# NextWind

Le Wagon - Data Science program - Batch 704

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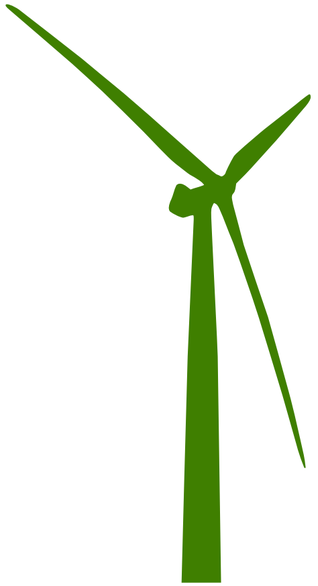
# Use case



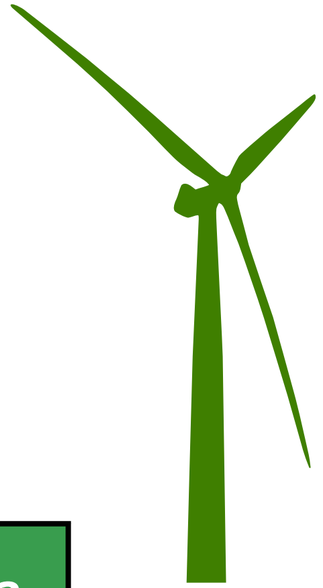
Predict wind energy production to optimize

