HACKDAY@IFIC - 27/02/2020

**PREDICTING RENEWABLE ENERGY OUTPUT AND CONSUMPTION**

horizontal line

# Placeholder image

# Introduction

This is the first of AI@IFIC hackdays, this time focusing on an issue important to climate change, the accurate prediction of variable energy sources such as wind and solar.

During this half-day we will explore the use of Machine Learning techniques to forecast variable low-carbon energy sources. We will start by using data sources from a small town with a small solar plant in [documents](https://drive.google.com/drive/folders/1FHrBPNFQzbBVAM0P717KGAtmbru5JUdl?usp=sharing). The idea is to correlate them with weather measurements and projections to predict future production with methods such as RNNs and LSTMs as well as regular NNs.

## How to Start :

1. If not done, please register in Google Colab and/or setup their computers to run jupyter notebooks and conda.
2. Copy files in [documents](https://drive.google.com/drive/folders/1FHrBPNFQzbBVAM0P717KGAtmbru5JUdl?usp=sharing) to your drive
3. Make a copy of the sample Colab Notebook [Renewable](https://colab.research.google.com/drive/18arx8qgJtpjPKK3G22hMv2omFj0OoROD)
4. Test notebook.

## Files :

* **Meteo.csv** : contains meteorological information from a weather station close to the solar panels and the town. Information is quite self explanatory, see Colab table, units are in US standard units.
* **Datos\_solar\_y\_demanda\_residencial.xls** : excel file with data from a solar plant, a rooftop test photovoltaic cell (*PV2 Parque*) and the consumption from the town (*Demanda*).

### Goals :

Prediction of both production and consumption using available data. Specifically :

* Train a NN (LSTM, RNN) to make predictions, e.g. for the next hour.
  + Which is your best loss (use “mean absolute error” as measure) for the validation dataset?
  + Additionally, measure your accuracy as :
    - rmse = sqrt(mean\_squared\_error(test, prediction))
    - print('Test RMSE: %.3f' % rmse)
  + How long can you extend the prediction without losing accuracy?
  + Explore the issue of how the length of past history impacts the accuracy, e.g. using data for the last week helps predicting the next 24hrs.
  + Explore different NN configurations.
* How can you apply these predictions (NNs) to weather forecasts?
* Robustness: Explore how introducing fake error bars in the meteorological values affects the accuracy.
* Explore other possible measurements, such as ‘cloud cover’, ‘soil temperature’ etc.

As a benchmark, we would expect your model to predict consumption with an error of around 1-2% overall.

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**ALTERNATIVE PROJECT, or if you want to go further**

As an alternative project, participants may want to dwell into this Kaggle dataset

<https://www.kaggle.com/nicholasjhana/energy-consumption-generation-prices-and-weather>

And a good example of how to mine it is here

<https://www.kaggle.com/nicholasjhana/univariate-time-series-forecasting-with-keras>

Although the user posting this ‘solution’ hasn’t used the weather data. His results are really good nonetheless, as the dataset had several years (2015-2018) and not just one like the Aras de los Olmos dataset.