

37th International Conference on Principles of Diagnosis and Resilient Systems

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

Edited by

Ingo Pill

Marina Zanella

Gregory Provan



Editors

Ingo Pill 

Graz University of Technology, Austria
ingo.pill@gmail.com

Marina Zanella 

University of Brescia, Italy
marina.zanella@unibs.it

Gregory Provan 

University College Cork, Ireland
gprovan@cs.ucc.ie

ACM Classification 2012

Computing methodologies → Knowledge representation and reasoning

ISBN 978-3-95977-455-0

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/978-3-95977-455-0>.

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.DX.2026.0

ISBN 978-3-95977-455-0

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>Ingo Pill, Marina Zanella, and Gregory Provan</i>	0:vii
Conference Organization	
.....	0:ix
List of Authors	
.....	0:xi

Regular Papers

A Realization-Theoretic Foundation for Fault Diagnosis, with Diagnosability Equivalence Predictions	
<i>Gregory Provan</i>	1:1–1:20
An Explainable GNN Framework for Component-Level Anomaly Diagnosis	
<i>Sena Ozgunay, Louise Travé-Massuyès, Jean-Michel Loubes, and Raul Sena Ferreira</i>	2:1–2:17
Dissecting NetDoktor’s Online Questionnaire with Entropy, Tree Simplification & Logical Abduction	
<i>Alexander Perko, Emir Mujić, and Franz Wotawa</i>	3:1–3:20
Early Failure Prediction from Near-Anomaly Detection: A Proactive Approach	
<i>Léa Billet, Louise Travé-Massuyès, Elodie Chanthery, and Alexandre Gaffet</i>	4:1–4:18
FELIX: Model Repair in Numeric Planning	
<i>Nir Aharoni, Yarin Benyamin, Shiwali Mohan, and Roni Stern</i>	5:1–5:18
Geometric Feature Selection for Interpretable SVM Classifiers in Cyber-Physical Systems	
<i>Leonie Hatte, Pauline Ribot, and Elodie Chanthery</i>	6:1–6:20
HSU TwinFlow: A Living Benchmark for Evaluating Anomaly Detection and Diagnosis Methods in Cyber-Physical Production Systems Using Digital-Twin-Generated Data	
<i>Nemanja Hranisavljevic, Alexander Diedrich, Lukas Moddemann, Domenic Schaeffer, Frank Marek, Ingo Pill, and Oliver Niggemann</i>	7:1–7:14
Hybrid Fault Detection and Isolation for the Fuel Turbopump Subsystem of the LOX/LNG Expander-Bleed Rocket Engine LUMEN	
<i>Eldin Kurudzija, Marcos Quinones-Grueiro, Kai Dresia, Austin Coursey, Gautam Biswas, Jan Deeken, and Günther Waxenegger-Wilfing</i>	8:1–8:20
On the Practical Utility of Diagnoses	
<i>Ingo Pill and Johan de Kleer</i>	9:1–9:20
Planning Domain Repair Using Preferred Plans and Background Knowledge	
<i>Thomas Eckstein and Gerald Steinbauer-Wagner</i>	10:1–10:22

37th International Conference on Principles of Diagnosis and Resilient Systems (DX 2026).

Editors: Ingo Pill, Marina Zanella, and Gregory Provan



OpenAccess Series in Informatics

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

QSIM-Guided Weak Supervision for Fault Detection in Cyber-Physical Systems <i>Ankita Das, Roxane Koitz-Hristov, and Franz Wotawa</i>	11:1–11:20
Reinforcement Learning-Driven Predictive Maintenance Planning via Timed Automata Modeling <i>Ferhat Tamssaouet, Pauline Ribot, and Yannick Pencolé</i>	12:1–12:20
Statistical Foundations of Local Geometric Fault Detection: The Curvature Channel <i>Gregory Provan</i>	13:1–13:20
Using SLMs and LLMs for Diagnosis <i>Sophia Plank and Franz Wotawa</i>	14:1–14:17
DX Competition	
Physics-Informed ML Diagnostic Engine: DXC’26 LiU-ICE Track Solution <i>Antoni Rogowski and Anna Sztzyber-Betley</i>	15:1–15:20
Short Papers	
Counterfactual Fault Responsibility in a Dynamic Structural Causal Model of a DC Motor <i>Emir Mujić and Franz Wotawa</i>	16:1–16:14
When Dynamic Slicing Helps and Hurts Spectrum-Based Fault Localization: Evidence from an Expanded TCAS Benchmark <i>Iulia Nica and Franz Wotawa</i>	17:1–17:15
Extended Abstracts	
Summary Of: Modelling Cyber-Physical Systems for Fault Diagnosis <i>Alexander Diedrich, Mattias Krysander, René Heesch, and Oliver Niggemann</i>	18:1–18:6
Uncertainty-Aware Fault Diagnosis of Unknown Faults Using Ensemble-Based NODE Residuals <i>Daniel Jung and Theodor Westny</i>	19:1–19:6

