Journal Name: IEEE Internet of Things Journal **IF:** 8.9

Title: EMI Characteristics Informed JSPA-BR Approach for Sensing, Networking, and Computing Integrated Aerial IoT Applications

Author: Xiao H.; Li Y.; Chakraborty C.; Meng Y.; Alblehai F.; Jian X.

Details: Volume 12, Issue 15 August 2025

Abstract: The next generation of industrial Internet of Things (IoT) dominated by uncrewed aerial vehicle (UAV) relies on the coordinated operation of heterogeneous UAV-mounted transceiver cluster (HUTC) in constrained environments. However, the electromagnetic resources available to these transceivers deployed in crowded spaces are limited, and the resulting spectrum conflicts can easily lead to difficulties in aerial sensing, computing, and networking. Beyond interference from external sources, spectrum allocation in dense spaces is further complicated by interference from frequency-domain neighbors, making efficient resource allocation challenging. Thus, this article utilize the electromagnetic interference (EMI) characteristics of heterogeneous transceivers as prior knowledge and proposes an innovative joint spectrum and power allocation based on better response (JSPA-BR) method to tackle the EMI problem in HUTC composed of heterogeneous transceivers. More specifically, we construct a game-theoretic model for joint spectrum and power allocation, and it is proved that the model constitutes an exact potential game (EPG) with at least one Nash equilibrium (NE) point. We then design the JSPA-BR algorithm which can converge quickly and approach the global optimal solution. Simulations and measurements show that this method maximizes the use of limited spectrum resources. It also mitigates EMI between transceivers and the external radiation of the system. It achieves electromagnetic compatibility of HUTC, thereby demonstrating the effectiveness and accuracy of the proposed approach.

URL: https://ieeexplore.ieee.org/document/11015542

SCHOLARLY PUBLICATIONS
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Journal Name: IEEE Transactions on Intelligent Transportation Systems **IF: 8.4**

Title: SG-GAN for Electric Vehicle Road Networks and Q-Learning in Energy Efficient Routing

Author: Das S.K.; Maity S.P.; Chakraborty C.

Details: July 2025

Abstract: This paper suggests a novel routing scheme for multiple electric vehicles (EVs) on a mesh-type road network, which is generated using a Spatial Graph-Generative Adversarial Network (SG-GAN). The scheme focuses on optimizing both the routing of EVs and their association with the respective charging stations (CSs) to reduce energy consumption. The challenge lies in effectively managing factors such as travel cost, the state of charge (SoC) of the battery, and congestion in the road network. To address this problem, we propose a Reinforcement Learning (RL) based approach that minimizes energy consumption and the overall travel time for EVs to reach their destinations. A Q-learning algorithm for RL is employed to solve the nonlinear constrained optimization problems. Through simulation experiments on a road network evolved through SG-GAN, which generates realistic and complex network topologies, we address the allocation of CSs and EVs optimal routing. The results demonstrate the effectiveness of our approach compared to the existing methods, achieving a 2.68% reduction in energy consumption along with a similarity measure, on an average Kullback–Leibler (KL) distance (divergence) 0.54 in the SG-GAN generated road network from the reference real one.

URL: https://ieeexplore.ieee.org/document/11080099

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Journal Name: Biomedical Signal Processing and Control **IF: 4.9**

Title: Preprocessing and frame level classification framework for cardiac phase detection in 2D echocardiography

Author: Singh G.; Darji A.D.; Sarvaiya J.N.; Patnaik S.

