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Knapsack problems for right-angled Artin groups

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Abstract:
The knapsack problem for a finitely generated (f.g.) group is the following computational problem: Given group elements $g_1, \ldots, g_n, g, \in G$, are there exponents $e_1, \ldots, e_n$ (natural numbers) such that $g = g_1^{e_1} \cdots g_n^{e_n}$? This generalizes the classical NP-complete knapsack problem for integers to arbitrary (possibly noncommutative) f.g. groups. In the talk, I will sketch proofs of the following results that were jointly obtained with Georg Zetzsche:

- For every right-angled Artin group G the knapsack problem is in NP. This holds is even for the knapsack variant, where the group element are given succinctly by straight-line programs (context-free grammars that generate a single word).
- If the underlying commutation graph of G contains an induced cycle on 4 nodes or path on 4 nodes, then the knapsack problem of G is NP-complete.