

2022 9TH INTERNATIONAL CONFERENCE ON
COMPUTERS COMMUNICATIONS AND CONTROL
ICCCC 2022

Felix & Oradea, Romania,
May 16-20, 2022

ABSTRACTS OF ICCCC 2022 PAPERS



2022 9th International Conference on Computers Communications and Control (ICCCC)

<http://univagora.ro/en/icccc2022/>

Home

Place: [Hotel President](#) (4 stars, aqua-park, spa), Băile Felix, Oradea, România

Period: May 16-20, 2022

Organizers: Cercetare Dezvoltare Agora (Research & Development Center of Agora University), Agora University of Oradea under the aegis of the [Romanian Academy](#)- Information Science and Technology Section.

Partners: Springer (Advances in Intelligent Systems and Computing Series) , Association Cluster of Scientific Research, Innovation and European Studies from Oradea.

Dedication:

This edition is dedicated in memory of Prof. Univ. Dr. Habil. Dzițac Ioan – founder of the International Conference on Computers Communications and Control (ICCCC).

On this occasion, the Dzițac Family (wife Simona & daughter Domnica) will award the “Ioan Dzițac Prize” worth 500 EUR for the most appreciated scientific paper presented at IC CCC 2022 by a promising young researcher.



Photo Ioan Dzițac (14.02.1953 – 06.02.2021)

Post Conference Proceedings will be published by Springer (“Advances in Intelligent Systems and Computing” Series) - Intelligent Methods Systems and Applications in Computing, Communications and Control - 9th International Conference on Computers Communications and Control (ICCCC) 2022.

The editorial team of the International Journal of Computers Communications & Control (IJCCC) will award prizes (vouchers) consisting in the free publication in IJCCC of the most valuable 10% papers accepted / presented at IC CCC 2022.

On the occasion of ICCCC 2022, *the title of Doctor Honoris Causa of the Agora University of Oradea* will be awarded to **Professor Enrique Herrera - Viedma** from the University of Granada, Spain, and *the title of Professor Honoris Causa of the Agora University of Oradea* will be awarded to **Professor Gastón Lefranc H.** from the Pontificia Universidad Católica de Valparaíso, Chile.

Scope

The International Conference on Computers Communications and Control (ICCCC) has been founded in 2006 by [I. Dzitac](#), [F.G. Filip](#) and [M.-J. Manolescu](#) and organized every even year by [Agora University of Oradea](#), under the aegis of the [Information Science and Technology Section](#) of Romanian Academy.

The goal of this conference is to bring together international researchers, scientists in academia and industry to present and discuss in a friendly environment their latest research findings on a broad array of topics in computer networking and control.

The Program Committee is soliciting paper describing original, previously unpublished, completed research, not currently under review by another conference or journal, addressing state-of-the-art research and development in all areas related to computer networking and control.

Proceedings of ICCCC2022 will be published by Springer ("Advances in Intelligent Systems and Computing" Series) - Intelligent Methods Systems and Applications in Computing, Communications and Control - 9th International Conference on Computers Communications and Control (ICCCC) 2022, *Editors:* S. Dzitac, D. Dzitac, F.G. Filip, J. Kacprzyk, M.J. Manolescu, H. Oros.

Topics

- Chapter 1. Integrated Solutions in Computer-Based Control;
- Chapter 2. Advanced Control Systems Integrating Computers and Communications;
- Chapter 3. Soft Computing Including Fuzzy System Approach;
- Chapter 4. Decision Making and Support Systems;
- Chapter 5. Trustworthy & Green Design.

Chairs and Committees

General Chair



Assoc. prof. Simona DZITAC - General Chair (Oradea, Romania)
University of Oradea / Software System Engineer & Researcher at R&D Agora,
simona@dzitac.ro, rd.agora@univagora.ro

Dr. Simona Dzitac is an Associate Professor at Energy Engineering Department, Faculty of Energy Engineering and Industrial Management, University of Oradea, Romania and Software System Engineer & Researcher at R&D Agora. She received her B.Sc. in Mathematics (2000), Energy Engineering (2005), Economic Informatics (2007) and PhD in Energy Engineering (2008). Her current research interests include different aspects of reliability, modelling, simulation, quality management, IT management. She has published 11 books/courses and materials for students and more than 120 scientific papers in journals and conferences proceedings. Her research activity includes participation in 42 grants/projects. The impact of her published works are over 370 citations and h-index 11 in ISI Web of Science.

Program Committee Chair



Acad. Florin Gheorghe FILIP - Program Committee Chair (Bucuresti, Romania)
President of "Information Science and Technology" Section of Romanian Academy, Romania,
ffilip@acad.ro

Acad. Florin Gheorghe Filip was born in 1947 in Bucharest, Romania. He graduated in *Control Engineering* at Technical University of Bucharest in 1970 and received his PhD degree from the same university in 1982. He was elected as corresponding member of the Romanian Academy in 1991 and became full member of the Academy in 1999. During 2000-2010, he was vice-president of the Romanian Academy (elected in 2000, re-elected in 2004, and 2006). In 2010, he was elected president of the *Information Science and Technology* section of the Academy (re-elected in 2015, and 2019). He was the managing director of National Institute for R&D in Informatics-ICI Bucharest (1991-1997). He is honorary member of the Romanian Academy of Technical Sciences, and Academy of Sciences of Republic of Moldova. He was the chair of IFAC TC 5.4 (Large-scale Complex Systems) from 2002 to 2008. His main scientific interests include optimization and control of large-scale

complex/collaborative systems, decision support systems, technology management and foresight, and IT applications in the cultural sector. He authored/co-authored over 350 papers published in international journals (IFAC J Automatica, IFAC J Control Engineering Practice, Annual Reviews in Control, Computers in Industry, Large-Scale Systems, Technological and Economic Development of Economy, and so on) and contributed to volumes printed by international publishing houses (Pergamon Press, Elsevier, Kluwer, Chapman & Hall and so on). He is also the author/co-author of thirteen monographs (published by Editura Tehnică, Hermès-Lavoisier, J. Wiley & Sons, Springer) and editor/co-editor of 30 volumes of contributions (published by Editura Academiei Române, Pergamon Press, North Holland, Elsevier, IEEE Computer Society, and so on). He presented invited lectures in universities and research institutes, and plenary papers at scientific conferences in Brazil, Chile, China, France, Germany, Lithuania, Poland, Portugal, Republic of Moldova, Romania, Spain, Sweden, Tunisia, and UK. More details can be found at:

http://www.academiaromana.ro/sectii/sectia14_informatica/sti_FFilip.htm

Organizing Committee Chairs



Prof. Misu-Jan MANOLESCU - Organizing Committee Chair (Oradea, Romania)
President of Agora University of Oradea, Romania, mmj@univagora.ro

Prof. Misu-Jan Manolescu is a Professor of Risk Management and President of Administration Council of Agora University. He is an Engineer, PhD in Energy Engineering, PhD in Management, president of Agora Foundation, Founder of Agora University and co-founder and Managing Editor of International Journal of Computers Communications & Control and co-founder of International Conference Computers Communications & Control.

His publications and research results consist in 10 books, over 60 papers and 2 inventions.

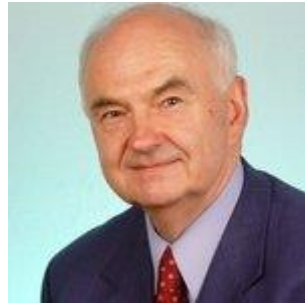


Domnica DZITAC - Organizing Committee Chair (Abu Dhabi, UAE)
Technical and Operational Coordinator of the [Social Science Experimental Laboratory](#) at [New York University Abu Dhabi](#), domnica.dzitac@nyu.edu

Domnica Dzitac is a fresh graduate from New York University Abu Dhabi from where she obtained a degree in Computer Science with concentrations in Applied Mathematics and Political Science.

Domnica conducted meaningful research and studied in global locations such as Abu Dhabi (UAE), Paris (France), Washington D.C. (USA) and New York City (USA). Her research interests consist of applying computational tools to answer questions about human behavior, contributing to fields such as Computational Social Science, Natural Language Understanding, Machine Learning, Data Science and Behavioural Economics.

Publication Chairs



Acad. Janusz KACPRZYK - Publication Chair, Poland
Polish Academy of Sciences, Poland, kacprzyk@ibspan.waw.pl

Janusz Kacprzyk is Professor of Computer Science at the Systems Research Institute, Polish Academy of Sciences, WIT – Warsaw School of Information Technology, and Chongqing Three Gorges University, Wanzhou, Chongqing, China, and Professor of Automatic Control at PIAP – Industrial Institute of Automation and Measurements in Warsaw, Poland. He is Honorary Foreign Professor at the Department of Mathematics, Yli Normal University, Xinjiang, China. He is Full Member of the Polish Academy of Sciences, Member of Academia Europaea, European Academy of Sciences and Arts, European Academy of Sciences, Foreign Member of the: Bulgarian Academy of Sciences, Spanish Royal Academy of Economic and Financial Sciences (RACEF), Finnish Society of Sciences and Letters, Flemish Royal Academy of Belgium of Sciences and the Arts (KVAB), National Academy of Sciences of Ukraine and Lithuanian Academy of Sciences. He was awarded with 6 honorary doctorates. He is Fellow of IEEE, IET, IFSA, EurAI, IFIP, AAIA, I2CICC, and SMIA.

