GUEST EDITORIAL: SPECIAL ISSUE ON INTELLIGENT SYSTEMS AND SOLUTIONS

Nafaa JABEUR

Computer Science Department
German University of Technology in Oman
Muscat, Sultanate of Oman
e-mail: `nafaa.jabeur@gutech.edu.om`

Ansar YASAR

Transportation Research
Institute Hasselt University
Hasselt, Belgium
e-mail: `ansar.yasar@uhasselt.be`

Ahmed NAIT SIDI MOH

Jean Monnet University Saint Etienne
LASPI Laboratory – IUT of Roanne
Campus Pierre Mendes France
20 Av. de Paris, 42300 Roanne Cedex, France
e-mail: `ahmed.nait@univ-st-etienne.fr`

This special issue is based on the best papers selected from the 1st International Conference on Applied Data Science and Intelligence (ADSI 2021), the 1st International Conference on Recent Theories and Applications in Transportation and Mobility (RTATM 2021), and the 1st International Conference on Informatics Revolution for Smarter Healthcare (IRSH 2021). The conferences, which were planned to take place on 14–15 October 2021 in Prague, Czech Republic, were held online on the same dates due to COVID restrictions. They attracted a large number of scientific papers. Based on a thorough peer review process as well as on the evaluations of the Guest Editors, about 20 % of the papers were selected for their significant

contributions to the field of intelligent systems and intelligent solutions. We present in what follows a short abstract of each paper.

Paper 1: Smart Cities Security Threat Landscape: A Review, by Raja Waseem Anwar and Saqib Ali [1]

The paper presents the holistic view of the security landscape and highlights the security threats, challenges, and risks to the smart city environment. It outlines that the interconnectivity and the complex heterogeneity between physical and cyber infrastructures require special security countermeasures. It discusses the architecture of smart cities and investigates the various attacks at the Network, Perception, and Application layers.

Paper 2: Secure and Efficient Blockchain Scheme for the Internet of Bikes, by Bacem Mbarek and Tomáš Pitner [2]

Blockchain can be used as an access control mechanism to present a decentralized solution to the distributed authentication problem in the Internet of Bikes (IoB). Although several Blockchain access control mechanisms have been proposed to address the security concerns in IoB, most of them are still vulnerable to some active attacks, especially the cloning attacks. Therefore, the paper proposes a new Trust-Based Access Control Blockchain System (TBACS) to address the cloning attack based on using a secure Trusted Digital Ticket (DGT). Simulations with the Hyperledger Fabric show relevant results in terms of communication overhead and the detection probability of cloning attacks.

Paper 3: Business Process Analysis and Simulation: An Industrial Application, by Ilaria Angela Amantea, Emilio Sulis, Antonio Di Leva, Mattia Majolo, Paolo Rege, Luca Patti and Alessandro Prinzis [3]

Analysis and automation of business processes are a relevant topic in Industry 4.0. The paper describes a framework called BP-M* for the analysis, restructuring and implementation of business processes, starting with the creation of a process model and ending with the implementation of the process itself on a workflow management system. The BP-M* framework has been applied to a real case-study, which is the production of fabrics that will be distributed worldwide by an Italian woollen mill. This process was analyzed and automated, providing the company with useful information to simplify processes and support human operators.

Paper 4: Early Warning Signals in Open Source Intelligence: Two Use Cases of the 2019 Iraqi and 2020 Indian Farmers' Protests, by Étienne Voutaz and Albert Blarer [4]

The paper investigates how the waves of ongoing farmers' protests could be anticipated using early warning signals for the time series of daily occurrences of these protests. To this end, it uses metric-based indicators, analyses trends using Kendall rank correlation, and uses bootstrapping methods to implement a statistical test exhibiting a regime shift (tipping points) in the dynamics of

protests. The paper also highlights the importance of the standard deviation as an indicator.

Paper 5: A Framework for Self-Inspection Buildings Based on Augmented Reality Agents, by Fatma Outay, Nafaa Jabeur, Hedi Haddad and Zied Bouyahia [5]

Emergent technologies are being adopted at all the stages of smart building lifecycles, particularly to improve the building performance (e.g. ventilation, air conditioning, heating, lighting, and security) and reduce its related running costs. Augmented Reality (AR) has arisen as a promising tool to achieve these goals. However, in spite of the multiple solutions that have integrated AR within smart buildings, several shortcomings are yet to be solved, including limited user experience, lack of AR content, and limited effective collaborations between construction stakeholders. To address some of these shortcomings, the paper proposes a new framework for intelligent collaborative self-inspection buildings based on the concept of awareness wheel as well as the multi-agent system paradigm.

