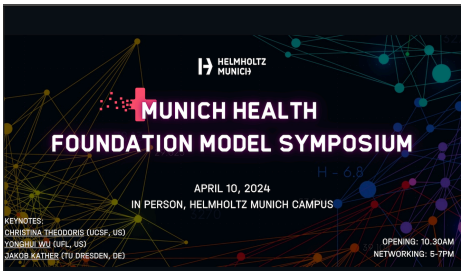

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Advancing Clinical Trials Through Digital Twins

Clinical trials play a fundamental role in medical research, serving as the bridge between the development of safe and effective medical interventions and their widespread use for public benefit. Despite their significance, the process of conducting clinical research is paved with challenges. It is a time-consuming task that requires substantial financial investment and yet exhibits alarmingly high failure rates. Key contributing factors of failed trials include cohort selection, recruiting mechanisms, and insufficient technical infrastructure. These limitations highlight the necessity for innovative approaches to address these issues and optimize trial methodologies while upholding ethical standards and securing regulatory approvals.

Our project, a collaborative effort between the Machine Learning and Data Analytics Lab at the Friedrich-Alexander-Universität Erlangen-Nürnberg and the Novartis Medical Data Strategy & Science Department, aims to enhance clinical trials with a focus on developing innovative methods for synthetic control arms. At the heart of our approach is the concept of a 'digital twin'for each trial participant, created by integrating a comprehensive array of (health) data from the respective participants. This digital twin serves as a foundation for employing advanced machine learning and explainable artificial intelligence technologies. Our efforts are concentrated on crafting sophisticated patient-matching algorithms, and predictive models. These advancements are aimed at enriching trials with external or even synthetic control groups.

In addition, our goal is to overcome obstacles related to participant recruitment, mitigate selection bias, and resolve issues related to missing data and accuracy. Through the incorporation of predictive components within real-time digital dashboards, we can early identify and understand trends and act upon them.
The current research phase involves a thorough exploration of existing clinical trial data, simulation of online components, and a comprehensive feasibility analysis.

By building upon state-of-the-art tools and methodologies, we are working towards paving the way for more efficient, ethical, and cost-effective clinical research. The anticipated outcomes promise to align clinical trials more closely with the rapidly evolving healthcare landscapes.

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