FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
SCHOOL OF BUSINESS AND ECONOMICS

Predictive Business Process Monitoring

Process Analytics

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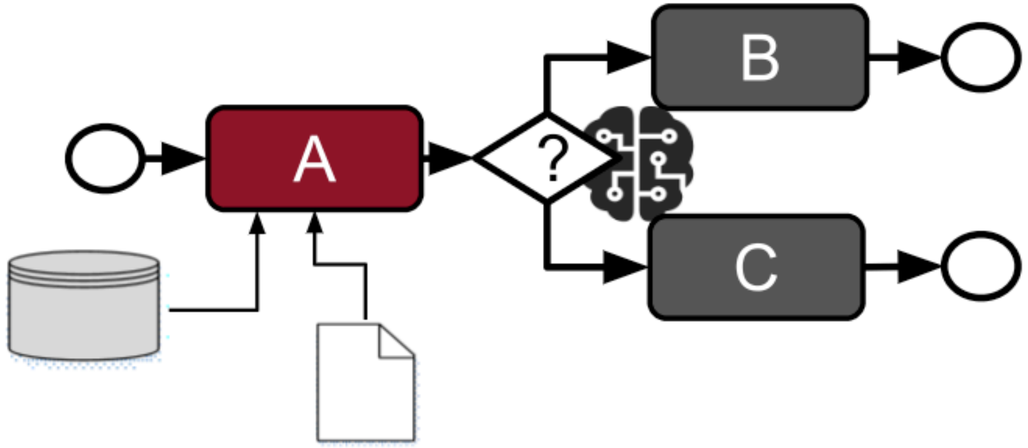
What brings Predictive Business Process Monitoring?

Motivation

- **Predictive Business Process Monitoring** enables proactive and corrective actions to improve process performance and mitigate risks (Márquez-Chamorro, Resinas, and Ruiz-Cortás, 2017)
- Example: DATEV Use Case „Automated Invoice Checking“

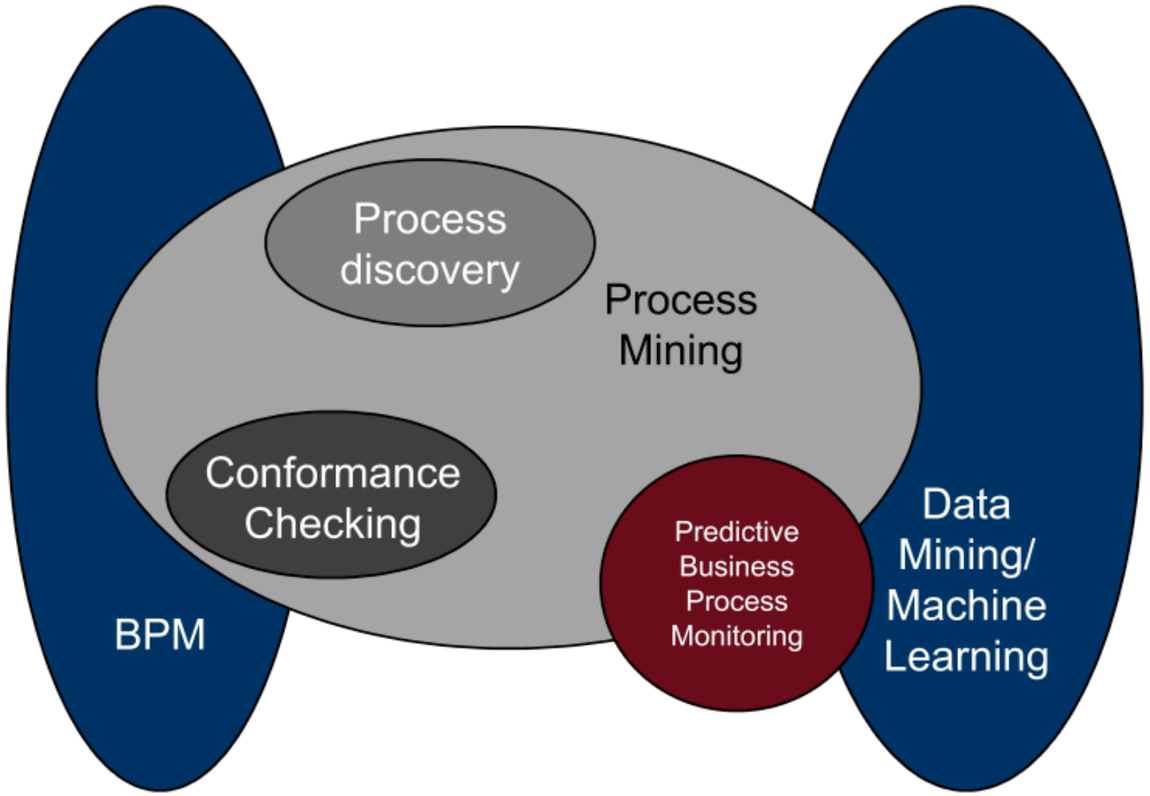


- ***However, not in organizations yet, since the predictive quality or/and the interpretability is limited…***

Positioning Predictive Business Process Monitoring

Fundamentals of Predictive Business Process Monitoring

- **Process Mining and Data Mining/Machine Learning** start from data
- **(Traditional) Data Mining/Machine Learning techniques**
  - … are data-centric and not process-centric
  - … don't address topics such as process discovery and conformance checking
- **Process Mining** assumes event logs where events have timestamps and refer to cases (process instances)
- Process Mining and Data Mining/Machine Learning need to be combined for more advanced questions (prediction tasks) in context of **Predictive Business Process Monitoring**



Source: (van der Aalst, 2016)

What is Predictive Process Monitoring?

