On ranks of hyperbolic group extensions

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The rank of a group is the minimal cardinality of a generating set. While simple to define, this quantity is notoriously difficult to calculate, and often uncomputable, even for well behaved groups. In this talk I will explain general conditions that may be used to show many hyperbolic group extensions have rank equal to the rank of the kernel plus the rank of the quotient. In this case, we further show that any minimal generating set is Nielsen equivalent to one in a standard form. As an application, we prove that if $g_1, \ldots, g_k$ are independent, atoroidal, fully irreducible outer automorphisms of the free group F_n, then there exists $m \geq 1$ so that the preimage of $\langle g_1^m, \ldots, g_k^m \rangle$ in $\mathrm{Aut}(F_n)$ is a hyperbolic extension of F_n with rank $n + k$. Joint work with Sam Taylor.