Title: Executable Digital Twin. From simulations to reality.

Abstract: While simulation models are still the basis of modern product design engineering, executable digital twin (xDT) expands the usefulness of a traditional digital replica through the product life-time cycle. This feature allows to run real-time simulations and to make real-time predictions, as the system state of health, increasing the reliability of industrial systems by early fault diagnosis. xDT is a physics-based virtual model and uses only a few data coming from sensors to determine the system real-time performance and then to predict the whole behavior of the system at given virtual sensors locations. It evolves and updates to reflect any change in the real system, becoming smart and self-adaptive by including Kalman filters to estimate the states or the parameters of the system. All approaches must be carefully chosen so that the used algorithms fit the requirements of high-fidelity nonlinear models of industrial complexity.

Join us on a journey that takes you from modelling a high-fidelity digital replica of an industrial system to its interaction with the real physical one. We'll show you how to:

- Use Simcenter Amesim within the framework proposed by IMOCO4.E (https://www.imoco4e.eu/) to build a high-fidelity virtual model of an industrial system.
- Improve the physics-based model and used algorithms to match reality by using XiL (Model and Software in the Loop).
- Augment the xDT with new data using Kalman filters
- Perform predictive maintenance, discover effects early and push the device to the limit to make sure it is safe and reliable.
- Install the developed xDT on the edge, in the cloud.

Speaker bio: Raluca Raia received the B.Sc. and M.Sc. degrees in Electrical Engineering from the Technical University of Cluj-Napoca (TUCN), Romania, in 2018 and 2020, respectively, being rewarded with the First in class qualification. Currently, Raluca is pursuing the Ph.D. degree at the same University, with secondments at Siemens Industry Software, Leuven, Belgium, studying the field of electrical motors, developing automated processes that enable multi-physical analysis, big data generation for data-driven models and system-level integration. At the same time, since august 2022, she is a research engineer at Siemens Industry Software Brasov, Romania, where she is focused on developing advanced model-based and knowledge-based methods for building digital twins, AI and optimizations. Raluca has a strong industrial background, working with companies with interest in automotive industry. During her stay in 2018 at Brose, Würzburg, Germany, she specialized into finite element electromagnetic simulations, MOR and surrogate models. Her M.Sc. thesis was done in collaboration with Siemens Industry Software, Leuven, Belgium, where she specialized into vibro-acoustic characteristics of electrical motors. After her MSc, she joined the Department of Electrical Machines and Drives, Faculty of Electrical Engineering, TUCN as a research assistant where she was involved in research projects, being strongly connected with both industry and academia. Her research interests include system-level simulations, multi-physical modeling, reduced order modeling, NVH, electric vehicles and executable digital twin.