

Bike Sharing Atlas

A Global Perspective on Bike-Sharing Networks
and Urban Commuting Patterns

Michael Oppermann, Michael Sedlmair, Torsten Möller

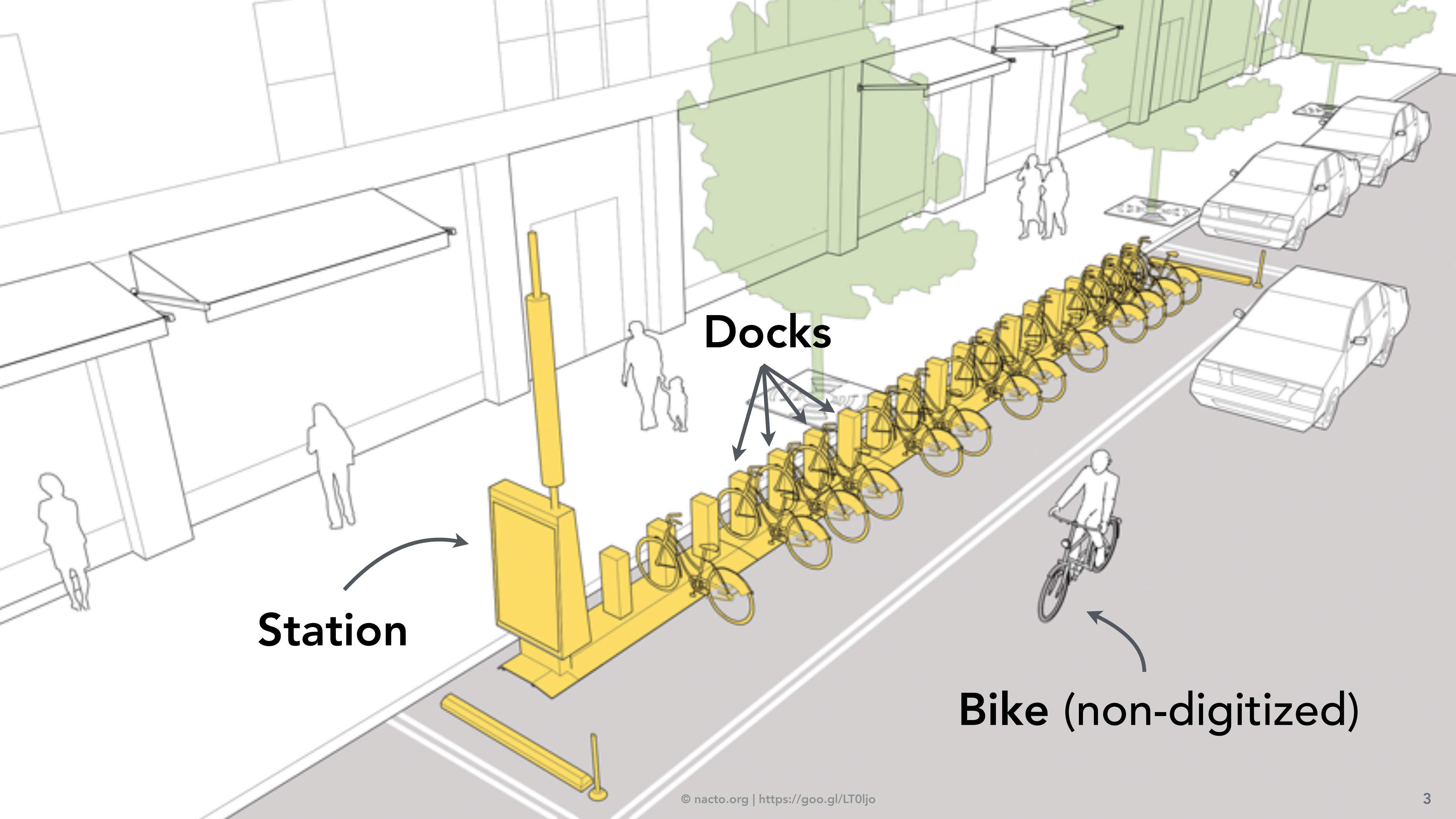
8th International Visualization in Transportation Symposium | July 27, 2017



universität
wien

Reveal interesting insights and provide a benefit for various target groups.

- **Patterns of bicycle usage**
- **Underlying spatio-temporal dynamics of a city**



Docks

Station

Bike (non-digitized)

- Recorded data from different data sources
- Created multiple visualization prototypes
- Worked with various user groups

A global perspective on bike-sharing networks and urban commuting patterns worldwide.

Bike-Sharing in your region:

Citybike Wien
Vienna, AT



Focus Networks

We have selected various bike sharing networks that share their data and contribute to open data initiatives around the globe. Compared to all other networks these cities provide detailed trip information that allows us in-depth analysis of the network activity. The focus networks are marked with a compass symbol.



London
Barclays Cycle Hire



San Francisco Bay Area, CA
Bay Area Bike Share



Washington, DC
Capital Bike Share

Help & Guides

What can you find on this website?

