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NEWSLETTER 05/2023

# TALON PROJECT



## TALON

Autonomous and self-organised artificial intelligent  
orchestrator for a greener industry 5.0

[talon-project.eu](https://talon-project.eu)

# EDITORIAL

**T** This newsletter presents a summary of the primary dissemination outcomes of the project in the first semester of its lifetime, which includes journal and conference publications, as well as organization of events. Specifically, one (1) journal was published, two (2) journals were submitted, one (1) conference paper was successfully accepted, and a workshop was co-organized by the TALON consortium entitled establishing the next level of “Intelligence” and autonomy.

Stylianos Trevlakis, InnoCube

## CLUSTERING WORKSHOP ORGANIZATION

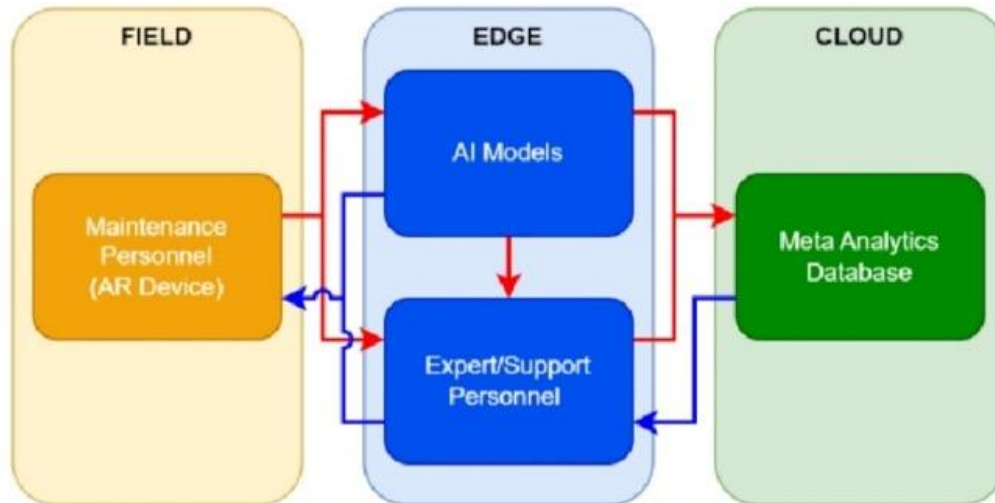
The graphic is a promotional banner for a Clustering Workshop. On the left, the text reads 'CLUSTERING WORKSHOP' in large blue letters, followed by 'ESTABLISHING THE NEXT LEVEL OF "INTELLIGENCE" AND AUTONOMY' in a slightly smaller blue font. Below this, the date and time are given as '2 March 2023 | 10:00-13:00 CET'. On the right side, there is a central illustration of a hand holding a smartphone, surrounded by various icons representing technology, data, and industry. Above the illustration, it says 'Organised by' followed by the TALON logo. Below the illustration, it says 'In collaboration with' followed by logos for enexa, EVENFLOW, REXASI, SAFEXPLAIN, and Tuples ULTIMATE.

The Clustering Workshop is organized by the EU-funded project TALON in close collaboration with the projects AutoFair, ENEXA, EVENFLOW, REXASI-PRO, SAFEXPLAIN, SustainML, TUPLES, and ULTIMATE funded under the HORIZON-CL4-2021-HUMAN-01-01 topic. This workshop aims at bringing together projects and experts for exploring synergies and identifying actions that can be pursued in common in the area of verifiable robustness, energy efficiency and transparency for trustworthy AI.

**Scope:** The industrial technologies of the future will heavily support automation through collaborative and autonomous robotics, computers, equipment as well as Industrial-Internet-of-Things (IIoT) devices that are interconnected and make decisions based on AI algorithms. Until now, to support data processing and storage, edge and cloud computing have been employed without exploiting the full potential of their intelligent interplay. This requires improvement in transparency, interoperability and verifiability. To build the next level of “intelligence” and autonomy in industrial technologies, it is essential to scale-up local and distributed deployment, in solving wider set and more complex problems, adapting to new situations and context knowledge, addressing real-time performance requirements, data and energy efficiency, also for greener AI and robotics solutions.

This 1st Clustering Workshop among the funded HORIZON-CL4-2021-HUMAN-01-01 projects will investigate common dissemination paths and scientific approaches to build the next level of intelligence including integration of learning, causality, contextualization and knowledge discovery, human-in-the loop approaches, and advancements in intelligence, transparency and autonomy of AI-based systems.

