

## Guest Editorial: Special Issue on “6G Enabled Intelligent Edge Computing and Human-Centric IoT”

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The 6G network, aiming for commercialization around 2030, is the next-generation communication technology expected to achieve ultra-high-speed transmission (up to 1 Tbps), ultra-low latency (0.1 ms), and massive device connectivity (100 million devices/km<sup>2</sup>), surpassing current 5G capabilities. This network environment is anticipated to integrate mobile broadband, massive machine-type communications, high-reliability low-latency services, and advanced sensing functions. Additionally, it will connect fog/edge computing with core computing via communication, establishing a new infrastructure. Such convergence is expected to maximize real-time data processing and decision-making efficiency, with broad applications in fields like autonomous vehicles, smart cities, healthcare, telemedicine, and human-centric IoT. Edge computing, in particular, reduces latency and energy consumption by preprocessing collected data at edge nodes instead of transmitting it to a central cloud. Human-centric IoT, designed around user experience and ethical frameworks, enhances applicability, convenience, and efficiency across domains such as smart homes/offices, transportation, healthcare, and precision agriculture. Furthermore, in the 6G ecosystem, holographic video calls and high-definition 360° VR meetings could enable vivid communication akin to sharing the same physical space, even for geographically distant participants. This special issue has three papers.

The first paper is titled “Flexible and Enhanced Cyber Threat Intelligence: Research on Advanced Analysis Methods.” The paper developed a novel framework for inferring the intent behind cyberattacks during their early and middle stages by analyzing key elements such as the attack group, target, and harm caused. The objective is to improve existing classification methods by addressing their limitations and supporting more proactive cyber defense strategies. This research demonstrates that combining multiple core elements, specifically the attack group, target, and damage, like pieces of a puzzle, enables a more accurate inference of attack intent, even when only limited initial information is available. Moreover, it highlights the complementary nature of these elements and shows that iterative analysis gradually increases the reliability of conclusions over time. Traditional approaches, which rely heavily on technical indicators such as Indicators of Compromise (IoCs), face increasing challenges due to attackers’ growing use of deception and automation. Therefore, there is a clear need for a more comprehensive and strategic method that integrates multiple data sources

and contextual factors to effectively identify attacker intent and enable proactive defense. To address this issue, the study proposes a structured attack-intent analysis model that combines technical, behavioral, and contextual elements. This model effectively bridges the gap between tactical detection and strategic understanding, while placing particular emphasis on the early inference of intent, a topic that has been underexplored in previous research. We believe that our study makes a significant contribution to the literature by introducing a comprehensive and iterative model for attack intent analysis.

The second paper is titled “A Study on Image Resolution and Object Scale Adjustment for Efficient Object Detection in Mobile Network Environments”. In the field of object detection, the application of YOLO has been widely utilized for efficient object search using intelligent systems, such as images. It is also anticipated to become more prominent in 6G mobile networks following the 5G era. As an example, network cameras (CCTV) illustrate this trend. Many deep learning AI models show degraded object detection performance compared to reported benchmark results, with one well-known reason being the discrepancy in characteristics between publicly available training datasets and images collected in CCTV environments. This degradation often stems from the inherent bandwidth limitations of 5G wireless networks, which restrict data transmission. To mitigate the network load of object detection models deployed in CCTV systems, various approaches - including the integration of edge computing - are currently under investigation. The paper investigates how systematically and linearly adjusting the image resolution and object scale of video/image data transmitted over the network affects detection performance. By analyzing these factors, the study aims to identify practical strategies for achieving efficient real-time object detection under constrained network conditions.

The last paper is titled “The Strategic Orientation of Internet of Things Utilization and Firm Performance: An Empirical Investigation of Korean Firms”. This paper investigates the differential impact of inward-oriented versus outward-oriented IoT technology adoption on firm performance. While many studies in the 6G network environment focus on technical aspects of human-centric IoT - such as system development or efficiency validation - papers demonstrating actual efficiency or public perception are equally critical. Using panel data from 571 South Korean firms between 2017 and 2022, this study conducts empirical analysis to explore the relationship between IoT

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utilization orientation (inward vs. outward) and business outcomes under 5G networks. The findings reveal that firms adopting IoT technologies in mobile network environments for outward-oriented purposes - such as sales strategies and marketing - experience significantly more positive performance impacts compared to those primarily focused on internal operational efficiency, including product development, production processes, and organizational management. Robustness tests using Return on Assets (ROA) indicate that while the effect is positive, it is not statistically significant, suggesting that the value creation mechanisms of outward-oriented IoT operate predominantly through capital efficiency rather than asset-based returns. These results underscore that the strategic value of IoT is most effectively realized when leveraged as a tool for competitive advantage beyond mere internal optimization. The insights provide valuable guidance for strategic technology deployment decisions and highlight the importance of market-facing IoT applications in driving superior firm performance.

## Acknowledgements

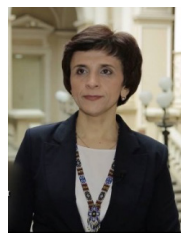
This special issue features outstanding papers made possible through the rigorous review and evaluation provided by all our dedicated reviewers. Especially, as the Guest Editors of this special issue, we extend our heartfelt gratitude to Dr. Han-Chieh Chao, the Editor-in-Chief of JIT journal, for his unwavering support and encouragement in facilitating the publication of this special issue. Additionally, we sincerely thank Ms. Sharon Chang, the Assistant Editor, for her consistently kind and professional guidance and assistance throughout this process.

## Guest Editors



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**Olha S. Hrynkevych** has been the Head of the Statistics Department of the Economics Faculty at the Ivan Franko National University of Lviv, Ukraine since 2024. Dr. Olha S. Hrynkevych received a Master's degree with honors in Economic Cybernetics (1998), at the Ivan Franko National University of Lviv. She obtained Ph.D. and Doctor of Science degrees in «Management and Regulation of the National Economy» (2018). The idea from her doctoral thesis on «Management of the Competitiveness of Higher Education in Ukraine (Methodology of Analysis and Monitoring Systems)» was implemented in a regional development project aimed at improving the quality of higher and professional education based on monitoring the employment of graduates in Ukraine and the creation of a specialized digital platform. She is a member of working groups researching human capital development commissioned by the ILO and on regional development projects implemented in Ukraine with the support of the European Union. Since 2021. Professor Olha Hrynkevych has been leading the working group for the implementation of the project ««Development of the Bioeconomy in the Western Region: Production of Eco-Packaging Made of Biodegradable Polymers»» at Lviv University. She has been a key expert in the USAID HOVERLA project «Comprehensive Research of Needs in Community-Level Data and Municipal Statistics for Development of Ukraine Municipal Statistics Concept and Respective Draft Law» from 2023 to now on. Dr. Olha S. Hrynkevych has been the Editor-in-Chief of the Bulletin of Lviv University. Economic Series From 2020 to now. Since 2020 – Member of the Editorial Board of the scientific journal «Economic Theory and Law» of the Yaroslav Mudryi National Law University, Kharkiv, Ukraine. She is the co-founder of the Ukrainian NGO «Center for Research and Monitoring of Human Resource Quality and Mobility», a member of the Ukrainian NGO «Innovative University» and a member of the International Society for Business Education. Her research area includes the statistical and information-analytical support for decision-making in the social economy, human capital development, the labor market, higher and vocational education, as well as interdisciplinary research that promotes the implementation of sustainable development goals.

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