Live data

This website provides real-time data of available bikes and docks in more than 300 networks worldwide. Additional predictions make it easy to check if you can pick up and drop off a bike at the desired stations.

» Get the current state of the bike sharing system in Vienna, Austria

Route planner

Give us the endpoints of your trip and our algorithm will find the nearest bikeshare locations and fastest route.

» Compute an example route

Analyze usage patterns

Paris

Capital of France | 2.24mio inhabitants

VELIB (1226 STATIONS)

Elevation Profile



Weather



Similar Networks

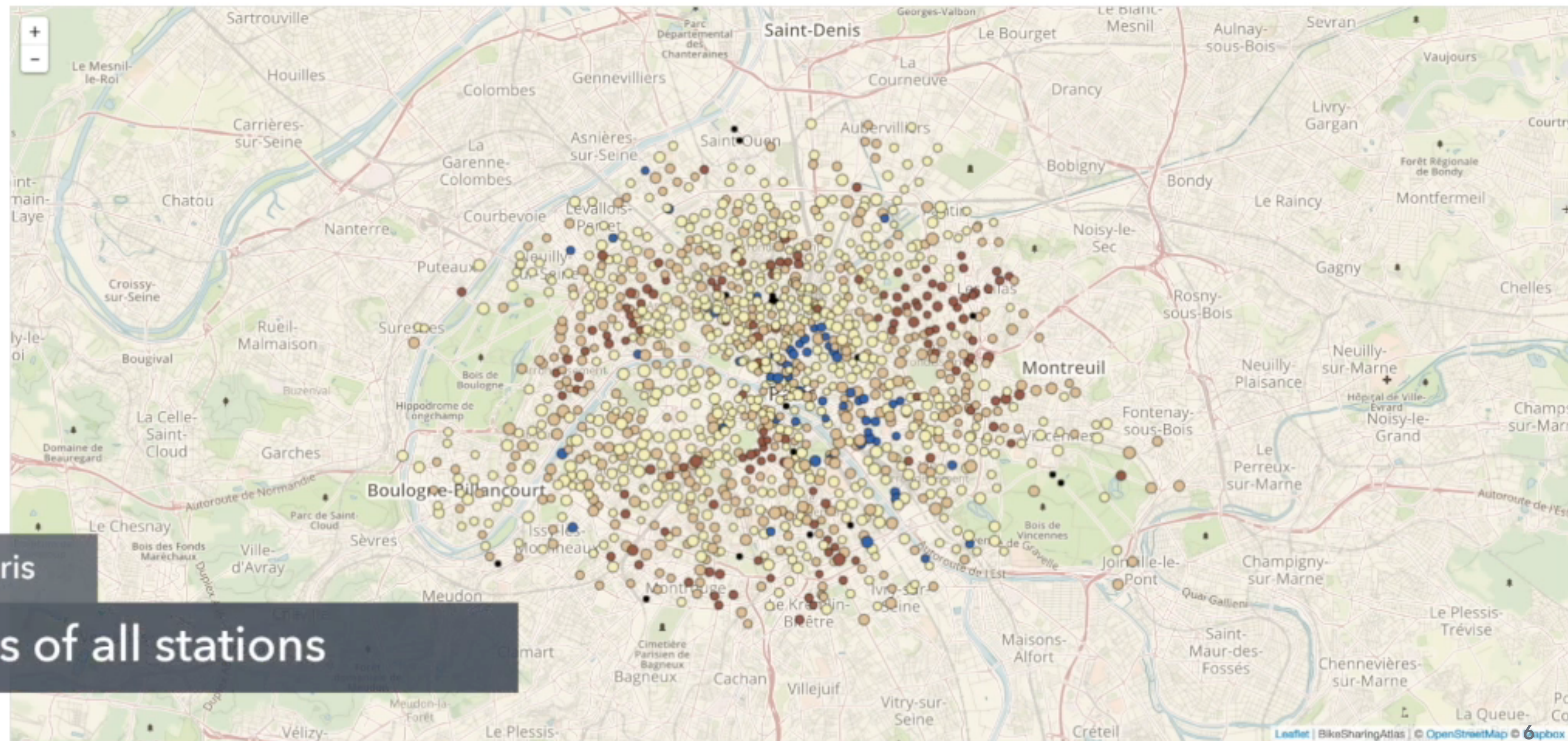
- London, GB
- New York, NY, US
- Chicago, IL, US

