• Freixas i Montplet, Lipnowski, Schaeffer. *Growth of torsion for weight 1 modular forms*. In preparation.

Heuristics of Bhargava suggest that, for varying $p$, there should be an abundance of odd, two dimensional mod $p$ Galois representations which are unramified at $p$ and which do not lift to characteristic 0. Computations of Schaeffer appear to confirm this.

Such Galois mod $p$ Galois representations correspond to non-liftable weight 1 cuspidal eigenforms and equivalently to $p$-torsion classes in the coherent cohomology group $H^1(X/\mathbb{Z}, \omega/\mathbb{Z})$, where $X$ is an appropriate modular curve and $\omega$ is the line bundle over $X$ whose sections are weight 1 cusp forms. We provide theoretical evidence for the abundance of non-liftable weight 1 cusp forms using the Arakelov-Riemann-Roch theorem, which gives some handle on the size of the $|H^1(X,\omega)_{tors}|$. 