

Orthogonal modular forms for $O(5)$, paramodular forms, and congruences

Gustavo Rama

Universidad de la República, Uruguay

We introduce orthogonal modular forms, particularly modular forms for the group $O(5)$. Along with Dummigam, Pacetti, and Tornaría, combined with a work by Rösner and Weissauer, we proved that certain of these forms correspond to Siegel modular forms invariant under the paramodular group. We also proved several examples of Harder's conjecture, which relates Hecke eigenvalues of classical modular forms to Hecke eigenvalues of paramodular forms. Additionally, we proved a conjectured congruence by Buzzard and Golyshev between a modular form of weight 2 and level 61 and the non-lift paramodular form of weight 3 and level 61. Together with Assaf, Ladd, Tornaría, and Voight, we computed databases of paramodular forms for weights $(k, j) = (3, 0), (4, 0), (3, 2)$ and levels less than 1000. We search for new congruences of Harder type and of Buzzard, Golyshev type. We will show new examples of these congruences and provide proofs for some of them.

In Special Session 14 on Galois Representations and Automorphic Forms at the Mathematical Congress of the Americas 2025.