

33rd International Symposium on Temporal Representation and Reasoning

TIME 2026, September 1–3, 2026, Cork, Ireland

Edited by

Andrea Orlandini
Sophie Pinchinat



Editors

Andrea Orlandini 

National Research Council, Rome, Italy
andrea.orlandini@istc.cnr.it

Sophie Pinchinat 

IRISA Laboratory/University of Rennes, France
sophie.pinchinat@irisa.fr

ACM Classification 2012

Computing methodologies → Temporal reasoning; Information systems → Spatial-temporal systems;
Theory of computation → Modal and temporal logics; Information systems → Temporal data; Mathematics
of computing → Time series analysis; Theory of computation → Timed and hybrid models; Computing
methodologies → Discrete-event simulation

ISBN 978-3-95977-448-2

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern,
Germany. Online available at <https://www.dagstuhl.de/dagpub/978-3-95977-448-2>.

Publication date

October, 2026

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists all publications of this volume in the Deutsche Nationalbibliografie;
detailed bibliographic data are available in the Internet at <https://portal.dnb.de>.

License

This work is licensed under a Creative Commons Attribution 4.0 International license (CC-BY 4.0):
<https://creativecommons.org/licenses/by/4.0/legalcode>.



In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work
under the following conditions, without impairing or restricting the authors' moral rights:

- Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/OASlcs.TIME.2026.0

ISBN 978-3-95977-448-2

ISSN 1868-8969

<https://www.dagstuhl.de/oasics>

OASlcs – OpenAccess Series in Informatics

OASlcs is a series of high-quality conference proceedings across all fields in informatics. OASlcs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Daniel Cremers (TU München, Germany)
- Barbara Hammer (Universität Bielefeld, Germany)
- Marc Langheinrich (Università della Svizzera Italiana – Lugano, Switzerland)
- Dorothea Wagner (*Editor-in-Chief*, Karlsruher Institut für Technologie, Germany)

ISSN 1868-8969

<https://www.dagstuhl.de/oasics>

■ Contents

Preface	
<i>AndreA Orlandini and Sophie Pinchinat</i>	0:vii
TIME Steering Committee	
.....	0:ix
Program Committee Members	
.....	0:xi
List of Authors	
.....	0:xiii

Papers

Revisiting the Expressiveness of Metric Temporal Logic	
<i>Mohammed Aristide Foughali</i>	1:1–1:18
Core Fragments of Compass Logic	
<i>Pietro Casavecchia, Guido Sciavicco, and Leonardo Serrentino</i>	2:1–2:16
The Σ -Chain Product: A Succinct Model of Automata (De)Composition	
<i>Roberto Borelli, Davide Bresolin, Luca Geatti, Angelo Montanari,</i> <i>and Matteo Zavatteri</i>	3:1–3:17
Discrete Linear Ensemble Logic: Decidability, Expressiveness, and Axiomatization	
<i>Manfred Droste and Guo-Qiang Zhang</i>	4:1–4:18
Social Networks Through Time: Completeness of Temporal Network Logic	
<i>Saúl Fernández González, Mina Young Pedersen, and Sonja Smets</i>	5:1–5:21
Querying Interval-Based Temporal Data with SPARQL	
<i>Julien Corman, Roman Kontchakov, and Cem Okumus</i>	6:1–6:21
A Multi-Scale Process for Mining and Abstracting Environmental Spatio-Temporal Graphs	
<i>Assaad Zeghina, Aurélie Leborgne, Florence Le Ber, and Antoine Vacavant</i>	7:1–7:15
The Satisfiability Problem of Temporal-Spatial Logics over Quasi-Temporal Graphs	
<i>Eric Alsmann, Martin Lange, and Igor Semezie</i>	8:1–8:16
Dynamic Quantitative Skill Distribution in Multi-Agent Temporal Planning as SMT	
<i>Josselin Guéron and Frédéric Maris</i>	9:1–9:20
A Formal Model for Forensically Sound Timestamp Normalization	
<i>Lorenz Hornung, Carly Bakker, Bouke Timmermont, Roel van Dijk,</i> <i>Harm van Beek, and Natasha Alechina</i>	10:1–10:21
Decidable Reasoning About Time in Finite-Domain Situation Calculus Theories	
<i>Till Hofmann, Stefan Schupp, and Gerhard Lakemeyer</i>	11:1–11:22

33rd International Symposium on Temporal Representation and Reasoning (TIME 2026).

