SCHOLARLY PUBLICATIONS
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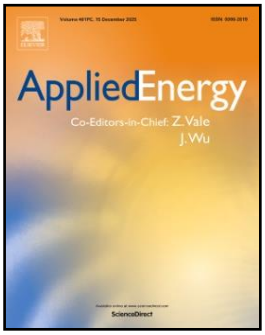
Journal Name: Applied Energy **IF: 11.0**

Title: Collaborative participation of wind power producer and charging station aggregator in electricity markets

Author: Abbasi, M.H.; Mishra, D.K.; Arjmandzadeh, Z.; Zhang, J.; Xu, B.; Krovi, V.

Details: Vol. 401, December 2025

Abstract: The widespread adoption of electric vehicles (EVs) is hindered by two major challenges: limited fast-charging infrastructure and reliance on fossil-fuel-based electricity. Expanding fast-charging stations (FCSs) requires optimal scheduling, which is complicated by the stochastic behavior of EV users. Additionally, rapid fluctuations in renewable power availability, typically mitigated by fossil-fuel generation, can limit EVs' environmental benefits. This paper addresses these challenges through the coordinated operation of a wind power producer (WPP) and an FCS aggregator, aiming to optimize the revenue of both parties while considering EV battery degradation and FCS charging limits. The problem is formulated as a bi-level optimization problem: the WPP and FCS aggregator maximize their own profits, linked via a peer-to-peer (P2P) energy trading agreement. It is then cast within a Lyapunov optimization framework, decomposing the problem into single-step subproblems, which reduces the impact of EV charging uncertainty. Collaboration with the aggregator decreases WPP's imbalance by an average of 45.77 % in a case study, while the P2P energy trading increases the renewable share of power delivered to EVs by 11.17 % on average. Furthermore, a reinforcement learning agent is trained to improve FCS energy storage utilization. Simulation results show that the proposed approach can reduce daily FCS operating costs by up to 58 % and increase daily WPP profit by up to 31 %.



URL: https://www.sciencedirect.com/science/article/pii/S0306261925015120?via%3Dihub

SCHOLARLY PUBLICATIONS
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Journal Name: Engineering Applications of Artificial Intelligence **IF: 8.0**

Title: Recurrence plot and change quantile-based deep supervised and semi-supervised protection for transmission lines connected to photovoltaic plants

Author: Bera, P.K.; Pani, S.R.

Details: Volume 163, January 2026

Abstract: Conventional relays encounter difficulties in protecting transmission lines (TLs) connected to converter-based energy sources (CBESs) due to the influence of power electronics on fault characteristics. This article proposes a single-ended intelligent protection method for the TL segment between the grid and a Photovoltaic (PV) plant. The approach utilizes a Recurrence Matrix and an InceptionTime-based system to identify faults by using the mean change in quantiles of 3-phase currents. It determines the fault position and identifies the faulty phase. ReliefF feature selection is applied to extract the optimal quantile features. The scheme's performance is assessed under abnormal conditions, including faults and capacitor and load-switching events, simulated in Power Systems Computer Aided Design/Electromagnetic Transients Program (PSCAD/EMTDC) on the Western System Coordinating Council (WSCC) 9-bus system, with various fault and switching parameters. The scheme is also validated on the New England IEEE 39-bus system and in presence of partially rated converters. Additionally, the validation of the proposed strategy takes into account various conditions, including double-circuit line configuration, noise, series compensation, high-impedance faults, current transformer (CT) saturation, evolving and cross-country faults, remote and local faults, as well as variations in PV capacity, sampling frequency, and data window size. To address label scarcity and improve generalization, semi-supervised learning paradigms including label spreading, label propagation, and self-training are integrated with the Inception Time framework, enabling near-supervised performance with limited annotated fault data. The results demonstrate that the approach is effective in handling different system configurations and conditions, ensuring the protection of TLs connected to large PV plants.

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Journal Name: Results in Engineering **IF: 7.9**

Title: Improved three phase PLL performance for DC offset affected grid: Advanced third order generalized integrator-based methods

Author: Tripathy, P.; Misra, B.; Nayak, B.; Tripathy, P.

