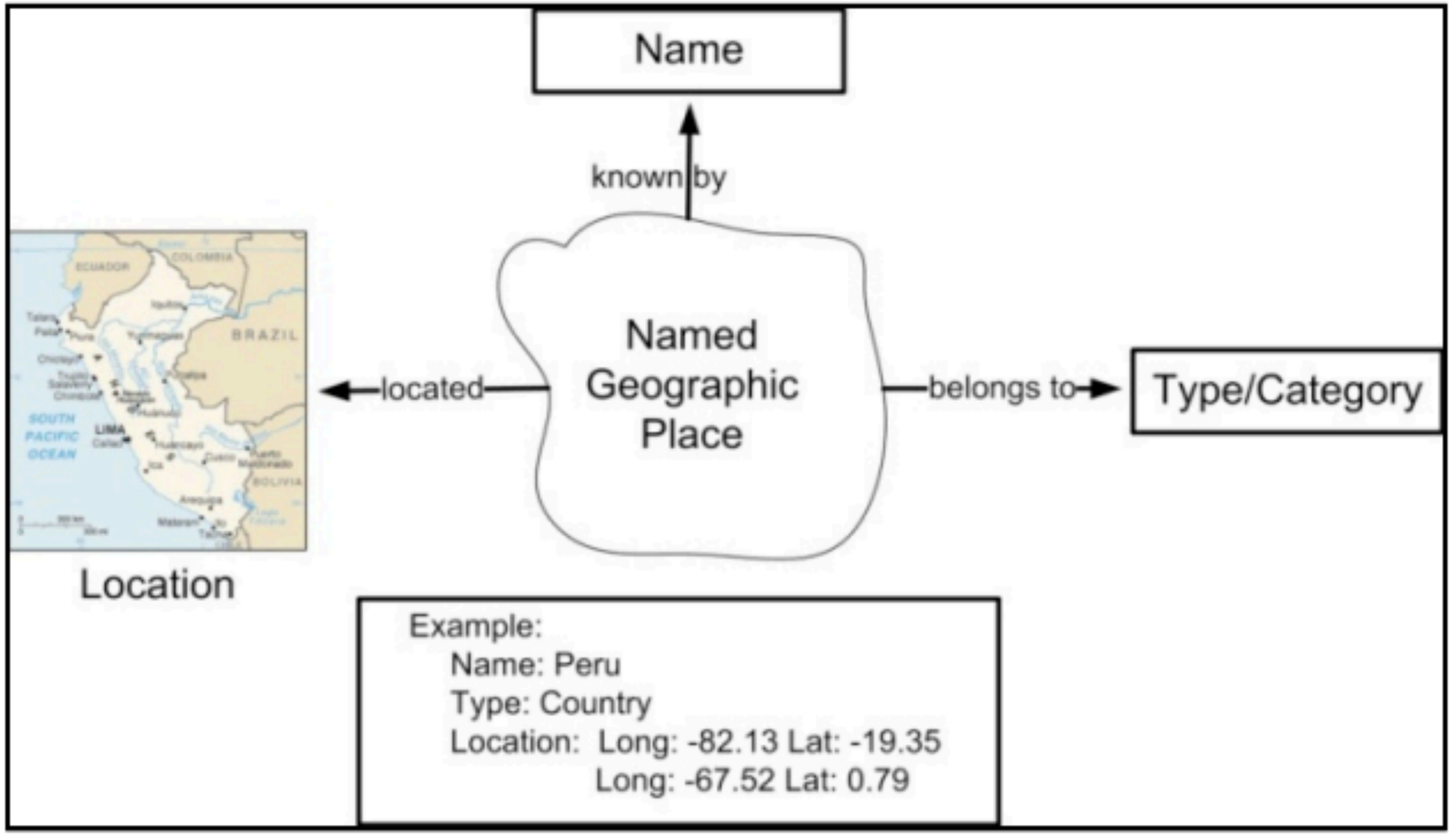
NEW ENGLAND COMPLEX SYSTEMS INSTITUTE

solving problems of science and society

