



AI at the service of urban mobility

from data to the citizen experience

Proyecto 315



EMT MADRID

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EMT Technology Management Model

A NEW MANAGEMENT MODEL THAT EVOLVES

Focus on results

A strategic alignment between digital and business is ensured, working together.

To achieve this, management policies are created that are adapted to each area, **ensuring that the company is agile and keeps pace with the digital evolution of the market.**



DIGITAL MOBILITY:
Innovation as a transformation element

Technology facilitates our transformation and evolution

The forces of digital transformation that are trending in today's
market and where we want to go include:



Cybersecurity



5G



Cloud



IoT



AI



Big Data



VR / AR

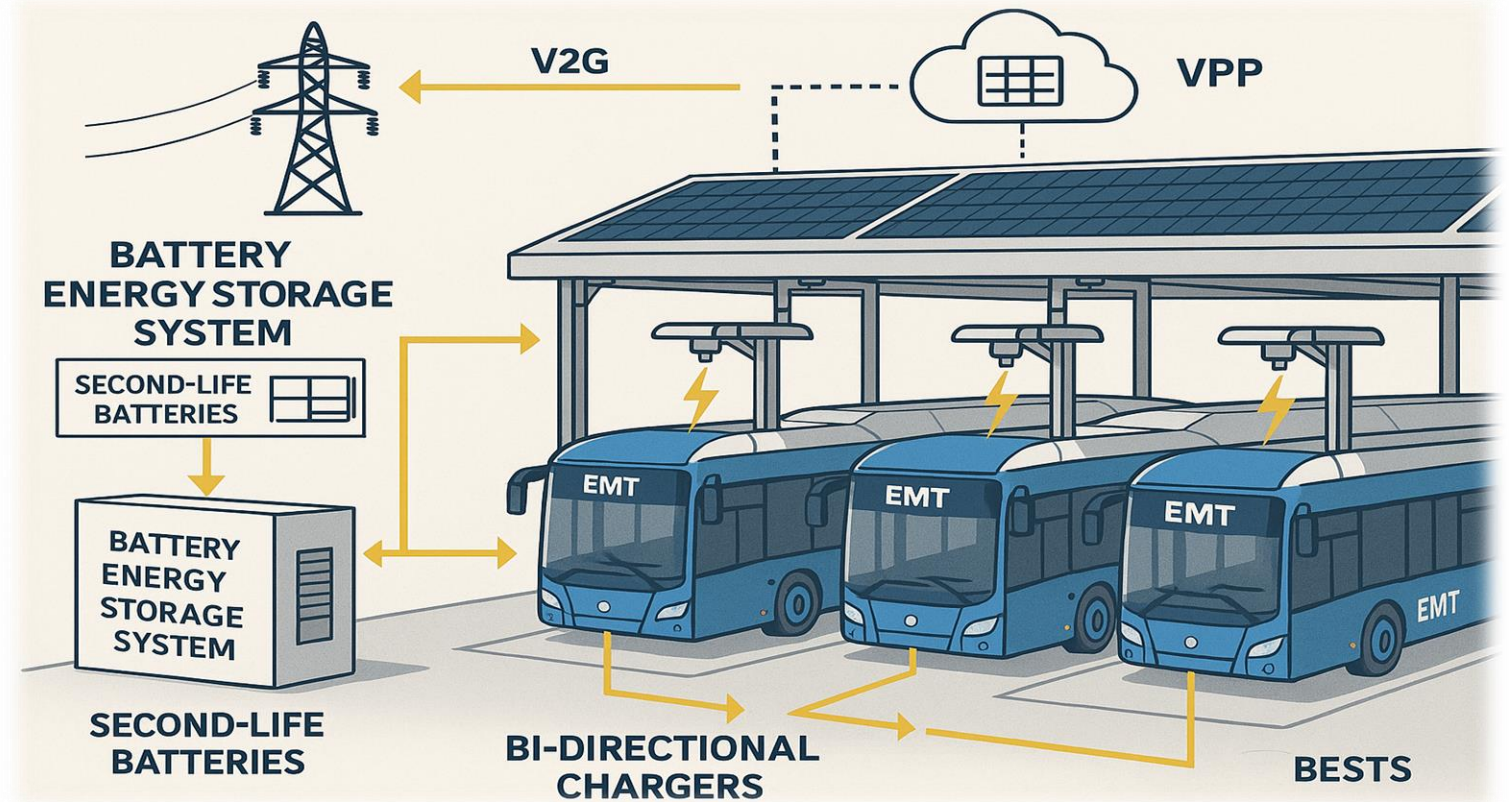


Blockchain

Our digital plan focuses on effectively applying these transformative forces and trends in
our management, integrating an innovative vision and the application of artificial
intelligence, which will improve operational efficiency and transform the travel experience
of our users.