Bike-Sharing in Paris

Live fill levels of all stations

Stations Route Planner Price Availability Network Activity

Everything ok Almost full or empty (15%) Full Empty

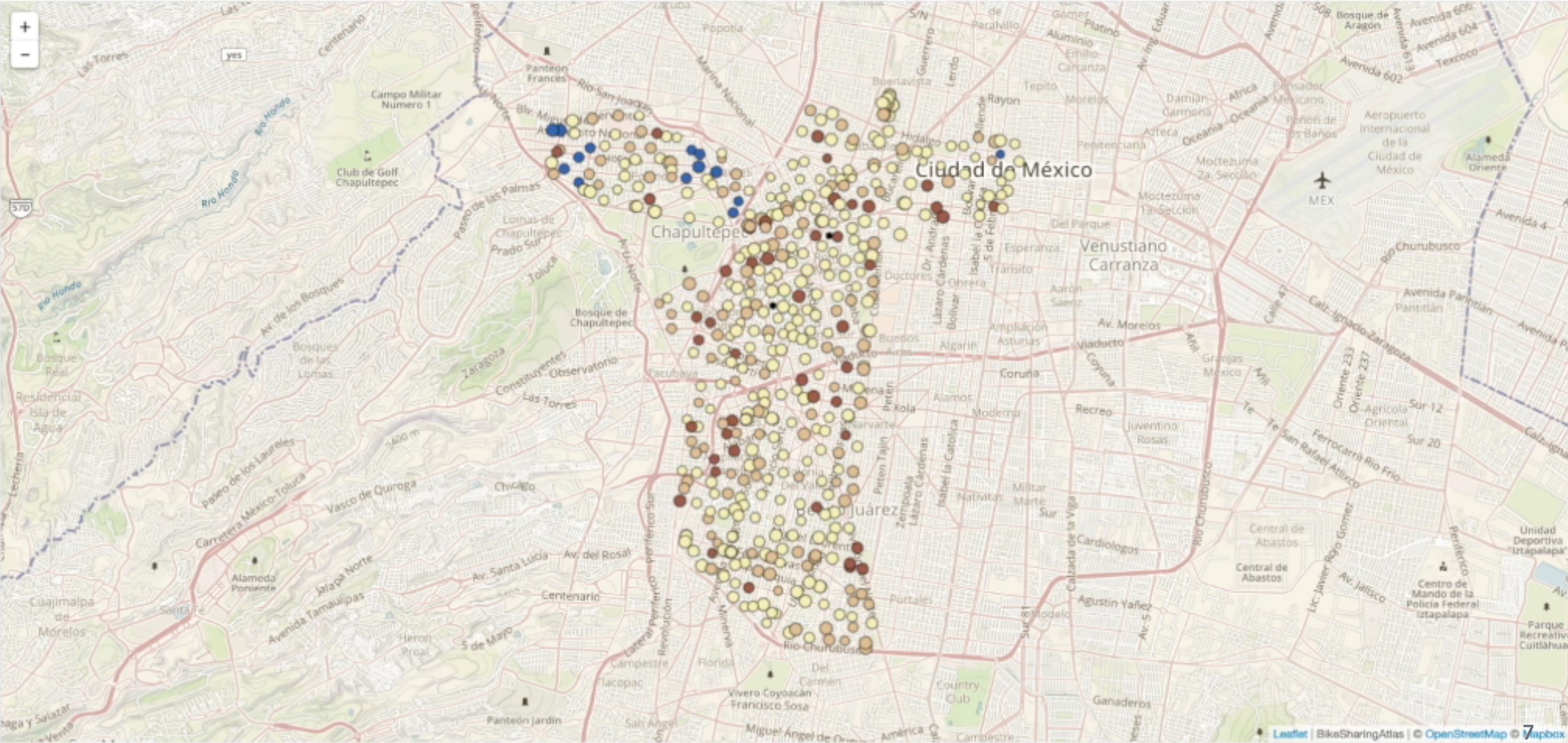


Mexico City

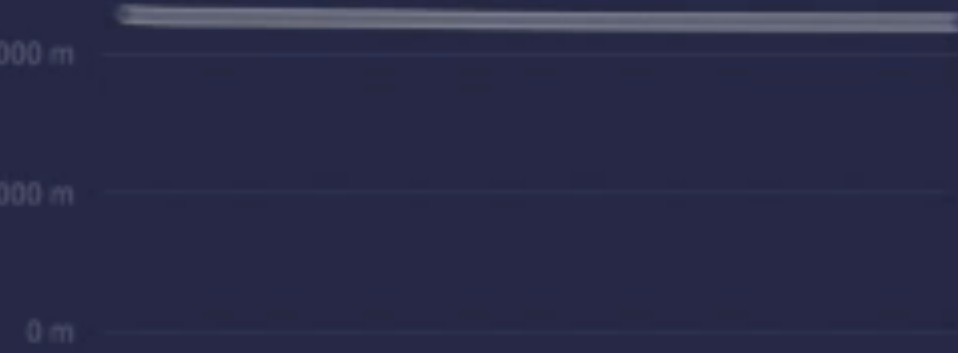
Capital of Mexico | 8.85mio inhabitants

Stations Route Planner Price Availability Network Activity Trips

Everything ok Almost full or empty (15%) Full Empty



Elevation Profile



Weather



Similar Networks

- Montreal, QC, CA
- Barcelona, ES
- Chicago, IL, US



Mexico City

Capital of Mexico | 8.85mio Inhabitants

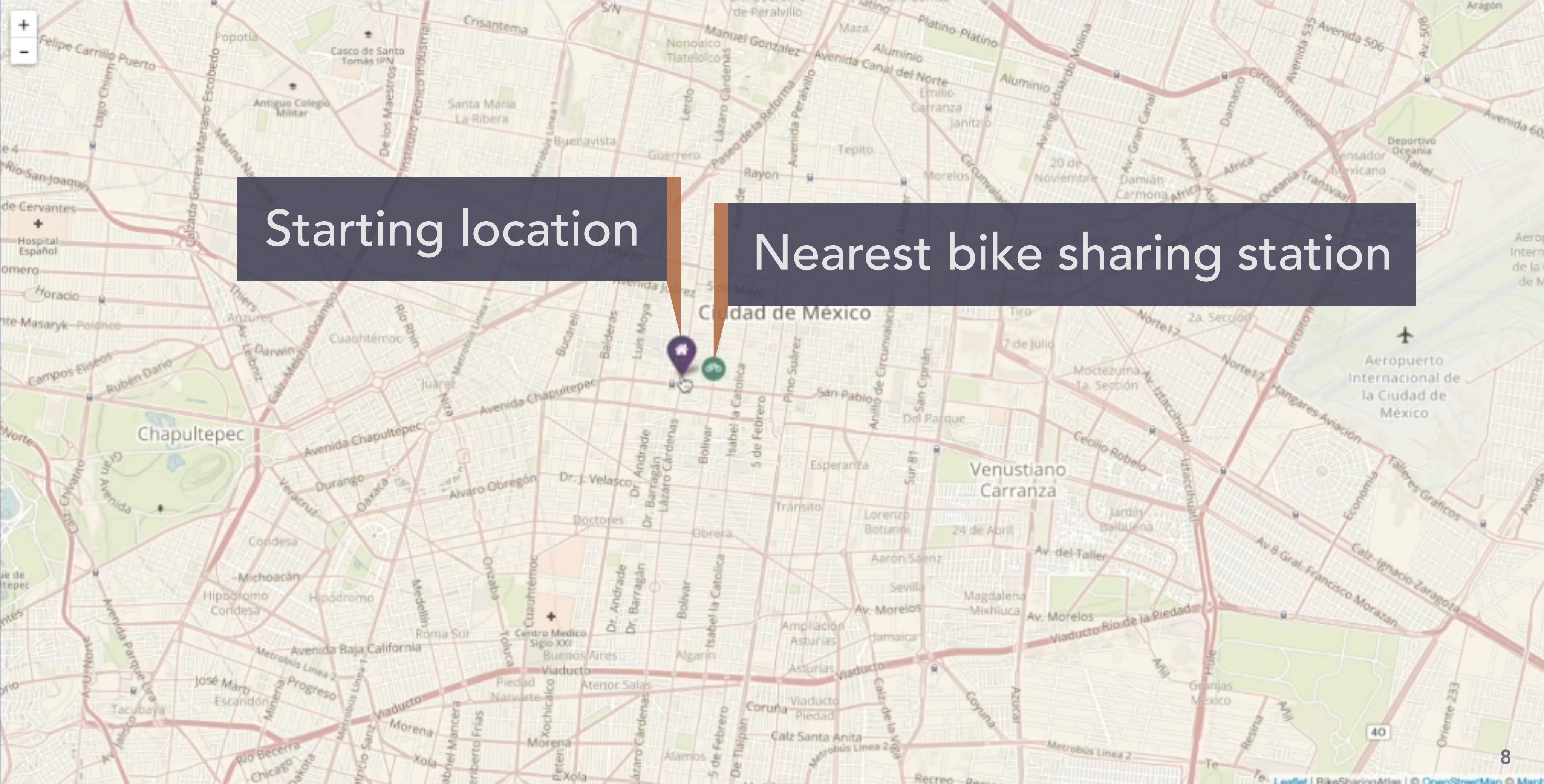
ECOBICI (444 STATIONS)

Start Location

Eje Central Lázaro Cárdenas 82, Centro, Cuauhtémoc

Destination

- Stations
- Route Planner
- Price
- Availability
- Network Activity
- Trips



Starting location

Nearest bike sharing station

Mexico City

Mexico | 8.85mio Inhabitants

Route planner

ECOBICI (644 STATIONS)

Stations

Route Planner

Price

Availability

Network Activity

Trips

Start Location

Eje Central Lázaro Cárdenas

Destination

Quintana Roo 19, Roma

Automatically finds the nearest stations and the fastest cycling route

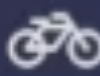
Route Details

You will need about 28 min (5.17 km) until you arrive at your destination



Walk (6 min)

Walk 0.47 km to the next bike sharing station: 102 ECHEVESTE-BOLIVAR



Rent a bike (22 min)

Grab a bike and cycle 4.63 km to 161 QUINTANA ROO-MANZANILLO, which is the closest bike sharing station to your destination.



