ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4

Use Case Submission Form

The quality of use case submissions will be evaluated for inclusion in the Working Group's Technical Report based the application area, relevant AI technologies, credible reference sources (see References section), and the following characteristics:

— Data Focus & Learning: Use cases for AI system which utilizes Machine Learning, and those that use a fixed *a priori* knowledge base.

— Level of Autonomy: Use cases demonstrating several degrees (dependent, autonomous, human/critic in the loop, etc.) of AI system autonomy.

— Verifiability & Transparency: Use cases demonstrating several types and levels of verifiability and transparency, including approaches for explainable AI, accountability, etc.

— Impact: Use cases demonstrating the impact of AI systems to society, environment, etc.

— Architecture: Use cases demonstrating several architectural paradigms for AI systems (e.g., cloud, distributed AI, crowdsourcing, swarm intelligence, etc.)

1. General

ID	(leave blank, for internal use)	
Use case name	Leveraging AI to enhance adhesive quality	
Application domain	Manufacturing	
Deployment model	On-premise systems	
Status	In operation	
Scope[1]	Batch/Continuous/Discrete Manufacturing (Deployed in 75+ manufacturing lines in 10+ countries; Specifically identified the contributors to quality; predict potential quality failures).	
Objective(s)[2]	Enhance Adhesive Quality, Performance Benchmarking	
Narrative	Short description (not more than 150 words)	Cerebra IOT signal intelligence platform provides the ability to have a holistic perspective and understanding of the sensitivity of the key parameters affecting output quality and ability to monitor and control the process in real-time. This will avoid variations in yields, build-up of inventories and missed customer deadlines.

[1] The scope defines the intended area of applicability, limits, and audience.
[2] The intention of the system; what is to be accomplished?; who/what will benefit?.

	Complete description	Cerebra IOT signal intelligence platform ingested 3+ years of process data and sensor data regarding plant operations from temperature, rpm, torque and pressure sensors which were strapped on to industrial mixers. These are the mandatory sensors for the operations. Cerebra used its episode detection algorithms (deep learning) to filter signal from noise and specifically identify the contributors to quality (anomaly signatures) that can then be used as signals to predict quality. It used its proprietary N-dimensional Euclidian distance-based scoring algorithms to normalize and present a unified score to the business team. This unified health score provided the process team a different lens to benchmark, specifically target and radically improve process efficiencies. Cerebra then leveraged its sophisticated ensemble models to predict potential quality failures allowing the operations team to take real-time actions to control process deviations. The signals identified in the earlier steps provide Model Explainability to the end-user for reasons behind Quality deviation.		
Stakeholders[3]	Manufacturing industries; Suppliers and Buyers; Environment			
Stakeholders' assets, values[4]	Competitiveness (Respond to and exceed customers' and consumers' expectations by providing the best value, quality, service and winning innovations, brands and technologies to create sustainable value).			
System's threats & vulnerabilities[5]	Challenges to accountability, New Security Threats.			
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Prediction Accuracy	To what extent has the model been able to predict correctly	Provided ability as to % of times the quality complied
AI features	Task(s)	Prediction		
	Method(s)[6]	N-dimensional Euclidian distance-based scoring algorithms		
	Hardware[7]	Application Server: 64 GB RAM/ 16 Core / 500 GB HDD Data Server: 128 GB RAM/ 16 Core, 3 TB HDD		
	Topology[8]			

[3] Stakeholder are those that can affect or be affected by the AI system in the scenario; e.g., organizations, customers, 3rd parties, end users, community, environment, negative influencers, bad actors, etc.

[4] Stakeholders' assets and values that are at stake with potential risk of being compromised by the AI system deployment – e.g., competitiveness, reputation, trustworthiness, fair treatment, safety, privacy, stability, etc.

[5] Threats and vulnerabilities can compromise the assets and values above - e.g., different sources of bias, incorrect AI system use, new security threats, challenges to accountability, new privacy threats (hidden patterns), etc.

