

**Pro2Future
Products and Production
Systems of the Future**

Programme: COMET – Competence
Centers for Excellent Technologies

Programme line: COMET-Centre K1

Type of project: Common Research
Programme (CRP), 4 Years, MFP DP1

together with K1 Centre „Austrian
Center for Digital Production“



AI <> HI :: ARTIFICIAL INTELLIGENCE MEETS HUMAN INTELLIGENCE

USAGE OF A COGNITIVE HEADGEAR FOR OPTIMIZING
PROCESSES IN INDUSTRIAL PRODUCTION.



The COMET K1 competence center Pro²Future, founded at the end of the Industry 4.0 era, addresses research questions of industrial production and product design in the era of **cognitive systems**. The central theme of the center: **Products and production systems of the future "think with you"**. More than 25 industry partners - mainly from the thematic sectors AI, mechatronics, mathematics and software - work with around 30 center employees on "cognitive" products and industrial systems that use human-like cognitive skills such as perception, interpretation, understanding, memorization and learning, prediction and conclusions and appropriate cognition-controlled action.

During Pro²Future's research activities, there is a **common research program (CRP)** with the Austrian Center for Digital Production (CDP) in Vienna. Different **demo cases** were implemented in this **CRP**, which are summarized in three **demonstrators**. One of these demonstrators is a **cognitive helmet** to support workers (see picture on next page).

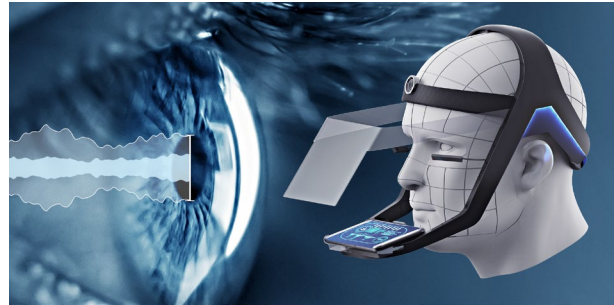
For the second funding period (2021-2025), which is now starting, Pro²Future is committed to a central challenge for such systems, namely the confluent cooperation between **humans** and increasingly **AI-powered machines**, and **products with embedded AI**. The projects in preparation are aimed at situation and work step-aware, self-adapting, AI-powered machines that control interaction with human

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workers based on workers' observations and experiences, skills and abilities. The level and scope of AI-based assistance functions must be adapted individually, context-sensitive and to the minute in the manufacturing process.

A reference implementation of AI-controlled manufacturing systems based on (i) **formal models** of human perception, recognition and understanding, (ii) **multisensory, unattended recognition architectures** and (iii) **embedded subtle AI support mechanisms** has already been implemented (see pictures). Future industrial manufacturing will combine the special capabilities of AI-controlled robots in terms of strength, accuracy, and efficient execution of repetitive tasks with the flexibility, fine motor skills and intuition and skills of human workers in collaborative environments. The initial motivation for the research work in Pro²Future is the **development of multimodal sensor systems** that enable machines to perceive their environment and their operators and to react to them in a situational manner. The emerging multi-sensor-based AI user interaction platform combines four functional levels: cognitive modeling of the user (**operator models**), evaluation of the experience and ability levels of the

user to select the assistance and interaction mode (**recognition component**), knowledge transfer database as a repository of reference processes (**intelligence component**) for triggering and controlling machine control commands and feedback to the assisted worker (**assistant component**).



Illustrations: Institute for Pervasive Computing, JKU Linz

Pro²Future methodically uses cognitive processes in human-machine interaction based on the current state of research (**deep learning, reinforcement learning, perception, attention research, cognitive load modeling**), and strives for a **new generation of assistive collaboration systems** that combine complementary qualities and possibilities of AI and AI.

Project coordination (Story)

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- SONY Europe B.V., DE
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- Institutes at TUG, Austria
- ACDP GmbH, AT

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