**Grid management due to wind turbines intermittency**

**Operations and maintenance**

**Battery charge/discharge cycle**

# Data Sourcing



**Turbine Data**

**Wind Speed**

**Wind Direction**

**Pitch & Yaw**

**Energy**

**Target**

**Turbine Direction**

**Weather forecast data**

**Wind Speed**

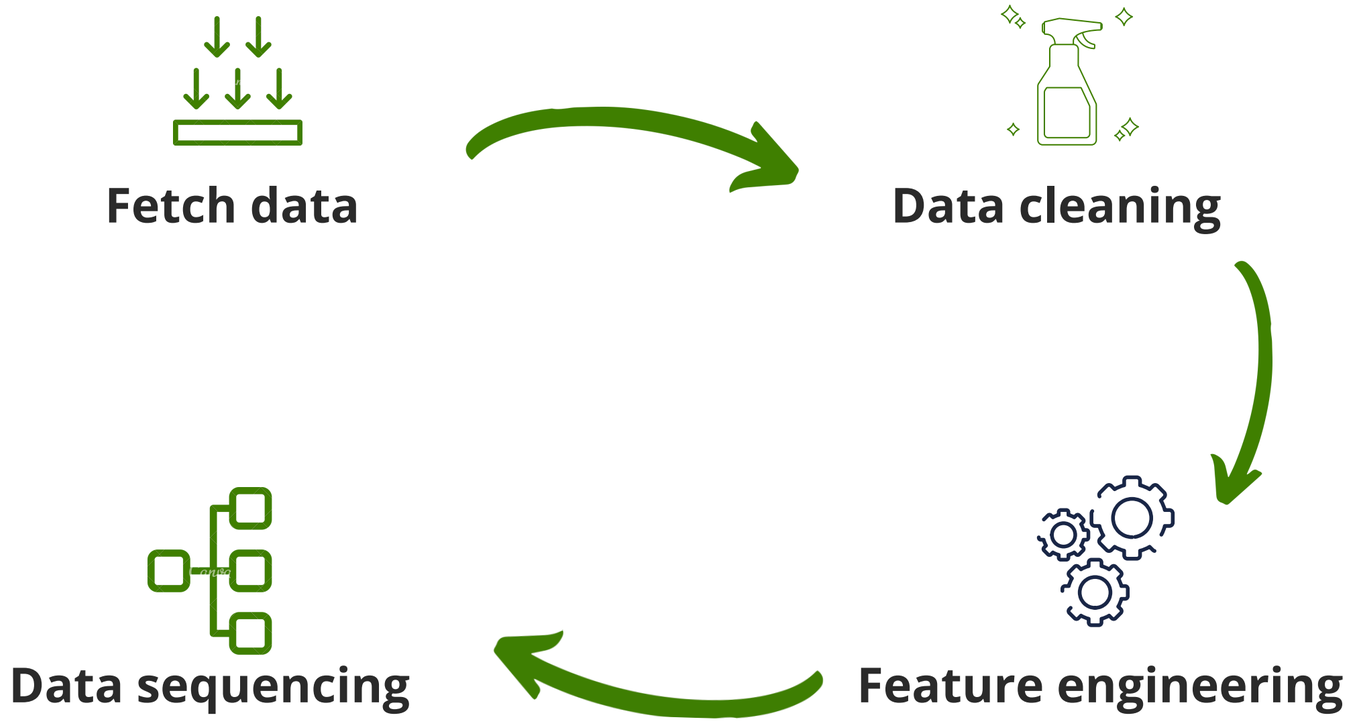
**Temperature**

+

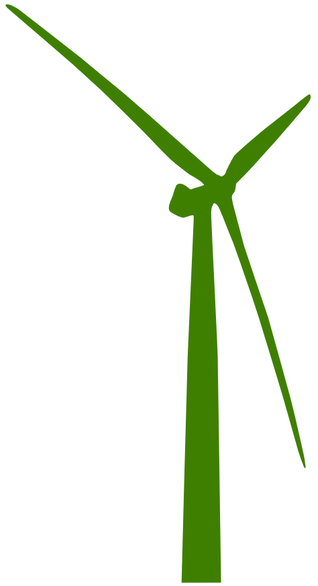
**Wind Direction**

**Humidity**

# Preprocessing



# Preparing the data for a time series model



**RNN models allow for timeseries data as inputs.**

**Example of a sequence:**

Historical data

| 0 | 1 | 2 | 3 | ... | ... | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|

