International Conference

on

Topology and Geometry

in honor of Prof. Tej Bahadur Singh on the occasion of his retirement

November 23-24, 2017

Sponsored by

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University of Delhi, Delhi

Organized by

Department of Mathematics
(UGC-SAP/DST-FIST/DST-PURSE)
University of Delhi, Delhi

Prof. Tej Bahadur Singh

Dr. Tej Bahadur Singh received his master's degree from the University of Delhi, Delhi in 1973 and doctorate degree from the University of Allahabad, Allhabad in 1983. In 1988 he joined the Department of Mathematics, University of Delhi as Reader and become Professor in 2001. Prior to this, he served University of Allahabad and Atarra P.G. College, Banda as Lecturer. He has written several research articles on the cohomological theory of compact transformation groups and has guided several M. Phil. and Ph. D. students. He has taught graduate courses on Module Theory, Field Theory, Commutative Algebra, General Topology and Algebraic Topology. He has also written a text book entitled "*Elements of Topology*" which is published by Taylor and Francis.

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University of Glasgow, U.K.

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About the Department

In University of Delhi, Department of Mathematics was started in 1947 and in 1957 a post-graduate course in Mathematical Statistics was initiated. The department was therefore renamed as Department of Mathematics and Mathematical Statistics. In 1963 a two year postgraduate course in Operational Research was instituted under this department. As such the department expanded considerably and so did its activities. Consequently in December 1964 the Faculty of Mathematics was formed and in August 1973 the only department under the Faculty was divided into four departments, viz., Department of Mathematics, Department of Statistics, Department of Operational Research, and Department of Computer Science.

The impressive tradition of the Department of Mathematics derives its roots from the east which predates the formation of the post graduate department. Encompassed within the tradition are names such as P. L. Bhatnagar, J. N. Kapur, A. N. Mitra, and B. R. Seth, all of whom distinguished themselves by their teaching and research and who later carved out major roles for themselves on the Indian mathematical scenario even though they were not directly associated with the post-graduate department.

The post-graduate department was set up in 1947. It was fortunate to have Professor Ram Behari as its first head. Prof. Ram Behari was an eminent mathematician who specialised in the important field of Differential Geometry. He can be credited with having started the tradition of research in Differential Geometry, one of the first disciplines in pure mathematics to have been pursued in the department. He guided a number of research scholars and established the high traditions of teaching in the department. During his tenure, in 1957, the department also initiated an M.A./M.Sc. program in Mathematical Statistics and the department was designated as the Department of Mathematics and Mathematical Statistics.

In 1962, the department was given a formidable push when a distinguished mathematician, Prof. R. S. Varma, assumed the responsibilities of the head. It was entirely due to his dynamism and academic breadth that research activities in the department blossomed in several directions such as Operational Research, Information Theory, Coding Theory, Space Dynamics and in Complex Analysis. The first masters program in Operational Research in the country was started in this department under his leadership. This was even before any university in the U.K. and in several other advanced countries had done so. Since the activities and the courses in the department were now so wide and varied the department was enlarged into the Faculty of Mathematics at the initiative of Prof. R. S. Varma and he was appointed as the first Dean.

In 1970, another distinguished mathematician, Prof. U. N. Singh, was appointed the Head of the Department and the Dean of the Faculty of Mathematics. He provided the department with the requisite strength and depth in the core areas of mathematics. He created strong research in Functional Analysis, Harmonic Analysis, and in Operator Theory. During his stewardship of the department, several distinguished mathematicians from all over the globe began to visit the department regularly and the department can be said to have attained full maturity. He foresaw the need to have separate departments within the overall set-up of the Faculty of Mathematics and thus were created, in 1973, the Department of Mathematics, the Department of Statistics, the Department of Operational Research and the Department of Computer Science. The Faculty of Mathematics was re-designated as the Faculty of Mathematical Sciences.

