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Digital twins in Quality Engineering: cases, challenges and the role of statisticians

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The pace of digitalization is rapidly accelerating with businesses and industries utilizing technologies such as IoT, cloud computing, big data analytics, and AI to create digital twins (DTs) - virtual replicas of physical systems or environments. DTs offer a powerful framework for integrating the physical and virtual worlds, enabling more efficient and effective decision-making. Industries such as manufacturing, automotive, and healthcare are utilizing DTs to simulate behavior and create personalized models for more efficient optimization, safer vehicle design, and better treatment plans. As the use of DTs continues to grow, it is crucial for businesses to stay updated and leverage them to gain a competitive advantage. DTs require a multidisciplinary approach, bringing together specialists from different fields such as computer science, mathematics, and statistics. The talk will showcase two real-world examples of DTs used in product development and quality inspection to define key challenges and research avenues for statisticians. Whereas statisticians historically focused on physical world characteristics, an expanded focus including the virtual representation of DTs, as well as techniques combining the information gained from both worlds are interesting and will be discussed.

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