Details: Volume 28, December 2025

Abstract: A power electronic converter is the medium for integrating Renewable Energy Sources (RESs) into the grid to fulfill the rising energy demand. The control mechanism of the grid interfacing converter makes sure that the voltage and currents injected by RESs are in phase with the grid in order to facilitate optimal energy transfer between RESs and the grid. Phase Locked Loops (PLLs) are used for estimating the grid voltage amplitude and phase angle as synchronous data. However, any deviation in the phase-locked loop variables may result in inaccurate extraction of the fundamental voltage component due to the presence of grid harmonics and Direct Current (DC) offset in the grid voltage causing fundamental frequency oscillations. The inefficiency of widely used Synchronous Reference Frame Phase Locked Loop (SRF PLL) as well as the Dual Second Order Generalized Integrator PLL (DSOGI PLL) used for grid synchronization during DC offset leads to the demand for higher order advanced PLLs. The Dual Third Order Generalized Integrator PLL (DTOGI PLL) however becomes ineffective in achieving grid-tied RESs synchronization in DC offset case. The purpose of this work is to present a thorough examination of several proposed novel advanced TOGI-based PLLs for solving the issue of DC offset during grid synchronization, which has not been investigated before. The detailed design features, stability analysis using Bode plots, and performance analysis using simulation are carried out for all the novel approaches, and the results show better performance under DC offset conditions compared to the conventional DTOGI PLL.

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SCHOLARLY PUBLICATIONS
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Journal Name: Scientific Reports **IF: 3.9**

Title: Enhancing cardiac disease prediction with explainable bidirectional LSTM

Author: Lipsa, S.; Dash, R.K.; Debdas, S.; Cengiz, K.; Kumar, P.; Pal, N.

Details: Volume 15, Issue 1

Abstract: Cardiovascular disorders (heart diseases) are the most prevalent cause of death on a global scale. So early detection and classification increase the likelihood of survival. In the context of machine learning techniques, there is always a need for an accurate and explainable predictive model for detecting various diseases, such as cardiac disorders. The work carried out in this paper stacks bidirectional long short-term memory with deep learning to propose two models. The first model is used to detect cardiac disease with a binary label classification, while the second one classifies cardiac disease, which is a multi-label classification problem. Bidirectional LSTM is used as an approximate algorithm for feature extraction. Deep learning is used for classification purposes. The proposed models are trained and validated over the PTB-XL dataset. The performance of these models is evaluated and compared against state-of-the-art methods. The comparison shows the proposed model outperforms other methods in terms of accuracy, precision, f1-score, and recall. SHAP is used to make these models explainable, which in turn helps to annotate different diseases on the ECG report.

URL: https://www.nature.com/articles/s41598-025-25071-8

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

Title: A novel TID + IDN controller tuned with coatis optimization algorithm under deregulated hybrid power system

Author: Dei G.; Gupta D.K.; Sahu B.K.; Bajaj M.; Blazek V.; Prokop L.

Details: Volume 15, Issue 1, December, 2025

Abstract: Implementing a suitable load frequency controller to maintain the power balance equation for a multi-area system with many power generating units poses a challenge to a power system engineer. Incorporation of renewable energy sources along with non-renewable units is another challenge while maintaining the stability of the system. Hence a robust intelligent controller is an essential requirement to achieve the objective of automatic load frequency control. This article introduces a novel and efficient controller designed for a three-control area within a deregulated multi-source energy system. The three areas include diverse power generation sources: Area 1 integrates thermal units, hydro units, and solar thermal power plants. In Area 2, there is a combination of distributed solar technology (DST) with thermal and hydro units. Area 3 incorporates a geothermal power plant alongside thermal and hydro unit. The proposed controller is a parallel combination of the tilted integral derivative controller (TID) and the integral derivative with a first-order filter effect (IDN). The controller's parameters are optimized using an advanced Coatis Optimization Algorithm (COA). High effective efficiency and absence of control parameters are the key advantages of Coatis Optimization Algorithm. In summary, this paper presents an innovative TID + IDN controller optimized using a novel Coatis Optimization Algorithm within a three-area hybrid system operating in a deregulated context. Considering the poolco transaction and implementing the COA optimized TID + IDN controller with an error margin of 0.02%, the value of the objective function, ITAE for the transient responses is 0.1233. This value is less than the value obtained in other controllers optimized with different optimization techniques. In case of poolco transaction, the settling time of deviation of frequency in area-1, deviation of frequency in area-2, and deviation of frequency in area-3 are 8.129, 3.72, and 2.254 respectively. As compared to other controllers, the transient parameters are better in case of this proposed controller.

