JH Solar

Spatial prediction of thermal power storage field

Overview

Can a data-driven temperature field prediction method improve battery thermal management?

Abstract: The monitoring of temperature distribution is crucial for advanced battery thermal management. This study proposes a data-driven temperature field prediction method for the pouch cell thermal process, a typical distributed parameter system (DPS).

Can physics-reserved spatiotemporal modeling predict battery temperature?

Extensive experiments showed that the physics-reserved spatiotemporal modeling method outperforms a widely used data-driven spatiotemporal modeling method for battery temperature prediction.

How does physics-reserved spatiotemporal modeling work?

As shown in Fig. 1, the physics-reserved spatiotemporal modeling method constructs a composite network to model the battery thermal process. Except for the spatial coordinate (i.e., x) and time variable (i.e., t), the composite network adopts the battery current (i.e., I) and terminal voltage (i.e., V) as two extra control inputs.

What is a data-driven temperature field prediction method for pouch cell thermal process?

This study proposes a data-driven temperature field prediction method for the pouch cell thermal process, a typical distributed parameter system (DPS). First, empirical spatial basis functions (SBFs) that represent underlying spatial modes of the thermal system are extracted from data snapshots collected offline.

Can physics improve the performance of spatiotemporal modeling?

Without using physics, the DL method performs worse than the proposed method for battery temperature prediction. That is to say, the physics can

improve the performance of spatiotemporal modeling significantly. 4.4.2. Effectiveness of the branch network for parameter identification.

How to model battery thermal process using physics-reserved spatiotemporal modeling?

The proposed physics-reserved spatiotemporal modeling method constructed a composite network to model the battery thermal process. The settings of the composite network were as follows. The backbone network and the two branch networks had 8 layers. For the first seven layers, each layer contained 80 neurons. There were 60 neurons in the last layer.

Spatial prediction of thermal power storage field

Neural network-based reconstruction of steady-state

Effective thermal management is crucial for the performance and longevity of devices such as computer chips and batteries. A fundamental challenge in this field is ...

Research on spatial prediction of energy storage field in china

Based on spatial methods such as standard deviation ellipse and Moran index, this paper visually analyses the spatial patterns that influence the technological innovation of LiB in China, and ...

A survey on spatio-temporal series prediction with deep learning

With the rapid development of data acquisition and storage technology, spatio-temporal (ST) data in various fields are growing explosively, so many ST prediction methods ...

The Lithium-Ion Battery Temperature Field ...

This study focuses on the internal temperature field of lithium-ion batteries, aiming to address the temperature variation issues arising from

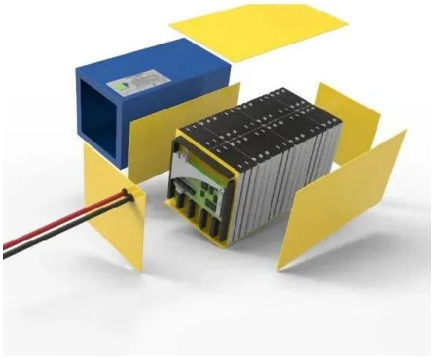
complex operating conditions in new energy batteries. To ...

Spatial energy density of large-scale electricity generation from power

Spatial power density evaluation is a topic of relevance to the field of life cycle assessment (LCA). In power generation LCA, not only is the power plant itself considered but ...

A spatiotemporal prediction approach for a 3D thermal field from ...

To address this issue, we propose a field spatiotemporal prediction approach based on transfer learning techniques by studying the dynamics of a 3 D thermal field from ...



The contribution of artificial intelligence to phase change materials

Artificial Intelligence (AI) is leading the charge in revolutionizing research methodologies within the field of latent heat storage (LHS) by using phase change materials ...

Thermal runaway and flame propagation of lithium-ion battery in

These findings establish key spatial scale threshold parameters for thermal safety strategies in transportation and storage scenarios. And the innovative application of FDS ...

Spatial prediction of thermal power storage field

Accurate real-time temperature prediction in electrochemical energy storage systems plays a critical role in enhancing battery performance, extending lifespan, and preventing thermal

Multi-scale collaborative modeling and deep learning-based thermal

The proposed method transcends the limitations of conventional models and not only achieves a fast solution in the thermal full-field, but also the fusion with deep learning in ...

Experiment and prediction analysis of thermal energy storage for ...

This paper presents the efficient process of thermal energy storage (TES) operation for heat load balancing in the domestic hot water (DHW) systems of district heating ...

SESP: Spatial energy storage perception for thermal vulnerability

To address this, the article introduces a spatial energy storage perception model (SESP) for thermal fault detection and localization, utilizing the Transformer architecture for ...

Spatial Analysis in Thermal Energy Storage: Optimizing ...

