Case Study: Enhancing Solar Power Generation Forecast Accuracy to Meet Government Mandates

About the Client

A prominent Solar Power Generation farm located in the South-West region of Maharashtra faced a critical challenge in accurately predicting their solar power generation. This was vital due to the requirement of submitting weekly power generation forecasts to the Government Electricity Department as part of compliance reporting.

Business Problem

The client's existing forecasting accuracy was only at 40%, far below the Government Electricity Board's stipulated range of 75-80%. With this discrepancy, the client sought a solution to improve the accuracy of their solar power generation forecasts to align with the mandated standards. Lacking in-house capabilities for machine learning-based forecasting, they looked for a reliable partner to develop a model that could achieve the desired 75-80% accuracy.

Solution Offered

To tackle this challenge, our expert team delved into the client's existing infrastructure. The client's solar power plant was equipped with a SCADA system that automated the plant's operations and collected data from each solar panel. This data was transmitted to the cloud every 15 minutes, resulting in a comprehensive dataset spanning over 24 months. The dataset followed a time series format.

Our solution entailed training a machine learning model on this historical dataset to capture underlying data patterns. Additionally, we incorporated weather data to enhance the forecasting accuracy. Two main models, ARIMA and LSTM, were experimented with to accomplish this goal. The predictive accuracy of each model was meticulously tested by contrasting the forecasts with actual generation data over a 40-day period. Remarkably, the LSTM model outshone expectations by achieving an accuracy exceeding 85%, surpassing the client's mandate of 80% accuracy.

To further integrate the solution into the client's workflow, we developed RESTful APIs that seamlessly linked the forecasting model to the client's application. This facilitated streamlined and automated power generation forecasting, saving time and resources.

Outcome

The transformation was extraordinary. Before the machine learning-based solution, the client was operating with a 40% accuracy in solar power generation forecasting. Post-implementation, our

solution empowered them to deliver forecasts with an impressive 85% accuracy, in full compliance with the government mandate. This remarkable improvement not only met the government's expectations but also positioned the client as an industry leader in solar power generation forecasting.

Technology Stack

Our technical approach harnessed the power of Python as the programming language and leveraged key libraries such as Sci-kit Learn for data analysis. We explored ARIMA and LSTM models to uncover insights from historical data patterns. To provide seamless integration, we employed Flask to develop RESTful APIs, ensuring the solution's compatibility with the client's existing systems.

Conclusion

This case study underscores our commitment to transforming businesses through innovative solutions. By aligning our technical expertise with the client's industry-specific challenge, we were able to not only meet but exceed their expectations. The success story of enhancing solar power generation forecasting accuracy showcases the potential of machine learning to revolutionize even the most intricate aspects of operations, ultimately contributing to a sustainable and efficient energy landscape.