

Preface

This summer we are organizing the twentieth edition of DepCoS-RELCOMEX conference. The years that have passed since our first meeting in Szkalrska Poręba in 2006 have seen tremendous civilizational changes in our daily lives and, above all, in research and engineering related to computer science. We have tried to keep up with these changes; the topics have changed, the conference format and location have changed, and above all, the group of participants has changed as we “grew” in knowledge, titles and years, but fortunately new young enthusiasts have joined. And so, a DepCoS family was formed, influencing the development of dependability in both theoretical research and engineering.

To outline the history of our meetings, it should be noted that, although currently its chief organizer is Department of Computer Engineering at the Faculty of Information and Communication Technology of Wrocław University of Science and Technology, its roots go back to the heritage of two much older events: RELCOMEX (1977–89) and Microcomputer School (1985–95) which were organized by the Institute of Engineering Cybernetics under the leadership of prof. Wojciech Zamojski, now still the DepCoS chairman. Initially, our proceedings were published by the IEEE Computer Society (till 2009), then, after one year when post-conference monographs were printed by the Publishing House of the University, in 2011 we began our cooperation with Springer Nature. Since then, the proceedings were included first in the series “Advances in Intelligent Systems and Computing” (vols. 97, 170, 224, 286, 365, 479, 582, 761, 987, 1173 and 1389) and starting from 2022—in “Lecture Notes in Networks and Systems” (vols. 484, 737 and 1024). With Springer Nature being one of the largest and most prestigious scientific publishers, DepCoS papers included in the LNNS series are submitted for indexing in CORE Computing Research & Education database, SCOPUS, Web of Science, INSPEC, DBLP and other indexing services.

Over the years, the topical scope of the conference had to evolve in order to stay focused on diverse issues which have been constantly arising in performability and dependability analysis of computer systems and networks. As compared to a more technical, reliability-oriented approach which was clear at the beginning, now dependability of computer processing means obtaining reliable (true and timely) results in the conditions of processing both quantitative and qualitative data, using precise and “fuzzy/imitating” models and algorithms. It should be emphasized that in modern information technology artificial intelligence algorithms and tools are used increasingly, and therefore we are expanding our view on the dependability of systems that are progressively using methods based on cognitive systems, deep learning tools and large language models. In our opinion, this approach (**dependability** as the credibility of systems, **AI** tools and computer applications) meets the challenges which the computer science presently faces, both in its theoretical studies and in engineering. Ever-growing number of research methods being continuously developed for such analyses apply the newest results of artificial intelligence and computational intelligence. Topical diversity of papers in these proceedings

illustrates broad variety of multi-disciplinary subjects which should be considered in contemporary dependability explorations.

At the end of this preface, we would like to express our appreciation to everyone who participated in organization of the conference and in preparation of this volume: the members of the Programme and the Organizing Committees and all other individuals who assisted in creation of this book. Also, we must not forget to thank reviewers who helped to select and refine contents of this volume. In this edition, the following individuals devoted their time and efforts to read and assess the submissions: Frank Coolen, Wiktor Daszczuk, Zbigniew Gomulka, Łukasz Jeleń, Vyacheslav Kharchenko, Urszula Kuźelewska, Alexey Lastovetsky, Jan Magott, Jacek Mazurkiewicz, Marek Młyńczak, Robert Sobolewski, Jarosław Sugier, Kamil Szyc, Tomasz Walkowiak, Marek Woda, Wojciech Zamojski and Ewa Żesławska.

Finally, the last words should be devoted to the authors who selected DepCoS-RELCOMEX as *the* platform to publish and discuss their research. Communicating our sincerest thanks to them we believe that their papers will contribute to advances in design, analysis and engineering of dependable computer systems and networks and will create an interesting source material for scientists, researchers, engineers and students working in these areas.

Wojciech Zamojski
Jacek Mazurkiewicz
Jarosław Sugier
Tomasz Walkowiak
Janusz Kacprzyk

About this Book

Contemporary computer systems and networks are the most complex structures ever engineered by man yet their reliable operation is paramount in today's interconnected world. These systems form the backbone of almost every sector, from healthcare and finance to communication and transportation. Dependable systems ensure the seamless functioning of critical services, such as medical diagnostics, financial transactions and emergency responses. This volume offers a selection of papers addressing challenges encountered in dependability studies of such systems. It can serve as an engaging and thought-provoking resource for scientists, researchers, engineers and students who must tackle diverse dependability considerations in the design, analysis or maintenance of contemporary computer systems.

