The ***28th International Conference on Information and Software Technologies (ICIST 2022)*** is taking place in Kaunas, Lithuania.

WELCOME

The scientific conference programme includes three invited talks, a workshop and research paper presentations in parallel sessions. The conference papers present recent results as well as discuss research challenges, propose methodologies and describe new applications in four major areas that are covered during the conference, namely,

- Intelligent Methods for Data Analysis and Computer Aided Software Engineering,
- Intelligent Systems and Software Engineering Advances,
- Smart e-Learning Technologies and Applications,
- Language Technologies.

The papers on the aforementioned areas are further subdivided into four special sessions that are to be held at the conference:

- Special Session on Intelligent Methods for Data Analysis and Computer Aided Software Engineering;
- Special Session on Intelligent Systems and Software Engineering Advances;
- Special Session on Smart e-Learning Technologies and Applications;
- Special Session on Language Technologies.

For the tenth time already, the Conference Proceedings are published by Springer as a part of *Communications in Computer and Information Science (CCIS)* series and will be referred in Clarivate Analytics.

The conference was made possible due to the support of the *Faculty of Informatics*, Kaunas University of Technology, and *Research Council of Lithuania*, whose contribution is gratefully acknowledged.

CHAIRS & COMMITTEE

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KEY NOTES & SPEAKERS

ANTONIO J. R. NEVES

has published more than 160 scientific manuscripts, including books, book chapters, journal articles and conference papers. Being a member of the Editorial Board for several journals and an IEEE Senior Member, António has gathered extensive experience as a Project Reviewer and a reviewer for several journals in his research areas. So far, he has organized 7 conferences or special sessions and served as a Scientific/Technical Committees member for more than 100 conferences/workshops

Memory Enhancement and Moment Retrieval from Daily Digital Data

Thursday, October 13th, 10.00 – 11.00

Over the past decade, the wide availability and small size of different types of sensors, together with the decrease in pricing, have allowed the acquisition of a huge amount of data about a person's life in real time. These sensors can be incorporated into personal electronic devices available at reasonable cost, such as smartphones and small wearable devices. They allow the acquisition of images, audio, location, physical activity, and physiological signals among other data. Then, with these data, usually denoted as lifelog data, we can analyze and understand personal experiences and behaviors. This process is called lifelogging. The use of personal lifelogs can be beneficial to improve the quality of our life, as they can serve as tools for memory augmentation or for providing support to people with memory issues. Through the acquisition and analysis of lifelog data, lifelogging systems can create digital memories that can be potentially used as surrogate memory. Through this talk, we will understand that contextual information can be extracted from lifelogs, which provides an understanding of the daily life of a person based on events, experiences, and behaviors.

Snake Robots: State-of-the-Art

Friday, October 14th,
10.00 – 11.00

In nature, snakes are capable of performing an astounding variety of tasks. They can locomote, swim, climb and even glide through the air in some species. One of the most interesting features is their ability to exploit and traverse various typologies of terrain, which allows them to adapt to different types of environments. Biological snakes can push against rocks, stones, branches, obstacles, or other environment irregularities. They can also exploit walls and surfaces of narrow passages or pipes for locomotion. Another significant feature that many natural snakes exhibit concern their prehensile capabilities, which enable them to wrap around and grasp objects. Snake robots imitating this wide array of actions could enable a variety of possible applications for use in demanding real-life operations, such as explorations of earthquake-hit areas, pipe inspections for the oil and gas industry, fire-fighting operations and search-and-rescue (SAR) activities. The possibility of achieving versatile locomotion and grasping of objects with snake-like configurations is of critical interest for SAR missions, e.g., to enlarge passages around victims or while passing through an evadable but blocked area during exploratory navigation or transport. These features may also be used to bring first aids or drugs to the trapped people. This talk will explore challenges and possibilities.