Geospatial Relationships in Organization of Knowledge

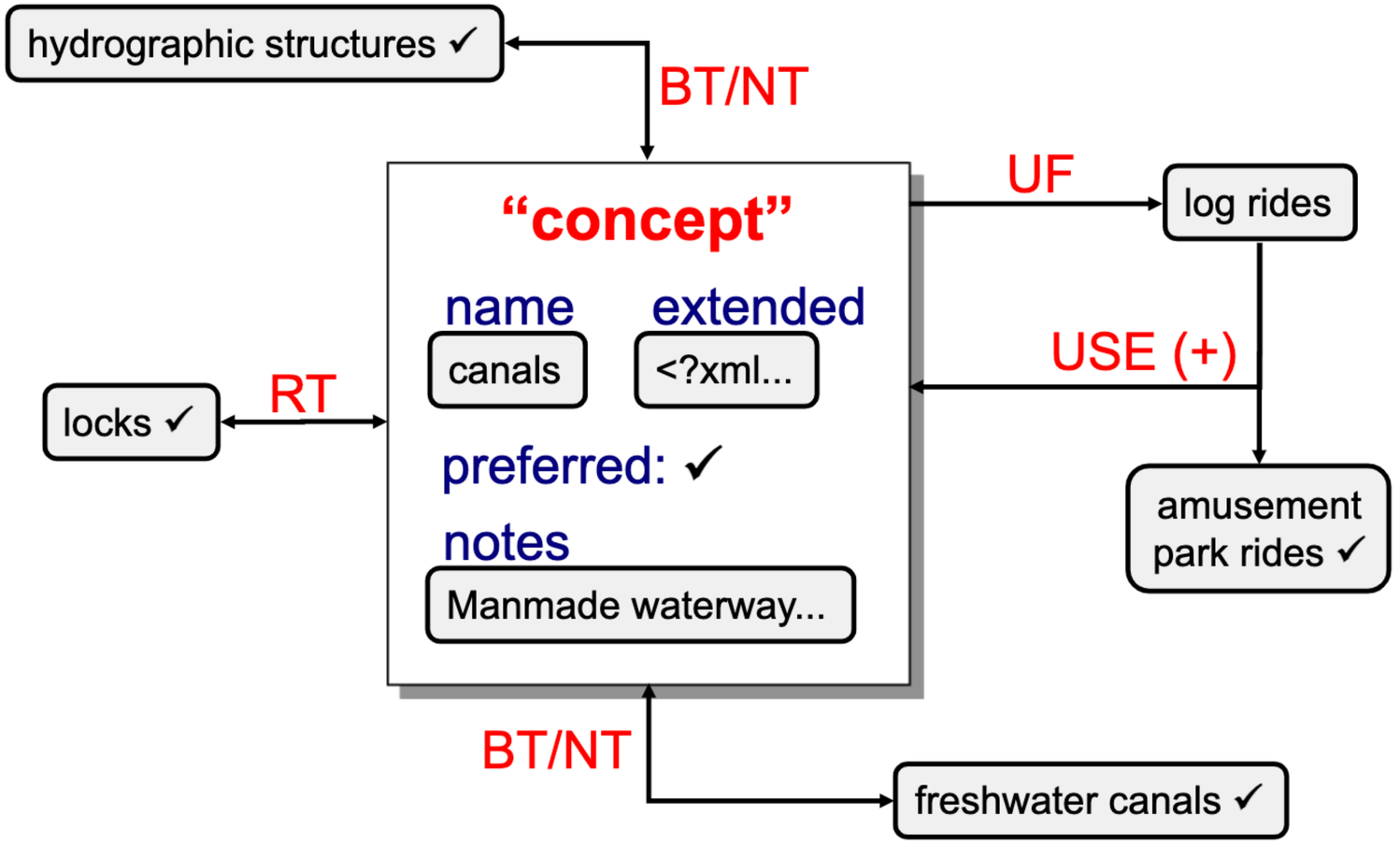
Olha Buchel
New England Complex Systems Institute

