# Componentwise Automata Learning for System Integration (Extended Version)

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## Abstract

This paper proposes a new problem setting for compositional automata learning, called componentwise automata learning, focusing on system integration. Unlike traditional compositional learning which queries only the whole system, this approach allows direct access to individual black-box components. The paper addresses the challenge of component redundancies (where parts of components are irrelevant to system behavior) by introducing a contextual componentwise learning algorithm that systematically removes these redundancies.

## Key Findings

* - Identified system integration as a new application domain for compositional automata learning, where direct component-level queries are available (componentwise automata learning).
* - Formalized the problem using Moore machine networks and identified component redundancies as the main challenge.
* - Introduced a contextual componentwise learning algorithm that eliminates component redundancies by pruning observation tables using reachability analysis.
* - Demonstrated the practical value of the algorithm through experiments, showing improvements over monolithic and naive componentwise learning.