The Department currently offers M.A./M.Sc. courses and runs M.Phil., and Ph.D. programs in Mathematics.

Faculty and their Research Specializations

The area(s) of expertise of the faculty members of the department are given below

Professors	
Dinesh Singh dsingh@maths.du.ac.in	Banach Algebras, Complex Analysis, Functional Analysis
Tej B. Singh (retired) tbsingh@maths.du.ac.in	Algebraic Topology
Ajay Kumar akumar@maths.du.ac.in	Harmonic Analysis, Complex Analysis, Operator Algebras
V. Ravichandran (HOD) vravi68@gmail.com	Complex Analysis
Tarun Das tarukd@gmail.com	General Topology, Dynamical systems and Ergodic Theory
C. S. Lalitha cslalitha1@gmail.com	Mathematical Programming, Optimization Theory
Ruchi Das rdasmsu@gmail.com	General Topology, Dynamical Systems and Ergodic Theory

Associate Professors	
Sachi Srivastava sachi_srivastava@yahoo.com	Functional Analysis, Operator Theory, Abstract Differential Equations, Operator Algebras
Vusala Ambethkar vambethkar@maths.du.ac.in	Computational Fluid Mechanics

Assistant Professors	
Ratikanta Panda rkpanda@maths.du.ac.in	Analysis of PDE, Nonlinear Functional Analysis
A. Zothansanga azothansanga26@yahoo.com	Functional Analysis
Lalit Kumar lalitkvashisht@gmail.com	Frames, Wavelets, Functional Analysis
Anupama Panigrahi anupama.panigrahi@gmail.com	Number Theory, Cryptography, Information Security
Arvind Patel apatel@maths.du.ac.in	Fluid Dnamics, Computational Fluid Dynamics, PDE
Kanchan Joshi kanchan.joshi@gmail.com	Algebra: Non-Commutative Group Rings
Atul Gaur agaur@maths.du.ac.in	Commutative Algebra
Hemant Kumar Singh hksinghdu@gmail.com	Algebraic Topology
Anuj Bishnoi anuj.bshn@gmail.com	Field Theory and Polynomials
Pratima Rai pratimarai5@gmail.com	Numerical analysis, Differential equations
Sachin Kumar sachinambariya@gmail.com	Differential Equations, General Relativity
Surendra Kumar surendraiitr8@gmail.com	Ordinary differential equations, Systems theory; control
Ranjana Jain rjain.math@gmail.com	Functional Analysis, Operator Spaces, Operator Algebras
Randheer Singh randheernsit@gmail.com	Partial Differential Equations, Nonlinear Waves

Programme

Day 1: November 23, 2017

Venue: Room No. 5, Satyakam Bhavan

Session I: Welcome	
09:00 am - 09:30 am	Registration
09:30 am - 10:30 am	Inauguration & Felicitations of Prof. Tej B. Singh
10:30 am - 11:00 am	**High Tea**
Session II: Invited Talks **Chair:** Prof. Ravi Kulkarni	
11:00 am - 12:00 pm	*On counterexample to Tverberg Theorem given by Florian Frick* Prof. Satya Deo Harish-Chandra Research Institute, Allahabad
12:00 pm - 12:45 pm	*Topology of generalized Dold manifolds* Prof. P. Sankaran Institute of Mathematical Sciences, Chennai
12:45 pm - 01:30 pm	*Intersection lattices of 4-manifolds with boundary: some applications and problems* Dr. Brendan Owens University of Glasgow, U. K.
01:30 pm - 02:30 pm	**Lunch**
Session III: Invited Talks **Chair:** Prof. Ruchi Das	
02:30 pm - 03:15 pm	*Equivalence classes of piecewise monotonic real continuous functions* Prof. V. Kannan University of Hyderabad, Hyderabad
03:15 pm - 04:00 pm	*On classification of higher dimensional manifolds* Prof. Himadri Mukerjee North Eastern Hill University, Shillong
04:00 pm - 04:45 pm	*Cofibrations in the category of graphs* Dr. Rekha Santhanam Indian Institute of Technology, Bombay
04:45 pm - 05:15 pm	**Tea**