The 20th DepCoS-RELCOMEX conference marked yet another instalment in a series of events held annually since 2006. Initially conceived as a platform for scholarly dialogue on reliability in computer engineering, the conference's focus has continually evolved to encompass emerging challenges arising from advancements in information technologies and computer engineering. Today, dependable computer operations involve delivering accurate and timely results while processing both quantitative and qualitative data, utilizing precise or fuzzy models and algorithms. As artificial intelligence and large language models become increasingly prominent, ensuring dependability in modern IT and computer engineering necessitates employing cognitive systems and deep learning methodologies. The diverse topics explored in the conference papers underscore how crucial dependability has become across all applications of contemporary computer systems and networks. They also highlight the multifaceted, interdisciplinary nature of subjects that must be addressed in this area.

Twentieth International Conference on Dependability of Computer Systems DepCoS-RELCOMEX Brunów, Poland, June 30–July 3, 2025

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Contents

Method for Applying Channels Plan Change to Minimize Message Loss During LoRaWAN Network Reconfiguration - Case Study	1
<i>Marek A. Bawiec</i>	
Machine Learning-Based Surrogate Models for Noise Level Prediction on Urban Scale Maps	11
<i>Marek Bazan, Przemysław Lewicki, Michał Piórek, Ewa Skubalska-Rafajłowicz, Kamil Szyk, and Henryk Maciejewski</i>	
Gas Management in Smart Homes: A Multi-agent and Knowledge Graph Approach	21
<i>Meriem Berkani, Mimoun Malki, Khayra Bencherif, and Samir Ouchani</i>	
Standard and RL-Controlled Tabu Search Algorithms Comparison in Capacitated Vehicle Routing Problem Solving	32
<i>Jan Bronicki and Piotr Nowak</i>	
Using ChatGPT for Converting Sequential Python Programs into Parallel Code	41
<i>Denny B. Czejdo, Wiktor B. Daszczuk, and Waldemar Grabski</i>	
Multiprocessor Task Scheduling - Comparison of Some Heuristics and Metaheuristics	51
<i>Dariusz Dorota</i>	
Standardization Processes for the Implementation of AI in Healthcare System: Challenges and Limitations	61
<i>Barbara Anna Jantos, Michał Paweł Wierzbicki, and Michał Tomaszewski</i>	
Dynamic Infrared Thermography and Machine Learning for Advanced Diagnostic Applications in Biomedical Imaging	75
<i>Łukasz Jeleń, Krzysztof Krupka, and Andrzej Rusiecki</i>	
Models for Assessing the Dependability of Programmable Devices with Controlled Multi-Level Degradation	85
<i>Vyacheslav Kharchenko, Yuriy Ponochovnyi, Oleksandr Vdovichenko, and Khanlar Mahmudov</i>	
FPGAs in Reduct Calculation Using Rough Sets	96
<i>Maciej Kopczyński</i>	

Resilient Software Development of Intelligent Services in Cloud Environments	106
<i>Henryk Krawczyk and Bogdan Wiszniewski</i>	
Proposal of an Optimised Path Tracing Algorithm for Computer Graphics	117
<i>Adam Krizar and Marek Woda</i>	
Speech Recognition Using Spectrogram Images and Formant Data with Neural Networks	129
<i>Mateusz Kucharski and Ewa Skubalska-Rafajłowicz</i>	
Bibliometric Analysis of Research on AI-Based Forecasting in Renewable Energy	138
<i>Paweł Kut, Katarzyna Pietrucha-Urbanik, Martina Zelenakova, and Hany F. Abd-Elhamid</i>	
Neighbourhood Generation in Session-Based Recommender Systems Using a Density-Based Approach	148
<i>Urszula Kuźelewska and Łukasz Milewski</i>	
Cascading Failure Analysis of Hierarchical IoT Systems	158
<i>Jerzy Martyna</i>	
Robołapa - Electromyographically Controlled Prosthetic Hand Model	170
<i>Gabriel Pankowski, Beata Mazurkiewicz, Jacek Mazurkiewicz, and Dominik Cedro</i>	
Analysis of the Impact of Time Window Lengths on Maintenance Vehicle Routing Problem Efficiency	181
<i>Konrad Pempers and Michał Jaroszczyk</i>	
Preparing a Dataset of Mixers BTC Addresses for Machine Learning Purpose	191
<i>Przemysław Rodwald</i>	
Technique for Constructing Structural Models of Fault-Tolerant Moore Finite State Machines	199
<i>Valery Salauyou</i>	
Implementing Cryptographic Algorithms Across Various Generations of FPGA Devices – A Case Study	209
<i>Jarosław Sugier</i>	
Energy Efficiency in Large Language Models: An Empirical Study	221
<i>Tomasz Walkowiak</i>	

Enhancing Cervical Cell Classification with DenseNet201 and Spatial Attention Mechanism 229
Betelhem Zewdu Wubineh, Andrzej Rusiecki, and Krzysztof Halawa

