

Public summary of PhD-thesis of Guangming Li

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A novel model for more precisely analyzing business processes

Process mining is widely used throughout the modern business world to analyze data from information systems. With it companies and organizations are able to gain new model-based insights to improve their business processes. Researcher Guangming Li has developed a new model and a range of new process mining techniques based on the model, which can more precisely analyze the business processes in data-centric information systems such as Enterprise Resource Planning (ERP) systems.

Nowadays, information systems are widely used in various organizations to support the execution of their business processes. This has led to the rapid growth of data being stored about process executions. Today's main innovations lie in intelligently exploiting these data and turning them into real value. Process mining leverages execution data to analyze the business processes, such as discovering process models to reveal how business processes are really executed, checking conformance to detect deviations and analyzing performance to highlight bottlenecks of business processes.

Existing process mining techniques make a fundamental assumption about processes. Process models and event logs assume the presence of well-defined cases, with each event referring to a case and the model describing the whole life-cycle of cases. This assumption is consistent with case-centric information systems, e.g., Workflow Management (WFM) systems. However, most modern information systems are data-centric (or artefact-centric), which do not assume the existence of individual cases in their business processes. Such differences lead to problems when applying existing process mining techniques, which makes it difficult to identify the cases for the whole process, and the many-to-many relations cannot be well described.

In order to solve these problems, we developed a series of process mining techniques in this thesis, such as a novel log format named eXtensible Object-Centric (XOC) to organize the data generated by artifact-centric information systems and a novel modeling language named Object-Centric Behavioral Constraint (OCBC) which combines data/object modeling languages and declarative languages. Besides, we developed approaches to automatically discover OCBC models from XOC logs, to check conformance and to analyze the performance. In summary, this thesis reports on new process mining techniques to analyze the data from artifact-centric information systems.

The research can help businesses discover better models to describe their processes, adding a powerful data perspective to the traditional behavioral perspective. It can also detect deviations which currently remain undetected. Moreover, it can deliver more precise performance results, e.g., the delay time between two activities in an order-to-cash business process. The research also triggers future work such as distributed processing, i.e., applying process mining to big data in a parallel manner.

Title of PhD-thesis: Process Mining based on Object-Centric Behavioral Constraint (OCBC) Models.

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