

RESEARCH PROPOSAL

Title: Navigating the Future: Integrating AI into Systems Engineering for Enhanced Efficiency and Innovation

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Scientific background

Systems engineering spearheads innovation by navigating complexity with organized approaches effectively coordinating intricate projects and various stakeholders. Rooted in systems theory, it underscores coordinating interactions within a system. With AI's advent, the potential grows to evolve more adaptive, intelligent systems. Research shows AI can enhance decision-making, optimize resources, and improve project management. However, AI's theoretical role in systems engineering—especially human-AI collaboration and transforming workflows—is mainly unexplored. As we enter a new era in systems engineering, AI integration offers great potential to redefine system limits, necessitating more profound research to unlock full AI-enhanced systems engineering potential.

Research objectives

The objective of this study is to explore the integration of artificial intelligence (AI) into systems engineering processes. It aims to identify the challenges associated with this integration and develop strategies to address them.

Research Questions:

- How can AI tools streamline systems engineering processes?
- What are the primary challenges of integrating AI into systems engineering, and how can these challenges be overcome?

Methodology

This study employs a mixed-methods approach to explore artificial intelligence (AI) integration in systems engineering, combining qualitative and quantitative research. It begins with qualitative interviews with systems engineering and AI experts to gather insights into AI's practical benefits, challenges, and successful deployment strategies. An experimental phase follows, where participants, divided into groups with and without AI tools, perform tasks to assess AI's utility in a controlled setting. This methodology connects theoretical and practical knowledge, highlighting AI's impact on systems engineering. The study's findings are expected to offer a detailed understanding of AI's potential to enhance engineering solutions, addressing the industry's changing demands.

Data analysis involves a three-stage process: qualitative interview data analysis, quantitative experimental data analysis, and integrating these findings for a comprehensive view of AI in systems engineering. Statistical methods including descriptive, inferential statistics, and advanced analyses like machine learning, network analysis, and natural language processing (NLP) will be utilized. These approaches aim to provide a deep understanding of AI's role in systems engineering, fostering advancements in the field through innovative statistical analyses and methodologies. This research seeks to guide future studies and enable breakthroughs in systems engineering by leveraging AI.

Significance and innovation

In an era where technological advancements are rapidly reshaping industries, this study emerges as a beacon of innovation, poised to redefine systems engineering through the strategic integration of artificial intelligence (AI). Its significance transcends traditional boundaries, offering a visionary approach to overcoming the limitations of conventional methodologies. This study stands out for its potential to fundamentally transform systems engineering through the integration of AI. It aims to tackle the increasing complexity of projects that traditional methods may find challenging to manage effectively. By delving into the role of AI in augmenting human tasks within systems engineering, this research could usher in a new paradigm for the field. It anticipates guiding the development of novel project management, design, and implementation strategies that align with the pace of technological advancement. Ultimately, the findings of this research promise not only to enhance the efficiency and effectiveness of systems engineering processes but also to set a precedent for future innovations in the field. By charting a course toward more intelligent, adaptive systems, this study could significantly contribute to advancing engineering practices, marking a pivotal moment in the evolution of systems engineering.