Day 1: November 23, 2017

Session IV: Paper Presentations **Chair:** Dr. Samik Basu	
05:15 pm - 06:30 pm	**Paper Presentation**
Conference Dinner	
07:30 pm	**Venue: University Guest House**

Day 2: November 24, 2017

Session I: Invited Talks **Chair:** Prof. Satya Deo	
09:30 am - 10:30 am	*Matrix representation of finite solvable groups over arbitrary fields* Prof. Ravi Kulkarni Bhaskarachrya Prathisthan, Pune
10:30 am - 11:15 am	*Nambu structures on Lie algebroids and modular classes* Prof. Goutam Mukherjee Indian Statistical Institute, Kolkata
11:15 am - 11:45 am	**Tea**
Session II: Invited Talks **Chair:** Dr. Brendan Owens	
11:45 am - 12:30 pm	*Immersions and Embeddings inducing prescribed geometric structures* Prof. Mahuya Datta Indian Statistical Institute, Kolkata
12:30 pm - 01:15 pm	*Equivariant maps related to Tverberg, Kakutani and Dyson Theorems* Dr. Samik Basu Department of Mathematical and Computational Science, Indian Association for the Cultivation of Science, Kolkata
01:15 pm - 02:15 pm	**Lunch**

Day 2: November 24, 2017

Session II: Invited Talks **Chair:** Prof. Tej B. Singh	
02:15 pm - 03:00 pm	*Span of Wall manifolds* Prof. S. S. Khare North Eastern Hill University, Shillong
03:00 pm - 03:45 pm	*Semi Equivelar Maps* Dr. Ashish Kumar Upadhyay Indian Institute of Tehcnologyt, Patna
03:45 pm - 04:30 pm	*Topological properties of quasi partial B-metric space* Dr. Anuradha Gupta Delhi College of Arts & Commerece, University of Delhi, Delhi
04:30 pm - 05:00 pm	**Tea**
Session IV: Paper Presentation **Chair:** Prof. V. Ravichandran	
05:00 pm - 06:15 pm	**Paper Presentation**

Paper Presentations

Day 1: November 23, 2017
Venue: R-5, Satyakam Bhavan
Time: 05:15 pm - 06:30 pm

1. *On Biconservative Lorentz Hypersurface with Complex Eigen values*
   Deepika

2. *A new approach to multiset topological spaces*
   Karishma Shravan

3. *Willmore surfaces in three dimensional simply isotropic spaces* $\mathbb{I}_3^1$
   Mohamd Saleem Lone

4. *Connectedness of Certain Graph Coloring Complexes*
   Samir Shukla

5. *Double mapping cylinder of graphs*
   Shuchita Goyal

Day 2: November 24, 2017
Venue: R-5, Satyakam Bhavan
Time: 05:00 pm - 06:15 pm

1. *Null quences over locally compact convergence groups: Duality aspects*
   Pranav Sharma

2. *On CR-statistical submanifolds of holomorphic statistical manifolds*
   Aliya Naaz Siddiqui

3. *Generalized Wintgen inequality for bi-slant submanifolds in locally conformal Kaehler space form*
   Mohd Aquib

4. *Non-Existence of Hopf hypersurfaces in the complex quadric with recurrent Ricci tensor*
   Pooja Bansal

5. *Index of free* $\mathbb{S}^1$ *and* $\mathbb{S}^3$ *actions on certain spaces and existence of equivariant maps*
   Jaspreet Kaur

Abstracts of Invited Talks

On counterexample to Tverberg Theorem given by Florian Frick

Satya Deo

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Harish-Chandra Research Institute, Allahabad

The topological Tverberg theorem of topological combinatorics says that if $f : \Delta^N \to \mathbb{R}^d$ is a continuous map, where $N = (r-1)(d+1)$, then there exists r disjoint faces $\sigma_1, ..., \sigma_r$ of Δ^N whose f-images will have nonempty intersection. The theorem is true when r is a prime power. F. Frick has given a counterexample to this theorem when r is not a power of prime. This counterexaxmple solved a very basic open problem of topological combinatorics. However, there are some important questions raised by this counterexample. I will try to explain them and discuss some possibilities.

