

Modular Entanglement

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We study entanglement phenomena between residual Galois representations attached to modular forms and modular abelian varieties, focusing on whether two such representations - possibly in different residual characteristics - can correspond to the same number field or share a common non-trivial subfield. These questions are closely related to inverse Galois theory and to congruences between modular forms. We present explicit examples arising from elliptic curves: for levels N_1, N_2 in $\{3, 4, 5\}$, we describe one-dimensional families of pairs of elliptic curves whose N_1 - and N_2 -torsion Galois representations exhibit projective A_4 -entanglement. We also give explicit models for the associated modular surfaces over suitable cyclotomic extensions of $\mathbb{Q}$.

This is joint work with David Kohel (AMU) and Zoé Yvon (Toulouse), and ongoing work with Luis Dieulefait (UB) and Gabor Wiese (Université du Luxembourg).