Editors: AndreA Orlandini and Sophie Pinchinat

OpenAccess Series in Informatics



OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

Earth Observation Satellite Constellation Planning with Matheuristics and
Metaheuristics Combination

Romain Barrault, Cedric Pralet, Gauthier Picard, and Eric Sawyer 12:1–12:17

Multi-Agent Path Finding with Tasks Under Time Uncertainty

Alexandre Albore, Christophe Grand, Noëlie Ramuzat, and Ajdin Sumic 13:1–13:21

■ Preface

We are delighted to welcome you to the 33rd International Symposium on Temporal Representation and Reasoning (TIME 2026). This year, TIME 2026 is co-located with the 37th International Conference on Principles of Diagnosis and Resilient Systems (DX'26) and is hosted from the 1st to the 3rd of September 2026 at the University College of Cork.

TIME has been for more than twenty years the only yearly multidisciplinary international event dedicated to the topic of time in computer science. The purpose of the symposium is to bring together active researchers in different scientific fields involving temporal and spatio-temporal data, information, and/or knowledge management. Such a concern arises in a number of different though often related research domains, namely Artificial Intelligence (both symbolic approaches based on explicit Logic or Constraint-based models, and numerical data-based approaches such as Deep Learning and Large Language Models), Databases and Data Mining, or System Specification and Verification. In an effort to broaden the symposium program we considered in TIME 2026 three types of submissions:

- Original long papers (15 pages), presenting unpublished theoretical (algorithms, models, proofs) or applied (systems, evaluations, applications) work;
- Survey papers (15 pages), offering concise overviews of established research areas;
- Extended abstracts (4 pages), initially intended to stimulate discussion and include work-in-progress, project reviews, PhD summaries, or summaries of papers published elsewhere.

This year, we received 26 submissions. Following a rigorous single blind peer-review process, 16 papers were accepted for presentation: 15 original long papers and 1 short paper (submitted extended abstracts). There were no survey papers among the submissions for this edition. Following requests from the respective authors, two papers accepted for presentation at the conference have been withdrawn from publication in these proceedings. These papers were presented as part of the conference program, but are intentionally omitted from this volume. Accordingly, the proceedings include all accepted contributions for which publication in the proceedings was authorized by the authors.

The program also features two invited talks by Kristin-Yvonne Rozier, Iowa State University, USA, and (shared with DX 2026) Alessandro Cimatti, Fondazione Bruno Kessler, Italy. The details of the talks are not available in this moment.

This year we also organized an open session where all participants may present interesting questions, open problems, highest priority locks that prevent the field from progressing, etc. This is for fostering interactions and possibly leading to new collaborations and synergies among attendees.

We are deeply grateful to the members of the program committee for their diligence and commitment to maintaining the scientific quality of the symposium, as well as to all authors for the care taken in their submissions and final versions of their articles and in their oral presentations, including our invited speakers.

In view of the high quality of these contributions, we have decided to give the best paper award is **Revisiting the Expressiveness of Metric Temporal Logic** which author is Mohammed Foughali. This paper provides a significant theoretical contribution by revisiting the expressiveness of Metric Temporal Logic, demonstrating the incomparability of

33rd International Symposium on Temporal Representation and Reasoning (TIME 2026).

Editors: AndreA Orlandini and Sophie Pinchinat



OpenAccess Series in Informatics

OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

its pointwise and interval-based semantics, and introducing a novel mixed semantics that unifies both approaches, offering a deeper understanding of temporal reasoning over timed executions.

We also thank the DX organizing team, Ingo Pill, Gregory Provan, and Marina Zanella, for their dedication in making this event a success, and express our appreciation to OASICs for publishing the proceedings and supporting open-access dissemination of scientific knowledge.

We hope that TIME 2026 provides a stimulating and collaborative environment for all participants and contributes meaningfully to the advancement of temporal representation and reasoning.

TIME 2026 Program Committee Chairs

Andrea Orlandini, National Research Council of Italy, Italy

Sophie Pinchinat, IRISA Laboratory/University of Rennes, France

■ TIME Steering Committee

Alexander Artikis

University of Piraeus & NCSR Demokritos
Greece
a.artikis@unipi.gr

Carlo Combi (Chair)

University of Verona
Italy
carlo.combi@univr.it

Thomas Guyet

IRISA
France
thomas.guyet@irisa.fr

Martin Lange (Chair)

University of Kassel
Germany
martin.lange@uni-kassel.de

Shankara Narayanan Krishna (Krishna S.)

