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Photovoltaic panel internal defect detection method

Overview

For defect detection in crystalline silicon photovoltaics, the industry currently widely uses technologies such as manual visual inspection, current-voltage (I-V) curve analysis, infrared thermal imaging, photoluminescence (PL) imaging detection, and electroluminescence. For defect detection in crystalline silicon photovoltaics, the industry currently widely uses technologies such as manual visual inspection, current-voltage (I-V) curve analysis, infrared thermal imaging, photoluminescence (PL) imaging detection, and electroluminescence. This paper proposes a lightweight PV defect detection algorithm based on an improved YOLOv11n architecture. Building upon the original YOLOv11n framework, two modules are introduced to enhance model performance: (1) the CFA module (Channel-wise Feature Aggregation), which improves feature. To address the shortcomings of existing photovoltaic defect detection technologies, such as high labor costs, large workloads, high sensor failure rates, low reliability, high false alarm rates, high network demands, and slow detection speeds of traditional algorithms, we propose an algorithm named. To address the challenges of high missed detection rates, complex backgrounds, unclear defect features, and uneven difficulty levels in target detection during the industrial process of photovoltaic panel defect detection, this article proposes an infrared detection method based on computer vision. Photovoltaic panel defect detection presents significant challenges due to the wide range of defect scales, diverse defect types, and severe background interference, often leading to a high rate of false positives and missed detections. To address these challenges, this paper proposes the. To tackle these challenges, we propose YOLOv8-DG, an enhanced YOLOv8 model tailored for defect detection in electroluminescence images of photovoltaic cells. Firstly, YOLOv8-DG integrates Adaptive Channel Conv and Adaptive Channel Combination Spatial Pyramid Pooling Fast in the backbone to boost.

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ST-YOLO: A defect detection method for photovoltaic modules based ...

Based on the experiences of the aforementioned researchers and the summary of existing photovoltaic module defect detection methods, this paper proposes ST-YOLO, specifically ...

A novel internal crack detection method for photovoltaic (PV) panels

This paper develops a novel internal crack detection device for PV panels based on air-coupled ultrasonics and establishes a dedicated model for PV panel crack detection.

A photovoltaic panel defect detection framework enhanced by deep

This paper proposes a photovoltaic panel defect detection method based on an improved YOLOv11 architecture. By introducing the CFA and C2CGA modules, the YOLOv11 model is ...

A novel deep learning model for

defect detection in photovoltaic ...

To address the current limitations of low precision and high image data requirements in defect detection algorithms based on visible light imaging, this paper proposes a novel visible light ...

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

Several electroluminescent photovoltaic defect datasets are used to verify the effectiveness of the proposed model. The experimental results show that the map@50 and ...

Defect Detection of Photovoltaic Panels by Current Distribution

Based on the intrinsic connection

between the surface magnetic field and the internal current of PV panels, this article proposes a current distribution reconstruction and busbar current estimation ...

LEM-Detector: An Efficient Detector for Photovoltaic Panel Defect Detection

To address these challenges, this paper proposes the LEM-Detector, an efficient end-to-end photovoltaic panel defect detector based on the transformer architecture.

ResNet-based image processing approach for precise detection

Advancing renewable energy solutions requires efficient and durable solar Photovoltaic (PV) modules. A novel mechanism based on Deep Learning (DL) and Residual Network (ResNet) for ...

Photovoltaic panel defect detection algorithm based on infrared ...

A Defect detection model for PV panel electroluminescence images: We developed a defect detection model

tailored to EL images of PV panels, addressing the poor detection ...

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