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Ph.D. DISSERTATION DEFENSE

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Degree:	Doctor of Philosophy
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Title:	Impact of Human Reliance on Collaboration with Intelligent Decision Support Systems
Chairperson:	Dr. Onur Asan, School of Systems and Enterprises
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ABSTRACT

In today's rapidly evolving world, intelligent systems are taking on a crucial role in assisting human across various fields, spanning healthcare to transportation. Within this context, the level of user reliance becomes a crucial factor determining how effectively intelligent systems can support human decision-makers in numerous domains. How much a user should rely on an intelligent system to maximize the benefits is an open question. In this research we try to study the dynamics of human – AI interaction, aiming to investigate the optimal level of reliance that lead to effective collaboration.

In this research we utilized a multidimensional approach that combines computational modelling and human subject experimentation to unfold the research questions. Through the lens of computational simulation, we studied the optimal reliance level that is needed to gain the maximum performance in human-decision support system teaming. By analyzing various characteristics, our research unearths how user should appropriately rely on intelligent systems to maximize collaboration performance. This novel perspective helps system designer to tailor AI systems effectively.
Transitioning to empirical study, we developed an engaging computer game to investigate human reliance on embedded AI in solving classification problems. The experimental findings brightened the effect of transparency, robustness, and fairness in shaping human-AI collaboration. Notably, transparency, robustness, and fairness enhancements corelate with improved collaboration performance, albeit at the cost of added mental workload. Furthermore, our results show no significant differences in gender performance and reliance to AI, highlighting the systems' universal impact.

Finally, we verified our research using continuous design problems, bridging different problem classes. This cross-domain investigation offers a comprehensive understanding of how reliance and system design

intricately intertwine to facilitate effective human-AI collaboration. By unveiling the underpinnings of these interactions, this research provides invaluable insights into designing AI systems that are not only technically capable but also seamlessly integrated with human decision-making processes. Ultimately, these findings pave the way for optimizing the synergy between humans and intelligent systems, driving us towards a future of enhanced collaboration and improved decision- making across various domain.