Intersection cohomology in positive characteristic

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This series of two talks will be an introduction to the use of perverse sheaves with coefficients in positive characteristic in representation theory.

In the first talk, as a motivation, we will explain some applications of these methods to the modular representation theory of reductive groups and Weyl groups, based on work by Mirkovic-Vilonen, Soergel, Fiebig and Juteau. The varieties involved are the Schubert varieties (including the affine case), and the nilpotent cone in a semi-simple Lie algebra. For the sake of concreteness, we will treat in detail the case of the nilpotent cone of $\mathfrak{sl}_2$.

In the second talk, we will present our joint work establishing a connection between equivariant multiplicities and p-smoothness. A p-smooth variety satisfies Poincaré duality with $\mathbb{F}_p$ coefficients. We will also discuss work of Fiebig and Williamson extending ideas of Soergel. Both techniques allow the determination of the p-smooth locus of Schubert varieties for many primes p.