Solar Energy: Intelligent Green Energy

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Solar Energy

Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis..

Figure 1. A figure caption.

The potential solar energy that could be used by humans differs from the amount of solar energy present near the surface of the planet because factors such as geography, time variation, cloud cover, and the land available to humans limit the amount of solar energy that we can acquire.

Solar Energy and IoT

Solar power is important for many scenarios of the Internet of Things (IoT). Resource-constrained devices depend on limited energy budgets to operate without degrading performance. Predicting solar energy is necessary for an efficient management and utilization of resources. While machine learning is already used to predict solar power for larger power plants, we examine how different machine learning methods can be used in a constrained sensor setting, based on easily available public weather data. The conducted evaluation resorts to commercial IoT hardware, demonstrating the feasibility of the proposed solution in a real deployment. Our results show that predicting solar energy is possible even with limited access to data, progressively improving as the system runs.

- the past decade, the cost of solar has fallen dramatically.
- New technologies promise to increase efficiency and lower costs further.
- Solar energy will soon be unbeatable compared to fossil fuels.

Future of Solar Energy

Solar energy has come a long way in a decade. Back in 2010, the global market was small and highly dependent on subsidy regimes in countries such as Germany and Italy. This year there will be more than 115 gigawatts (GW) of solar installed across the world, which is more than all other generation technologies put together. It is also increasingly low cost, especially in sunnier regions where it has already become the lowest-cost form of new electricity generation. In the coming years, technology improvements will ensure that solar becomes even cheaper. It could well be that by 2030, solar will have become the most important source of energy for electricity production in a large part of the world. This will also have a positive impact on the environment and climate change.

Big Data and Solar Energy Are a Match Made in Heaven

As awareness of climate change grows, one thing has become exceedingly clear: Using energy generated by renewable sources is crucial to reducing harmful greenhouse-gas emissions. And while energy sources like wind and solar are increasingly valuable in this effort, they can be unpredictable and intermittent.

1. How much energy will any single panel or solar plant contribute to the grid on any particular day?

This is where big data comes in. Through an amazing mix of weather data, satellite feeds, predictive analytics and machine learning, we're entering a future where renewable power can reach the grid on a reliable and much more consistent basis. In fact, the latest forecasting technology may be the missing puzzle piece in the widespread adoption of solar energy.

Time Series Forecasting

A time series is data collected periodically, over time. Time series forecasting is the task of predicting future data points, given some historical data. It is commonly used in a variety of tasks from weather forecasting, retail and sales forecasting, stock market prediction, and in behavior prediction (such as predicting the flow of car traffic over a day). There is a lot of time series data out there, and recognizing patterns in that data is an active area of machine learning research!

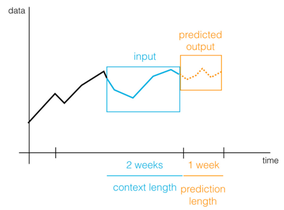

Figure 2. Pair of adjacent context and prediction.

Energy Consumption Data

Using IoT sensors in many areas to measure consumed energy, data represents power consumption collected over several years from 2006 to 2010. With such a large dataset, we can aim to predict over long periods of time, over days, weeks or months of time. Predicting energy consumption can be a useful task for a variety of reasons including determining seasonal prices for power consumption and efficiently delivering power to people, according to their predicted usage.

Training and Testing

There is a lot of data, collected every minute, and so we could go on different ways switch analysis,It depends on whether you want to predict time patterns over a day/week or over a longer time period, like a month. We can visualize what these analysis look like, by plotting the train/test series. We should see that the test series contains all of our data in a year, and a training series contains all but the last prediction points.

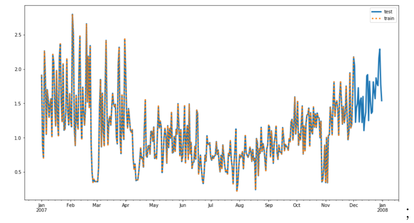

Figure 3. Training and Test Series.

the moment to launch the training job, start training the model and save the trained model.

Deployment and Create a Predictor

Machine Learning Model Deployment is not exactly the same as software development. In ML models a constant stream of new data is needed to keep models working well. Models need to adjust in the real world because of various reasons like adding new categories, new levels and many other reasons. Deploying models is just the beginning, as many times models need to retrain and check their performance. So, using serverless deployment can save time and effort and for retraining models every time, which is cool!

Visualize some model's prediction and actual result:

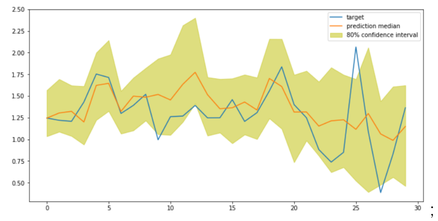

Figure 4. Predicting the Future.

References

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