DIGITAL TWIN WEEK

ESReDA | European Safety, Reliability & Data Association — **Deusto** Universidad de Deusto

Join us for an upcoming event on Digital Twins, featuring a doctoral training session and a seminar that serves as a unique academia-industry gathering. Delve into the world of Digital Twins with our training and explore their key application in Digital Maintenance.

NOTE: Please register separately for each of the two activities happening concurrently. The registration for the doctoral workshop includes access to plenary talks and social events of the ESReDA Seminar.

64th ESReDA Seminar

ESReDA

digital maintenace in the digital twin era.

30th 31th may

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ENHAnCE
Featuring Engineering

Marie Skłodowska-Curie Actions

Funded by the European Union

BUILDCHAIN

doctoral workshop on digital twin.

29th 30th 31th may

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REGISTRATION LINK
https://forms.gle/v6GFGmD7bJqCRpcb8

EVENT LOCATION
Universidad de Deusto
Bilbao (Spain)

Deusto Universidad de Deusto

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The Seminar

Digital Twins Technology (DTT) is becoming indispensable for understanding and deciphering the utility of current developments, unlocking the potential of digital transformation. It operates like the keystone in an arch, seamlessly bringing together diverse elements of digital technologies and modeling techniques. This synergy creates a unified structural entity, crucial in the emergence of new and complex System of Systems (SoS) structures.

One of the most significant areas where this transformation is expected to make waves is **Digital Maintenance**. Analyzing how maintenance can benefit from this evolution is essential. The advent of new technologies has made the maintenance landscape more intricate, requiring efficient management of vast information and predictive alarms within dynamic schedules. However, the complexity of the maintenance management process often hampers the technology's impact on organizations. Conventional maintenance practices persist, causing delays in embracing digitalization and hindering the expected return on investment for companies undergoing the digital transformation effort.

Furthermore, **the role of individuals in the context of maintenance digitalization and servitization** is critical. Embracing digital transformation offers an opportunity for human evolution, leveraging the expertise and experience of employees in the new digital environment. This provides a competitive edge in driving innovation and technological progress.

Join us at the **64th ESReDA seminar**, where researchers, practitioners, and experts from **companies and academia** converge to share insights and advancements in the realm of digital maintenance and its relationship with digital twins, complex systems, and human resources

LINK TO DETAILS OF
REGISTRATION, FEE AND VENUE:
64th ESReDA SEminar

The City

Bilbao, Spain, will host the 64th ESReDA. Nestled along the Nervión River, Bilbao seamlessly blends rich history with cutting-edge architecture, epitomized by the iconic Guggenheim Museum designed by Frank Gehry. Participants will have the chance to immerse themselves in the lively Old Town, savor exquisite Basque cuisine, and explore a city that exudes charm at every turn. Join us for an event that marries knowledge exchange with the cool vibe of Bilbao.

We look forward to welcoming you to this unforgettable experience!

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doctoral workshop on digital twin.

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Introduction to Digital Twinning

01

What are digital twins (DT) // Range of applications and opportunities // Descriptive and forecasting DTs // Playing "what if?"

Introduction to Inverse Problems and their Probabilistic Treatment

02

Forward and inverse problems - maps and their inverses // Well-posedness and its significance // Issues when considering inverse problems // Observational noise // Estimation, inversion of non-invertible maps

Computational techniques for Bayesian updating and filtering

03

Short recap of random variables, sample, expectation, probability // Conditioning, Bayes's theorem, conditional expectation and conditional probability // Connections with machine learning and model order reduction // MCMC // Approximate Bayesian Computataion // Kalman filters and Particle filtering // Gauss-Markov Filter // Mixture density network

Predictive/proxi modeling, explainability of models

04

Machine Learning techniques // Bias-variance trade-offs, generalization capability, validation techniques // Ensemble tree methods and the SHAP analysis // Deep neural networks // Physics-based surrogate modeling

Proxy modeling for stochastic systems

05

Orthogonal stochastic polynomials and the gPCE // Computation of gPCE: direct integration, spectral methods // Numerical integration // Statistics and global sensitivities with gPCE // Gaussian process estimation

BIM technologies and digital twinning

06

Overview of existing techniques and their connection with the DT // View of BIM technologies from industry // Management-communication of DT

Educative examples of the whole framework, summary

07

Toy modeling: explanation and configuration // Practicing session // Summary and conclusion of the doctoral school

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