



## STAR technologies for trusted AI solutions

Artificial intelligence (AI) systems in the manufacturing sector are increasingly replacing human tasks improving the automation of production. These systems need to be safe, trusted and secure, even when operating in dynamic, unstructured and unpredictable environments to be able to react to different situations and security threats. Ensuring the safety and reliability of these systems is a key prerequisite for deploying them at scale and for fully leveraging the benefits of AI in manufacturing.

The Horizon 2020 STAR project is developing a number of technologies for trusted AI solutions that address different domains such as Cyber Security, Human-Robot collaboration, and Safety. These assets, resulting from continuous research, development, and validation, are crucial enablers of security and safety in production lines.

STAR components support authentication procedures, querying, browsing, accessing, and modifying data, orchestrating data flow, and can be leveraged to find holistic solutions that can increase the overall trustworthiness of several production systems.

- **Distributed Ledger Services for Data Reliability (DLSDR):** A trusted decentralised solution for industrial data provenance and traceability covering tracking and tracing of raw data, AI models/algorithms and AI analytics.
- **Runtime Monitoring System (RMS):** RMS provides a real time service which collects security related data from monitored IoT system components or applications. RMS enables appropriate filtering and data transformation mechanisms for reporting irregular measurements, that might be related to an attack/abuse case, and are used to drive the STAR Security Policy Manager.
- **AI Cyber-Defense Strategies (ACDS):** AI Cyber defense tool for the protection of manufacturing AI data pipelines against poisoning and evasion attacks.
- **Risk Assessment and Mitigation Engine (RAME):** Risk assessment and Mitigation Engine for the management of the lifecycle security incidents and risk indicators in manufacturing environments.
- **Security Policies Manager (SPM) - Security Policies Repository (SPR):** The Security Policy Manager is a multipurpose tool for defining a system of rules for automatically identifying cyber threats. The rule definition is specific to the application domain and the type of data available (e.g., GPS, CPU consumption, logs). Additionally, the Security Policy Manager is agnostic to the data source, allowing the definition of policies for both hardware and software components.
- **XAI Models and Library:** A set of techniques that help develop more explainable models while at the same time preserving their high-performing learning functionalities in real-world manufacturing environments and applications.
- **Simulated Reality (SR):** Synthetic data generation and intelligent oversampling methods. This can be used to improve the performance of machine learning models, when little data exists or when skewed distributions are found.
- **Active Learning (AL):** Algorithms that enable finding most informative data samples from unlabelled data, which allow to increase the learning of machine learning models while



minimising the labelling effort.

- **Production Processes Knowledge Base (PPKB):** Prototype knowledge-graph encoding information regarding users' perception of anomaly and heat maps showing either potential defects or where a machine learning algorithm focuses (pays attention to in the image) to determine whether a defect exists.
- **Multimodal Workers' Training Platform:** Web service that combines Natural Language Processing and Workers Training Platforms to offer a solution that allows operators to learn more about their occupation, detect knowledge gaps and get training recommendations. All offered through chatbots and multimodal interfaces.
- **Feedback Module:** Prototype for feedback service implemented for a demand forecasting and logistics planning proof of concept.
- **AMR Safety:** Solution for automated visual analysis and robots deployed in next generation work floor, using a computer vision module detecting empty areas merged with a dynamic robot path planning engine for secure robot displacements.
- **Human-Centred Digital Twin:** The Human Digital Twin Core Infrastructure is an extensible and flexible IIoT - industrial internet of things - based platform supporting the creation of customised data representations of production systems and their entities, including humans.
- **Fatigue Monitoring System:** The Fatigue Monitoring System uses artificial intelligence (AI) models relying on machine learning to estimate the exertion level of subjects based on static data (e.g. age, weight, etc.) and dynamic data (e.g. HR, EDA, skin temperature).
- **Workers Activity Recognition:** The Workers Activity Recognition Module recognises worker's activities by using time-series sensor data from wearable sensors including accelerometer, gyroscope, magnetometer, and capacitive sensors to optimise the interaction between humans and mobile robots and prevent collisions.

For more information about the project, visit STAR website: [www.star-ai.eu](http://www.star-ai.eu)

## About STAR

STAR is a joint effort of 15 European partners towards designing new technologies to enable the deployment of standard-based secure, safe, reliable and trusted human centric AI systems in manufacturing environment. STAR aims to research, develop, validate and make available to the community leading-edge AI technologies including explainable AI, active learning systems, simulated reality systems, human-centric digital twins, advanced reinforcement learning techniques and cyber-defense mechanisms, thus becoming a catalyst for the deployment of advanced AI systems in the manufacturing shop-floor.

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Safe and Trusted Human Centric Artificial Intelligence in  
Future Manufacturing Lines

### PROJECT KEY FACTS

Full Name:	STAR: Safe and Trusted Human Centric Artificial Intelligence in Future Manufacturing Lines
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Website:	<a href="http://www.star-ai.eu">www.star-ai.eu</a>
Coordinator:	Netcompany-Intrasoft

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