

ISSN 2786-8443 (Print)
ISSN 2786-8451 (Online)



Security of Infocommunication Systems and Internet of Things

2025, Vol 3, No 1

Yuriy Fedkovych Chernivtsi National University
<https://journals.chnu.edu.ua/sisiot>

Security of Infocommunication Systems and Internet of Things

2025 Vol 3, No 1

Journal of the
Yuriy Fedkovych
Chernivtsi National University

Editorial Team

Editor-in-Chief

Andrii Samila

DSc, Professor, Head of Radio Engineering and Information Security Department, Yuriy Fedkovych Chernivtsi National University
(Chernivtsi, Ukraine)

Deputy Editor

Oleksandra Hotra

DSc, Professor, Head of the Division of Teleinformatics and Medical Diagnostics, Lublin University of Technology
(Lublin, Poland)

Executive Secretary

Halyna Lastivka

PhD, Assoc. Prof., Department of Radio Engineering and Information Security, Yuriy Fedkovych Chernivtsi National University
(Chernivtsi, Ukraine)

Editorial Board Members

Olena Arsirii

DSc, Professor, Head of the Department of Information Systems, Odessa Polytechnic National University
(Odesa, Ukraine)

Serhiy Balovsyak

DSc, Associate Professor, Computer Systems and Networks Department, Yuriy Fedkovych Chernivtsi National University
(Chernivtsi, Ukraine)

Volodymyr Barannik

DSc, Professor, Department of Artificial Intelligence and Software, V. N. Karazin Kharkiv National University
(Kharkiv, Ukraine)

Andrii Berko

DSc, Professor, Information Systems and Networks Department, Lviv Polytechnic National University
(Lviv, Ukraine)

Olena Bezvesilna

DSc, Professor, Department of Automation and Non-Destructive Control Systems, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"
(Kyiv, Ukraine)

Ihor Bodnarchuk

PhD, Associate Professor, Head of Computer Science Department, Ternopil Ivan Puluj National Technical University
(Ternopil, Ukraine)

Yevhen Burov

DSc, Professor, Information System and Networks Department, Lviv Polytechnic National University
(Lviv, Ukraine)

Ivan Demydov

DSc, Professor, Vice Rector for Scientific Research, Lviv Polytechnic National University
(Lviv, Ukraine)

Dmytro Dosyn

DSc, Senior Sci. Fellow, Department of Information Systems and Networks, Lviv Polytechnic National University
(Lviv, Ukraine)

Oleksii Duda

PhD, Associate Professor, Department of Computer sciences, Ternopil Ivan Puluj National Technical University
(Ternopil, Ukraine)

Mahdi Fahmideh

PhD, Senior Lecturer of the Cyber Security Department, University of Southern Queensland
(Toowoomba, Australia)

Paulo Gonçalves

PhD, Professor, Department of Electrotechnical and Industrial Engineering, Instituto Politecnico de Castelo Branco
(Castelo Branco, Portugal)

Milan Guzan

PhD, Associate Professor, Department of Theoretical and Industrial Electrical Engineering, Technical university of Košice
(Košice, Slovakia)

Rolando Herrero

PhD, Adjunct Professor, College of Engineering, Northeastern University
(Boston, United States)

Serhii Holub

DSc, Professor, Acting Head of the Department of Software for Automated Systems, Cherkasy State Technological University
(Cherkasy, Ukraine)

Roman Holyaka

DSc, Professor, Department of Electronics of Information-computer Technologies, Lviv Polytechnic National University
(Lviv, Ukraine)

Wei-Chiang Hong

PhD, Professor, Head of Department of Information Management, Asia Eastern University of Science and Technology
(New Taipei, Taiwan)

Ivan Horbatiy

DSc, Professor, Head of Department of Theoretical Radio Engineering and Radio Measurement, Lviv Polytechnic National University
(Lviv, Ukraine)

Lyudmyla Kirichenko

DSc, Professor, Department of Applied Mathematics, Kharkiv National University of Radio Electronics
(Kharkiv, Ukraine)

Piotr Kisala

PhD, Professor, Department of Electronics and Information Technology, Lublin University of Technology
(Lublin, Poland)

