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GUEST EDITORIAL
Special Issue on Recent Trends in Advanced Computing, Engineering and Technology: Transformation and Innovation

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Due to continuing advances in computing and communication technology innovation has become one of the most important fields. It drives transformations in human life, engineering, business, entertainment, education, etc.

The special issue addresses these challenging trends. It overviews the latest advances and opportunities in interdisciplinary areas of advanced computing, software engineering, multi-objective resource optimization, etc. It features nineteen papers selected from thirty-nine submitted by authors from eight countries.

The paper "Formal Verification of Blockchain-Based Tender Systems" addresses that tenders are developed using centralized unverified systems, which reduce transparency, fairness, and trust in the process, and the ability to detect malicious attempts to manipulate the process. This paper proposes using a combination of Satisfiability Module Theories (SMT) and Blockchain to deal with this problem. The authors argued that SMT provides a formal analysis to prove the correctness of tender and offers properties ensuring system reliability, while Blockchain claims to provide decentralization and a chain of distributed and decentralized records linked so that integrity is ensured. This combination allows a formal, verified and decentralized system to make electronic procurement tenders more reliable, transparent, and fair.

The paper "Automatic code generation of user-centered serious games: A decade in review" presents a review covering a decade of information from January 2012 to June 2022. It is divided into two parts: one study about serious games with model-driven engineering and another study about user-centered serious games. The main objective is to know the literature that helps to mitigate the costs and time of software development of serious games. The overall conclusion is that there is still work to be done to combine serious user-centered games and automatic generation.

The paper "Building Adaptable Dashboards for Smart Cities: Design and Evaluation" focuses on the idea that dashboards aim to provide users with information to support decision-making. It is essential to adapt the visualization of the information provided to their needs and preferences. To address this necessity, the authors performed a literature review. Based on the identified elements of adaptable dashboards, they propose a dashboard architecture, identify the main characteristics of the users of a smart city dashboard, and build an adaptable dashboard prototype using user-centered techniques. It was tested obtaining acceptable scores for REQ and SUS questionnaires.

The paper "Towards Conversational Agents to support Informal Caregivers of Patients with Dementia: Challenges and Opportunities" addresses the need of creating assistive systems to support people who have dementia experience deteriorating executive functions, in particular the working memory, who find it hard to complete multi step tasks or activities of daily living. The authors present a proposal to design a model with technological strategies extracted from semi-structured interviews. A study with a sample of seven informal caregivers from two different countries has been done. Based on these interviews the authors proposed some design insights for implementing solutions to help informal caregivers to take care of their PwD in their homes using conversational agents.

The paper "Modified Error Detection and Localization in the Residue Number System" presents the design of the modified error detection and localization algorithm in the Residue Number System (RNS). This proposal overcame the weaknesses of classical redundant RNS which with one control module can detect one error but not localize it, having the necessity of two control modules to localize a single error. The proposed algorithm can achieve an error correction with a single control module transmitted over a reliable communication channel.

The paper "Method for Convolutional Neural Network Hardware Implementation Based on a Residue Number System" addresses one weakness of Convolutional Neural Networks (CNN) which have high computational complexity slowing data processing. To increase the speed of CNN, the authors propose a hardware implementation method with calculations in the residue number system with moduli of a special type of 2^{α} and $2^{\alpha}-1$. A hardware simulation of the proposed method on Field-Programmable Gate Array for LeNet-5 CNN is trained with the MNIST, FMNIST, and CIFAR-10 image databases. The results showed that the proposed approach can

increase the clock frequency and performance of the device by 11%-12%, compared with the traditional approach based on the positional number system.

The paper "Optimization of artificial neural networks using wavelet transforms" shows that the existing approaches of wavelet transform implementation in neural networks imply either transformation before neural networks or using WaveNet architecture, which requires new neural network training approaches. To overcome this problem, the authors present an artificial neural network performance optimization using wavelet transform. The proposed approach is based on the representation of the neuron as a no recursive adaptive filter and wavelet filter application to obtain the low-frequency part of the image; it reduces the image size and filtering interference, which is usually high-frequency. It was tested on three MNIST-like datasets providing approximately 50.5% of the speed gain with a slight loss of recognition quality of no more than 4%.

The paper "Influence of Belbin's Role Theory on Database Design: Experimenting with Software Engineering Students" explores the benefits of using Belbin's role theory of team and individual related tasks in the software development process, particularly for Database Design (DB) Design. The experiments showed that in the case of quality of the logical design, the monitor-evaluator role presented significant differences when compared with the other six identified roles.

The paper "Process Improvement in Software Requirements Engineering: A Systematic Mapping Study" presents a study motivated by the necessity of improving the software analysis phase where many defects are injected when the requirements are gathered. The different models that are applied throughout the software requirements engineering process were identified. The most used models are considered such as CMMI, Requirements Engineering Good Practice Guide (REGPG), and ISO/IEC 15504.

