

KI-Net: AI-based Optimization in Industrial Manufacturing - A Project Overview

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1 Introduction and Motivation

In the following extended abstract, an overview including motivation, objectives and expected results of the Interreg Austria-Bavaria project "KI-Net" (AB292; www.ki-net.eu/) is summarized. The project develops a cross-border competence network that investigates, researches, and develops fundamental methods for AI-based optimizations in industrial manufacturing.

Artificial intelligence (AI) is a key technology of industrial digitalization. Especially in the area of production, a great potential is present in the optimization of existing production processes, e.g., concerning resource consumption, energy consumption, emission reduction, quality improvements, predictive maintenance, and so forth. Some of this potential is addressed by methods of industrial analytics, which is in some sense beyond particular production technology, while another part of this potential is addressed by particular technological aspects in production systems, e.g., concerning mechatronics, robotics and motion control, industrial control and automation systems, etc.

AI technologies bring significant advantages in the analysis of complex data as well as in supporting people in solving complex problems or relieving them of time-consuming tasks. The strength of AI technologies lies in their ability to detect complex correlations, to generalize and to independently extract information and policies from data without relying on explicit domain-specific knowledge. They are therefore indispensable for evaluating data from a constantly growing number of sensors that are being installed as part of Internet of Things (IoT) and Industry 4.0, and thus generating added

value. At the same time, AI technologies are able to solve problems with a manageable number of algorithms and procedures, which cannot be solved with regular (i.e., requirements-driven) programming procedures, in which the knowledge for solving the problem is made available in the form of an algorithm.

The problem is that the field of AI includes so many research areas and methods that many companies are losing the overview of the methods that are necessary and appropriate for solving the company's problems. The reasons for this are, on the one hand, a lack of expertise in AI and, on the other hand, high complexity and risks of use for the companies (especially for SMEs). As a result, many potentials cannot yet be exploited.

2 Project Objectives

The KI-Net project develops a cross-border competence network that investigates, researches and develops fundamental methods for AI-based optimizations in industrial manufacturing. This is intended to facilitate access for companies, especially SMEs, to the targeted use of AI in production and maintenance processes. The project aims to clearly identify which AI methods are the most suitable for which industrial manufacturing tasks. The AI methods include in particular: (1) systems engineering processes, (2) digital twins and robotics, (3) knowledge representation and knowledge graphs, and (4) data analysis, optimization and learning techniques.

The project members pool the necessary know-how to be a main contact for industry, SMEs and other institutions on this topic. The public thus has the opportunity to obtain information and knowledge from a single competence network and thus access the knowledge of the project partners.

3 Expected Project Results

The cross-border approach (the project is conducted in five regions of Austria and Germany) is also expected to open the way for a new research and innovation partnership and intensify cooperation between academia and the AI-based manufacturing and maintenance industry sector in the program area.

Individual use cases are researched, developed, and prepared in a suitable form for the public. These best-practice examples are then summarized in the form of an application guideline for AI methods in industrial manufacturing and presented to the public at several knowledge transfer events. Furthermore, the results will be made available online (www.ki-net.eu/) and the developed knowledge will also be integrated into qualification modules of the project partners.

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