

## **Process Mining meets model learning : Discovering deterministic finite state automata from event logs for business process analysis**

This article proposes a new approach to the discovery of **Deterministic Finite State Automata (DFSA)** from event logs. This approach is designed to take advantage of the synergies between processes and event logs, a solution that marks a major breakthrough in the area of business process analysis.

The paper starts by explaining the central role of process mining in discovering the inner workings of business operations by **examining event logs**, which are the digital trails of process activities. The authors state that process mining has been instrumental in providing patterns, compliance issues, and bottlenecks in processes; however, incorporating the model learning (specifically discovery of DFSA) can greatly increase the **accuracy and applicability of mined models** in business process analysis.

Deterministic Finite State Automata represent the sequences of events or states in a process in the form of mathematical models. They are deterministic in the sense that their transition from one state to another is completely specified by their current state and the input symbol. In the realm of business processes, these symbols represent events or activities, and that is why DFSA is well suited as a modeling and analysis technique for business processes.

The essence of the article lies in the creation of an algorithm that **extracts DFSA models automatically only from the logs**. This method involves several key steps: preprocessing of event logs, accurate data quality, application of advanced algorithms to identify the states and transitions that form the DFSA, and validation of the discovered automata so that they are relevant to the business processes in an accurate way.

Dealing with the **complexity and variability of real-world business processes** is one of the key benefits of the proposed methodology. The authors showcase the power of their method through case studies by bringing to the forefront those processes which were not apparent through traditional process mining techniques. In addition, the developed and found DFSA models are proved to be **highly interpretable**, providing **good understanding of process dynamics** that is vital for process improvement and optimization.

The paper also covers technical challenges that arose during the implementation of the DFSA discovery approach, which were related to scalability issues, noise in event logs, and handling of parallel activities within processes. The approaches to the problems are discussed in the paper, and their robustness in the operational environments is emphasized.

In their analysis the authors contrast their method with the existing process mining techniques, demonstrating its **superiority in terms of accuracy, efficiency and the granularity of the resulting models of the processes**. The implications of this research are significant as it provides practical tools for organizations to improve their process management practices and holds promise for advancing the existing research direction in process mining and model learning.

The article ends with the author highlighting the possibility of combining process mining and model learning to create a system that will **streamline business process analysis**. The suggestion of DFSA from event traces makes a more detailed view of processes which in turn raises the efficiency and adaptability of businesses. The research proposed is carried out by testing the technique in other fields and in the face of the emerging challenges of process analysis in the digital age.