Exploring the Tidal Effect of Urban Business District with Large-scale Human Mobility Data

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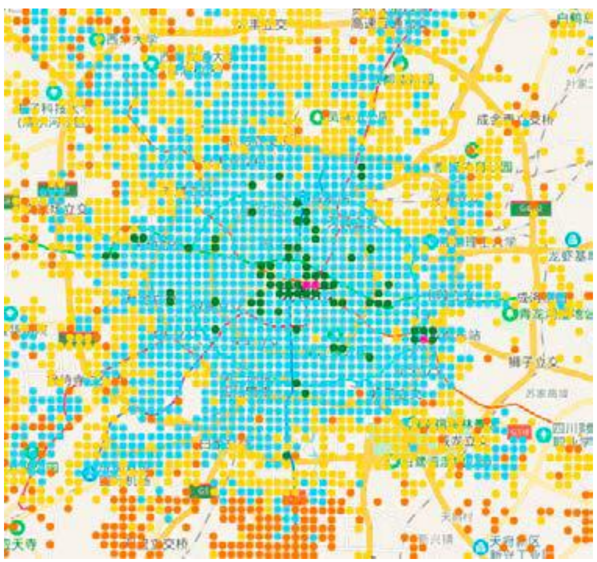
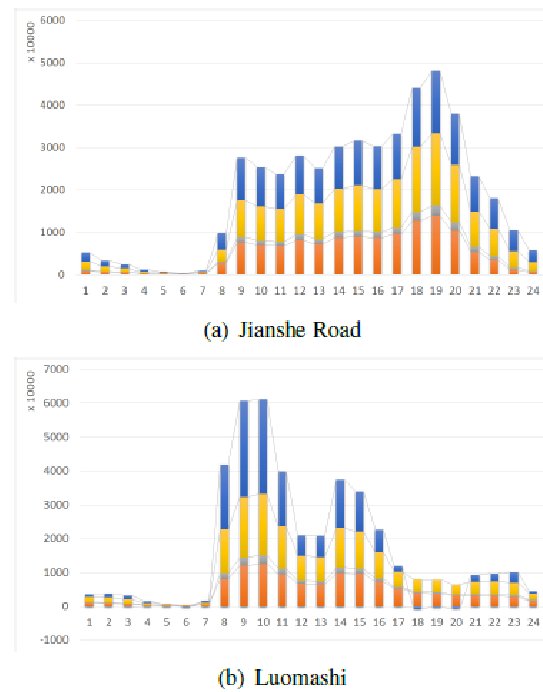
Problems & Ideas

- Problems of : The fine-grained and timely analysis on the tidal effect of business districts.
  - How to detect the dynamic boundary of the business district.
  - How business district boundaries and functions evolve over time.
- Ideas: a data-driven and multi-dimensional framework for dynamic business district analysis.



Classification result of boundary score. All grids are colored with several grades. Set the score from high to low to green, blue, yellow and orange.



Functionality evolution in one day of the typical business districts in the city.

Main Contributions

- Contributions:
  - used large-scale human trajectory data in urban areas to dynamically detect and forecast the boundary changes of business districts in different time periods;
  - detected the functional distribution of the business district in different time periods, and adopted a forecast the functionality evolution model based on dynamic boundary changes;
  - discover meaningful patterns and provide interesting insights into the dynamics of business districts.

The performance comparison for boundary prediction of each method on 144-time slices in one day.

	144-Time Slices		
Index	Precision	Recall	F-Score
LSTM	**0.8640**	**0.9761**	**0.9166**
GBDT	0.7272	0.9317	0.8168
DT	0.6230	0.9737	0.7598
RF	0.8121	0.8226	0.8173
SVM	0.6190	0.9037	0.7347
LR	0.6190	0.9739	0.7569

The performance comparison for functionality prediction of each method in one day of the typical business districts in the city.

Method	RF			GNB			LSTM		
Index	Topic1	Topic2	Ave.	Topic1	Topic2	Ave.	Topic1	Topic2	Ave.
Wuhouci	0.7083	0.6667	0.6875	0.6250	0.5833	0.6042	0.8333	0.7500	0.7917
Shuangnan	0.5417	0.6250	0.5833	0.5000	0.4583	0.4792	0.7083	0.6250	0.6667
Luomashi	0.5417	0.7083	0.6250	0.7500	0.5833	0.6667	0.6667	0.7083	0.6875
Jianshe Road	0.7083	0.6250	0.6667	0.7500	0.8333	0.7917	0.8750	0.8333	0.8542
High-tech District	0.5833	0.7083	0.6458	0.4583	0.5417	0.5000	0.7917	0.6250	0.7084
Chunxi Road	0.8750	0.8333	0.8542	0.8333	0.7917	0.8125	0.9583	0.8333	0.8958
Average	0.6597	0.6944	**0.6875**	0.6528	0.6319	**0.6434**	0.8056	0.7292	**0.7674**