

Applications of artificial intelligence in electrical power systems

What are the applications of artificial intelligence for power electronic systems?

Abstract: This article gives an overview of the artificial intelligence (AI) applications for power electronic systems. The three distinctive life-cycle phases, design, control, and maintenance are correlated with one or more tasks to be addressed by AI, including optimization, classification, regression, and data structure exploration.

Can artificial intelligence be used for distribution power system operation?

This paper provides a systematic overview of some of the most recent studies applying artificial intelligence methods to distribution power system operation published during the last 10 years. Based on that, a general guideline is developed to support the reader in finding a suitable AI technique for a specific operation task.

How can artificial intelligence help electric power operations?

Leveraging artificial intelligence (AI) tools to support operational personnel in monitoring and decision-making minimizes staff workload and enhances incident response efficiency. This convergence of electric power operations and AI represents a significant trend in recent years.

How does artificial intelligence affect power systems?

As different artificial intelligence (AI) techniques continue to evolve, power systems are undergoing significant technological changes with the primary goal of reducing computational time, decreasing utility and consumer costs and ensuring the reliable operation of an electrical power system.

What are the applications of AI in power electronics?

The applications of four categories of AI are discussed, which are expert system, fuzzy logic, metaheuristic method, and machine learning. More than 500 publications have been reviewed to identify the common understandings, practical implementation challenges, and research opportunities in the application of AI for power electronics.

How AI is used in power generation?

With regard to the planning of power generation, AI applications have been widely used in siting tasks, for example using genetic algorithms (AI domain "Planning") or Analytical Hierarchy Processes (AHP - AI domain "Reasoning") to site wind power plants [34,62] or to locate power-to-gas plants . 5.4.2. AI applications for distribution networks

Power systems are becoming vastly more complex as demand for electricity grows and decarbonisation efforts ramp up. In the past, grids directed energy from centralised power stations. ... This need arrives just as the capabilities of artificial intelligence (AI) applications are rapidly progressing. As machine learning models have become more ...

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The primary purpose of this report is to provide an overview of the advancement in artificial intelligence and machine learning (AI/ML) technologies and their applications in power systems. It offers a foundation for understanding the transformative role of AI/ML in power systems and aims to stimulate further research and development in this area.

This article first analyzes the artificial intelligence technology, introduces the two mainstream artificial intelligence technologies in the current situation, and analyzes the power system, and ...

This research provides a detailed review of AI applications in power systems, particularly in stability, control, and protection, identifying key challenges and research gaps ...

Due to the energy transition and the distribution of electricity generation, distribution power systems gain a lot of attention as their importance increases and new challenges in operation emerge. The integration of renewables and electric vehicles for instance leads to manifold changes in the system, e.g. participation in provision of ancillary services. To solve these ...

This paper offers a comprehensive summary of some of the most recent research on artificial intelligence techniques used to DC Micro grids and electrical power system networks.

Artificial Intelligence Technologies for Electric Power Systems . Submission Deadline: 31 December 2019 IEEE Access invites manuscript submissions in the area of Artificial Intelligence Technologies for Electric Power Systems.. As the main energy supply system and the most complicated artificial system, the electric power system is undergoing revolutionary changes, ...

As global energy crises and climate change intensify, offshore wind energy, as a renewable energy source, is given more attention globally. The wind power generation system is fundamental in harnessing offshore wind energy, where the control and design significantly influence the power production performance and the production cost. As the scale of the wind ...

Artificial intelligence (AI) can successfully help in solving real-world problems in power transmission and distribution systems because AI-based schemes are fast, adaptive, and robust and are applicable without any knowledge of the system parameters. This book considers the application of AI methods for the protection of different types and topologies of transmission ...

Through condition monitoring, early fault detection, and predictive maintenance, AI ensures that electrical systems operate at peak performance, offering a glimpse of the transformative potential of artificial intelligence in electrical engineering. Read This Article on Artificial Intelligence in Electrical Predictive Maintenance. 3.

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We consider six AI domains (reasoning, planning, learning, communication, perception, integration & interaction) and 19 use cases from the power supply chain (i.e., ...

Applications of Artificial Intelligence Models in Power System Analysis. Syed Ammar Shah. Electrical Engineering Department. King Fahd University of Petroleum & Minerals Dhahran, Saudi Arabia. I. O. Habiballah. Department of Electrical Engineering King Fahd University of Petroleum & Minerals. Dhahran, Saudi Arabia

AI techniques have become popular for solving different problems in power systems like control, planning, scheduling, forecast, etc and can deal with difficult tasks faced by applications in modern large power systems with even more interconnections installed to meet increasing load demand. : A continuous and reliable supply of electricity is necessary for the functioning of ...

In this paper, the application of heuristic and optimization algorithms based on artificial intelligence (AI) is investigated on electrical power systems. Three distinct areas have been categorized validating the application of AI methods in power systems. It involves classical problem of economic load dispatch in conventional power plant, continuing with optimal sizing issue of ...

IET Electric Power Applications; IET Electrical Systems in Transportation; IET Energy Systems Integration ... Application of Statistical Relational Artificial Intelligence in New Electric Power Systems. Submission deadline: Wednesday, 30 April 2025 ... This special issue seeks to explore and showcase innovative applications and methodologies of ...

As different artificial intelligence (AI) techniques continue to evolve, power systems are undergoing significant technological changes with the primary goal of reducing ...

Sanjeevikumar Padmanaban, PhD, is a Full Professor with the Department of Electrical Engineering, IT and Cybernetics, at the University of South-Eastern Norway, Porsgrunn, Norway. He serves as an Editor/Associate Editor/Editorial Board Member of many refereed journals, in particular, the IEEE Systems Journal, the IEEE Access Journal, IEEE Transactions ...

13. References o Warwick k, Ekwue A. and Aggarwal R.(ed).Artificial intelligence techniques in power systems.The institution of Electrical Engineers, London, 1997. o International Journal of Engineering Intelligent Systems,The special issue on AI applications to power system protection, edited by M.M.Saha and B.Kasztenny, vol.5,No.4,December 1997, pp.185-93.

This paper lists the literature related to artificial intelligence applications to power systems and notes the artificial intelligence technologies that are becoming important in conjunction with expert systems. ... Application of Artificial Intelligence in Electrical Automation Control. Procedia Computer Science, Volume 166, 2020, pp. 292-295 ...

Therefore, we should classify forms of power utilization in every block and every production process, and establish the best utilization systems for each equipment. 3.2 The problems which should be solved in System When we regard the electric power system as the total system which includes suppliers, equipments and users. following problems ...

This paper provides a systematic overview of some of the most recent studies applying artificial intelligence methods to distribution power system operation published during the last 10 years. ...

This Special Issue, "Application of Artificial Intelligence in Power System Monitoring and Fault Diagnosis", aims to introduce the latest advances in this field and discusses the application of AI technology in power system modeling and control, state estimation, performance diagnosis, and prognosis, among other fields.

The methods of artificial intelligence (AI) have been used in the planning and operation of electric power systems for more than 40 years. In recent years, due to the development of microprocessor and data storage technologies, the effectiveness of this use has greatly increased. This paper provides a systematic overview of the application of AI, including ...

Electrical power systems [1,10] provide the whole electricity supply across the country to ensure the basic needs of people's livelihood. The application of automated monitoring and analysis on ...

This systematic review paper examines the current integration of artificial intelligence into energy management systems for electric vehicles. Using the preferred reporting items for systematic reviews and meta-analyses (PRISMA) methodology, 46 highly relevant articles were systematically identified from extensive literature research. Recent ...

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