Walk (1 min)

Finally, walk 0.07 km to your destination.





Database

**468 networks with more
than 21.500 stations**



Database

Timestamp every 15 min

Station ID	30184e9...
Network	citybike-wien
Empty Slots	16
Free Bikes	11
Timestamp	2017-07-27 08:45:02

Mexico City

Mexico | 8.85mio Inhabitants

Route planner

ECOBICI (644 STATIONS)

Stations

Route Planner

Price

Availability

Network Activity

Trips

Automatically finds the nearest stations and the fastest cycling route

Start Location

Eje Central Lázaro Cárdenas (Ayuntamiento)

Destination

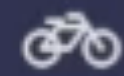
Quintana Roo 19, Roma (Ayuntamiento)

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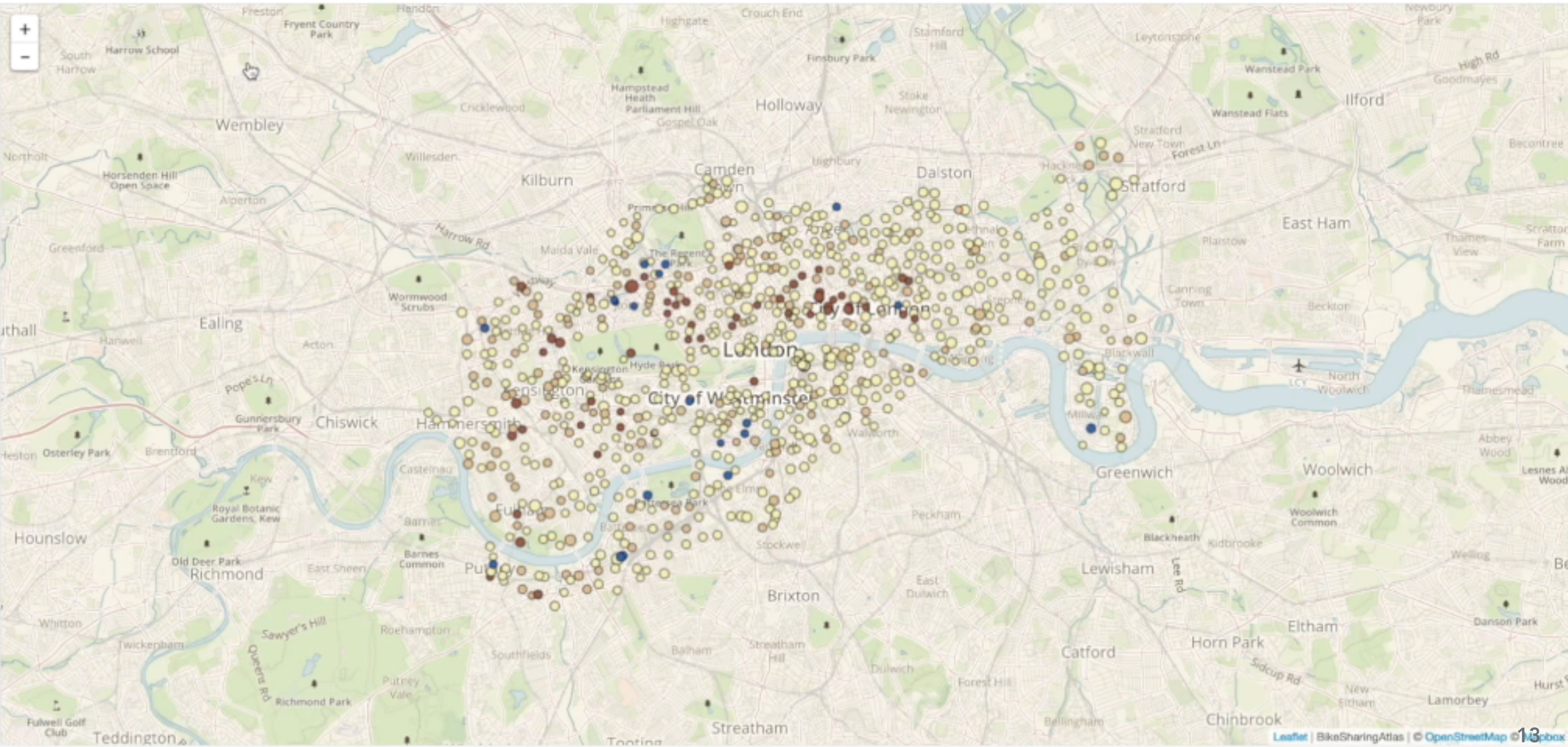


London

Capital of United Kingdom | 8.67mio inhabitants

Stations Route Planner Price Availability Network Activity Trips

Everything ok Almost full or empty (15%) Full Empty



Elevation Profile



Weather



Similar Networks

- New York, NY, US
- Chicago, IL, US
- Barcelona, ES

London

Capital of United Kingdom | 8.67mio inhabitants

SANTANDER CYCLES (734 STATIONS)