His main research interests include the use of modern computation computational and artificial intelligence tools, notably fuzzy logic, in systems science, decision making, optimization, control, data analysis and data mining, with applications in mobile robotics, systems modeling, ICT etc.

He authored 7 books, (co)edited more than 150 volumes, (co)authored more than 650 papers, including ca. 150 in journals indexed by the WoS. He is listed in 2020 and 2021 "World's 2% Top Scientists" by Stanford University, Elsevier (Scopus) and ScieTech Strategies and published in PLOS Biology Journal.

He is the editor in chief of 8 book series at Springer, and of 2 journals, and is on the editorial boards of ca. 40 journals. He is President of the Polish Operational and Systems Research Society and Past President of International Fuzzy Systems Association.



Lecturer Horea OROS - Publication Chair (Oradea, Romania)
University of Oradea, Romania, horea.oros@gmail.com

Horea Oros (b. August 22, 1977) received his PhD in Computer Science (2009) from "Babeş Bolyai" University of Cluj-Napoca, Romania. Since 2001 he is working within the Department of Mathematics

and Computer Science, Faculty of Informatics and Sciences, University of Oradea, Romania, where currently he is a lecturer. He also was a former lecturer at Agora University of Oradea for several years. He co-authored five books in the field of computer science and published twenty-one articles in several journals and proceedings of international conferences. His main research interest is in the field of cryptology and computer security.

Keynote speakers at ICCCC 2022 (in alphabetical order)

1. Acad. Gintautas DZEMYDA (Vilnius, Lithuania),
2. Prof. Enrique HERERRA-VIDEMA (Granada, Spain),
3. Acad. Janusz KACPRZYK (Warsaw, Poland),
4. Prof. Gaston LEFRANC (Chile).

Invited speakers at ICCCC 2022 (in alphabetical order)

1. Prof. Razvan ANDONIE (Ellensburg, USA),
2. Prof. Valentina BALAS (Arad, Romania),
3. Prof. Valeriu BEIU (Arad, Romania),
4. Prof. Alfred BRUCKSTEIN (Haifa, Israel),
5. Prof. Yezid DONOSO (Bogota, Colombia).

Program Committee

- Fuad ALESKEROV, National Research University 'Higher School of Economics, Moscow, Russia
- Răzvan ANDONIE, Central Washington University, USA
- Valentina BALAS, "Aurel Vlaicu" University of Arad, Romania
- Barnabas BEDE, DigiPen University, USA
- Valeriu BEIU, "Aurel Vlaicu" University of Arad, Romania
- Hector BENITEZ-PEREZ, IMAS, UNAM, Mexico
- Pierre BORNE, Ecole Centrale de Lille, France
- Dominic BUCERZAN, "Aurel Vlaicu" University of Arad, Romania
- Felisa CORDOVA; University of Finis Terrae, Chile
- Bogdan CRIVAT, Predixion Software, USA
- Gabriela CRISTESCU, "Aurel Vlaicu" University of Arad, Romania
- Antonio DI NOLA, University of Salerno, Italy
- Yezid DONOSO, Universidad de los Andes, Colombia
- Gintautas DZEMYDA, Vilnius University, Lithuania
- Ömer EĞECİOĞLU, University of Santa Barbara, USA
- Florin Gheorghe FILIP, Romanian Academy, Romania
- Daniela GIFU, Alexandru Ioan Cuza University, Iasi, Romania & Romanian Academy - Iasi Branch
- Marian GHEORGHE, The University of Bradford, UK
- Enrique HERERRA-VIDEMA, University of Granada, Spain
- Kaoru HIROTA, Tokyo Institute of Technology, Japan
- Arturas KAKLAUSKAS, Vilnius Gediminas Technical University, Lithuania
- Gang KOU, Southwestern University of Finance and Economics, Chengdu, China
- Ioana MOISIL; Lucian Blaga University of Sibiu, Romania
- Radu NICOLESCU, The University of Auckland, New Zealand
- Sorin NADABAN, "Aurel Vlaicu" University of Arad, Romania
- Mariana NAGY, "Aurel Vlaicu" University of Arad, Romania
- Shimon Y. NOF, Purdue University, USA
- Stephan OLARIU, Old Dominion University, USA
- Gheorghe PĂUN, Romanian Academy, IMAR, Romania
- Yi PENG, University of Electronic Science and Technology of China, China
- Mario de J. PEREZ-JIMENEZ, University of Seville, Spain

- Lorena POPA, "Aurel Vlaicu" University of Arad, Romania
- Radu-Emil PRECUP, Politehnica University of Timisoara, Romania (Senior Member of IEEE)
- Imre J. RUDAS, Óbuda University, Hungary (Member of IEEE)
- Yong SHI, University of Chinese Academy of Sciences
- Milan STANOJEVIC, University of Belgrad, Serbia
- Codruța STOICA, "Aurel Vlaicu" University of Arad, Romania
- Athanasios D. STYLIADIS, Kavala Institute of Technology, Greece
- Ioan Alexandru ȘUCAN, Google [x], USA
- Gheorghe TECUCI, George Mason University, USA (Full Member of Romanian Academy)
- Horia-Nicolai TEODORESCU, Technical Univ. Gh. Asachi Iasi, Romania (Full Member of Romanian Academy)
- Dan TUFÎȘ, Romanian Academy – Institute of Artificial Intelligence "Mihai Drăganescu", Romania (Full Member of Romanian Academy)
- Zenonas TURSKIS, Vilnius Gediminas Technical University, Lithuania

Organizing Committee

- Dan BENTA, Agora University of Oradea, Romania
- Horea OROS, University of Oradea, Romania
- Adrian-Claudiu CHEREGI, University of Oradea, Romania
- Gabriela BOLOGA, Agora University of Oradea, Romania
- Casian BUTACI, Agora University of Oradea, Romania
- Adriana MANOLESCU, Agora University of Oradea, Romania
- Alina MANOLESCU, Agora University of Oradea, Romania
- Razvan MEZEI, Lenoir-Rhyne University, USA
- Ioana MOISIL, "Lucian Blaga" University of Sibiu, Romania
- Marius SINCA, Agora University of Oradea, Romania
- Bogdana STANOJEVIC, Mathematical Institute of the Serbian ASA, Serbia
- Oana Petrisor MATEUT, Agora University of Oradea, Romania

ABSTRACTS OF KEYNOTE LECTURES

Keynote speaker	Title & Abstract
<p data-bbox="186 302 515 472">Gintautas DZEMYDA Lithuanian Academy of Sciences, Vilnius University, Lithuania</p> 	<p data-bbox="537 302 1377 365">Geometric Multidimensional Scaling: A New Approach for Data Dimensionality Reduction</p> <p data-bbox="537 383 1383 1480">Abstract: <i>Real-life applications often deal with multidimensional data. Multidimensional scaling (MDS) is an often-used method to reduce the dimensionality of multidimensional data nonlinearly and to present the data visually. MDS minimizes some stress function which variables are coordinates of points in the projected lower-dimensional space. We have proposed to consider the stress function and multidimensional scaling, in general, from the geometric point of view, and the so-called Geometric MDS has been developed. It is proved that using ideas of Geometric MDS, it is possible to construct the iterative procedure of minimization of the stress where coordinates of a separate point of the projected space are moved to the new position defined analytically. In Geometric MDS, the step size and direction forward the minimum of the stress function are found analytically for a separate point or all the points at once in a projected space without reference to the analytical expression of the stress function, numerical evaluation of its derivatives and the linear search. It is proved theoretically that the direction coincides with the steepest descent direction, and the analytically found step size guarantees almost the optimal step in this direction. Despite the fact that the Geometric MDS uses the simplest (raw) stress function, there is no need for its normalization depending on the number of data points, the scales of features and proximities. These advantages allow the Geometric MDS to become the main realization of MDS. The obtained results allow us to extend the understanding of properties and ideas of Geometric MDS for the future development of a class of new both sequential and parallel algorithms, including global optimization. In addition to introducing Geometric MDS, the presentation also provides an overview of other strategies for multidimensional data visualisation. This research has received funding from the Research Council of Lithuania (LMTLT), agreement No S-MIP-20-19.</i></p>
<p data-bbox="186 1494 467 1632">Enrique HERERRA-VIDMA University of Granada, Spain</p> 	<p data-bbox="537 1494 1361 1556">On Fuzzy and Linguistic Decision-Making: Scenarios and Challenges (Reception Speech)</p> <p data-bbox="537 1574 1383 2063">Abstract: <i>This talk takes a brief tour through the main trends, studies, methodologies and models developed around the field of fuzzy decision-making in the last decades. Fuzzy decision making approaches allow to deal with real-world decision problems of varying complexity where humans exhibit vagueness and imprecision to assess information about decision alternatives, criteria, etc. Specifically, we address a triple goal in this talk. Firstly, we introduce the main representation paradigms that have arisen from fuzzy set theory to model assessment information at different levels of expressive richness and complexity. Secondly, we examine three core scenarios around which fuzzy decision-making methods have been developed: multi-criteria decision-making, group (and consensus-driven) decision-making, and multi-person multi-criteria decision-making. Lastly, we discuss</i></p>

Janusz KACPRZYK
Polish Academy of
Sciences,
Poland



new complex decision-making scenarios that emerged in recent years where decisions should be guided by the “wisdom of the crowd”, highlighting their challenges and reflecting on much needed key guidelines for future research in the field.