Topology of generalized Dold manifolds

P. Sankaran

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Institute of Mathematical Sciences, Chennai

We introduce a class of manifolds which are a generalization of Dold manifolds. We will address two problems concerning them, namely, stable parallelizability and determining their unoriented cobordism classes.

Intersection lattices of 4-manifolds with boundary: Some applications and problems

Brendan Owens

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University of Glasgow, U. K.

The intersection form on the second homology group is a fundamental invariant of 4-dimensional manifolds. In particular it was observed by Milnor, using work of Whitehead, that the intersection form classifies simply-connected 4-manifolds up to homotopy equivalence. In this talk we will discuss certain questions about 3-manifolds and knots which involve the intersection forms of smooth bounding 4-manifolds.

Equivalence classes of piecewise monotonic real continuous functions

V. Kanan

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Department of Mathematics and Statistics,
University of Hyderabad, Hyderabad.

We say that two p.m. continuous real functions are order-equivalent if one can be obtained from the other by composing with two order isomorphisms, one in the left and he other in the right. The main theorem is that two functions are order-equivalent if and only if they have the same sizes of fibers in the same order. This is proved using the order-patterns of critical values.

On classification of higher dimensional manifolds

Himadri Kumar Mukerjee

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Department of Mathematics,
North-Eastern Hill University, Shillong.

How surgery has played a central role in classification of manifolds will be demonstrated and a survey of algebraic and differential topological techniques leading to development of classification results of higher dimensional (dim ¿ 4) manifolds will be given.

Cofibrations in the category of graphs

Rekha Santhanam

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Indian Institute of Technology, Bombay.

In this talk, we describe a class of cofigration on the category of graphs with weak equivalences as $\times$-homotopy equivalences. W then discuss their properties. This is a joint work with Shuchita Goyal.

Matrix representation of finite solvable groups over arbitrary fields

Ravi Kulkarni

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Let G be a finite group, and $\rho : G - -- > GL(V)$ a representation. If G is generated by $\{x_1, x_2 ...., x_n\}$ then ρ is determined by $\{\rho(x_1), \rho_(x_2), ..., \rho(x_n)\}$. If V is over the field F, $dim_F V = d$, and a basis $\{e_1, ..., e_d\}$ of V is chosen, then $\{\rho(x_i)'s\}$ are given by $d \times d$ matrices. In this talk, I shall describe an algorithmic construction of such matrices when G is a finite solvable group, and the char F does not divide the order of G. The construction is based on many deep results of representation of finite groups, developed over the last 120 years. Yet even in the case of abelian groups there is something new to say. This work is submitted for a Ph.D. by Soham Pradhan at IIT(Bombay).

Nambu structures on Lie algebroids and modular classes

Goutam Mukherjee

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Indian Statistical Institute, Kolkata.

A Poisson structure on a smooth manifold is 2-vector field π such that $[\pi, \pi] = 0$, where the bracket is the Schouten bracket on graded algebra of multi vector fields. This talk is based on a generalization Poisson structures on manifolds (more generally, on Lie algebroids), called Nambu structure. In 1973, Y. Nambu introduced the notion of Nambu structure, studied the main features of this new mechanics at the classical level and investigated the problem of quantization. In 1975, F. Bayen and M. Flato observed that in the classical case this new mechanics in a three-dimensional phase space, as proposed by