Paper 6: Multicriteria Decision Making Approach to Support Adoption of Connected and Autonomous Vehicles, by Siham Farrag, Nabil Sahli, Ansar Yasar and Davy Janssens [6]

The paper aims at formulating recommendations to support decision-makers in choosing the most appropriate and sustainable strategy to implement Connected and Autonomous Vehicles (CAV) technology. To do so, it identifies key barriers based on the literature review and discussions with decision-makers. It develops a long-term adoption of CAV technologies in alternative future scenarios. It conducts a multi-criteria decision-making analysis to weigh the barriers and rank different strategies of CAV implementation. It suggests some strategies, such as establishing low-cost and short-term solutions, providing training to transportation professionals, and investing in statewide radio communications/IoT for emergency responses. The transportation system of the Sultanate of Oman is used as a study case.

Paper 7: New Cyber Physical System Architecture for the Management of Driving Behavior Within the Context of Connected Vehicles, by Khalid Ali Sulaiyam Al Abri, Nafaa Jabeur, Ansar Yasar and Youssef El-Hansali [7]

The paper addresses the problem of managing driving behaviours within the context of Connected Vehicles (CVs). In contrast with the existing related solutions, it proposes a Cyber Physical System (CPS) architecture that ultimately enables the continuous acquisition and processing of driving data and then the assessment and classification of driving performance according to a well-defined set of driving states. The transitions between these states are decided based on current and previous driving records.

Paper 8: A Connected Mobility Scheme for Taxi Supply-Demand Balancing in a Smart City Context, by Hedi Haddad, Zied Bouyahia, Leila Horchani, Nafaa Jabeur and Hana Gharrad [8]

The authors present the preliminary results of simulation-based experiments of an integrated scheme that has been proposed to control taxi supply demand imbalance in the context of a smart city with multiple taxi operators and using Connected Mobility. They particularly explore the difference between centralized and decentralized implementations of the scheme as well as the difference between collaborative and competitive attitudes of connected taxis.

Paper 9: Analyzing Terrific Traffic in Urban Areas: A Small Step Towards Bringing Order into City Roads, by Sakhawat Hossain, Mosaddekul Islam and Ashikur Rahman [9]

The purpose of the paper is to analyze bus or car travel time data and demonstrate different insight and aspect of a society from its traffic pattern. Google Distance Matrix API, Python programming language and machine learning algorithms are applied to automatically extract, analyze, and visualize traffic data and showcase analysis methodology to improve people's travel experience in Dhaka City and the City of New York. In particular, the paper applies data analytics to develop an oracle that gives answers to different queries about traffic, such as least congested period and/or least congested route within a day/week/month etc.

Paper 10: Modular Design and Adaptive Control of Urban Signalized Intersections Systems Using Synchronized Timed Petri Nets, by Hajar Lamghari Elidrissi, Ahmed Nait Sidi Moh and Abdelouahed Tajer [10]

Traffic flow at urban intersections varies randomly during the day. It depends on several dynamic factors and requires efficient regulation and flexible control strategies, particularly for traffic light regulation. The paper proposes a strategy that allows for the management of the green light time autonomously. The dynamic behavior of traffic signals at intersections can be seen as a discrete event system. Through the paper, a modular Timed Synchronized Petri Net (TSPN) model is developed and a real-time adaptive control strategy of urban signalized intersections is proposed. The control is shared between two communicant actors. The master-slaves approach is adopted in this control strategy. The master (controller) decides the next phase to be served with green light and its duration. The slaves (TSPN modules) control the traffic signals displays, phases transitions, and model traffic flow fluctuations.

Paper 11: Towards a Network of Dynamic Message Signs for Congestion Alerting, by Nabil Sahli, Wassim Trojet, Zhehan Zhang and Nesrine Ouled Abdallah [11]

Traffic applications such as Google Traffic and Waze have been introduced to let users know about existing congestions on real time. However, this cannot help drivers who are not using these applications or not connected to Internet. Besides, it also suggests that drivers can interact with their smart phones while driving, which is illegal in most countries. The idea of this paper is to use dynamic road signs which can collect real-time data from traffic applications and

alert drivers who are heading towards congestions. A proof-of-concept of the dynamic road sign has been developed.