■ Preface

In 2026, the 37th International Conference on Principles of Diagnosis and Resilient Systems (DX'26) was hosted by University College Cork from September 1st to 3rd in Cork, Ireland. The DX conference has been a leading forum to present and discuss the latest research, experience reports, and emerging ideas related to diagnosis and resilient systems. Since DX is application-agnostic, the research presented covers a wide range of systems, from physical via biological to computational ones, represented as either abstract or detailed models. Starting with the 2024 edition, DX not only evolved from a workshop to a full conference, but also expanded its focus to include resilience systems. Directly connected to diagnostic issues, resilience in a system refers to a system's inherent ability to maintain its essential operations when faced with both expected and unforeseen challenges. Related aspects of interest to DX include resilient design as well as approaches that enable operational resilience. The topics covered in the DX conference thus include, but are not limited to:

- Monitoring, detection, diagnosis and mitigation of faults, unexpected issues and anomalies
- Formal theories and symbolic, sub-symbolic, as well as hybrid approaches to diagnosis
- Data-driven and learning-enabled methods for monitoring and diagnosis
- Connections between diagnosis and other techniques such as decision-making, (re-)planning, (re-)configuration, control, formal verification, and testing
- Theoretical concepts for design and operational resilience
- Designing, developing, and operationalizing resilient systems
- Hardware and software instrumentation for dependable data acquisition and probing
- Development, learning, abstraction, transformation, analysis, optimization, maintenance and transfer of diagnosis models
- Diagnosis in resilient, intelligent, and autonomous systems
- Diagnosis in a distributed, hierarchical, system-of-systems, or multi-agent context

For our 2026 edition, we received 29 submissions, ranging from extended abstracts to full papers and targeting the regular, DX Competition, and PhD panel tracks. This number includes two submissions that have been re-evaluated. For publication in these proceedings, we accepted 19 submissions, which entails an acceptance rate of 65.5%.

The manuscripts in these proceedings demonstrate the wide and innovative scope of research on diagnosis, prognosis, and resilient systems. Contributions include advances in methodology – such as temporal reasoning and planning or uncertainty considerations – as well as the incorporation of large language models for developing diagnostic models. The application areas are just as varied, covering control software, cyber-physical systems, or combustion and space rocket engines. Several studies highlight benchmarking and evaluation frameworks, like the revived DX Competition, a benchmark for fault isolation and diagnosis in production plants, and the systematic consideration or analysis of diagnostic algorithms and derived diagnoses. All these papers exemplify the theoretical depth as well as practical applications of diagnosis research, pointing towards the future integration of AI, multimodal reasoning, and resilience-by-design for enabling complex engineered systems.

A special highlight this year is that TIME, i.e., the International Symposium on Temporal Representation and Reasoning, organized by *Sophie Pinchinat* and *Andrea Orlandini*, chose to co-locate with DX. To honor the co-location, the program on September 2nd was shared between the two events, starting with a keynote given by *Alessandro Cimatti* from FBK, Italy,

with the title *From Runtime Verification to Model-Based Diagnosis*. For the DX program, we could also secure an invited talk on *Engineering Resilience for Critical Infrastructure* given by *Utz Roenig* from UCC, Ireland.

Organizing a conference is always a team effort, so we would like to thank a few people. We start with the program committee members and thank them for their reviews that helped us select the right papers for our program and the subset accepted for these proceedings. We would like to specifically mention also our keynote speaker *Alessandro Cimatti*, the invited speaker *Utz Roedig*, the DX Competition committee (see below), as well as the DX Steering Committee (see below) for their essential contributions to the DX community and this conference. Further thanks go to the DX'26 award committee members, *Franz Wotawa*, *Oliver Niggemann* and *Marina Zanella*, who selected the awardees from the following four full papers that were nominated for receiving a best paper award (in a.o.):