Nambu, is equivalent to a singular hamiltonian mechanics. Later, in 1994, L. Takhtajan outlined the basic principles of a canonical formalism for the Nambu mechanics showing that it is based on the notion of a Nambu bracket, which generalizes the Poisson bracket to the multiple operation of higher order $n \geq 3$. In this paper the author also introduced the fundamental identity (a generalization of Jacobi identity), as a consistency condition for the Nambu dynamics and introduced the notion of Nambu-Poisson manifolds as phase spaces for Nambu mechanics which turn out to be more rigid than Poisson manifolds−phase spaces for the hamiltonian mechanics. A smooth manifold equipped with a skew-symmetric n-bracket on the function algebra satisfying derivation property and the fundamental identity is called a Nambu-Poisson manifold of order n. We introduce a notion of Nambu structure on a Lie algebroid and show that there is a Leibniz algebroid associated to such object. This helps us to introduce the notion of Modular class of a Lie algebroid with Nambu structure. This is a joint work with Apurba Das and Shilpa Gondhali.

Immersions and Embeddings inducing prescribed geometric structures

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Indian Statistical Institute, Kolkata.

In 1938, Whitney proved that every abstract manifold can be embedded in some $\mathbb{R}^q$ which marked the beginning of the golden age of immersion theory. The result implies that all differentiable manifolds may be considered as subspaces of Euclidean spaces. In topology and geometry, manifolds often come with some geometric structures g, e.g., Riemannian metrics. A natural question, in the light of Whitney's result, is whether they may be embedded in some $\mathbb{R}^q$ with a canonical geometric structure g_0 of the same type so that g is induced from g_0 in an appropriate sense. Nash proved that every Riemannian manifold can be isometrically immersed in $\mathbb{R}^q$ for some large q. We shall briefly review the Smale-Hirsch theory of immersions and Nash's isometric immersion theorems. We shall also discuss Gromov's symplectic immerson theorem and its generalizations for differential forms of any even degree $2k$, $k > 1$.

Equivariant maps related to Tverberg, Kakutani and Dyson Theorems

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Indian Association for the Cultivation of Science, Kolkata.

Various theorems of discrete geometry are intricately related to problems in equivariant topology. We discuss a number of questions and results : namely, Tverberg, Kakutani and Dyson's Theorems on the discrete geometry side and equivariant maps between spheres and Stiefel manifolds on the topological side. Further these arguments are related to Borsuk-Ulam type theorems, and construction of equivariant maps from certain universal spaces to representation spheres. The results presented are due to myself and in joint work with Surojit Ghosh.

Span of Wall manifolds

S S Khare

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North-Eastern Hill University, Shillong.

The objective of the talk is to discuss about the span (number of linearly independent nowhere vanishing vector fields) on Wall manifolds.

Semi Equivelar Maps

Ashish K Upadhyay

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Department of Mathematics,

Indian Institute of Technology, Patna.

A triangulation of a surface is called d-covered if each of its edge is incident with a vertex of degree d. In answering a question about existence of d-covered triangulation Semi equivelar maps were naturally constructed. In this talk we present the ongoing work.

Topological properties of Quasi partial b-metric space

Anuradha Gupta

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University of Delhi, Delhi.

A quasi-partial b-metric on a nonempty set X is a mapping $qp_b : X \times X \to \mathbb{R}^+$ such that for some real number s ≥ 1 and for all $x, y, z \in X$

(QP$_{b1}$) $qp_b(x,x) = qp_b(x,y) = qp_b(y,y) \Rightarrow x = y$,

(QP$_{b2}$) $qp_b(x,x) \leq qp_b(x,y)$,

(QP$_{b3}$) $qp_b(x,x) \leq qp_b(y,x)$,

(QP$_{b4}$) $qp_b(x,y) \leq s[qp_b(x,z) + qp_b(z,y)] - qp_b(z,z)$.

A quasi-partial b-metric space is a pair (X, qp_b) such that X is a nonempty set and qp_b is a quasi-partial b-metric on X.