Elevation Profile



Weather



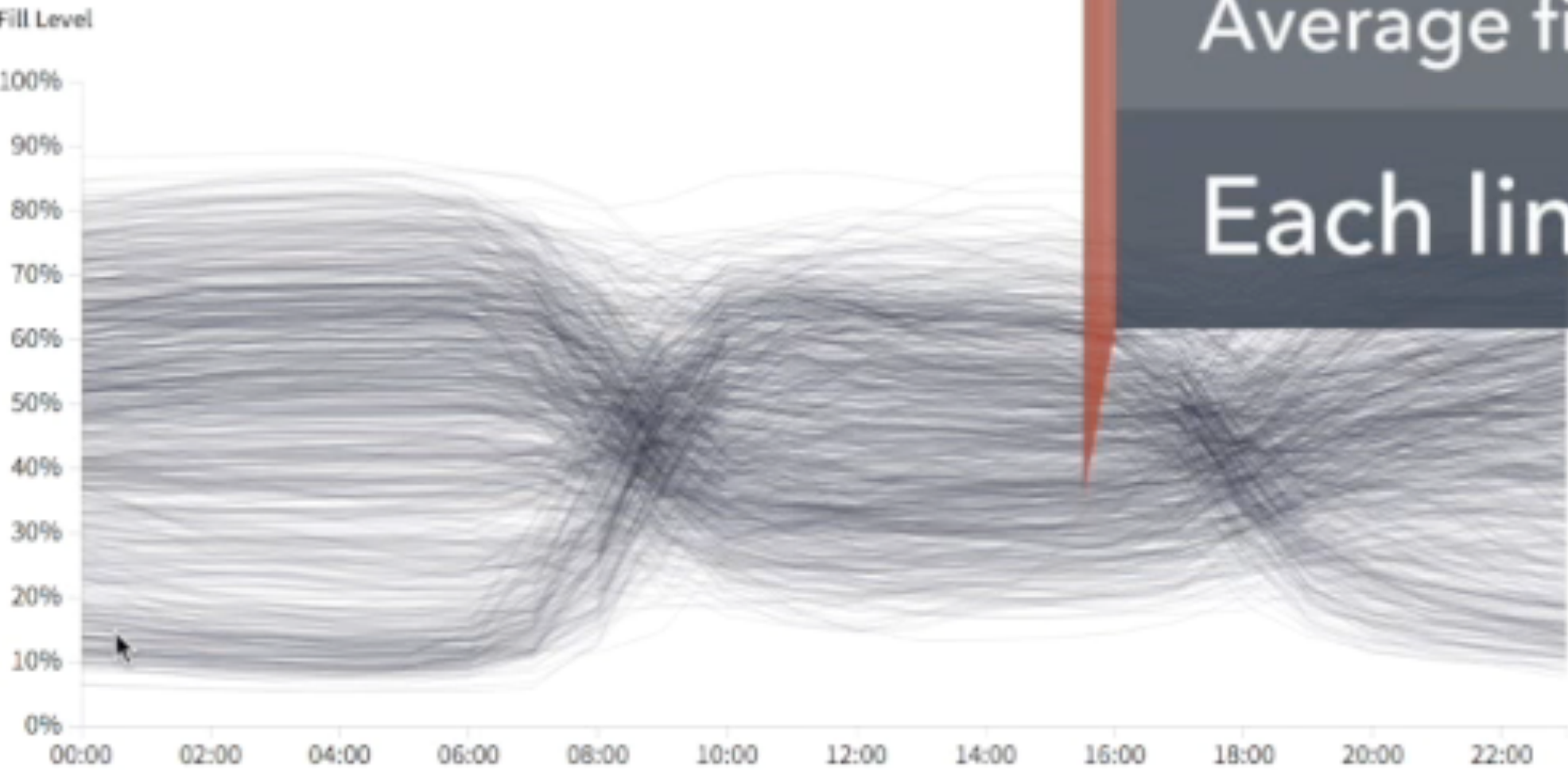
Similar Networks

- New York, NY, US
- Chicago, IL, US
- Barcelona, ES

Stations Route Planner Price Availability Network Activity Trips

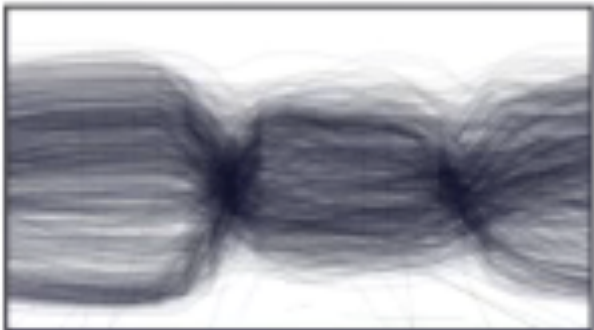
Draw & Select

Average utilization

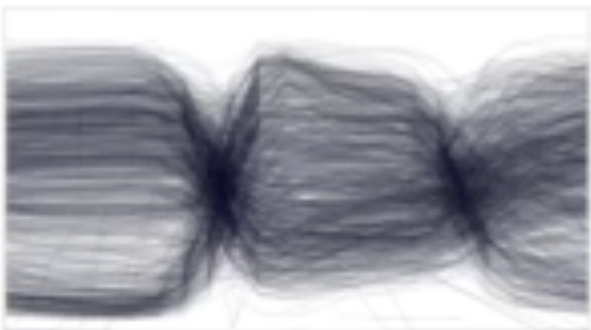


Average fill levels

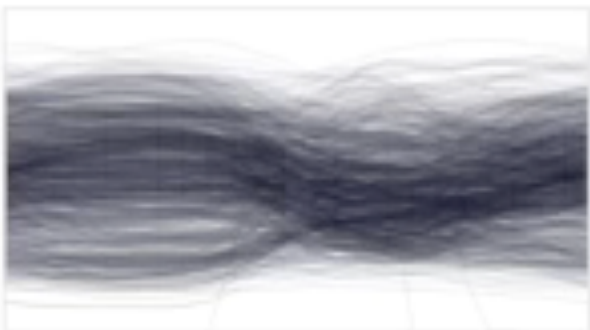
Each line represents one station



