

Abstract

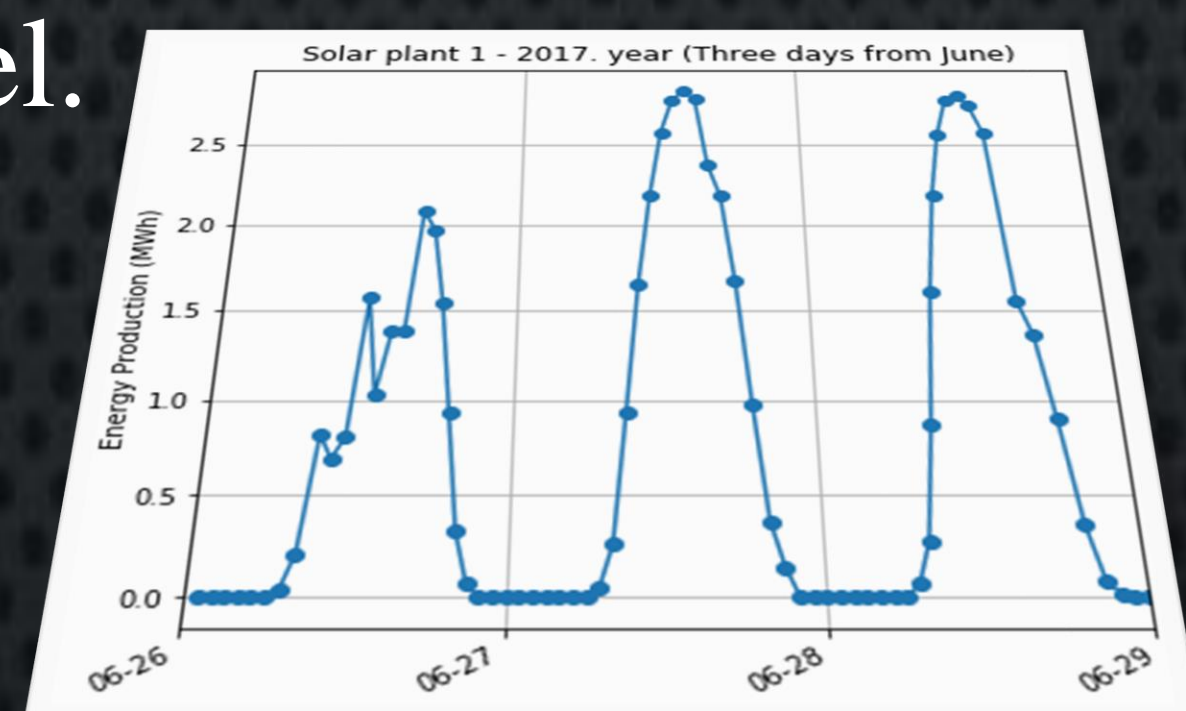
- This paper shows new and contemporary methods for forecasting solar power production for next hour on the basis of the reduced set of data, using machine learning.

Introduction

- One of the critical challenges in transition on renewable energy sources for energy economy is variable nature of these resources.
- Even though that the solar energy is the most widespread available power resource, implementation is still difficult because of its sensitivity to weather conditions.
- In this work, is developed forecasting model for predicting the power output 1 h-ahead of time, based on the information about previous hour.