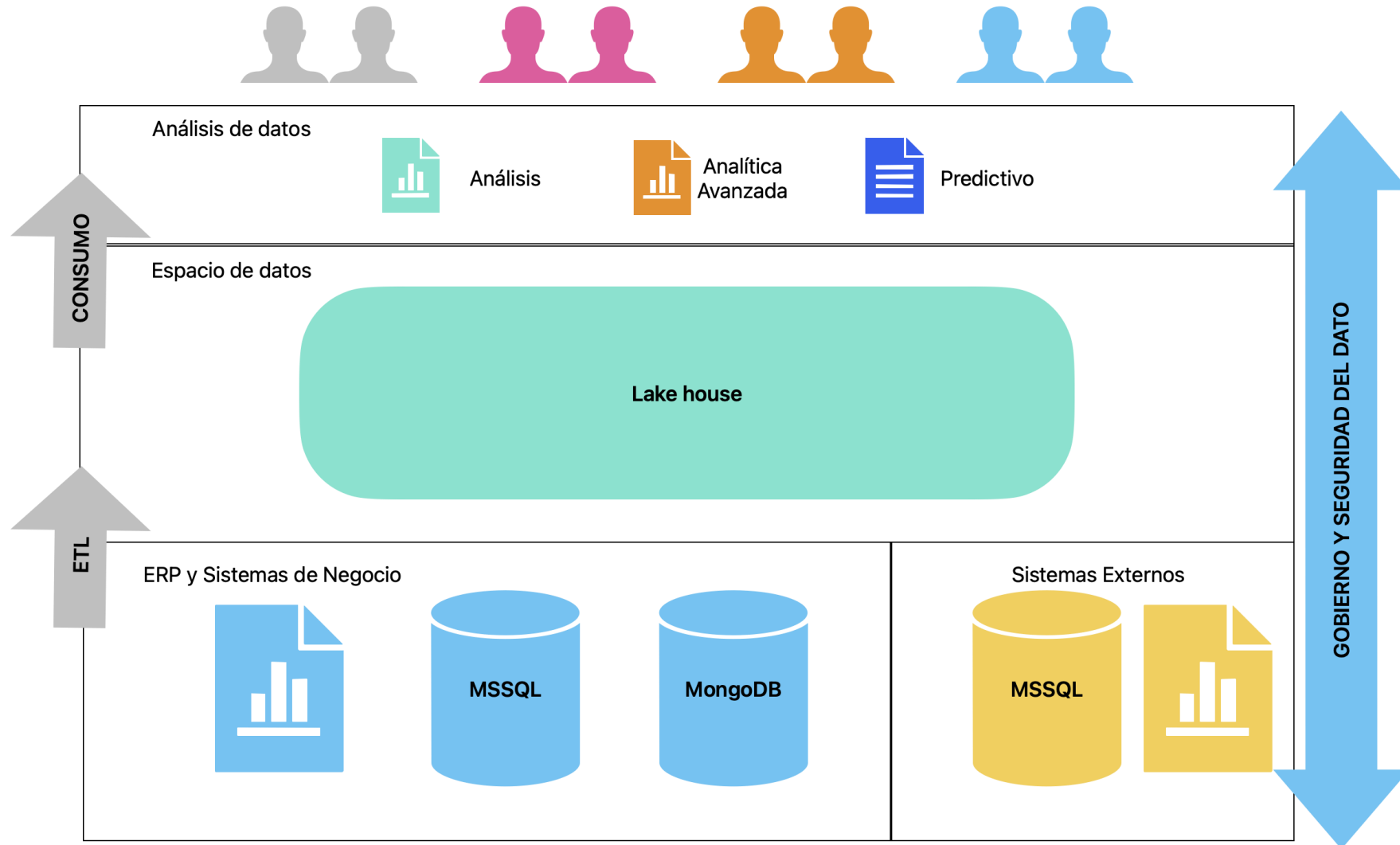
INTELIGENCIA DE DATOS E IA

Photovoltaic, BESS (Battery Energy Storage System), and V2G (Vehicle-to-Grid, from vehicles to the internal grid).



DATA INTELLIGENCE AND AI

Data Lake



DATA INTELLIGENCE AND AI

IBM customer project

La Inteligencia Artificial, en la EMT de Madrid

Esta primera fase del proyecto está basado en watsonx, la plataforma empresarial de Datos e IA de IBM, a través de la cual se clasifican y gestionan automáticamente las consultas de los ciudadanos



As a result,

1. the time taken to resolve incidents is optimised, improving the daily experience of the customers who use the buses, car parks and bicycles.
2. In addition, the responses provided by agents are standardised, ensuring a more consistent and coherent service for all citizens.










Purpose: Automatically classify and manage citizen enquiries.

IBM's Watsonx technology automates tasks and provides real-time analysis.



DATA INTELLIGENCE AND AI

EDGE - Computer Vision: GPU - NVIDIA

USE CASE	BRIEF DESCRIPTION
 Aggression or Fight Detection	Identify violence/aggression between passengers to alert driver/security, minimizing false positives
 Fall Detection	Immediately immediately a passenger's fall to alert driver and activate assistance
 Sudden Brake Detection	Analyze sudden movements o determine harsh braking and assess driving conditions
 Abandoned Objects	Evaluate proper placement of strollers and wheelchairs and detect blockage of aisles for emergency risk
