**TUΠ**

Forschungsinstitut –
Unternehmensführung, Logistik und Produktion
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ZF

## Master Thesis with ZF Group

# Development of a GenAI code analyzer and code generation tool for Programmable logic controller (PLC)

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| **Question:** | How can Generative AI be used for PLC Program Change to automatically generate and analyze PLC code? |
| **Start:** | Immediately |
| **Application:** | Send your CVs and a letter of motivation to Benedikt Blümelhuber |

### Background

ZF is exploring the use of Generative AI (GenAI) for PLC code generation to address challenges with externally-written and poorly-understood code, alongside compatibility issues across various systems. With the increasing complexity of products and a growing dependency on vendor-specific systems, GenAI presents a promising solution to streamline operations and foster innovation. This project is part of a broader collaboration with industry professionals, aiming to apply real-world applications and solve practical challenges observed in modern industrial settings.

### Goal

The primary objective of this thesis is to develop a comprehensive GenAI-based solution for PLC programming at ZF. This project will focus on creating two key tools: a code generation tool to automate PLC code creation, and a code analyzer to assess and understand existing PLC programs. By leveraging GenAI's capabilities, these tools aim to streamline the PLC programming process, reduce reliance on external vendors, and enhance in-house expertise. The ultimate goal is to empower ZF to efficiently manage the growing complexity of their PLC systems and improve competitive edge in the automation industry.

### Your tasks

- Familiarize yourself with the existing literature on Generative AI for code generation and code analysis
- Analyze existing PLC code and draft necessary roadmap for automated code generation and analysis
- Design a plan to implement the required changes in the PLC code due to modifications in the associated assets
- Develop a strategy to replace older PLCs with whitelisted newer/other models (e.g., upgrading from S7300 to S71500), taking into account the complications arising from vendor changes
- Organize and execute the transition from the current engineering software to the target version (e.g., migrating from Siemens Classic to TIA Portal or upgrading from TIA 14 to TIA 16)

### Requirements

- Project can commence immediately
- Solid programming skills (e.g., Python)
- Experience in fine-tuning Large Language Models
- Initial experience with PLC (Siemens und Beckhoff)
- Excellent self-management and interpersonal skills

- Team-oriented (working in a group of 2 Master students)
- You are interested in the development of Generative AI applications and its potentials
- You are passionate about delivering high-quality solutions to drive innovation

**If interested, please send a brief application with resume and proof of accomplishments to: benedikt.bluemelhuber @tum.de**