Classification of Manufacturing Data for Efficient Processing on an Edge-Cloud Network

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Abstract : The widespread interest in 'Industry 4.0' or 'digital manufacturing' has led to significant research requiring the acquisition of data from sensors, instruments, and machine signals. In-depth research then identifies methods of analysis of the massive amounts of data generated before and during manufacture to solve a particular problem. The ultimate goal is for industrial Internet of Things (IIoT) data to be processed automatically to assist with either visualisation or autonomous system decision-making. However, the collection and processing of data in an industrial environment come with a cost. Little research has been undertaken on how to specify optimally what data to capture, transmit, process, and store at various levels of an edge-cloud network. The first step in this specification is to categorise IIoT data for efficient and effective use. This paper proposes the required attributes and classification to take manufacturing digital data from various sources to determine the most suitable location for data processing on the edge-cloud network. The proposed classification framework will minimise overhead in terms of network bandwidth/cost and processing time of machine tool data via efficient decision making on which dataset should be processed at the 'edge' and what to send to a remote server (cloud). A fast-and-frugal heuristic method is implemented for this decision-making. The framework is tested using case studies from industrial machine tools for machine productivity and maintenance.

Keywords : data classification, decision making, edge computing, industrial IoT, industry 4.0

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