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*A conjectural uniform construction of many rigid Calabi-Yau threefolds*

Given a rational Hecke eigenform  $f$  of weight 2, Eichler-Shimura theory gives a construction of an elliptic curve over  $\mathbb{Q}$  whose associated modular form is  $f$ . Mazur, van Straten, and others have asked whether there is an analogous construction for Hecke eigenforms  $f$  of weight  $k > 2$  that produces a variety for which the Galois representation on its étale  $H^{k-1}$  (modulo classes of cycles if  $k$  is odd) is that of  $f$ . In weight 3 this is understood by work of Elkies and Schütt, but in higher weight it remains mysterious, despite many examples in weight 4. In this talk I will present a new construction based on families of K3 surfaces of Picard number 19 that recovers many existing examples in weight 4 and produces almost 20 new ones.