Quotients for Behaviour Comparisons: Monotone Precision and Recall Measures for Process Mining

Jan Mendling

WU (Vienna University of Economics and Business),
Department of Information Systems and Operations,
Institute for Information Business,
Building D2, 3rd Floor,
Welthandelsplatz 1, 1020 Vienna, Austria
jan.mendling@wu.ac.at

Abstract. The behavioural comparison of dynamic systems is an important concern of information systems research, sociology, management science and software engineering. In the area of process mining, various techniques for conformance checking have been proposed to measure how similar observed execution sequences and system specification such given by a business process models are. Though various measures have been proposed, [2] observe that non of them fulfills essential properties. To address this research problem, we build on the observation that if two systems are not language-equivalent, the quantification of behavioural differences enables conclusions on the extent of the deviation. However, there is no systematic approach for defining quotients and it is unclear which measures enable meaningful comparisons of systems having infinite behaviours.

It is the contribution of this talk to introduce a framework for defining language quotients, which resolves the measurement problem of conformance checking in process mining. We instantiate the framework with cardinality- and entropy-based measures to handle finite and infinite behaviours, and prove important properties of the quotients. We demonstrate the application of quotients in the field of process mining to capture precision and recall between a log of recorded and a model of expected system executions. An experimental evaluation of the quotients using our open-source implementation demonstrates their feasibility and indicates that the quotients enable a monotonic assessment, unlike state-of-the-art measures in process mining. This talk is based on joint research with Polyvyanyy, Solti, Weidlich, and Di Ciccio [1].

References

1. Artem Polyvyanyy, Andreas Solti, Matthias Weidlich, Claudio Di Ciccio, and Jan Mendling. Monotone Precision and Recall Measures for Comparing Executions and Specifications of Dynamic Systems. *CoRR*, abs/1812.07334, 2018.
2. Niek Tax, Xixi Lu, Natalia Sidorova, Dirk Fahland, and Wil M. P. van der Aalst. The imprecisions of precision measures in process mining. *Inf. Process. Lett.*, 135:1–8, 2018.