



# European Center of Excellence in Digital Twins for Infrastructures and Cities



Rocío López Espinosa

Barcelona, 7th of November, 2024



Capital  
Digital



Capital  
Digital



01.



# DIGITAL TWINS Project

infrastructures & cities



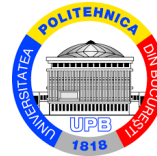
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# Objectives



Training on the application of digital technologies to the civil engineering and building sectors



Creation of a Centre of Excellence of digital twins



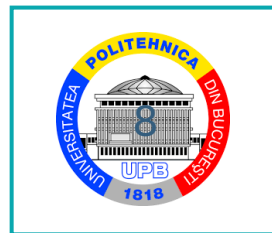
Facilitate the digital transformation of the sector



## Consortium: Academy + Innovation



Civil Engineering & Architecture Schools of the EELISA alliance



AI and CS research center



Innovation SMEs



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# Action lines of the project

## The Executive Master in Digital Twins



## The Centre of Excellence in Digital Twins



A one-year international master program addressed to engineers of the built & mobility environments.

Coordinated by four European leading Civil Engineering Universities and participated by public and private entities of all sectors related with the civil engineering and building sectors

To create the leaders of the digital transformation of the sector

A platform to promote the creation of networks between the different players of the built & mobility environment.

The main goal is accelerating the digital transformation of the sector, with three main lines of action:

- Training.
- Research and technology transfer.
- Entrepreneurship promotion.



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02.



# DIGITAL TWINS

centre of excellence



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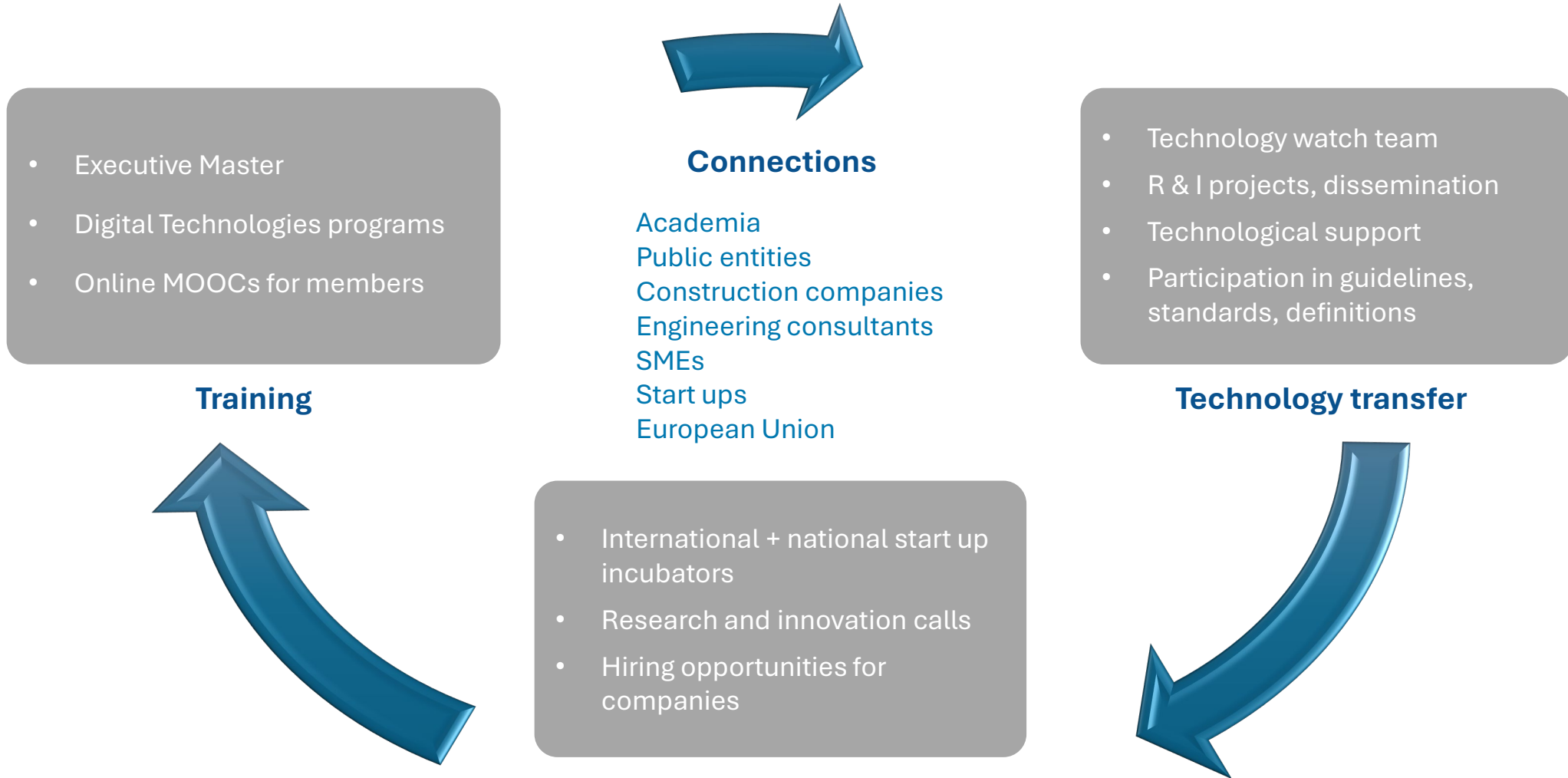


