Machine learning approaches for design and management of manufacturing and logistics systems

The fourth industrial revolution currently in progress is geared towards the production of small batches of diversified high-quality products. This goal requires a deep data-driven knowledge of the manufacturing environment. In this context, data availability is a fundamental prerequisite for analytics that can then be carried out using either well-established statistical tools or more sophisticated approaches. With the advent of modern computer technology, a huge amount of data can now be collected even in small and medium enterprises. However, the sheer quantity of information limits the applicability of traditional statistical methods, designed with smaller scales and human supervision in mind. In fact, rapid changes and high variability of the industrial settings make automatic procedures not only desirable but even necessary. Big data analytics is the expression adopted to summarize the operations ranging from data collection to data organization and data analysis itself, and takes place in scenarios where traditional statistical tools appear inadequate. It should also be pointed out that data collection operations are not restricted to the manufacturing phase. Significant amount of data can be collected during the whole product life cycle, from the product and process design phase to the post-sale services. Machine learning theory is a research field of computer sciences introduced for the Artificial Intelligence (AI) development, but it detached early from AI becoming an autonomous branch. Machine learning algorithms focus on data-driven pattern recognition methodologies, applicable to regression, classification and decision making problems, and designed to be particularly effective in contexts characterized by lots of high-dimensional data.

The session proposal focuses on well-established and innovative machine learning tools (e.g. artificial neural networks, support vector machines, decision trees, linear and non-linear regressions and so on) for supervised and unsupervised classification, regression, component analysis and so on. The possible application fields of such tools include, but are not restricted to:

- Time series forecasting;
- Inventory classification;
- Inventory control;
- Predictive maintenance;
- Warehouse management;
- Strategic decisions.

Research papers, case studies and surveys are welcome.

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