AI-enabled decision support systems: an effective and efficient solution for complex problems

Abstract: *As the complexity of our world grows, decision making problems – which are the crux of virtually all human activities – get more and more complicated with more and more stakeholders, much uncertain, imprecise and lacking information, and an explicit human centrality in the sense of a crucial role of the human being in the decision process. This implies that the inherent human decision making abilities alone are not enough to find a good decision.*

A more effective and efficient setting, at least for the foreseeable future, is to assume the human being to still be the decisive stakeholder in nontrivial decision processes though he/she should not be replaced but be aided or supported by some additional „units”, humans (e.g. advisors) or „machines” (e.g. algorithms and computer systems). In this respect, the first obvious option is that the human decision maker, who knows about the domain of his activities but not necessarily about solution tools, be aided by a domain expert who knows solution tools but not necessarily the domain. This gives rise to, e.g., a judge-advisor type approaches. In their new versions they can be augmented by some AI (artificial intelligence) tools and techniques, notably machine learning models which can help find patterns and relationships in bigger and bigger data sets. A consistency of the AI models employed with some inherent human characteristics, notably the cognitive biases, is here crucial as is a collaborative partnership between the human being and AI models and systems.

An effective and efficient implementation of the above forms of decision making in complex environments is to combine the power of the computer and the power of the humans, notably by a powerful and widely employed concept of a decision support system (DSS), notably in its data or document driven forms which best suited for handling data intensive situations and for implementing data driven approaches.

New concepts, often termed the AI-enabled DSSs, are promising the essence of which is that they heavily use tools and techniques of AI (artificial intelligence) for the gathering and analysis of data and evidence, identification and diagnosis of problems, proposing courses of actions with their analyses, etc. More specifically, machine learning, analyses and handling of uncertainties, knowledge sharing, automated inference and reasoning, multiagent and autonomous systems, etc. are employed. Since, as already mentioned, the human being is assumed to be the main stakeholder, the AI based tools and techniques to be employed that could „mimic” human cognitive capabilities, observe some inherent human characteristic features, notably cognitive biases, provide comprehensive and trustworthy procedures and forms of results, and – in general - collaborate with the human during the derivation of a decision in a synergistic, human consistent way, with a limitation of autonomy of the system.

Some examples on supporting decision making in socio-economic planning will be presented.

Gaston LEFRANC H.
*Pontificia Universidad
Católica de Valparaíso,
Chile*



**Review of Trends in Manufacturing Systems based on Industry 4.0:
The Opportunities
(Reception Speech)**

Abstract: *The paper presents a review of current trends in Manufacturing Systems that would give developed countries opportunities to improve their economy and create jobs. This would allow creating or improving companies that would have greater efficiency, flexibility, productivity and security of the processes. These companies would produce better quality products and more profitable production. Industry 4.0 criteria are used to accelerate manufacturing automation, giving rise to a completely new business model, which facilitates product diversification. Some opportunities are presented to integrate new technologies, to improve production, and achieve more benefits.*

ABSTRACTS OF INVITED LECTURES

Invited speakers	Title & Abstract
<p data-bbox="188 293 435 389">Razvan ANDONIE Central Washington University, USA</p> 	<p data-bbox="539 293 1062 320">Computational Semiotics in Deep Learning</p> <p data-bbox="539 338 1382 546">Abstract: <i>Semiotics is the study of signs and sign-using behavior. Computational semiotics is an interdisciplinary field which proposes a new kind of approach to intelligent systems, where an explicit account for the notion of sign is prominent. In our work, the definition of computational semiotics refers to the application of semiotics to artificial intelligence.</i></p> <p data-bbox="539 555 1382 831"><i>Our fundamental thesis is that information concentration processes appear in successive layers of deep learning models: each layer aggregates information from the previous layer of the network. In computational semiotics, this information concentration is known as superization, and it is accompanied by a decrease of entropy: signs are aggregated into supersign. Our interdisciplinary approach enables us to depict superization processes within deep learning models. This is a novel semantic interpretation of deep learning.</i></p> <p data-bbox="539 840 1382 1010"><i>We use concepts from computational semiotics to explain decision processes in deep learning. In addition, we apply semiotic tools to optimize the architecture of deep neural networks. Explainability and architecture optimization of neural models are currently among the hottest topics in machine learning.</i></p>
<p data-bbox="188 1023 496 1155">Valentina E. BALAS "Aurel Vlaicu" University of Arad, Romania</p> 	<p data-bbox="539 1023 1098 1050">Advances in Soft Computing and Applications</p> <p data-bbox="539 1068 1382 1135">Abstract: <i>The presentation is focusing on soft computing methodologies used in designing of complex systems.</i></p> <p data-bbox="539 1144 1382 1632"><i>Nowadays computers are doing many tasks on two-digit numbers which seeks precision, certainty, and rigor by following conventional rules. But there are tasks which require natural intelligence, that are best handled by human brains. While conventional computers are suitable for handling tasks sequentially, other tasks that required natural intelligence, past experience, self-improvements, probabilistic reasoning are best handled using parallel processing. Researchers are working to mimic human brains, so in the realm of artificial intelligence emerged the field of Soft Computing. This topic was introduced by Professor Lotfi Zadeh who showed that computation, reasoning, decision making should exploit the tolerance for imprecision and uncertainty and said that soft computing techniques uses the human brain as a role model. Professor Zadeh is a legend in fuzzy logic, known as a root of Artificial Intelligence.</i></p> <p data-bbox="539 1641 1382 1812"><i>Soft computing represents a collection of methodologies like fuzzy logic, neural networks, genetic algorithms, that exploit the tolerance for imprecision and uncertainty to achieve robustness and low-cost solutions. Fuzzy logic and expert systems are considered good approaches to solve control problems in many applications.</i></p> <p data-bbox="539 1821 1382 1955"><i>We introduced methodologies and some applications in the case of different complex systems, where we provided elements of deterministic knowledge about the processes and assisted the design with simulations.</i></p> <p data-bbox="539 1964 1382 2031"><i>We will also introduce some recent regulations on Artificial Intelligence.</i></p>

Valeriu BEIU
„Aurel Vlaicu” University
of Arad, Romania



Reflective Optics from Stars to Dust

*Magic mirror on the wall, who is the flattest one of all?
Paraphrasing from “Snow White and the Seven Dwarfs”*

Abstract: *This presentation will focus on a very particular application which, although off the beaten track, is perfectly fitting for several fields: optics & photonics, precision mechanics, electronics, control & automation, as well as IT (including AI). It achieves the lowest possible tolerances and outstandingly fine positioning. The first thoughts which might come to mind when thinking about ultimate reflective optical systems most probably lead towards cutting-edge mirrors like, e.g., the ones of the Extremely Large Telescope ELT (elt.eso.org & [Extremely_Large_Telescope](https://www.extremelylarge.org/)), aptly known as the world’s biggest eye on the sky. Still, even better optical techniques and systems have been developed and put together, which also incorporate high-power lasers. In fact, if working in reverse, one might use these to hit a golf ball on the Moon with a laser ray. The question “What is it (this) good for?” naturally comes to mind, while the unexpected answer is that such techniques (and the machines/systems relying on them) are—and will be for some time—a key ingredient for making the most advanced integrated circuits. This (key ingredient) is extreme ultraviolet lithography EUV or EUVL ([Extreme_ultraviolet_lithography](https://www.euvl.com/)) which is at the heart of transforming dust (silicon) into the most advanced few-nanometer integrated circuits powering cloud and edge computing, AI, IoT, and most probably quantum computing as well. The presentation will mention the difficult technical problems faced, go over solutions which have been discovered over the last three decades (landing the German Future Prize in Fall 2020, [news/11/11/44](https://www.zeitungsonline.de/news/11/11/44)). All of these clearly make EUV a success, but also pinpoint to a monopolistic growth potential (in the context of the expected demise of Moore’s law) revealing very stringent financial constraints.*

Alfred M. BRUCKSTEIN
Technion University,
Israel



Guiding Swarms with Pheromone Gradients or Broadcast Signals

Abstract: *Several ideas for guiding many simple agents interacting in order to form a cohesive swarm while moving in a desired direction or toward a target location will be surveyed. The assumption is that the agents are all identical and anonymous and oblivious, disoriented and cannot explicitly communicate, however they can receive broadcast signals or sense pheromones locally. Hence they cannot be individually addressed, in the guidance process. The control signals for the guidance can only influence some of them, and the agents react to them locally and thereby modify their motion parameters in some preset way.*

(This presentation will be based on joint work with Yotam Elor, Ariel Barel, Rotem Manor and Ilana Segall.)

