Spatio-Temporal Challenges in Understanding your (Smart) City

Keynote

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ABSTRACT

In this talk, we will explore challenges and opportunities of *spatio-temporal information access* as connecting temporal and spatial dimensions of mining and analysis. We focus on use cases and examples in the development of systems and services in *smart sustainable cities*, and in urban energy and climate transitions.

CCS CONCEPTS

• **Information systems** → **Spatial-temporal systems**; **Information systems applications**; • **Human-centered computing**;

KEYWORDS

Spatio-Temporal Information Access; Smart Cities; Urban Data

1 INTRODUCTION

Information access and system development in (smart) urban environments can take many forms. In our understanding, Smart Cities include the aim for data-driven urban transformation in an inherently cross-disciplinary way. This includes developing and integrating systems and data sources, and aligning with city strategies and ensuring a consideration of public and social good.

While a lot of data and service approaches are explicitly location-based or spatially anchored, the temporal dimension is often not yet considered at a similar level or implicitly referred to only as "now". Fully integrating temporal and spatial dimensions can bring temporal information access and question answering into understanding and support for smart city development and urban transitions. This was partially explored earlier when the TempWeb and LocWeb workshops were running co-located sessions to explore similarities in these two complementary dimensions [5].

As examples, we earlier argued for scenario-based search and recommendation, data and service integration, combination of services, cross-domain complex search, to further the topics of Smart City Search [2] and Recommendation [1]. While in some cases, existing search engines or research prototypes are already sufficient, others need dedicated mining and analysis tools.

A number of possibilities arise for spatio-temporal information access, such as event mining, opinion and sentiment analysis over time to track responses to short- and long-term urban planning interventions, urban planning and scenario simulations, mobility analysis and optimisation and development [3], detection of spatio-temporal usage patterns, energy modeling and analysis [4], digital support for climate neutral and liveable cities [6], etc.

In our project Re-Value, we aim with partners to find ways to enable collaborative urban design and planning, for an urban transition to climate neutrality. We sketch two integrated use cases:

Digital Twins & Data-driven co-creation: Processes around city planning include the ways that strategies are developed and negotiated, and participation processes are held. Data mining, analysis, and visualisation can make historic data and changes visible.

Impact assessment and feedback loops: An explicit feedback loop for learning from interventions and comparing against original plans is a critical challenge, also targeting participation and systems.

The talk will explore these and other examples in more detail and discuss how inclusion of time and temporal features can improve results and open new possibilities of mining and analysis within urban and climate transformations.

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