Chapter 5
Method for Semantic Annotation and Lifting of Process Models

ABSTRACT

The work done in this chapter demonstrates how the main components of the SPMaAF framework and sets of algorithms described earlier in Chapters 3 and 4, respectively, fit and rely on each other in achieving the semantic enhancement of the discovered process models. This is done by representing the models discovered through the standard process mining techniques as a set of annotated terms that links to or references the concepts defined within ontologies. It permits the process analysts to formally represent and analyse the several information in the underlying knowledge-bases in a more efficient and yet accurate manner. Henceforth, the conceptualisation method or tactics is allied to semantic lifting of the process models.

INTRODUCTION

A semantic-based process mining approach should present the discovered models or patterns in a formal and structured manner. Clearly, the primary aim must be on how best to interpret the mining results to provide domain knowledge (semantics) that can help improve or extend the derived process models. Thus, such type of *conceptualization* tactics is referred to as *semantic lifting of process models*.

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The work done in this book demonstrates how the main components and algorithms described in the earlier Chapters 3 and 4 fit and rely on each other to carry out the semantic enhancement of the discovered models. For example, the extracted logs/models from the standard process mining techniques can be represented as a set of annotated terms that links or relates to defined terms within the ontologies. Thereby, making it straightforward to formally represent the information that underlies the knowledge-bases in an easy and yet accurate manner. Perhaps, *ontolog*ies has shown to be one of the many existing tools that have the capability to provide means to represent the models (annotated terms) in a formal and structured way. This is done by defining the associations (relationships) that exist between the different process elements in the model, and also in ensuring that the various range of tasks (activities) conforms naturally to the event logs/model representations as executed in reality. In other words, by encoding the deployed models in the *formal structure of ontology* (semantic modelling), one can then further expand the existing models.

Besides, the *Reasoner* (inference engine) is designed to perform the (semantic) reasoning and ontological classifications (taxonomies) in order to validate the resulting models and clean out inconsistent outputs, and consequently, presents the inferred (underlying) semantic associations in a structured (formal) manner. Over the next sections of this chapter, we look at suitable techniques that can be applied to represent the events logs and models in the formal way of ontologies, as well as, technologies that enable the different metadata creation and automated computation. We do this using the case study of the learning process as described in Okoye et al (2016).

ANNOTATION OF FUZZY LEARNING MODEL

Indeed, the first step towards achieving the semantic annotation of any given model should be aimed at making use of process description languages/ assertions to link elements in the models with concepts that they represent in a well-defined ontology. Using the learning process model as a case study, we demonstrate that the main purpose of the semantic annotation method must be to seek the equivalence between *the concepts of the process models (e.g fuzzy models*) derived by applying the fuzzy miner algorithm on the learning process logs and the *concepts of the defined (learning) process domain ontolog*ies. Apparently, this is done by making use of the process