Yezid DONOSO
Universidad de los Andes,
Colombia



Methodologies for Solving Complex Multi-Objective Combinatorial Problems in Engineering: An Evolutionary Approach Applied to Computer Networks

Abstract: *In real problems in Engineering, solving a problem is not enough; the solution of the problem must be the best solution possible. In other words, it is necessary to find the optimal solution. The solution is the best possible solution because in the real world this problem may have certain constraints by which the solutions found may be feasible, that is, they can be implemented in practice and, unfeasible or that they cannot be implemented. Some of these problems in engineering can be MOP (Multi-Objective Optimization Problem). A general MOP includes a set of n parameters (decision variables), a set of k objective functions and a set of m restrictions. The objective and restriction functions are functions of the decision variables where is possible to obtain a set of optimal values. Then the MOP can be expressed as:*

$$\text{Optimize } y = f(x) = (f_1(x), f_2(x), \dots, f_k(x))$$

$$\text{Subject to } e(x) = (e_1(x), e_2(x), \dots, e_m(x)) \leq 0$$

$$\text{Where } x = (x_1, x_2, \dots, x_n) \in X$$

$$y = (y_1, y_2, \dots, y_k) \in Y$$

The method evolutionary algorithm (EA) refers to searching and optimization techniques based on the evolution model proposed by Charles Darwin. Genetic algorithms are used in several areas especially for searching and optimizations. In the real case the algorithm is implemented by choosing a coding for the possible solutions to the problem. The coding is done through chains of bits, numbers or characters that represent the chromosomes. The crossing and mutation operations are applied in a very simple way through functions of vector value manipulation. The EAs are interesting given the fact that at first glance they seem especially apt to deal with the difficulties presented by MOPs. The reason for this is that they can return an entire set of solutions after a simple run and they do not have any other of the limitations of traditional techniques. In addition, some researchers have suggested that the EAs would behave better than other blind searching techniques.

ABSTRACTS OF ACCEPTED PAPERS

Authors	Title & Abstract
<p>Luiz Fernando Capretz¹, Saad Harous², Ali Bou Nassif³</p> <p>¹Western University, Canada</p> <p>²UAE University, United Arab Emirates</p> <p>³University of Sharjah, United Arab Emirates</p>	<p>What UAE Software Students Think about Software Testing: A Replicated Study</p> <p>Abstract: <i>Software testing is vital to improve software quality. However, software tester role is stigmatized, partly due to misperception and partly due to the treatment of the testing process within the software industry. The present study analyses this situation aiming to explore what might inhibit an individual from taking up a software testing career. In order to investigate this issue, we surveyed 132 senior students pursuing degrees in information systems, information and communication technology, computer science, computer engineering, software engineering, and other closely-related disciplines at three universities in the United Arab Emirates: two publicly funded and one top-notch private university. The students were asked to describe the PROs and CONs of taking up a career in software testing and to ponder the likelihood that they would take up the career themselves. The study identified 7 main PROs and 9 main CONSs for pursuing a testing career, and indicated that the role of software tester is perceived as a social role, which may require as many soft skills as technical prowess. The results also show that UAE software-related students have a stronger negative attitude towards software testing compared to their counterparts in other countries where similar investigations have been carried out in the past three years.</i></p>
<p>Bogdana Stanojević¹, Milan Stanojević²</p> <p>¹Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia,</p> <p>²University of Belgrade, Serbia</p>	<p>Extension-principle-based approach to least square fuzzy linear regression</p> <p>Abstract: <i>The regression method is widely used in predictive analysis. Its role is to derive an analytic estimation of the outputs expected for given inputs based on observed input-output data. The objective function that is optimized within the regression model is generally the representation of the approximation error comparing to the observed data. Nowadays, the uncertainty is commonly taken into consideration when modeling real systems, and vectorizing information is an important aspect of addressing big data in computer science. Consequently, finding pertinent fuzzy regression models is of great importance within mathematical modeling. In this paper we report our findings related to the full use of the extension principle in solving the optimization model comprised in a least square fuzzy linear regression methodology. We propose a solution approach based on mathematical programming to estimate the fuzzy outputs of the observed fuzzy data; and group our experiments in two categories with respect to the crispness of the observed input data. The first category uses crisp input data and is considered to better explain the advantage of using the extension principle within the solution approach; while the second category, having fuzzy both input and output observed data, is included to prove the relevance of the new approach compared to methodologies from the recent literature.</i></p>

Razvan Marcus,
Cosmin Rus, Monica
Leba, Marius Risteiu
University of
Petrosani,
Romania

Electric vehicles between recycling and sustainable development - @.ro

Abstract: *Even if until now electric vehicles are not 100% clean, they are becoming an increasingly viable alternative to classic transport solutions, bringing in addition new innovations designed to help within the general concept of sustainable development, especially within large urban areas. In addition to the classic transport function, through new technologies (V2V, V2G), an electric vehicle can be successfully transformed into an active tool in achieving the goals of a Smart City. This paper presents several alternatives both as an effective part of control hardware for an electric vehicle and algorithms implemented on this hardware. The special characteristics that can be implemented in an electric vehicle are highlighted by presenting the achievements of such vehicles. The original note is the conversion of a vintage off-road vehicle from Romania into an electric vehicle. It is noteworthy that many of the hardware components used in the construction of various electric vehicles are recycled so it can be said that the first step in terms of the concept of sustainable development has already been achieved. All electric vehicles designed or converted at the University of Petrosani benefit from LoRa type communications (a communication network still little used in Romania but which has proven its reliability) and are intended for use inside an urban area and can successfully fulfil the role of the platform for monitoring the air quality parameters in a certain area precisely in view of the fact that it does not pollute directly.*

Ionela Samuil,
Andreea Ionica,
Monica Leba
University of
Petrosani,
Romania

Algorithmic Modeling to Individualize Touristic Experience in Petrila Theme Park

Abstract: *The perception of tourism activity has changed a lot in recent years, as a result of the innovation of services, now accessible through the Internet and smart devices. The tourist offer is of an impressive variety and the tourist is looking for personalized services. In the light of this information, it is necessary to develop a tool for automatic planning of a tourist route based on the requirements defined by a tourist in order to increase his satisfaction. The personalized planning of the tour involves the selection, from the base of information related to the destination, of the elements that correspond to the requirements of the tourist, and the configuration of the tourist route according to the selected elements. In order to achieve this goal, in this article, the personalized planning of the tourist route in the context of the industrial tourism within the proposed Petrila Theme Park, is modeled on the basis of the knapsack problem, the discreet form. Gamification elements are also introduced in the analysis to enhance the result. Thus, in the case under study, the tourist represents the knapsack, the elements to be introduced in the knapsack are represented by the characteristics that define each type of player and the constraint is given by the time that allows the player to explore the destination by buying the ticket.*

Maria Georgiana
Stoica
Bucharest University
of Economic
Studies,
Romania

Smart contracts: A valuable technology in ERP e-commerce systems and for customer experience

Abstract: *In the past few years, more and more e-commerce companies are progressively looking for business opportunities and ways to evolve in terms of their informatic system in such a crowded market and gain a unique customer experience to earn the client's trust. This need is exacerbated, taking into account the competition generated by the major market leaders, by constantly introducing innovations in planning the business resources, and by the results-oriented for stimulating the competition. This study theoretically systematizes how blockchain technology and smart contracts are slowly becoming a necessity in the ERP systems from the big companies that offer online shopping services, whether B2B or B2C, providing extra security for its clients. The models defined in this study highlight the technical efficiency in a resource system planning of three companies, market leaders in Romania, in terms of supply-chain, secure payments, and forecast, for comparing the costs of the change when using blockchain technology. Moreover, for a better shopping experience in online stores, the efficiency and effectiveness scores of applying these technologies to the customer review section, so that frauds are analyzed and can be significantly reduced by making in this way a secured and more reliable system. The study analysis of these aspects shows that the efficiency of minimizing frauds and improving the technology of ERP development by creating a safe and stable environment varies substantially between models and leads to a new era in e-commerce that is so needed nowadays.*

German A. Montoya,
Carlos Lozano-
Garzon, Yezid Donoso
Universidad de Los
Andes, Colombia

A Stochastic Mobility Prediction Algorithm for finding Delay and Energy Efficient Routing Paths considering Movement Patterns in Mobile IoT Networks

Abstract: *In Mobile IoT Networks, the network nodes are constantly moving in a field, causing interruptions in the communication paths and, thus, generating long delays at the time of building a communication path from a source IoT node to the gateway (destination node). Communication interruptions affect the delay performance in delay-sensitive applications such as health and military scenarios. In addition, these IoT nodes are equipped with batteries, whereby it is also necessary to accomplish energy consumption requirements. In summary, a gateway node should not receive messages or packets coming from the IoT nodes with undesired delays, whereby it is pertinent to propose new algorithms or techniques for minimizing the delay and energy consumption experimented in the IoT network. Due to IoT nodes are attached to humans, animals or objects, they present a specific movement pattern that can be analyzed to improve the path-building with the aim of reducing the end-to-end delay. Therefore, we propose the usage of a mobility prediction technique based on a Stochastic Model to predict nodes' positions in order to obtain minimum cost paths in terms of energy consumption and delay in mobile IoT networks. Our stochastic model is tuned and evaluated under the Markov-Gauss mobility model, considering different levels of movement randomness in order to test how the capability prediction of our proposal can impact the delay and energy consumption in mobile IoT networks in comparison with others routing algorithms.*

Smaranda Belciug,
Renato Constantin
Ivanescu
University of Craiova,
Romania

Non-parametric rank correlation trained single-hidden layer feedforward neural networks for medical data

Abstract: Massive amounts of medical data led to a faster, more accurate diagnosis and course of treatment for cancer. Machine learning (ML) algorithms have been developed increasingly in order to process medical data. By embedding knowledge from data into the algorithm's architecture we customize MLs to provide personalized diagnosis and personalized treatment plan. The goal of this study is to statistically analyze non-parametric correlation coefficients for initializing the input-hidden weight matrix of three single hidden layer feedforward neural networks (SLFNs). A SLFN is able to approximate a continuous function given a training dataset as input for a desired output. Using different non-parametric correlation coefficients, ρ , τ , and Υ , we developed three novel SLFNs that have their input hidden layer weight matrix initialized using the above-mentioned correlation coefficients computed between the input and the output. The matrix that contains the hidden output weights is computed in just one step, using the Moore-Penrose pseudoinverse matrix. A statistical analysis is performed for assessing the models' results when applied on three medical datasets that regard differentiating lung, breast, and liver cancer. The statistical benchmarking showed that the ρ -SLFN is superior to the other two. All three models were overall competitive to other state-of-the-art algorithms.

