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RAI4P: Responsible AI for Process Mining 2.0

RAI4P moves on to process mining 2.0, a process mining centered on process intelligence rather than on descriptive analytics. We will focus on predictive monitoring, i.e., on forecasting some process features such as the next activity, the remaining time, resources, outcomes, etc. Moreover, this prediction could target a specific point in time or consider the entire life cycle of the process to infer longterm information such as percentages of execution of the different (sub)paths, resources demand, etc.

Also, we will apply process mining techniques to processes for which events are not initially available and stored in a Business Process Management (BPM) platform, but must be identified and extracted from video recordings. This opens the door to apply predictive monitoring to processes that are not (fully) automatized, as the logs will be generated through video analytics techniques. This is a double challenge: for video analytics, it will be necessary to generate high quality events to allow accurate predictions; for process mining, the algorithms must cope with noisy and/or missing data due to the difficulty of detecting all the events from videos.

This proposal is committed to observe the Ethics Guidelines for Trustworthy Artificial Intelligence (AI), recently presented by the EU High-Level Expert Group on AI, since we will stick to the Responsible AI principles in all the models we will develop, to guarantee that both the data and algorithms are accountable, transparent, fair, trustworthy and explainable. Also, we will research in Natural Language Generation models adapted for process mining 2.0, including the generation of textual descriptions for both process models and AI-based analytics. Use of Natural Language in this field will be a novel way for integrating post-hoc explanations about the processes and about the analytical information extracted from them.

Objectives

The objective of RAI4P is to design AI Responsible-aware predictive monitoring models for processes. Also, we seek to support real-world scenarios where processes are not explicit and must be inferred from the environment, in this project through video analytics. This approach will pose a significant challenge both from the perspective of identifying and generating events from video streams as well as from the perspective of process mining, since algorithms will learn from logs that could have an unbalanced trace distribution and, moreover, will have missing data due to the difficulty of capturing all events from videos. Furthermore, we will use natural language descriptions to explain how and why the predictive monitoring models have been generated. This general objective can be divided into the following specific objectives:
Develop new DL models based on graph neural networks that: (i) improve intra- and inter-predictions by leveraging the information that can be inferred from traces, including process models, frequent and infrequent behavioral patterns, conformance checking data, and sudden and gradual drifts; (ii) improve predictions adjusting traces distribution whenever logs are unbalanced, and adding tolerance to noise.
Develop CNN-based detectors and trackers that generate high quality logs for process mining by: (i) improving small target detection accuracy, working with high resolution feature maps in deepest layers; (ii) exploiting the temporal information in videos by short- and long-term object linking; (iii) designing Siamese CNN architectures for multiple object tracking.
Consider all the relevant dimensions of Responsible AI in process mining. Also, integrate natural language descriptions with other explanation modalities, to achieve multimodal explanations that convey the relevant information adapted to the users' real needs and expectations.



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