Paper 12: VR Scenarios to Treat Mental Health, by Leonel Deusdado, Elisabete Freitas, Carlos Coelho and Mateo Morgado [12]

Schizophrenia is characterized by delusions, hallucinations, anhedonia and apathy, and is a chronic mental illness, which still has no cure. It affects the patient in major areas of life, such as work, interpersonal relationships, or self-care. The usual treatment is carried out with the help of antipsychotic medications, which mainly target the positive symptoms of the illness, but have little effect on the negative symptoms of schizophrenia. Virtual reality (VR) is increasingly used as a powerful auxiliary tool in rehabilitation. Within this context, the paper proposes the design of virtual environments and computer simulations, providing the patient with an experience close to the real world, and allowing intensive repetition of essential tasks during the mental health rehabilitation process, with real-time feedback in a controlled and safe environment.

Paper 13: SingTRACeX: Navigation System to Address Wandering Behavior for Elders and Their Caregivers, by Wei Jie Teo, Seanglidet Yean, Bo Zhi Lim, Hong Lye Oh and Bu Sung Lee [13]

The issue of an ever-increasing ageing population has been increasing the burden on caregivers to care for the elderly population. Caring for elders, especially those diagnosed with dementia, can be challenging. People living with dementia (PWD) require extra care and attention from the caregivers due to the associated behaviours that come with dementia. Wandering is a frequent behaviour exhibited by PWD, which can bring about negative outcomes on the PWD as well as increasing the stress of the caregivers. Though many technological solutions exist, they are not widely deployed. This paper introduces a technological framework, bridging the localisation technologies to the needs of elders and caregivers. The aim is to minimize or eliminate the negative outcomes of dementia wandering and to reduce the burden and stress on the caregivers, thus improving overall well-being.

REFERENCES

[1] WASEEM ANWAR, R.—ALI, S.: Smart Cities Security Threat Landscape: A Review. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 405–423, doi: 10.31577/cai_2022_2_405.

[2] MBAREK, B.—PITNER, T.: Secure and Efficient Blockchain Scheme for the Internet of Bikes. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 424–442, doi: 10.31577/cai_2022_2_424.

[3] AMANTEA, I. A.—SULIS, E.—DI LEVA, A.—MAJOLO, M.—REGE, P.—PATTI, L.—PRINZIS, A.: Business Process Analysis and Simulation: An Industrial

Application. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 443–462, doi: 10.31577/cai_2022_2_443.

[4] VOUTAZ, E.—BLARER, A.: Early Warning Signals in Open Source Intelligence: Two Use Cases of the 2019 Iraqi and 2020 Indian Farmers' Protests. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 463–478, doi: 10.31577/cai_2022_2_463.

[5] OUTAY, F.—JABEUR, N.—HADDAD, H.—BOUYAHIA, Z.: A Framework for Self-Inspection Buildings Based on Augmented Reality Agents. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 479–502, doi: 10.31577/cai_2022_2_479.

[6] FARRAG, S.—SAHLI, N.—YASAR, A.—JANSSENS, D.: Multicriteria Decision Making Approach to Support Adoption of Connected and Autonomous Vehicles. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 503–526, doi: 10.31577/cai_2022_2_503.

[7] AL ABRI, K. A. S.—JABEUR, N.—YASAR, A.—EL-HANSALI, Y.: New Cyber Physical System Architecture for the Management of Driving Behavior Within the Context of Connected Vehicles. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 527–549, doi: 10.31577/cai_2022_2_527.

[8] HADDAD, H.—BOUYAHIA, Z.—HORCHANI, L.—JABEUR, N.—GHARRAD, H.: A Connected Mobility Scheme for Taxi Supply-Demand Balancing in a Smart City Context. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 550–570, doi: 10.31577/cai_2022_2_550.

[9] HOSSAIN, S.—ISLAM, M.—RAHMAN, A.: Analyzing Terrific Traffic in Urban Areas: A Small Step Towards Bringing Order into City Roads. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 571–589, doi: 10.31577/cai_2022_2_571.

[10] LAMGHARI ELIDRISSI, H.—NAIT SIDI MOH, A.—TAJER, A.: Modular Design and Adaptive Control of Urban Signalized Intersections Systems Using Synchronized Timed Petri Nets. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 590–608, doi: 10.31577/cai_2022_2_590.

[11] SAHLI, N.—TROJET, W.—ZHANG, Z.—ABDALLAH, N. O.: Towards a Network of Dynamic Message Signs for Congestion Alerting. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 609–626, doi: 10.31577/cai_2022_2_609.