Fuad Aleskerov^{1,2},
Sergey Demin^{1,2},
Alexey Myachin^{1,2},
Vyacheslav Yakuba^{1,2}
¹ HSE University,
² Institute of Control
Science of Russian
Academy of Science,
Russia

Short-Term Covid-19 Incidence Prediction in Countries Using Clustering and Regression Analysis

Abstract: As of February 07, 2022, more than 395 million cases of COVID-19 had been identified in the world, with 5.74 million deaths. The paper considers methodology for predicting the number of cases in the short term using a preliminary assessment of countries based on three indicators: expert assessments of the law-abiding population, the level of education and restrictive measures taken in the country. The description and composition of the groups obtained are given. An assessment of the accuracy of the forecast results is made. A comparison of the considered models of 2020 with 2022 is given.

Victorita Radulescu
University Politehnica
of Bucharest,
Romania

Fuzzy Logic Applied in Hierarchical Secondary Regulation Voltage-Reactive Power

Abstract: Hierarchical regulation between voltage and reactive power in electricity supply systems is proposed, in the current conditions of the liberalization of the internal energy market and of the permanent international trades. In Romania there are several electricity transmission and distribution companies, usually zonal, each with a specific approach to this regulation.

There is also a problem with the overloaded power lines in different areas, for certain distribution nodes, especially in the transition zones from one company to another. The regulation between voltage and reactive power is absolutely necessary both in normal operation but especially in emergency mode, when it is necessary to ensure the supply of as many consumers as possible, in a short time. The focus is on secondary regulation, using Fuzzy Logic by managing complex control space in a modern way. This adjustment allows to change the voltage of the generators in the control zone, when there is a variation of the voltage in

the pilot node, as a result of the variation of the reactive power consumption in that area. The Fuzzy model is numerically tested for the monofilament diagrams of the developed Power Test line. Some of the numerical results obtained are finally presented.

Claudio J. Macuada,
Astrid M.
Oddershede, Luis E.
Quezada, Pedro I.
Palominos
University of
Santiago of Chile,
Chile

Decision support model for raw water availability for purification in a region in Chile

Abstract: *This article proposes a decision model to identify the most sustainable solution(s) to ensure the availability of raw water to be subsequently treated to be converted into drinking water as a consequence of the climate change scenario, particularly the drought currently experienced by the Metropolitan Region in Chile, derived from the technical and regulatory requirements associated with the availability of water resources from its capture to its drinkability to meet the future demand of the region. From the perspective of drought, the solution must provide security levels that guarantee the availability of raw water is one of the main concerns of the stakeholders. In turn, the need to adapt current regulations regarding raw water sources, as well as community acceptance of some proposals for converting raw water into potable water and climate dependency, involve qualitative as well as technical aspects that may affect the investment and operating costs of the different solutions required to ensure raw water availability.*

Therefore, through a multi-criteria approach, it is possible to incorporate quantifiable and intangible aspects and to address conflicting objectives. Through a case study, we present a decision model based on the Analytic Hierarchy Process to define and evaluate the most sustainable solution(s) to secure raw water for drinking. This study proposes to integrate technical and qualitative attributes to identify the challenging criteria and the associated linkage to the problem of selecting proposals for the most sustainable solution(s) to secure raw water, being a guide to decide the implementation of the most appropriate solution.

Alexandra-Iulia
Szedlak-Stinean,
Radu-Emil Precup,
Raul-Cristian Roman
Politehnica University
of Timisoara,
Romania

Linear and nonlinear observers developed for direct current electric drive systems

Abstract: *act. This paper suggests four estimation approaches, namely two linear and two nonlinear ones: Extended Luenberger State Observer (ELSO), Kalman Filter Observer (KFO), Extended Kalman Filter Observer (EKFO) and Sliding Mode Observer (SMO), for electric drive systems (EDSs) with direct current (DC) motor. The application considered in this paper is a simple mechanism, a mechatronic system that does not require complex hardware and also exhibits attractive features such as high efficiency, low manufacturing cost, simple construction and operation and linear torque-speed characteristics. The performance and the efficiency of the four estimation approaches are validated through results obtained by digital simulation. To better highlight the performance, a comparative study of all four estimation approaches is performed considering the values for the mean square error (MSE) regarding two simulation scenarios – step reference input and staircase reference input – obtained for two state variables. The results show that all these estimation approaches work efficiently for such types of processes.*

Constanta Zoie
Radulescu, Marius
Radulescu, Radu
Boncea
National Institute for
Research and
Development in
Informatics,
Romania

A combined VIKOR-TOPSIS method with application in Cloud Services Provider selection

Abstract: In the last decades multi-criteria methods have known an important development and their area of application was significantly enlarged. Multi-criteria methods are used for making decisions that involve multiple and conflicting criteria. These methods consider a set of alternatives and a set of criteria. Each alternative is evaluated according to each criterion. As a result, a best alternative or an alternatives ranking is obtained. The selection of the appropriate multi-criteria method, for a decision, is an important problem. Two classical multi-criteria methods are TOPSIS and VIKOR, which have been proven effective through a large number of applications. Sometimes the two methods give different solutions regarding the alternatives ranking when they are starting from the same input data. In this paper we propose a new method that is a combination of these two methods. The combined VIKOR-TOPSIS method, is applied to evaluate and ranking a set of CSP (Cloud Service Provider) for selecting a best CSP, taking into account the user requirements and Quality of Service (QoS) criteria.

Victorita Radulescu
University Politehnica
of Bucharest,
Romania

Modeling with Fuzzy Logic the Impact of Power Lines on the Environment

Abstract: Recently in Romania, due to the development of new power plants based on renewable sources, there is the problem of developing surface power grids. In their realization, an increasing importance is given on the impact induced by them on the environment, biological and economical life. The ground electric field, the induced current, the magnetic field and the noise produced affect the area over quite large distances. The effect on the environment produced by the power lines cannot be separated from the economic aspect regarding the distances required in their realization associated with the costs of maintenance and access roads. Applying Fuzzy logic, a balance is obtained between these two major aspects, of economic and environmental nature. Some factors need to be quantified, including environmental impact, impact over agriculture, visual impact, occupied areas for new roads and housing constructions, population health, land animal life, migratory bird flight routes, TV and radio reception signals, etc. A multi-criteria model based on some Fuzzy inequalities is used to solve the problem. The values known for the electric and magnetic field are compared with the values obtained by numerical modeling and the fuzzy parameters are corrected. As Case Study is presented, a network from the Project 138- Black Sea Corridor, 400 kV suspended power lines - LEA Smardan – Gutinas. The utilization of this method allows a higher degree of flexibility than the classic solutions, easier to adapt in different concrete cases.

Qianli Zhou¹,
Chenhui Qiang^{1,2},
Yong Deng^{1,3,4,5}
¹ Institute of
Fundamental and
Frontier Science,
University of
Electronic Science
and

Fuzzy Fractal: An Information Entropy View *

Abstract: We model intuitionistic fuzzy sets (IFS) by Dempster-Shafer theory, and use belief entropy to give a new intuitionistic fuzzy measure. Combining the Shannon entropy measure of fuzzy sets (FS) and the proposed IFS measure, we explore the fractal features of FS and IFS from the perspective of information entropy. Besides, we give the fuzzy information fractal dimension according to the growth rate of normalized information entropy of the joint distributions.

Technology of China,
²Yingcai Honors
College, University of
Electronic Science
and Technology of
China, China
³School of Education
Shaanxi Normal
University,
⁴ School of
Knowledge Science,
Japan
⁵ ETH Zurich,
Switzerland

Jixiang Deng¹, Yong
Deng^{1,2,3,4}

¹ Institute of
Fundamental and
Frontier Science,
University of
Electronic Science
and
Technology of China,
China

²School of Education
Shaanxi Normal
University,

³School of Knowledge
Science, Japan

⁴ ETH Zurich,
Switzerland

IV-FEC: Information Volume-Based Fuzzy Evidential Classifier *

Abstract: Classification based on fuzzy set theory and evidence theory has attracted much attention. However, traditional fuzzy classifiers and evidential classifiers may encounter two issues when facing data with high uncertainty. For one thing, the knowledge represented by the classifier may be in conflict, making classification difficult. For the other thing, most classifiers only consider one type of uncertainty. Hence, in this paper, information volume-based fuzzy evidential classifier (IV-FEC) is proposed by considering both the fuzziness and the total uncertainty (TU) of the classification problem. IV-FEC incorporates fuzzy information volume (FIV) and evidential information volume (EIV) for conflict management under the different types of uncertainty. FIV and EIV respectively estimate the fuzziness of the Gaussian membership degree of the samples and the TU for each attribute. An FIV and EIV-based discounting technique is utilized to modify the mass functions in order to manage conflicts in evidence combination and improve classification performance. The proposed IV-FEC is applied in target classification and verified based on several experiments. The results show that IV-FEC has a better classification accuracy compared with the existing models.

