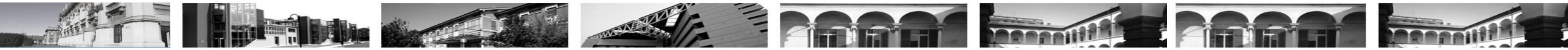
POLITECNICO
MILANO 1863



Offer-Demand Dataset

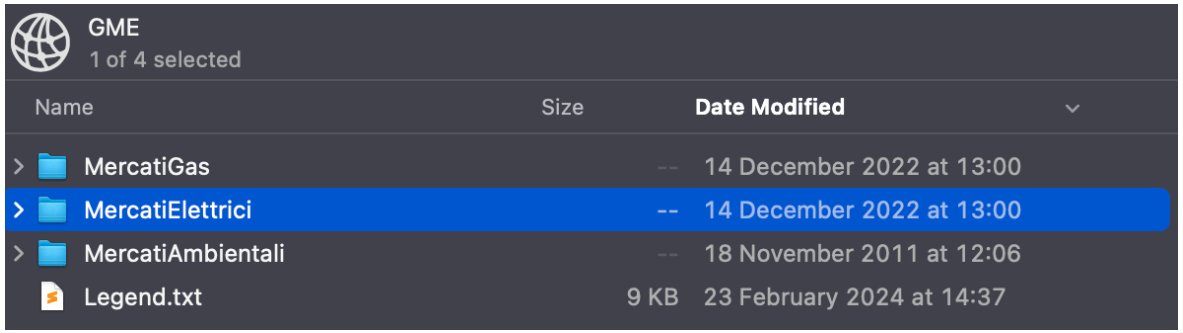
Applied Statistics Project

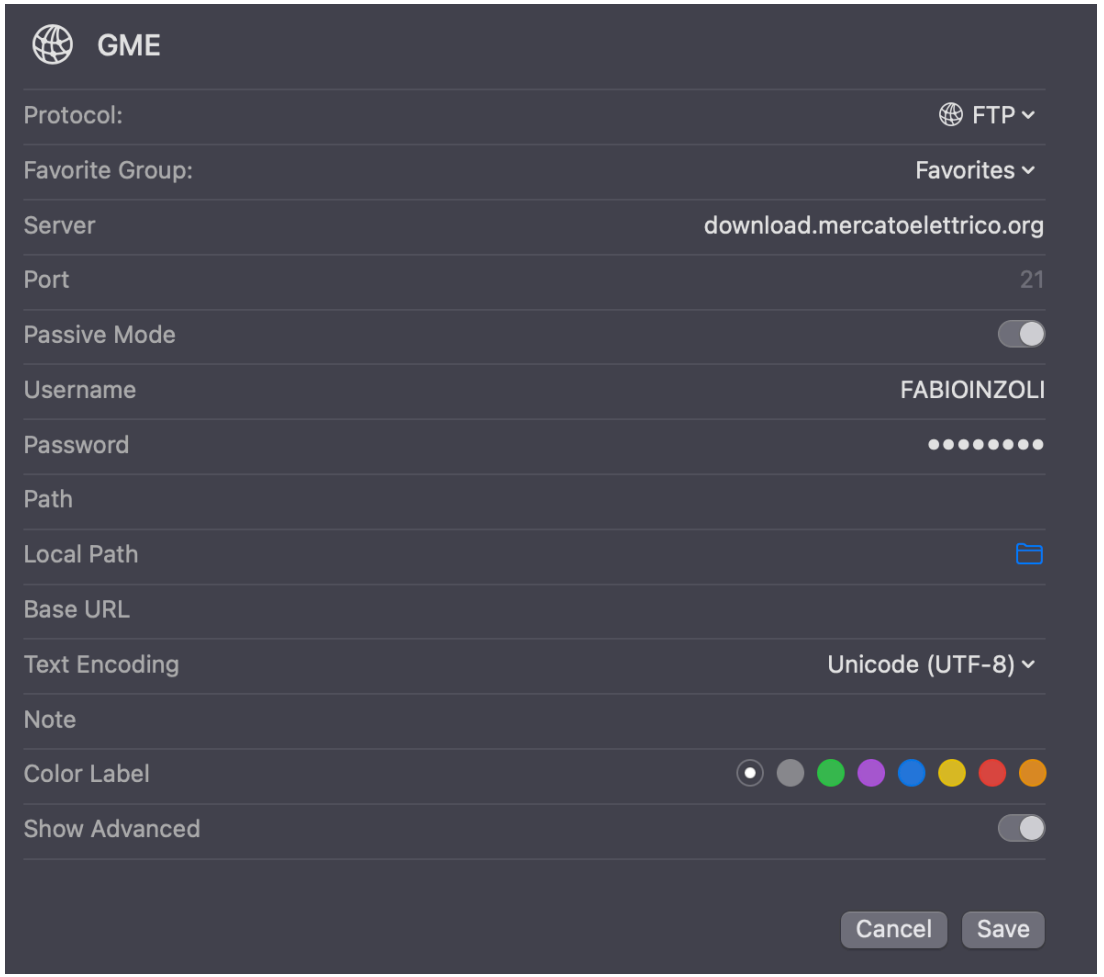
12/03/2024

guillaume.koechlin@polimi.it

Data Access > GME FTP server

