Chapter 4
Proposed Algorithms and Formalizations

ABSTRACT

In this chapter, the work presents and describes the different algorithms that it proposes for ample implementation of the SPMaAF framework. The procedures outlined in the Algorithms 1, 2, and 3 illustrates the method that the work applies for developing the semantic-based process mining approach described in this book. Technically, the outlined procedures (i.e., Algorithms 1, 2, and 3) are aligned with the entire speculation of the work in this book, which are grounded on the three different phases or components of the SPMaAF Framework.

SEMANTICALLY MOTIVATED PROCESS MINING ALGORITHMS

Essentially, the following sets of algorithms are provided for the purpose of the work done in this book by considering the different phases that constitutes practical implementation of the SPMaAF framework.

Algorithm 1

The work describes in this section the proposed *Algorithm 1* and how it makes use of the method to perform the process mining and model discovery (Phase 1). Perhaps, the algorithm (Algorithm 1) is developed to show how to

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effectively discover useful process models from the readily available events (data) logs. In principle, the process proves useful towards generation and mapping of the individual traces that makes up each of the process executions. For example, we illustrate in Chapters 5 and 7 how the proposed *algorithm 1* is implemented using process mining tools such as Disco that is based on Fuzzy Miner framework (Rozinat & Gunther, 2012) to generate and map the process models from the readily available event logs. In addition to the process models discovery, the process is also carried out for conformance checking and analysis of the individual cases (i.e. classified traces) and visualization of the several sequence(s) of activities executions.

Practically, the following *Algorithm 1* describes how the work discovers and generates the process models and individual traces from any given events data log as follows:

Algorithm 1: Discovering Fitting Process Models through Fuzzy Mining Approach

```
1: For all Recorded Events Data Log, L
2: Input:   PM – Process mining tool used to extract model, M
                  L – Input Data for process Mapping/
Visualization
                  e – Classifier for the event logs, L and
traces, T
3: Assign:  case_id(e)  i.e. the Case associated to event, e
within the events log, L
                  act_name(e)  i.e. Activities associated to
event, e within L
                  other_attributes e.g. Event ID, Timestamp,
Resources, Roles etc. related to event, e within L
4: Output: Process maps (fuzzy model), M & individuals traces,
T classifications for the events log, L
                   Model or TraceFitness, TF discovery through
semantic fuzzy mining
5: Procedure: Discover Fuzzy Models, M from L for cross-
validation to determine how well M reflects the performed
activities in reality, i.e TraceFitness, TF and for further
analysis
6: Begin
7:     For all Event Data Log L
8:       Extract Process Maps, M, & Traces, T ← from Event Log
L
9:       while no more process element is left do
10:       Analyze Fuzzy Model, M and Traces, T to determine
tracesFitness, TF
```