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Invariants of a Vector and a Covector

For an action of a group G on an $\mathbf{F}$-vector space V, we consider the invariant ring $\mathbf{F}[V \oplus V^*]^G$. We are particularly interested in the case where $V = \mathbf{F}_q^n$ and G is the group U_n of all upper unipotent matrices or the group B_n of all invertible upper triangular matrices.

In fact, we determine $\mathbf{F}[V \oplus V^*]^G$ for $G = U_n$ and $G = B_n$. The result is a complete intersection for all values of n and q. We get explicit lists of generating invariants and the relations between them. This makes an addition to the rather short list of "doubly parametrized" series of group actions whose invariant rings are known to have a uniform description.

This talk is about joint work with Cédric Bonnafé.