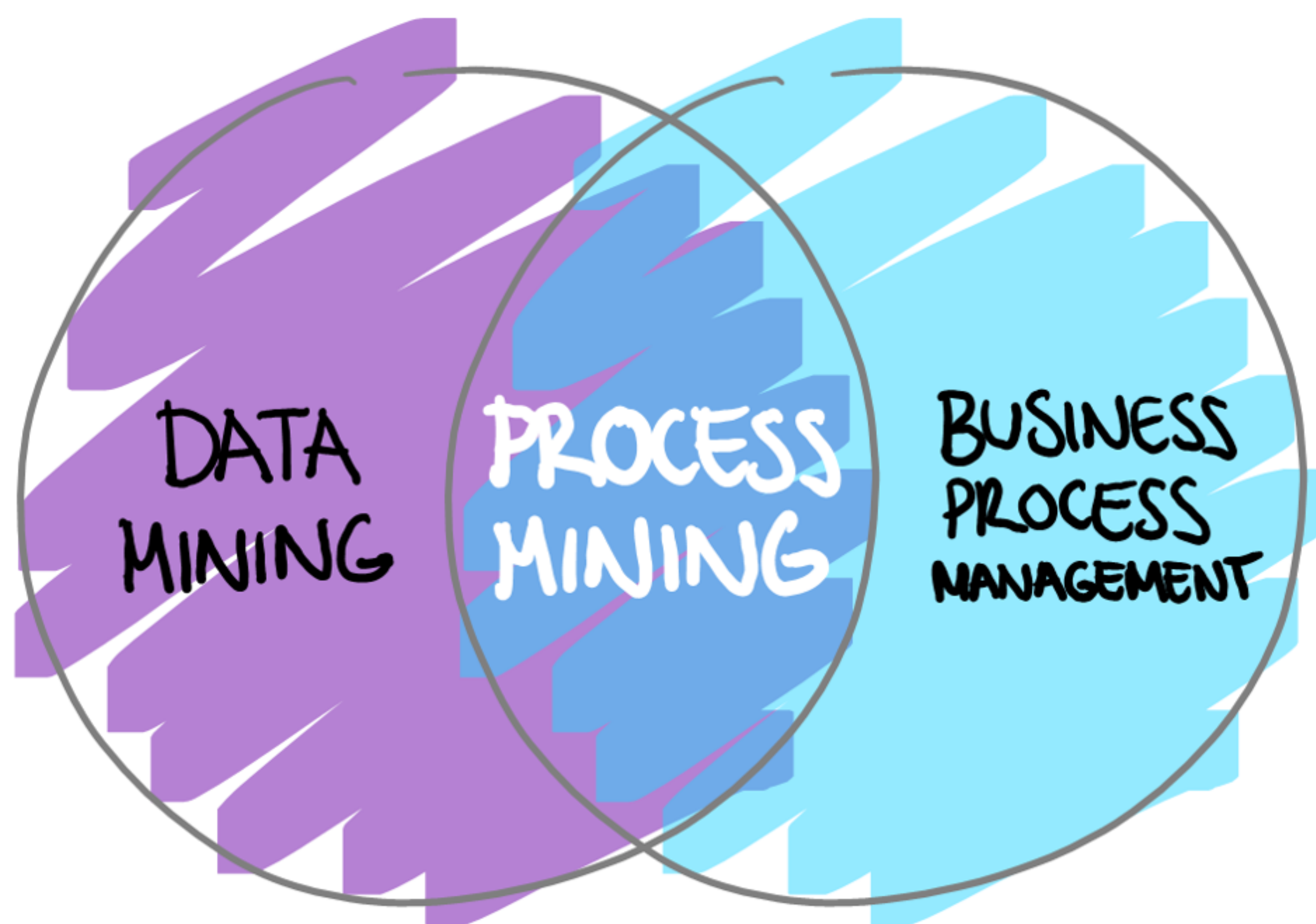


Business process simulation workflow tool

Proposing an open-source tool for the creation, simulation, and subsequent analysis of operational processes with CPN Tools.

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ABSTRACT

Process simulation can help give insights into process models and answer that which has been described as **what if** questions.

Writing simulation models is tedious work because it requires manual model transformations from a representational model to an executable model.

The representational model often being in written in BPMN.

Automatic and direct model transformation of BPMN models is not possible due to BPMNs poor semantics and lack of constructs pertaining to simulation.

Coloured petri nets are an extension of the petri net formalism and can be used to formally verify and simulate systems.

This project aims to lessen the burden of creating executable simulation models

of business processes in CPN and subsequently executing them by offering this in one single workflow and application.

What if questions

Simulation gives us answers to questions regarding the performance of our process model. E.g.,

What if we add or remove a resource of “this” type?

What if we introduce or remove “this” activity?

What if we are faced with “this” scenario?

Issues with existing tooling

Commercial tools offer direct simulation of BPMN models but offer no insights into how this model is transformed into a executable format nor what simulation engine they are being run on.

The resulting simulation model are not offered to the client and therefore not verifiable. Mission critical systems require verifiable models. This makes it difficult to trust the results returned from these commercial tools.

There exists no **academic** tool

that offers this entire workflow.

Existing tools such as *ProM* [3] are not created for reuse in other applications as they can only be interacted with via a GUI. This makes them impossible to incorporate into any other toolsets or enterprise workflow.

Modularity

The resulting application adopts the microservices architectural style. All large components are packaged into loosely coupled reusable web services, thus making it easier for new adopters to quickly employ these same techniques in their workflows and applications.

The services being: process mining, GUI, and CPN Tools. This would for example allow for the creation of intelligent automatic workflows that employ process mining techniques on logs gathered in a system.

Simulation model anatomy

The composition of a CPN simulation model was first described in [1,2] and is not novel.

Control flow

Describes the different nodes and their relationships

Performance

Information on waiting times, execution times, and gateway probabilities.

Role discovery

Information on what resource is tied to what activity.

Decision point

Information on the decision rules that guide tokens to a specific path.

Merging perspectives

The gathered perspectives need to be merged and encoded as a single CPN model.

Representational format

The GUI allows for the model to be represented as a BPMN model as there are model transformers that support a core subset of the BPMN specification. This in turn means that the user will interact with a BPMN model build using this core subset, which is then automatically transformed to a petri net when executing.

Related efforts

[1,2] addressed the problem of *discovering simulation models* by offering a plugin for the popular *ProM* application. This work takes a naïve approach to resource scheduling and does not support the direct simulation of the model.

Thus making it cumbersome to do successive iterations in CPN as this implies manually importing and exporting files. It also has no capacity to specify specific scenarios nor offer the simulation model in a *easier to understand* representational format.

REFERENCES

- [1] Discovering simulation models - <https://doi.org/10.1016/j.is.2008.09.002>
- [2] Mining CPN Models: Discovering Process Models with Data from Event Logs - https://www.researchgate.net/publication/229124706_Mining_CPN_Models_Discovering_Process_Models_with_Data_from_Event_Logs
- [3] ProM - <https://www.promtools.org/doku.php>
- [4] CPN Tools - <http://cpntools.org/>

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