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Implementation on Solar Forecasting Analysis based on Regression Analysis and Classification Technique using Machine Learning

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Abstract: ***As a case study the authors use meteorological data for a real operated solar power plant. The improvement of solar power plant output prediction will significantly simplify power system operation mode planning taking into market procedures and active power generation reserves allocation. As results of regression modelling the statistical significance of the meteorological parameters was analyzed. The optimal mathematical formulation of regression model was provided. In addition, the paper gives the idea of empirical cauterization approach, providing significant improvement of prediction accuracy. The results of the verification on real data allow deciding on the applicability of the proposed methods in industrial operation. The proposed solar forecasting analysis used machine learning SVM algorithm to predict the weather forecasting.***

Keywords:Machine Learning, Weather Prediction, Languages and compilers, Optimization, Classification.

I. INTRODUCTION

To achieve the forecasting model for solar power generation we need to have large amount of data to be processed. This data can be obtained from various solar power plants and can be used as dataset for further processing. Dataset should cover maximum parameters such as temperature, humidity, cloud cover, wind speed, power unit generated, date, time, etc. As there is no standard dataset for this, we will be using some dataset as collected data from solar power plants. This data will go through machine learning algorithms and can generate models on which current data and statistics are to be mapped to get predictions as forecasting for desired time period. The energy generation forecasting problem is closely linked to the problem of weather variables forecasting. Indeed, this problem is usually split into two parts, on one hand focusing on the forecasting of solar PV or any other meteorological variable and on the other hand estimating the amount of energy that a concrete power plant will produce with the estimated meteorological resource. In general, the way to deal with this difficult problem is usually related to the spatial and temporal scales we are interested in, which yields to different approaches that can be found in the literature.

Problem Statement:

The rapid increase in solar power plant installed capacity leads to considerable difficulties in terms of power system operation and control, resulting from highly stochastic nature of solar energy harvesting. The paper considers the problem of day ahead solar power plant output forecasting, based on the meteorological data. The improvement of solar power plant output prediction will significantly simplify power system operation mode planning taking into market procedures and active power generation reserves allocation.

SVM can be of two types:

Linear SVM: Linear SVM is used for linearly separable data, which means if a dataset can be classified into two classes by using a single straight line, then such data is termed as linearly separable data, and classifier is used called as Linear SVM classifier.

Non-linear SVM: Non-Linear SVM is used for non-linearly separated data, which means if a dataset cannot be classified by using a straight line, then such data is termed as non-linear data and classifier used is called as Non-linear SVM classifier.

Fig 1. Typical solar PV generation forecasting process

II. PROPOSED SYSTEM

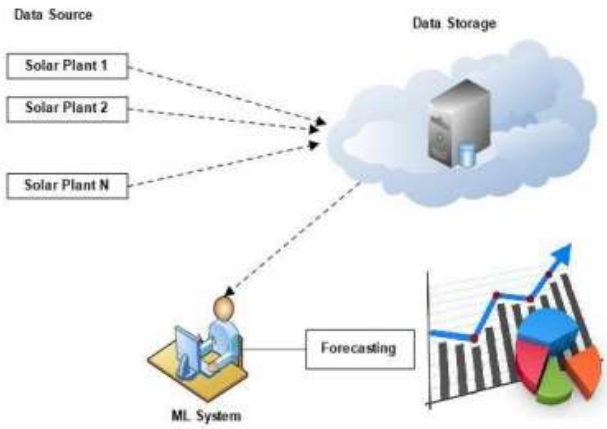

Fig 2. System Architecture

A. Description:

The energy generation forecasting problem is closely linked to the problem of weather variables forecasting. Indeed, this problem is usually split into two parts, on one hand focusing on the forecasting of solar PV or any other meteorological variable and on the other hand estimating the amount of energy that a concrete power plant will produce with the estimated meteorological resource. In general, the way to deal with this difficult problem is usually related to the spatial and temporal scales we are interested in, which yields to different approaches that can be found in the literature.

In this sense, it is useful to classify these techniques depending on the forecasting horizon, so it is possible to distinguish between nowcasting (forecasting 3–4 hours ahead), short-term forecasting (up to 7 days ahead) and long-term forecasting (months, years...). To achieve the forecasting model for solar power generation we need to have large amount of data to be processed. This data can be obtained from various solar power plants and can be used as dataset for further processing. Dataset should cover maximum parameters such as temperature, humidity, cloud cover, wind speed, power unit generated, date, time, etc. As there is no standard dataset for this, we will be using some dataset as collected data from solar power plants. This data will go through machine learning algorithms and can generate models on which current data and statistics are to be mapped to get predictions as forecasting for desired time period.

