant and reversing overpotential methods. Compared to other processes, this electrolysis method is simpler, more ecological, and economical. It offers control over parameters like electrolyte type, applied voltage, current density, temperature, and graphite type.
A tree-based Machine Learning (ML) model describes the relationship between these parameters and graphene quality. The model, trained with production process parameters as inputs and graphene quality as the target variable, uses expert-provided quality labels. The extracted rules from the ML model guide optimal graphene production, achieving high-yield, cost-effective results.
An equation-based model was also used to calculate theoretical 002 X-ray diffraction (XRD) peak intensities, enhanced by partitioning the 2θ interval for improved accuracy. The model curves fit well with the XRD intensities of the quality 3 graphene samples. The parameters used in the equation allowed for

determining the number of graphene layers. Results align with Raman spectra C-peak position values, indicating the graphene samples are few-layered.

This integrated approach of theoretical modeling, electrochemical methods, and machine learning enhances the precision of layer determination and improves the efficiency and cost-effectiveness of graphene production.

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Functions preserving Cantor connectedness

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In [2], several theorems and examples are stated, considering functions preserving connectedness and functions preserving path connectedness In [1] is staed the following

Theorem : Suppose X is Hausdorff,locally path-connected and 1-countable, Y is Hausdorff, and f: X→Y a function. Then f is continuous iff f preserves compactness and f preserves path connectedness.

In this paper the notion of functions preserving Cantor connectedness is introduced, and discussed results similar to those tin [1] and [2] .

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Topological Data Analysis and Decision Trees for Breast Cancer Detection using Thermal Images

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In our research, we propose an innovative method for analyzing thermal images for breast cancer detection using machine learning. By implementing features extracted from Topological Data Analysis (TDA), we aim to boost the diagnostic precision and consistency of thermal imaging. Our dataset consists of thermal images from breast cancer patients, from which we isolate essential topological characteristics that encapsulate the inherent geometric and structural details. Subsequently, these TDA features are incorporated into our decision tree model to attain a classification precision of 92%. This highlights the potential of merging TDA with machine learning algorithms in medical image analysis. Our results indicate that the addition of topological features can significantly enhance the capabilities of conventional imaging methods, establishing a robust foundation for early and precise detection of breast cancer.

Uniformly paracompactness of ordered uniform spaces

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A triple is called an ordered uniform space if:
1. The uniformity generates on interval topology;
2. The uniformity has a base , each covering of which consists of intervals [1].
In this case the uniformity is called an ordered uniformity of the ordered space . Ordered topological space is understood as a linearly ordered set, endowed with the interval topology, and the interval is any convex subset which is open in the interval topology.
If the covering of an ordered space consists of intervals, then covering is called interval.
Let be an ordered uniform space.
An ordered uniform space is said to be (countable) uniformly paracompact if every of its (countable) open interval covering has uniformly locally finite open refinement. An ordered uniform space is said to be strongly uniformly paracompact if every of its open interval covering has uniformly star finite open refinement.

Theorem 1. For an ordered uniform space the following conditions are equivalent:
1) Ordered uniform space is strongly uniformly paracompact;
2) Ordered uniform space is uniformly paracompact.

Theorem 2. Any ordered uniform space is countable uniformly paracompact.

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