Mumbai–Pune Number Theory Seminar - 2024

April 05 – 06, 2024

Schedule and Abstracts of Talks

School of Mathematics
Tata Institute of Fundamental Research

Title of Talks

Srimathy Srinivasan   *On the ramification of subfields of p-algebras*

Jishu Das   *Discrepancy results for modular forms*

M. S. Qadri   *Ext branching laws for the general linear group*

Anish Ghosh   *Equidistribution in number theory and ergodic theory*

Dipendra Prasad   *Diophantine approximation on tori*

Pranjal Vishwakarma   *Two results on Eisenstein part of homology and cohomology groups of Bianchi modular groups*

Abstracts

Friday, 5 April 2024 (14:30-15:30)

Speaker : **Srimathy Srinivasan**
Title : **On the ramification of subfields of p-algebras**

A *p*-algebra is a central simple algebra of *p*-th power degree over a field of characteristic *p*. There is a close connection between cyclic maximal subfields and purely inseparable maximal subfields of *p*-algebras, namely, a *p*-algebra is cyclic if and only if it contains a simple purely inseparable maximal subfield. In this talk, we draw a similar connection between ramifications of cyclic and purely inseparable maximal subfields when the base field is complete discrete valued. Based on joint work with Adam Chapman.

Friday, 5 April 2024 (15:45-16:45)

Speaker : **Jishu Das**
Title : **Discrepancy results for modular forms**

Let F be a totally real number field, $r = [F : \mathbb{Q}]$, and $\mathfrak{N}$ be an integral ideal. Let $A_k(\mathfrak{N}, \omega)$ be the space of holomorphic Hilbert cusp forms with respect to $K_1(\mathfrak{N})$, weight $k = (k_1, ..., k_r)$ with $k_j > 2$ for all j and central Hecke character ω. For a fixed level $\mathfrak{N}$, we study the behavior of the Petersson trace formula for the Hecke operators acting on $A_k(\mathfrak{N}, \omega)$ as $k_0 \to \infty$ where $k_0 = \min(k_1, ..., k_r)$ subjected to a given condition. We give an asymptotic formula for the Petersson formula under certain conditions. As an application, we generalize a discrepancy result (proved in 2020) for classical cusp forms with squarefree levels by Jung and Sardari to Hilbert cusp forms for F with the ring of integers O having narrow class number 1, and the ideals being generated by numbers belonging to $\mathbb{Z}$.

In the second part, we restrict ourselves to classical cusp forms i.e. the case $F = \mathbb{Q}$. We obtain a generalization for the discrepancy result in the context of levels (of the form $2^a \times b$ with b odd, $a = 0, 1, 2$) and the space of old forms. Then we get a similar kind of lower bound for $\lambda_{p^2}(f)$ for an eigenform f. This is achieved as an application to an asymptotic version of the Petersson formula.

Friday, 5 April 2024 (17:15-18:15)

Speaker : **M. S. Qadri**
Title : **Ext branching laws for the general linear group**

We study Ext branching laws for Arthur type representations of the *p*-adic general linear group. We give a precise condition predicting Ext non-vanishing in some cases.

Saturday, 6 April 2024 (9:30-10:30)

Speaker : **Anish Ghosh**
Title : **Equidistribution in number theory and ergodic theory**

I will discuss a classical problem, namely the distribution of points arising in Diophantine analysis. After a historical overview, I will present some new work in this direction. The latter is joint with Gaurav Aggarwal.

Saturday, 6 April 2024 (11:00-12:00)

Speaker : **Dipendra Prasad**
Title : **Diophantine approximation on tori**

I will revisit a question I considered several decades ago which is about the density (in the Euclidean topology) of a certain group of points arising from number theory on compact tori over R arising from number theory. I will try to discuss a *p*-adic analogue as well as a non-abelian analogue.

Saturday, 6 April 2024 (12:15-13:15)

Speaker : **Pranjal Vishwakarma**
Title : **Two results on Eisenstein part of homology and cohomology groups of Bianchi modular groups**

We explicitly write down the Eisenstein cycles in the first homology groups of quotients of the hyperbolic three-spaces as linear combinations of Cremona symbols (a generalization of Manin symbols) for imaginary quadratic fields. They generate the Eisenstein part of the homology groups. We also studied Eisenstein's part of the cohomology groups. As an application, we find an asymptotic dimension formula (level aspect) for the cuspidal cohomology groups of congruence subgroups of the form $\Gamma_1(N)$ inside the full Bianchi groups. This is a joint work with Debargha Banerjee.