Details: Volume 107, September 2025

Abstract: Accurate detection of end-diastole (ED) and end-systole (ES) frames is a crucial step in cardiac function analysis, enabling precise measurement of ventricular volume, ejection fraction (EF), and stroke volume (SV). However, this task is challenging due to variations in cardiac structure, heart rate fluctuations associated with clinical conditions, and the low-resolution nature of echocardiographic sequences. This study addresses these challenges by introducing three preprocessing steps — noise reduction via heart rate formulation, video frame synchronization, and non-oscillating mean absolute frame difference — to denoise and enhance the EchoNet-Dynamic dataset. Additionally, the echo phase detection problem is reformulated as a frame-level binary classification task to mitigate class imbalance between diastole and systole phases. The proposed architecture employs a time-distributed convolutional neural network (CNN) to extract spatial features, followed by a bidirectional long short-term memory (BiLSTM) network to capture temporal dynamics, and a classification layer for phase prediction. The model achieves an average absolute frame distance of 1.02 and 1.04 frames for ED and ES frames, respectively, on the preprocessed EchoNet-Dynamic dataset. To ensure better generalization, the model was also validated on the CAMUS dataset and private data, where it demonstrated consistent performance and robust results. These findings significantly enhance the reliability of cardiac metrics, offering clinicians a precise and efficient tool for echocardiographic analysis.

URL: https://www.sciencedirect.com/science/article/pii/S1746809425003143?via%3Dihub

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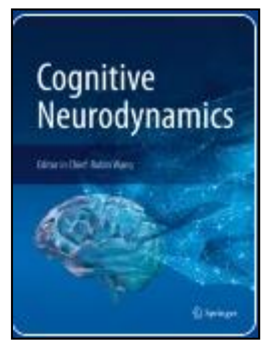
Journal Name: Cognitive Neurodynamics **IF: 3.9**

Title: Convolutional autoencoder-based deep learning for intracerebral hemorrhage classification using brain CT images

Author: Nageswara Rao B.; Acharya U.R.; Tan R.-S.; Dash P.; Mohapatra M.; Sabut S.

Details: Volume 19, Issue 1, December 2025, Article number 77

Abstract: Intracerebral haemorrhage (ICH) is a common form of stroke that affects millions of people worldwide. The incidence is associated with a high rate of mortality and morbidity. Accurate diagnosis using brain non-contrast computed tomography (NCCT) is crucial for decision-making on potentially life-saving surgery. Limited access to expert readers and inter-observer variability imposes barriers to timeous and accurate ICH diagnosis. We proposed a hybrid deep learning model for automated ICH diagnosis using NCCT images, which comprises a convolutional autoencoder (CAE) to extract features with reduced data dimensionality and a dense neural network (DNN) for classification. In order to ensure that the model generalizes to new data, we trained it using tenfold cross-validation and holdout methods. Principal component analysis (PCA) based dimensionality reduction and classification is systematically implemented for comparison. The study dataset comprises 1645 ("ICH" class) and 1648 ("Normal" class belongs to patients with non-hemorrhagic stroke) labelled images obtained from 108 patients, who had undergone CT examination on a 64-slice computed tomography scanner at Kalinga Institute of Medical Sciences between 2020 and 2023. Our developed CAE-DNN hybrid model attained 99.84% accuracy, 99.69% sensitivity, 100% specificity, 100% precision, and 99.84% F1-score, which outperformed the comparator PCA-DNN model as well as the published results in the literature. In addition, using saliency maps, our CAE-DNN model can highlight areas on the images that are closely correlated with regions of ICH, which have been manually contoured by expert readers. The CAE-DNN model demonstrates the proof-of-concept for accurate ICH detection and localization, which can potentially be implemented to prioritize the treatment using NCCT images in clinical settings.



URL: https://link.springer.com/article/10.1007/s11571-025-10259-5

SCHOLARLY PUBLICATIONS
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Journal Name: Scientific Reports **IF: 3.8**

Title: Optimized placement of distributed generators, capacitors, and EV charging stations in reconfigured radial distribution networks using enhanced artificial hummingbird algorithm

Author: Sahay S.; Biswal S.R.; Shankar G.; Jha A.V.; Appasani B.; Srinivasulu A.; Nsengiyumva P.

