

Master's Thesis Proposal

Automated Registration and Classification of IoT Sensors in an Urban Data Catalog

Urban Digital Twins (UDTs) offer virtual representations of physical city environments by combining various data sources, including 3D city models, sensors, and simulation data. The UDTs enhance urban planning and decision-making processes in multiple domains, such as environmental monitoring, transport, mobility, building management systems, energy and utility monitoring, and citizen participation.

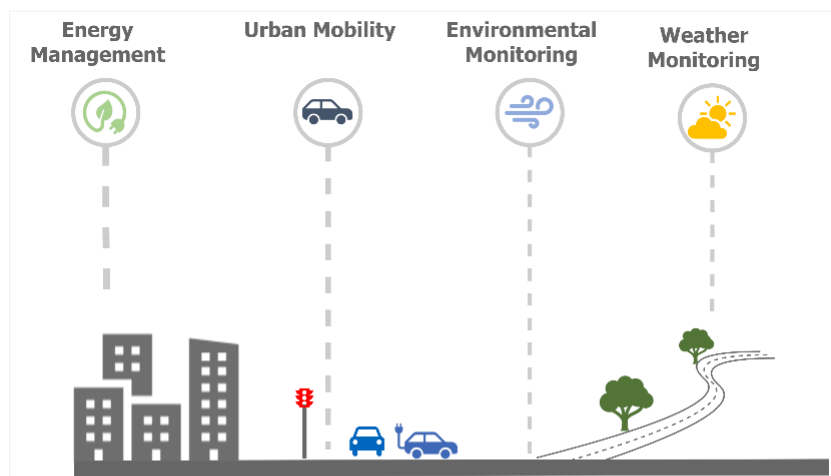


Figure 1: IoT sensors in an urban environment.

The diverse datasets required for the digital representation of cities in UDTs are managed and organised using urban data catalogs. These catalogs serve as central metadata repositories facilitating structured data indexing and discovery. One of the datasets is real-time data collected by Internet of Things (IoT) sensors deployed in cities and integrated into UDTs to provide up-to-date information about the urban environment. However, a challenge arises due to the heterogeneous nature of sensor data, and their distribution across diverse services. These services have multiple sensors but are often registered as one data catalog entry, leading to inadequate metadata about the available sensors. The lack of detailed information makes it difficult for users to find relevant sensor data. A further limitation is the absence of sensor data categories, making it challenging to discover domain-specific sensor data.

This thesis's primary goal is to enhance the discoverability of sensor data in urban data catalogs. The first task is to investigate how sensors and their metadata from IoT services, such as the OGC SensorThings API, can be automatically registered in a data catalog. Changes in the IoT services, including new sensors and metadata updates, should also be automatically registered in a catalog through continuous data harvesting. Second, the thesis should investigate how to classify heterogeneous sensor data and store the categories in a data catalog. The practical component of the thesis will be proof-of-concept implementation using existing sensor data from IoT platforms operated by cities.

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