

Multiple Linear Regression-Based Correlation Analysis of Various Critical Weather Factors and Solar Energy Generation in Smart Homes

Kasaraneni Purna Prakash, Yellapragada Venkata Pavan Kumar, Gogulamudi Pradeep Reddy

Corresponding Author: Yellapragada Venkata Pavan Kumar Email ID: pavankumar.yv@vitap.ac.in

INTRODUCTION & AIM

- The smart home culture is widely spread across the world by transforming traditional homes into smart homes with technological advancements.
- Besides, consumers are becoming prosumers by adding renewable energy namely solar, wind, etc., to their homes along with traditional energy sources. However, intermittent weather conditions impact the power generation of renewable sources. Hence, there is a need to understand the correlation between several weather parameters and power generation.
- Thus, this paper employs multiple linear regression to analyze the correlation between weather conditions.

METHODOLOGY

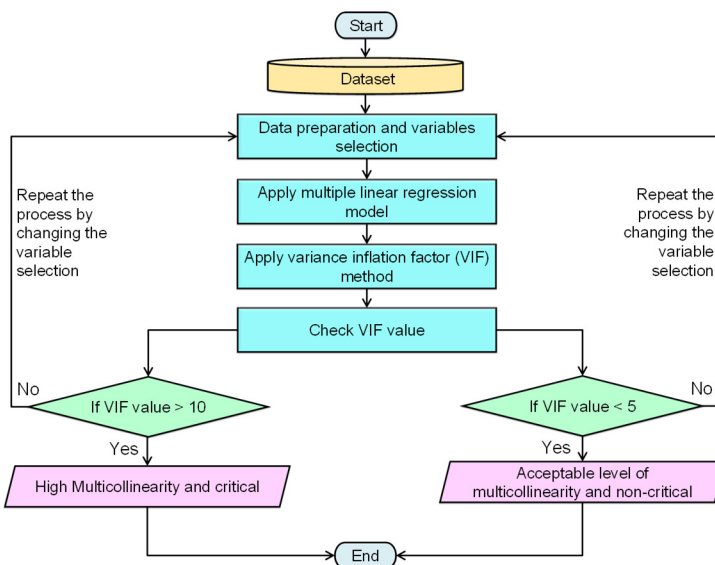


Fig. 1. Workflow of the proposed methodology

RESULTS & DISCUSSION

- The results showcase the variance inflation factor (VIF) values of each independent variable. From these, the variables with the VIF value > 10 have high multicollinearity.
- The following variables such as temperature, humidity, apparent_temperature, and dew_point with VIF values 296.67, 37.35, 126.29, and 152.15 respectively, and having high multicollinearity that indicates potential issues for solar power generation shown in Fig. 2.
- Remaining variables with a VIF value < 5 indicate acceptable levels of multicollinearity and no potential issue for solar power generation shown in Fig. 3.

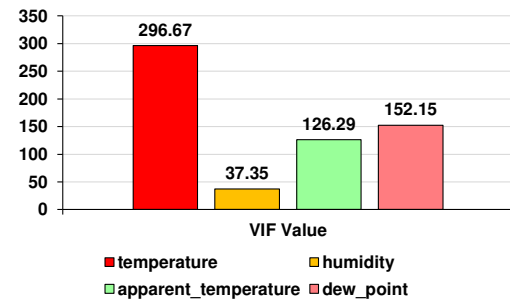


Fig. 2. Critical weather parameters (VIF value > 10).

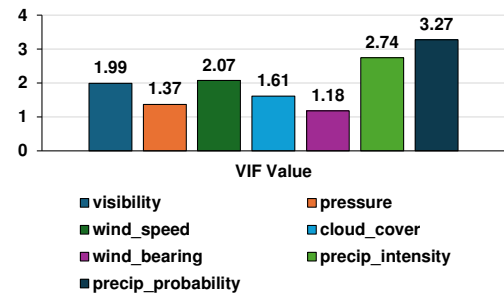


Fig. 3. Non-critical weather parameters (VIF value < 5).

CONCLUSION AND FUTURE SCOPE

- This paper presents a correlation analysis for identifying critical weather parameters that impact solar power generation.
- The following variables such as temperature, humidity, apparent_temperature, and dew_point with VIF values 296.67, 37.35, 126.29, and 152.15 respectively, thereby concluded as the critical weather parameters that significantly influence solar energy generation.
- This helps in better planning of generation and load management in smart homes.

KEY REFERENCES

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