

ICT PHD

Research project for a PhD curriculum in ICT – Electronics and Telecommunication

Tutor: Prof. Giovanni Simonini

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() Foreign Co-tutor:**

Proposed Title of the research:

Multidimensional Time Series Analysis Integrated with Local Language Models for Advanced Operational Support Systems

Keywords: (5)

Time Series Analysis; Local Language Models; Industrial Monitoring; Operational Support; Predictive Diagnostics

Research objectives: --(max 10 rows)

The project aims to study advanced methods for the analysis of multidimensional time series in industrial settings, with a focus on their integration with local language models for operational support. The main objective is to support monitoring, diagnostics, anomaly interpretation, and decision-making by combining temporal data from machines, sensors, and processes with language-based reasoning and interaction capabilities. The research will investigate how local language models can explain, contextualize, and interact with time-series analytics results, while satisfying industrial requirements related to privacy, latency, robustness, and local deployment. The final goal is to develop intelligent support systems able to assist operators, engineers, and decision-makers in interpreting complex temporal phenomena and improving industrial workflows.

Proposed research activity -- (max 10 rows)

The PhD student will study the state of the art in multidimensional time series analysis, industrial AI, and local language models. The activity will focus on methods for anomaly detection, pattern discovery, forecasting, and temporal data interpretation, as well as on the integration of these methods with local language models and industrial knowledge bases. Prototype systems will be developed for advanced operational support in monitoring and diagnostics scenarios, enabling users to query, explain, and summarize relevant temporal phenomena. The experimental activity will involve sensor data, machine logs, production data, and other temporal industrial sources, with evaluation based on detection quality, explanation quality, latency, efficiency, robustness, and usability.

Supporting research projects (and Department)

The research will be carried out at the Department of Engineering “Enzo Ferrari” and in collaboration with important partners at the national and international level.

Possible connections with research groups, companies, universities.

- *Universite Paris Cite*

(*) optional

(**) optional/to be completed on the second year