Photovoltaic panel efficiency detection

Overview

This study evaluates the performance of three state-of-the-art YOLO models—YOLOv5, YOLOv8, and YOLOv11—for detecting solar panel defects under realistic conditions. With the rapid development of the solar photovoltaic industry, the efficient and stable operation of PV modules is crucial for the reliability of energy systems. YOLOv5 achieved the fastest inference time (7. 1 ms per image) and high precision (94. Traditional manual inspection methods suffer from high labor costs and inconsistent accuracy, while.

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A Photovoltaic Panel Defect Detection Method Based on the Improved

Aiming at the current PV panel defect detection methods with insufficient accuracy, few defect categories, and the problem that defect targets cannot be localized, this paper proposes a PV panel ...

Enhancing defect detection in photovoltaic cells: a dynamic group

Ensuring the quality of photovoltaic cells is paramount for enhancing the efficiency of solar energy systems. Traditional defect detection methods struggle with feature extraction and suffer from ...

Fault Detection and Classification for Photovoltaic Panel System Using

Advances in automation, prediction, and management have enabled sophisticated fault detection methods to enhance system reliability and availability. This paper emphasizes the

pivotal ...

YOLO-LitePV: a lightweight detection algorithm for photovoltaic panel

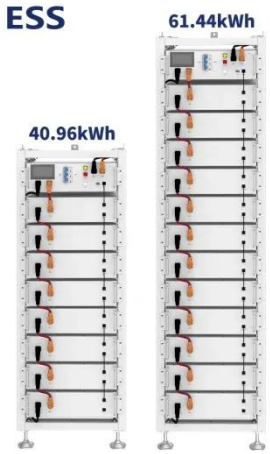
To address the low operational efficiency of detection algorithms and the low accuracy due to the similarity and large-scale variance of PV defects, we propose an improved lightweight ...

Lightweight Solar Panel Defect Detection Network Based on Improved

With the rapid development of photovoltaic technology, efficient and accurate defect detection in solar panels has become crucial for maintaining energy conversion efficiency and ...

Performance assessment and dynamic fault detection in photovoltaic

Precise characterization of losses and effective fault detection are crucial for informed decision-making in PV system optimization. This work introduces a computational model for ...



A lightweight and efficient model for photovoltaic panel defect

We hypothesize that a lightweight object detection framework that integrates hierarchical feature enhancement and adaptive spatial processing can simultaneously improve the detection ...

A photovoltaic panel defect detection framework enhanced by deep

This study not only offers a new, efficient, and accurate approach for PV defect detection but also provides strong technical support for intelligent operation and maintenance as well as quality ...

An effective approach to improving photovoltaic defect

detection using

Photovoltaic (PV) systems play a vital role in the global transition to renewable energy, yet their efficiency is often compromised by surface defects such as dust accumulation, bird droppings,

Comparative Performance Evaluation of YOLOv5, YOLOv8, and

Automated defect detection is critical for addressing these challenges in large-scale solar farms, where manual inspections are impractical. This study evaluates three YOLO object detection ...

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