Fundamentals of Predictive Business Process Monitoring

- **Business process monitoring**
  - … is a core task of business process management (BPM) (van der Aalst, 2013) that represents an important phase of the process cycle (Maggi et al., 2014)
  - … deals with the analysis of events produced during a business process's execution in order to assess the fulfillment of its compliance requirements and performance objectives (Dumas et al., 2018)
- **Monitoring** can take place offline (e.g., based on periodically produced reports) or online (e.g., via dashboards displaying the performance of currently running process instances) (Castellanos et al., 2004)
- **Predictive Business Process Monitoring** refers to a set of online process monitoring techniques (Verenich, Dumas, La Rosa, et al., 2018) that are concerned with predicting the evolution of running process instances of a business process with quantifiable metrics (Márquez-Chamorro, Resinas, and Ruiz-Cortás, 2017) and based on predictive models extracted from historical event logs (Tax et al., 2017)

There are six prediction tasks

Fundamentals of Predictive Business Process Monitoring

Prediction tasks in context of Predictive Business Process Monitoring can be classified into six categories (Di Francescomarin, 2018):

- **Time** (maintaining time, activity delays, remaining time)
- **Categorial outcome** (outcome, next activity, last value of an attribute)
- **Sequence of outcomes/values** (sequence of further activities, sequence of future activity timestamps)
- **Risk**
- **Inter-case metrics** (inter-case metrics, workload)
- **Cost**

So far, there are four Types of Techniques

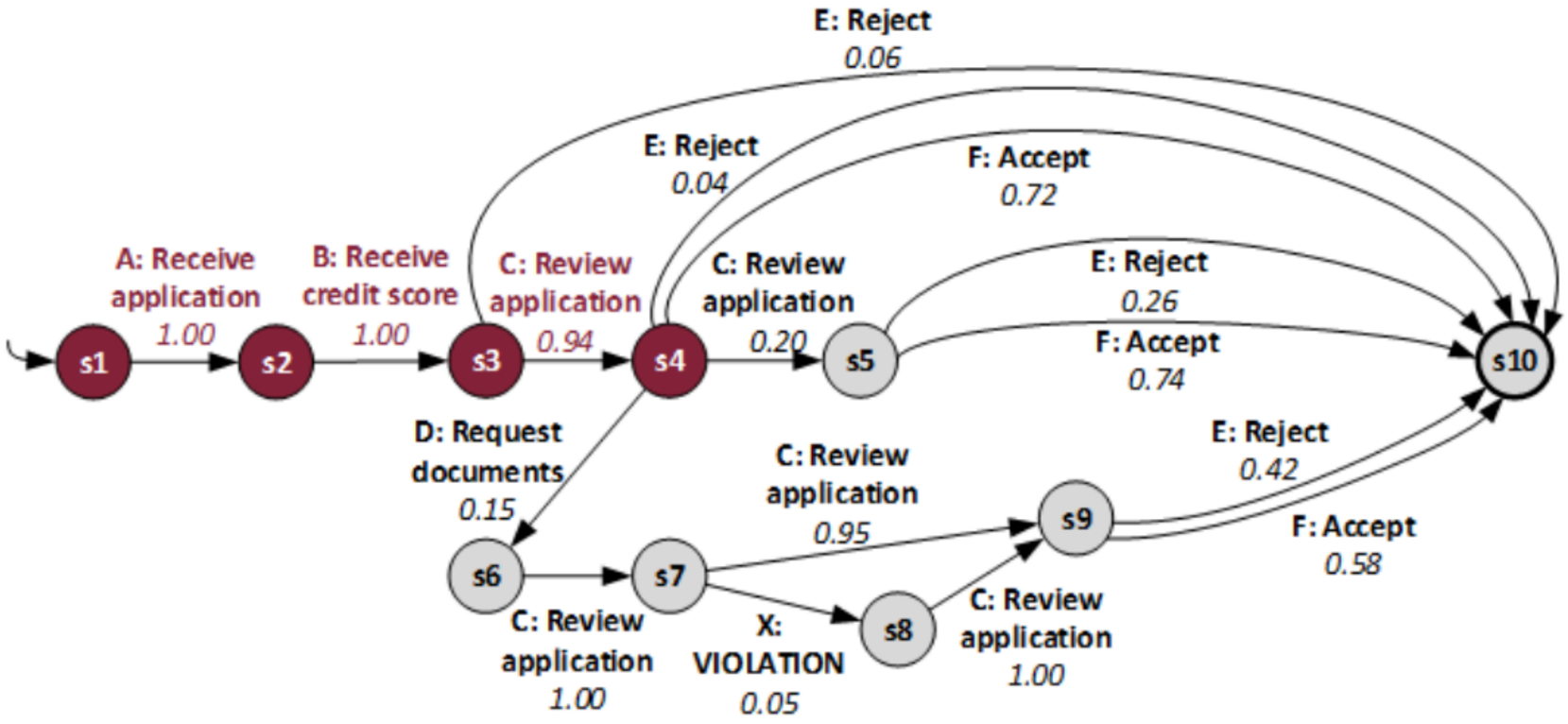
Predictive Process Prediction Techniques

Techniques in context of Predictive Business Process Monitoring can be classified into four categories (Márquez-Chamorro, Resinas and Ruiz-Cortés, 2017; Di Francescomarin, 2018):

- **(Pure-) Statistical methods:** Statistical Analysis
- **Machine Learning approaches:**
  - **Probabilistic Models (e.g., Probabilistic Finite Automata)**
  - **(Deep) Artificial Neural Network (e.g., Recurrent Neural Networks)**
  - Traditional ML-Models (e.g., Decision Trees)
- **Annotated transition systems**
- **Hybrid methods**

Example Process Credit Application

Probabilistic Models



ABC ➡ *How big is the risk for not keeping the deadline?*

References (1/2)

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