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Future and evolving technologies

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Future and evolving technologies

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The ITU Journal on Future and Evolving Technologies (ITU J-FET) is an international journal providing complete coverage of all communications and networking paradigms, free of charge for both readers and authors.

The ITU Journal considers yet-to-be-published papers addressing fundamental and applied research. It shares new techniques and concepts, analyses and tutorials, as well as learning from experiments and physical and simulated testbeds. It also discusses the implications of the latest research results for policy and regulation, legal frameworks, the economy and society. This publication builds bridges between disciplines, connects theory with application, and stimulates international dialogue. Its interdisciplinary approach reflects ITU's comprehensive field of interest and explores the convergence of ICT with other disciplines.

The ITU Journal welcomes submissions at any time, and on any topic within its scope.

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Foreword

Seizo Onoe

Director
ITU Telecommunication Standardization Bureau

The ITU Journal on Future and Evolving Technologies is unique in publishing papers from renowned experts in academia and industry at no charge to authors or readers.

It embodies ITU's commitment to the public interest.

We seek global representation in our published papers and teams of reviewers and editors, and we welcome an interdisciplinary approach to the broad scope of topics addressed by ITU.

This inclusive character of our journal has received a warm welcome from both academia and industry. Our journal's webinar series is achieving similar success.

Academia and industry are key partners in research and development as well as bringing the latest innovations to market. Industry and academia are stimulating one another's work.

This synergy is highly evident in the strength of academia's participation in ITU work and industry's support to the ITU Journal.

Contributions to our work from academia bring greater strength to the work of ITU and greater impact to research, to the mutual benefit of academia and industry.

Our international standards, for example, support the global adoption of solutions developed in collaboration by academia and industry and thereby boost return on investment for both.

I extend my gratitude to everyone supporting our journal and I would especially like to thank our Editor-in-Chief, Ian F. Akyildiz, for his outstanding leadership.

I am also glad to have this opportunity to thank Professor Akyildiz for co-authoring two papers in this issue of our journal on research challenges in immersive media of key importance to our ambitions for the metaverse and 6G.

Our journal succeeds in offering comprehensive coverage of the latest developments in communications and networking thanks to its flourishing supporting community.

I welcome you to join us.

Seizo Onoe
Director
ITU Telecommunication Standardization Bureau

Foreword

Bilel Jamoussi

Deputy to the Director
ITU Telecommunication Standardization Bureau

Our journal shares research on innovations of key strategic importance to the future of digital technology and associated work underway at ITU to bring these innovations to global scale.

Prospects for the metaverse are in focus in this issue of the journal alongside vehicle-to-everything communications, edge computing, low-earth orbit satellite networking, and digital inclusion. The insights shared will undoubtedly be of great value to all innovators, especially experts contributing to ITU's work on radiocommunication, standardization, and development.

I thank our Editor-in-Chief, Ian F. Akyildiz, both for his expert leadership and co-authoring two papers in this issue; our leading Guest Editors for this issue, Wei Wang, Hongzhi Guo, and Pradipta Biswas; and everyone bringing life to our journal as authors, reviewers, editors, and readers. Our journal is growing stronger by the day thanks to your support.

"A comparison of virtual worlds based on the metaverse maturity model" analyses the attributes of six virtual worlds, finding that the technical preconditions for the metaverse are not yet satisfied but also that certain attributes of virtual worlds can display high levels of maturity if supported by well-crafted strategies.

"Mulsemedia communication research challenges for metaverse in 6G wireless systems" explores the state of the art in multisensory media (mulsemedia) aimed at engaging all five human senses, relevant technologies for extended reality and holographic-type communication, and key research directions for mulsemedia and their relationship with envisioned 6G capabilities.

"Multi-codec rate adaptive point cloud streaming for holographic-type communication" proposes a streaming method for point cloud videos – videos crucial to immersive applications and associated ambitions for the metaverse and 6G – which selects a video codec along with appropriate compression parameters to minimize latency for streaming and maximize the quality of user experience.

"Networking for the metaverse: The standardization landscape" presents a basic taxonomy of the metaverse developed by ITU's metaverse focus group as a framework to highlight some the networking requirements created by envisioned metaverse applications, how networks will need to evolve to meet these requirements, and the progress of associated standardization efforts.

"Emergency message broadcasting scheme based on V2V and V2I" proposes an emergency message broadcasting scheme and details its demonstrated advantages in view of key challenges facing the design and implementation of a multi-hop broadcast protocol.

"The lane detection algorithm based on multiscale aggregated attention fusion network" targets highly accurate lane detection for autonomous driving systems, a task made challenging by the complexity of real-world road environments.

"TransFiner: A full-scale refinement approach for multiple object tracking" looks at solutions to identify and accurately classify various objects, proposing a transformer-based approach to improve object-tracking performance and highlighting promising results achieved by experiments with the approach.

"Edge computing for critical environments: Vision and existing solutions" shares findings from a study of how edge computing helps to meet communication needs in critical environments – focusing on underground and open-pit mines – and identifies key related topics for future research.

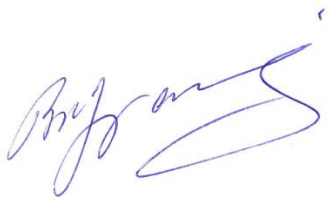
"LEO satellite networking relaunched: Survey and current research challenges" looks at the latest developments in research and standardization work focused on low-earth orbit satellite networking as well as related challenges and research directions with potential to help overcome these challenges.

"Accessibility evaluation of major assistive mobile applications available for the visually impaired" evaluates four assistive mobile applications leveraging AI and computer vision to gauge their success in improving users' lives and identify scope for improvement and innovation.

"*SignIt!* An Android game for sign bilingual play that collects labelled sign language data" considers the advantages of digital games to learn spoken and sign languages and presents a game enabling users to take quizzes on sign language individually or with others, as well as create their own quizzes.

"Accessibility difference in education-related websites from developing and developed countries" evaluates the accessibility of thirteen educational websites in view of the importance of such websites meeting the needs of people with varying abilities.

"Vibe - With people with hearing impairment" presents a sound indication device that alerts users to specific sounds and the value gained from machine learning performing tasks locally on the device rather than relying on cloud-based services.



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