

Draft

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1 Outline

1.1 Weather forecasting with machine learning

In [1], weather forecasting for predicting solar power production, distributed generation renewable energy.

In [2], framework

1. Data adquisition
2. Data processing (ETL)
3. Semantic rule reasoning layer processes RDF data according the rules and produces inferred data.
4. The learning layer preprocesses the incoming data, extracts relevant features and applies machine learning methods.
5. The actions layer is responsible for evaluating the results produced in learning layer

In [3], subseasonal prediction; timeframes;

1.2 Goal

We need

1. Prediction of wind speed and direction, useful for scheduling production of wind generators.
2. Cloud cover prediction, useful for sizing solar generators.
3. Prediction of frost, rain, and humidity, useful for agriculture.

Our goal: Establish a system of sustained operation over time, able to acquire new data, updating periodically its weights and thus improving its performance.

1.3 Objectives

1. Continuous data acquisition.
2. Development, training and comparison of different models.
3. Inference in different environments (Cloud, notebook, Raspberry Pi).
4. Periodic update of models with additional data.

1.4 Continuous data acquisition

1. Data table (Wind, humidity, pressure, temperature, rain, cloudiness, solar radiation) + Images.
2. Multiple data sources
 - (a) Own weather station
 - (b) API:
 - i. <https://openweathermap.org> (free),
 - ii. <https://insights.spire.com/weather-api> (paid)
 - (c) Historical data available for starters <https://www.smn.gob.ar/descarga-de-datos>
3. Process:
 - (a) Download raw data
 - (b) Pre-processing (cleaning, sorting and formatting)
 - (c) Review (plotting and descriptive statistics)
 - (d) Control dashboard
 - (e) Final processing (data as tensorflow dataset)

1.5 Why is this topic important?

write

1.6 How could I formulate my hypothesis?

write

1.7 What are my results?

write

1.8 What is my major finding?

write

2 Context and structure

2.1 Introduction

write

2.1.1 Why is this research important?

write

2.1.2 What is known about this topic?

write

2.1.3 What are my hypothesis?

write

2.1.4 What are my objectives?

write

2.2 Methods

2.2.1 What is the object of study?

write

2.2.2 What are thw research procedures to apply?

write

2.3 Results

2.3.1 What are the most significant results of this work?

write

2.3.2 What are the supporting results of this work?

write

2.4 Discussion and conclusion

2.4.1 What are the major findings of this work?

write

2.4.2 What is the significance of these findings?

write

References

- [1] N. Sharma, P. Sharma, D. Irwin, and P. Shenoy, “Predicting solar generation from weather forecasts using machine learning,” in *2011 IEEE international conference on smart grid communications (SmartGridComm)*, pp. 528–533, IEEE, 2011.
- [2] A. C. Onal, O. Berat Sezer, M. Ozbayoglu, and E. Dogdu, “Weather data analysis and sensor fault detection using an extended iot framework with semantics, big data, and machine learning,” in *2017 IEEE International Conference on Big Data (Big Data)*, pp. 2037–2046, Dec 2017.
- [3] J. A. Weyn, D. R. Durran, R. Caruana, and N. Cresswell-Clay, “Sub-seasonal forecasting with a large ensemble of deep-learning weather prediction models,” *Journal of Advances in Modeling Earth Systems*, vol. 13, no. 7, p. e2021MS002502, 2021.