

Semester Project / Master Thesis

Development of an AI-Based Expert System for Optimizing Turning Operations



Introduction:

In the manufacturing industry, determining the optimal process parameters is crucial for efficiency and quality. There is plenty of unstructured data available from relevant books, academic and industrial publications, and measurement data sets. Expert systems, which use artificial intelligence to emulate the decision-making abilities of a human expert, offer promising solutions for the automated integration of such sources.

This thesis aims to build an expert system, potentially based on large language models (LLMs) such as ChatGPT or other suitable AI models to determine optimal parameters for various turning operations. It is crucial to find the right combination of system architecture, base model, and data integration method to achieve the required performance.

Tasks:

- Conduct a literature review on the state of the art of expert systems in manufacturing, with a particular focusing on turning operations.
- Develop a methodology for integrating unstructured data sources such as books, academic and industrial publications and data sets into the expert system's knowledge base.
- Investigate the feasibility of using LLMs as the base for the expert system, or identify other suitable AI models.
- Design and implement an expert system capable of determining optimal parameters for a range of turning operations.

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- Validate the effectiveness of the expert system through case studies or simulations, comparing the system's recommendations with established best practices for different turning configurations.
 - Explore how such an expert system can be integrated into existing systems, such as CAM tools and turning machines, with a focus on enabling continuous learning from process data.

Start date: to be defined

Language: German or English

Supervision

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