In consideration of the determination of the Regione Piemonte – Direzione Istruzione, formazione e lavoro No. 218 of 2022, May 3 and s.m.i. which listed the higher institutions authorized to activate PhD positions in the apprenticeship format for the years 2022-2024 in the framework of a specific regional call for proposals (Apprendistato di Alta Formazione e Ricerca - Avviso Pubblico 2022-2026 per l'individuazione e la gestione dell'offerta formativa pubblica approvato con Determinazione 114 del 3/3/2022, modificato con D.D. n. 451 del 17/08/2022 e prorogato con D.D. n. 807 del 24/12/2024)

COMPUTER AND CONTROL ENGINEERING

Next-Generation IT Infrastructure optimization

Company	ARUBA A.I. SRL [P. IVA: 13073110960]

Supervisor	CAGLIERO LUCA - luca.cagliero@polito.it

Contact	Francesco Tarasconi

Context of the research activity	Summary The research investigates how Artificial Intelligence can optimize IT infrastructure and online services by leveraging advanced time series analysis and AI agents capable of interacting with structured and semi-structured data such as databases and tables. The project focuses on AI-driven predictive analytics, anomaly detection, and real-time decision support. It also explores fine-tuning domain-specific models and developing secure, scalable AI frameworks tailored to various industries. Format The Company ARUBA AI SRL has planned for the winner of this position a collaboration within a contract of high apprenticeship according to the Italian Legislative Decree 81/2015, art. 45.
	Context Artificial Intelligence (AI) is transforming how IT infrastructure is managed, particularly in areas requiring real-time analysis and decision-making based on dynamic data. Time series data —from server logs, sensor outputs, or user interactions— is fundamental for predictive maintenance, capacity planning, and anomaly detection. However, interpreting such data at scale requires AI models specifically tuned for temporal patterns and contextual signals. In parallel, the increasing use of AI agents that can query, analyze, and act on structured or semi-structured data (such as SQL databases or

Objectives	CSV files) opens new opportunities for automation and smart infrastructure management. The widespread adoption of cloud platforms and Large Language Models (LLMs) raises challenges related to data security, computational cost, and regulatory compliance. Small and medium-sized enterprises (SMEs) especially need adaptable and secure AI solutions capable of handling structured operational data without sacrificing control or privacy. This proposal seeks to advance Secure and Interpretable AI techniques that can analyze time-dependent data and interact meaningfully with enterprise data systems. Research objectives - Time Series-Based IT Infrastructure Optimization: Apply pretrained AI models to analyze temporal patterns for predictive maintenance, dynamic scaling, and anomaly detection. - Domain-Specific Transformer Models for Time Series and Structured Data: Train and fine-tune models for industry-specific use cases involving high-frequency structured data. - Large Generative Models adaptation: Adapt LLMs to support reasoning over business-specific structured data formats, such as financial logs or IT system metrics. - AI Agents for Structured Data: Develop intelligent agents capable of interacting with databases, APIs, and tabular datasets for real-time diagnostics and insights. - Comparative Analysis of AI Model Architectures: Evaluate the trade-offs between open-source and closed-source AI solutions. - Modular and Scalable AI Frameworks: Build adaptable systems that integrate time series analytics and structured data agents, ensuring they can scale across organizations of different sizes and sectors. - Security and Robustness: Design AI frameworks resistant to adversarial inputs and capable of preserving data privacy. Tentative work plan During the first year, the PhD student mainly explores the application of time series analysis techniques for infrastructure optimization, including the design and adaptation of LLM- and Transformer-based models tailored to specific industrial cases. In the second year, the research aims to combine structured and semi-structured data for IT infrastructure optimization. It compares different architectures, studies the development of agent-based solutions, and proposes innovative and scalable solutions. Finally, the last PhD year will be devoted to refining the designed AI frameworks in order to make them resistant to adversarial inputs and capable of preserving data privacy. List of possible publication venues - Conferences: ACL, EMNLP, ACM Multimedia, KDD, ACL, COLING, IEEE ICDM, ECML PKDD, ACM CIKM - Journals: IEEE TKDE, ACM TKDD, IEEE TAI, ACM TIST, IEEE/ACM TASLP¿ACL¿TACL

Skills and competencies for the development of the activity	The candidate shall be less than 30 years old at the moment of the hiring from the company. The PhD candidate is expected to - Have the ability to critically analyze complex systems, model them and identify weaknesses; - be proficient in Python programming; - know data science fundamentals; - have a solid background on machine learning and deep learning; - have natural inclination for teamwork; - be proficient in English speaking, reading, and writing; - proficiency with Docker and Kubernetes software is a plus.