The number s is called the coefficient of (X, qp_b).The topological structure of quasi-partial b-metric is studied by defining quasi -partial b-metric topology τ_{qp_b}.It is shown that the quasi partial b-metric space (X, qp_b) is T_0, T_1 and T_2 space.It is also proved that $(X, \tau_{qp_b})$is compact topological space.

Abstracts of Papers to be Presented

On Biconservative Lorentz Hypersurface with Complex Eigen values

Deepika

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S. N. Bose National Centre for Basic Sciences, Kolkata.

Recently, the theory of biconservative submanifolds, which is closely related to biharmonic submanifolds, is an active area of re- search in differential geometry. A biconservative submanifold of a Rie- mannian manifold is a submanifold with divergence free stress-energy tensor with respect to bienergy. We obtain some properties of bicon- servative Lorentz hypersurface M_1^n in E_1^{n+1} having shape operator with complex eigenvalues. We prove that every biconservative Lorentz hyper- surface M_1^n in E_1^{n+1} whose shape operator has complex eigenvalues with at most five distinct principal curvatures has constant mean curvature.

A new approach to multiset topological spaces

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Institute Of Advanced Study In Science and Technology, Guwahati.

Multisets are set-like algebraic structure where, unlike sets, repetition of elements are allowed. Since in the real world there are enormous repetition, multisets can be useful in studying many real life problems. Girish et al introduced a topology on multiset to study the similarities and dissimilarities between objects which are multisets. The number of times an element occurs in a multiset is called its multiplicity. It is due to this multiplicity that multisets behave nicely in a different way from sets. This has motivated the present study, where topological structure on multisets is studied from a different approach by introducing the notion of quasi-coincidence in multisets. Many significant topological properties which diverged from point-set topology are also modified.

Willmore surfaces in three dimensional simply isotropic spaces $\mathbb{I}_3^1$

Mohamd Saleem Lone

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National Institute of Technology, Srinagar.

In this paper, we study the translation and factorable surfaces in three dimensional simply isotropic space. We obtain explicit forms of translation and factorable Willmore surfaces in 3-dimensional simply isotropic space $\mathbb{I}_3^1$.

Connectedness of Certain Graph Coloring Complexes

Samir Shukla

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In 1978, Lovász proved the famous Kneser conjecture, which dealt with the chromatic number of a class of graphs, called Kneser graphs. Lovász constructed a simplicial complex called the neighbor- hood complex $\mathcal{N}(G)$ of a graph G, and relates the topological connectivity of $\mathcal{N}(G)$ with the chromatic number of G. Further, he generalize this notion to a polyhedral complex, $\mathrm{Hom}(G, H)$ for graphs G and H. In this talk, we consider the bipartite graphs $K_2 \times K_n$. We prove that the connectedness of the complex $\mathrm{Hom}(K_2 \times K_n, K_m)$ is $m - n - 1$ if $m \geq n$ and $m - 3$ in the other cases. Therefore, we show that for this class of graphs, $\mathrm{Hom}(G, K_m)$ is exactly $(m - d - 2)$-connected, $m \geq n$, where d is the maximal degree of the graph G.

Double mapping cylinder of graphs

Shuchita Goyal
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Department of Mathematics,
Indian Institute of Technology, Bombay.

Let $\mathcal{G}$ denote the category whose objects are undirected graphs without multiple edges and morphisms are vertex set maps that sends edges to edges. For graphs G and H in $\mathcal{G}$, the hom complex $\mathrm{Hom}(G, H)$ was defined by Lovász in his paper - Kneser's conjecture, chromatic number, and homotopy. He conjectured that the connectivity of the hom complex $\mathrm{Hom}(G, H)$ gives a lower bound on the chromatic number of H. The hom complex of graphs has been studied extensively for past few years. In general, computing the hom complex for arbitrary graphs G and H is often tedious and not much is known about the topology of $\mathrm{Hom}(G, H)$ for arbitrary graphs G and H.