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# The Centre of Excellence







# The Centre of Excellence

The Centre of Excellence in Digital Twins for Infrastructure and Cities has started its activities towards the acceleration of the digital transformation, promoting collaboration between stakeholders, disseminating know-how, coordinating European innovation projects, leading research around DT and supporting companies and start-ups in their transition to a sustainable and digital transformation.





03.

# Training Pillar

## Executive Master in Digital Twins for Infrastructures and cities



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# Executive Master: Target Students



## No geographical restrictions.

Worldwide candidates, with the only requirement to attend to the online sessions and the onsite workshops

Working for companies who need talent to lead their digital teams and/or...

No BIM nor computer science skills required, except some basic programming skills

Civil & mechanical engineers, architects and related professionals from the built environment

Young skilled professionals with an ideal experience of at least 1-3 years

...professionals willing to divert their careers stepping into a digital framework



## ...Engineers of the future

Capable of leading digital teams composed by experts in different fields (programming, BIM, IoT, data...) and of designing, implementing and operating digital twins of physical assets



# The Executive Master



## Executive

Targeted to professionals in the built environment

Structured to facilitate conciliation with work



## Blended

Online evening live sessions (Mon to Wed 6 to 8:30pm CET)

Three onsite meetings (Thu-Sat) in Madrid, Budapest & Paris



## Joint Diploma

An institutional master jointly organized by four leading European Civil Engineering universities



## Project based

Learning-by-doing through real capstone projects under the mentorship of our industrial partners.



## One year

60 ECTS master program, from Sep'24 to July'25



## Faculty

Combination of professors and experts from academia and industrial partners



## Global

Students from all over the world, not necessarily from the coordinating universities countries  
Fully taught in English



## Networking

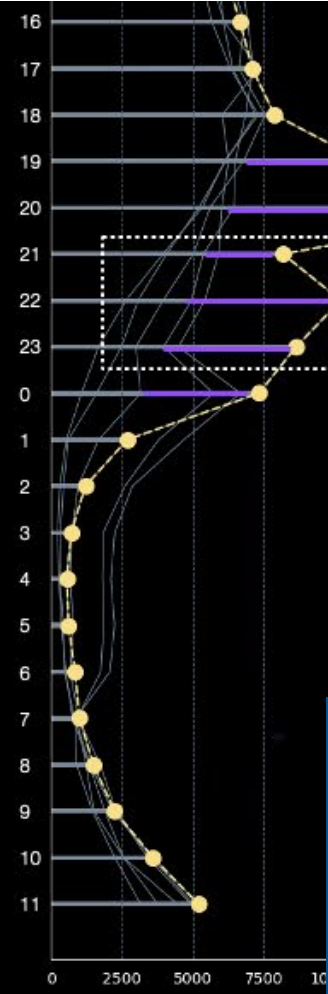
Encouraged through onsite events, capstone projects, conferences, team group tasks...



