Joint Workshop Proceedings
ATAED'23 & PN4TT'23

**Workshop on**

# Algorithms & Theories for the Analysis of Event Data (ATAED'23)

**Workshop, June 27, 2023**

supported by the IEEE Task Force on Process Mining

Satellite event of the conference

**44th International Conference on Application and Theory of Petri Nets and Concurrency (Petri Nets 2023)**

Edited by
Robert Lorenz, Jan Martijn van der Werf, and Sebastiaan J. van Zelst

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## Preface

Ehrenfeucht and Rozenberg defined regions more than 30 years ago as sets of nodes of a finite transition system. Every region relates to potential conditions that enable or disable transition occurrences in an associated elementary net system. Later, similar concepts were used to define regions for Petri nets from languages as well. Both *state-based* and *language-based* approaches aim to constrain a Petri net by adding places deduced from the set of *region*s. By now, many variations have been proposed, e.g., approaches dealing with multiple tokens in a place, region definitions for Petri nets with inhibitor arcs, extensions to partial languages, regions for infinite languages, etc.

Initially, region theory focused on *synthesis*. We require the input and the behavior of the resulting Petri net to be equivalent. Recently, region-based research started to focus on *process mining* as well where the goal is *not* to create an equivalent model but to *infer* new knowledge from the input. Process mining examines observed behavior rather than assuming a complete description in terms of a transition system or prefix-closed language. For this reason, one needs to deal with new problems such as noise and incompleteness. Equivalence notions are replaced by trade-offs between fitness, simplicity, precision, and generalization. A model with good *fitness* allows for most of the behavior seen in the event log. A model that does not *generalize* is "overfitting". Overfitting is the problem that a very specific model is generated whereas it is obvious that the log only holds example behavior. A model that allows for "too much behavior" lacks *precision*. Simplicity is related to Occam's Razor which states that "one should not increase, beyond what is necessary, the number of entities required to explain anything". Following this principle, we look for the *simplest* process model that can explain what was observed in the event log. Process discovery from event logs is very challenging because of these and many other trade-offs. Clearly, there are many theoretical process-mining challenges with a high practical relevance that need to be addressed urgently.

All these challenges and opportunities are the motivation for organizing the *Algorithms & Theories for the Analysis of Event Data* (ATAED) workshop. The workshop first took place in Brussels in 2015 as a succession of the *Applications of Region Theory* (ART) workshop series. From there on, the workshop moved to Toruń (2016), Zaragoza (2017), Bratislava (2018), Aachen (2019), virtually in 2020 (due to the COVID-19 pandemic), and to Bergen in 2022. After the success of these workshops, it is only natural to bring together researchers working on region-based synthesis and process mining again.

The ATAED'23 workshop took place as a physical workshop on June 27th, 2023 and was a satellite event of the 43rd International Conference on Application and Theory of Petri Nets and Concurrency (Petri Nets 2022), held in Caparica, Portugal.

Papers related to process mining, region theory and other synthesis techniques were presented at the ATAED'2023, divided over two content-oriented sessions, i.e., "Concurrency" and "Discovery". In the Concurrency session, the inference of concurrency relations in the case of incomplete event logs is consid-

ered, as well as the synthesis of net systems with interval orders. In the Discovery session, the authors focus on algorithmic improvements of existing process discovery algorithms, particularly when using these with real event data.

After a careful reviewing process, four papers (out of a total of nine submissions) were accepted for the workshop. We thank the reviewers for providing the authors with valuable and constructive feedback. We thank the authors and the presenters for their wonderful contributions. The workshop was supported by the IEEE Task Force on Process Mining (`www.tf-pm.org/`).

Enjoy reading the proceedings!

Robert Lorenz, Jan Martijn van der Werf, and Sebastiaan J. van Zelst
June 2023

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Joint Workshop Proceedings ATAED'230 & PN4TT'23

# International Workshop on Petri Nets for Twin Transition (PN4TT'23)

**June 26, 2023**

Satellite event of the conference

**44th International Conference on Application and Theory of Petri Nets and Concurrency (Petri Nets 2023)**

Edited by
Luis Gomes, Paulo Leitão

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## Preface

These are the proceedings of the International Workshop on Petri Nets for Twin Transition (PN4TT'2023) to be held at June 26, 2023. The workshop is co-located with the 44th International Conference on Application and Theory of Petri Nets and Concurrency (PETRI NETS 2023) in Lisbon, Portugal.

The aim of PN4TT'2023 is to provide an opportunity to promote discussions and identifying potential contributions from Petri nets to on-going societal challenges in line with the goals of the "twin transition" concept. Twin transition has been promoted within European initiatives and addresses a balanced combination of digital transformations and decarbonising and sustainability approaches.

After a careful reviewing process, three papers (out of a total of four submissions) were accepted for the workshop, as well as a poster presentation. Each paper was reviewed by at least three referees. The proceedings also contain the extended abstract for the poster contribution.

We are glad that Wil van der Aalst accepted our invitation to give an invited talk about Twin Transitions Powered By Event Data - Using Object-Centric Process Mining To Make Processes Digital and Sustainable.

We would like to thank all the authors and presenters for their contributions. We also wish to acknowledge the contributions of all members of the Technical Program Committee for providing the authors with valuable and constructive feedback, that greatly contributed to the improvement of the quality of the final works.

Furthermore, we would like to thank our colleagues from local organization team in Lisbon for their support.

Enjoy reading the proceedings!

Luis Gomes, Paulo Leitão
June 2023

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