Topic 1: Process Model Understandability

Business processes are typically documented using graphical business process models, with modeling languages such as BPMN. These models serve as foundations for analyzing, communicating, and improving processes, making their clarity a crucial determinant of their utility. Poorly understandable models can lead to misunderstandings, poor decision-making, misaligned implementations, and reduced collaboration among stakeholders. Thus, the understandability of process models is essential for their effectiveness in business process management.

The goal of this seminar thesis is to provide an overview of current research on process model understandability. Specifically, the participant should identify factors influencing the understandability of process models and the methods used to measure them. Given the extensive literature on this topic, the participant should focus on understandability within the context of process mining.

Literature:
[1] Figl, K. (2017). Comprehension of procedural visual business process models: A literature review. Business & Information Systems Engineering, 59, 41–67.
[2] Dikici, A., Turetken, O., & Demirors, O. (2018). Factors influencing the understandability of process models: A systematic literature review. Information and Software Technology, 93, 112–129.
[3] Reijers, H. A., & Mendling, J. (2010). A study into the factors that influence the understandability of business process models. IEEE Transactions on Systems, Man, and Cybernetics, 41(3), 449–462.

Topic 2: Retrieval-Augmented Generation

Retrieval-Augmented Generation (RAG) combines the strengths of large language models with external knowledge retrieval systems, enabling more accurate and context-aware responses. Unlike traditional generative models that rely solely on pre-trained knowledge, RAG dynamically retrieves relevant information from external data sources, such as databases or document repositories, to augment the generation process. This approach is particularly relevant in domains requiring up-to-date, domain-specific, or verifiable information, such as customer support, medical diagnostics, or legal analysis.

The goal of this seminar thesis is to provide an overview of RAG and its applications in a business context. The participant should (a) explain the workings of RAG and (b) analyze its applications in domains such as management or finance. Special focus should be given to any applications of RAG in business process management.

Literature:
[1] Lewis, P., Perez, E., Piktus, A., Petroni, F., Karpukhin, V., Goyal, N., ... & Kiela, D. (2020). Retrieval-augmented generation for knowledge-intensive NLP tasks. Advances in Neural Information Processing Systems, 33, 9459–9474.
[2] Minor, M., & Kaucher, E. (2024). Retrieval augmented generation with LLMs for explaining business process models. In International Conference on Case-Based Reasoning, 175–190.
[3] Casciani, A., Bernardi, M. L., Cimitile, M., & Marrella, A. (2024). Conversational systems for AI-augmented business process management. In International Conference on Research Challenges in Information Science, 183–200.

Topic 3: Business Process Simulation

Process simulation is a powerful method for analyzing and optimizing the behavior of business processes. It involves building a simulation model of a process that can be used to experiment with different process configurations and scenarios in a controlled environment, without having to implement changes in a real operations context. However, despite its potential advantages, simulation is rarely used in practical business process management, due to the difficulty of creating accurate models and the expertise required to analyze simulation results.

The goal of this seminar thesis is to explore the topic of business process simulation from a research perspective. It should provide an overview of the key principles and techniques used in business process simulation (e.g., discrete event simulation and agent-based modeling). Furthermore, it should compile an overview of the current state-of-the-art techniques for process simulation and highlight unsolved challenges or research gaps in the field.

Literature:
[1] Wynn, M. T., Dumas, M., Fidge, C. J., ter Hofstede, A. H. M., & van der Aalst, W. M. P. (2008). Business process simulation for operational decision support. In Business Process Management Workshops, 66–77.
[7] Martin, N., Depaire, B., & Caris, A. (2014). The use of process mining in a business process simulation context: Overview and challenges. In IEEE Symposium on Computational Intelligence and Data Mining, 381–388.

Topic 4: KPIs in Business Process Management and for Process Mining

Key Performance Indicators (KPIs) are essential for assessing the effectiveness and success of business processes. In process mining, Process Performance Indicators (PPIs) provide a data-driven means of measuring processes and their adaptations. Despite their potential, the practical use of PPIs is often criticized for lacking clarity or failing to drive actionable insights, which hinders further managerial support.

The goal of this seminar thesis is to compile a structured overview of existing PPIs and process metrics. The participant should categorize them into relevant groups, analyze the required data to measure these metrics, and identify those measurable through process mining. Furthermore, the thesis should highlight how specific metrics align with particular process types and identify differences between them.