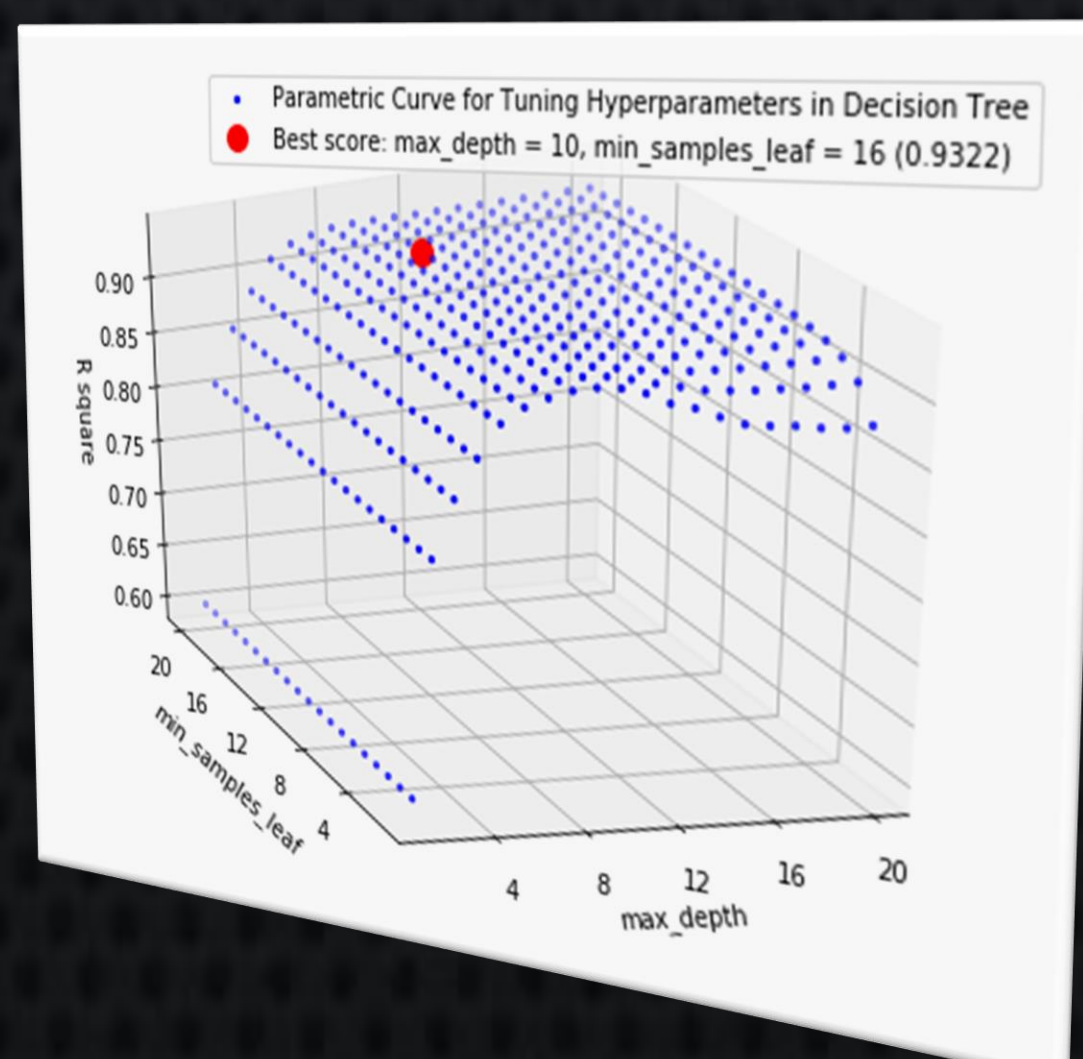
Data Analysis

- The data were collected from three solar power plants in Romania. The time period spans two years period (2017-2018).
- Data were divided into train and test data.
- The main objective is to assess performance of endogenous methodologies in the forecasting of the power output with no external weather influence on forecast model.