ALL



WEEK



WEEKEND





SANTANDER CYCLES (734 STATIONS)

Elevation Profile



Weather



Similar Networks

New York, NY, US

Chicago, IL, US

Barcelona, ES



London

Capital of United Kingdom | 6.67 mi

Visual selection tool and multi-coordinated views

Stations

Route Planner

Price

Availability

Network Activity

Trips

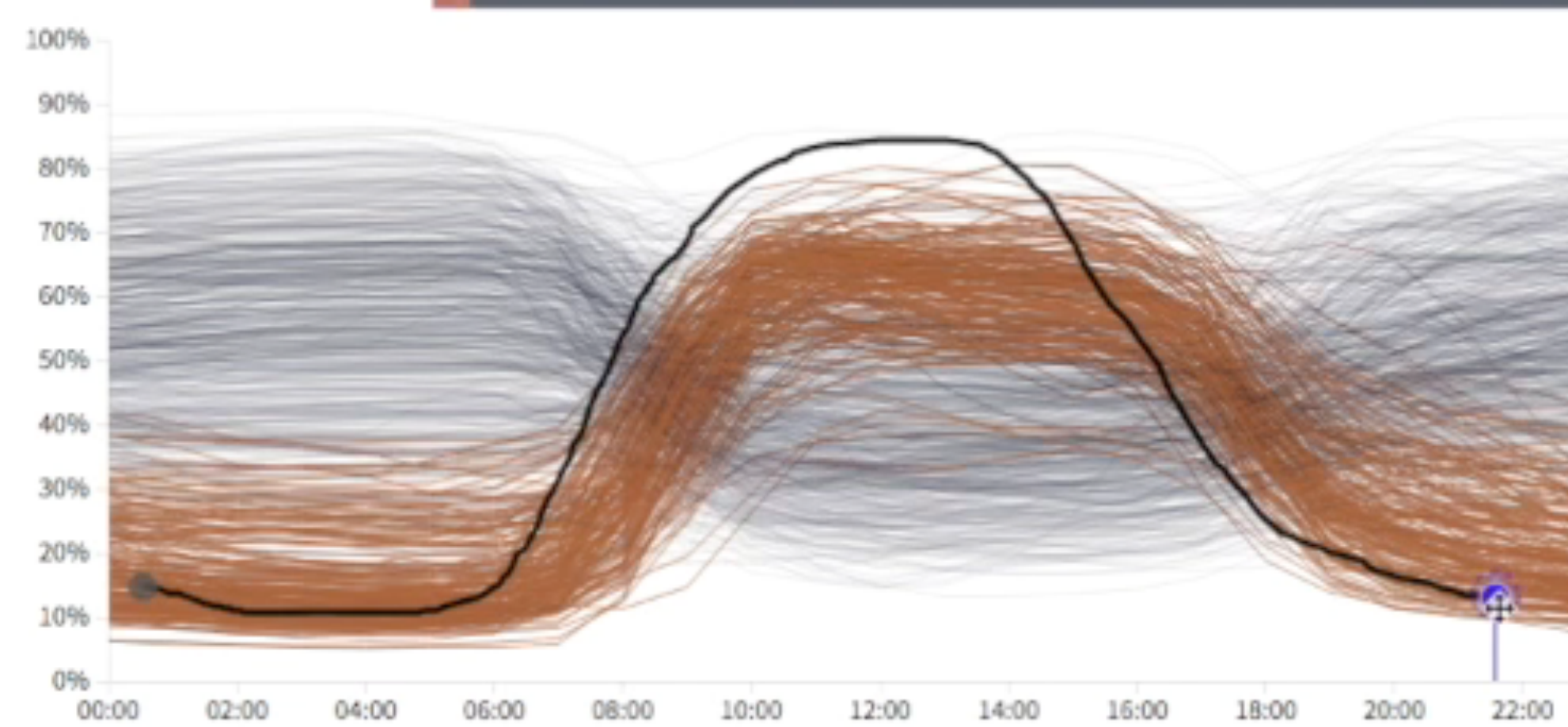
Draw & Select

Selection:

