Master Thesis - “Secure Modular Integration Architecture for AI-Enabled Industrial Robot Cells: A Standardized Local-First Approach” (30 credits/20 weeks – 1 students)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 33 manufacturing locations in 12 countries, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

Project Background

The robotics landscape is undergoing fundamental transformation. Traditional robot programming—based on pre-programmed, extensively tested routines—is becoming increasingly inadequate as manufacturing and research demands greater flexibility, customization, and real-time adaptability. AI-driven capabilities such as dynamic path planning, vision-based adaptation, and real-time decision-making are no longer optional but essential for competitive manufacturing. The core problem is architectural: existing robot cell systems lack standardized, secure interfaces for integrating AI applications in a modular way. Current approaches face: (1) Security risks from cloud-dependent solutions exposing proprietary manufacturing data, (2) Vendor lock-in through proprietary interfaces preventing agile adoption of new technologies, (3) Integration complexity requiring extensive re-engineering for each new capability, and (4) Development overhead where adding AI features disrupts validated production code. This research explores whether a standardized protocol-based framework can bridge traditional industrial robotics with emerging AI applications, making advanced robotics accessible without prohibitive development costs.

Further, the assignment offers a unique opportunity to work in a creative environment, supervised by the Global Technology Centre at GKN Aerospace in Tröllhättan.

Assignment Description

This thesis investigates the design and feasibility of a secure, modular integration framework for industrial robot cells that enables rapid integration of AI applications while maintaining local-only operation, addressing the gap between traditional robot programming paradigms and the demands of AI-driven manufacturing.

Research Objectives:

- Conduct gap analysis of existing robot cell integration architectures and identify barriers to AI adoption in industrial settings
- Define requirements for a modular framework that reduces development time and complexity while ensuring security and industrial compatibility
- Design a protocol-based architecture addressing authentication, authorization, data isolation, and standardized interfaces
- Implement a demonstrator integrating at least one AI application (e.g., dynamic path planning)
- Evaluate the framework against security, modularity, efficiency, and performance criteria through benchmarking

Qualifications

Student in the final year of their M.Sc. studies in the field of Computer/Data Science, Production Systems, Robotics, Automation, Mechatronics, or similar with a strong interest in sustainability and data science.

Apply by

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Last date for application: 2025-11-30