## PAPER PUBLISHED “AI-POWERED INTERFACES FOR EXTENDED REALITY TO SUPPORT REMOTE MAINTENANCE “

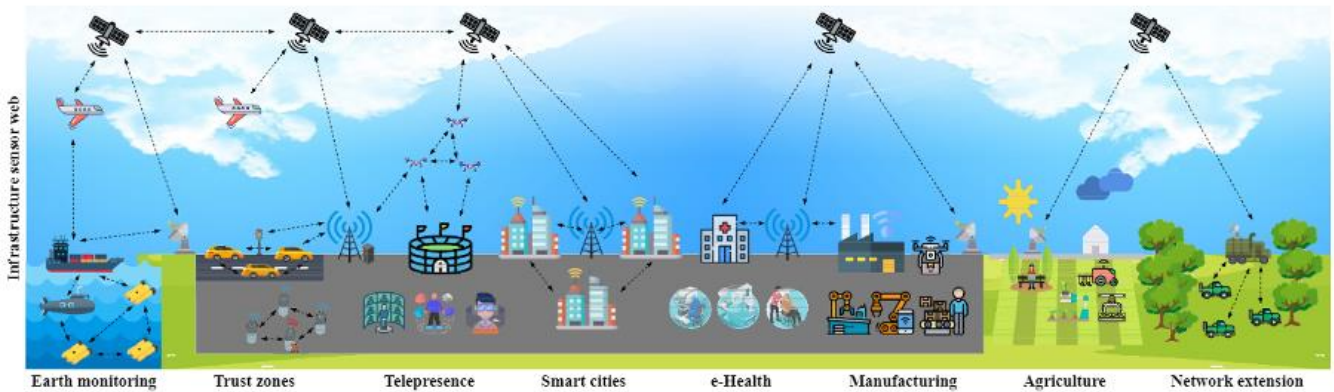


High-end components that conduct complicated tasks automatically are a part of modern industrial systems. However, in order for these parts to function at the desired level, they need to be maintained by qualified experts. Solutions based on Augmented Reality (AR) have been established with the goal of raising production rates and quality while lowering maintenance costs. With the introduction of two unique interaction interfaces based on wearable targets and human face orientation, we are proposing hands-free advanced interactive solutions in this study with the goal of reducing the bias towards certain users. Using traditional devices in real time, a comparison investigation using alternative interaction interfaces is conducted. The suggested solutions are supported by various AI powered methods such as novel gravity-map based motion adjustment that is made possible by predictive deep models that reduce the bias of traditional hand- or finger- based interaction interfaces.

You can refer to this paper as:

A. Nagy, G. Amponis, K. Kyranou, T. Lagkas, A. A. Boulogeorgos, P. Sarigiannidis, V. Argyriou, "AI-Powered Interfaces for Extended Reality to Support Remote Maintenance", CLEF: Cloud, Edge, and Fog for Smart Industries, May, 2023.

## PAPER SUBMITTED: “LOCALIZATION AS A KEY ENABLER OF 6G WIRELESS SYSTEMS: A COMPREHENSIVE SURVEY AND AN OUTLOOK”

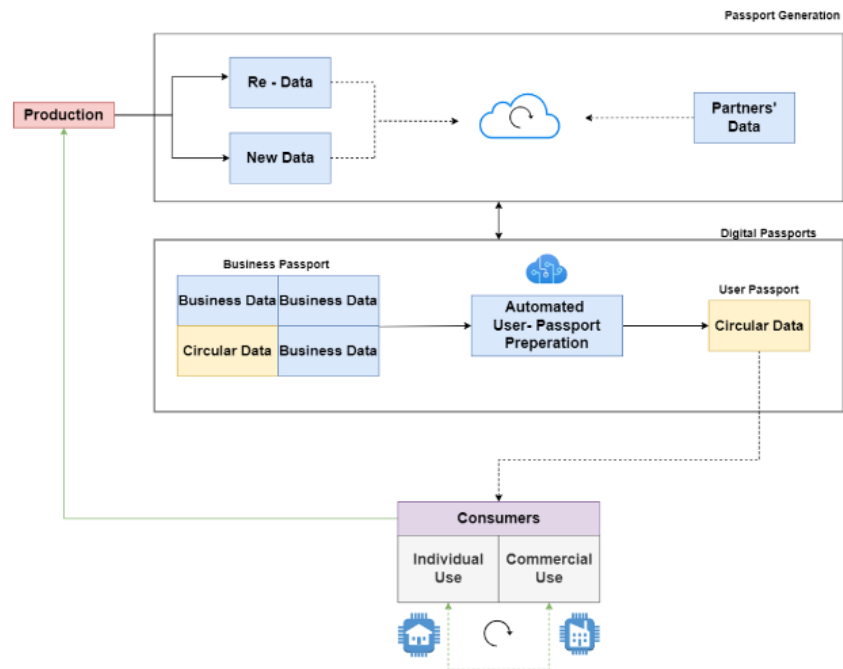


When fully implemented, sixth generation (6G) wireless systems will constitute intelligent wireless networks that enable not only ubiquitous communication but also high-accuracy localization services. They will be the driving force behind this transformation by introducing a new set of characteristics and service capabilities in which location will coexist with communication while sharing available resources. To that purpose, this survey investigates the envisioned applications and use cases of localization in future 6G wireless systems, while analyzing the impact of the major technology enablers. Afterwards, system models for millimeter wave, terahertz and visible light positioning that take into account both line-of-sight (LOS) and non-LOS channels are presented, while localization key performance indicators are revisited alongside mathematical definitions. Moreover, a detailed review of the state of the art conventional and learningbased localization techniques is conducted. Furthermore, the localization problem is formulated, the wireless system design is considered and the optimization of both is investigated. Finally, insights that arise from the presented analysis are summarized and used to highlight the most important future directions for localization in 6G wireless systems.

