Tailored Industrial Solar Solutions: Enhancing Safety and Efficiency through Generative AI

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INTRODUCTION

Context and Motivation

With the depletion of fossil fuels and increasing environmental concerns, solar photovoltaic (PV) systems have emerged as a crucial renewable energy source. Traditional solar systems, however, often lack optimization for industrial applications where specific conditions and requirements vary significantly.

Objective

This study introduces a Generative AI-based framework aimed at customizing industrial PV systems. By using AI, the framework addresses **safety, security, and performance** tailored to the unique needs of industrial settings, ensuring compliance with **international standards and contributing** to a more sustainable energy landscape.
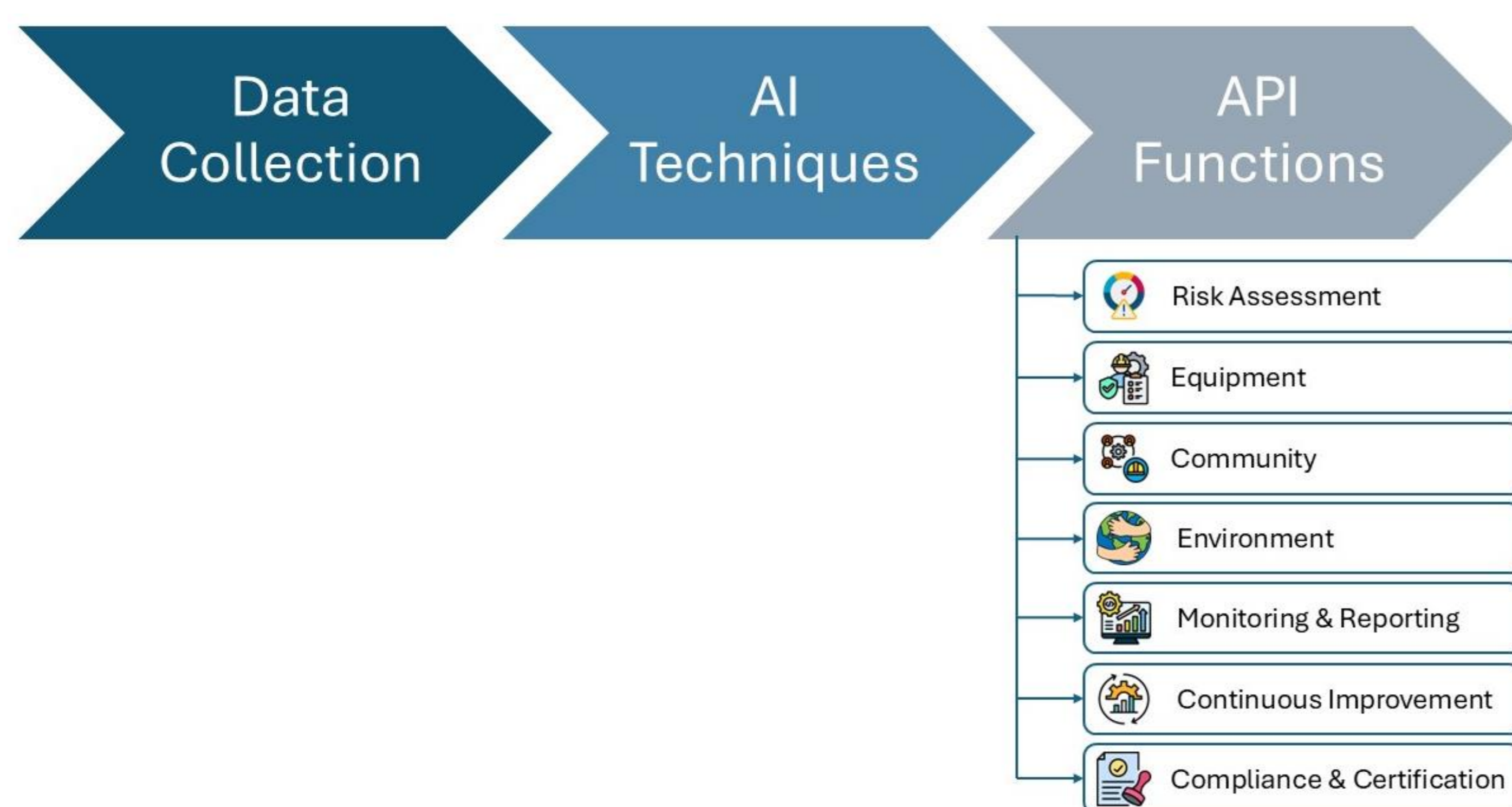

MATERIALS AND METHODOLOGY

Materials

- The research utilized ChatGPT to create the *Tailoring PV Systems Solution API*.
- This API integrates real-time data inputs, safety protocols, and environmental monitoring, leveraging AI to provide customized recommendations.

Methodology

RESULTS AND DISCUSSION

Prompt for each API function → **Tailored GAI answer**

| Enhanced Safety and Compliance | • The Tailoring PV Systems Solution API ensures compliance with safety standards by providing adaptive safety protocols and real-time risk assessments. |

| Efficiency Improvements | • The application of predictive modeling allowed for significant enhancements in the reliability and efficiency of PV systems, addressing challenges like equipment degradation and energy optimization. |

| Community and Environmental Protection | • The API promotes community well-being by minimizing potential hazards, including electrical risks and environmental impact, through robust monitoring and reporting systems. |

| Challenges | • The implementation of AI in PV systems revealed challenges related to data privacy, algorithmic biases, and technical scalability, which need to be addressed for broader adoption. |

CONCLUSIONS

- GAI provides an innovative solution for customizing solar PV systems in industrial settings, directly contributing to sustainability goals by optimizing energy production and enhancing safety.
- The integration of GAI with IoT and smart grid technologies holds promise for further advancements, enabling more precise energy forecasting, real-time adaptation, and scalability across different industrial contexts.
- This work illustrates the transformative potential of AI in renewable energy, paving the way for safer, more efficient, and customized solar solutions.

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