III. ALGORITHM USED

SVM Algorithm:

1. Collect data of solar power plants in CSV file format
2. Read features of data such as temperature, humidity, cloud cover and wind speed
3. Read date-times for all and divide it in seasons
4. Save features along with power generated at that particular feature as label in a model file
5. Get current data
6. Map with model file
7. Show forecasting predictions
8. The Graph will plot of weather forecast for next 7 days
9. The Graph will energy generation forecast for next 7 days
10. The final result of the total forecasting result will display to the admin

IV. RESULT AND DISCUSSION

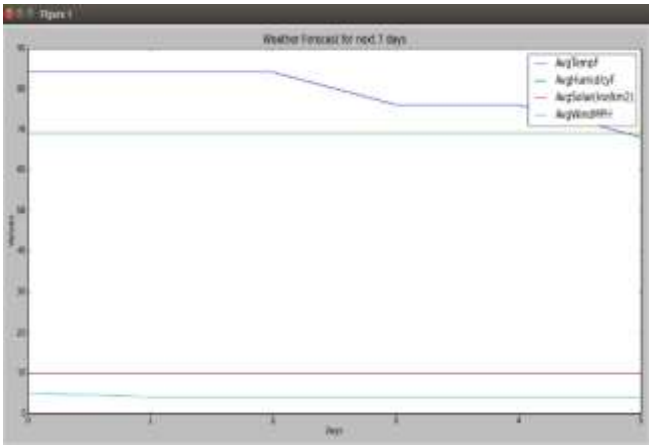

Fig 3. Weather Forecast for next 7 days

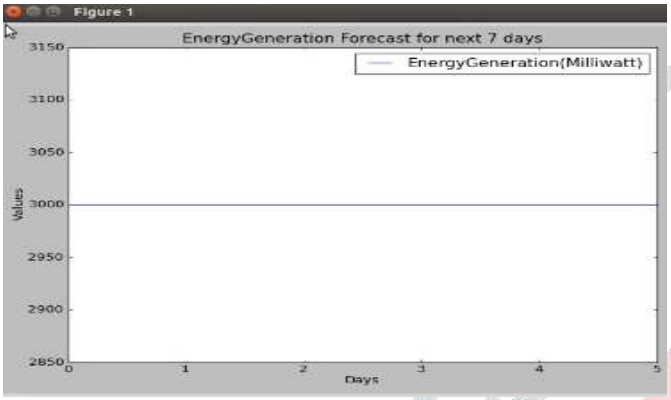

Fig 4. Energy Generation Forecast for next 7 days

V. ACKNOWLEDGEMENT

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VI. CONCLUSION

In this paper, we propose a solar energy forecasting model with Machine Learning algorithm.

In order to train the machine learning model, regression analysis and time series analysis is used.

This system is useful in to improve the efficacy of solar plant.

VII. REFERENCES

[1] Day-ahead Solar Power Plant Forecasting Accuracy Improvement on the Hourly Basis- Denis A. Snegirev, Stanislav A. Eroshenko, Alexandra I. Khalyasmaa, Valeria V. Dubailova, Alina I. Stepanova-2019.

[2] Solar Forecasting using Remote Solar Monitoring Stations and Artificial Neural Networks - Graeme Vanderstar, PetrMusilek, AlexandreNassif- 2018.

[3] Short Term Solar Power Generation Forecasting: A Novel Approach- FatihSerttas, FatihOnurHocaoglu, EmreAkarslan- 2018.

[4] Coherent Probabilistic Solar Power Forecasting- HosseinPanamtash, Qun Zhou- 2018.

[5] Forecasting Day-ahead Solar Radiation Using Machine Learning Approach- M. Z. Hassan, K.M.E. Ali, ABM Shawkat Ali, Jashnil Kumar- 2017.

[6] Learning Solar Flare Forecasting Model from MagnetogramsXin Huang, Huaning Wang, Long Xu, Wenqing Sun- 2017.

[7] Solar Power Forecasting Using a Hybrid EMD-ELM Method- IraniMajumder, Manoja Kumar Behera, Niranjan Nayak2017.

[8] Algorithmic Realization of Short-term Solar Power Plant Output Forecasting- D. A. Snegirev, S. A. Eroshenko, R. T. Valiev, A. I. Khalyasmaa- 2017.

[9] Solar Forecast Reconciliation and Effects of Improved Base Forecasts- GokhanMertYagli, Dazhi Yang, Dipti Srinivasan, and Monika- 2017.

[10] Data-Analytic-Based Adaptive Solar Energy Forecasting Framework- YasharSahraeiManjili, Rolando Vega, Mo M. Jamshidi- 2017.