

Infocommunications Journal welcomes HTE 75

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Our publisher, HTE – the Scientific Association for Infocommunications – reaches its platinum age, turning 75. This ever-evolving, independent, professional organization was officially registered on January 29, 1949, and for 75 years, it has been providing objective representation for the entire infocommunications sector (ICT; telecommunications, information technology, media), facilitating the acceptance and development of technological advancements. The secret to its long-standing success lies in its ability to continuously renew itself: by creating modern scientific and professional platforms, it expands the knowledge base of those interested, and by utilizing the collective expertise of its members, it provides opinions on Hungarian and EU projects, compiles comprehensive technical reports, and offers customized training sessions.

Let's see what the summer issue of ICJ in 2024 has brought.

Simon Dahdal et al. present a novel MLOps framework to address the challenges of data scarcity and imbalance in smart manufacturing, particularly in Industry 5.0. The framework utilizes Generative Adversarial Networks (GANs), specifically a WGAN, to generate synthetic data that rebalances datasets, significantly improving the training and reliability of Machine Learning (ML) models. This approach was successfully applied to a real-life industrial scenario in Bonfiglioli's EVO plant, where it enhanced the accuracy of a binary classifier used for fault detection in gearboxes. Besides demonstrating the effectiveness of synthetic data in improving ML applications this study paves the way for future advancements in sustainable and zero-defect manufacturing within Industry 5.0.

The paper by G. Á. Németh and M. I. Lugosi presents a novel, open-source model-based testing framework specifically designed for finite state machine specifications. The framework's flexibility in model conversion and test generation makes it ideal for testing complex software systems across various domains, such as infocommunications. Notably, the framework includes a new heuristic test generation algorithm for the N-Switch Coverage Criteria, allowing for fine-tuned test criteria and coverage. Through analytical complexity assessments and empirical simulations, the framework's ability to balance test execution resources and fault coverage was demonstrated, offering valuable insights for test engineers to optimize their testing strategies.

M. Z. I. Nazir, M. Alqaradaghi and T. Kozsik introduce a new automated checker, "FindHidingMethod," that detects method-hiding issues in Java programs, a common programming weakness that can lead to unexpected results. Integrated into the SpotBugs static analysis tool, the checker identifies instances where static methods in subclasses inadvertently hide methods in their superclasses. The approach was rigorously tested on both custom test cases and real-world programs, demonstrating high precision in detecting these method-hiding issues. This tool significantly enhances the capabilities of static analysis in identifying programming errors in Java code.

T. Padmavathi, K. K. Cheepurupalli, and R. Madhu present a unique approach to channel estimation and interference cancellation in Filter Bank Multi-Carrier (FBMC) modulation, which is a strong candidate for 5G and beyond communications. Their paper introduces the use of multiple auxiliary symbols per pilot to neutralize imaginary interference, thereby enhancing throughput and

channel capacity. The proposed Iterative Minimum Mean Squared Error (IMMSE) cancellation scheme significantly reduces interference at pilot and data positions. The authors demonstrate that FBMC, when paired with the proposed techniques, outperforms Orthogonal Frequency Division Multiplexing (OFDM) in terms of Bit Error Rate (BER) and system throughput, particularly at low transmission power. This advancement in channel estimation and interference cancellation promises improved performance for future communication systems.

The article by R. Praveen Kumar et al. introduces a novel hybridization of Machine Learning algorithms, specifically combining the Genetic Algorithm (GA) and Lion Algorithm (LA), to optimize Cluster Head (CH) selection in Wireless Sensor Networks (WSNs). The proposed model addresses key challenges in WSNs, such as node failures and unbalanced energy consumption, by implementing a non-uniform clustering strategy and multi-hop communication. The hybridized model enhances routing efficiency while considering energy, cost, time, network lifetime, and data accuracy. The performance of the model was validated through comparative studies, demonstrating significant improvements in throughput and packet loss ratios over existing models like WOA, GWO, LA, and GA. This innovative approach ensures an optimal balance between data transmission accuracy and energy efficiency, making it a robust solution for real-world WSN applications.

In their paper, B. Csóka, P. Fiala and P. Rucz explore the estimation of direction and distance of sound sources using microphone arrays. They specifically employ the MUSIC (Multiple Signal Classification) beamforming algorithm combined with Kalman filtering for tracking moving sources. While MUSIC proved effective and efficient for direction-of-arrival (DOA) estimations, particularly when enhanced with the Kalman filter for smoother tracking, distance estimation posed significant challenges, especially during practical measurements with unmanned aerial vehicles (UAVs). The study highlights the initial success in simulations but also underscores the difficulties encountered in real-world cases.

György Wersényi and Ádám Csapó studied and compared auditory and visual short-term memory using a serious game, in their paper. The participants of their experiments played a "finding pairs" game with either visual icons or auditory objects. Results showed no significant difference between visual and auditory memory overall, but familiar sounds were 2 recalled better than unfamiliar ones. They found that male and younger participants performed better, though further research with a larger sample size is suggested.



Pal Varga is the Head of Department of Telecommunications and Media Informatics at the Budapest University of Technology and Economics. His main research interests include communication systems, Cyber-Physical Systems and Industrial Io T, network traffic analysis, end-to-end QoS and SLA issues – for which he is keen to apply hardware acceleration and AI/ML techniques as well. Besides being a member of HTE, he is a senior member of IEEE (both in Com-Soc and IES). He is Editorial Board member in many journals, Associate Editor in IEEE TNSM, and the Editor-in-Chief of the Infocommunications Journal.