Sergey Shvydun

¹National Research
University Higher
School of Economics,
Russia,

²V.A. Trapeznikov
Institute of Control
Sciences of Russian
Academy of Science,
Russia

The Impact of COVID-19 on the Air Transportation Network

Abstract: The COVID-19 pandemic have changed our lives and caused severe social, economic and environmental disruption worldwide. This paper examines the impact of coronavirus outbreak and subsequent wave of lockdowns and travel restrictions on air transportation from the network perspective. Using the air traffic data from 2019 to 2021, we examine how the structure of the network has changed both globally and locally. We quantify the similarity of air transportation network for adjacent years and compare it to the pre-pandemic period. The connectivity configuration of countries is also considered. Finally, we identify the most important participants of the air transportation industry and reveal countries with the largest change of centrality during the pandemic.

Fabián Barrales¹,
Claudia Duran², Diego
Fuentealba³ and Raúl
Carrasco⁴

¹Universidad de

Flexibility in Organizational Design A Decision Making Guide

Abstract: Global changes have influenced organizations generating uncertainty in economic, social, environmental and technological decisionmaking. To face this situation, it has been necessary to incorporate increasingly the concept of flexibility in the organizational

Santiago de Chile, Chile
²*Universidad Tecnológica Metropolitana, Chile*
³*Universidad Tecnológica Metropolitana, Chile*
⁴*Universidad de Las Americas, Santiago Chile*

structure of companies. In the present work through a review of the scientific literature of the last 30 years, the key factors related to the new trends, models and areas of application showing as evolved the design and organizational structure is evolved. Successful cases are studied, results and conclusions are delivered.

Nadaban Sorin, Deac Dan
"Aurel Vlaicu"
University of Arad, Romania

Nonstandard Fuzzy Sets : A General View

Abstract: *Nonstandard fuzzy sets are extensions, generalizations of fuzzy sets introduced by Zadeh. They represent a research domain of great interest due to the multiple applications in ambiguity situations and in problems with incomplete information. We make a systematic review of these types of fuzzy sets in order to provide a framework for new research in this field, to strengthen the available theoretical results, to establish the relations among them as well as their various applications*

Francisco Sepúlveda-Ortiz¹, Claudia Duran¹, Diego Fuentealba¹, Manuel Vargas², Raúl Carrasco³
¹*Universidad Tecnológica Metropolitana, Chile*
²*Universidad de Santiago de Chile,*
³*Universidad de Las Américas, Santiago, Chile*

Boosting data management using artificial neural networks

Abstract: *The present work promotes the study of artificial neural networks (ANN) in the management of data from logistics chains. The main aspects and advantages of applying this technology to business are reviewed. Through a literature review, the business domains, models, algorithms and benefits of ANN forecasting are determined. A case study is generated with historical data to predict with ANN the flow of cargo moving by land and sea transport during the year 2020. The results are analyzed and when compared with the company's actual data and the least squares method, they show greater efficiency when using ANN. Finally, conclusions are drawn on the advantages of incorporating this technology in a public company and the need to generate more research in this area to reduce costs, increase process efficiency and improve decision making.*

Attila Simo¹, Simona Dzitac²
¹*Politehnica University Timisoara,*
²*University of Oradea, Romania*

Energy-Efficient Wireless Sensor Networks for Greenhouse Management

Abstract: *Agriculture plays a crucial role in the economy of the country. The agricultural industry is getting more data-centric and requires precise, more advanced data and technologies than before, despite being familiar with agricultural processes. The agriculture industry is being advanced by various information and advanced communication technologies, such as the Internet of Things (IoT). Development and deployment of sensing technologies is one of the main steps in achieving sustainability in crop production through precision agriculture. The energy crisis will further accelerate this digitization process. The energy crisis will accelerate this digitization process even more, but at the same time it will help farmers consume energy more responsibly. To optimize electrical energy consumption, farmers need monitoring devices. In this paper the authors propose a low-cost, low-power, long range monitoring device development. The results obtained show the usefulness of such a monitoring device.*

Simona Dzitac¹,
Adrian Cheregi¹,
Daniel Alexuță²,
Attila Simo³, Badea
Gabriela Elena¹
¹ University of
Oradea, Romania
² "Aurel Vlaicu"
University of Arad,
Romania
³ Politehnica
University Timisoara,
Romania

Digitization of the characteristic parameters of a greenhouse in order to streamline energy consumption

Abstract: Smart agriculture represents a management concept focused on industrial agriculture that already has the infrastructure to use advanced technologies like big data, cloud and Internet of Things (IoT) in order to supervise, automatize and analyze operations. It is known as well as precise agriculture, smart agriculture is driven by software and supervised by sensors. The importance of smart agriculture is constantly growing as it needs to use natural resources as efficiently as possible. In present paper we will consider supervising and controlling a greenhouse through sensors and software for its energy efficiency. In a first phase, the architecture of the sensor network and of the possible equipment that will control the temperature, the humidity of the greenhouse in order to make the production as efficient and the consumption of energy are established. Based on some measurements, solutions will be found to reduce the consumption of electrical energy. The conclusions present the advantages of smart agriculture, the stages of energy efficiency of a greenhouse by adding sensors and software control.

Víctor Lomas-Barrie¹,
Mario Peña-Cabrera¹,
Mauricio Reyes-
Castillo¹, T.
Alcantara-
Concepcion¹, Gaston
Lefranc²
¹ Universidad
Nacional Autonoma
de México, México
² Pontificia
Universidad Católica
de Valparaiso, Chile

A nursing mobile robot for COVID19 patients using a RPI and mobile device

Abstract: The article shows the design and implementation of a caterpillar structure mobile platform, which includes integrated electronic communication and control devices, as well as 3D printed parts for custom mechanical and additive manufacturing. The objective is to help in the care of patients with COVID19 within the restricted areas of the hospital. PWM technique is used for motion control due to its proven use of robust and reliable performance for service robot applications. The implementation is done with a commercial mechanical caterpillar platform with the architecture and electronic components manufactured by 3D printing are described in order to show the scope and technique used to control the operation. The article aims to test the efficiency and reliable performance of a mobile platform using PWM control techniques and Wi-Fi communication implemented in a RaspBerry Pi hardware electronic device as an auxiliary nursing robotic system in hospital areas restricted by COVID19. Assisted remote control is web-based, so any mobile device can perform actions. MQTT WebSocket is used to send and receive commands and telemetry.

Valente Vázquez-
Velazquez¹, Mario
Mario Peña-Cabrera¹,
Víctor Lomas-Barrié¹
and Gaston Lefranc²
¹ Instituto de
Investigaciones en
Matemáticas
Aplicadas y en
Sistemas (IIMAS),
Universidad Nacional
Autónoma de
México, México
² Pontificia
Universidad Católica
de Valparaiso, Chile

Conversion of a Hybrid Flexible Manufacturing Cell to Industry 4.0

Abstract: A flexible manufacturing cell implemented in a hybrid way is presented, that is, integrating a real physical part with a simulated one. The cell is made up of a Kuka robotic manipulator, a vision system, sensors and containers for parts and products. The simulation part is fully connected to the real part and vice versa. The cell is converted using industry 4.0 criteria, which is implemented with a wireless communications system, and is controlled through a hierarchical system. The cell is tested by way of a picking and placing parts task on a conveyor belt.

Catalin Dimon,
Marius Teme,
Dumitru Popescu,
University Politehnica
of Bucharest,
Romania

Optimization of road traffic using intelligent traffic light systems

Abstract: *If we consider road traffic in urban areas, one of its major problems encountered nowadays is that of traffic congestion. The paper aims to provide an improvement, in terms of reducing traffic congestion, by analyzing different traffic light cycles. A traffic light cycle is determined by the red and green duration of the traffic lights. Traditionally these two have a fixed duration and controlling road traffic can be achieved by modifying it, resulting in a congestion reduction. We present a comparison between the fixed and an improved fixed situation, as well as a QL algorithm to further reduce the congestion at an intersection. Urban traffic can thus be optimized, in terms of reducing congestion, on an existing traffic light system.*

A study case validates the results, based on road traffic data obtained from the city of Bucharest.

Bogdan Alexandru
Radulescu, Victorita
Radulescu
University Politehnica
of Bucharest,
Romania

Artificial intelligence, solution in planning the electricity transactions

Abstract: *In Romania, starting with 2018, the electricity supply market has been liberalized. Starting with 2021, the gas supply market has also been liberalized. We are currently facing a global energy crisis, with an unprecedented rise in the price of electricity and gas. The correct substantiation of the portfolio framework contracts concluded between the electricity producers, suppliers and consumers represents an essential condition from the financial point of view regarding the electricity supply services. They must provide a benefit to the producers, within reasonable limits, so that the consumer price is not artificially increased. This process becomes optimal if a forecast based on artificial intelligence, made over an average of one year, is used. It must reflect domestic consumption associated with the international trade to be made. The forecast must be realized in the form of load curves with hourly levels for each day of the selected period. The adopted solution uses a hybrid model, optimized statisticneuronal, built on the basis of selected preliminary data. The calculation model and modeling used in the daily task graphs are presented, using self-organizing processes. The results obtained by forecasting the data recorded for the minimum, average and maximum consumption scenario for each form of estimating the average daily and monthly consumption is compared with the values of the consumption recorded in the months selected as a model. The errors obtained are in the range of 1.8-5.4%*

Yangxue Li¹,
Francisco Javier
Cabrerizo¹, Enrique
Herrera-Viedma^{2,1},
Juan Antonio
Morente-Molinera¹
¹University of
Granada, Spain.
² School of Business
Administration,
University of Finance
and Economics,
Chengdu, China