FILIPPO SANFILIPPO

holds a PhD in Engineering Cybernetics from the Norwegian University of Science and Technology (NTNU), Norway, with a focus on alternative and flexible control approaches for robotic manipulators. His research interests include robotics, wearables, software engineering, human-robot collaboration, artificial intelligence and control theory. He is currently appointed as a Professor at the Department of Engineering Sciences, Faculty of Engineering and Science, University of Agder (UiA), Grimstad, Norway and carries a vast experience in participating to European research programs and various national projects from the Research Council of Norway (RCN). Filippo has also authored and co-authored several technical papers in various journals and conferences.

THURSDAY, OCTOBER 13th

09.00 – 09.30 **REGISTRATION**

1st floor of the KTU University Campus Library

09.30 – 10.00 **OPENING CEREMONY**

Assoc. Prof. Dr. ***Rita Butkienė***,
Kaunas University of Technology, Faculty of Informatics
Prof. ***Leonas Balaševičius***, Kaunas University of Technology
Prof. Dr. ***Audrius Lopata***, Kaunas University of Technology, Faculty of Informatics

10.00 – 11.00 **KEY NOTE**

Assistant Professor at the University of Aveiro
António José Ribeiro Neves
Memory Enhancement and Moment Retrieval from Daily Digital Data

11.00 – 11.30

11.30 – 13.00 **SESSION 1**

SOFTWARE ENGINEERING

Special Session on ***Intelligent Systems and Software Engineering Advances (part 1)***
Chaired by Prof. Dr. ***Marcin Wozniak***

1
Deep Learning-Based Malware Detection Using PE Headers
Arnas Nakrošis, Ingrida Lagzdinytė-Budnikė, Agnė Paulauskaitė-Tarasevičienė, Giedrius Paulikas, Paulius Dapkus

2
Survey of cloud traffic anomaly detection algorithms
Giedrius Paulikas, Donatas Sandonavičius, Edgaras Stasiukaitis, Mindaugas Vaitkūnas, Gytis Vilutis

3
Real-time anomaly detection for distributed systems logs using Apache Kafka and H2O.ai
Kęstutis Daugėla, Evaldas Vaičiukynas

4
Decomposition of Fuzzy Homogeneous Classes of Objects
Dmytro Terletskyi, Sergey Yershov

12.30 – 14.00

14.00 – 15.00 **SESSION 2**

SOFTWARE ENGINEERING

Special Session on ***Intelligent Systems and Software Engineering Advances (part 2)***

Chaired by Prof. Dr. ***Marcin Wozniak***

1
Deep Learning in Audio Classification
Yaqin Wang, Jin Wei-Kocsis, John Springer, Eric Matson

2
Research of cryptocurrencies function of instant payments in the tourism sector: risks, options and solutions
Kotryna Laptevaitė, Evaldas Krampas, Saulius Masteika, Kęstutis Driaunys, Aida Mačerinskienė, Alfreda Šapkauskienė

3
Random Forest Classifier for Correcting Point Cloud Segmentation Based on Metrics of Recursive 2-Means Splits
Karolis Ryselis

4
Automated system and machine learning application in economic activity monitoring and nowcasting
Mantas Lukauskas, Vaida Pilinkienė, Jurgita Bruneckienė, Alina Stundžienė, Andrius Grybauskas

15.00 – 15.30

15.30 – 16.45 **SESSION 3**

BUSINESS INTELLIGENCE FOR INFORMATION AND SOFTWARE SYSTEMS

Special Session on ***Intelligent Methods for Data Analysis and Computer Aided Software Engineering (part 1)***

Chaired by Assoc. Prof. Dr. ***Audrius Lopata***

1

Artificial intelligence solutions towards to BIM6D: Sustainability and Energy Efficiency

Justas Kardoka, Agne Paulauskaite-Taraseviciene, Darius Pupeikis

2

The Only Link You'll Ever Need: How Social Media Reference Landing Pages speed up Profile Matching

Sergej Denisov, Frederik Simon Bäumer

3

Enhancing End-to-End Communication Security in IoT Devices Through Application Layer Protocol

