Project Description for research attachment

Job Title: research attachment on AI-assisted contactless measurement of solar cells

Project Description:

This research attachment focuses on developing AI-assisted techniques for the contactless measurement of photovoltaic (PV) devices. Conventional inline I-V measurements, which require direct electrical contact with the solar cell, suffer from several limitations:

- **Time-consuming**: The process of contacting and stabilizing measurements increases testing time.
- **Contacting challenges**: Proper electrical contact can be difficult.
- **Measurement stabilization**: Variability in contacting pressure and setup can lead to inconsistent results.
- **Mechanical stress**: Contact probes can induce physical stress or damage to the cell, potentially affecting performance.
- **Protocol variations**: Different cell geometries and materials require customized measurement setups and protocols, adding complexity.

To overcome these challenges, this project integrates machine learning with contactless characterization techniques (e.g., photoluminescence) to develop a non-invasive, accurate, and scalable measurement approach. The student will contribute to data collection/generation, AI model development, and validation of contactless measurement techniques.

Job Description:

- Conduct literature reviews on AI-assisted contactless measurement of solar cells.
- Support data collection/generation using lab equipment and simulation tools.
- Assist in the development/training of machine learning models
- Compare AI-assisted measurement results with conventional contacted I-V measurement.
- Document findings and contribute to technical reports or publications.

Competencies Gained During Research Attachment Program:

- Understanding of photovoltaic technologies and characterization methods.
- Practical experience in applying AI models.
- Hands-on exposure to advanced solar cell characterization techniques, including photoluminescence (PL) imaging.
- Proficiency in data handling, image processing, and machine learning applications for PV research.

- Familiarity with research methodologies and experimental design.
- Experience working in an interdisciplinary R&D environment, bridging simulation, experimentation, and AI-driven analysis.

Skills & Requirements:

- Looking for 1 or 2 students currently enrolled in or have completed a degree in computer engineering, physics, electrical engineering, material science, or a related field.
- Basic knowledge of machine learning and programming (Python preferred).
- Experience or coursework in image processing and data analysis is a plus.
- Familiarity with photovoltaic device characterization is beneficial but not required.
- Strong analytical and problem-solving skills.
- Ability to work independently and in a team-oriented research setting.
- Proactive mindset with a strong ability to quickly learn and apply new concepts and skills effectively.

Interested applicants to kindly submit CV to Dr Wang Puqun (puqun.wang@nus.edu.sg) for review.