LEVEL 0 SUMMARY TEMPLATE

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Paper title: Machine Learning in Business Process Monitoring : A comparison of deep learning and classical approaches used for outcome prediction

Keywords specific to the paper: Predictive process monitoring, business process management, outcome prediction, deep learning, machine learning

Summary of the main contributions:

This article makes a comparison between the effectiveness of deep learning (DL) and traditional machine learning (ML) techniques in predicting outcomes in business process monitoring. It highlights the increasing importance of predictive process monitoring in identifying and addressing potential issues in business processes before they occur.

They start from the fact that data has been used so far for “process discovery or analysis” and it starts to be used in monitoring to be able to predict and forecast. The most common way to have predictive process monitoring was the use of machine learning. The article presents the benefits of deep learning for business process monitoring.

In the part 2 of the document, the authors give us knowledge to better the study on machine learning VS deep learning. First, it explain the nature of Business Process Management which can be described as lifecycle phases such as identification, discovery, analysis, improvement, implementation, monitoring, and controlling. The BPM is interdisciplinary.

They also explain Machine learning as a subfield of artificial intelligence that employs statistical methods to identify patterns in large datasets, automating decision-making processes without predefined rules. The document discusses various ML applications such as classification, clustering, regression, and anomaly detection, highlighting the division between supervised and unsupervised learning.

The authors made a study and used 5 public event logs, which we can define as records of events occurring in a system or process, in order to know which log properties will facilitate the use of deep learning for “outcome-oriented predictive process monitoring”. These logs were chosen for their diversity in terms of process instances, number of events, and types of data attributes. The event logs were classified based on their characteristics from both data and control flow perspectives.

The logs were analyzed and classified based on data and control flow perspectives. There is a preprocessing steps in order to transform the event logs into a format suitable for analysis by the classifiers. The study applied both classical ML techniques and DL techniques to the preprocessed logs. A comparison of these techniques was then made based on their performance in predicting outcomes of business processes.

They demonstrated that to use deep learning, we should use the relationship between certain properties. They discovered that deep learning method has superior performance and it's particularly noticeable in logs with a high variant-to-instance ratio, indicating many non-standard cases. Additionally, deep learning techniques demonstrated more stability across different logs. This can suggest a robsustness in handling complex business process data.

As a result, deep learning is more performant than classical machine learning approaches for predictive analysis focused on the outcomes in process monitoring. This means that deep learning can be highly effective in forecasting future events or outcomes in complex processes based on historical data. The study suggests that logs with a high activity-to-instance payload ratio, where input data is predominantly generated at runtime, particularly benefit from using Long Short-Term Memory (LSTM) networks, a specific type of deep learning architecture.

According to the authors, the problem often faced is the lack of knowledge in deep learning and this explains why it's not yet widespread even if it's more performant.