

# Advances in Speech Recognition, Musical Anamnesis, Inter-ISP communication, MEC offloading and Software-Defined Radio

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Infocommunications is a vast domain, and our journal tries to capture the latest advances. 2024 was a turbulent year in many ways – full of technological advances and societal challenges. Regarding the Infocommunications Journal, 2024 was a very special year, as we handled a record number of 265 papers that has been submitted. This is the last issue, with quite diverse topics – from speech recognition and transfer learning, through enhancing QoS of IoT devices by MEC offloading, Software-Defined Radios and inter-ISP communications. Let us briefly capture the topics in the December 2024 issue of the Infocommunications Journal.

Yan Meng and Peter Mihajlik investigate the use of adapter modules in pre-trained speech recognition models for cross-language transfer learning in low-resource automatic speech recognition tasks. Their study evaluates the impact of adapters on recognition accuracy, GPU memory consumption, and training duration across different models, including multi-lingual and target-language-trained foundational models. The results demonstrate that adapters enhance generalization while reducing overfitting, with significant gains in word error rate for models pre-trained in the target language. Moreover, adapters substantially reduce GPU memory usage during fine-tuning, highlighting their efficiency in optimizing resource-constrained training scenarios.

The paper by Marouane Myyara and his co-authors presents heuristic-based computation offloading algorithms to enhance Quality of Service (QoS) for IoT devices in Multi-access Edge Computing (MEC) environments. The proposed approach optimally offloads computational tasks from resource-constrained IoT devices to nearby edge locations, reducing latency and improving task execution performance. Evaluated using the EdgeCloudSim simulator, the algorithms demonstrated noticeable reductions in service times and task failure rates compared to existing solutions. This work addresses key challenges in QoS management for MEC networks and contributes to advancing computation offloading strategies for resource-intensive IoT applications.

In their paper, Hari Krishnan S. and Syed Sadiqvali introduce a novel Finite Impulse Response (FIR) filter architecture based on Distributed Arithmetic (DA) and Look-Up Tables (LUTs) to enhance efficiency in Software-Defined Radio (SDR) systems. By addressing the limitations of traditional multiplier-based FIR filters, the proposed design reduces hardware complexity, power consumption, latency, and memory usage while improving throughput and bit error rate. The inclusion of a dynamic decimation factor and a highly adaptable Parallel Prefix Adder

further optimizes the filter's performance, enabling flexible frequency response adjustments and faster partial product accumulation. Experimental results on an Artix-7 FPGA demonstrate significant improvements, including an operating speed of 260 MHz, power dissipation of 1 mW, delay of 190 ps, and throughput of 938.12 Mbps, making the DA-LUT-FIR filter a robust solution for real-time digital signal processing in future SDR applications.

Hamid Garmani et al. investigated interactions among ISPs and advertisers in an Information-Centric Networking (ICN) framework, focusing on collaborative caching of free content to enhance network performance and reduce distribution costs. Using game-theoretic models, they formulate ISP interactions as a non-cooperative game in their paper, proving the existence and uniqueness of a Nash equilibrium under certain conditions. They propose an iterative algorithm to guide ISPs toward equilibrium, balancing content caching strategies, pricing, and quality of service. Numerical simulations demonstrate that the approach benefits both ISPs and end-users, offering a scalable, economically incentivized solution for efficient content distribution in ICN environments.

In their paper, Fabian Simmank and his co-authors introduce Automated Musical Anamnesis (AMA), a scalable solution to streamline the manual and expertise-intensive process of gathering musical history for music-based interventions in dementia patients. By addressing cognitive and emotional challenges associated with dementia, AMA aims to enhance therapy relevance and reduce overstimulation, providing personalized and effective care. The study highlights the interdisciplinary nature of developing AMA, integrating methods from music therapy, technology, and cultural heritage to curate structured and meaningful digital repositories. This approach aims to expand access to music-based interventions, offering a cost-effective, sustainable, and inclusive therapeutic model to address the global rise in dementia cases.



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