ABOUT THE DATA

🗄 **Dataset:**

Offer – Demand Dataset provided by Dr. Guillaume Koechlin*
The data have been collected by Gestore dei Mercati Energetici (**GME**)

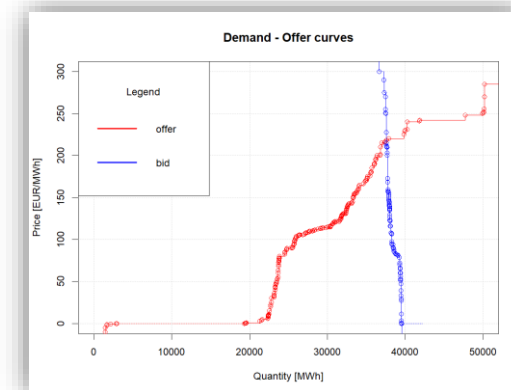Time Period: **2007 - 2024**

Data Features:

Fixing | 📅 **Day** / ⏱ **Hour** / 🧭 **Zone** | we obtain a subdataset | 🔋 **Quantity** [MWh] / € **Price** [€/MWh] / 📉 **Type** ∈ {OFF, BID} | ➡

Demand - Offer curves

* PhD candidate in Data Analytics and Decision Science, Dept. of Mathematics - MOX Lab, Politecnico di Milano

THE GOALS

➢ **ANALYSIS OF THE ENVIROMENT:**
  - Identify **trends** and **tendency** in the Electricity Market
  - Identify which **factors** can be significant in determining the final price.

➢ **PREDICTION:**
  - **Predict** both curves of Suppy and Demand for the next day, given the observed curves in the previous time instants.

DATA PREPARATION

NONPARAMETRIC REGRESSION

FUNCTIONAL INFERENCE

FUNCTIONAL PREDICTION

- **Data Processing**
  Period of interest: 2023-2024
  Zones of interest: All together

- **Data Exploration**
  Exploration using summary variables
  Detect missing observations
  Set a specific time slot
  Kernel density estimation on a subset of curves

DATA PREPARATION

NONPARAMETRIC REGRESSION

FUNCTIONAL INFERENCE

FUNCTIONAL PREDICTION

- **Time-Series Regression**
  Fourier Basis smoothing with roughtness penalty and equispaced knots

- **Suppy-Demand Curves Smoothing**
  Smoothing with Basis Expansion
  Local Avereges
  Local Polynomials

- **Functional Data Exploration**
  Exploration on the functional representative of the supply-demend curves

DATA
PREPARATION

NONPARAMETRIC
REGRESSION

**FUNCTIONAL
INFERENCE**

FUNCTIONAL
PREDICTION

- **Functional Inference on Time-Series Functions**
  Local inference on the time-series smoothed functional
  representative in different embedded spaces
  The aim is to detect trends on a **yearly** scale

- **Functional Inference on Supply-Demand functional
  representative curves**
  Local inferece on the the supply-demand smoothed
  functional representative
  The aim is to detect trends on a **daily** scale

DATA PREPARATION

NONPARAMETRIC REGRESSION

FUNCTIONAL INFERENCE

FUNCTIONAL PREDICTION

- **Auto Regressive Functional Model**
  Implement an autoregressive functional model to predict the unobserved supply and demand curve for the next day, hence predict the new equilibrium price at which the energy is exchanges

  This part might require to consider proper methods to treat missing functional observation.
  IDEA: AR(1) and Adjustment (?)