Rimsha Zahid, Muhammad Waseem Anwar, Farooque Azam, Anam Amjad, Danish Mukhtar

4

Rationale, Design and Validity of Immersive Virtual Reality Exercises in Cognitive Rehabilitation

Jovita Janavičiūtė, Paulauskas Andrius, Liuda Šinkariova, Tomas Blažauskas, Eligijus Kiudys, Airidas Janonis, Martynas Girdžiūna

5

IoTs applications powered by Piezoelectric Vibration Energy Harvesting Device

Chandana Ravikumar

FRIDAY, OCTOBER 14th

09.30 – 10.00 **REGISTRATION**

1st floor of the KTU University Campus Library

10.00 – 11.00 **KEY NOTE**

Professor at the University of Agder

Filippo Sanfilippo

Snake Robots: State-of-the-Art

11.00 – 11.30

11.30 – 12.30 **SESSION 4**

BUSINESS INTELLIGENCE FOR INFORMATION AND SOFTWARE SYSTEMS

Special Session on ***Intelligent Methods for Data Analysis and Computer Aided Software Engineering (part 2)***

Chaired by Prof. Dr. ***Audrius Lopata***

1

Holistic Approach for Representation of Interaction Scenarios in Semantically Integrated Conceptual Modelling

Remigijus Gustas, Prima Gustiene

2

A Model-driven Framework for Design and Analysis of Vehicle Suspension Systems

Muhammad Waseem Anwar, Muhammad Taaha Bin Shuaib, Farooque Azam, Aon Safdar

3

Financial Process Mining Characteristics

Ilona Veitaite, Audrius Lopata, Rimantas Butleris, Saulius Gudas, Kristina Rudžionienė, Liutauras Žioba, Darius Dilijonas, Evaldas Grišius, Maarten Zwitserloot

4

Intelligent Method for Forming the Consumer Basket

Khrystyna Lipianina-Honcharenko, Carsten Wolff, Zoriana Chyzhovska, Anatoliy Sachenko, Taras Lendiuk, Sergii Grodskyi

12.30 – 13.00

13.00 – 14.00 **SESSION 5**

INFORMATION TECHNOLOGY APPLICATIONS
Special Session on ***Language Technologies***
Chaired by Prof. Dr. ***Jurgita Kapočiūtė-Dzikienė***

1
Intelligent Invoice Documents Processing Employing RPA Technologies
Vilius Kerutis, Dalia Čalnerytė

2
Topic Modeling for Tracking COVID-19 Communication on Twitter
Petar Kristijan Bogović, Ana Meštrović, Sanda Martinčić-Ipšić

3
Efficiency of End-to-End Speech Recognition for Languages with Scarce Resources
Vytautas Rudžionis, Audrius Lopata, Ugnius Malukas

4
Improvement of Speech Recognition Accuracy Using Post-Processing of Recognized Text
Vytautas Rudžionis, Renata Danielienė, Ugnius Malukas

14.00 – 14.30

14.30 – 15.45 **SESSION 6**

INFORMATION TECHNOLOGY APPLICATIONS
Special Session on ***Smart e-Learning Technologies and Applications***
Chaired by Dr. ***Diana Andone***

1
Technology-Enriched Challenge-Based Learning for Responsible Education
Jurgita Barynienė, Asta Daunorienė, Daina Gudonienė

2
Open Course Integration into Formal Education: Case on Databases Course
Rita Butkienė, Linas Ablonskis, Algirdas Šukys

3
The Ways of Recognition of Open Online Courses
Tim Brueggemann, Rita Butkiene, Edgaras Dambrauskas, Elif Toprak, Cengiz Hakan Aydin, Diana Andone, Carlos Vaz de Carvalho, Vlad Mihaescu

