Title: Isolation Forest Based Anomaly Detection and Fault Localization for Solar PV System

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Abstract:

The decrease in fossil fuel reserves has prompted a global move toward distributed energy resources. For this reason, solar PV power generation has recently gained much attention as a feasible renewable energy source. However, large-scale generation is challenging if there are anomalies in individual solar PV panels. This will reduce the efficiency of the PV system and create a potential fire hazard. In this perspective, the anomaly detection technique discloses system anomalies accurately and effectively. Identified anomalies will localize the event for an improved generation. This paper addresses the performance analysis of using the isolation forest technique to identify anomalies in the PV system and the rule-based fault localization technique to identify defective panel events. In the developed model, the isolation forest technique found around 453 anomalies in 45,740 observations, and approximately six panels indicated a fault in the system. The accuracy score is found to be approximately 0.9886. The proposed fault detection method will help detect the faults in solar power systems.