Integration of Uncertainty Modeling for the Detection of Pedestrian Intention 237
Yusuf Yesilyurt and Marek Woda

Creating an Automatic Classifier for Detecting Diabetic Retinopathy Based on the Combining a New 7-Class Dataset Fundus Images and a Collection of Images from Another Source 246
Michał Zmonarski, Ewa Skubalska-Rafajłowicz, Aleksandra Zgryźniak, and Sławomir Zmonarski

Author Index 257

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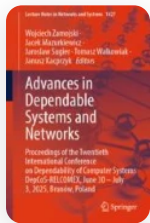
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[Home](#) > [Advances in Dependable Systems and Networks](#) > Conference paper

Models for Assessing the Dependability of Programmable Devices with Controlled Multi-Level Degradation


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Advances in Dependable Systems and Networks

(DepCoS-RELCOMEX 2025)

[Vyacheslav Kharchenko](#), [Yuriy Ponochovnyi](#) , [Oleksandr Vdovichenko](#) & [Khanlar Mahmudov](#)

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Abstract

This paper explores the dependability and availability of programmable devices (PDs) with controlled multilevel degradation using Markov models. It presents a classification

of single-fragment and multi-fragment models based on key parameters influencing failure rates and reconfiguration capabilities for PDs. The study develops a Markov availability model for PDs, detailing state transition matrices and simulation methods in MATLAB. Three PD models are considered: a single-fragment model, a multi-fragment model with degradation, and a multi-fragment model with degradation and reconfiguration. The simulation results demonstrate how reconfiguration and degradation affect system availability over extended operational periods. A comparison of availability functions across the models illustrates the effects of degradation and reconfiguration, delivering key findings for improving PD resilience in critical applications within harsh settings.

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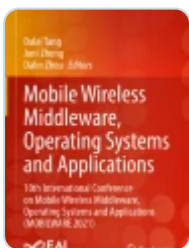
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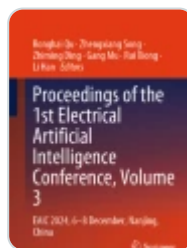
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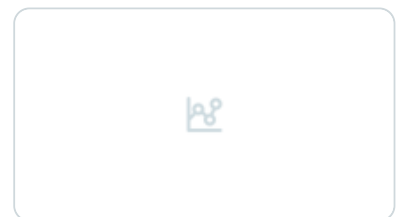
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Author Index

A

Abd-Elhamid, Hany F. 138

B

Bawiec, Marek A. 1
Bazan, Marek 11
Bencherif, Khayra 21
Berkani, Meriem 21
Bronicki, Jan 32

C

Cedro, Dominik 170
Czejdo, Denny B. 41

D

Daszczuk, Wiktor B. 41
Dorota, Dariusz 51

G

Grabski, Waldemar 41

H

Halawa, Krzysztof 229

J

Jantos, Barbara Anna 61
Jaroszczuk, Michał 181
Jeleń, Łukasz 75

K

Kharchenko, Vyacheslav 85
Kopczynski, Maciej 96
Krawczyk, Henryk 106
Krizar, Adam 117
Krupka, Krzysztof 75
Kucharski, Mateusz 129

Kut, Paweł 138

Kuźelewska, Urszula 148

L

Lewicki, Przemysław 11

M

Maciejewski, Henryk 11
Mahmudov, Khanlar 85
Malki, Mimoun 21
Martyna, Jerzy 158
Mazurkiewicz, Beata 170
Mazurkiewicz, Jacek 170
Milewski, Łukasz 148

N

Nowak, Piotr 32

O

Ouchani, Samir 21

P

Pankowski, Gabriel 170
Pempera, Konrad 181
Pietrucha-Urbanik, Katarzyna 138
Piórek, Michał 11
Ponochovnyi, Yuriy 85

R

Rodwald, Przemysław 191
Rusiecki, Andrzej 75, 229

S

Salauyou, Valery 199
Skubalska-Rafajłowicz, Ewa 11, 129
Skubalska-Rafajłowicz, Ewa 246

Sugier, Jarosław 209
Szyc, Kamil 11

T

Tomaszewski, Michał 61

V

Vdovichenko, Oleksandr 85

W

Walkowiak, Tomasz 221
Wierzbicki, Michał Paweł 61
Wiszniewski, Bogdan 106

Woda, Marek 117, 237
Wubineh, Betelhem Zewdu 229


Y

Yesilyurt, Yusuf 237

Z

Zelenakova, Martina 138
Zgryźniak, Aleksandra 246
Zmonarski, Michał 246
Zmonarski, Sławomir 246

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