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Representations of Algebraic Groups via Algebraic Topology

Since the early 1980s, a number of major questions in representation theory have been resolved by translating them into questions about the algebraic topology of various spaces, especially flag manifolds and related spaces. I will explain a few classical (characteristic 0) examples of this pattern. I will then discuss new developments from the past decade that have made it possible to push these ideas forward in characteristic $p > 0$, and I will survey some of the consequences for representation theory. This includes joint work with S. Makisumi, S. Riche, L. Rider and G. Williamson.