 Insecure Stroller/Wheelchair Placement	Detect e-scooters (prohibited by EMT), distinguishing other objects to prevent false positives
 Presence of E-Scooters Inside Buses	Identify patterns of passenger congestion for specific areas (e.g., near doors) to alert driver or take regulatory action
 Crowd Detection in Specific Vehicle Areas	Automatically monitor onboard cameras' functional state (no signal, lens covered, defocus) to generate maintenance alerts
 Onboard Camera Fault Detection	Automatically monitor onboard cameras' into a composite flow for real-time efficient transmission with limited connectivity
 Video Stream Fusion for Efficient Transmission	



UC3M CHAIR AND EMT MADRID: ARTIFICIAL INTELLIGENCE FOR TRANSPORT AND MOBILITY

Presentación de la Cátedra
UC3M y EMT Madrid

Inteligencia Artificial
para el transporte
y la movilidad



CONTEXT

Artificial Intelligence (AI) is redefining how public transport systems operate and make decisions.

This project, developed in collaboration with Universidad Carlos III, applies AI to improve efficiency across different areas of EMT de Madrid.

It integrates three complementary initiatives:

- ❑ HR analytics to understand and predict employee absenteeism.
- ❑ An AI-based assistant for public bike maintenance and diagnostics.
- ❑ A smart simulator to optimize bus routes and scheduling.

Together, these projects demonstrate how AI enhances both internal management and public mobility services.

AI drives smarter, data-based decisions to improve people, processes, and public transport performance.