Details: Volume 15, Issue 1, December, 2025

Abstract: This study presents an assessment of concurrently identifying the best location and size of distributed generators (DGs), shunt capacitors (SCs), and electric vehicle charging stations (EVCSs) in optimally reconfigured radial distribution networks (RDNs). A comprehensive literature review indicates that this multi-unit combination has the potential to enhance RDN performance significantly, but it remains an underexplored area of research. Therefore, further in-depth investigation is necessary to understand and fully maximize the benefits of this method. The optimal placement and sizing (OPS) of the mentioned multi-unit in RDNs is realized by employing a metaheuristic optimization technique subject to the fulfillment of a well-defined fuzzified-objective function comprising of line losses reduction, power factor improvement, voltage deviation reduction, and DG penetration limit. Employing the concept of centroid-based oppositional learning (COL), an improved version of the artificial hummingbird algorithm (AHA), named COLAHA, is proposed to decipher the adopted issue. The results achieved utilizing the offered approach are matched with those of the additional innovative algorithms such as the basic AHA, arithmetic optimization algorithm, genetic algorithm, and whale optimization algorithm. By evaluating it against several benchmark functions, the effectiveness of the proposed COLAHA is established. The performance of the aforementioned studied algorithms is further tested to find the OPS of DGs, SCs and EVCSs in the standard IEEE 69- and 118-bus RDNs. Results obtained conclude that the COLAHA has offered quick convergence and the best results over the others for all the studied combinations of the multi-unit model.

URL: https://www.nature.com/articles/s41598-025-89089-8

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Journal Name: Scientific Reports **IF: 3.8**

Title: Neural network backstepping control of OWC wave energy system

Author: Nath P.; Mishra S.K.; Jha A.V.; Appasani B.; Pati A.K.; Verma V.K.; Nsengiyumva P.; Srinivasulu A.

Details: Volume 15, Issue 1, December 2025

Abstract: This paper investigates the application of Neural Network Backstepping Control (NN-BSC) for enhancing the rotational speed control of Oscillating Water Column (OWC) wave energy systems. Traditional control methods face limitations when dealing with nonlinearities, irregular wave conditions, and actuator disturbances. To address these challenges, this research paper introduces a Chebyshev NN within the BSC framework, leveraging its high approximation accuracy and computational efficiency. The design of the NN-BSC involves estimating the disturbance term using the Chebyshev NN and validating the stability OWC control system through Lyapunov analysis. The proposed NN-BSC law effectively handles nonlinearities and improves system robustness under dynamic conditions. Numerical simulations have been conducted using MATLAB/SIMULINK to compare the performance of the uncontrolled OWC system, conventional PI and BSC, and NN-BSC, under scenarios with and without actuator disturbances. The parameters for PI, BSC, and NN-BSC are optimized using a Particle Swarm Optimization (PSO) algorithm, which minimizes a fitness function defined by the Integral Squared Error (ISE). Results indicate that NN-BSC achieves smoother rotor speed tracking, particularly under actuator disturbances, where the conventional PI and BSC exhibits significant performance degradation in terms of ISE. Under actuator disturbance scenarios: (1) NN-BSC achieved the lowest ISE value of 22.5433, outperforming PI (40.6381) and BSC (37.1192), and (2) NN-BSC demonstrated the lowest maximum peak overshoot (0.9651 rad/s) and fastest settling time (0.0561 s).

URL: https://www.nature.com/articles/s41598-025-87725-x

Journal Name: IEEE Access **IF: 3.4**

Title: Sb-PiPLU: A Novel Parametric Activation Function for Deep Learning

Author: Mondal A.; Shrivastava V.K.; Chatterjee A.; Ramachandra R.

Details: Volume: 13, Article, 2025

Abstract: The choice of activation function—particularly non-linear ones—plays a vital role in enhancing the classification performance of deep neural networks. In recent years, a variety of non-linear activation functions have been proposed. However, many of these suffer from drawbacks that limit the effectiveness of deep learning models. Common issues include the dying neuron problem, bias shift, gradient explosion, and vanishing gradients. To address these challenges, we introduce a new activation function: Softsign-based Piecewise Parametric Linear Unit (Sb-PiPLU). This function offers improved non-linear approximation capabilities for neural networks. Its piecewise, parametric design allows for greater adaptability and flexibility, which in turn enhances overall model performance. We evaluated Sb-PiPLU through a series of image classification experiments across various Convolutional Neural Network (CNN) architectures. Additionally, we assessed its memory usage and computational cost, demonstrating that Sb-PiPLU is both stable and efficient in practical applications. Our experimental results show that Sb-PiPLU consistently outperforms conventional activation functions in both classification accuracy and computational efficiency. It achieved higher accuracy on multiple benchmark datasets, including CIFAR-10, CINIC-10, MWD, Brain Tumor, and SVHN, surpassing widely-used functions such as ReLU and Tanh. Due to its flexibility and robustness, Sb-PiPLU is particularly well-suited for complex image classification tasks.

