Engineering AI in manufacturing.

Technologies, Challenges, Results and Impact.

This proposal is endorsed by TC51 Manufacturing Plant Control

Aitor Arnaiz[1], Alexandre Voisin[2], Giorgios Triantafyllou[3], Kerman López De Calle[4]

[1] *Tekniker, Eibar, Spain (aitor.arnaiz@tekniker.es)*
[2] *Lorraine University, Nancy, France (alexandre.voisin@univ-lorraine.fr)*
[3] *Giorgios Triantafyllou - Athens Technology Center, Athens, Greece (g.triantafyllou@atc.gr)*
[4] *Kerman López De Calle – Tekniker, Eibar, Spain (kerman.lopezdecalle@tekniker.es)*

(session code `626ah`) *https://www.incom2024.org/cfp/sessions/*

Keywords – Artificial Intelligence, Applied AI, Manufacturing, Production, AI Engineering, Model engineering, Trustworthiness, Human on the loop, Human in command, Operator engagement, Self-learning, Adaptation, Explainability, Standards, Lessons learnt.

Abstract

AI technologies are becoming ubiquitous in almost every field of activity, and this also includes manufacturing and production, from process quality prediction to workflow optimization, from energy management to supply chain interoperability, from edge systems for real-time anomaly detection to cloud-based off-line automated analysis approaches, from data-driven algorithmic approaches to model-driven solutions, combining physics modelling, semantic technologies, etc. to support analysis and decision, from supervised & unsupervised learning approached to reinforcement mechanisms. In short, the scope of AI in manufacturing, both in terms of technologies involved as well as in potential applications, is huge.

This session focuses on the general aspects that should be taken into account throughout the life cycle of AI solutions applied to production and manufacturing systems, as there exist common challenges that must be addressed when AI technologies are transformed into solutions for any manufacturing scenario.

The session welcomes papers that show actual implementation of AI technologies in manufacturing and production scenarios, including results and impact, with a particular focus on elements that help to highlight and understand the challenges that have the application of AI technologies, and the way these have been solved.

A non-exclusive list of challenge topics includes:

- How to take into account domain-specific requirements in terms e.g. of time criticality, human-interaction, plant safety and security?
- How to find effective ways for collaboration between humans and AI systems, exploiting the strengths of both humans and AI while keeping the human in a central position, assuming supervisory (human-on-the-loop) or executive (human-in-command) roles?

- How to engage operators through successful implementation and acknowledgement of AI solutions, including - e.g. explainability approaches, user feedback management, interfaces that facilitate HMI collaboration?
- How to ensure and facilitate trustworthiness with the consideration of HLEG guidelines [1]? How to convert into useful requirements for the manufacturing domain?
- How to handle concept drift and data shift scenarios – How include self-learning technologies that can keep AI solutions working for long time after first deployments, even in changing manufacturing contexts such as agile production.
- What is the value of 'engineered approaches' (e.g. MLOPs) to develop more robust and efficient AI solutions, with respect to 'handcrafted' approaches? How to design, analyse, deploy and maintain them? ¿What role can play AI repositories such as AI4EU in providing support for new solutions. How to handle models, datasets, etc. to facilitate re-use?
- How to handle privacy concerns of pilot and end users regarding both data exploration and models exploitation – e.g. Establishment of data governance; Use of FAIR approach to data, documents and results management.
- How to design, implement or connect to platforms that should provide a continuum support in analysis and exploitation - from edge to cloud AI solutions
- The role of standards to facilitate a widespread application of solutions.

Organizers expect that the session can serve as a forum for exchange on the latest results and ideas on the above mentioned thriving technology fields. This session will welcome papers that show actual implementation of AI technologies in manufacturing and production scenarios, including results and impact, with a particular focus on elements that help to highlight and understand the challenges that have the application of AI technologies [2, 3]

References

[1] https://digital-strategy.ec.europa.eu/en/policies/expert-group-ai

[2] https://cordis.europa.eu/programme/id/H2020_ICT-38-2020/en

[3] https://www.linkedin.com/company/ai-proficient-eu/

Time schedule

Deadline for paper submission	**January 31, 2024**
Notification of acceptance/rejection	**March 15, 2024**
Final paper submission	**April 15, 2024**
INCOM 2024, Vienna (Austria)	**August 28-30, 2024**