Capgemini test: forecasting water levels

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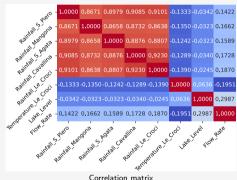
Software

- Written in Python and available on GitHub
- Used standard libraries:
 - Pandas
 - Seaborn
 - Statsmodels
- One class for the data set (with methods for plotting and split data into train/test)
- Some functions for the statistical models
- Everything is documented within the code (it should be Doxygen friendly as well)

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Data set

- Chosen Lake Bilancino
- Two target variables:
 - I ake level
 - Flow rate
- Most variables missing before 01/01/2004
 - \Rightarrow removed (\sim 8% of the total)
- Missing data not replaced^a



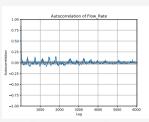
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^aApplied an interpolation only when computing the autocorrelation.

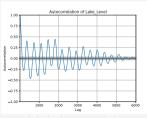
Forecasting strategy

- Simple AutoRegressive (AR) model
- 2 More complex AutoRegressive Integrated Moving Average (ARIMA) model
- Multivariate analysis (not implemented)

Both models used in this project require to setup the lag. ⇒ chosen from autocorrelation plots.



Flow rate - autocorrelation

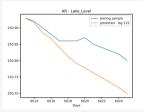


Lake level - autocorrelation

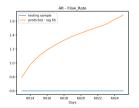
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Predictions - 13 samples

AutoRegressive model

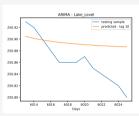


Lake level

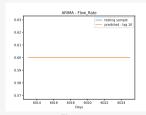


Flow rate

ARIMA model



Lake level



Flow rate

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Conclusions

- Implemented a toy script to compute AR and ARIMA algorithms
- Both algorithms showed better performance on Lake_level
- The behavior of Flow_rate requires additional investigation Optimizing ARIMA's parameters might improve performance

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Thank you for your attention