PROBLEM STATEMENT

The world is transitioning toward renewable energy to combat climate change and ensure sustainable development. Solar energy is one of the most promising renewable sources; however, maintaining solar panels for maximum efficiency is a challenge. Over time, solar panels can develop defects such as cracks, dust accumulation, delamination, and hotspots that reduce energy output and increase maintenance costs. Manual inspection of solar panels is time-consuming, expensive, and prone to human error.

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To address this issue, there is a need for an intelligent, automated system that can accurately detect and classify defects in solar panels using advanced technologies like **Convolutional Neural Networks (CNNs)** and **Deep Learning**. Such a system can promote sustainable energy management, reduce operational inefficiencies, and support the large-scale deployment of renewable energy solutions.

DATASET

- **Dataset Name:** Solar Panel Images Clean and Faulty Images

About Dataset:

The accumulation of dust, snow, bird drops etc. on the surface of solar panels reduces the efficiency of the solar modules and hence the amount of produced energy. Monitoring and cleaning solar panels is a crucial task, hence developing an optimal procedure to monitor and clean these panels is very important in order to increase modules efficiency, reduce maintenance cost and reducing the use of resources.The objective of this dataset is to investigate the ability of different machine learning classifiers to detect dust, snow, bird drops, physical and electrical on solar panel surfaces with the highest possible accuracy.

Source: Kaggle

Next Steps

1. Collect and prepare the thermal image dataset.
2. Train the CNN model using TensorFlow or Teachable Machine.
3. Evaluate and test the model's accuracy and detection performance.
4. Develop a web-based interface for leak detection visualization.
5. Integrate real-time image input and model predictions.
6. Deploy and document the complete system for practical industrial use.