

Can machine learning improve solar power generation efficiency in a smart grid?

However, this research aims to enhance the efficiency of solar power generation systems in a smart grid context using machine learning hybrid models such as Hybrid Convolutional-Recurrence Net (HCRN), Hybrid Convolutional-LSTM Net (HCLN), and Hybrid Convolutional-GRU Net (HCGRN).

Can hybrid models predict energy output in solar plants?

Through the presentation of newly developed and enhanced hybrid models that demonstrate higher performance in forecasting energy output in solar plants, this study represents an important improvement in this field. As a result, it contributes to the development of predictive modeling in renewable energy systems.

Why is predicting voltage anomalies important in energy storage stations?

Early and precise prediction of voltage anomalies during the operation of energy storage stations is crucial to prevent the occurrence of voltage-related faults, as these anomalies often indicate the possibility of more serious issues.

How can a smart energy grid improve energy security?

Although by incorporating sensors, analytics, and automation, these grids can manage energy demand and supply more efficiently, reducing carbon emissions, increase energy security, and improve access to electricity in remote areas.

Can neural network models predict battery voltage anomalies in energy storage plant?

Based on the pre-processed dataset, the Informer and Bayesian-Informer neural network models were used to predict battery voltage anomalies in the energy storage plant. In this study, the dataset was divided into training and test sets in the ratio of 7:3.

How to predict wind power output?

To predict the output of WGs, we combined particle swarm optimization (PSO) and backpropagation neural network to create a prediction model of the wind power. An improved simulated annealing PSO algorithm (ISAPSO) is used to solve the optimization problem. Numerical studies are carried out in a modified IEEE 33-node distribution system.

In the context of the "double carbon" target, a high share of renewable energy is becoming an essential trend and a key feature in the construction of a new energy system []. As a clean and renewable energy source, wind power is subject to intermittency and volatility [], and large scale grid connection affects the safe and stable operation of the system [].

The worst prediction value among the three methods is located at node 18, which is not only far from the

generator node but also the PV node, and thus, the prediction is mainly affected by the PV power; without the assistance of PV power prediction, the prediction results of both UKF and SVSF at this node show a more serious bias.

ESS implementations and PV power prediction are used to improve voltage/power profile of the system.. Quantile nearest neighbour forecasting is a new efficient method utilized for PV output power prediction.. The proposed evolutionary algorithm is also used for optimising the size and location of ESSs in the system. o Simulation results show the ...

As the proportion of photovoltaic (PV) power generation rapidly increases, accurate PV output power prediction becomes more crucial to energy efficiency and renewable energy production. There are numerous approaches for PV output power prediction. Many researchers have previously summarized PV output power prediction from different angles.

This paper describes a technique for improving distribution network dispatch by using the four-quadrant power output of distributed energy storage systems to address voltage deviation and grid loss problems resulting from the large integration of distributed generation into the distribution network. The approach creates an optimization dispatch model for an active ...

Wong et al. [23] summarized the examples of applying AI algorithms to the optimization of placement, sizing and control of different types of energy storage in power distribution network. Energy storage techniques like superconducting magnetic energy storage, flywheel energy storage, super capacitor and battery were discussed.

A new type of photovoltaic power prediction method of zero energy buildings is proposed. ... Furthermore, grid-connected ZEBs with a high percentage of PV power systems can significantly impact the main grid. Accurate prediction PV power is a prerequisite for maintaining energy balance in ZEBs, particularly those with a high proportion of PV ...

WIND power has developed rapidly in the past decade with the advantages of abundant resources, low cost and convenient development. By 2020, renewable energy accounted for 11 % of the global primary energy, among which wind energy will account for 21.22 % [1].Due to the nonlinearity, instability as well as intermittency of wind speed, the output ...

The example is composed of the charging and discharging power configuration of the energy storage medium in the grid-connected operation. The IGBT life prediction results of the energy storage converter operated according to different power optimization methods are not necessarily the same but can be calculated with reference to this method.

Due to the increase of world energy demand and environmental concerns, wind energy has been receiving

attention over the past decades. Wind energy is clean and abundant energy without CO<sub>2</sub> emissions and is economically competitive with non-renewable energies, such as coal [1]. The generated wind power output is directly proportional to the cube of wind ...

The rapid development of the global economy has led to a notable surge in energy demand. Due to the increasing greenhouse gas emissions, the global warming becomes one of humanity's paramount challenges [1]. The primary methods for decreasing emissions associated with energy production include the utilization of renewable energy sources (RESs) ...

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2.1 Virtual grid system. The power grid system is an extremely complex cyber-physical social system [], and it is impossible to establish an accurate mathematical or mechanism model for it using simulation tools to analyze the operating characteristics of systems and equipment and solve different problems encountered in the process of system management ...

1 Yangjiang Power Supply Bureau of Guangdong Power Grid Co., Ltd., Yangjiang, China; 2 Electric Power Science Research Institute of Guangdong Power Grid Co., Ltd., Guangzhou, China; 3 Shenzhen Huagong Energy Technology Co., Ltd., Shenzhen, China; As the proportion of renewable energy generation continues to increase, the participation of ...

1 Shenyang Institute of Engineering, Shenyang, China; 2 Shenyang Faleo Technology Co., Ltd., Shenyang, China; To solve the instability problem of wind turbine power output, the wind power was predicted, and a wind power prediction algorithm optimized by the backpropagation neural network based on the CSO (cat swarm optimization) algorithm was ...

The prediction of renewable power is mandatory to estimate the future global energy needs as well as deliver significant decisions in the energy industry (Park and Hur, 2018). However, accurate prediction of renewable power is a complex process due to the various input features and intermittency characteristics of RESs (Hannan et al., 2019). A lot of ...

This article presents a review of current advances and prospects in the field of forecasting renewable energy generation using machine learning (ML) and deep learning (DL) techniques. With the increasing penetration of renewable energy sources (RES) into the electricity grid, accurate forecasting of their generation becomes crucial for efficient grid operation and ...

In the field of new energy, such as wind and solar power generation, accurate SOC prediction of energy

storage systems is of great importance for the stability of the power grid and the effective distribution of energy (Schmietendorf et al.,2017; Yu G. ...

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