30th Annual Conference of the Ramanujan Mathematical Society

Symposium on Topological Dynamics and Applications

Abstracts of Talks

May 15, 2015

11:30 AM - 12:10 PM

Values of quadratic forms at integer points

Anish Ghosh, Tata Institute of Fundamental Reseach, Bombay

Abstract: An old conjecture of Oppenheim and Davenport, now a famous theorem of Margulis, states that the set of values at integer points, of an indefinite irrational quadratic form in at least three variables is dense in the real line. An observation of Raghunathan relating this problem to dynamics of flows on homogeneous spaces was key to Margulis' proof. I will discuss some recent developments which aim to obtain effective versions of Margulis' theorem. Joint work with A. Gorodnik and A. Nevo.

12:15 PM - 12:55 PM

Diophantine approximation on lines with prime constraints

Stephan Baier, Georg-August-Universitat zu Gottingen, Germany

Abstract: This is joint work with Anish Ghosh. We investigate simultaneous Diophantine approximation with prime numerators and denominators on lines in the plane with irrational slopes. Our work is inspired by results of G. Harman and H. Jones on a similar question for functions $f(x) = x^\tau$, where $\tau > 0$. Our approach combines the method of Harman and Jones with estimates for exponential sums in several variables, where the Diophantine properties of the said slopes come into play. We also discuss potential generalizations of our results to manifolds.

2:00 PM - 2:40 PM

Repetitivity of patterns of return times for linear toral flows

Alan Haynes, University of York, England

Abstract: A discrete set Y in $\mathbb{R}^d$ is said to be linearly repetitive if there exists a constant $C > 0$ such that every pattern of diameter r, which occurs somewhere in Y, occurs in every ball of diameter Cr in $\mathbb{R}^d$. In this talk we will focus on the case when Y is a 'cut and project set', i.e. the collection of return times to a canonical region of a linear $\mathbb{R}^d$ action on a higher dimensional torus. We will provide a characterization of the collection of all linearly repetitive

cut and project sets, answering a question posed by Lagarias and Pleasants. If time permits, we will also discuss a connection to the Littlewood Conjecture in Diophantine approximation.

2:45 PM - 3:25 PM

Linear equations in primes and nilpotent Lie groups
Gyan Prakash, Harish-Chandra Research Institute, Allahabad

Abstract: Ben Green and Terence Tao, in 2006, obtained an asymptotics for the number of k-term arithmetic progressions (more generally solutions of a system of a system of linear equations satisfying certain constraints) contained in the set of primes. This was obtained by assuming the following two major conjectures, one being the inverse Gowers norm conjecture and the other being Möbius nilsequence conjecture. The inverse Gowers norm conjecture was later proved by Green, Tao and Ziegler. The Möbius nilsequence conjecture, which is a special case of Sarnak's conjecture was proved by Green and Tao. In this survey talk, we shall give an exposition of this topic.

May 16, 2015

11:30 AM - 12:10 PM

Tverberg like theorems and equivariant cohomology
Samik Basu, Ramkrishna Mission Vivekananda University, Belur

Abstract: The Tverberg Theorem proved in 1966 deals with intersecting convex hulls of points in Euclidean space. There is an interesting topological version which is a conjecture about intersecting disjoint faces of a continuous image of a simplex. Usual techniques used here are generalised Borsuk-Ulam theorems and ideal valued obstructions. We use techniques from equivariant homotopy theory to obtain similar results.

12:15 PM - 12:55 PM

Higher order Density recurrent sets in countable amenable groups
Dibyendu De, University of Kalyani, Kalyani

Abstract: A subset A of $\mathbb{N}$ is said to have positive upper density if $\overline{d}(A) = \limsup_n \frac{|A\cap\{1,2,\ldots,n\}|}{n} > 0$. Celebrated Szemeredi's Theorem states that every subset of $\mathbb{N}$ with positive upper density contains arithmetic progression of arbitrary length. This Theorem ensures the definition of *k-density intersective* sets : a subset $S \subset \mathbb{N}$ is called *k-density intersective* if for every subset A of $\mathbb{N}$, with positive upper density (that is $\overline{d}(A) > 0$) there exists $d \in \mathbb{N}$ such that $A\cap(-d+A)\cap\ldots\cap(-(k-1)d+A) \neq \emptyset$. On the other hand a subset $S \subset \mathbb{N}$ is called *k-density recurrent* if for every subset A of $\mathbb{N}$ with positive upper density there exists $d \in \mathbb{N}$ such that $\overline{d}(A \cap (-d + A) \cap \ldots \cap (-(k-1)d + A)) > 0$. This is clear from the definition that *k-density recurrent* sets are *k-density intersective*. On the other hand, it is the work of Furstenberg and

Katznelson that *k-density intersective* sets are also *k-density recurrent*. We extend this result for arbitrary amenable groups for the case $k = 2$, where an amenable group is one, in which there exists a left invariant probability measure. Finally we show that for an amenable group G the set $\mathcal{DR}_2(G)$ of ultrafilters on G, every member of which is density 2-recurrent, is a compact subsemigroup of the Stone-Čech compactification βG of G containing the minimnal idempotents of βG.

2:00 PM - 2:55 PM

On the Colored Tverberg Theorem of Blagojevic, Matschke and Ziegler
Satya Deo, Harish-Chandra Research Institute, Allahabad.

Abstract: Let $d \geq 1, r \geq 2$, a prime and $N = (d+1)(r-1)$. The Topological Tverberg Theorem says that if Δ_N is the N-simplex and $f : \Delta_N \to \mathbb{R}^d$ is a continuous map, then we can always find a family $F_1, F_2. \cdots F_r$ of r disjoint faces of Δ_N whose f-images will have a nonempty intersection. We will present a survey talk on the above topological Tverberg Theorem culminating into the BMZ theorem which has been acclaimed as the most satisfactory and surprising form of the colored topological Tverberg theorem.