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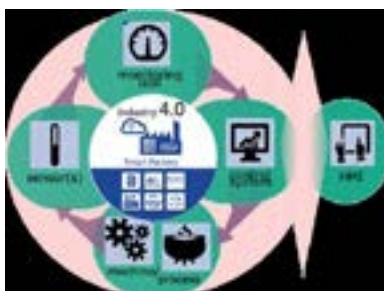


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Machine learning: A new paradigm for process monitoring in industry 4.0

Industry 4.0 is a new concept that incorporates multiple cutting edge technologies into a single environment and promises fast, high quality and cheap manufacturing capabilities. In this philosophy the human participation in routine tasks of the manufacturing process is minimized, or even excluded, and the process monitoring and decision making is delegated to machines. From this perspective the recent advances in machine learning (ML) are materializing the ideas of Industry 4.0 and give the directions for the further developments. The present work is an Industry 4.0 approach that employs the latest advances in ML creating monitoring systems for several industrial processes. In particular, the quality monitoring for laser welding, additive manufacturing, fracture mechanics and friction of mechanical parts is presented. Our technique relies on the measurements of the versatile physical parameters of the real processes that are unified in a single parameter space within ML framework. This information further is processed to obtain higher context information. This implies the search of the unique signatures of the momentary, quality-critical events that are extracted by the algorithms from a continuous signals flow. This approach, combined with the high sensitive detectors, allowed observing separate groups of the momentary events with a time resolution within (10-500) millisecond range thus discovering a promising precision of such systems in the future. The realization of this approach for real-time monitoring was investigated as well and the feasibility of this on the example of the laser welding was shown.



Biography

Shevchik S got his background in laser physics and bio photonics and later enriched it participating in a number of projects in machine learning and artificial intelligence. This dual expertise allowed creating a number of unique techniques, in which the artificial intelligence is employed to understand the physics of a number of industrial processes and to go beyond the human possibilities in process monitoring.

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