4
A Case Study on Gaming Implementation for Social Inclusion and Civic Participation
Afxentis Afxentiou, Peter Frühmann, Maria Kyriakidou, Maria Patsarika, Daina Gudoniene, Andrius Paulauskas, Alicia García-Holgado, Francisco José García-Peñalvo

5
Designing MOOC Based on the Framework for Teacher Professional Development in STEAM
Ligita Zailskaitė-Jakštė, Renata Burbaitė, Lina Narbutaitė, Armantas Ostreika, Aušra Urbaitytė, Piet Kommers, Sümeyye Hatice Eral, Ceyda Aydos, Şükran KoÇ

15.45 – 16.00 **BEST PAPER AWARDS AND CLOSING THE CONFERENCE**
Awarded by Prof. Dr. ***Audrius Lopata***
KTU University Campus Library

16.00 – 18.00 *Fourchette*

SATURDAY, OCTOBER 15th

09.00 – 09.30 **REGISTRATION**

1st floor of the KTU University Campus Library

09.30 – 16.30 **CLOSED SESSION ON E-LEARNING ADVANTAGES AND DISADVANTAGES IN EDUCATION**

During the recent years e-Learning have become a common practice in the higher education. While its implementation and experience varied institution-to-institution, it is clear that e-Learning has made a significant impact on the way we understand both the learning process as well as the innovative practices and tools that became available. This closed session is dedicated to discussing new approaches to e-Learning, challenges experienced by the administrative and teaching staff as well as further opportunities for its future. Topics to be discussed:

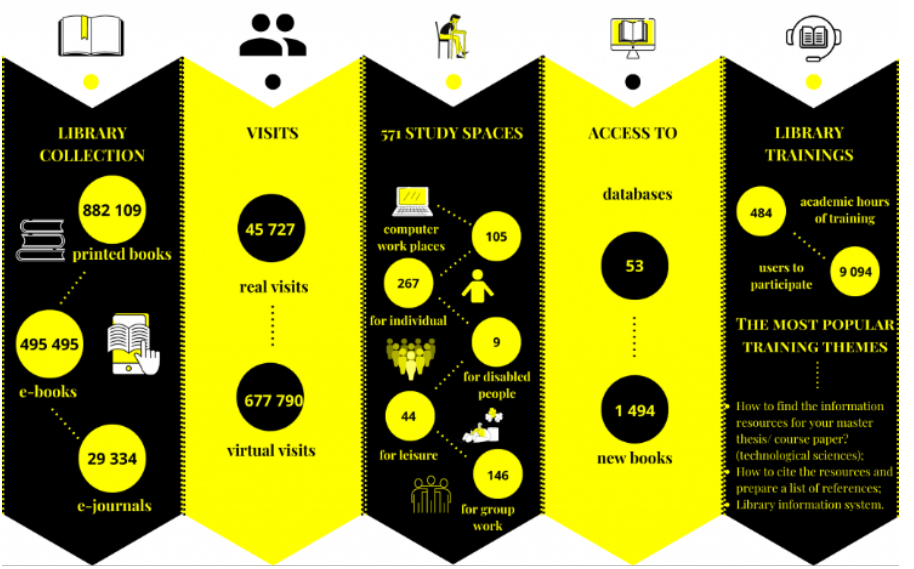
- Course management, planning and design
- Teaching and learning activities
- VR and AR in education
- Tools and resources for online learning
- Core tools for content development
- Quality control of the online courses

CONFERENCE VENUE

The Library of Kaunas University of Technology is one of the largest libraries in Lithuania; it stores and constantly replenishes one of the richest collections of printed books and periodicals on engineering, technology and sciences in Lithuanian and other languages. The Library also provides access to vast e-resources.

The Library's mission is to provide efficient services meeting the needs of current and future subjects of learning and research by ensuring access to the resources stored at the Library and the global information resources available online.

The Library's vision: a state-of-the-art science and study information resource hub that integrates physical and virtual spaces, creating the favourable environment for study and research, providing services and access to the necessary information resources.