Geospatial Relationships in Gazetteers



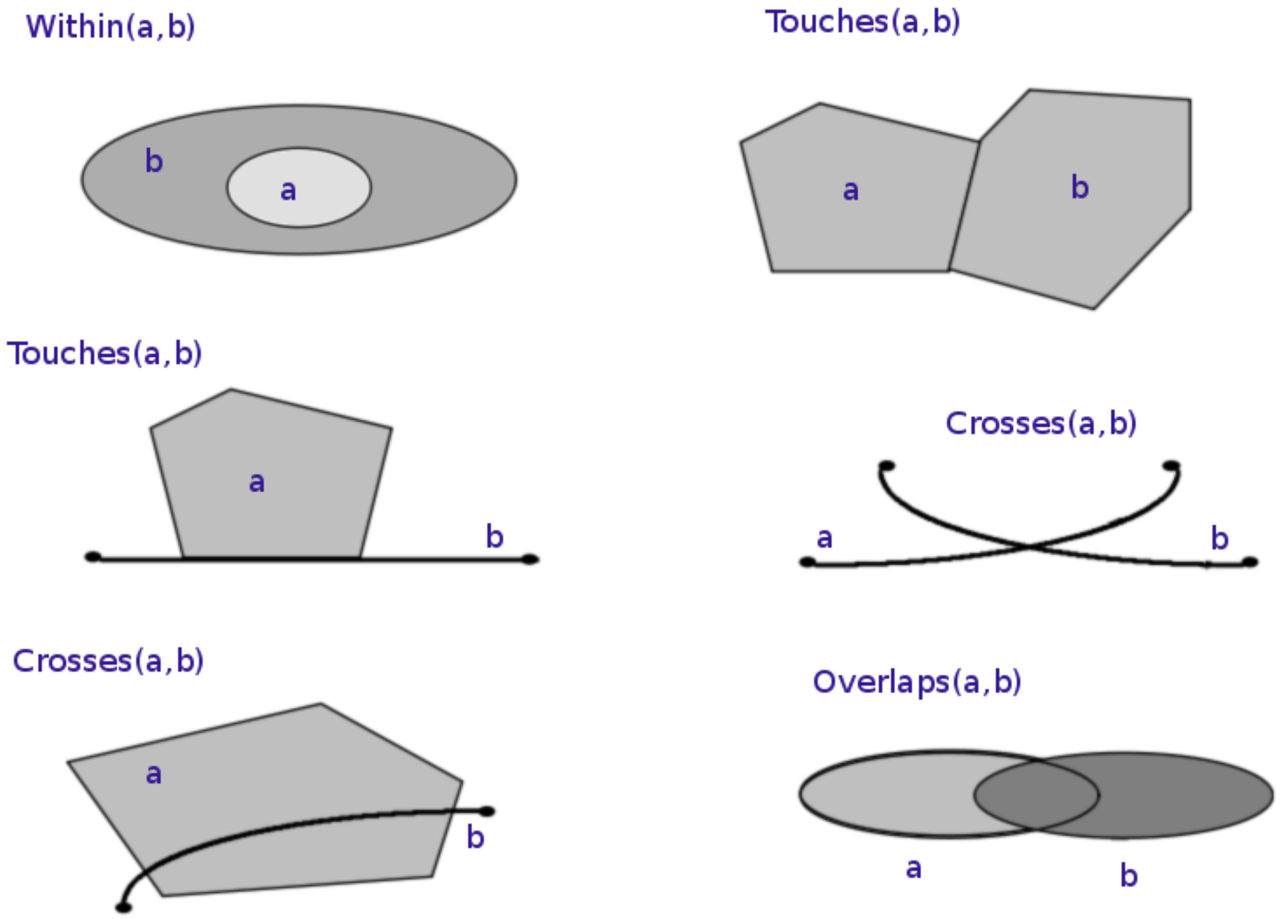
Buchel, O., & Hill, L. L. (2010). Treatment of Georeferencing in knowledge organization systems: North American contributions to integrated Georeferencing. *KO KNOWLEDGE ORGANIZATION*, *37*(1), 72-78.

Geospatial Relationships as First-Class Objects



Janée, G. 2002. The ADL Gazetteer & Thesaurus Service Protocols. Alexandria Digital Library Project.

Geospatial Relationships in Geographic Information Retrieval



Hill, L. L. (2009). Georeferencing: The geographic associations of information. Mit Press.

Geospatial Relationships in Ontologies

Ontologies

Baclawski, K., Bennett, M., Berg-Cross, G., Schneider, T., Sharma, R., Singer, J., & Sriram, R. D. (2021). Ontology summit 2020 communiqué: Knowledge graphs. *Applied Ontology*, (Preprint), 1-19.

