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On the Hilbert cuspidal eigenvariety at weight one Eisenstein points

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When the p-adic L-function of a finite order totally odd character \phi of a totally real field F has trivial zeros, any p-stabilization of the corresponding weight one Eisenstein series belongs to the Hilbert cuspidal eigencurve. In the case of elliptic modular forms, it was proved by Betina-Dimitrov-Pozzi that such points are etale over the weight space, hence belong to a unique cuspidal Hida family. In this talk, we will first present a generalisation to a real quadratic field in which p splits.

The complexity of the geometry of the Hilbert cuspidal eigencurve at such points growing with the dimension of H^1(F,\phi) which equals the degree of F, a challenging question is to determine the extension classes occurring in Galois representations attached to cuspidal Hida families. We will provide a partial answer in the case when p is inert in F and satisfied the Leopoldt conjecture. A key step of our work is to construct p-ordinary irreducible Galois representations with values in certain local rings of the eigencurve.

As an application, we give a new proof of the rank one abelian Gross-Stark conjecture relating the leading term of p-adic L-function of \phi and a non-zero algebraic L-invariant. This conjecture was first proved by Dasgupta-Darmon-Pollack under the assumption that a sum of two analytic L-invariances is non-zero. This is an ongoing work with Adel Betina and Mladen Dimitrov.

Orateur: SHIH, Sheng-Chi