

# Deep learning solar irradiance forecast from short-term to long-term.

Interested in deep learning, industrial processes and applied research? This internship is made for you!

The Transvalor-SoDa team maintain a solar irradiance database from 2004 up to today and developed a solar forecast method based on satellite images. The method proved its success on local tests and now required to be run on large areas or even on the whole image. This first network provides a reliable forecast for the next hours.

Another deep learning network is used to improve numerical weather prediction (NWP) forecast up to 7 days. This method needs to be tested and validated toward measurements.

How about to join together these forecasts and provide to customers the best forecast for each horizon? You can build up your solution with us!

## Who are we?

The Transvalor-SoDa is a 8 members team focusing on solar radiation mainly using satellite data to reliably provide (99.9% of the time) a real time database to hundreds of customers. More than 100 million requests are made on our servers a year. We are based in Sophia-Antipolis, south of France.

## For what purpose?

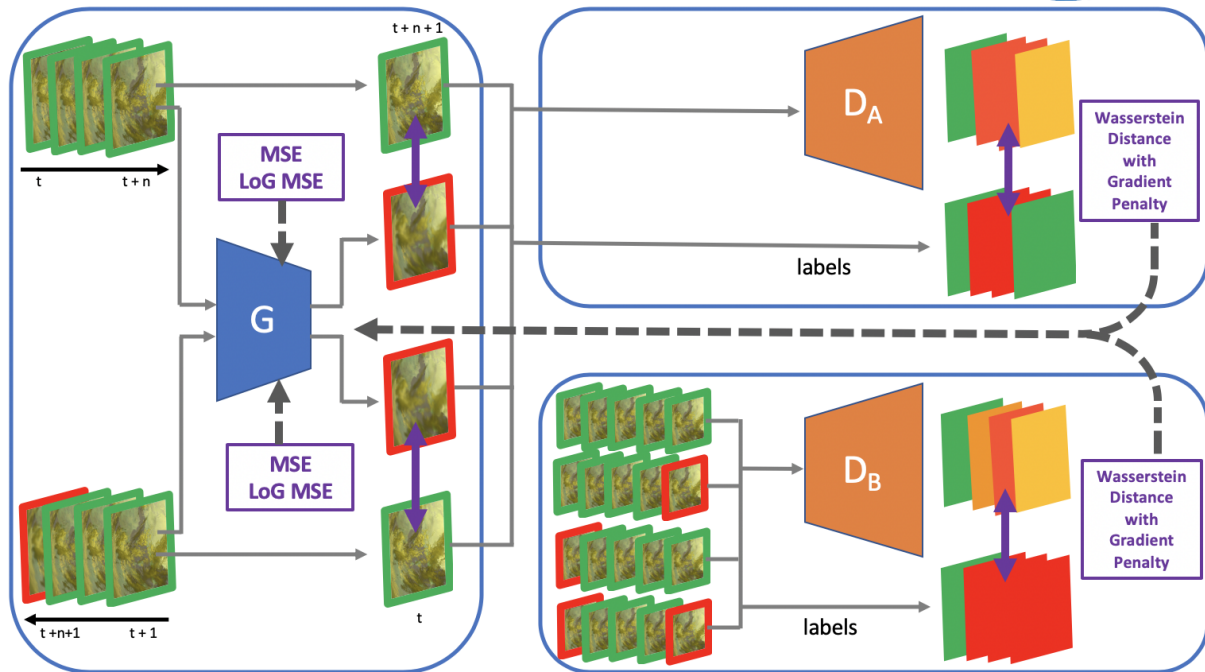
There is a growing need in solar and power forecasting to maintain the power grid in good operation. Particularly for new plants submitted to energy market energy selling constraint as well as for solar plants in isolated area (island for example) where storage is mandatory. Since solar irradiance is the key input to estimate the power output of solar systems it is important to focus on forecasting solar irradiance.

Several methods are already in operation on SoDa server: simple method for short term forecast or machine learning methods for medium range forecast and NWP for long range forecast. Methods using image processing (motion flow) and deep learning methods are on the shelf waiting for you!

## Practically

The work will be separated in three steps. The first is to use a deep learning method to improve spatio temporal resolution of NWP. This step uses a 'standard' convolutional neural network and a method presented in Stengel et al. (2020).

The second step is to continue the work on the GAN method setup over Europe (see figure here after). This network predicts the next few images of Meteosat using past data of 3 channels (VIS1, VIS2, IR09) of Meteosat Seviri available from 2004 to nowadays. The database is 13 TB. Extend the current model to other location or apply it to the whole MeteoSat image area which could require research and test of new methods.



The final step if the previous are successful is to combine all of the forecast methods together to obtain the best forecast from short term to long term. This step can be a simple RMSE combination or another neural network fitting the best parameters given the situation.

This offer is for a 6 month internship. SoDa works in strong relationship with MINES ParisTech research lab OIE therefore meetings and discussions can be conducted with them.

### Required skills

This work will be done mainly in Python. Knowledge of python is then mandatory. Existing network is coded in PyTorch. A good knowledge of deep learning (LSTM, GAN etc) is strongly recommended. A high rigor in data processing and statistics is also required. It will require manipulating big dataset so a basic knowledge in big data can be a plus. The successful candidate has to be autonomous.

Given current sanitary conditions the internship kick off could be distant.