

Analysis and Modelling of Faults in Solar Power Plant

Emilija Bareikaitė, Aušrinė Budzevičiūtė

Vilnius University

Faculty of Mathematics and Informatics

Naugarduko st. 24, Vilnius, Lithuania

{emilija.bareikaite,
ausrine.budzeviciute}@mif.stud.vu.lt

Emilija Bareikaitė, Aušrinė Budzevičiūtė

Vilnius University

Faculty of Mathematics and Informatics

Naugarduko st. 24, Vilnius, Lithuania

{emilija.bareikaite,
ausrine.budzeviciute}@mif.stud.vu.lt

Abstract. *Considering the rapid increase in electricity consumption and the necessity to transition to sustainable energy sources, the reliable operation of solar power plants has become particularly crucial. This study analyses real data from a solar power plant to identify the factors influencing system performance. Initially, the preliminary analysis of the data and the methodologies employed in the literature is conducted. The primary focus is on the investigation of anomalies and the development of significant covariates that contribute to power plant failures. Subsequently, these variables are utilized in logistic regression models to predict operational disruptions, with the best model achieving an accuracy of 96.5%. The study is further enhanced by the application of a machine learning technique – random forests – which attained an accuracy of 98.4%. This research contributes to the more effective management of renewable energy sources, specifically solar power plants, and aids in ensuring their reliable operation over the long term.*

Keywords. solar power plants, modelling, statistical analysis, machine learning.

Acknowledgments

We gratefully acknowledge the guidance and support of our project supervisor, Assoc. Prof. Dr. Ruta Levulienė, throughout this work.

References

- Statista. (2025). *World power consumption*. <https://www.statista.com/statistics/280704/world-power-consumption/>.
- EMBER. (2024). *World passes 30% renewable electricity milestone*. <https://ember-energy.org/latest-updates/world-passes-30-renewable-electricity-milestone/>.
- PVcase. (2024). *PV plant performance: challenges and solutions for largescale solar projects*. <https://pvcase.com/blog/pv-performance#factors-influencing-pv-plant-performance>.