Igor Kogut

DSc, Professor, Head of Computer Engineering and Electronics Department, Vasyl Stefanyk Precarpatian National University
(Ivano-Frankivsk, Ukraine)

Yevgen Kotukh

DSc, PhD, Associate Professor,
Professor of Cybersecurity
Department, Dnipro Polytechnic
University
(*Dnipro, Ukraine*)

Natalia Lukova-Chuiko

DSc, Professor, Head of the
Department of Cybersecurity and
Information Protection, Taras
Shevchenko National University of
Kyiv
(*Kyiv, Ukraine*)

Laurentiu Dan Milici

PhD, Professor, Dean of Faculty of
Electrical Engineering and Computer
Science, Stefan cel Mare University
of Suceava
(*Suceava, Romania*)

Leo Mrsic

PhD, Associate Professor, Vice dean
for Science and Research of Algebra
University College, Algebra
University Zagreb
(*Zagreb, Croatia*)

Dmytro Mykhalevskiy

DSc, Associate Professor,
Department of Information
Communication Systems and
Technologies, Vinnytsia National
Technical University
(*Vinnytsia, Ukraine*)

Roman Nemish

BSc, MBA, President of TEKTELIC
Communications Inc.
(*Calgary, Canada*)

Oksana Olar

PhD, Associate Professor,
Department of Computer Systems
and Networks, Yuriy Fedkovych
Chernivtsi National University
(*Chernivtsi, Ukraine*)

Zbigniew Omiotek

DSc, Associate Professor, Head of
Combustion Process Diagnostics
Laboratory, Faculty of Electrical
Engineering and Computer Science,
Lublin University of Technology
(*Lublin, Poland*)

Liubomyr Parkhuts

DSc, Professor, Department of
Information Protection, Lviv
Polytechnic National University
(*Lviv, Ukraine*)

Dragan Peraković

PhD, Professor, Department of
Information and Communication
Traffic, University of Zagreb
(*Zagreb, Croatia*)

Yurii Podchashynskiy

DSc, Professor, Head of the
Department of Metrology and
Information and Measurement
Technology, Zhytomyr Polytechnic
State University
(*Zhytomyr, Ukraine*)

Oleksiy Polikarovskyyh

DSc, Professor, Department of
Technical Cybernetics and
Information Technologies named
after Professor R.V. Merkta, Odesa
National Maritime University
(*Odesa, Ukraine*)

Ruslan Politasnyi

DSc, Professor, Department of Radio
Engineering and Information
Security, Yuriy Fedkovych
Chernivtsi National University
(*Chernivtsi, Ukraine*)

Tamara Radivilova

DSc, Professor, V.V. Popovskyy
Department of Infocommunication
Engineering, Kharkiv National
University of Radio Electronics
(*Kharkiv, Ukraine*)

Oleksii Romankevych

DSc, Professor, Department of
System Programming and
Specialized Computer Systems,
National Technical University of
Ukraine "Igor Sikorsky Kyiv
Polytechnic Institute"
(*Kyiv, Ukraine*)

Heorhii Rozorinov

DSc, Professor, Department of
Acoustic Multimedia and Electronic
Systems, National Technical
University of Ukraine "Igor Sikorsky
Kyiv Polytechnic Institute"
(*Kyiv, Ukraine*)

Hooman Samani

PhD, Senior Lecturer of the School
of Physics Engineering and
Computer Science, University of
Hertfordshire
(*Hertfordshire, United Kingdom*)

Aceng Sambas

PhD, Associate Professor,
Department of Mechanical
Engineering, Universitas
Muhamadiyah Tasikmalaya
(*Tasikmalaya, Indonesia*)

Olena Semenova

PhD, Associate Professor,
Department of Infocommunication
Systems and Technologies, Vinnytsia
National Technical University
(*Vinnytsia, Ukraine*)

Oleksandr Shayko-Shaykovskiy

DSc, Professor, Department of
Professional and Technological
Education and General Physics,
Yuriy Fedkovych Chernivtsi
National University
(*Chernivtsi, Ukraine*)

Oleksii Slyotov

DSc, Associate Professor, Electronics
and Power Engineering Department,
Yuriy Fedkovych Chernivtsi
National University
(*Chernivtsi, Ukraine*)