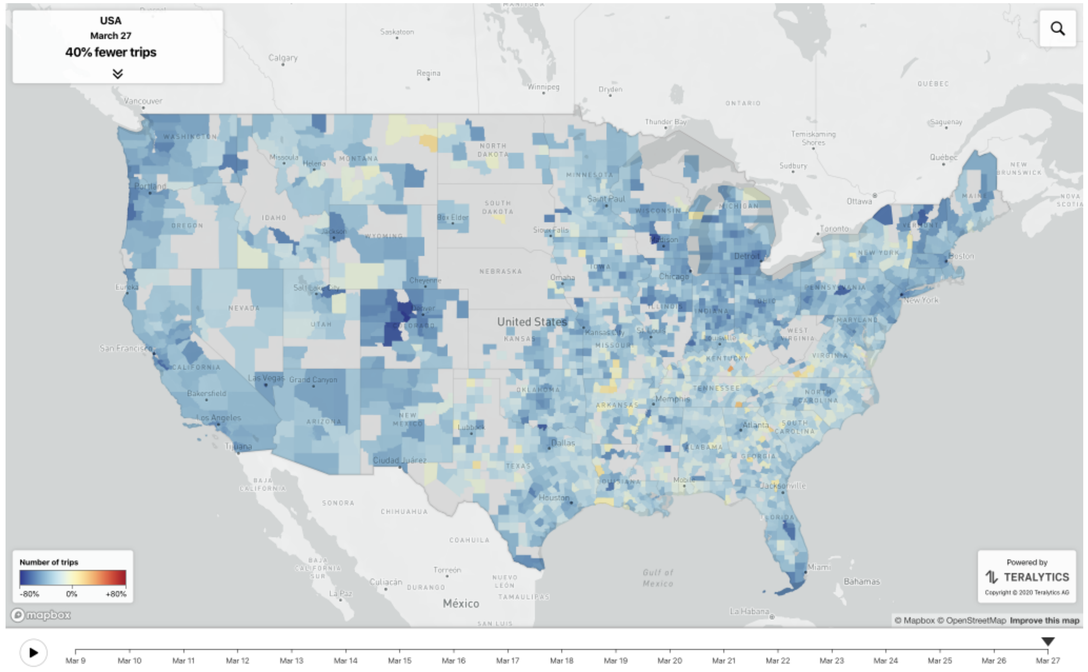
Digital Twins

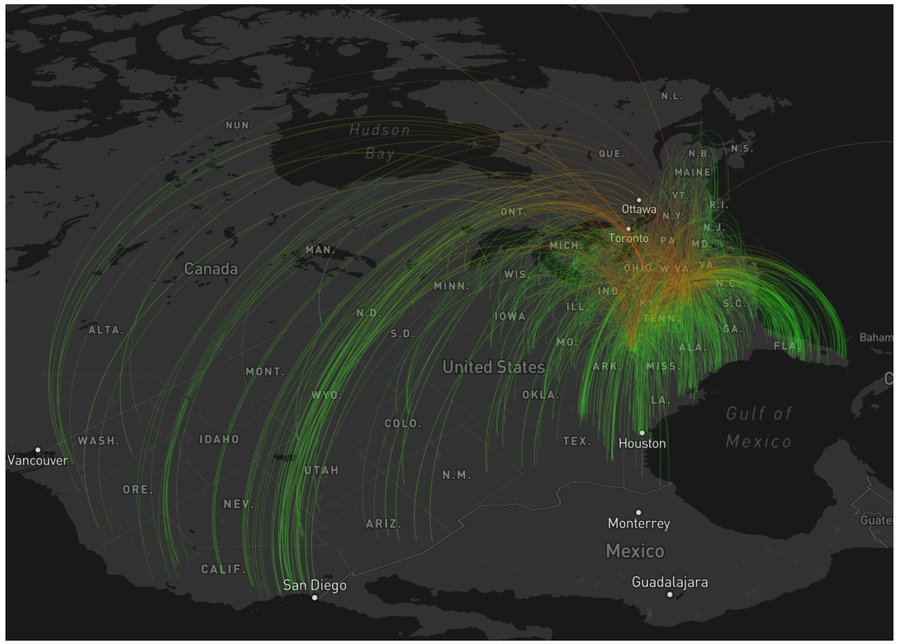
West, M. (2020) The Digital Twin Project in the UK. https://go.aws/2HdGBYr.

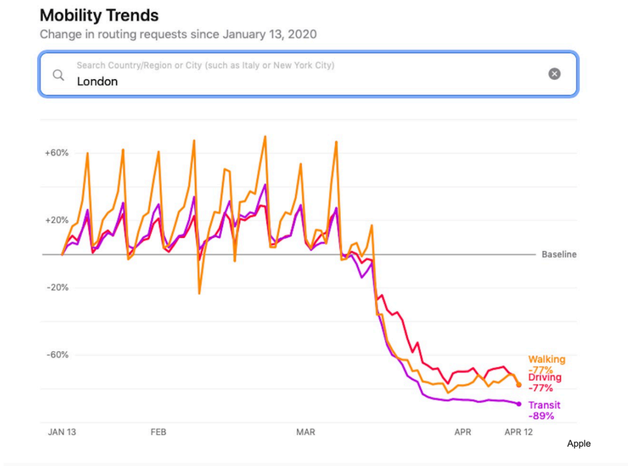
KnowWhereGraph

Janowicz, K. (2020) KnowWhereGraph: Enriching and Linking Cross-Domain Knowledge Graphs using Spatially-Explicit AI Technologies to Address Pressing Challenges at the Human-Environment Nexus. https://go.aws/2xmMSQd.

