TITLES AND ABSTRACTS

Speaker: R. Balasubramanian

Title: Product of three primes

Abstract: It was proved by Linnik that there exists a constant $c > 0$ such that the following holds. For any integer q, if we consider all the primes p, not dividing q, and less than q^c , then this set covers all invertible residue classes $\pmod q$. It is expected that one could take c to be any real number bigger than 2. But the best known result is c around 5. We consider the analogous problem of taking primes less than q^d and taking the product $p_1p_2p_3$. For what value of d we can claim that $p_1p_2p_3$ covers all the residue classes $\pmod q$.

Speaker: Atul Dixit

Title: Koshliakov zeta functions and modular relations

Abstract: Nikolai Sergeevich Koshliakov was an outstanding Russian mathematician who made phenomenal contributions to number theory and differential equations. In the aftermath of World War II, he was one among the many scientists who were arrested on fabricated charges and incarcerated. Under extreme hardships while still in prison, Koshliakov (under a different name 'N. S. Sergeev') wrote two manuscripts out of which one was lost. Fortunately the second one was published in 1949 although, to the best of our knowledge, no one studied it until the last year when my student Rajat Gupta and I started examining it in detail. This manuscript contains a complete theory of two interesting generalizations of the Riemann zeta function having their genesis in heat conduction and is truly a masterpiece! In this talk, we will discuss some of the contents of this manuscript and then proceed to give some new results (modular relations) that we have obtained in this theory. This is joint work with Rajat Gupta.

Speaker: Krishna Hanumanthu

Title: Seshadri constants

Abstract: Seshadri constants of line bundles on projective varieties were defined by J.-P. Demailly in 1990, motivated by an ampleness criterion of C. S. Seshadri. They are a measure of local positivity of line bundles and have interesting applications in different areas in mathematics. We will start with a brief introduction to them and mention some questions and applications. Then we give an overview of the current work in this area and discuss some recent results on algebraic surfaces.

<u>**Speaker**</u>: Somnath Jha

<u>**Title**</u>: Fine Selmer groups of elliptic curves

<u>**Abstract**</u>: Selmer group of an elliptic curve encapsulates important arithmetic properties of the elliptic curve. Fine Selmer group of an elliptic curve is a subgroup of the Selmer group of the elliptic curve. We will discuss some properties of the fine Selmer group of an elliptic curve and relate it to the growth of the ideal class groups in a cyclotomic tower of number fields.

<u>**Speaker**</u>: Filip Najman

<u>**Title**</u>: Q-curves over odd degree fields and sporadic points

<u>**Abstract**</u>: I will discuss recent results obtained in two papers with Abbey Bourdon and John Cremona about Q-curves over odd degree number fields. We prove results on uniform bounds on torsion groups and isogeny degrees, and on sporadic points corresponding to Q-curves and their connection to Serre's uniformity conjecture.

<u>**Speaker**</u>: Anilatmaja Aryasomayajula

<u>**Title**</u>: Sub-convexity estimates of cusp forms associated to cocompact arithmetic subgroups

<u>**Abstract**</u>: Sub-convexity estimates of cusp forms associated to cocompact arithmetic subgroups is a problem of deep interest in number theory, and is motivated by a conjecture of Sarnak. In this talk, we will discuss a recent result of ours in this direction. This work is in collaboration with Dr. Baskar Balasubramanyam.

<u>**Speaker**</u>: Debargha Banerjee

<u>**Title**</u>: Variance of epsilon factors for modular forms with arbitrary nebentypus

<u>**Abstract**</u>: We study the variance of local epsilon factors for a modular form with arbitrary nebentypus with respect to twisting by a certain quadratic character. As an application, we will determine the type of the supercuspidal representation from that if the attached representation at a prime p is supercuspidal. For modular forms with trivial nebentypus, similar results are proved by Pacetti. In the ramified principal series (with $p \mid\mid N$ and p odd) and unramified supercuspidal representation of level zero case, we relate the variance with Morita's p-adic Gamma function. This is joint work with Tathagata Mandal.

