TECH OFFER

Solar Energy Management System Using Computer Vision

KEY INFORMATION

TECHNOLOGY CATEGORY:
Infocomm - Video/Image Analysis & Computer Vision

TECHNOLOGY READINESS LEVEL (TRL): TRL8
COUNTRY: SINGAPORE
ID NUMBER: TO174831

OVERVIEW

The solar energy industry is experiencing rapid growth and innovation, and machine learning is playing a key role in driving this trend. Solar energy plays a crucial role in the sustainability initiative providing a clean, renewable, and cost-effective source of power. The adoption of solar energy usage can help to address climate change, improve energy security, and provide access to electricity in remote areas. This growth is fueled by the increasing adoption of machine learning and artificial intelligence technologies, which are helping organisations in the solar energy industry to more accurately predict and optimise the performance of their solar panels. These models can effectively analyse images of solar panels to detect and diagnose issues such as microcracks, “snail trails”, broken glass, hot spots, dust build-up and other defects that may impact their performance. Building and deploying these models can be a complex process, requiring the use of multiple tools and a high level of technical expertise.

This technology offer is a customisable end-to-end MLOps platform that is capable of streamlining the process and makes it easier for teams to build custom computer vision models specifically for solar energy monitoring and optimisation. With this platform, teams can quickly and easily convert their data into working models with enterprise-standard practices, ensuring the

accuracy and reliability of their solar energy monitoring systems.

The technology owner is keen to do R&D collaboration with organisations looking to improve and optimise the overall design and integration of solar energy systems.

TECHNOLOGY FEATURES & SPECIFICATIONS

The technology offer can help organisations improve the efficiency of solar panel systems by as much as 25%. It consists of the following features:

- **AI-Assisted Labeling** - in-built annotating method with a mixture of contour analysis methods and deep-learning to label datasets with a few clicks per image with pixel-level accuracy.
- **Image Augmentation** - allows generation of synthetic variations of datasets directly in the platform to increase robustness.
- **Multi Architecture and GPU Support** - supports large data size that may require multiple GPUs to calculate gradients simultaneously.
- **Model Deployment & Active Learning** - can be adopted in models built natively on the platform, on a fully managed GPU environment or edge deployment.
    - Works on 2D RGB Images (or converted from other spectrums)
    - Supports polygon, bounding box, and mask labels
    - Exportable to major annotation formats e.g. COCO JSON, LabelMe, PascalVOC, COCO MASK, CSV Width-Height, etc
    - Supports model training with State of the Art models such as MaskRCNN, DeepLabV3 with "One-Click Train" feature
- **Evaluation and Report Generation** - to generate detailed evaluation result and statistical analysis of the model that can be included as part of the publication or technical specification sheet.

POTENTIAL APPLICATIONS

The technology offer can be used for a variety of use cases in the solar energy industry, including:

- Building custom ML model to continuously monitor solar panels to identify and diagnose any issues affecting efficiency, such as power degradation, hotspots, and shading.
- Developing predictive maintenance models to proactively address potential problems before they occur
- Analysing images of solar panels to detect cracked cells, microcracks, hot spots, dust build-up, broken glass, and other defects
- Optimising the placement and orientation of solar panels to maximize energy production
- Developing a monitoring system to detect when a junction box is faulty, providing alerts to maintenance teams to take action.
- Addressing the challenge of low power production efficiency caused by “Snail Trails” by automating the detection and remediation of micro-cracks

UNIQUE VALUE PROPOSITION

The technology offer helps a wide range of demographics in helping improve the efficiency of industrial application developers, deep-tech problem solvers, and researchers. It improves the development cycle by enhancing in-house capability to custom-build computer vision models that are robust and production-ready. Using this technology offer, the collaborators can enhance both speed and cost benefits when developing computer vision capabilities. Active learning methods can further increase model accuracy over time.

The technology offer is designed to elevate the capabilities of AI companies in the Solar Panel industry by providing cutting-edge integration and advanced technology for image processing by streamlining data analysis, allowing AI algorithms to quickly process and analyse both IR (Infrared Spectrum) and Photovoltaic (PV) images with speed and accuracy. This enhances the accuracy of AI algorithms and reduces the risk of errors, leading to more effective maintenance and optimisation of solar panels. The advanced image processing capabilities of the platform drive innovation in the Solar Panel industry and allow AI companies to develop new and more advanced algorithms, resulting in improved performance, cost savings, and greater efficiency.

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