Mobility Data (Secondary Data)







SAFEGRAPH

https://www.safegraph.com

Mobility Datasets

SafeGraph's Social Distancing Metrics

https://docs.safegraph.com/docs/social-distancing-metrics

Column Name	Description	Type	Example
origin_census_block_group	The unique 12-digit FIPS code for the Census Block Group. Please note that some CBGs have	String	131000000000
date_range_start	Start time for measurement period in ISO 8601 format of YYYY-MM-DDTHH:mm:SS±hh:mm	String	2020-03-01T00:00:00-06:00
date_range_end	End time for measurement period in ISO 8601 format of YYYY-MM-DDTHH:mm:SS±hh:mm	String	2020-03-02T00:00:00-06:00
device_count	Number of devices seen in our panel during the date range whose home is in this	Integer	100
distance_traveled_from_home	Median distance (in meters) traveled from the geohash-7 of the home by the devices included	Integer	200
bucketed_distance_traveled	Key is range of meters (from geohash-7 of home) and value is device count. If a device	JSON {String:	{"0": 100, "1-1000": 40, "1001-2000": 45, "2001:8000": 15, "8001-16000": 0, "16001-50000": 0, "<50000": 0}
median_dwell_at_bucketed_distance_traveled	Key is range of meters and value is the median dwell time in minutes of the devices that traveled	JSON {String:	{"<1000": 300, "1001-2000": 60, "2001:8000": 120, "8001-16000": 5, "16001-50000": 5, "<50000": 60}
completely_home_device_count	Out of the device_count, the number of devices which did not leave the geohash-7 in which their	Integer	40
median_home_dwell_time	Median dwell time at home geohash-7 ("home") in minutes for all devices in the device_count	Integer	1200
bucketed_home_dwell_time	Key is range of minutes and value is device count of devices that dwelled at geohash-7 of	JSON {String:	{"<60": 0, "61-360": 0, "361-720": 10, "721-1080": 40, ">1081": 50}
at_home_by_each_hour	A mapping of hour of day to the number of devices at geohash-7 home in each hour over	JSON [Integer]	[90, 90, 90, 80, 80, 70, 70, ...]
part_time_work_behavior_devices	Out of the device_count, the number of devices that spent one period of between 3 and 6 hours	Integer	10
full_time_work_behavior_devices	Out of the device_count, the number of devices that spent greater than 6 hours at a location	Integer	10
* destination_cbgs	Key is a destination census block group and value is the number of devices with a home in	JSON {String:	{"130890212162":91,"131210101101":22,"131350502123":20}
* delivery_behavior_devices	Out of the device_count, the number of devices that stopped for < 20 minutes at > 3 locations	Integer	10
* median_non_home_dwell_time	Median dwell time at places outside of geohash-7 home in minutes for all devices in the	Integer	60
* candidate_device_count	Number of devices in our panel whose home is in this census_block_group regardless of	Integer	100
* bucketed_away_from_home_time	Key is range of minutes and value is device count of devices that dwelled anywhere outside	JSON {String:	{"0- 20": 5, "21-45": 4, "46-60": 5, "61-120": 4, "121-180": 5, "181-240": 10, "241-300": 4, "301-360": 8, "361-420": 10,
* median_percentage_time_home	Median percentage of time we observed devices home versus observed at all during the time	Integer	72
* bucketed_percentage_time_home	Key is a range of percentage of time a device was observed at home (numerator) out of total	JSON {String:	{"0-25": 6, "26-50": 5, "51-75": 10, "76-100": 100}
** mean_home_dwell_time	Mean dwell time at home geohash-7 ("home") in minutes for all devices in the device_count	Integer	1200
** mean_non_home_dwell_time	Mean dwell time at places outside of geohash-7 home in minutes for all devices in the	Integer	60
** mean_distance_traveled_from_home	Mean distance (in meters) traveled from the	Integer	200