URL: https://ieeexplore.ieee.org/document/10966899

Journal Name: International Journal of Robust and Nonlinear Control **IF: 3.2**

Title: Fractional Standalone Backstepping Control for Nonlinear Continuous Stirred Tank Reactor

Author: Ramana M.; Santra S.B.; Chatterjee D.; Siwakoti Y.P.

Details: July 2025

Abstract: Controlling the molar concentration in a chemical reactor is a challenging task in the presence of noise and disturbance. Contrary to the reported works based on augmented method, this work proposes a novel fractional order standalone backstepping rule as a feasible alternative to stabilize the concentration of a nonlinear continuous stirred tank reactor process. The novel indirect biquadratic equiripple approximation technique is suggested to realize the behavior of fractional order element in the proposed rule with a suitable integer order process. The proposed approximation method is further modified by an additional exact phase approach to enhance the behavior of fractional order element. A comprehensive simulation study on both frequency and time domain platforms is carried out to establish the suitable fractional order in the proposed law. Closed-loop performance and control efforts obtained through simulation studies vindicate that the proposed technique outperforms existing control strategies without unnecessary overshoots and yields relatively smooth control action in the presence of noise and disturbance. By abruptly altering the system settings, the robust stability investigation of the proposed rule is also carried out in the presence of load disturbance and noise. This proposed technique offers greater accuracy by resulting in less integral errors and total variation of input control action in both nominal and perturbed circumstances.

URL: https://onlinelibrary.wiley.com/doi/10.1002/rnc.70058

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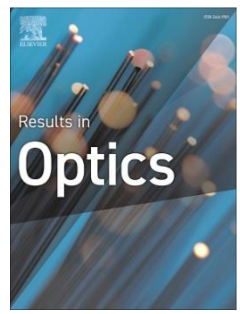
Journal Name: Results in Optics **IF: 3.0**

Title: Absorption bandwidth enhancement technique using stacked unequal cross-shaped graphene absorber

Author: Mohsen Daraei O.; Rezaei P.; Khatami S.A.; Zamzam P.; Mohapatra S.; Appasani B.; Khani S.

Details: Vol. 21, December 2025

Abstract: Terahertz metamaterial absorbers (TMAs) are gaining considerable attention due to their unique characteristics. Graphene-based absorbers are a subclass of TMAs that exhibit tunable absorption characteristics for myriad applications. This paper proposes a TMA consisting of two layers of graphene in a cross-shaped structure where the absorption can be modified by altering the chemical potential of the graphene layers. A quarter-wave impedance transformer has been utilized to attain optimal absorption in the vicinity of the central frequency of this absorber. Also, the transmission line theory has been considered to verify the absorption level achieved around the central frequency. The conductivity of the graphene layer is changed by altering the levels of chemical potential; the Fermi levels for the upper and lower layers of the graphene cross-shaped THz absorber have been considered 1 eV and 0.3 eV, respectively, to achieve maximum absorption. Therefore, the bandwidth of this absorber reached 1.74 THz, around 7 THz as the central frequency. The proposed asymmetric stacked graphene structure provides broadband, polarization-insensitive, and electrically tunable absorption around 7 THz, making it highly suitable for applications such as THz imaging, sensing, and electromagnetic signature reduction technologies. Compared to prior designs, it offers improved bandwidth, tunability, and angular stability, making it a compact and practical solution for next-generation terahertz systems.



URL: https://www.sciencedirect.com/science/article/pii/S2666950125001002?via%3Dihub