In this talk we will define the notion of double mapping cylinder in this category. We will further see a specific construction to obtain a relatively smaller subgraph G' of G such that $\chi(G') = \chi(G)$ and the connectivity of $\mathrm{N}(G')$ is at least as much as the connectivity of $\mathrm{N}(G)$.

This is a joint work with Prof. Rekha Santhanam, IIT Bombay.

Null quences over locally compact convergence groups: Duality aspects

Pranav Sharma
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Lovely Professional University, Jalandhar.

Convergence groups are natural generalisation of topological groups which arise in complex analysis from the theory of quasi-conformal maps and play an important role in geometric group theory. On the other hand, quences are order freed sequences defined by Dolecki and Mynard as a generalisation of sequences. We investigate the class of null quences defined over locally compact convergence groups. Using local quasi-convexity of convergence groups we obtain a suitable class of null quences for the purpose of analysis. Finally, we present the results obtained while investigating the duality properties in these classes.

On CR-statistical submanifolds of holomorphic statistical manifolds

Aliya Naaz Siddiqui

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Jamia Millia Islamia, New Delhi.

The notion of CR-submanifolds in Kaehler manifolds was studied by A. Bejancu. On the other hand, H. Furuhata and I. Hasegawa intensively studied their statistical version, i.e., CR-statistical submanifolds in holomorphic statistical manifolds. In this paper, we investigate integrability conditions for the distribu- tions which are involved in the definition of a CR-statistical submanifold. We give necessary and sufficient condition for a CR-statistical submanifold to be a CR-product in holomorphic statistical manifolds and obtain its some immediate consequences. We also give, under certain geometric conditions, a simple classification of proper CR-statistical submanifolds in holomorphic statistical manifolds. The paper finishes with the discussion of de Rham cohomology class for CR-statistical submanifolds in holomorphic statistical manifolds.

Generalized Wintgen inequality for bi-slant submanifolds in locally conformal Kaehler space form

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Jamia Millia Islamia New Delhi.

In 1999, De Smet, Dillen, Verstraelen and Vrancken conjectured the generalized Wintgen inequality for submanifolds in real space form. This conjecture is also known as DDVV conjecture. It is proved by G. Jianquan and T. Zizhou (2008). Recently, Ion Mihai (2014) established such inequality for Lagrangian submanifold in complex space form. In this paper, we obtain generalized Wintgen inequality for bislant submanifold, CR-submanifold, invariant submanifold and anti-invariant submanifold in the same ambient space.

Non-Existence of Hopf hypersurfaces in the complex quadric with recurrent Ricci tensor

Pooja Bansal

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Jamia Millia Islamia, New Delhi.

In this paper, we first introduce the notion of recurrent Ricci tensor which is the generalisation of parallel Ricci tensor in complex quadric $Q^m = SO_{m+2}/SO_mSO_2$. Moreover, we investigate real hypersurfaces of complex quadric $Q^m = SO_{m+2}/SO_mSO_2$ with the con- dition of recurrent Ricci tensor and give the full classification with this condition.

Index of free $\mathbb{S}^1$ and $\mathbb{S}^3$ actions on certain spaces and existence of equivariant maps

Jaspreet Kaur

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University of Delhi, Delhi.

In this talk, we present our computation of the Volovikov's index for free $\mathbb{S}^1$-actions on the product of two real projective spaces and on the product of a (real or complex) projective space and three dimensional sphere. Volovikov's index of free $\mathbb{S}^3$ actions on the product of a (real or complex) projective space and three dimensional sphere shall also be shown. As a consequence of our computation, we get some (Borsuk-Ulam type) results on the non-existence of equivariant maps between these transformation groups and spheres with free $\mathbb{S}^1$ and $\mathbb{S}^3$-actions. Leray-Serre spectral sequence technique has been used to determine these indices. This techinque can also be used to show the non-existence of free actions. We shall discuss this briefly at the end.

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