You can find more information about this paper [here](#).

You can refer to the preprint as: “S. Trevlakis, A.-A. A. Boulogeorgos, D. Pliatsios, K. Ntontin, P. Sarigiannidis, S. Chatzinotas, and M. D. Renzo, "Localization as a key enabler of 6G Wireless Systems: A comprehensive survey and an outlook," TechArxiv, Jan. 2023.”

## PAPER SUBMITTED: “DIGITAL PRODUCT PASSPORTS AS ENABLERS OF DIGITAL CIRCULAR ECONOMY: A FRAMEWORK BASED ON TECHNOLOGICAL PERSPECTIVE”

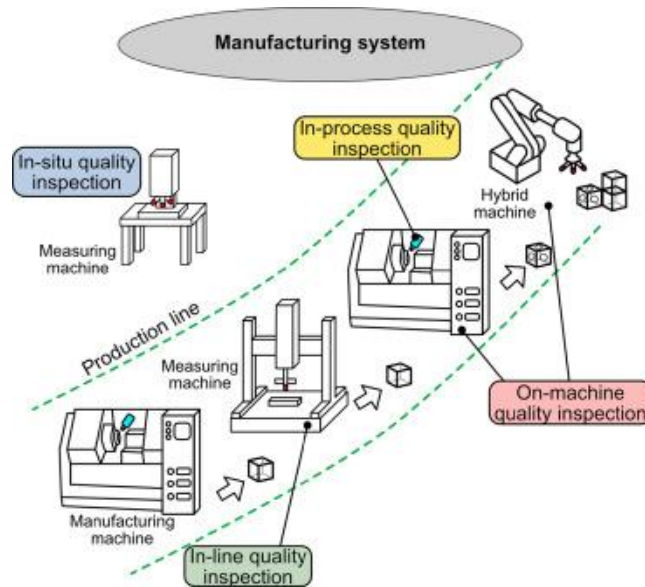


Taking into consideration the rise of Industry 5.0 (I5.0), more and more solutions are being developed, aiming towards increased environmental consciousness through advanced technologies, and human centricity. Digital Product Passports (DPPs) constitute a novel technological solution that can enable the transition toward a digital Circular Economy (CE) and sustainable I5.0, as digital identities that are assigned to physical products, capable of tracing their lifecycles through data such as their technical specifications, usage instructions, and repair and maintenance information. Although the respective research community has started providing a thorough analysis of DPPs potential to constitute a CE enabler, their technical requirements are still unclear. As part of our contribution to this issue, we propose a fundamental CE framework with integrated DPP characteristics, capable of being adapted in different sector stages for the generation and distribution of DPPs both for stakeholders and consumers. The corresponding solution is further supported through a systematic literature review that follows a technological approach to the DPPs implementation.

You can find more information about this paper [here](#).

You can refer to this paper as: “K. Voulgaridis, T. Lagkas, C. M. Angelopoulos, A. A. A. Boulogeorgos, V. Argyriou, and P. Sarigiannidis, "Digital Product Passports as Enablers of Digital Circular Economy: a Framework based on Technological Perspective", TechRxiv, Mar. 2023.”

## PAPER PUBLISHED: “APPLICATION OF AUTOMATION FOR IN-LINE QUALITY INSPECTION, A ZERO-DEFECT MANUFACTURING APPROACH”



Contemporary manufacturing must prioritise the sustainability of its manufacturing processes and systems. Zero Defect Manufacturing (ZDM) focusses on minimising waste of any kind using data-driven technology, hence enhancing the quality of all manufacturing aspects (product, process, service, etc.). Making things right on the first try is the central tenet of ZDM. In recent years, the application of automation for in-line quality inspection systems has begun to attract the interest of both practitioners and academics because of its capability to detect defects in real-time, and thus adapt the system to disturbances. In this work, we provide a systematic review of the literature on current trends in the application of automation for in-line quality inspection with the ultimate objective of achieving ZDM. Additionally, bibliometric and performance analyses have been performed to gain a complete picture of the field. In this work, we have collected bibliometric data from the most widely referred search engines for academic engineering papers, i.e., Scopus, Web of Science, and IEEE Explorer, involving a total of 145 academic publications from 2011 to 2021. Uniquely for this study, we used three research attributes for the analysis of the selected articles, that is, the level of automation, the condition for quality inspection, and the contribution to ZDM dimensions. The literature suggests that there is a lack of research on the use of in-line detection data for the prediction of defects or repair. Based on the results and our interpretation of the literature, an adapted framework of ZDM (Psarommatis et al., 2020a) and multi-layer quality inspection (Azamfirei et al., 2021a) is presented.

You can find more information about this paper [here](#).

You can refer to this paper as: “V. Azamfirei, F. Psarommatis, and Y. Largosen, “Application of automation for in-line quality inspection, a zero-defect manufacturing approach,” *Journal of Manufacturing Systems*, vol. 67, p. 1-21, Apr. 2023.”







# TALON



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