IIT Bombay
India
krishnas@cse.iitb.ac.in

Patricia Bouyer

CNRS & ENS Paris-Saclay
France
bouyer@lsv.fr

Johann Eder

University of Klagenfurt
Austria
johann.eder@aau.at

Luke Hunsberger

Vassar College
United States
hunsberger@vassar.edu

Angelo Montanari

University of Udine
Italy
angelo.montanari@uniud.it

Mark Reynolds

University of Western Australia
Australia
mark.reynolds@uwa.edu.au



■ Program Committee Members

Sundaraman Akshay

Indian Institute of Technology Bombay
India
akshayss@cse.iitb.ac.in

Alexandros Artikis

NCSR Demokritos & University of Piraeus
Greece
a.artikis@iit.demokritos.gr

Béatrice Bérard

Sorbonne University
France
beatrice.berard@lip6.fr

Jaewook Byun

Sejong University
South Korea
jwbyun@sejong.ac.kr

Nicola Gigante

Free University of Bozen-Bolzano
Italy
nicola.gigante@unibz.it

Peter Jonsson

Linköping University
Sweden
peter.jonsson@liu.se

Martin Lange

University of Kassel
Germany
martin.lange@uni-kassel.de

Periklis Mantenoglou

Örebro University
Sweden
periklis.mantenoglou@oru.se

Andrea Micheli

FBK, Trento
Italy
amicheli@fbk.eu

Andrea Orlandini

ISTC-CNR, Roma
Italy
andrea.orlandini@istc.cnr.it

Sophie Pinchinat

IRISA, Rennes
France
sophie.pinchinat@irisa.fr

Vladislav Ryzhikov

Birkbeck, University of London
United Kingdom
v.ryzhikov@bbk.ac.uk

Beatrice Amico

University of Verona
Italy
beatrice.amico@univr.it

Massimo Benerecetti

Università di Napoli "Federico II"
Italy
massimo.benerecetti@unina.it

Florian Bruse

University of Kassel
Germany
florian.bruse@uni-kassel.de

Carlo Combi

University of Verona
Italy
carlo.combi@univr.it

Thomas Guyet

Inria-AIstroSight
France
thomas.guyet@inria.fr

Roman Kontchakov

Birkbeck, University of London
United Kingdom
roman@dcs.bbk.ac.uk

Ruizhe Ma

University of Massachusetts Lowell
United States of America
ruizhe_ma@uml.edu

Maria Chiara Meo

"G. d'Annunzio" University of Chieti-Pescara
Italy
mariachiara.meo@unich.it

Angelo Montanari

University of Udine
Italy
angelo.montanari@uniud.it

Yannick Pencolé

LAAS-CNRS, Toulouse
France
yannick.pencole@laas.fr

Roberto Posenato

University of Verona
Italy
roberto.posenato@univr.it

Marco Saelzer

University of Kassel
Germany
marco.saelzer@uni-kassel.de

33rd International Symposium on Temporal Representation and Reasoning (TIME 2026).

Editors: Andrea Orlandini and Sophie Pinchinat

OpenAccess Series in Informatics



OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

Yakoub Salhi

Artois University
France
salhi@cril.fr

Guido Sciavicco

University of Ferrara
Italy
scvgdu@unife.it

Kathleen Stewart

University of Maryland
US
stewartk@umd.edu

Paolo Terenziani

University of Piemonte Orientale, Alessandria
Italy
paolo.terenziani@unipmn.it

Emanuel Sallinger

Technical University, Wien
Austria
emanuel.sallinger@tuwien.ac.at

Michael Sioutis

University of Montpellier
France
michael.sioutis@lirmm.fr

Ajdin Sumic

ONERA, Toulouse
France
aidin.sumic@onera.fr

Matteo Zavatteri

University of Padua
Italy
matteo.zavatteri@unipd.it

■ List of Authors

Alexandre Albore  (13)
ONERA, University of Toulouse, France

Natasha Alechina  (10)
Open Universiteit, Heerlen, The Netherlands;
Utrecht University, The Netherlands

