

ICT PHD

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

Tutor: *Prof. Giovanni Simonini*

(*) Italian Co-tutor: *Angelo Mozzillo, PhD*

() Foreign Co-tutor:**

Proposed Title of the research:

Analysis of Multidimensional and Heterogeneous Data Integrated with Local Language Models for Advanced Operational Support Systems in Industrial Contexts

Keywords: (5)

Multidimensional Data; Heterogeneous Data; Local Language Models; Industrial AI; Operational Support Systems

Research objectives: --(max 10 rows)

The project aims to study methods and architectures for the analysis of multidimensional and heterogeneous data in industrial contexts, integrating structured, semi-structured, temporal, and textual information with local language models. The main objective is to design AI-based systems able to support operational decision-making, monitoring, diagnostics, and process understanding, while preserving efficiency, privacy, and deployment control. The research will investigate how local language models can interpret, contextualize, and interact with industrial data sources, enabling more effective human-machine interaction and more reliable operational support. Special attention will be devoted to data representation, semantic interpretation, context management, and the development of solutions suitable for real industrial environments.

Proposed research activity -- (max 10 rows)

The PhD student will study the state of the art in industrial AI, data analytics, local language models, and operational support systems. The activity will focus on methods for integrating heterogeneous industrial data with local AI models, including techniques for representing, selecting, and contextualizing relevant data for language-model-based reasoning. Prototype systems will be developed for monitoring, diagnostics, reporting, and decision support in industrial scenarios, with experimentation on multidimensional data, tabular data, logs, sensor streams, documents, and semi-structured sources. Evaluation will consider accuracy, robustness, latency, interpretability, usability, and industrial applicability, with results disseminated through scientific publications and possible technology transfer activities.

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.

- *HPI, University of Potsdam*

(*) optional

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