- Early Failure Prediction from Near-Anomaly Detection: A Proactive Approach, *by Léa Billet, Louise Travé-Massuyès, Elodie Chantry and Alexandre Gaffet*
- Hybrid Fault Detection and Isolation for the Fuel Turbopump Subsystem of the LOX/LNG Expander-Bleed Rocket Engine LUMEN, *by Eldin Kurudzija, Kai Dresia, Günther Waxenegger-Wilfing, Marcos Quinones-Grueiro, Austin Coursey and Gautam Biswas*
- On the Practical Utility of Diagnoses, *by Ingo Pill and Johan de Kleer*
- Reinforcement Learning-Driven Predictive Maintenance Planning via Timed Automata Modeling, *by Ferhat Tamssaouet, Pauline Ribot and Yannick Pencolé*

We congratulate the winners of the issued award(s) who were not known at the time of writing this preface. Special thanks go to Dagstuhl, our publisher, and the editors of the OASIs series for collaborating with us to make our technical program available through open-access proceedings. Finally, we thank the authors for contributing to the success of this conference and the high quality of our archival proceedings. Without their work and their choice to present their most recent research at DX, this event would not have been possible.

The DX'26 chairs: Ingo Pill, Gregory Provan, Marina Zanella

■ Conference Organization

DX 2026 Organizing Committee (in a.o.)

- Johan de Kleer, C-Infinity, USA
- Ingo Pill (chair), Graz University of Technology, Austria
- Gregory Provan (local chair), University College Cork, Ireland
- Marcos Quinones-Grueiro, Vanderbilt University, USA
- Marina Zanella (chair), Università di Brescia, Italy

DX Steering Committee (in a.o.)

- Gautam Biswas, Vanderbilt University, Vanderbilt, USA
- Johan de Kleer, C-Infinity, USA
- Meir Kalech, Ben Gurion University of the Negev, Israel
- Oliver Niggemann, Helmut-Schmidt-Universität Hamburg, Germany
- Ingo Pill (chair), Graz University of Technology, Austria
- Louise Travé-Massuyès, LAAS-CNRS / Université de Toulouse, France
- Franz Wotawa, Graz University of Technology, Austria
- Marina Zanella, Università di Brescia, Italy

DX Competition 2026 Committee (in a.o.)

- Johan de Kleer (co-chair, chair COMIC Benchmark), C-Infinity, USA
- Erik Frisk, Linköping University, Sweden
- Daniel Jung (chair LiU-ICE Benchmark), Linköping University, Sweden
- Mattias Krysander, Linköping University, Sweden
- Ingo Pill (chair), Graz University of Technology, Austria
- Michal Syfert (chair SLIDE Benchmark), Warsaw University of Technology, Poland
- Anna Szttyber-Betley, Warsaw University of Technology, Poland

DX 2026 Program Committee (in a.o.)

- Elodie Chantry, LAAS-CNRS / Université de Toulouse, France
- Alessandro Cimatti, Fondazione Bruno Kessler, Italy
- Johan de Kleer, C-Infinity, USA
- Alexander Diedrich, Helmut-Schmidt-Universität Hamburg, Germany
- Görschwin Fey, Technische Universität Hamburg, Germany
- Daniel Jung, Linköping University, Sweden
- Martin Leucker, University of Lübeck, Germany
- Avraham Natan, Ben Gurion University of the Negev, Israel
- Yannick Pencolé, LAAS-CNRS / Université de Toulouse, France
- Ingo Pill (chair), Graz University of Technology, Austria
- Gregory Provan (chair), University College Cork, Ireland
- Belarmino Pulido, Universidad de Valladolid, Spain
- Marcos Quinones-Grueiro, Vanderbilt University, USA
- Pauline Ribot, LAAS-CNRS / Université de Toulouse, France
- Patrick Rodler, Alpen-Adria Universität Klagenfurt, Austria
- Indranil Roychoudhury, Schlumberger Menlo Park, USA

37th International Conference on Principles of Diagnosis and Resilient Systems (DX 2026).
Editors: Ingo Pill, Marina Zanella, and Gregory Provan



OpenAccess Series in Informatics
OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

- Martin Sachenbacher, Technical University of Applied Sciences Regensburg, Germany
- Gerald Steinbauer-Wagner, Graz University of Technology, Austria
- Roni Stern, Ben Gurion University of the Negev, Israel
- Peter Struss, Technical University of Munich, Germany
- Michal Syfert, Warsaw University of Technology, Poland
- Anna Sztzyber-Betley, Warsaw University of Technology, Poland
- Stefano Tonetta, Fondazione Bruno Kessler, Italy
- Gianluca Torta, Università di Torino, Italy
- Louise Travé-Massuyès, LAAS-CNRS / Université de Toulouse, France
- Günther Waxenegger-Wilfing, DLR and Julius Maximilian University Würzburg, Germany
- Franz Wotawa, Graz University of Technology, Austria
- Marina Zanella (chair), Università di Brescia, Italy

