

USING SMART WATER TECHNOLOGY TO SOLVE GLOBAL WATER ISSUES



www.iot4win.org.uk

Background

Ensuring the sustainability, security and resilience of water supplies in the face of climate change is a global challenge which demands increasingly intelligent approaches to the management and transport of finite water resources. The design and operation of smarter water networks creates a currently unmet demand for highly-skilled and multi-disciplinary engineers and scientists who apply advanced sensors; ICT, the Internet of Things (IoT) to enable smarter water networks in an increasingly complex regulated environment.

IoT4Win is a Horizon 2020 MSCA-ITN research project from 2018-2022 and aims to enhance knowledge and understanding about advanced sensors; IoT and AI to develop novel, robust, practical methodologies and tools for the sustainability, security and resilience of water supply and distribution system in the face of climate change.

Methodology

IoT4Win adopts a holistic approach to address design and operation of smart water networks, which creates a currently unmet demand for highly-skilled and multi-disciplinary engineers and scientists who apply advanced sensors; ICT, the Internet of Things (IoT) to enable smart water networks in an increasingly complex regulated environment to implement a multidisciplinary European Industrial Doctorates (EID) training program of three ESRs.

Three topics are investigated:

1. Context-Aware Framework for Water Quality in IoT-enabled Smart Water Networks
2. Interoperability Framework for IoT-enabled Smart Water Networks
3. Data intelligence and Security for IoT-enabled Smart Water Network Management

Outcomes

Topic 1: Context-Aware Framework for Water Quality in IoT-enabled Smart Water Networks

- Optimal sensor deployment for water quality monitoring
- Contamination detection in water distribution network using AI
- Simulation model of human health analysis in contaminated water distribution networks
- Context aware framework of water quality monitoring in WDS with edge and cloud computing architecture

Topic 2: Interoperability Framework for IoT-enabled Smart Water Networks

- Overcomes the serialization format issues of the IoT data by format translation
- Harmonises the semantic models of IoT and a data-consuming application by aligning their ontologies with each other.
- An OWL knowledge graph from semi-structured IoT data and (re)-annotate with aligning with the domain-specific ontologies and standards

Topic 3: Data intelligence and Security for IoT-enabled Smart Water Network Management

- Attack detection model with identified suitable Machine Learning algorithms
- A decentralised approach and toolkit for data validation with blockchain technology
- A decentralised and intelligent security Framework for IoT-enabled cyber physical Water Distribution Systems

Impact

- Present innovative approaches with integrating smart sensor and IoT technologies for developing smart water networks
- Explore the monitoring and data acquisition and add analytical capability to understand water quality data using AI and ML
- Enhance water management of efficiency and resilience for smart water networks under the uncertainty of climate changes
- Provide industrial doctorate training for three early-stage researchers and enhancing the career perspectives and employability of researchers
- Establish long-term partnership with water companies and other industrial partners



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