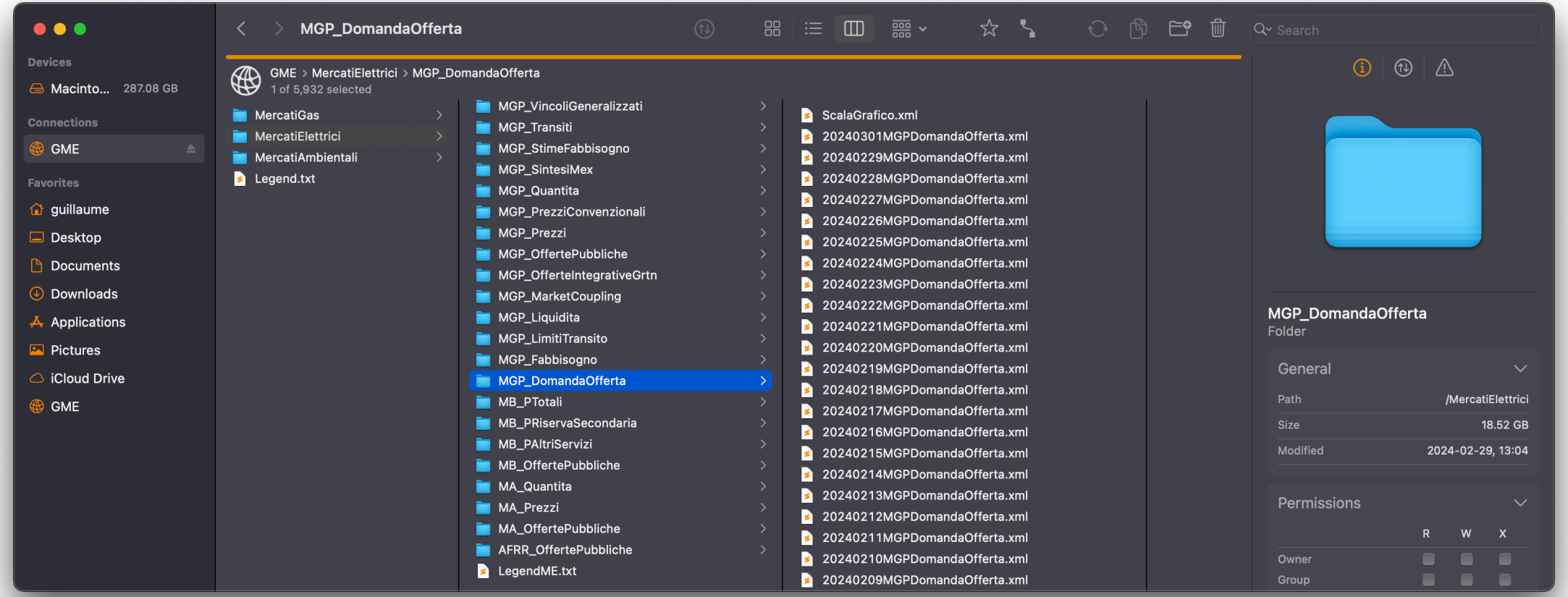
1. Download FTP client (FileZilla, Cyberduck, Forklift)
2. Connect to GME FTP server:
   - Protocol: FTP
   - Host: download.mercatoelettrico.org
   - Username: FABIOINZOLI
   - Password: *sent by mail*
3. You can now navigate on GME data repository