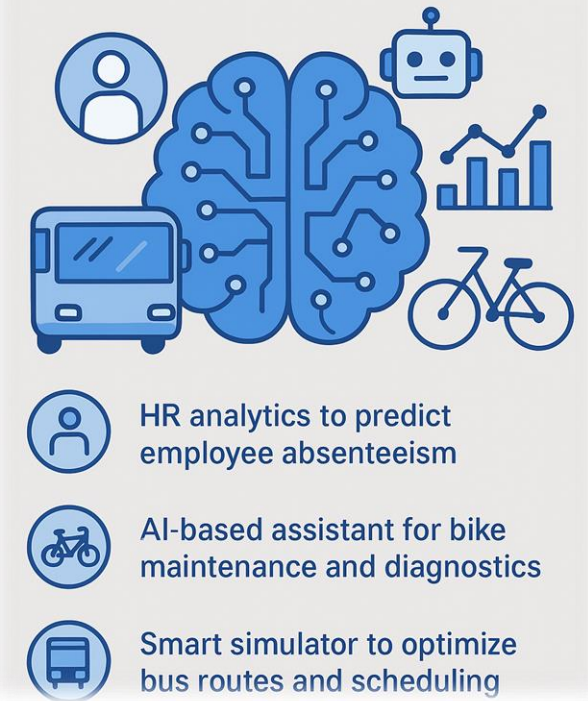


EMT MADRID

PROJECT OVERVIEW – AI FOR PUBLIC TRANSPORT IMPROVEMENT

Project	Focus	AI Objective / Benefit
1. Absenteeism Analytics	Internal management (HR)	Predict absenteeism patterns, identify key factors, and support data-driven HR decisions.
2. bicimad Assistant	bicimad maintenance	AI chatbot assists mechanics with diagnostics, learns from past repairs, and detects recurring or unusual failures.
3. Transport Simulator	Bus operations	Simulate route and schedule scenarios to improve planning, detect inefficiencies, and minimize user impact.

A unified AI strategy improving efficiency across people, assets, and public transport services.



ABSENTISM ANALYTICS

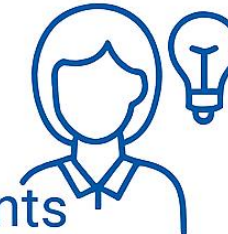


Problem

- ✓ Rising short-term absences and unplanned leaves affect service continuity
- ✓ Lack of predictive insight limits proactive planning
- ⚠ Detecting unusual issues or anomalies takes time and delays service

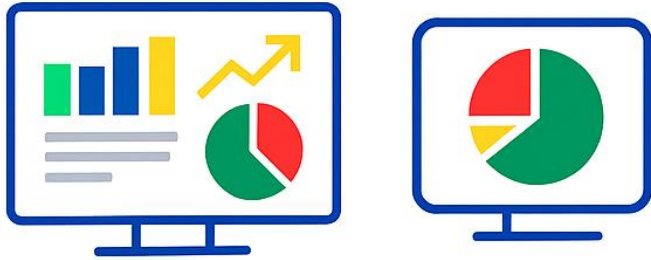
Objective

- ✓ Identify the main factors behind absenteeism trends.
- ✓ Develop predictive models to anticipate recurring short-term absences
- ✓ Support HR departments in designing preventive and corrective measures

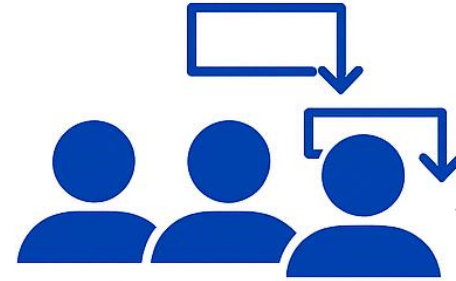


ABSENTISM ANALYTICS

AI Approach



- Use statistical analysis and explainable Machine Learning models.
- Detect patterns and risk profiles across historical employee data.
- Generate dashboards for HR decision-making and workforce planning



Expected Benefits

- Improved understanding of absenteeism causes.
- Proactive HR strategies instead of reactive measures
- More efficient personnel management and reduced operational impact.

BICIMAD ASSISTANT



Problem



Maintenance processes depend heavily on individual experience



Information about repairs, patterns, and recurring failures is dispersed



Detecting unusual issues or anomalies takes time and delays service

Objective

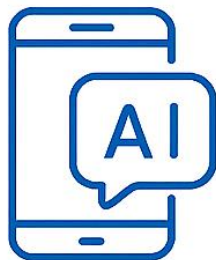


Centralize maintenance knowledge and repair history



Provide real-time support to mechanics through an intelligent assistant

BICIMAD ASSISTANT



AI Approach



Implementation of an AI chatbot trained with maintenance data



Suggests repairs based on triage, symptoms, and historical patterns



Learns continuously from user interactions to improve recommendations



Expected Benefits



Faster and more accurate maintenance diagnostics



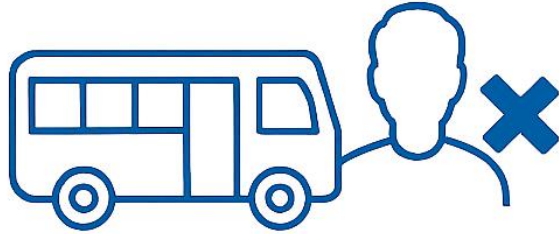
Knowledge sharing across teams and reduced dependency on individual expertise