A Modified Uncertainty Measure of Z-numbers

Abstract: *The Z-number is a more adequate construct for describing real-life information. While considering the uncertainty of the information, it also models the partial reliability of the information. It is a combination of probabilistic restriction and possibilistic restriction. In this paper, we modified the uncertainty measurement of the discrete Z-number and proposed the uncertainty measurement of the continuous Z-number. Some numerical examples are used to illustrate the calculation processes and advantages of the proposed method. An application of journey vehicle selection shows the effectiveness of the proposed uncertainty measurement in determining the weights of criteria.*

Stefano Bonnini,
Michela Borghesi
University of Ferrara,
Italy

Two-sample permutation test for comparing marginal probabilities of multivariate Bernoulli distributions

Abstract: *The contribution of this paper is both methodological and applicative. A combined permutation test for two independent samples is proposed for comparing the vectors of marginal probabilities of two multivariate Bernoulli distributions. The power behavior of the test is analyzed through a Monte Carlo simulation study. The application of the method to real data concerning the propensity towards circular economy of small Italian companies in the sector of metal, contributes to the debates on the effect of firm size to the “circularity” of companies.*

J. M. Tapia¹, F.
Chiclana², M. J. del
Moral¹, E. Herrera-
Viedma¹
¹University of
Granada, Spain,
²De Montfort
University, UK

Measuring Consensus in Group Decision-Making Problems through an inequality measure

Abstract: *Gini index, a measure of statistical dispersion intending to represent inequality within a group, used mainly in economics, becomes in this paper a tool to introduce a new index to measure the level of consensus in Group Decision Making problems. An empirical study reveals that the levels of consensus obtained by this index are similar to those derived through the use of a distance function when fuzzy preference relations are considered. The results obtained suggest that this new index can be satisfactorily used to measure the degree of consensus in this framework.*

Dan Noje, Radu
Tarca, Nicolae Pop,
Alin Moldovan,
Ovidiu Moldovan
University of Oradea,
Romania

Automatic system based on Riesz MV-algebras, for predictive maintenance of bearings of industrial equipment using temperature sensors

Abstract: *Predictive maintenance systems take a more and more important place in increasing the reliability of industrial equipment, of productivity and reducing production costs. There's a constant focus to develop new system architectures and in using the latest numerical methods and algorithms in developing more and more reliable predictive maintenance systems. Based on recent results in using Shepard local approximation operators defined in Riesz MV-Algebras for IoT devices signals processing, in this article we propose a new architecture for a predictive maintenance system by adding an extra layer (denoted Data Validation Layer). This new layer is processing the acquired signals by sensors such that to provide to the predictive algorithms a complete and validated data set. The proposed architecture was validated by implementing and testing a predictive maintenance system that is monitoring the bearings of industrial equipment using temperature sensors.*

Bogdan Alexandru
Radulescu, Victorita
Radulescu
University Politehnica
of Bucharest,
Romania

Integrated Solutions and Computerized Human Gesture Control using Convolutional Architecture

Abstract: *Recognition of human actions is a topical issue due to its applicability in many different domains such as medicine, security, behavioral analysis, education, etc. The development of the computer processing power, as well as human motion capture equipment, has increased the accessibility to larger data sets. In this way the performances of the elaborated programs are improved. Convolutional neural networks represent the starting point for solving the analysis of human gestures or human faces. By their nature, they can recognize spatio-temporal features ideal for processing TGB images and sequences of RGB images. The proposed model with 3D Kernel is useful in certain*

	<p>situations where gestures are very different between them, necessary to be recognized by the system that must react quickly at a high speed (urgent situations, critical cases, etc.). The main objective of this paper is to build a reliable and easy human gesture recognition classifier. It must be able to easily classify large number of images so that it can operate in real time, processing at least 30 frames per second. This is possible by using other hardware of a shelf computer connected to a normal CCTV infrastructure. Selection of gesture class should not be related to the environment, person, background, appearance, or viewing angle. The decision must be related only to the person to whom the gesture is attributed and to the context in which he reacts.</p>
<p>Maria Vişan¹ , Sorin Lenus Negrea² ¹ School of Advanced Studies of the Romanian Academy, ² Romanian Association for Smart City and Mobility, Romania</p>	<p>Decision support systems for integrated land management and transport infrastructure in support of climate change mitigation and pandemic</p> <p>Abstract: <i>The third sector is important in the climate change race for the "reduction of carbon emission effects", severely affected by the pandemic and under pressure to implement drastic measures, the transportation from urban agglomerations (UA) requires a sustainable transformation solution. An important point in this major effort is the understanding of the cognitive, institutional, strategic and regulatory barriers that may hinder the achievement of the objectives set by international climatic changes agreements. An integrated territory and infrastructure management centre equipped with decision support systems is a solution for this challenge. Dynamic spatial planning contributes through the regulatory framework to the operationalization of this solution in the "new normality" after the pandemic. But no matter how agile the adoption of technologies could be at the UA level (through the collaboration of all actors involved in the process, namely public administration, business environment, citizens), in a society where the "new normal" is disruption, the key to change remains the vision and how the transformation is conducted. However, the challenge remains the integrated management of the territory and operation under hybrid roles, and the development of collaborative workflows between all actors involved in the workflows processes, between organizations and the development of the relationship with civil society and the public or private business environment.</i></p>
<p>J.R. Trillo¹, F.J. Cabrerizo¹, F. Chiclana², M.A. Martinez¹, E.Herrera- Viedma¹ ¹ University of Granada, Spain, ² Montfort University, UK</p>	<p>Some Trends in Fuzzy Decision Making</p> <p>Abstract: <i>Decision making is a line of research that has been consolidating since its beginnings in the 1960s. The aim of this paper is to show the evolution and future challenges of this line of research, focusing especially on its evaluation and information methods. For this purpose, some issues and trends of the fuzzy decision system are presented. By doing so, it is possible to show which trend fuzzy decision systems will follow and the challenges that may arise.</i></p>
<p>Valeriu Beiu¹, Sorin- Horatiu Hoara² , Roxana-Mariana Beiu¹ ¹"Aurel Vlaicu" University of Arad, ² Politehnica</p>	<p>Bridging Reliability to Efficiency Consecutive Elegant and Simple Design</p> <p>Abstract: <i>An acute problem when moving into the few nanometers highly advanced CMOS technologies is represented by the inexorable cost-yield balance, lately clearly tilted by the hefty costs. Amongst the options worth investigating (for reducing costs), designing for (enhanced) reliability has still not gained traction, as implicitly considered a power-/energy-hungry solution (due to redundancy), as well as a complex design alternative</i></p>

University of
Timisoara
Romania

(hence risky). From the biological side, neurons are prime examples of highly efficient designs reaching outstanding communication and computation reliabilities, although relying on random devices (known as ion channels or, more appropriately, single ion transistors). In this paper, bridging from biology to circuits, we will show how kind of overlooked mathematical results (about consecutive systems) together with novel Binet-equivalent formulas (for Fibonacci numbers of higher orders) can be pieced together for completely avoiding reliability calculations for consecutive systems. Finally, using such results, in combination with freshly defined cost functions (for reliability), we are able to present a trivial design scheme for consecutive systems which is balancing reliability and efficiency.

Marilena Jianu¹,
Leonard Daus¹,
Mariana Nagy²,
Roxana-Mariana
Beiu²
¹Technical University
of Civil Engineering
Bucharest,
²“Aurel Vlaicu”
University of Arad,
Romania

Approximating the Level Curves on Pascal's Surface

Abstract: It is well-known that in general algorithms for determining all the coefficients of the reliability polynomial associated to a two-terminal network are computationally demanding, and even just bounding them can be taxing. Still, reliability polynomials can be expressed in Bernstein form, hence the coefficients of such polynomials are always fractions of the binomial coefficients. That is why we have very recently proposed an extension of the classical discrete Pascal's triangle (which comprises all the binomial coefficients) to a continuous version/surface. The fact that this continuous Pascal's surface has values in between the binomial coefficients makes it appealing as being an entity which comprises all the coefficients of all the reliability polynomials (which are integers, as resulting from counting processes), and even more (i.e., infinitely many real values). This means that the coefficients of any reliability polynomial represent discrete steps (integer values) on geodesics on this surface. Unfortunately, we were not able to find closed forms for the level curves on the Pascal's surface. That is why in this paper we are going to approach the level curves problem on Pascal's surface using approximations, and we will show that approximations for the level curves can be both accurate and computationally simple. Besides theoretical results we are also going to use simulations for supporting such claims.