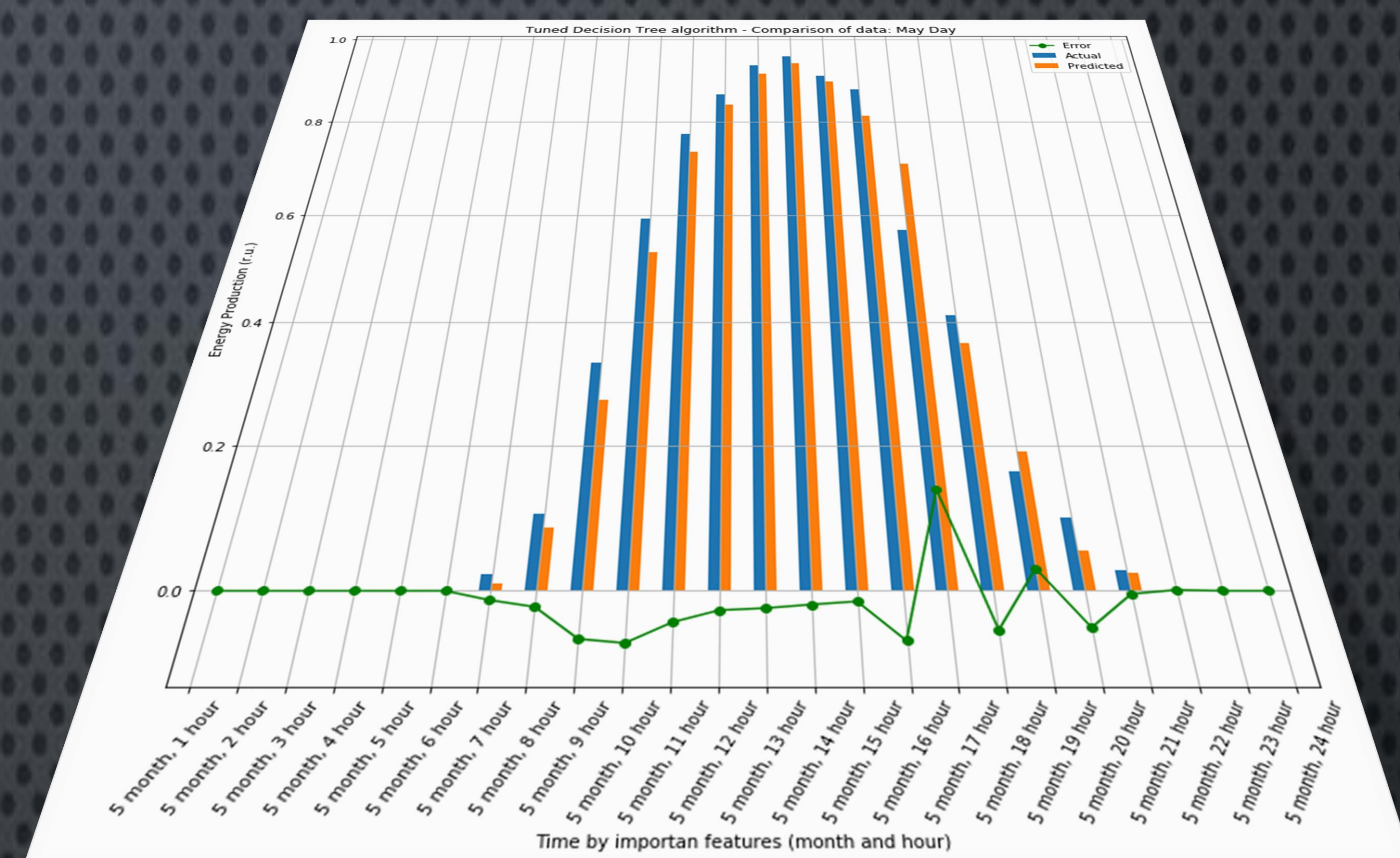
Training Prediction Model

- For model training, machine learning algorithm is used with decision tree regression.
- Data Preprocessing.
- Tuning Hyperparameters.
- Feature Importance.



Algorithm Evaluation

- Regression Accuracy Metrics (*MAE, MSE, R-squared*).
- Cross-Validation technique was applied to make sure machine learning models have a low bias-variance factor.
- Results of test data.



- Comparison of algorithms: In addition, two more algorithms were developed for comparison, *Linear Regression* and *Support Vector Machine*.

Index	Linear Regression	Tree	SVM	Tunned Tree
Root Mean Squared Error	0.0853915	0.0742002	0.0852812	0.0621144
R squared	0.855647	0.891005	0.85602	0.92362
Mean Squared Error	0.00729171	0.00550567	0.00727288	0.0038582
Mean Apsolute Error	0.0503462	0.0320937	0.0722229	0.0267567

Conclusion

- The developed machine learning models can be applied to predict one-hour-ahead PV power generation based on endogenous parameters like date time information and previous hour values of photovoltaic power output.
- Primarily, the purpose of the work is ability to quickly and easily predict an hour ahead for the needs of the market and market agents.
- Future studies will also focus on assessing the performance of machine learning methods in other time-scales and for different types of features.