Early detection of failure trends, improving safety and operational efficiency

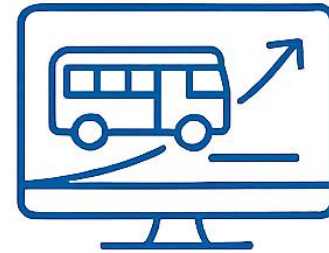


BICIMAD ASSISTANT



Problem

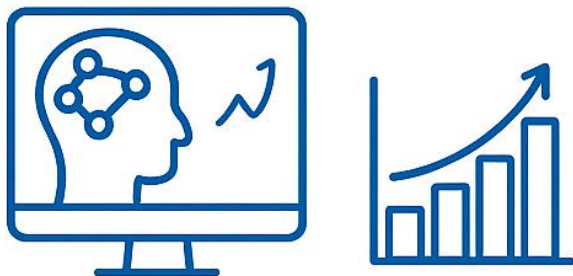
- ✓ Operational decisions are mostly manual and reactive
 - ✓ Route or schedule changes can have unpredictable negative effects
 - ✓ Passengers often perceive inconsistencies in bus frequency and punctuality
- 



Objective

- ✓ Create an intelligent simulator to support planning and decision-making
- ✓ Test different operational scenarios before implementation
- ✓ Evaluate the impact of route, timetable, or resource adjustments

TRANSPORT SIMULATOR



AI Approach



Development of a predictive simulation environment using operational and passenger data



Models evaluate efficiency, congestion and service reliability under different scenarios

Expected Benefits



Informed, data-driven decisions° instead of reactive measures

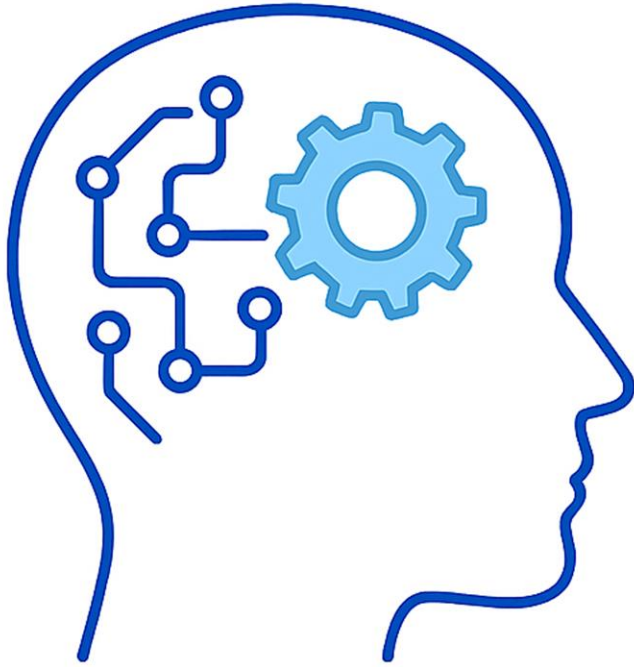


Identification of inefficiencies, overloads, or critical points in the network



Stronger acceptance of changes through visual, evidence-based analysis

Conclusions



- Use statistical analysis and explainable Machine Learning models.
- Detect patterns and risk profiles across historical employee data

Next Steps

- Continue developing predictive models with larger and more more datasets.
- Integrate results into daily operations and digital platforms.
- Evaluate new use case on other areas of urban mobility and sport

Expected Benefits

- Improved understanding of absenteeism causes.
- Proactive HR strategies instead of reactive measures.

Thank you



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