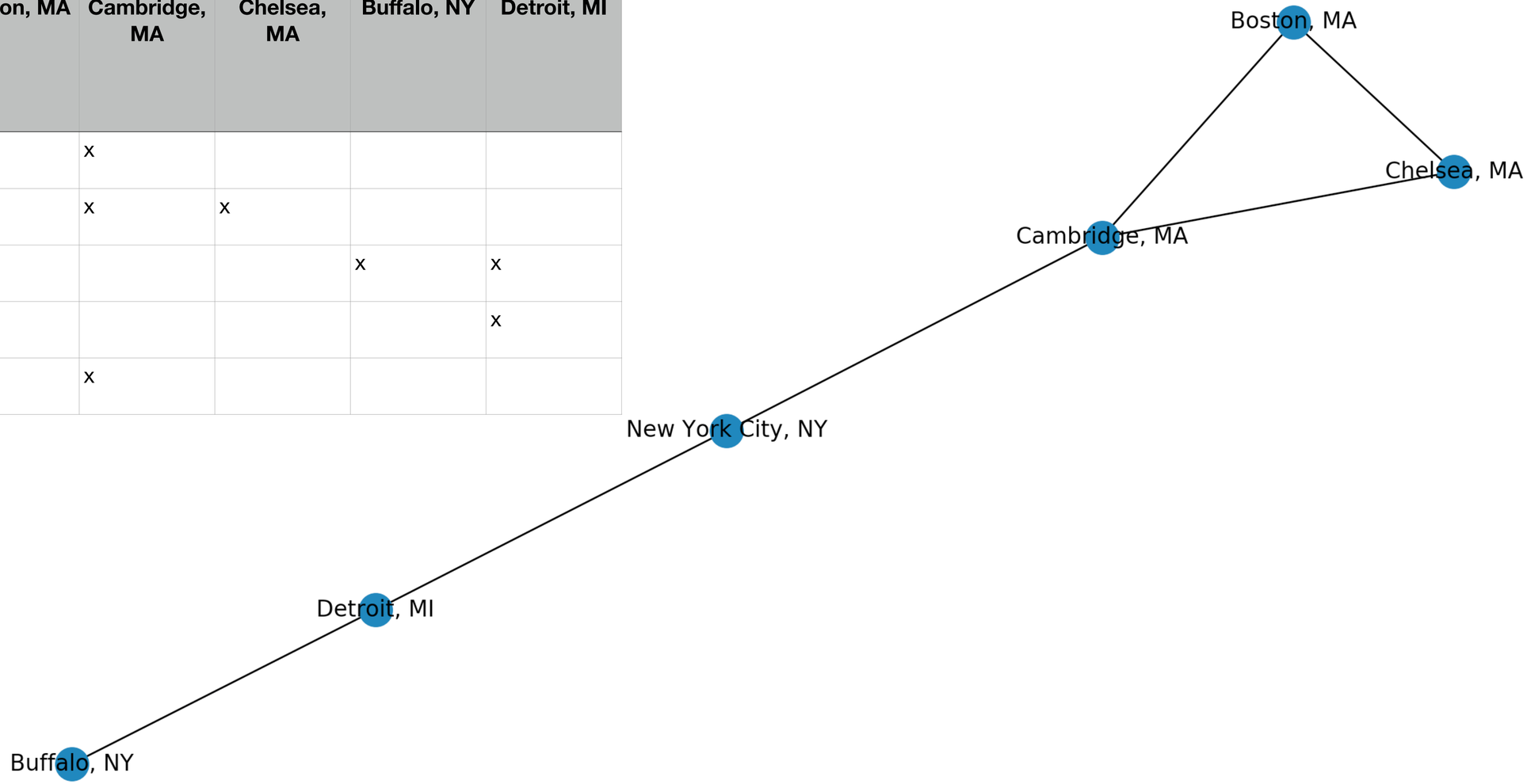
Sources of Primary Data

- Twitter data

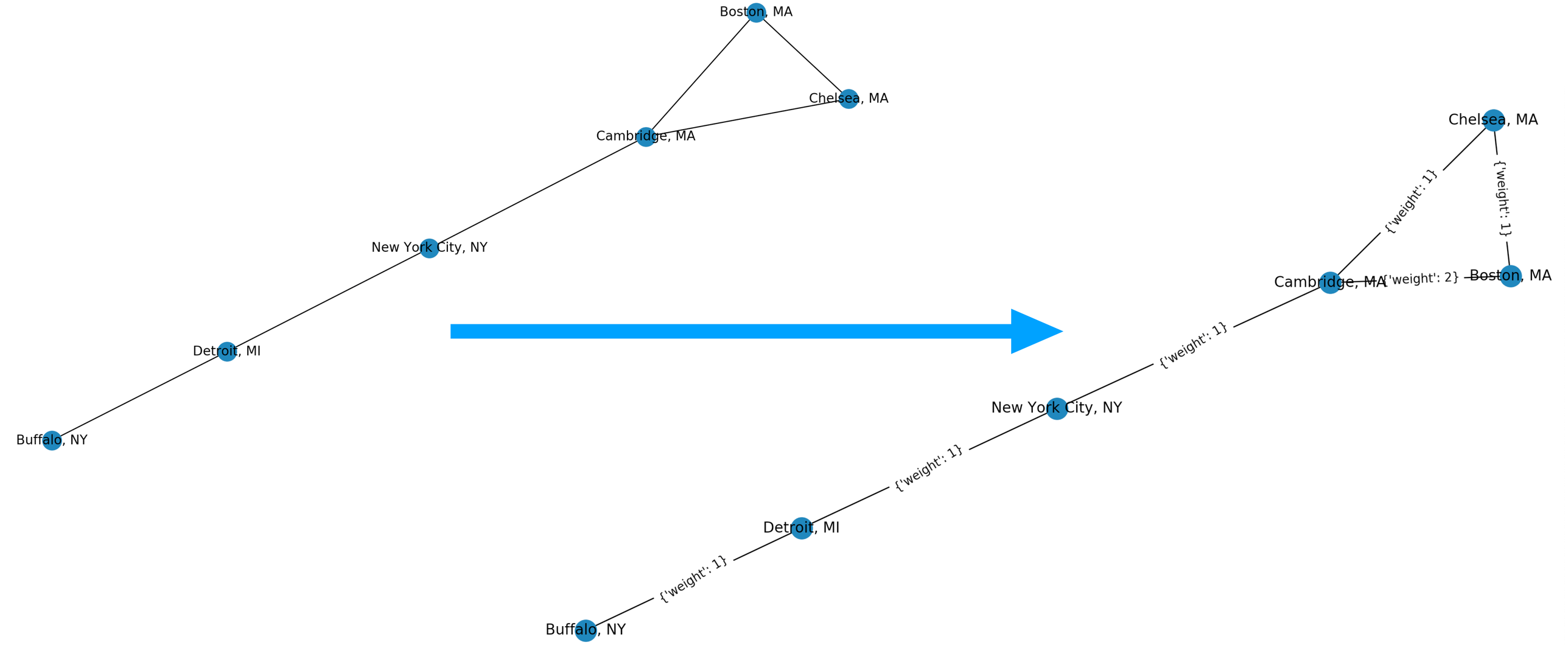
- Facebook data
- Mobile phone data
- LinkedIn data
- Transportation data

Primary Data

	New York City, NY	Boston, MA	Cambridge, MA	Chelsea, MA	Buffalo, NY	Detroit, MI
A	X		x			
B		x	x	x		
C					x	x
D	x					x
E		x	x			

