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Rings of Invariants and Varieties of Representations

Suppose that G is a finite group, F is a field and V is finite dimensional representation of G over F . The action of G on V induces an action on the dual V^* which extends to an action by algebra automorphisms on the symmetric algebra $S := S(V^*)$. The subring of fixed points, S^G , is known as the ring of invariants of V . For fixed G , F , and $\dim(V)$, the representations of G can be parameterised by an algebraic variety. I will discuss the resulting parameterisation of invariant rings, using modular representations of elementary abelian p -groups as illustrative examples.