

## Power of Nondeterministic JAGs on Cayley graphs

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*The talk is based on joint work with Ramyaa Ramyaa, Wesleyan University.*

*Session: 6. Computational Logic*

The Immerman-Szelepcsényi Theorem uses an algorithm for co-st-connectivity based on inductive counting to prove that nondeterministic logarithmic space (NL) is closed under complementation. We want to investigate whether counting is necessary for this theorem to hold. Concretely, we show that Nondeterministic Jumping Automata on Graphs (nondeterministic JAGs) (pebble automata on graphs) can order several families of Cayley graphs and thus can decide all NL-properties on them, in particular co-st-connectivity. This came as a surprise since Cook and Rackoff showed that deterministic JAGs cannot solve st-connectivity on many Cayley graphs due to their high self-similarity (every neighbourhood looks the same). Thus, our results show that on these graphs, nondeterminism provably adds computational power. The families of Cayley graphs which according to our results can be ordered include Cayley graphs for particular presentations of all finite simple groups and arbitrary wreath products as well as Cayley graphs of abelian groups irrespective of how they are presented.

We remark that assessing the precise power of nondeterministic JAGs and in particular whether they can solve co-st-connectivity on arbitrary graphs is left as an open problem by Edmonds, Poon and Achlioptas. Our results suggest a positive answer to this question and in particular considerably limit the search space for a potential counterexample.