

Forecasting of Medium-Term Energy Output of On-Grid Rooftop Photovoltaic Arrays -Case Study for a Sri Lankan Solar Panel Installer

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The world is shifting towards the higher utilization of renewable energy sources in the road to greener energy which conserves an environmentally friendly atmosphere. The generation of sustainable energy via adopting solar photovoltaic is common worldwide. The objectives of the research study are to identify the salient factors contributing to the energy generation of photovoltaic systems, to utilize a gamut of machine learning algorithms to build the predictive model and to identify the best machine learning algorithm to predict the energy generation based on accuracy and precision metrics. These objectives aid to achieve the aim of this study, which is to build a predictive model to determine the medium-term energy generated from on-grid rooftop solar systems. The study has unveiled a new piece of knowledge on how the photovoltaic system dynamics and location specific data has contributed to the prediction of the power output of the system. Further the findings are of paramount importance to the industry experts as well as the current and prospective solar panel users. The data of all solar panel sites of the installer was utilized and it was extracted from the source information systems. The necessary transformations and validations were applied and a detailed analysis was performed. The feature engineering, feature scaling, outlier-handling, multi-collinearity and feature selection was performed on data. The intended forecasting model based on fourteen supervised machine learning algorithms was built. The KNN Regression algorithm in the factor analysis of all features after principal component analysis has outperformed all other built models. Moreover, a strong positive co-relation was observed in the principal component analysis towards the solar panel energy output prediction. As part of future work, it's imperative to build models utilizing a wider sample of on-grid roof top solar plants.

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