■ List of Authors

Nir Aharoni  (5)

Ben-Gurion University of the Negev,
Beer Sheva, Israel

Yarin Benyamin  (5)

Ben-Gurion University of the Negev,
Beer Sheva, Israel

Léa Billet  (4)

Schaeffler, Toulouse, France; LAAS-CNRS,
University of Toulouse, INSA, France

Gautam Biswas  (8)

Institute for Software Integrated Systems,
Vanderbilt University, Nashville, TN, USA

Elodie Chantry  (4, 6)

LAAS-CNRS, University of Toulouse, INSA,
UPS, France

Austin Coursey  (8)

Institute for Software Integrated Systems,
Vanderbilt University, Nashville, TN, USA

Ankita Das  (11)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Johan de Kleer  (9)

c-infinity, Mountain View, CA, USA

Jan Deeken  (8)

Institute of Space Propulsion, German
Aerospace Center (DLR), Hardthausen,
Germany;
Institute of Jet Propulsion and Turbomachinery,
RWTH Aachen, Germany

Alexander Diedrich  (7, 18)

Helmut Schmidt University, Hamburg, Germany

Kai Dresia  (8)

Institute of Space Propulsion, German
Aerospace Center (DLR), Erlenbach, Germany

Thomas Eckstein (10)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Raul Sena Ferreira  (2)

Airbus Protect, Toulouse, France

Alexandre Gaffet  (4)

Schaeffler, Toulouse, France

Leonie Hatte  (6)

LAAS-CNRS, Université de Toulouse, INSA,
UPS, France

René Heesch  (18)

Helmut-Schmidt-University, Hamburg, Germany

Nemanja Hranisavljevic  (7)

Helmut Schmidt University, Hamburg, Germany

Daniel Jung  (19)

Linköping University, Sweden

Roxane Koitz-Hristov  (11)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Mattias Krysander  (18)

Linköping University, Sweden

Eldin Kurudzija  (8)

Institute of Space Propulsion, German
Aerospace Center (DLR), Köln, Germany

Jean-Michel Loubes  (2)

INRIA, Toulouse, France

Frank Marek (7)

Novatio Solutions GmbH, Monheim, Germany

Lukas Moddemann  (7)

Helmut Schmidt University, Hamburg, Germany

Shiwali Mohan  (5)

Future Concepts Division, SRI International,
Menlo Park, CA, USA

Emir Mujić  (3, 16)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Iulia Nica  (17)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Oliver Niggemann  (7, 18)

Helmut Schmidt University, Hamburg, Germany

Sena Ozgunay  (2)

LAAS-CNRS, Université de Toulouse, France

Yannick Pencolé  (12)

LAAS-CNRS, CNRS, Université de Toulouse,
France

37th International Conference on Principles of Diagnosis and Resilient Systems (DX 2026).

Editors: Ingo Pill, Marina Zanella, and Gregory Provan



OpenAccess Series in Informatics

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

Alexander Perko  (3)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Ingo Pill  (7, 9)

Institute of Software Engineering and Artificial
Intelligence, TU Graz, Graz, Austria

Sophia Plank (14)

Graz University of Technology, Austria

Gregory Provan  (1, 13)

School of Computer Science and IT,
University College Cork, Ireland

Marcos Quinones-Grueiro  (8)

Institute for Software Integrated Systems,
Vanderbilt University, Nashville, TN, USA

Pauline Ribot  (6, 12)

LAAS-CNRS, Université de Toulouse, INSA,
UPS, France

Antoni Rogowski  (15)

Warsaw University of Technology, Poland

Domenic Schaeffer (7)

Digital Twin Factory GmbH,
Bad Oeynhausen, Germany

Gerald Steinbauer-Wagner  (10)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria

Roni Stern  (5)

Ben-Gurion University of the Negev, Israel

Anna Sztyber-Betley  (15)

Warsaw University of Technology, Poland

Ferhat Tamssaouet  (12)

LAAS-CNRS, Université de Toulouse, France

Louise Travé-Massuyès  (2, 4)

LAAS-CNRS, Université de Toulouse, CNRS,
France

Günther Waxenegger-Wilfing  (8)

Institute of Space Propulsion, German
Aerospace Center (DLR), Hardthausen,
Germany;
Institute of Computer Science, University of
Würzburg, Germany

Theodor Westny  (19)

Linköping University, Sweden

Franz Wotawa  (3, 11, 14, 16, 17)

Institute of Software Engineering and Artificial
Intelligence, Graz University of Technology,
Austria