

PDLC-based machine learning for photovoltaic systems fault detection and localization

Publisher: IET

Cite This

PDF

Nabaa T. Salman ; Wasan A. Wali

All Authors

8

Full

Text Views

Abstract

Authors

Metrics

More Like This

Abstract:

Photovoltaic systems operate in various climatic conditions and are affected by shading, dust, bird droppings, and cracks, which can cause various faults. Detecting and locating faults is critical for photovoltaics maintenance and ensuring continued operation. In this work, polymer-dispersed liquid crystal (PDLC) was used to detect and locate faults. The cell voltage and current are monitored by varying irradiance intensity, thus distinguishing whether the cells are working or not. Experiments were conducted to measure the transparency of the PDLC. A photovoltaic was simulated in MATLAB/SIMULINK for several faults at different locations. Machine learning tools were used to accurately detect and locate faults. Support vector machine (SVM) and random forest (RF) were utilized to determine classification. RF performed better than SVM, achieving an accuracy of 98.89% compared to 96.30% for SVM in the binary detection stage. Furthermore, RF achieved an accuracy of 98.61% compared to 96.76% for SVM in the localization phase. The PDLC film can be intelligently used to protect cells from excessive radiation and control it in real time. The behaviour of the PDLC is simulated using an adaptive neuro-fuzzy inference system (ANFIS), while an iterative learning controller (ILC) is used to control the transparency.

Published in: 4th International Scientific Conference of Engineering Sciences (ISCES 2025)

Date of Conference: 10-11 December 2025

DOI: 10.1049/icp.2025.4374

Date Added to IEEE Xplore: 11 May 2026

Publisher: IET

Electronic ISBN:978-1-80705-135-8

Conference Location: Hybrid Conference, Baquba, Iraq

Recommended for You (Beta)

- Fractional-Order PI Controller Implementation on a...

Fractional Order PID Controller Design and Tuning via Oustaloup Approximation for TCLab System

Fractional-order PID Control of an Aeropendulum Simulation Model

Learn More

Authors	▼
Metrics	▼



Need
Full-Text

access to IEEE *Xplore*
for your organization?

CONTACT IEEE TO SUBSCRIBE >

IEEE Personal Account

CHANGE
USERNAME/PASSWORD

Purchase Details

PAYMENT OPTIONS
VIEW PURCHASED
DOCUMENTS

Profile Information

COMMUNICATIONS
PREFERENCES
PROFESSION AND
EDUCATION
TECHNICAL INTERESTS

Need Help?

US & CANADA: +1 800
678 4333
WORLDWIDE: +1 732
981 0060
CONTACT & SUPPORT

Follow

[f](#) [@](#) [in](#) [v](#)

About IEEE *Xplore* | Contact Us | Help | Accessibility | Terms of Use | Nondiscrimination Policy | IEEE Ethics Reporting [🔗](#) | Sitemap | IEEE Privacy Policy

A public charity, IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.

© Copyright 2026 IEEE - All rights reserved, including rights for text and data mining and training of artificial intelligence and similar technologies.