Distributed machine learning in power system

The application of machine learning (ML) to power and energy systems (PES) is being researched at an astounding rate, resulting in a significant number of recent additions to the literature. As the infrastructure of electric ...

This work presents the vision for MLbase, a novel system harnessing the power of machine learning for both end-users and ML researchers, which provides a simple declarative way to specify ML tasks and a novel optimizer to select and dynamically adapt the choice of learning algorithm. Machine learning (ML) and statistical techniques are key to transforming big data ...

Karim et al. [72] developed a power system restoration method based on distributed machine learning. After a fault occurrence in the system, the power network was divided into several groups based ...

The application of machine learning (ML) to power and energy systems (PES) is being researched at an astounding rate, resulting in a significant number of recent additions to the literature. As the infrastructure of electric power systems evolves, so does interest in deploying ML techniques to PES.

The conventional power systems are based on a few centralized and large power generation sources, mainly hydropower or fossil fuel based power generation systems, with a ...

Downloadable! Numerous online methods for post-fault restoration have been tested on different types of systems. Modern power systems are usually operated at design limits and therefore more prone to post-fault instability. However, traditional online methods often struggle to accurately identify events from time series data, as pattern-recognition in a stochastic post-fault dynamic ...

Federated learning (FL) is a promising decentralized deep learning technology, which allows users to update models cooperatively without sharing their data. FL is reshaping existing industry paradigms for mathematical modeling and analysis, enabling an increasing number of industries to build privacy-preserving, secure distributed machine learning models. ...

DG systems or distributed energy systems (DES) offer several advantages over centralized energy systems. ... Typically, these include solar and wind power systems which have resource intermittency issues and need storage systems as a backup for offering a reliable solution. 3. ... Development of AI techniques and machine learning (ML) methods ...

In recent years, machine learning methods have found numerous applications in power systems for load forecasting, voltage control, power quality monitoring, anomaly detection, etc. Distributed ...

Machine learning will be one of the major drivers of future smart electric power systems, and this study can

provide a preliminary foundation for further exploration and development of related knowledge and insights. 1. Introduction The history of electric supply is nearly 200 years old.

This survey provides a comprehensive overview of recent advances in distributed optimization and machine learning for power systems, particularly focusing on optimal power flow (OPF) ...

This paper makes use of machine learning as a tool for voltage regulation in distribution networks that contain electric vehicles and a large production from distributed generation.

This thesis proposes two distributed computing frameworks: a parameter server framework which features efficient data communication, and MXNet, a multi-language library aiming to simplify the development of deep neural network algorithms that are specialized for large machine learning problems. For a lot of important machine learning problems, due to the rapid growth of data ...

The development of distributed renewable energy, such as photovoltaic power and wind power generation, makes the energy system cleaner, and is of great significance in reducing carbon emissions. However, weather can affect distributed renewable energy power generation, and the uncertainty of output brings challenges to uncertainty planning for distributed ...

Machine Learning (ML) has seen a great potential to solve many power system problems along with its transition into Smart Grid. Specifically, electric distribution systems have witnessed a rapid integration of distributed energy resources (DERs), including photovoltaic (PV) panels, electric vehicles (EV), and smart appliances, etc. Electricity consumers, equipped with ...

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To help highlight areas where this gap could be narrowed, this article discusses the challenges and opportunities in developing and adapting ML techniques for modern electric power ...

The penetration of such systems requires effective and efficient planning strategies while maintaining the optimal power flow and supply/demand balance, which can be modeled as a complex non-linear problem where machine learning tools such as SVM, Q-learning, Decision trees, and so forth can be effectively employed. Fig. 4.

The integration and incorporation of significant numbers of IoT devices and the proper implementations of machine learning techniques into power system not only facilitate the power system operation efficiency but also improves the overall system performance in terms of economics, security, sustainability, and reliability

(Ibrahim et al., 2020; Duchesne et al., 2020; ...

To mitigate the socio-economical impacts of a power outage, we need to develop efficient algorithms to ensure resilient operation of the power system. In this paper, we first explain the ...

Lecture 22 : Distributed Systems for ML 3 methods that are not designed for big data. There is inadequate scalability support for newer methods, and it is challenging to provide a general distributed system that supports all machine learning algorithms. Figure 4: Machine learning algorithms that are easy to scale. 3 ML methods

energies Article Distributed Machine Learning on Dynamic Power System Data Features to Improve Resiliency for the Purpose of Self-Healing Miftah Al Karim 1, Jonathan Currie 2 and Tek-Tjing Lie 3 ...

Data mining; Large-scale learning; Machine learning Definition Distributed machine learning refers to multi-node machine learning algorithms and systems that are designed to improve performance, in-crease accuracy, and scale to larger input data sizes. Increasing the input data size for many algorithms can significantly reduce the learning

Distributed Machine Learning has several benefits: Fault Tolerance and Reliability: With tools to automatically find, isolate, and fix errors, distributed machine learning systems are built to manage failures graciously. The system"s performance is unaffected by any one machine"s failure because the computation is spread over numerous machines.

These distributed systems present new challenges,?rst and foremost the e?cient parallelization of the training process and the creation of a coherent model. This article provides an extensive overview of the current state-of-the-art in the?eld by outlining the challenges and opportunities of distributed machine learning over conventional ...

power systems, control theory, optimization, and machine learning, offering insights into the application of distributed optimization and ML techniques to power system problems, particularly OPF.

Collectively, our results contribute to the state of the art of distributed ML system optimization and algorithm design. Index Terms--Online resource scheduling, distributed machine learning, approximation algorithm F 1 INTRODUCTION Fueled by the rapid growth of data analytics and machine learning (ML) applications, recent years have witnessed

4 days ago· Advancing Cyber-Attack Detection in Power Systems: A Comparative Study of Machine Learning and Graph Neural Network Approaches + + thanks: This work was ...

Huyen, Chip, author. Machine learning systems are both complex and unique. Complex because they consist

of many different components and involve many different stakeholders. Unique because they"re data dependent, with data varying wildly from one use case to the next.

Power system resilience is crucial to ensure secure energy delivery to electricity consumers. Power system outages lead to economical and societal burdens for the society and industries. To mitigate the socio-economical impacts of a power outage, we need to develop efficient algorithms to ensure resilient operation of the power system. In this paper, we first explain the notion of ...

deep reinforcement learning (DRL) can make decision and inference under unknown and dynamically changing network conditions (e.g., channel state information) [9]. Given the dispersed or distributed nature of many wireless systems, distributed machine learning (DML) is particularly useful under different wireless network settings for the ...

This paper proposes a novel distributed machine learning paradigm that relies on local Resilience Management Systems that serve as intelligent decision-making entities in each area, e.g. an autonomous micro-grid or a smart home can act as RMS. Power system resilience is crucial to ensure secure energy delivery to electricity consumers. Power system outages lead ...