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Using large language models (LLMs) to support simulation-based optimization in supply chain management

Wiśniewski, T.[*a]

[a]Faculty of Economics, Finance and Management, University of Szczecin, Szczecin, Poland

ABSTRACT

The emergence of Artificial Intelligence (AI) in Supply Chain Management (SCM) heralds a transformative shift, breaking traditional barriers and unlocking new opportunities for optimization and efficiency. This study explores the impact of artificial intelligence, particularly large language models (LLMs), on simulation-based optimization applications in supply chain management. The novelty of LLMs lies in their ability to enhance both the technical and practical aspects of simulation-based optimization. On the technical side, LLMs can assist in constructing and fine-tuning optimization models by analyzing historical data, identifying patterns, and generating recommendations for optimal strategies. On the practical side, these models have the potential to simplify complex methodologies, making them more comprehensible and actionable for practitioners without extensive expertise in AI or advanced analytics. The article presents practical implications of LLMs in the form of a ChatGPT-based application, in which users express their supply chain challenges in natural language, and the model responds with tailored optimization strategies or simulation scenarios. The presented examples demonstrate how LLMs can automatically generate simulation models and support optimization processes in typical supply chain management scenarios. These results are preliminary and highlight both the potential of this approach and its current limitations, including occasional inaccuracies in the generated code.

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**Corresponding author:*
tomasz.wisniewski1@usz.edu.pl
(Wiśniewski, T.)

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Izvirni znanstveni članek

Uporaba velikih jezikovnih modelov (LLM) za podporo simulacijsko osnovani optimizaciji v upravljanju dobavnih verig

Wiśniewski, T.[*a]

[a]Faculty of Economics, Finance and Management, University of Szczecin, Szczecin, Poland

POVZETEK

Uporaba umetne inteligence (UI) v upravljanju dobavnih verig (SCM) prinaša pomembne spremembe, saj omogoča preseganje tradicionalnih omejitev ter odpira nove priložnosti za optimizacijo in večjo učinkovitost. Raziskava obravnava vpliv umetne inteligence, zlasti velikih jezikovnih modelov (LLM), na aplikacije simulacijsko osnovane optimizacije v upravljanju dobavnih verig. Novost velikih jezikovnih modelov se kaže v njihovi sposobnosti izboljšanja tehničnih in praktičnih vidikov simulacijsko osnovane optimizacije. S tehničnega vidika lahko LLM pomagajo pri oblikovanju in natančnem prilagajanju optimizacijskih modelov z analizo zgodovinskih podatkov, prepoznavanjem vzorcev ter generiranjem priporočil za optimalne strategije. S praktičnega vidika imajo ti modeli potencial poenostaviti zapletene metodologije ter jih narediti bolj razumljive in uporabne za strokovnjake brez poglobljenega znanja umetne inteligence ali napredne analitike. Prispevek predstavlja praktične implikacije uporabe LLM v obliki aplikacije, ki temelji na orodju ChatGPT, pri čemer uporabniki svoje zahtevke v dobavnih verigah izražajo v naravnem jeziku, model pa odgovarja s prilagojenimi optimizacijskimi strategijami ali simulacijskimi scenariji. Predstavljeni primeri ponazarjajo, kako lahko LLM samodejno generirajo simulacijske modele in podpirajo optimizacijske procese v tipičnih scenarijih upravljanja dobavnih verig. Dobljeni rezultati so preliminarni in izpostavljajo potencial tega pristopa ter njegove trenutne omejitve, med katerimi so tudi občasne netočnosti v generirani programski kodi.

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Ključne besede:
Upravljanje dobavnih verig;
Simulacijsko osnovana optimizacija;
Umetna inteligenca;
Veliki jezikovni modeli (LLM);
Generativna umetna inteligenca;
Pogovorna umetna inteligenca;
ChatGPT;
Odločanje, podprto z umetno inteligenco

Kontaktna oseba:
tomasz.wisniewski1@usz.edu.pl
(Wiśniewski, T.)

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