



PHD PROFILE, III YEAR STUDENTS, A.A. 2022/2023

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- A Deep Framework for time series forecasting
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OUTLINE OF THE RESEARCH

Time series analysis has always been of enormous interest by the scientific community, this is due to the fact that they are an integral part of a variety of different applications, to name a few:

climate modeling, biological sciences, medical field, in commercial or industrial decision making, and finance.

While traditional methods have focused on parametric models based on domain experience, such as *autoregressive (AR), exponential smoothing or structural time series models*, modern *Machine Learning (ML)* methods provide a means to learn temporal dynamics in a purely data-driven manner.

Due to the increased availability of today's data, *ML* has become central to the next generation of time series prediction models. In particular, *Deep Learning (DL)* has gained popularity because *Neural Networks (NNs)* can exploit features of datasets to obtain complex representations of the data, alleviating the need for manual feature and model design.

Given the diversity of time series problems across domains, many *NN* design choices have emerged, and this is where my research project stems from:

to make available a framework based on deep networks to make predictions on generic time series effectively and efficiently.

Since time series are used in a variety of domains, I will focus on analyses inherent to *Industry 4.0* (e.g., data from sensors to perform predictive maintenance of industrial plants) and in the *financial domain* (e.g., time series inherent to stock market indices to predict possible purchases or sales, providing portfolio optimization support).

In conclusion, the main contribution of my research will be the release of a proposed *fully modularizable and customizable time series forecasting framework*; it will be evaluated in modern industrial scenarios as a way to minimize downtime and failure rate for various equipment and in the *Financial Technology (FinTech)* field to predict market trends, providing indication of buying or selling of particular stocks or assets, through the combination of *Artificial Intelligence (AI)* approaches and techniques.