The paper "ISO/IEC 29110 and Software Engineering Education: A Systematic Mapping Study" present a literature review. 241 articles were obtained, and 17 of them became primary studies, having the following findings: (1) the software engineering Basic profile of ISO 29110 and its processes (Project Management and Software Implementation) have been the most studied; (2) project-oriented learning and gamification techniques have been the most used ISO 29110 learning strategies in the training of future software industry professionals.

The paper "Usability Evaluation of BCI Software Applications: A systematic review of the literature" addresses the necessity of the use of other techniques to collect data and complete the opinions of users expressed in the traditional technique of questionnaires. This paper presents the results of an exhaustive analysis of the literature about the usability evaluation based on Brain-computer interfaces (BCI) and the use of Electroencephalography (EEG) signals in different domains, to explore the possibility of including the signals EEGs in the usability evaluation process of these kinds of applications.

The paper "Usability Evaluation of a Mobile Learning Platform Focused on Learning Monitoring and Customization based on a Laboratory Study" presents the usability evaluation of the learning monitoring and personalization services of a mobile learning platform based on a laboratory study with teachers and students. The quality attributes evaluated were effectiveness, efficiency, and user satisfaction as proposed by the ISO/IEC 25000 family standards. The authors argued that the usability evaluation described in this work can serve as a reference for developers seeking to improve learning monitoring and personalization services in software applications.

The paper "Software Testing in the DevOps Context: A Systematic Mapping Study" is motivated by the fact that DevOps is a philosophy and framework that allows software development and operations teams to work in a coordinated manner, to develop and release software quickly and cheaply. However, software test automation, which is a cornerstone for the continuous integration phase in DevOps, needs to be identified and classified. The results show that: (1) Researchers maintain a continuing and growing interest in software testing in the DevOps context; (2) most of the research (71.2%) is carried out in the industry and is done on web applications and SOA; (3) the most reported types of tests are unit and integration tests.

The paper "A Microservice Deployment Guide" proposes a guide for deploying systems with a microservices architecture. It considers the practices of the DevOps culture and providing practitioners with a base path to start implementing the necessary platform. The authors conducted this work following the Design Science Research Methodology for Information Systems (DSRM). They presented a Systematic Literature Mapping and a Gray Literature Review, resulting in the proposed guide, which includes practices, patterns, technologies, and tips found in the literature.

The paper "A Usability and Persuasion Evaluation of Mobile Apps for Diabetes Type 2" is focused on the evaluation of diabetes apps available commercially for Android and iOS, considering two attributes as important for the user: persuasion and usability. Six mobile apps for diabetes management and its prevention are evaluated. The evaluation showed that these apps had an acceptable score on the System Usability Scale (SUS). However, they do not perform persuasion strategies as it should be done for medical systems. The authors concluded that mobile applications should include persuasion strategies and integrate usability guidelines to change users' attitudes and behaviors and improve user satisfaction.

The paper "Students' Systems Thinking Competency Level Detection through Software Cost Estimation Concept Modeling" is based on the idea that Systems Thinking Competencies have become extremely important in analyzing the increasing complexity of technical and societal systems. The authors present a study to assess the level of these competencies possessed by students. They use the Adapted Holistic Scoring Method to assess Concept Maps developed by postgraduate and undergraduate engineering students to determine their knowledge of Systems Thinking Competencies. The authors argued that this research contributes to the body of knowledge because it provides empirical evidence on systems thinking competencies among engineering students in cost estimation.

The paper "How COVID-19 Pandemic Affects Software Developers' Wellbeing, and the Necessity to Strengthen Soft Skills" presents a study of how the COVID-19 pandemic has impacted the software industry, where thousands of software developers began working from home. The sample was taken from the west border area of Mexico-USA. A descriptive analysis is presented, which describes the developers' well-being during the pandemic, expressed as emotions and the perceptions of the level at which soft skills are practiced/required in the working from home mode. It represents a new way of developing software.

The paper "Software project estimation using smooth curve methods and variable selection and regularization methods as an alternative to linear regression models when the reference database presents a wedge-shaped form" addresses a problem presented in software estimation. The generation of models needs a reference database, which is usually a wedge-shaped dataset when real projects are considered. Using regression-based estimation techniques provides low accuracy with this type of database. To tackle this problem, the authors present a proposal based on the use of smooth curve methods and variable selection and regularization methods to build estimation models, providing an alternative to linear regression models, having improvements in the estimation results.

The paper "Scrumlity: An Agile Framework Based on Quality of User Stories" presents a proposal to support the quality assessment in Scrum. The authors propose to add a quality role and some artifacts to evaluate quality through a complete execution of a Sprint. The proposal focuses on assessing the quality of user stories, performed by an agent. It was supported by the opinion of practitioners indicating the importance of including this practice in the Scrum framework.

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Fig. 1. Andrei Tchernykh

Fig. 2. Reyes Juárez-Ramírez

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Fig. 3. Teresa Guarda

Fig. 4. Filipe Portela