[6] AI method(s)/framework(s) used in development.

[7] Hardware system used in development and deployment.

[8] Topology of the deployment network architecture.

	Terms and concepts used[9]	Deep learning; Anomaly Signatures.
Standardization opportunities/ requirements	• **Mandate of the key sensors based on the type of equipment.** Based on the type of equipment, the makers need to have the basic set on sensors imbibed onto the system. e.g. for a pump – it is important to measure the input flow and output flow rates, vibrations, rotation speed, lube oil temperature and pressure. This will guide the equipment manufactures to provide their customers and their data products to capture the minimum required data and understand the equipment performance. • **Mandate for the organizations to expose the minimum and key parameters.** The equipment owners need to enable the basic set of sensors for the equipment health and performance which are required for monitoring the asset from any failures. • **Standards for Data Formats** Each organization has a different way of capturing data and storing them in different formats. Due to this, the solutions are not scalable across organizations though the product behind them is same. It takes customised efforts each time. • **Guidelines for deciding the sampling frequency based on the type of data.** We see a need to have a specific set of guidelines to capture data at a minimum required sampling frequency, e.g. a vibration sensor should capture data at least at 1 ms or less. • **Guidelines for Feature Engineering.** There must be guidelines as to how the features need to be engineered for AI models. Lack of this would lead to more black box models not explaining how the models behave the way they do. • **Guidelines for Standardization of event types and codes.** There are multiple events which occur for an asset or in a manufacturing plant. Guidelines would help people capture the data in a similar fashion helping the industry to benchmark against one another and at industry level we can understand, which events are the most critical. • **Guidelines for standardization of Fault and Error Codes for an equipment or process.** Similar to events, it is also useful to capture fault, failure and error codes in a standard way. • **Process Guidelines for event related data (Maintenance and Work Orders):** Guidelines would help people capture the data in a similar fashion helping the industry to benchmark against one another and at industry level we can understand, which events are the most critical. • **Guidelines for Training AI models:** A defined set of guidelines for AI models would be useful for the data scientists to follow. It will also aid the consumers of AI models to understand how the outcome has been deduced.	

[9] Terms and concepts used here should be consistent with those defined by Working Group 1 (AWI 22989 and AWI 23053) or to be recommended for inclusion.

	• **Guidelines around AI model explainability:** With so many black-box models floating around in the industry, it is difficult for consumers of AI models to understand these models and their output. And with engineers and domain experts coming into the picture, it is very much required to make these models more explainable. • **Process Guidelines and methods for model evaluation (retraining)** Before deployment and post deployment, it is very critical to have standard methods for models. And also post deployment, we must set guidelines for retaining the model on a periodic basis or based on data volatility. This is increasingly becoming important as AI models are being involved in more strategic and operational decision making. • **Guidelines for disaster recovery n autonomous operations:** With the aid of AI models, the operations of an equipment or manufacturing plant are becoming more and more autonomous and self-sufficient. But the human monitoring is also important as any kind of inaccurate prediction can lead to a disaster and it is must to have some standard to recover from this situation and to assess the conditions to go for autonomous operations.	
Challenges and issues	Patented process if any, security restrictions	
Societal Concerns[10]	Description	Promoting sustainable industries, and investing in scientific research and innovation, are all important ways to facilitate sustainable development.
	SDGs[11] to be achieved	Industry, Innovation, and Infrastructure

[10] To be inserted.

[11] The Sustainable Development Goals (SDGs), also known as the Global Goals, are a collection of 17 global goals set by the United Nations General Assembly. SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
URL: http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

References

References						
No.	Type	Reference	Status	Impact on use case	Originator/organization	Link
1	Web link	Leveraging Cerebra's AI to enhance quality – from Quality Inspection to Quality Assurance	Published as case study	Use case take from this case study	Flutura Business Solutions Pvt. Ltd.	https://flutura.com/case-study-specialty-chemicals