ABOUT KAUNAS

Kaunas, second-largest Lithuania's city, which keeps the authentic spirit of the country's national character alive. The city is located at the confluence of the two largest Lithuanian rivers, surrounded by the hills and situated at the crossroads of the most important roads in Lithuania. Due to its geographical position, today, Kaunas is Lithuania's most important center of communication.

It is a home of a variety of festivals & events, from operettas to modern dance, from classical music to Jazz. Kaunas was chosen as the European Capital of Culture 2022. And as a Capital of Culture 2022, Kaunas is changing: from the TEMPORARY CAPITAL to CONTEMPORARY. The city is famous for its Interwar architecture which was awarded the European Heritage Label and is on its way to UNESCO. Kaunas is the only city in the world where so much of the style of the buildings has survived to the present day. Kaunas is a colorful city, famous for its street art, with probably the only square in the world that you can't get into - George Maciunas square, inspired by FLUXUS movement.

Discover Kaunas as a great place for meetings, experience the city's unique ambience and get introduced to a number of modern conference facilities and quality services, along with exciting leisure activities. The unique atmosphere of Kaunas can be explored, which is distinguished by the

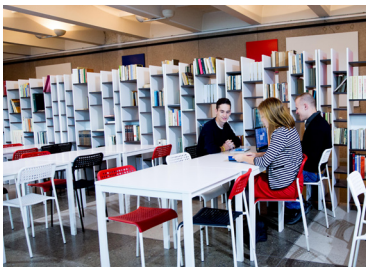
heritage of the painter and composer M. K. Čiurlionis. Kaunas is not only a city of old traditions but also a large centre of business and industry. It can also lay claim to being a city of young people with over 35,000 students (the largest number in Lithuania) studying at one of the seven universities here. For business and investors, our city offers a friendly, open, and creative space for partnerships and cooperation.

Green streets, tree-lined avenues and wide–open squares create surroundings to match everybody's moods. Kaunas is proud of its great number of museums, theatres, universities, colleges, fine hotels, restaurants, cafes and bars. Guests can try a range of cuisine from many European and Asian countries as well as an abundance of traditional Lithuanian food, drink and hospitality.

For more information about Kaunas please visit
https://visit.kaunas.lt/en/

ABOUT KAUNAS UNIVERSITY OF TECHNOLOGY

Kaunas University of Technology, with its eight faculties, a branch in Panevėžys, high school (gymnasium), progymnasium and nine research centres, is the second-largest university in Lithuania. About 80% of Lithuania's industrial engineers have graduated from KTU. In 1990, KPI was restructured and brought into line with most Western universities.



Under Parliamentary decision, it was then granted its present university status and name. Now, Kaunas University of Technology is the largest technical university in Lithuania. More information about Kaunas University of Technology can be found at ***http://ktu.edu***

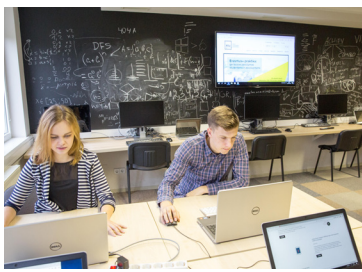
FACULTY OF INFORMATICS

The Faculty of Informatics of Kaunas University of Technology was established in 1977. The faculty currently consists of five departments:

Department of Multimedia Engineering,
Department of Information Systems,
Department of Computer Science,
Department of Software Engineering,
Department of Applied Informatics,

and two research centres:

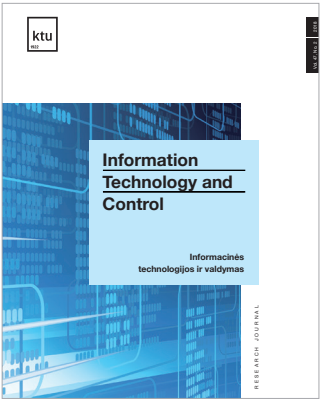
Centre of Real Time Computer Systems,
Centre of Information Systems Design Technology.



