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<b>Paper title</b>	Exploring the Potentials of Artificial Intelligence Techniques for Business Process Analysis
<b>Keywords specific to the paper</b>	process mining, process analysis, artificial intelligence, log clustering, deep learning

## **Summary**

### ***Data Description & Tools***

Nowadays, business processes are growing more intricate in terms of their structure and the number of cases they handle. With the ongoing digitization of these processes, there are now Terabytes of gathered process data available, often in the form of event logs. This data holds immense value for organizations, as it enables them to continuously monitor, analyze, and enhance the underlying processes. This, in turn, leads to lower cost and higher quality.

Process Mining offers a solution to overcome this intricacy, so that by utilizing the data generated from events, it uncovers process models, verifies their compliance, examines possible bottlenecks, and proposes enhancements. Renowned process mining software like Disco, minit or Celonis excel at organizing detailed process logs and presenting them in a way that individuals can understand.

Furthermore, apart from the current tools that are specifically designed for process logs, there are numerous other methods for data analysis that can be easily modified to be utilized on process logs. Research areas like Data Mining or Machine Learning, which fall under the umbrella of "Artificial Intelligence" (AI), offer effective tools for various data analysts. In terms of descriptive analytics, conventional process mining tools have been employed, while

customized software components have been utilized for predictive analytics using Deep Learning techniques.

***software frameworks and tools that have been employed for data preprocessing and analysis:***

Framework/Tool	Application purpose
Aris	Process visualization and modeling
Disco	Process mining, process discovery, behavior analysis
ProM 5.2	Sequence clustering, data conversion
Python	Data preprocessing, data querying, data conversion
R and RStudio	Data discovery, descriptive analysis, data manipulation, graphs
RefMod-Miner	Model comparison, reference model mining
Tensorflow	Deep Learning
Weka	Machine Learning, regression analysis

## **Descriptive Process Analysis**

### **1) Description of the BPI2017 Process:**

The global loan application and handling process is divided into three subprocesses (application, offer, and workflow subprocess), with a total of 26 activities, and it can be outlined as follows: The process begins with creating and submitting a new application. Subsequently, additional internal preparation steps are taken to conduct automated tests on the application and create a new workflow for managing the leads. In some situations, the applicant must provide additional information before the application may be processed. After validation, the application can be refused due to formal issues, accepted (known as "shortened completion"), or validated further.

First of all, the application will be terminated, then an offer will be generated, sent to the customer (via mail or online exclusively), and then discussed with them over the phone. The third point involves conducting a thorough analysis, including fraud detection and potential requests for missing application documents, and finally an offer may be extended upon successful validation, or the application may be rejected if validation is unsuccessful.

### **2) Description of the BPI 2012 process**

The 2012 version consists of 36 activities and comprises three sub processes .The process commences with the submission of a loan application, followed by initial automatic checks and fraud detection activities. If there is any missing information, the applicant is contacted

to complete the application. When an application is complete and not rejected for formal reasons or failure to pass automatic checks, an offer is generated and delivered to the applicant. Customers are then contacted to discuss the offer. Finally, the application undergoes assessment, leading to a decision of either approval or dismissal.

### 3) Process Comparison: Differences and Similarities:

The table below summarizes the metrics for both BPIC 2012 and BPIC 2017 event logs:

	<b>Dataset 2012</b>	<b>Dataset 2017 (application log)</b>
Events	262,200	561,671
Cases	13,087	31,509
Events per case	20,0	17,8
Activities	36	26
Median case duration	19.4 hrs	19.1 d
Mean case duration	8.6 d	21.9 d
Time period	5.5 months	13 months
Cases per month	2,380	2,420