

The health condition evaluation of photovoltaic plants is considered a significant challenge for years. This paper proposed a framework for photovoltaic panels segmentation and defects detection in module-level using infrared Images through addressing three technical challenges: (1) providing some high-quality infrared images captured by Unmanned Aerial Vehicles (UAV) ...

The maintenance of large-scale photovoltaic (PV) power plants is considered as an outstanding challenge for years. This paper presented a deep learning-based defect detection of PV modules using electroluminescence images through addressing two technical challenges: (1) providing a large number of high-quality Electroluminescence (EL) image generation ...

The traditional methods for detecting defects in PV panels, such as visual inspection, infrared (IR) thermography, Canny and Sobel edge detection operator, and electrical testing, have been widely used in practical applications. However, these methods have some limitations, such as the relatively single type of faults detected and insufficient sensitivity to tiny ...

Dust detection in solar panel using image processing techniques: A review and defect detection using infrared ima ging. In Automatic Target Recognition XXV (9476). [947600] SPIE. <https://doi ...>

To address this issue, a new PV panel condition monitoring and fault diagnosis technique is developed in this paper. The new technique uses a U-Net neural network and a ...

As an important component of photovoltaic power generation, PV panels play a crucial role in the photovoltaic power generation industry. In order to overcome the current problem of low speed and accuracy in detecting hot spot faults of PV panels in photovoltaic power plants, this paper proposes a lightweight YOLO V5 model to realize the detection of hot spot defects of PV ...

Photovoltaic (PV) cell defect detection has become a prominent problem in the development of the PV industry; however, the entire industry lacks effective technical means. In this paper, we propose a deep-learning-based defect detection method for photovoltaic cells, which addresses two technical challenges: (1) to propose a method for data enhancement and ...

It is clear from the number of research papers and the recent publication dates that more researchers are taking an active interest in CNN-based defect detection of PV-cell defects due to its numerous benefits, such as automated feature extraction, leading to better generalizability, reduced labor cost, reduced bias and downtime, and improved accuracy as a ...

The new technique uses a U-Net neural network and a classifier in combination to intelligently analyse the PV panel's infrared thermal images taken by drones or other kinds of remote operating systems. ... To facilitate the training of the algorithm, different types of PV panel defects are indicated by different numbers, e.g. the safety-glass ...

compared with the original model. This proposed method can accurately segment the PV panels and then identify different sizes of hot-spot defects on the PV panels. Keywords Deep learning · Deeplabv3+ · YOLO v5 · Infrared image of PV panel · Defect detection 1 Introduction In recent years, with the increasing environmental pollu-

Automated defect detection in electroluminescence (EL) images of photovoltaic (PV) modules on production lines remains a significant challenge, crucial for replacing labor-intensive and costly ...

Aiming at the problem of difficult operation and maintenance of PV power plants in complex backgrounds and combined with image processing technology, a method for detecting hot spot defects in infrared image PV panels that combines segmentation and detection, Deeplab-YOLO, is proposed. In the PV panel segmentation stage, MobileNetV2 was introduced into the ...

Detecting defects on photovoltaic panels using electroluminescence images can significantly enhance the production quality of these panels. Nonetheless, in the process of defect detection, there ...

Photovoltaic panels are the core equipment of photovoltaic power generation. Defects in photovoltaic panels are generally detected by analyzing infrared images taken by drones. However, the photovoltaic panel defects to be detected in infrared images are small, and traditional target detection algorithms are not sensitive to small targets. Misdetections and ...

The authors in have developed an SVM model utilizing infrared thermography to enhance the detection and classification of hotspots in PV panels. By combining features such as RGB, texture, histogram of oriented gradient (HOG), and local binary pattern (LBP) into a hybrid feature vector, the model effectively categorizes thermal images into healthy, non-faulty ...

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While solar energy holds great significance as a clean and sustainable energy source, photovoltaic panels serve as the linchpin of this energy conversion process. However, defects in these panels can adversely ...

The above research has greatly improved the speed and accuracy of solar photovoltaic panel defect detection, but due to the complex background of photovoltaic panel images, variable defect morphology, uneven distribution and other reasons, conventional detection methods will not take care of some special situations.

The efficient condition monitoring and accurate module defect detection in large-scale photovoltaic (PV) farms demand for novel inspection method and analysis tools.

Hotspot defect detection (HDD) of photovoltaic (PV) modules is one of the daily inspections of PV power stations. ... Improved Solar Photovoltaic Panel Defect Detection Technology Based on YOLOv5 ... Wei S, Li X, Ding S, Yang Q, Yan W (2019) Hotspots infrared detection of photovoltaic modules based on hough line transformation and faster-rcnn ...

on PV panel defect detection and (2.2) the development of target detection based on the YOLO algorithm. ... imaging, an infrared camera is used to scan the PV array, which is suitable for inspecting large PV plants. The ultrasonic imaging inspection method is used primarily for detecting cracks

Enhanced photovoltaic panel defect detection via adaptive complementary fusion in YOLO-ACF ... This dataset comprises a diverse set of near-infrared images, capturing various internal defects and ...

To improve the accuracy of hotspot detection in infrared thermal images, ... Z. H. & Luo, Y. Detection method of photovoltaic panel defect based on improved mask R-CNN. J. Internet Technol. 23 ...

In general, the segmentation algorithms trained to detect solar panel defects would not be 100% accurate. As a result, some solar panels may be incorrectly classified as defective. ... Zhu, C.; Zhao, X.; Aleem, M.; Ahmad, A. Improved outdoor thermography and processing of infrared images for defect detection in PV modules. Sol. Energy 2019, 190 ...

The future of active infrared imaging for defect detection in the renewable and electronic industries will be characterized by advancements in excitation sources, improvements in PV panels, widespread adoption in ...

Defects in photovoltaic panels are generally detected by analyzing infrared images taken by drones. However, the photovoltaic panel defects to be detected in infrared images are small, ...

In order to solve the problem that the network model is too large to affect the detection speed and it is difficult to deploy the detection equipment in some solar panel defect detection tasks, as shown in Fig. 6, the bottleneck part of the C2F module in the original YOLOv8n is replaced with the DSConv module, so as to reduce the amount of computation ...

Condition monitoring and fault diagnosis of photovoltaic modules are essential to ensure the efficient and reliable operation of large-scale photovoltaic plants. This article presents an algorithmic solution for the rapid and sensitive detection of photovoltaic modules with multiple visible defects by an image analyzing apparatus mounted onto an unmanned aerial vehicle. ...

A review of automated solar photovoltaic defect detection systems: Approaches, challenges, and future orientations ... The study utilises four 80-W PV panels, of which two are healthy, and the other two have different levels of crack damage. ... Automatic detection of photovoltaic module defects in infrared images with isolated and develop ...

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