Editorial

In this edition of our journal, we feature three groundbreaking research papers that highlight advancements in network management, nonlinear circuit design, and hyperspectral image classification. Each study offers innovative methodologies and insights that address complex problems in their respective fields, contributing significantly to technological development and practical applications.

The first paper focuses on the development and evolution of a specialized tool designed to verify the health status and availability of residual bandwidth across the Lepida ScpA broadband network. This tool addresses a critical issue: ensuring that the physical bandwidth allocated corresponds to the active contractual obligations of local network operators. Previously, this verification process was manual and time-consuming. The introduction of this in-house developed tool has significantly reduced the time required for verification and provided a comprehensive overview of network status. By leveraging graph representation and well-known graph algorithms, the tool enhances the efficiency and accuracy of bandwidth verification, streamlining the process for local customers and operators [1].

The second paper introduces an advanced load-line analysis software for the design and simulation of nonlinear microwave circuits, specifically focusing on low-distortion, high-efficiency, and high-power GaN HEMT amplifiers. This software integrates DC, small-signal, and large-signal performances of GaN HEMT devices into a single package, allowing for detailed analysis of nonlinear behaviors such as AM-AM and AM-PM modulations, intermodulation distortion (IMD), and error vector measurement (EVM). Utilizing behavioral modeling and time-domain analysis, the software provides deep insights into the nonlinear characteristics of GaN HEMT devices and the design techniques for achieving low-distortion and high-efficiency amplifiers. Compared to the harmonic-balance method, this software has demonstrated comparable performance for an L-band 10W GaN HEMT amplifier, making it a valuable tool for nonlinear circuit designers [2].

The third paper explores the effectiveness of 3D Convolutional Neural Networks (CNNs) in classifying hyperspectral images (HSIs). Traditional 3D CNNs often generate an excessive number of parameters, which can hinder the extraction of spectral-spatial properties of HSIs. To address this, the study introduces a channel service module and a spatial service module to optimize feature maps and enhance classification performance. The research evaluates various CNN methodologies for HSI categorization, examining the replacement of conventional 3D CNNs with mixed feature maps to reduce spatial redundancy and expand the receptive field. The study elaborates on the efficacy of these approaches and identifies gaps in current methods, offering insights into how these gaps can be addressed to improve image classification accuracy [3].

The three papers featured in this edition exemplify the innovative and impactful research that our journal aims to publish. From optimizing network bandwidth verification to advancing nonlinear circuit design and improving hyperspectral image classification, these studies provide valuable contributions to their fields. We are honored to share these insights with our readers and anticipate that they will inspire further advancements and research.

References:

[1] G.P. Jesi, A. Odorizzi, G. Mazzin, “Graph-based Tool for Bandwidth Estimation, Health Monitoring and Update Planning in Broadband Networks,” Journal of Engineering Research and Sciences, vol. 2, no. 4, pp. 1–13, 2023, doi:10.55708/js0204001.

[2] Y. Itoh, T. Kaho, K. Matsunaga, “An Advanced Load-Line Analysis Software for use in the Design and Simulation of Microwave Low-Distortion, High-Efficiency and High-Power GaN HEMT Amplifiers,” Journal of Engineering Research and Sciences, vol. 2, no. 4, pp. 14–21, 2023, doi:10.55708/js0204002.

[3] M.A. Aslam, M.T. Ali, S. Nawaz, S. Shahzadi, M.A. Fazal, “Classification of Rethinking Hyperspectral Images using 2D and 3D CNN with Channel and Spatial Attention: A Review,” Journal of Engineering Research and Sciences, vol. 2, no. 4, pp. 22–32, 2023, doi:10.55708/js0204003.

Editor-in-chief

Prof. Paul Andrew