3 x 24hr

\+

Wind Forecast

| 73 | 74 | 75 | 76 | 77 | 78 |
|---|---|---|---|---|---|

=

Energy output

| 73 | 74 | 75 | 76 | 77 | 78 |
|---|---|---|---|---|---|

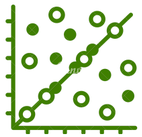
6hr

**x ~2 years**
**x 25 turbines**
**=**
**6,750 sequences**

# Models tested

FB Prophet

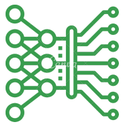
Linear Regression

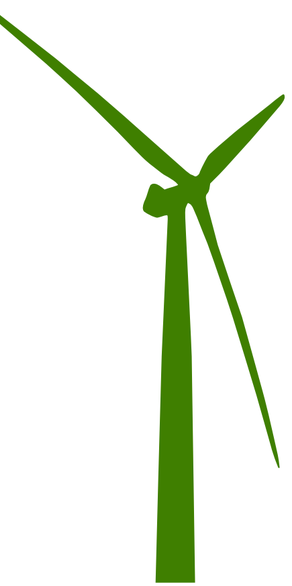


Autoregressive model

Memory Neural Network

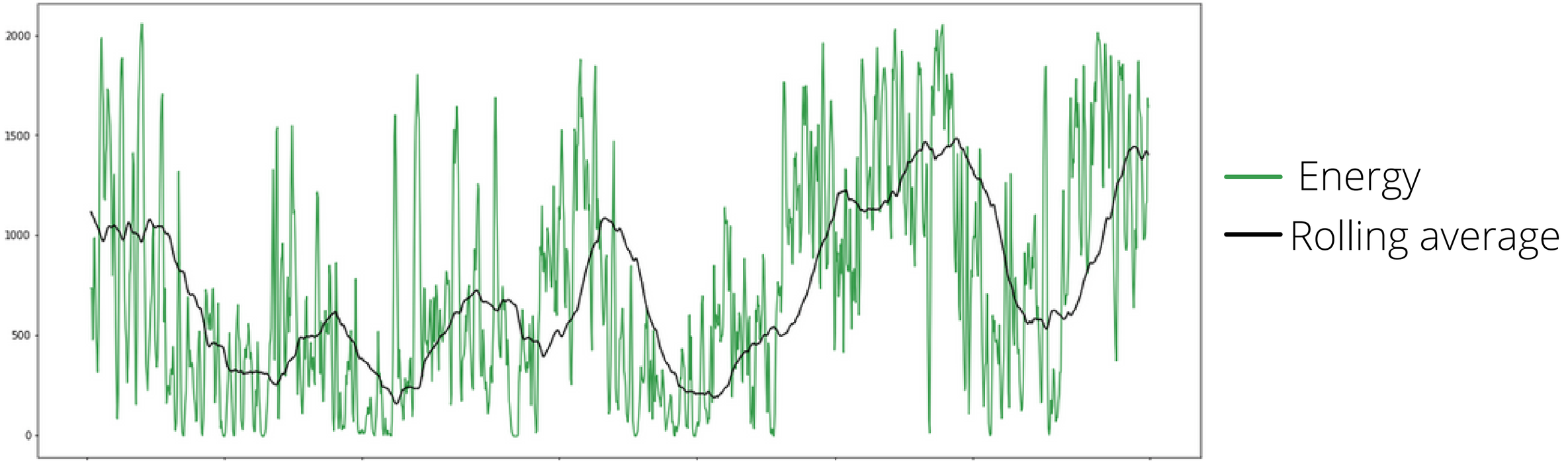
Classification with LSTM





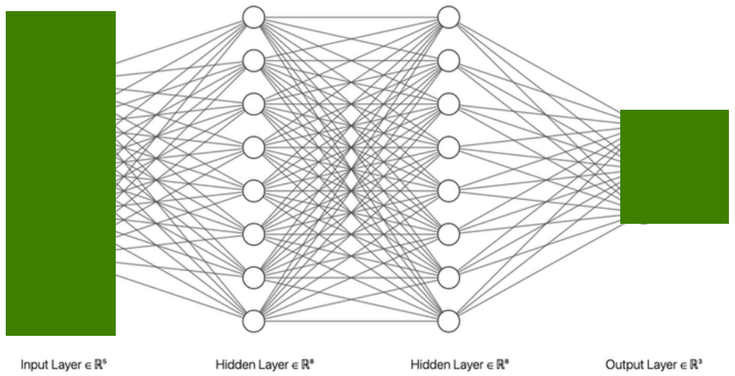
# Baseline

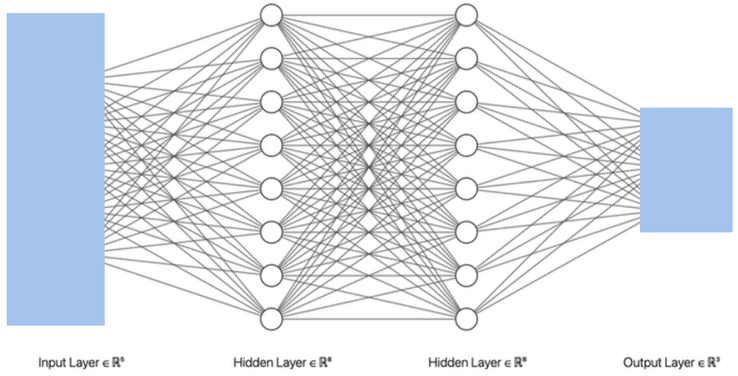
**Rolling average of the produced electricity from the last 6 hours to predict the 6 future hours**



