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Armin Weiß

University of Stuttgart

Membership in finite inverse semigroups.

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Abstract:

The DFA intersection emptiness problem is a well-known PSPACE-complete problem. A closely related, but more algebraic, problem is the subsemigroup membership problem for transformation semigroups acting on the states of the automata. A natural question arises: for which classes of semigroups does the membership problem remain PSPACE-complete, and for which can it be solved efficiently? One particularly interesting class of semigroups are inverse semigroups, which can be represented as semigroups of partial bijections on a set and serve as an intermediate class between groups and arbitrary semigroups.

In this talk, I will survey recent advancements in the complexity of the membership and also conjugacy problems, with a special focus on inverse semigroups. Specifically, for varieties of inverse semigroups, we provide a complete and unconditional characterization of when these problems are PSPACE-complete and when they are not. We also solve the problem when the inverse semigroup is given by its multiplication table.

This talk is based on joint work with Lukas Fleischer, Florian Stober, and Alexander Thumm.