

Ph.D. Pre-Synopsis Seminar

Title: Rankin-Cohen type operators and some properties of Fourier coefficients of modular forms

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Abstract

Modular forms are important object in number theory and it has a wide range of applications in other branches of mathematics as well as in physics. A modular form is a complex analytic function on the upper half plane with having Fourier expansion and the Fourier coefficients determine the modular form.

The vanishing or non-vanishing of Fourier coefficients of a modular form is a recurring motif in mathematics. In recent times, such questions have arisen in the context of modular forms both of integral weight and half-integral weight. In the first part, we will discuss simultaneous non-vanishing and sign changes of Fourier coefficients of distinct modular forms of integral weight.

Given a fixed Hilbert modular form, we consider a family of linear maps between the spaces of Hilbert cusp forms by using the Rankin-Cohen brackets and then we compute the adjoint maps of these linear maps with respect to the Petersson scalar product. The Fourier coefficients of the Hilbert cusp forms constructed using this method involve special values of certain Dirichlet series of Rankin-Selberg type associated to Hilbert cusp forms.

In the last part, we construct Rankin-Cohen type differential operators on the space of Hilbert-Jacobi forms. This generalizes a result of Choie and Eholzer in the case of Jacobi forms to Hilbert-Jacobi forms.

Publications

- (1) M. Kumari and M. R. Murty, *Simultaneous non-vanishing and sign changes of Fourier coefficients of Modular forms*, To appear in Int. J. Number theory.
- (2) M. Kumari and B. Sahu, *Rankin-Cohen brackets on Hilbert modular forms and special values of certain Dirichlet series*, To appear in *Functiones et Approximatio Commentarii Mathematici*.
- (3) M. Kumari and B. Sahu, *Rankin-Cohen type operators for Hilbert Jacobi forms*, Submitted.