Data Access > *DomandaOfferta* dataset

- Daily XML files: `/MercatiElettrici/MGP_DomandaOfferta/<YYYMMDD>MGPDomandaOfferta.xml`



Data Description

- Each XML file contains the 24 hourly pairs of supply and offer curves
- Each line corresponds to either an offer or a demand bid
- Scheme:
  - `Data`: Date in the `YYYYMMDD` format
  - `Ora`: Hour
  - `Mercato`: Market concerned (constant equal to MGP in our case)
  - `ZonaMercato`: Pool of market zones participating to the same auction
  - `PrezzoZonale`: Market Clearing Price (careful it is not exactly the intersection point of the offer and demand curves, the foreign exchanges should be also considered -> ignore it for now)
  - `Quantity`: [MWh] Quantity associated to the bid
  - `Prezzo`: [€/MWh] Bid price
  - `Tipo`: Bid type, `OFF` for offer bid and `BID` for demand bid

Collaboration

- Altogether
- Meetings every three weeks (slot to decide)
- Slides preferred, code if necessary
- Shared OneDrive folder for file exchange (link sent by mail)

Theoretical Material > Didactical

- Lectures of the course on Functional Data Analysis (6h) - Can be followed in anticipation with the recordings of last year
- Ramsay, J. O., Silverman, B. W., *Functional Data Analysis,* Second Edition (2005)
- Ramsay, J. O., Silverman, B. W., *Applied Functional Data Analysis: methods and case studies* (2002)
- Ramsay, J. O., Hooker Giles, Graves Spencer, *Functional Data Analysis with R and MATLAB* (2009)

Theoretical Material > Papers (to be considered in a second time)

- Rob J. Hyndman, Han Lin Shang, **Forecasting functional time series,** *Journal of the Korean Statistical Society,* Volume 38, no. 3, 2009, Pages 199-211, doi:10.1016/j.jkss.2009.06.002
- Antonio Canale, Simone Vantini, **Constrained functional time series: Applications to the Italian gas market**, *International Journal of Forecasting*, Volume 32, Issue 4, 2016, Pages 1340-1351, ISSN 0169-2070
- Florian Ziel, Rick Steinert, **Electricity price forecasting using sale and purchase curves: The X-Model**, *Energy Economics*, Volume 59, 2016, Pages 435-454, ISSN 0140-9883
- Shah I, Lisi F. **Forecasting of electricity price through a functional prediction of sale and purchase curve**s. *Journal of Forecasting*. 2020; 39: 242–259
- Ciarreta, Aitor, Blanca Martinez, and Shahriyar Nasirov. **Forecasting Electricity Prices Using Bid Data**. *International Journal of Forecasting* 39, no. 3 2023: 1253–71.
- Niccolò Ajroldi, Jacopo Diquigiovanni, Matteo Fontana, Simone Vantini, **Conformal prediction bands for two-dimensional functional time series**, *Computational Statistics & Data Analysis*, Volume 187, 2023, 107821, ISSN 0167-9473

Prospective Workflow

1. Processing
    - Focus on last 2 or 5 years
    - Consider only the pool where all the zones are present
2. Exploratory Data Analysis
    - Treat hours separately (so consider daily time series)
    - Look at similarities within day type, month
3. Functional Data Analysis
    - Smoothing
    - Functional Principal Component Analysis
    - K-means
4. Correlation with external variables (Gas price, load and renewable generation forecast)
5. Functional (Auto)Regression models

Distribution of the work

For now, one group will focus on the **offer** curves, and the other one on the **demand** curves