

Digital Process Assistant (D3.4)

Deliverable 3.4 presents the Digital Twin Recommendation System developed in R3VOLUTION. The system integrates Machine Learning model outputs, process-optimization tools and an AI chatbot into a unified interface to support wastewater treatment decision-making.

What is the solution/deliverable/report about?

Deliverable 3.4 details the architecture, implementation, and user interface of the R3VOLUTION Digital Process Assistant (DPA). It is a unified recommendation framework designed to consolidate outputs from multiple machine learning models and analytical tools to support decision-making in wastewater treatment processes. The solution features an intuitive, human-centric interface built with .NET 8 and Blazor, which integrates an AI-powered chatbot to assist users in understanding complex and heterogeneous data.

What challenges are addressed? OR Why was this done?

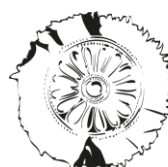
The adoption of Digital Twins in the industrial water sector often faces a "trust gap" because purely data-driven Machine Learning models operate as opaque "black boxes". Operators naturally hesitate to authorize critical process changes without understanding the causal reasoning behind a model's predictions. This deliverable was created to bridge this gap by organizing the generated knowledge and guiding users toward a deeper understanding of the data. It is designed to overcome the opacity of embedded sub-models and generate trustworthy, context-aware suggestions tailored to specific industrial use cases.

What is the innovation? OR What is the outcome?

The core innovation is the integration of a Retrieval-Augmented Generation (RAG) architecture alongside Explainable AI (XAI) insights directly into a chatbot interface. Powered by the Qwen 2.5-32B Large Language Model, the system retrieves relevant information from external sources (such as uploaded technical manuals or Standard Operating Procedures) and combines it with XAI metrics to explain the rationale behind its predictions. By delivering clear, text-based explanations and utilizing Evidence-Based Attribution, the chatbot ensures reliable, constraint-based answers that explicitly avoid speculative or fabricated information.

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