# Abstract

Electroluminescence (EL) imaging is a technique for acquiring images of photovoltaic (PV) modules and examining them for surface defects. Analysis of EL images has beenmanually performed by visual inspection of images by experts. This manual procedureis tedious, time-consuming, subjective, and requires deep expert knowledge. In this work, a hybrid and fully-automated classification system is developed for detecting different types of defects in EL images. The system fuses the deep feature representations extracted from two different deep learning models (Inception-V3 and ResNet50) to form more discriminative feature vectors. These feature vectors are then fed into the classifier layer to assign them into one of different types of defects. A large-scale, challenging solar cells dataset composed of 2,624 EL images was used to assess the performance of the proposed system in both the binary classification (functional vs defective) task and multi-class classification (functional, mild, moderate, and severe) task. The proposed system has managed to detect the correct defect type with less than1 s per image with an accuracy rate of 98.15% and 95.83% in the binary classification and multi-classification task, respectively



Keywords ; Damage Classification, CNN, Solar Panels