Mihai Tache^{1,2},
Sorin-Horatiu Hoara¹,
V.-F. Drăgoi²,
Roxana-Mariana
Beiu²
¹University
Politehnica of
Bucharest,
²Aurel Vlaicu”
University of Arad,
Romania

Green AI from Kirchhoff to Shannon

Abstract: Early on, communications (theorized by Shannon) and computations (abstracted by Turing and von Neumann) have relied on reliability augmenting schemes: one proposed by von Neumann and the other one introduced by Moore and Shannon. For computations the gate-level method of von Neumann was embraced, while the device-level scheme crafted by Moore and Shannon founded network reliability, and was employed for communications. Since those early days, steady advances towards single digit nanometer transistors have been constant. Lately, advanced technologies are in high demand for supporting the growing computational needs on which AI, IoT and G5 are blooming. As advance CMOS are sensitive to variations, it seems normal to analyze networks for identifying optimal ones, and the Moore and Shannon concept is a perfect fit for transistors/devices built and organized as arrays: FinFET, MBCFET, GAAFET, etc. Still, defining optimality in this context is a non-trivial task, as the conflicting power consumption and reliability requirements need to be optimized simultaneously. For a clear understanding we decided to perform very detailed simulations of 3x3 resistor/transistor networks including variations (using ASAP7 PDK). We

are reporting and discussing those simulations here. Their statistical processing will reveal subtle and unexpected links between classical Kirchhoff theorems (pertaining to power consumption) and Moore and Shannon theoretical reliability concepts, which will need plenty of additional investigations. Still, the main conclusion (based on our preliminary simulations) is that optimal networks for low-power reliable CMOS designs (for computations) are conceivable.

Leonard Daus¹,
Vlad-Florin Dragoi²,
Dominic Bucerzan²,
Valeriu Beiu²
¹Technical University
of Civil Engineering
Bucharest,
² Aurel Vlaicu”
University of Arad,
Romania

On the roots of certain reliability polynomials

Abstract: In this paper we assume that a network is a probabilistic graph where the vertices do not fail while the edges do, being independently functional with probability p . The two most common probabilistic models of network reliability are the all-terminal and the two-terminal reliability. For each of these two models, the reliability of a network is represented by a polynomial in p . While the roots of all-terminal reliability polynomials have been extensively studied, only a small number of papers have investigated the roots of two-terminal reliability polynomials. One particular two-terminal network was introduced in 1956 by Moore and Shannon when establishing the concepts of network reliability. They argued that for improving the reliability of a network when doing computations one should replace the unreliable devices (relays, transistors, etc.) by particular regular networks of such devices, called hammock networks. Although hammock networks were introduced more than sixty years ago, no general formula for their two-terminal reliability polynomials have been reported yet. Additionally, the roots associated to the reliability polynomials of hammock networks have not been mentioned and investigated, a fact which is unexpected and a bit odd—especially when taking into account the optimality suggestions of Moore and Shannon. In this paper, we are going to correct this omission by enumerating and studying the roots of the two-terminal reliability polynomials associated to the 29 hammock networks presented by Moore and Shannon in their original paper. These will lead to several conjectures and also suggest further directions for research.

Marilena Jianu¹,
Leonard Daus¹,
Sorin-Horatiu Hoara²,
Valeriu Beiu³
¹Technical University
of Civil Engineering
Bucharest,
²Politehnica
University of
Timisoara,
³Aurel Vlaicu”
University of Arad,
Romania

Using Delta-Wye Transformations For Estimating Networks' Reliability

Abstract: It is well-known that finding the exact reliability polynomial of a given two-terminal network in general is a highly demanding computational task (belonging to the #P-complete class of problems), while for particular networks this process might get to be significantly simpler (e.g., of polynomial complexity). This statement is especially true in the case of (very) large networks which cannot be reduced to compositions of simpler (e.g., series and parallel) networks, and contain complex bridge type sub-networks. An interesting, and not much explored approach, is to borrow concepts and methods from electrical circuits, in particular the delta-wye transformation which has long been established and used for computing exactly the equivalent resistance of a resistor network. We shall review how such concepts (from electronics) should be adapted and applied to reliability evaluations, showing that (as opposed to the case of electrical circuits) these are not always exact, hence sometimes leading to reliability estimates. We shall exemplify approximations of the reliability polynomials when using delta-wye transformations, and show that this approach is able to significantly reduce complexity. Finally, we will apply the delta-wye transformation method to the Moore-Shannon hammock networks (for the first time

	<p>ever), and show how hammock networks can be transformed into ladder networks/graphs whose reliability can be easily computed by a recurrence formula. A few illustrative examples revealing the accuracy of this type of approximation will also be presented.</p>
<p>Yi Song, Dan Chang Beijing Jiaotong University, China</p>	<p>Research on Early-Warning of Financial Risks of Logistics Enterprises</p> <p>Abstract:<i>The logistics industry is a composite service industry integrating transportation, warehousing, freight forwarding, and information industries. It is an important part of the national economy. Therefore, the research on the early-warning of the financial risks of logistics enterprises and whether they can be developed continuously are also necessary. Through the study of enterprise risk early-warning, doing a good job in financial risk management and control is the most important issue that must be solved to thoroughly evaluate, prevent, and resolve the financial risks of logistics companies so that they can develop in a sound and orderly manner. This paper builds 22 financial early-warning indicators from the six aspects of each share index, growth capability index, profitability index, profit quality index, operation quality index, risk capability index, etc., using PCA to reduce and optimize the latitude, and build a logistics enterprise Financial Risk Early-warning Model, which is based on BP neural network.</i></p>
<p>Chunxiang Sun, Dan Chang, Mincong Tang Beijing Jiaotong University, China</p>	<p>Research on the storage of integrated pipe corridor monitoring data based on blockchain technology</p> <p>Abstract: <i>As an emerging urban underground life line in China, the integrated pipeline corridor has received extensive attention from many scholars, and the operation and maintenance management about the integrated pipeline corridor is gradually developing towards intelligent management with the maturity of digital technology. This paper proposes a monitoring data storage scheme based on the alliance chain to further realize the intelligent management of the integrated pipe corridor. In this paper, the data storage federated chain model is constructed by using various monitoring hosts of the integrated pipeline corridor as pre-selected nodes of the federated chain. In addition, the paper also adopts a dual-chain storage model with "on-chain" storage of key data information and "off-chain" storage of complete monitoring data to avoid the problem of communication jams among nodes caused by too much data on the federated chain. Finally, the proposed storage scheme is analyzed and discussed in terms of security performance, and the advantages of the model are demonstrated. The storage scheme proposed in this paper can safely and reliably store the monitoring data in the integrated pipe corridor, which provides a theoretical reference for further construction of an intelligent platform for integrated pipe corridor management, and to a certain extent promotes the development of intelligent management of integrated pipe corridors.</i></p>
<p>Nicolaie Popescu-Bodorin¹, Mariana Nagy² ¹Spiru Haret University, Bucharest ²„Aurel Vlaicu” University of Arad,</p>	<p>A new way of controlling traffic jams inside a Smart City based on IoT devices and communication protocols designed for preserving perfect anonymity</p> <p>Abstract: <i>In the IoT communication based on the OSI model, by the nature of the used protocols, one can find out who is using what device, under what IP address, in what location, at what time - and this is what we</i></p>

Romania

ironically still call privacy today, when in fact, it is exactly the lack of that. In various situation, mainly connected to the "smart city" concept, the data should be collected while preserving the anonymity of its source device. Such a situation is aggregating and processing data for modelling and controlling the traffic flow.

We search here for new IoT communication protocols and technologies in the context of avoiding traffic jams in Smart cities, aiming to exemplify traffic data as IoT data that can be collected and transmitted without necessarily bounding it with an identity of a person or of a device, hence without creating any room for users' and devices' privacy to be compromised. For this, we will descend along the OSI model up to the point where perfect anonymity is achievable - eventually by changing a transmission protocol, and also the structure and functionality of the IoT devices accordingly to preserving anonymity at any moment.

**Florentin
Smarandache,
University of New
Mexico, USA**

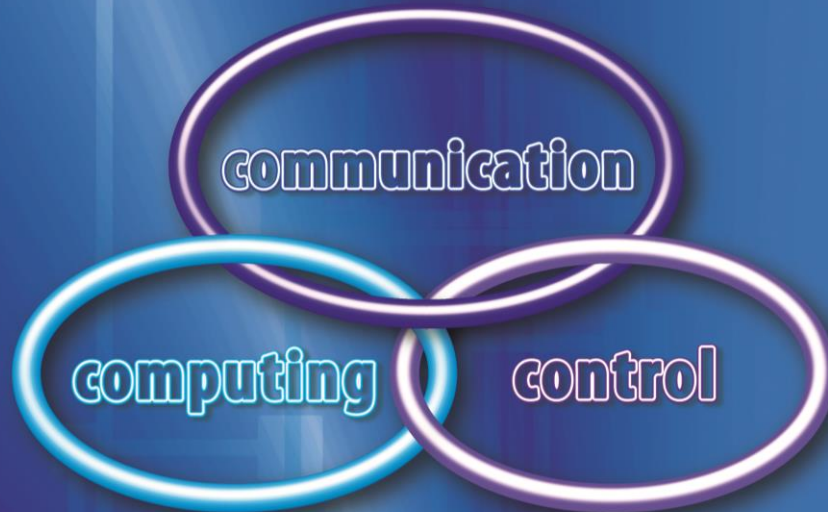
Extension of HyperAlgebra to SuperHyperAlgebra and Neutrosophic SuperHyperAlgebra (revisited)

Abstract: *This is a review paper. The n th-Powerset of a Set, and the concepts built on it such as SuperHyperOperation, SuperHyperAxiom, SuperHyperAlgebra, and their corresponding Neutrosophic SuperHyperOperation, Neutrosophic SuperHyperAxiom and Neutrosophic SuperHyperAlgebra are recalled and then prolonged to the Neutrosophic SuperHyperStructures {or more accurately Neutrosophic (m,n) -SuperHyperStructures}.*

ICCCC2022



Abstracts of ICCCC Papers



Agora University Editing House

ISSN 1844 - 4334

<https://portal.issn.org/resource/ISSN-L/1844-4334>