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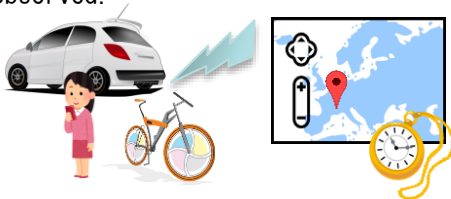
Understanding human activity patterns in cities

- Spatio-temporal analysis on city activities -

Abstract

Civil activities in a city are not random because of regular and routine behaviors of people. Recently, sensor networks and mobile phone networks enable us to collect those activities as spatio-temporal big data. However, because such data exhibit complex phenomena and are often incomplete due to sensor corruptions or network troubles, it is hard to understand civil activities by just visualizing spatio-temporal flow in a city from obtained data. We propose a machine learning method that discovers latent patterns of spatial activity patterns and its corresponding temporal dynamics. Furthermore, our method can recover missing entries in data with extracted latent patterns. We demonstrate that our method can analyze automobile traffic data in a city and can extract more interpretable patterns than existing pattern extraction methods.

Spatio-temporal data consists of information when and where it was observed.



Regular and routine behaviors of citizens appears repeatedly in spatio-temporal data

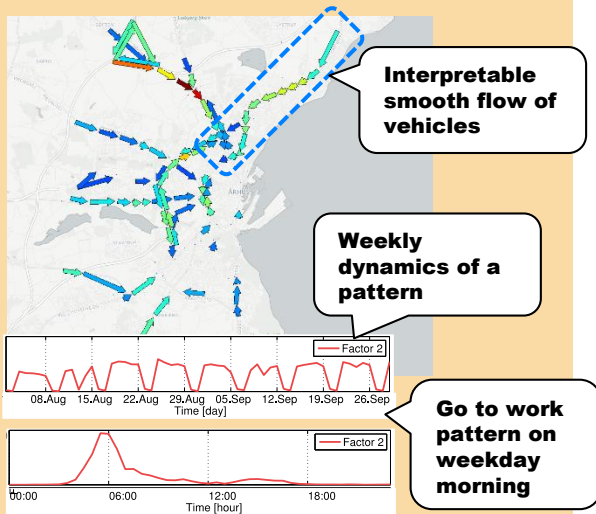


Go to work
Go back home
Go shopping

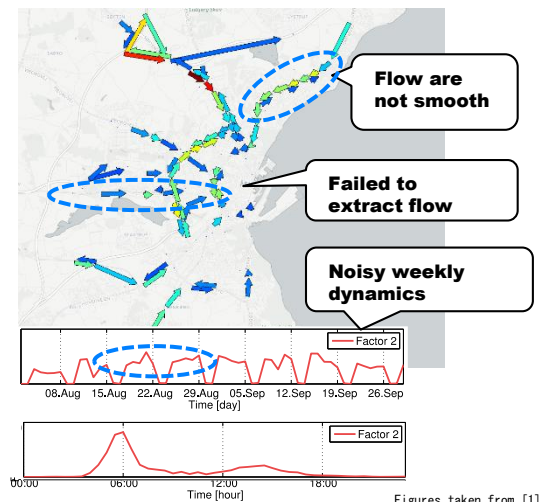
Appears in specific location and time

Tensor factorization is a machine learning method that extracts a few but essential spatial activity patterns and its corresponding temporal dynamics that can explain almost all observations in a spatial-temporal data.

Proposed method



Existing method



Figures taken from [1]

Reference

[1] K. Takeuchi, N. Ueda "Graph regularized Non-negative Tensor Completion for spatio-temporal data analysis," *2nd International Workshop on Smart Cities: People, Technology and Data*, 2016.

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