Pavlo Stakhira

DSc, Professor, Electronic
engineering Department, Lviv
Polytechnic National University
(*Lviv, Ukraine*)

Ihor Tereikovskiy

DSc, Professor, Department of
System Programming and
Specialized Computer Systems,
National Technical University of
Ukraine "Igor Sikorsky Kyiv
Polytechnic Institute"
(*Kyiv, Ukraine*)

Dmytro Uhryn

DSc, Associate Professor,
Department of Computer Sciences,
Yuriy Fedkovych Chernivtsi
National University
(*Chernivtsi, Ukraine*)

Yevhen Vasiliu

DSc, Professor, Acting Dean of the
Faculty of Information Technologies
and Cyber Security, State University
of Intelligent Technologies and
Telecommunication
(*Odesa, Ukraine*)

Dmytro Vovchuk

PhD, Senior Researcher, School of
Electrical Engineering, Tel Aviv
University
(*Tel Aviv, Israel*)

Oleksandr Vovna

DSc, Professor, Head of the
Electronic Engineering Department,
State Higher Education
Establishment "Donetsk National
Technical University"
(*Lutsk, Ukraine*)

Yurii Yaremchuk

DSc, Professor, Director of the
Center of IT and Information
Security, Department of
Management and Security of
Information Systems, Vinnytsia
National Technical University
(*Vinnytsia, Ukraine*)

Vasyl Yatskiv

DSc, Professor, Head of the
Department of Cyber Security, West
Ukrainian National University
(*Ternopil, Ukraine*)

Editorial and Publishing Group

Vasyl Bakai

Director of the “Ruta” Publishing House, Yuriy Fedkovych Chernivtsi National University

Serhii Haliuk

PhD, Assistant Professor at the Department of Radio Engineering and Information Security

Oleksandr Hres

PhD, Assistant Professor at the Department of Radio Engineering and Information Security

Mykola Khobzei

Postgraduate Student at the Department of Radio Engineering and Information Security

Hryhorii Kosovan

PhD, Assistant Professor at the Department of Radio Engineering and Information Security

Oleh Krulikovskiy

PhD, Assistant Professor at the Department of Radio Engineering and Information Security

Nataliia Melnychuk

PhD, Assistant Professor at the Department of Foreign Languages for Natural Sciences

Pavlo Molochko

PhD, Associate Professor at the Department of Political Science and Public Administration

Margharyta Rozhdestvenska

PhD, Associate Professor at the Department of Radio Engineering and Information Security

Oleh Shylyuk

PhD, Deputy Director for information technologies of the Scientific Library

Tetiana Venkel

PhD, Associate Professor at the Department of Foreign Languages for Natural Sciences

Other information

Editorial and Publisher Office

Editorial Department of Radio Engineering and Information Security, Yuriy Fedkovych Chernivtsi National University, 101 Storozhynetska St., 58011, Chernivtsi, Ukraine
Tel: +38 (0372) 50-94-89 | E-mail: sisiot@chnu.edu.ua

Printing “Ruta” Publishing House, Yuriy Fedkovych Chernivtsi National University, 2 Kotsiubynskoho St., 58002, Chernivtsi, Ukraine
Tel: +38 (0372) 58-48-30 | E-mail: ruta@chnu.edu.ua

Aims and Scope

- Models, software and hardware solutions for infocommunication devices and systems
- Modern component base for infocommunication devices
- Sensors, distributed sensor networks, machine-to-machine communications
- Features of the physical security of infocommunication devices and systems
- Protection of data transfer protocols
- Security of data, applications and cloud services, blockchain
- Internet of things, artificial intelligence, cyber-physical systems

Тематична спрямованість

Журнал внесено до категорії «Б» переліку наукових фахових видань України (Наказ МОН України від 24.04.2024 №582):

- 121 - Інженерія програмного забезпечення
- 122 - Комп'ютерні науки
- 123 - Комп'ютерна інженерія
- 125 - Кібербезпека та захист інформації
- 174 - Автоматизація, комп'ютерно-інтегровані технології та робототехніка

Журнал внесено до категорії «Б» переліку наукових фахових видань України (Наказ МОН України від 26.06.2024 №920):

