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Paper title: ***Predictive Business Process Monitoring Framework with Hyperparameter Optimization***

Keywords specific to the paper:

Predictive Process Monitoring: The use of historical and real-time data to predict the course of current business processes.

Hyperparameter Optimization: Describes the approach to adjusting the configuration parameters of AI models to improve their performance.

Linear Temporal Logic: Refers to a method of formalizing predictions and temporal constraints on processes.

Summary of the main contributions:

Business process monitoring uses event logs extracted from information systems to predict how ongoing cases of a process will unfold up to their completion. For a given ongoing case, the goal is to provide accurate predictions about the achievement of specific goals.

The paper discusses artificial intelligence (AI) using machine learning algorithms to predict and optimize business processes. The paper illustrates how AI and hyperparameter optimization techniques can be used in predictive monitoring of business processes to improve the accuracy of predictions, providing a framework that helps users.

Scenarios show how AI can help predict future events such as necessary medical examinations or problems with planning applications by analyzing available data. AI machine learning requires precise settings called hyperparameters to work properly. However, choosing the right technique and settings can be complicated, especially for those who are not experts in AI. The paper presents solutions to make this task easier, making AI more accessible and useful in real-world situations.

The predictive process monitoring framework is based on a client-server architecture where the server performs predictive monitoring and hyper-parameter optimization, while the client can evaluate and adjust the model parameters.

The paper investigates an advanced framework for predictive monitoring of business processes, without being limited to a single AI model. The system employs a variety of machine learning strategies, including clustering (k-means, agglomerative clustering, DBSCAN) and classification (decision trees, random forests), to examine historical data. The encoding of traces enables events to be transformed into vectors or sequences, making them easier to analyze. Hyperparameters are optimized using methods such as grid search and SMBO to adjust the flexibility of the model. The framework consists of the Predictive Process Monitoring Framework for predictions and the

Technique and Hyperparameter Tuner for evaluating and selecting optimal configurations, offering greater adaptability and accuracy in business process predictions.

These solutions enable users to benefit from accurate predictions for their specific business processes without requiring in-depth expertise in AI or machine learning.

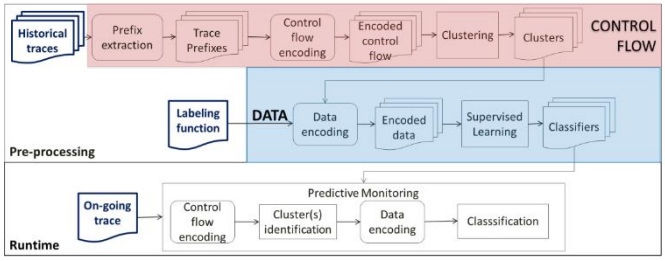

Fig. 2: *Predictive Process Monitoring Framework*

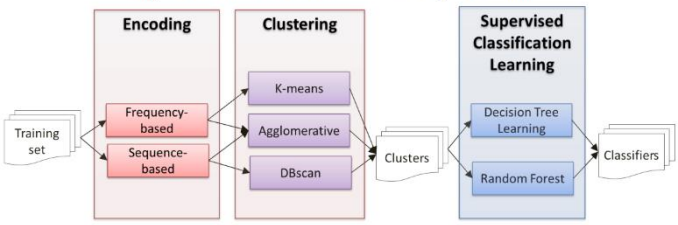

Fig. 3: Framework instances overview

- AI model used (e.g. Neural network, etc.)

The framework does not rely on a single AI model but adopts a flexible approach that allows the use of several machine learning techniques. These include decision trees and random forests to classify process questions, and k-means clustering to group cases based on similarity. The different facets of prediction problems in business processes can be handled effectively thanks to this diversity of models.

- Introduce the AI models.

Decision trees and random forests are used to classify ongoing processes by considering characteristics and previous events.

K-means clustering is used to identify groups of similar cases, which can help refine predictions by discovering common patterns.

- How do they contribute the idea proposed by the paper?

By providing a solid foundation for accurate and adaptive predictions, these AI models contribute directly to the goal of the framework. Hyperparameter optimisation makes the most of each model by adjusting their configuration to match the unique characteristics of the dataset and the specific requirements of the prediction. This strategy ensures that forecasts are not only accurate, but also relevant to each business process. Approaches such as grid search and random search are used to find the best configuration of hyperparameters.

- Supported by a software application? (If yes, provide more details)

The framework is integrated into the ProM toolset as an Operational Support (OS) provider, enabling fluid interaction with external workflow operators to analyze event flows in real time. The practice of the framework is enhanced by this integration into a recognized software application, enabling users to use the direct application in real business process contexts.

The paper highlights the importance of hyperparameter optimization and the flexible use of AI models to improve prediction accuracy in a variety of contexts.