Exploring the Applications of Natural Language Processing and Language Models for Production, Planning, and Control Activities of SMEs in Industry 4.0:

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Résumé

In the wake of the prominence of language models like ChatGPT/GPT4 and the emergence of various Natural Language Processing (NLP) approaches, there has been growing interest in their applications. However, a noticeable gap exists in scientific documentation regarding Small and Medium Enterprises (SMEs) within the industrial sector. This paper addresses this gap through a systematic literature review, focusing on the use of NLP and language models in industrial SMEs. Through five research questions, it investigates NLP solutions' applications, goals, technical solutions, obstacles, and applicability in these settings. Following the PRISMA 2020 methodology, the study reveals a lack of existing literature addressing the use of NLP in industrial SMEs. The findings also suggest that NLP and language models are predominantly applied in specific industrial domains, including design, process monitoring, and maintenance. NLP applications mainly aim to enhance operational performance, notably in support functions like maintenance, safety, and continuous improvement. When looking at the technical solutions implemented, the paper demonstrates a strong diversity in the encountered algorithmic approaches, as each paper proposes a unique algorithmic solution. Challenges involve staying up-to-date, scaling, addressing low-quality or insufficient data issues, and navigating domain or operator-specific vocabulary. In particular, maintaining up-to-date data presents a critical challenge for NLP applications, yet with limited identified solutions. Finally, the study indicates that only a fraction of proposed NLP algorithmic solutions may apply to SMEs because of a lack of resources, expertise, and standardized procedures.
Keywords: Natural Language Processing; Industry 4.0; Machine Learning; Language Models; SMEs

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