[12] DEUSDADO, L.—FREITAS, E.—COELHO, C.—MORGADO, M.: VR Scenarios to Treat Mental Health. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 627–645, doi: 10.31577/cai_2022_2_627.

[13] TEO, W. J.—YEAN, S.—LIM, B. Z.—OH, H. L.—LEE, B. S.: SingTRACeX: Navigation System to Address Wandering Behavior for Elders and Their Caregivers. Computing and Informatics, Vol. 41, 2022, No. 2, pp. 646–664, doi: 10.31577/cai_2022_2_646.

Nafaa JABEUR is Associate Professor and Director of Research at the German University of Technology in Oman (GUtech). He received his Ph.D. and M.Sc. degrees in computer science from the Laval University, Quebec, Canada in 2006 and 2001, respectively. He received his engineer degree in computer engineering in 1999 in Morocco. He has more than 19 years of experience in the industrial and academic sectors. He worked in several countries, including Tunisia, Morocco, Canada, Belgium, and the Sultanate of Oman. In the industrial sector, he worked as software engineer developer, project manager, business developer, and CEO of an IT company. In the academic sector, he worked in several universities, as Assistant/Associate Professor, Head of Department, and Director of Research. He has participated in several R & D and consultancy projects, edited 2 books, and authored more than 80 research papers in prestigious conferences and high ranked journals. His main research interests include smart cities, transportation, IoT, blockchain, artificial intelligence, drones, network security, and augmented reality.

Ansar YASAR is Professor at the Transportation Research Institute (IMOB), Hasselt University Belgium, one of the top European institutes focusing on the broader themes of road safety and transport management using new modes of mobility. He is Senior Member of IEEE, Chartered Engineer UK, Fellow BCS and EUR ING (European Engineer). At IMOB, he worked on the European FP7 project DATA SIM (2011–2014), European ERA-NET Smart-PT (2014–2017), H2020 Track & Know (2018–2020) and H2020 iSCAPE (2016-2019) projects. He is currently responsible for the H2020 Search & Rescue project (2020–2023) with a consortium of several international partners. He is responsible for the Intelligent Transport Systems (ITS) and Intelligent Topics in Transportation courses for the masters of transportation sciences students and related research around this topic at UHasselt. Furthermore, he is currently Head of the Business Development Unit at the institute focusing on several applications including Safe Routes to Schools & Safe-Trucking system that resulted in creation of successful spin-off companies. His broader research interests include smart cities and communities, connected and intelligent mobility, drones system management, road safety using smart transport solutions and mobility management. As a part of his basic research, he has expertise in modelling pedestrian flow using various IoT-based techniques and simulations tools such as VisWalk. He has supervised several Master and Ph.D. students in the topics of transport and pedestrian modelling using infused ITS techniques. He received his Ph.D. in engineering from Katholieke Universiteit Leuven, Belgium, his M.Sc. degree in computer science and engineering from Linkoping University, Sweden and his B.Sc. degree in software engineering from Foundation University Islamabad, Pakistan. He has authored more than 200 research articles in renowned international journals, conferences and workshops. As one of his accomplishments, he has co-edited a book entitled "Data Science and Simulation in Transportation Research" published by IGI Global in December 2013.

Furthermore, he has been involved in organization of many international peer-reviewed conferences, summer schools and other scientific events. He is also a technical expert to evaluate project proposals submitted to the European R & D – EUREKA and COST frameworks.

Ahmed Nait Sidi Moh is Full Professor at the Jean Monnet University (UJM), Saint Etienne, France. He received the Ph.D. degree in computer science and automatic control from the University of Technology of Belfort (UTBM), Belfort, France, in 2003. He was Assistant Professor at the UTBM from 2004 to 2011. After, he joined as Associate Professor the University of Picardie Jules Verne (UPJV), Amiens, France, where he obtained his Habilitation à diriger des Recherches (HDR) in computer engineering in 2016. He is the author of several articles published in international journals, conferences, and workshops. He is involved in several national and international events such as conferences and workshops organization, technical program committee member of many international journals and conferences; participation to national research groups. His research has been supported by many research and development projects including European grants, regional projects, and EU EACEA Erasmus Mundus projects. He is interested to research topics in the field of healthcare and industrial engineering, with problems of modeling, analysis and control, performance evaluation, resources sharing, optimization, scheduling and interoperability for service composition, information and communication technologies.