## Capstone projects

Hands-on real-world cases of applied digital twins, proposed and mentored by 1-2 industrial partners, and coordinated by faculty of the Master Program.

Developed in groups of 3-4 students between November and July, with 2 onsite workshops and a final presentation at the closing ceremony in Paris



09/03/2022 21.00-23.00h  
**Real Madrid – PSG**  
 Football match  
 District: Chamartín

## Capstone projects of 2023-2024

### Developing a Predictive Model of Mass Events' Impact on Mobility within an Urban Digital Twin Framework

**TEAM**

Project mentored by NOMMON and INECO and supervised by UPM.

Autors:

Francisco José Cartelle  
 Antía Fernández Fernández

This capstone project examines the growing occurrence of mass events in Madrid and their impact on urban mobility in 12 districts of the city of Madrid.

By combining data analysis techniques with urban and transport planning principles, it develops a predictive transformer model for integration into Madrid's evolving Digital Twin platform.

**Benefits**

- Assess the impact of mass events on Madrid's urban mobility and develop an AI-based model to predict and simulate these effects.
- Create a methodology for analysing mobile network data to predict mobility patterns across various urban settings.
- Develop a replicable framework that can be adapted to other cities hosting mass events.





# Executive Master. Edition 2023-2024

Madrid onsite event  
(Feb 2024)



Budapest onsite event  
(May 2024)



Paris onsite event (Sept 2024)





# 04.

# Technology transfer and connections



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# The Centre of Excellence

## Seminar: Digital Twins applied to the railway sector

### Agenda:

10:30	Conference registration
11:00	<b>Welcome Keynote</b> <b>José Miguel Atienza</b> Director Escuela de Ingenieros de Caminos, Canales y Puertos, UPM.
11:10	<b>The digital and green transformation of the public companies in the railway sector. Future impact of digital twins.</b> <b>Bruno Landes</b> SNCF, Head of the Analysis and Topographic Techniques Division <b>Javier Lozano</b> ADIF, Deputy Director of BIM and Digital Continuity <b>Moderated by: Sofía D'Agular</b> Executive Director of EELISA European University
12:10	<b>The private sector view. The transition from BIM to Digital Twins in the Railway Sector</b> <b>Laura Tordera</b> Ferrovial, Global Innovation Leader <b>Rafael Morán</b> Typsa, Global Director Transport Infrastructure <b>Guilhem Villemín</b> Altametrís, Chief Technical Director <b>Jorge Rodríguez</b> MainRail, CEO <b>Moderated by: Clara Zamorano</b> Railway engineering Professor at UPM
13:10	<b>Closing remarks</b>
13:15	<b>Networking Cocktail</b>










