

PIENAAR ENERGY (PTY) LTD

Photovoltaic panel dust detection algorithm



Overview

The methodology involves several key steps: first, using the YOLO11-OBB rotating object detection algorithm to accurately extract photovoltaic strings and individual solar panels from both visible light and thermal imaging images; second, applying the YOLO11-SEGMENT algorithm to. The methodology involves several key steps: first, using the YOLO11-OBB rotating object detection algorithm to accurately extract photovoltaic strings and individual solar panels from both visible light and thermal imaging images; second, applying the YOLO11-SEGMENT algorithm to. This study proposes SolPowNet, a novel Convolutional Neural Network (CNN) model based on deep learning with a lightweight architecture that is capable of reliably distinguishing between images of clean and dusty panels. The performance of the proposed model was evaluated by testing it on a dataset. To address these limitations, I propose a novel dust detection method that integrates deep learning with traditional image processing techniques. This approach leverages the YOLO11 algorithm for robust feature extraction and generalization, combined with histogram analysis and dual-light image. In this work, we are more concerned with the detection of dust from the images of the solar panels so that the cleaning process can be done in time to avoid power losses due to dust accumulation on the surface of solar panels. To this end, we utilize state-of-art deep learning-based image.

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Advanced Dust Detection on Solar Panels Using YOLO11 and Dual ...

Recent advancements in deep learning have introduced new solutions for object detection and image segmentation.

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Recognition Algorithm for Dust on Solar Photovoltaic Panels Based ...

Dust accumulation can reduce PV system efficiency, resulting in unstable energy output. To effectively detect and monitor dust impact on PV systems, this paper proposes a dust recognition ...



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A Hybrid Fuzzy-Support Vector Machine Framework for Real-Time ...

Dust accumulation significantly degrades the energy output of photovoltaic (PV) panels, particularly in arid and semi-arid regions. While existing studies have separately explored image ...

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SolPowNet: Dust Detection on Photovoltaic Panels Using

Lightweight CNN models that can operate with a lower hardware capacity and provide instantaneous decisions in real-time applications are needed in literature. This study aims to develop ...

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A new dust detection method for photovoltaic panel surface based on

The improved algorithm proposed in this article has significantly improved the efficiency of dust detection on the surface of photovoltaic panels compared to the Adam algorithm, and is suitable ...

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(PDF) Dust Detection on Solar Photovoltaic Panels Used in

In order to use this balanced dataset in the classification phase with deep learning models, the dataset was divided into 80% training and 20% testing.

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Solar Panel Dust Detection Using Deep Learning Model

This paper aims to construct an effective convolutional neural network model with

Energy storage(KWh)

102.4kWh

Nominal voltage(Vdc)

512V

Outdoor All-in-one ESS cabinet



hyperparameter tuning using the Equilibrium optimizer (EO) for accurately recognizing dust on solar panels and shows that ...

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Using Image Analysis Techniques for Dust Detection Over ...

In this work, we developed an artificial vision algorithm based on CIELAB color space to identify dust over panels in an automatic way. The proposed algorithm uses a series of images of ...



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Integrating battery packs
-  **Intelligent Integration**
integrated photovoltaic storage cabinet
-  **High-capacity**
50 - 500kWh
-  **Rated AC Power**
50 - 100kW
-  **Degree of Protection**
IP54
-  **Altitude**
3000m(>3000m derating)
-  **Operating Temperature Range**
-20~60°C(Derating above 50 °C)

Deep Learning-Based Dust Detection on Solar Panels: A Low-Cost

To this end, we utilize state-of-art deep learning-based image classification models and evaluate them on a publicly available dataset to identify the one that gives maximum classification ...

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A Novel Method for Detecting Dust Accumulation in Photovoltaic ...

arning algorithms to identify dust levels and bird or insect droppings accurately. The experimental setup in Gazipur, Bangladesh, found that excessive dust can block up to 55% of visible ...

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