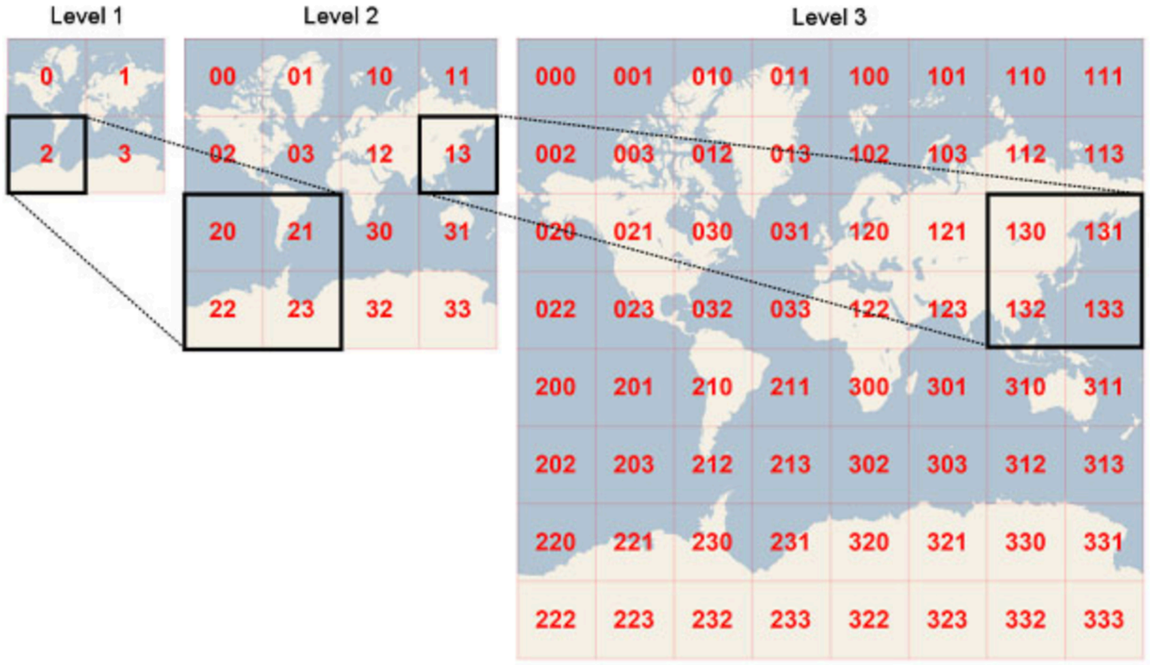


Weighted Graphs

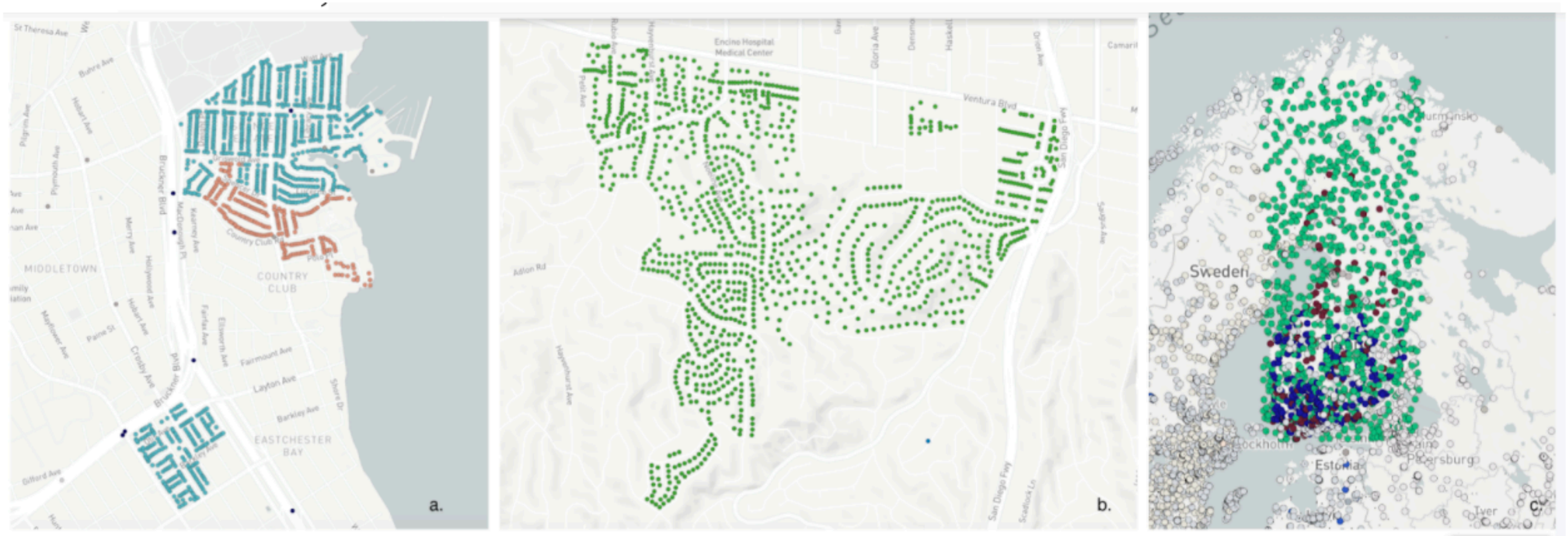


Types of Aggregation

	New York City, NY	Boston, MA	Cambridge, MA	Chelsea, MA	Buffalo, NY	Detroit, MI
A	X		x			
B		x	x	x		
C					x	x
D	x					x
E		x	x			



Biases in Geospatial Relationships



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Buchel, O., Hedayatifar, L. (Forthcoming). Multiscale functional communities. In Luke Sloan & Anabel Quan-Haase, *The Sage handbook of social media research methods*. SAGE Publications Ltd. 2nd ed.

NEW ENGLAND COMPLEX SYSTEMS INSTITUTE

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Thanks!

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