# The Centre of Excellence

## Seminar: Digitalization and urban mobility

### Tecnologías digitales y Movilidad Urbana



11 de octubre - 9:45h - Aula Torres Quevedo, ETSICCP

- 9:45h** **Registro**
- 10:15h** **Apertura de la jornada**  
 José Miguel Atienza. Director. ETSI Caminos, Canales y Puertos, UPM  
 Ricardo Herranz, CEO Nommon
- 10:30h** **El plan de digitalización de la Comunidad de Madrid**  
 Silvia Roldán. Viceconsejera de Digitalización de la CCAA de Madrid
- 11:05h** **Sesión técnica I. Tecnologías digitales aplicadas a la movilidad de personas en el entorno urbano.**  
 Moderadora: **Cristina Sanjuán**. Head of Digital Services. ARUP  
 Soledad Pérez Galdós. Infrastructures & Innovation Coordinator. CRTM  
 "Plataforma Big Data y Business Intelligence y otras aplicaciones de tecnologías digitales en el CRTM"  
 Javier Burrieza. Ing. Senior de Desarrollo de Negocio. NOMMON  
 "El pasajero en el centro: inteligencia artificial para predecir la demanda y optimizar la oferta de transporte público"  
 Nuria Alós & Daniel Croce. Planificación y Economía del Tpte. SENER  
 "Estudio de movilidad de las personas en el ámbito de la comunidad autónoma de Euskadi mediante técnicas Big Data"
- 12:00h** **Pausa. Café.**
- 12:25h** **Sesión técnica II. Tecnologías digitales aplicadas a la gestión de mercancías de última milla**  
 Moderador: **José Manuel Vassallo**. ETSI CAMINOS - TRANSYT  
 José María Iglesias. Subdirector, Dirección de Movilidad. EMT MADRID  
 "Herramientas tecnológicas de control y soporte a la actividad de reparto de última milla"  
 Natalia Sobrino. ETSI CAMINOS - TRANSYT  
 "Soluciones inteligentes para la logística de última milla de Madrid: El valor de los gemelos digitales"  
 Alfonso Molina. Project Manager. CITYlogin  
 "Aplicación de las tecnologías digitales para la innovación logística"
- 13:25h** **Cierre de la jornada. Aperitivo**









# The Centre of Excellence

Seminar: El gemelo digital de la ciudad de Madrid



## PRESENTACIÓN GEMELO DIGITAL DE MADRID DEMOSTRADOR



Con la colaboración de



Martes, 30 de abril, 09:00  
Salón de actos del Colegio de Ingenieros de Caminos, Canales y Puertos  
Calle de Almagro, 42 28010 Madrid (Metro Rubén Darío)



Click para acceder a la ubicación

"Madrid, Capital Digital", es la estrategia para facilitar y acelerar la transformación digital y reforzar el posicionamiento de Madrid como una ciudad referente en el contexto digital. Uno de los objetivos de esta estrategia es dotar de inteligencia a la ciudad, con una gestión basada en datos que facilite la toma de decisiones aplicando tecnologías emergentes para la hiperconectividad e hiperautomatización.

En el marco de esta estrategia, uno de los compromisos adquiridos es el de Reproducir digitalmente la ciudad y sus servicios para facilitar la toma de decisiones, en concreto el "crear una réplica virtual de la capital para realizar simulaciones y analizar el impacto y la afección en la vida de los ciudadanos ante cualquier obra, infraestructura o nuevo servicio, previa a su puesta en marcha.





# The Centre of Excellence

## Collaboration agreement with Ayuntamiento de Madrid



A collaboration agreement focused on the development of real cases of demonstrators of innovative projects for the digitalization and sustainability of the civil infrastructures of the Municipality of Madrid.



# The Centre of Excellence

## Muévete verde awards 2024

In May 2024 the Escuela de Ingenieros de Caminos, Canales y Puertos de Madrid (UPM) was awarded with the Muévete Verde 2024 prize, organised by the Madrid City Council as part of the activities of the European Mobility Week 2024 (SEM24).

The prize recognised the initiative that contributes to improving mobility in the city of Madrid in the Digitalisation category.

The Escuela de Ingenieros de Caminos, Canales y Puertos de Madrid (UPM) won the award for its project focused on the digital twins Digital Twins for Infrastructures and Cities. The award was collected by the deputy director, Vicente Alcaraz.



# The Centre of Excellence

Other European activities



Symposium.  
Transforming the Built Environment:  
Accelerating Circular and Digital Transition  
(Istanbul, November 23')



BIM World Paris 2023 & 2024  
Twin+ Trophies



Hackaton:  
European Engineering  
Projectwork course  
(Istanbul, June 24')  
Organizers ITU-BME



45th FNAU Annual Meeting of Urban Planning  
(Paris, October 24')





# Strategic partners and collaborating companies



## Collaboration opportunities



Mentoring one of the capstone projects, either alone or in coordination with another industrial partner



Propose candidates to the master program, expected to lead your digital teams in the future



Become part of the Center of Excellence



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Rocío López Espinosa  
rocio.lopez@upm.es



<https://www.digitwin4ciue.eu>