Speaker: Balesh Kumar

Title: Modular functions on the complex upper half plane and 3-dimensional hyperbolic space

Abstract: Modular functions of different types and their Fourier coefficients are of great interest because they encode various arithmetic and algebraic information. In a fundamental work, Katok and Sarnak establish a beautiful correspondence between modular functions (Maass forms) of weight 0 and modular functions of weight 1/2 on the complex upper half plane. The correspondence is explicitly given in terms of their Fourier coefficients. Inspired by this, we will discuss certain connections between modular functions on the complex upper half plane and 3-dimensional hyperbolic space.

Speaker: B. Ramakrishnan

Title: Representations of a natural number by certain quadratic forms

Abstract: In this talk, we shall give a survey of some of our results in finding formulas for the number of representations of a natural number by certain types of integral quadratic forms. We shall also discuss some of the consequences of our method.

Speaker: Pavlo Yatsyna

Title: Universal quadratic forms over number fields

Abstract: I will review what is known about quadratic forms that represent all positive integers. After that, I will describe the recent advances, specifically, focusing on the extension of the above problem to number fields.

Speaker: Shiv Prakash Patel

Title: Restriction of representations from $\widetilde{GL}_2(F)$ to $\widetilde{SL}_2(F)$

Abstract: Let F be a non Archimedean local field and $\widetilde{SL}_2(F)$ be the non-trivial twofold metaplectic cover of $SL_2(F)$. Let $\widetilde{GL}_2(F)$ be the twofold cover of $GL_2(F)$ defined by the Kubota cocycle which contains $\widetilde{SL}_2(F)$. We will discuss the restriction of genuine representations of $\widetilde{GL}_2(F)$ to the subgroup $\widetilde{SL}_2(F)$ using the Waldspurger's analysis of theta correspondence from $\widetilde{SL}_2(F)$ to $PGL_2(F)$.

Speaker: Karam Deo Shankhadhar

Title: On Dirichlet series attached to half-integral weight cusp forms

Abstract: In this talk we first focus on the zeros of the Dirichlet series attached to half-integral weight cusp forms and then we discuss its non-vanishing on a given point in the critical strip. This is based on the two joint works, one with Jaban Meher and Sudhir Pujahari and the other with B. Ramakrishnan.

Speaker: Bibekananda Maji

Title: Riesz-type criteria for the Riemann hypothesis

Abstract: In 1916, Riesz proved that the Riemann hypothesis is equivalent to the bound $\sum_{n=1}^{\infty} \frac{\mu(n)}{n^2} \exp\left(-\frac{x}{n^2}\right) = O_\epsilon\left(x^{-\frac{3}{4}+\epsilon}\right)$, as $x \to \infty$, for any $\epsilon > 0$. Around the same time, Hardy and Littlewood gave another equivalent criteria for the Riemann hypothesis while correcting an identity of Ramanujan. In this talk, we will discuss a one-variable generalization of the identity of Hardy and Littlewood and as an application, we provide a Riesz-type criteria for the Riemann hypothesis. In particular, we obtain the bound given by Riesz as well as the bound of Hardy and Littlewood. This is joint work with Archit Agarwal and Meghali Garg.

Speaker: Stephan Baier

Title: Distribution of $l\alpha$ modulo 1, where l runs over the primes

Abstract: Let α be an irrational real number. The question how $l\alpha$ distributes modulo 1 as l runs over the primes has received a lot of attention. We review the history of this problem and discuss recent results in the settings of number fields and p-adic numbers. Function field analogues will also be touched.

Speaker: Ratnadeep Acharya

Title: Continued fraction, rational approximation and certain exponential sums involving the Fourier coefficients of cusp forms

Abstract: Let f be a holomorphic cuspidal Hecke eigenform and it's normalized n-th Fourier coefficient is denoted by $\lambda_f(n)$. Fouvry and Ganguly have shown that there exists an absolute constant $c > 0$ such that we have

$$\sum_{n \le X} \lambda_f(n)\nu(n)e(n\alpha) \ll X \exp(-c\sqrt{\log X}).$$

Here ν is either the Von Mangoldt function or the Möbious function. However, they have also mentioned that the above result can be improved for certain choices of α with "nice" rational approximation.

In this talk we discuss such improvement for almost all α, in the sense of Lebesgue. In particular, if α is a quadratic irrational, then for any $\epsilon > 0$, we have

$$\sum_{n \leq X} \lambda_f(n)\nu(n)e(n\alpha) \ll X^{15/16+\epsilon},$$

by using the continued fraction expansion of α. Moreover, the case for general arithmetic function will also be considered.