- 171 - Електроніка
- 172 - Електронні комунікації та радіотехніка
- 175 - Інформаційно-вимірювальні технології

Founder and Publisher Yuriy Fedkovych Chernivtsi National University

Year of Foundation 2022

p-ISSN 2786-8443 **e-ISSN** 2786-8451

UDC 004(05)

Frequency 4 issue per year

Language English

Certificate of State Registration

Series KB №25293-15233P

Media Identifier R30-01709 (Decision of the National Council of Ukraine on Television and Radio Broadcasting No. 25 dated October 10, 2023)

Засновник і видавець Чернівецький національний університет імені Юрія Федьковича

Рік заснування 2022

ISSN 2786-8443 (Друкований) **ISSN** 2786-8451 (Онлайн)

УДК 004(05)

Періодичність випуску 4 рази на рік

Мова видання Англійська

Свідоцтво про державну реєстрацію друкованого засобу масової інформації Серія KB №25293-15233P

Ідентифікатор медіа R30-01709 (Рішення Національної ради України з питань телебачення і радіомовлення №25 від 31.10.2023 р.)

For additional information please contact the following e-mail addresses:

- proposals for cooperation, scientific and organizational issues a.samila@chnu.edu.ua – Editor-in-Chief, Andrii Samila;
- consultations regarding the package of documents, issues of technical support m.khobzei@chnu.edu.ua – responsible for accompaniment and support, Mykola Khobzei.

Contents

1.	Dmytro Prokopovych-Tkachenko, Volodymyr Zveriev, Ihor Kozachenko, Yulia Khavikova Methodology for Using Metadata in Machine Learning to Enhance the Security of State Information Systems.....	01001(7)
2.	Bohdan Dunaiev, Oksana Olar IoT Based Smart Parking Systems in Unity With ML-agents Toolkit.....	01002(6)
3.	Ihor Liutak, Zinoviy Liutak A Methodological Approach to Auditing Software Engineering Practices in the Energy Sector.....	01003(11)
4.	Yevhen Kyrychenko, Igor Malyk Information Technology for Data Compression and Transformation by Means of Amazon EMR.....	01004(8)
5.	Anatoly Ashcheulov, Mykola Derevianchuk, Dmytro Lavreniuk, Marharyta Rozhdestvenska Thermal Losses of an Anisotropic Electrically Conductive Transformer.....	01005(6)
6.	Petro Maksymiak, Serhii Shchukin Interference-based Research of the Goos-Hänchen Effect.....	01006(6)
7.	Heorhii Prokhorov, Mariia Hanzhelo, Rostyslav Diachuk, Serhii Yanushevskiy Investigation of Statistical Characteristics of Random Number Sequences Generated by a Webcam Using Cellular Automata Functionality and NIST Patterns.....	01007(5)
8.	Oleksandr Yevdochenko, Oleksandr Shefer Features of the Application of Compound Codes in Telecommunications.....	01008(5)
9.	Yevhen Parkhomenko, Halyna Lastivka, Oleksandr Lastivka, Andrii Samila Filtration Methods in Sonar Systems.....	01009(5)
10.	Artem Kasianchuk, Halyna Lastivka, Andrii Samila Perspectives on the Development and Use of Nuclear Methods for Detecting Landmines and Minefields: A Review.....	01010(7)
11.	Anatolii Banar, Heorhii Vorobets AI-enabled Cloud SDN Controllers: Architecture, Scalability, and Security – A Comparative Study..	01011(6)
12.	Yurii Hnatiuk Telecommunication System for Transmission of Adaptively Scaled Digital Images.....	01012(5)

Security

of Infocommunication Systems and Internet of Things

2025 Vol 3, No 1

Підписано до друку 30.06.2025 р. Формат 60x84 1/8
Папір офсетний. Друк цифровий. Умов. друк. арк. 4,5.
Обл.-вид. арк. 4,8. Зам. 3-011. Тираж 50.

Видавництво та друкарня Чернівецького національного
університету імені Юрія Федьковича
58002, м. Чернівці, вул. Коцюбинського, 2.
ruta@chnu.edu.ua

Свідоцтво суб'єкта видавничої справи ДК №891 від 08.04.2002 р.