TU Clausthal

Abschlussvortrag Masterarbeit Ovais Ul Haq

„Modelling and Analysis of Emergent Behaviors in Multi-Agent Systems: A Systematic Literature Review“

Emergent Behaviors in Multi-Agent system arise from the interactions and coordination of different individual agents, which leads to a global phenomenon. It is important to understand and analyze these emergent behaviors for ensuring desirable system outcomes in different domains. Our systematic literature review aims to investigate the state-of-the-art methods that are used to model and analyze emergent behaviors in Multi-Agent systems. The study addresses the main question: How do researchers employ analytical methods and tools to investigate and analyse emergent behaviors in MAS? The findings provide very valuable insights into the best practices, trends and the challenges faced in MAS. The review follows the PRISMA

2020 guidelines for our SLR. We selected studies based on a structured review of titles, abstracts and full text reviews to ensure relevance to our research questions.

In our study we examined vast range of analytical and modelling methods that are used to study emergent behaviors in Multi-Agent systems. We identified the methods strengths, advantages and limitations. We assessed approaches for controlling the emergent behaviors by modifying the individual agent rules. The results offer in-depth analysis of modelling methods and techniques for MAS, emphasizing potential areas for advancement and future research. The review provides a comprehensive overview of current research on modelling and analyzing emergent behaviors. That demonstrates how popular it is becoming in all the different potential uses for it in different domains. The findings highlight the need for further research into the analytical methods and control mechanisms of emergent behaviors for more better outcomes. Future research should focus on addressing the gaps and advancing the practical applications of emergent behavior modelling in real world Multi-Agent system deployments.

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