The faculty offers the choice of Informatics, Informatics Engineering, Multimedia Technologies, Information Systems, and Software Systems Bachelor degree programmes. Those pursuing a Master's degree can choose accordingly from five study programmes:

Informatics,
Information and Information Technology Security,
Information Systems Engineering,
Information Technologies of Distance Education,
Software Engineering.

Graduates of master's degree studies can pursue the academic career by choosing Informatics or Informatics Engineering doctoral studies.
Each year the Faculty of Informatics accepts around 500 new students seeking Bachelor's or Master's degree, respectively.



The Faculty also publishes a scientific journal,

INFORMATION TECHNOLOGY AND CONTROL

(indexed by Clarivate Analytics)
www.itc.ktu.lt
itc@ktu.lt

USEFUL INFORMATION

Lithuanian Time
Lithuania is located in the Eastern European Time Zone, GMT+2.

Currency Euro (€).

Useful Phone Numbers
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Information: 118

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ICIST 2022

28th International Conference on
Information and Software Technologies

**October 13th – 15th, 2022,
Kaunas, Lithuania**

PROCEEDINGS AND PUBLICATION

The paper's size should be 10–12 pages (fee for extra pages is 10 EUR per page) in Springer Template. Accepted papers will be published as a volume of Springer-Verlag CCIS. CCIS is indexed in Scopus, Clarivate Analytics Web of Science.

LOCATION

ICIST is organised by Kaunas University of Technology, a leading technical university of the Baltic States. In 2022, the conference will be organised in Kaunas, the second largest Lithuania's city, which keeps the authentic spirit of the country's national character alive.

ORGANIZATION

PC Chair
Audrius Lopata, Kaunas, Lithuania

Local Organising Committee Chair
Daina Gudonienė, Kaunas, Lithuania

Local Organising Committee:
icist@ktu.lt

DEADLINES

18 03 2022 – Full paper submission.

15 04 2022 – Notification of acceptance.

17 06 2022 – Print ready paper submission.

13 10 2022 – 15 10 2022 – Conference. Research sessions.

ktu faculty of informatics 1922

The International Conference on Information and Software Technologies (ICIST) is an international annual event, organized by Kaunas University of Technology. In 2022, the University will organize the 28th ICIST Conference from 13th to 15th October in Kaunas, Lithuania.

SCOPE AND TOPICS

INFORMATION SYSTEMS

Special Sessions on
• Innovative Applications for Knowledge Transfer Support;
• e-Health Information Systems;

Information Systems Development; Conceptual Modelling, Ontologies, and Databases; Business Processes and Business Rules; Enterprise Architecture and Enterprise Modelling; Distributed Information Systems and Semantic Web; Quality of Information Systems; Health Care Management Systems.

BUSINESS INTELLIGENCE FOR INFORMATION AND SOFTWARE SYSTEMS

Special Session on
• Intelligent Methods for Data Analysis and Computer-Aided Software Engineering

Data Mining and Knowledge Discovery; Decision Support Systems; Big Data Analytics; Expert Systems; Intelligent Web Mining; Knowledge-Based System Engineering.

SOFTWARE ENGINEERING

Special Sessions on
• Intelligent Systems and Software Engineering Advances

Software and Systems Engineering Methodologies; Model-Driven Development, SOA; Component-Based Development; Distributed, Mobile, and Open Architectures; Cloud Computing Software Quality and Testing; CASE Tools for Software Development; Compiutational Intelligence; Security and Trust.

IT APPLICATIONS

Special Sessions on
• Smart e-Learning Technologies and Applications;
• Digital Transformation;
• Language Technologies

STEAM Education; IT in Teaching and Learning; Internet of Things and Smart Environments; Wireless and Mobile Applications; Compiutional Linguistics; Learning Objects and MOOCs; Natural Language Processing; Computer Graphics and Multimedia.

More information and registration on ***http://icist.ktu.edu/***