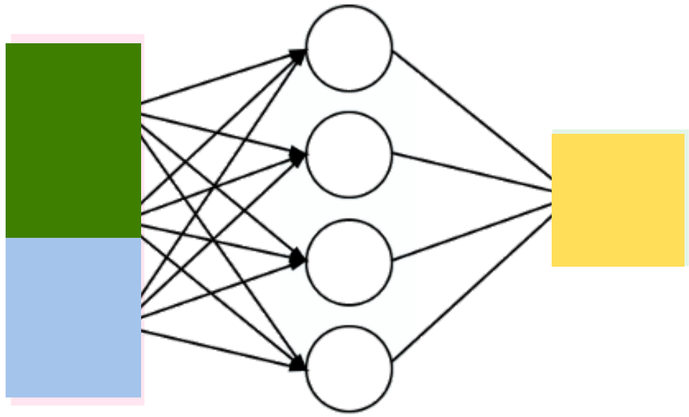
# Our hybrid model

**Historical performance  model**

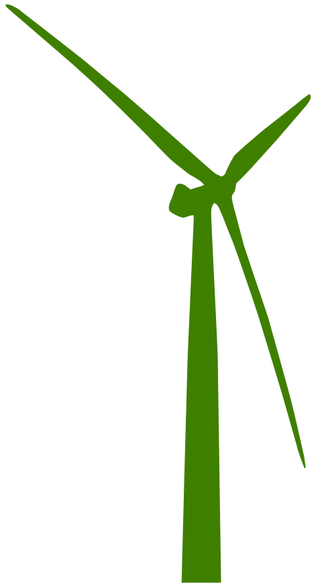



**Weather Forecast**



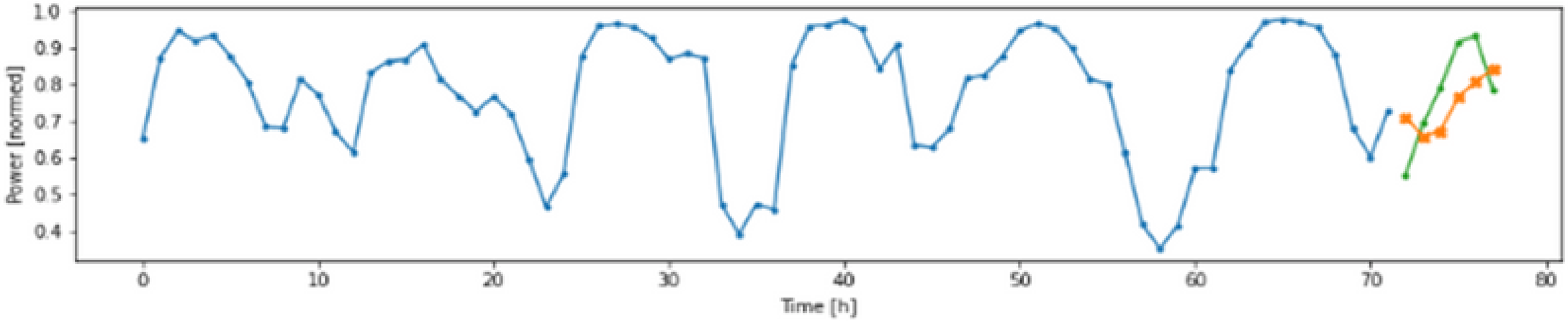
**Energy Forecast model**



# Results

## Regression models

**Historical energy** **Target** **Prediction**

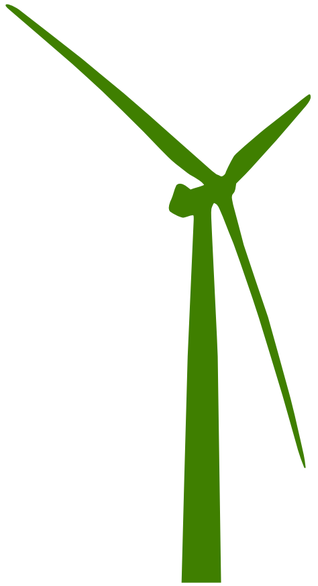



3 days

6 hours

# Results

## Classifier models



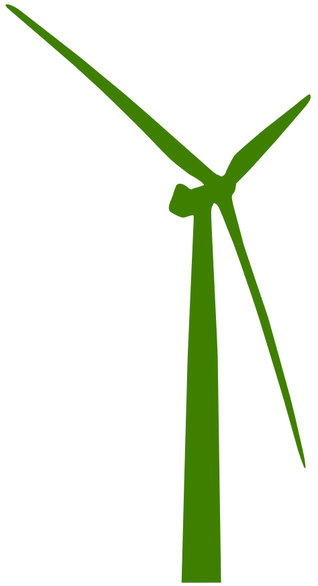
| Actuals \ Predicted | Low | Medium | High |
|---|---|---|---|
| Low | 252 | 43 | 45 |
| Medium | 88 | 240 | 104 |
| High | 1 | 93 | 484 |

**Accuracy:**
**Proportion of results which are correct**

**72%**

# Results

## Classifier models



| Actuals \ Predicted | Low | Medium | High |
|---|---|---|---|
| Low | 252 | ... | 45 |
| Medium | 88 | ... | 104 |
| High | 1 | ... | 484 |

**Precision:**
**Proportion of results which are NOT false alarms**

**76%**

# DEMO

A huge thanks to all the teacher team and all teacher assistants for this six-month journey !