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Towards an Internet of Production

A Model-Assisted and Data-Driven Ecosystem Based on Digital Shadows

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Abstract: Data-driven machine learning methods are typically most successful when they can rely on very large and in some sense homogeneous training sets in areas where little prior scientific knowledge exists. Production engineering, management, and usage satisfy few of these criteria and therefore do not show very many success stories, beyond narrowly defined specific issues in specific contexts. While, in contrast, the last years have seen impressive successes in model-driven materials and production engineering methods, these methods lack context and real-time adaptivity. Our vision of an Internet of Production, pursued in an interdisciplinary DFG Excellence Cluster at RWTH Aachen University, addresses these shortcomings: Through sophisticated heterogeneous data integration and controlled data sharing approaches, it broadens the experience base of cross-organizational product and process data. At the method level, it interleaves fast "reduced models" from different engineering fields, with enhanced explainable machine learning techniques and model-driven re-engineering during operations. As a common conceptual modeling abstraction, we investigate Digital Shadows, a strongly empowered variant of the well-known view concept from data management. Several initial experiments indicate the power of this approach but also highlight many further research challenges.

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