URL: https://www.nature.com/articles/s41598-025-89237-0

SCHOLARLY PUBLICATIONS
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Journal Name: IEEE Access **IF: 3.6**

Title: Robust Fault Classification of Three Phase Induction Motor Using GWO-SVM with Simulation and Hardware Validation

Author: Atal, J.K.; Rana, S.S.; Dash, R.N.; Sen, A.; Mishra, S.S.

Details: Volume 13, December 2025

Abstract: This paper presents a comprehensive fault classification framework for three-phase Induction Motors (IMs) using a novel Grey Wolf Optimization-enhanced Support Vector Machine (GWO-SVM) approach. Addressing critical limitations of traditional methods—including narrow fault scope, computational inefficiency, and reliance on simulation-only validation—the framework targets high-impact electrical faults under no-load conditions: single-phasing fault, winding break fault, winding short fault, under-voltage fault, and over-voltage fault. A rigorous dual-validation methodology combines MATLAB/Simulink 2023a with experimental hardware implementation using an XPO MFS fault trainer kit and a three-phase IM. Current signatures are acquired via a Digital Storage Oscilloscope (DSO) at 15 kHz meeting Nyquist criterion and processed through MATLAB's Diagnostic Feature Designer (DFD) to extract nine transient-sensitive time-domain features (e.g., RMS, crest factor, zero-crossing rate) from residual stator currents, enhancing fault signature discrimination. The GWO-SVM algorithm autonomously optimizes SVM hyper parameters (C, γ), achieving superior classification accuracy. Validation of simulation results with hardware results for five fault classification, the trained model achieves significant efficiency and the approach demonstrates robust performance. Comparative analysis with conventional SVM, K-nearest neighbor algorithm (KNN), Naive Bayes (NB), Random Forest (RF), Logistic Regression (LR), and Decision Tree (DT) classifiers confirms the GWO-SVM's efficacy, computational efficiency, and deployment readiness for resource-constrained edge applications

URL: https://ieeexplore.ieee.org/document/11271660

SCHOLARLY PUBLICATIONS
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Journal Name: Energies **IF: 3.2**

Title: Optimized Planning Framework for Radial Distribution Network Considering AC and DC EV Chargers, Uncertain Solar PVDG, and DSTATCOM Using HHO

Author: Bonela, R.; Tripathy, S.; Roy Ghatak, S.R.; Swain, S.C.; Lopes, F.; Acharjee, P.

Details: Volume 18, Issue 21, November 2025

Abstract: This study aims to provide an efficient framework for the coordinated integration of AC and DC chargers, intermittent solar Photovoltaic (PV) Distributed Generation (DG) units, and a Distribution Static Compensator (DSTATCOM) across residential, commercial, and industrial zones of a Radial Distribution Network (RDN) considering the benefits of various stakeholders: Electric Vehicle (EV) charging station owners, EV owners, and distribution network operators. The model uses a multi-zone planning method and healthy-bus strategy to allocate Electric Vehicle Charging Stations (EVCSs), Photovoltaic Distributed Generation (PVDG) units, and DSTATCOMs. The proposed framework optimally determines the numbers of EVCSs, PVDG units, and DSTATCOMs using Harris Hawk Optimization, considering the maximization of techno-economic benefits while satisfying all the security constraints. Further, to showcase the benefits from the perspective of EV owners, an EV waiting-time evaluation is performed. The simulation results show that integrating EVCSs (with both AC and DC chargers) with solar PVDG units and DSTATCOMs in the existing RDN improves the voltage profile, reduces power losses, and enhances cost-effectiveness compared to the system with only EVCSs. Furthermore, the zonal division ensures that charging infrastructure is distributed across the network increasing accessibility to the EV users. It is also observed that combining AC and DC chargers across the network provides overall benefits in terms of voltage profile, line loss, and waiting time as compared to a system with only AC or DC chargers. The proposed framework improves EV owners' access and reduces waiting time, while supporting distribution network operators through enhanced grid stability and efficient integration of EV loads, PV generation, and DSTATCOM.

URL: https://www.mdpi.com/1996-1073/18/21/5728