Eric Alsmann  (8)
Theoretical Computer Science / Formal
Methods, University of Kassel, Germany

Carly Bakker (10)
Netherlands Forensic Institute,
The Hague, The Netherlands

Romain Barrault  (12)
DTIS, ONERA, Université de Toulouse, 31000,
Toulouse, France

Roberto Borelli  (3)
University of Padua, Italy

Davide Bresolin  (3)
University of Padua, Italy

Pietro Casavecchia  (2)
Department of Mathematics and Computer
Science, University of Ferrara, Italy

Julien Corman  (6)
Free University of Bozen-Bolzano, Italy

Manfred Droste  (4)
Institute of Computer Science, Leipzig
University, Germany

Saúl Fernández González  (5)
University of Oviedo, Spain

Mohammed Aristide Foughali  (1)
Université Paris Cité, CNRS, IRIF, F-75013,
Paris, France

Luca Geatti  (3)
University of Udine, Italy

Christophe Grand  (13)
ONERA, University of Toulouse, France

Josselin Guéron  (9)
Université Caen Normandie, ENSICAEN,
CNRS, Normandie Univ, GREYC UMR6072,
F-14000 Caen, France

Till Hofmann  (11)
RWTH Aachen University, Germany;
University of Oxford, UK

Lorenz Hornung  (10)
Open Universiteit, Heerlen, The Netherlands

Roman Kontchakov  (6)
Birkbeck, University of London, UK

Gerhard Lakemeyer  (11)
RWTH Aachen University, Germany

Martin Lange  (8)
Theoretical Computer Science / Formal
Methods, University of Kassel, Germany

Florence Le Ber  (7)
Université de Strasbourg, CNRS, ENGEEES,
ICube UMR 7357, Strasbourg, France

Aurélié Leborgne  (7)
Université de Strasbourg, CNRS, ENGEEES,
ICube UMR 7357, Strasbourg, France

Frédéric Maris  (9)
Université de Toulouse, IRIT, France

Angelo Montanari  (3)
University of Udine, Italy

Cem Okulmus  (6)
Paderborn University, Germany

Mina Young Pedersen  (5)
Institute for Logic, Language and Computation,
University of Amsterdam, The Netherlands

Gauthier Picard  (12)
DTIS, ONERA, Université de Toulouse, 31000,
Toulouse, France

Cedric Pralet  (12)
DTIS, ONERA, Université de Toulouse, 31000,
Toulouse, France

Noëlie Ramuzat  (13)
ONERA, University of Toulouse, France

Eric Sawyer  (12)
CNES, Toulouse, France

Stefan Schupp  (11)
TU Wien, Austria

Guido Sciavicco  (2)
Department of Mathematics and Computer
Science, University of Ferrara, Italy

33rd International Symposium on Temporal Representation and Reasoning (TIME 2026).

Editors: AndreA Orlandini and Sophie Pinchinat



OpenAccess Series in Informatics

Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

Igor Semeziez  (8)

Theoretical Computer Science / Formal
Methods, University of Kassel, Germany;
Laboratoire Méthodes Formelles, ENS
Paris-Saclay, France

Leonardo Serrentino  (2)

Department of Mathematics and Computer
Science, University of Ferrara, Italy

Sonja Smets  (5)

Institute for Logic, Language and Computation,
University of Amsterdam, The Netherlands

Ajdin Sumic  (13)

ONERA, University of Toulouse, France

Bouke Timmermont (10)

Open Universiteit, Heerlen, The Netherlands;
Netherlands Forensic Institute,
The Hague, The Netherlands

Antoine Vacavant  (7)

Université Clermont Auvergne, CNRS,
SIGMA Clermont, Institut Pascal, France

Harm van Beek  (10)

Open Universiteit, Heerlen, The Netherlands;
Netherlands Forensic Institute,
The Hague, The Netherlands

Roel van Dijk (10)

Netherlands Forensic Institute,
The Hague, The Netherlands

Matteo Zavatteri  (3)

Fondazione Bruno Kessler, Trento, Italy

Assaad Zaghina  (7)

Université de Strasbourg, CNRS, ENGEEES,
ICube UMR 7357, Strasbourg, France

Guo-Qiang Zhang  (4)

The University of Texas Health Science Center
at Houston, TX, USA