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Iwasawa theory and congruences for the symmetric square of a modular form

I will report on joint work with R. Sujatha and V. Vatsal. Two p -ordinary Hecke-eigenforms are congruent at a prime $\varpi|p$ if all but finitely many of their Fourier coefficients are congruent modulo ϖ . R. Greenberg and V. Vatsal showed in 2000 that the Iwasawa-invariants of congruent modular forms are related. This involves studying the behavior of Selmer groups and p -adic L-functions with respect to congruences. We generalize these results to symmetric square representations.

In this setting, the normalized L-values for $\text{sym}^2(f)$ can be expressed in terms of the Petersson inner product of f with a nearly holomorphic function. The Petersson inner product is modified and related to an abstractly defined algebraic pairing due to Hida, and the two pairings are related up to a "canonical period". As a result, it is shown that the p -adic L-function for the symmetric-square exhibit congruences, and this has consequences for analytic Iwasawa invariants.