INTERNATIONAL

INVITED SESSION SUMMARY

Title of Session:

LDTH: Leveraging Digital Twins in Healthcare

Name, Title and Affiliation of Chair:

- Laura Verde, Dr, Department of Mathematics and Physics, Università degli Studi della Campania "Luigi Vanvitelli", Caserta, Italy.
- Jan Vrba, Dr, Department of Mathematics, Informatics and Cybernetics, University of Chemistry and Technology in Prague, Prague, Czech Republic.
- Roberta De Fazio, Dr, Department of Mathematics and Physics, Università degli Studi della Campania "Luigi Vanvitelli", Caserta, Italy.

Details of Session (including aim and scope):

Digital Twins (DTs) are emerging as a revolutionary factor in several industries due to their ability to provide a digital and dynamic representation of a physical system or process. With their ability to provide detailed and dynamic information, DTs enable more effective, efficient and predictive management of physical systems and industrial processes. This contributes significantly to improving performance, reducing costs and promoting innovation in the various sectors in which they are implemented. Moreover, their impact is not only limited to monitoring and predicting system status but involves even taking autonomous maintenance decisions, providing recovery action and ensuring the continuity of critical services. These characteristics have earned DTs a position of relevance in both the industrial and academic spheres, with increasing success in the field of Critical Infrastructures. In particular, in healthcare systems, DTs are transforming the delivery of patient care. Through the utilization of real-time data integration, advanced analytics, and virtual simulations, digital twins provide improved patient care, predictive analytics, optimization of clinical operations, and opportunities for training and simulation.

DTs can have multiple functions in healthcare. On the one hand, it is possible to create digital models of patients that contain anatomical, physiological and historical data. These models can be used to tailor treatment plans, simulate complex surgeries and predict individual responses to specific therapies. On the other hand, DTs can be used to monitor the condition and performance of medical devices in real time, predict preventive maintenance and improve the safety and reliability of instruments used in clinical settings. In addition, the flexibility of DTs layered architecture allows the embedding and the combination of several sophisticated analysis techniques – Machine Learning, Process Mining, Deep Learning, Model-driven approaches – that increase the dependability of the results obtained.

This Session will present both review and original research articles related to dynamic evolution of DT applications in healthcare optimization, but not limited to.

This Session covers but is not limited to the following topics:

- Architectural patterns for digital twins
- Modelling concepts and languages, methods, and tools for developing digital twins
- Digital twin for predictive maintenance and performance prediction
- Digital twin for process control
- Digital twin modelling of patients
- Combining models and data in digital twins
- AI for precision medicine
- Security, privacy, and ethical challenges in DT applications
- Use cases and applications of HDTs in clinical practice and research

Technical Program Committee:

Laura Verde, Università della Campania "Luigi Vanvitelli" (IT)
Jan Vrba, University of Chemistry and Technology, Prague (CZ)

Roberta De Fazio, Università della Campania "Luigi Vanvitelli" (IT)
Fiammetta Marulli, Università della Campania "Luigi Vanvitelli" (IT)
Stefano Marrone, Università della Campania "Luigi Vanvitelli" (IT)
Lelio Campanile, Università della Campania "Luigi Vanvitelli" (IT)
Giovanni Paragliola, ICAR-CNR (IT)
Jakub Steinbach, University of Chemistry and Technology, Prague (CZ)
Tomas Jirsa, University of Chemistry and Technology, Prague (CZ)
Francesco Mercaldo, Università del Molise (IT)
Michele Mastroianni, Università degli Studi di Salerno (IT)
Michele di Giovanni, Università della Campania "Luigi Vanvitelli" (IT)
Atrin Barzegar, Università della Campania "Luigi Vanvitelli" (IT)
Maria Stella de Biase, Università della Campania "Luigi Vanvitelli" (IT)
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https://sites.google.com/view/ldth2024/home?authuser=0

Important Dates

- Submission of Papers: 10th May, 2024
- Notification of Acceptance: 21st May, 2024
- Final paper publication files to be received by: 3rd June 2024