Literature:
[1] Van Looy, A., & Shafagatova, A. (2016). Business process performance measurement: A structured literature review of indicators, measures, and metrics. SpringerPlus, 5(1), 1797.
[2] Lamghari, Z., Radgui, M., Saidi, R., & Rahmani, M. D. (2019). Defining business process improvement metrics based on BPM life cycle and process mining techniques. International Journal of Business Process Integration and Management, 9(2), 107–133.
[3] Cho, M., Song, M., Comuzzi, M., & Yoo, S. (2017). Evaluating the effect of best practices for business process redesign: An evidence-based approach based on process mining techniques. Decision Support Systems, 104, 92–103.

Topic 5: Natural Language Semantics in Process Mining

Process mining involves analyzing event logs to gain insights into underlying business processes. These logs typically contain traces representing sequences of events performed for specific cases. Traditional techniques treat traces as sequences of abstract symbols, focusing solely on control-flow aspects of processes. More advanced, semantics-aware methods incorporate the meaning of events or their associated data attributes, enabling deeper insights. For instance, semantic analysis can uncover behavioral similarities between activities or reveal underlying business objects. Recent advances in Natural Language Processing (NLP), particularly in Large Language Models (LLMs), have significantly enhanced the potential for semantics-aware process mining, for instance in tasks like anomaly detection, prediction, and process discovery.

The goal of this seminar thesis is to identify and categorize techniques that utilize natural language semantics in process mining. The participant should examine (1) the types of semantics-aware tasks tackled in research, (2) the NLP concepts employed, and (3) the applications of these tasks in process mining. Finally, the thesis should propose a categorization framework for semantics-aware tasks and suggest future research directions.

Literature:
[1] Rebmann, A., & van der Aa, H. (2022). Enabling semantics-aware process mining through the automatic annotation of event logs. Information Systems 110, 102111.
[2] Busch, K., Kampik, T., & Leopold, H. (2024). XSEMAD: Explainable semantic anomaly detection in event logs using sequence-to-sequence models. Business Process Management, 309-327.
[3] Rebmann, A., et al. (2024). Evaluating the ability of LLMs to solve semantics-aware process mining tasks. International Conference on Process Mining, 9-16.

Topic 6: Privacy-preserving Process Mining

Privacy concerns are a significant challenge in process mining, as the analysis of event logs often involves sensitive data related to individuals and organizations. Sharing or analyzing such data without proper safeguards can lead to breaches of privacy, legal non-compliance, or loss of trust. To address these issues, privacy-preserving process mining focuses on techniques and approaches that enable the extraction of insights from event logs while ensuring that sensitive information remains protected.

The goal of this seminar thesis is to provide a comprehensive overview of privacy-preserving process mining techniques. The thesis should start by outlining the privacy challenges specific to process mining, followed by an exploration of existing privacy-preserving methods. Finally, the thesis should investigate the trade-offs between anonymization/encryption of event data and the performance of process mining techniques.

Literature:
[1] Elkoumy, G., Fahrenkrog-Petersen, S. A., Sani, M. F., et al. (2021). Privacy and confidentiality in process mining: Threats and research challenges. ACM Transactions on Management Information Systems 13(1), 11.
[2] Mannhardt, F., Koschmider, A., Baracaldo, N. et al. (2019). Privacy-Preserving Process Mining. Business Information Systems Engineering 61, 595–614.

Topic 7: Exploratory Process Mining

Exploration is a fundamental phase in many data science disciplines, including process mining. In process mining, exploration typically occurs during the initial analysis of event logs, process discovery, or when unexpected questions arise. Despite its importance, most research has focused on technical aspects, with limited attention to the exploratory phase itself.

The goal of this seminar thesis is to provide a comprehensive understanding of exploratory process mining. The participant should analyze its activities, challenges, and insights based on existing literature. Additionally, the thesis should summarize the current research focus in this area and identify any gaps. If applicable, similarities and differences to exploratory practices in other data science domains can also be discussed.

Literature:
[1] Zerbato, F., Soffer, P., & Weber, B. (2021). Initial insights into exploratory process mining practices. In Business Process Management Forum, 145–161.
[2] Sorokina, E., Soffer, P., Hadar, I., et al. (2023). PEM4PPM: A cognitive perspective on the process of process mining. In International Conference on Business Process Management, 465-481.
[3] Zerbato, F., Soffer, P., & Weber, B. (2022). Process mining practices: Evidence from interviews. In International Conference on Business Process Management, 268-285.