IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, June 2025
Impact Factor: 7.67

Deep Learning-Based Detection of Solar Panel Faults

Gurhal Gayatri Ram, Dhage Akshay Namdev, Suryawanshi Nandkishor Bapu, Prof. Y. G. Suryawanshi
Department of Computer Engineering
SGVSS Adsul Technical Campus, Chas, Ahmednagar

Abstract: *Lung Solar photovoltaic (PV) systems play a crucial role in the global transition to renewable energy. However, these systems are susceptible to various operational anomalies and environmental factors such as dust accumulation, shading, panel aging, and electrical malfunctions that can significantly degrade their performance. Traditional fault detection methods involving manual inspection and fixed-threshold monitoring are inefficient, especially in large-scale PV installations. With the increasing adoption of solar power and its integration into smart grids, there is a pressing need for intelligent and automated systems capable of detecting faults accurately and in real time.*
This paper presents a novel solution that combines time-series sensor data with a Convolutional Neural Network (CNN) to identify and classify solar panel faults. The system leverages data preprocessing techniques including normalization and sliding window segmentation to transform raw sensor readings into structured input for deep learning. A custom CNN architecture is then trained to detect fault patterns and deployed via a user-friendly Streamlit interface that allows real-time predictions from uploaded CSV files. Experimental results demonstrate high accuracy, precision, and recall, highlighting the model's practical utility in real-world solar farm environments. This approach provides a scalable, data-driven alternative to traditional inspection and enables proactive maintenance in renewable energy systems.

Keywords: Deep Learning, Convolutional Neural Networks, Solar Panel Fault Detection, Time-Series Data, Streamlit, Sliding Window, Renewable Energy

DOI: 10.48175/568