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Paper title	METHODS OF PROCESS MINING AND PREDICTION USING DEEP LEARNING
Keywords specific to the paper	process mining, Petri net, LSTM

Summary

process mining tools:

   The processes, although they occur repeatedly over time, assess and modify themselves to fit the requirements of the system in which they operate.Thus, it is crucial to comprehend and recognize the evolving circumstances, followed by developing a tool capable of autonomously predicting these changes. There are numerous algorithms for addressing optimization issues.

   The discipline of process mining provides strategies, tools, and techniques for attaining a more profound comprehension of a process commonly associated with business, but also relevant to security, for instance. This is achieved through analyzing the recorded event data, the gathered process data, and the stored formatted data. Due to the extensive use of process mining in various industries, a range of tools need to be developed, the majority of these tools are intended for process detection, that is to say creating process models.

 A different type of tool is used to check conformity, which implies determining how well a given model represents a precisely studied process. Process models can also help to enhance processes by showing pertinent information such as performance measures. Calonis is one example of a commercial tool that is frequently utilized in business.

   Another type of tool available is open systems tools, which are developed within or utilized by educational institutions. The ProM Framework is the most widely distributed tool in this category. Additionally, The third type of software is libraries that allow you to attach opportunities related to process mining in the created systems.

Analysis of event logs. Petri nets:

The Petri net is a bipartite directed graph whose vertices belong to two sets: places and transitions.The network's state is defined by markers that are placed and move due to transitions. When studying the behavior of digital machines and their software, the Petri net serves as a valuable tool for simulating interconnected concurrent phenomena. Although the fundamental structure of the network remains constant, tokens can move within it in accordance with the burning principle. The state of the Petri network, known as its tagging, is determined by the distribution of tokens in various locations.

Petri nets use the following basic concepts: marking, tokens, arches, places, and transitions. A Petri net is a tuple $PN = (P, T, F, W, M_0)$, where:

P is a finite collection of places.

T is a finite set of transitions.

$F \subset (P \times T) \cup (T \times P)$ is a finite set of arcs.

$W: F \rightarrow N$ is a function that assigns weights to arches.

$M_0: P \rightarrow N \cup \{0\}$ is the initial marking.

$N = (P, T, F, W)$ refers to a network without a distinct beginning marking. Through (N, M_0), a network with a set initial marking.

A Petri net is a workflow that fulfills the subsequent three criteria: there is a unique source site (part of the pre-tag), there is a unique take-up site (part of the final tag), and each site and transition is in the path from the source site to the dumpsite.

The source of information for the Petri nets is data collected in event logs. The trace is a finite non-empty sequence of events so that each event occurs only once and the time does not diminish. The event log is a set of traces, thanks to which each event appears maximum once in the entire log.

LSTM

Long Short-Term Memory (LSTM), is employed for acquiring extensive knowledge of long-term connections. Consequently, models trained with LSTM prove to be advantageous in various applications including speech recognition, anomaly detection, analysis of long-term relationships, and traffic analysis. One of the inherent characteristics of LSTM is Retaining information over an extended duration, rather than a skill it strives to acquire. It is a component of recursive neural networks, characterized by a chain-like structure, but with a distinctive arrangement in its repeating module. This latter comprises four layers of neural network that interact in a distinctive manner.