Spatial analysis isn't just some buzzword--it's becoming the difference between profit and loss in thermal storage. Facilities using these methods report 25% faster ROI on average compared to ...

Temperature field spatiotemporal modeling of lithium-ion battery ...

A highly accurate temperature field prediction model of battery pack characterized by low computational demands and a distinctive ability to capture temporal and ...

A multi-scale spatial-temporal interaction fusion network for digital

The SGCN is able to realize accurate spatial relationship modeling, while the GRU-TCN is used to fuse spatial and temporal features, enhancing predictive accuracy and ...

Spatial analysis of thermal power storage field

storage, cavern thermal energy storage, and molten-salt thermal energy sto rage. Sensible Sensible solid storage, on the other hand, comprises borehole thermal energy storage and ...

Fast prediction of spatial temperature distributions in urban areas

The variable selection network identifies important variables for temperature prediction, excludes data that have less impact on the prediction results, and weights the ...

study on spatial prediction of thermal power energy storage field

To address this issue, we propose a field spatiotemporal prediction approach based on transfer learning techniques by studying the dynamics of a 3 D thermal field from multiple ...

Data-Driven Real-Time Prediction of Pouch Cell Temperature ...

The monitoring of temperature distribution is crucial for advanced battery thermal management. This study proposes a data-driven temperature field prediction method ...

SPATIAL PREDICTION METHOD OF ENERGY STORAGE ...

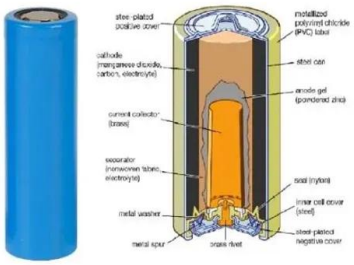
What drives spatial differentiation of carbon storage in Shanxi province? According to the results of geographical detector factors,the dominant driving factors for spatial differentiation of carbon ...

Physics-reserved spatiotemporal modeling of battery thermal ...

The battery thermal process, as a typical distributed parameter system (DPS), is critical to battery management. In practice, the process information is often partially known. ...

Integrated monitoring and prediction of thermal ...

To predict the spatial distribution of thermal discharge from a nuclear power plant under construction, we followed the method in "Numerical simulation" and used the MIKE 3 numerical model to simulate ...



A comprehensive review on the development of data-driven ...

By summarizing the development and characteristics of wind-thermal bundled power system in China and different countries, current research in this field can be clearly ...

Spatio-temporal distribution and peak prediction of energy ...

The calculation formula is as follows: (2-5) f e = ? E H i f i / ? H + R where f e is electricity carbon emission factor; E H i is consumption of various types of fossil energy in ...

A Review of Multitemporal and Multispatial Scales Photovoltaic

Finally, the results are analyzed on the basis of the predicted temporal scale, spatial scale and input data. It has been observed that most recent papers highlight the importance of short-term ...

Temperature field prediction of lithium-ion batteries using ...

The temperature field prediction of lithium-ion batteries (LIBs) plays a crucial role in the safety of electric vehicles and their lifetime. However, it is essentially a nonlinear ...

Physics-informed Convolutional Neural Networks for Temperature Field

View a PDF of the paper titled Physics-informed Convolutional Neural Networks for Temperature Field Prediction of Heat Source Layout without Labeled Data, by Xiaoyu Zhao ...

A study on improving temperature field prediction accuracy using ...

In temperature field prediction, SegNet's encoder-decoder architecture is particularly adept at extracting spatial features and reconstructing the local distribution of the ...

Prediction of superheated steam temperature for thermal power ...

The stability of superheated steam temperature (SST) is severely challenged by the adjustment of thermal power plants under a wide-load range. Accurate and efficient ...

Fast prediction model of three-dimensional temperature field of

Then the CFD simulation results were trained by BP neural network algorithm, and the "entrance-atrium" three-dimensional temperature field prediction model was ...

Thermal prediction for energy management of clouds using a ...

Regarding that data-driven approaches seem promising for temperature prediction, this research offers a unique efficient temperature prediction model. The model ...

A spatiotemporal prediction approach for a 3D ...

To address this issue, we propose a field spatiotemporal prediction approach based on transfer learning techniques by studying the dynamics of a 3 D thermal field from multiple homogeneous fields.

TES-PD: A Fast and Reliable Numerical Model to Predict the

Therefore, the results underline that a differential and time-accurate model, like the TES-PD, even if one-dimensional, allows a fast and effective prediction of the performance ...

Degradation Capacity Spatial-Temporal Embedding RUL Prediction

Accurately predicting the remaining useful life (RUL) of lithium-ion batteries is crucial to ensure the safe and reliable operation of the energy storage and power supply systems. However, RUL ...

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