22%

Expose commuting patterns

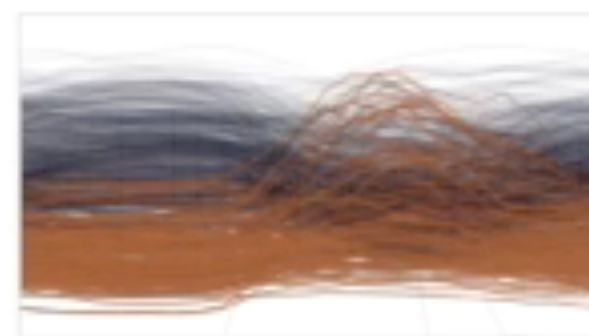
Fill Level



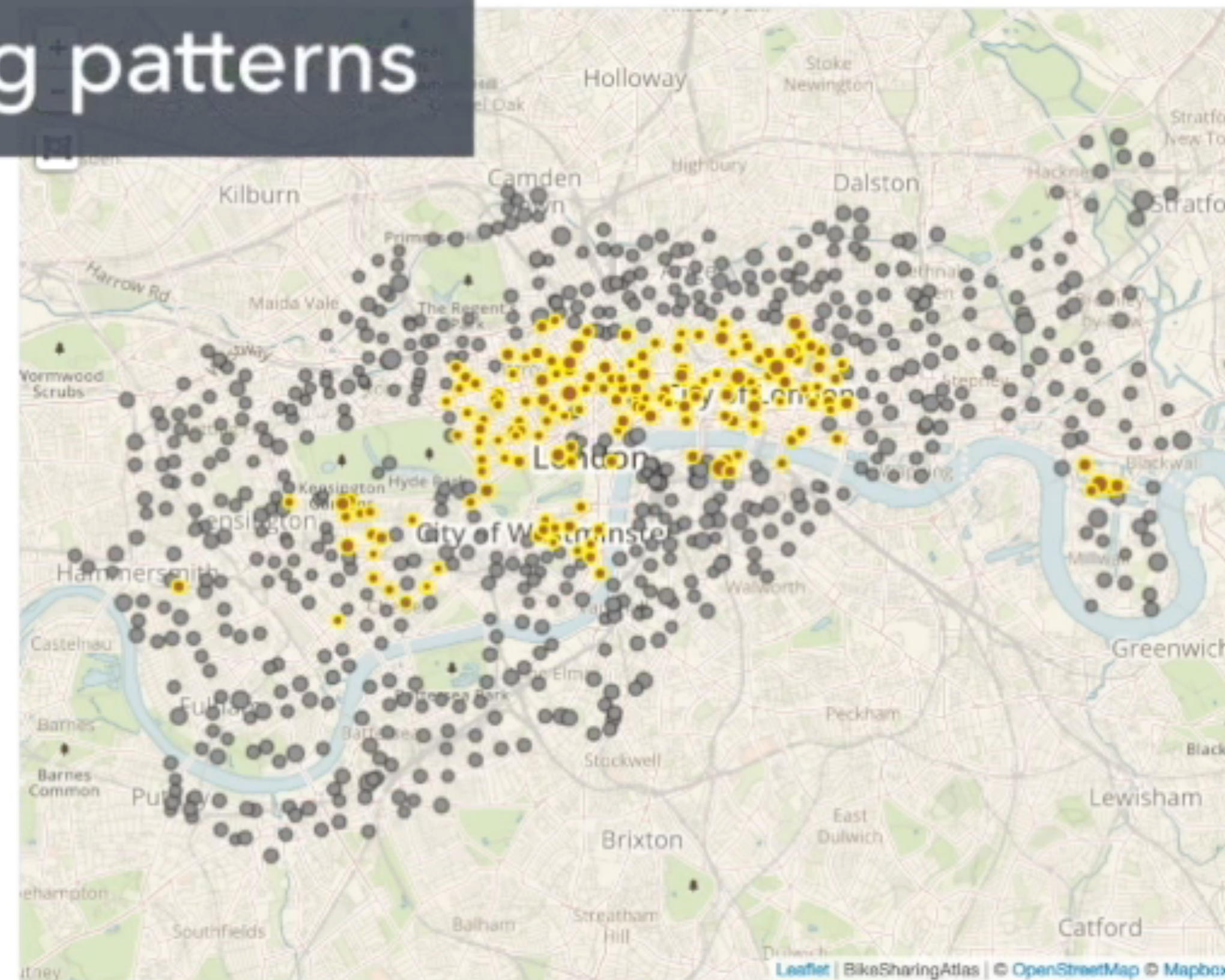
ALL



WEEK



WEEKEND





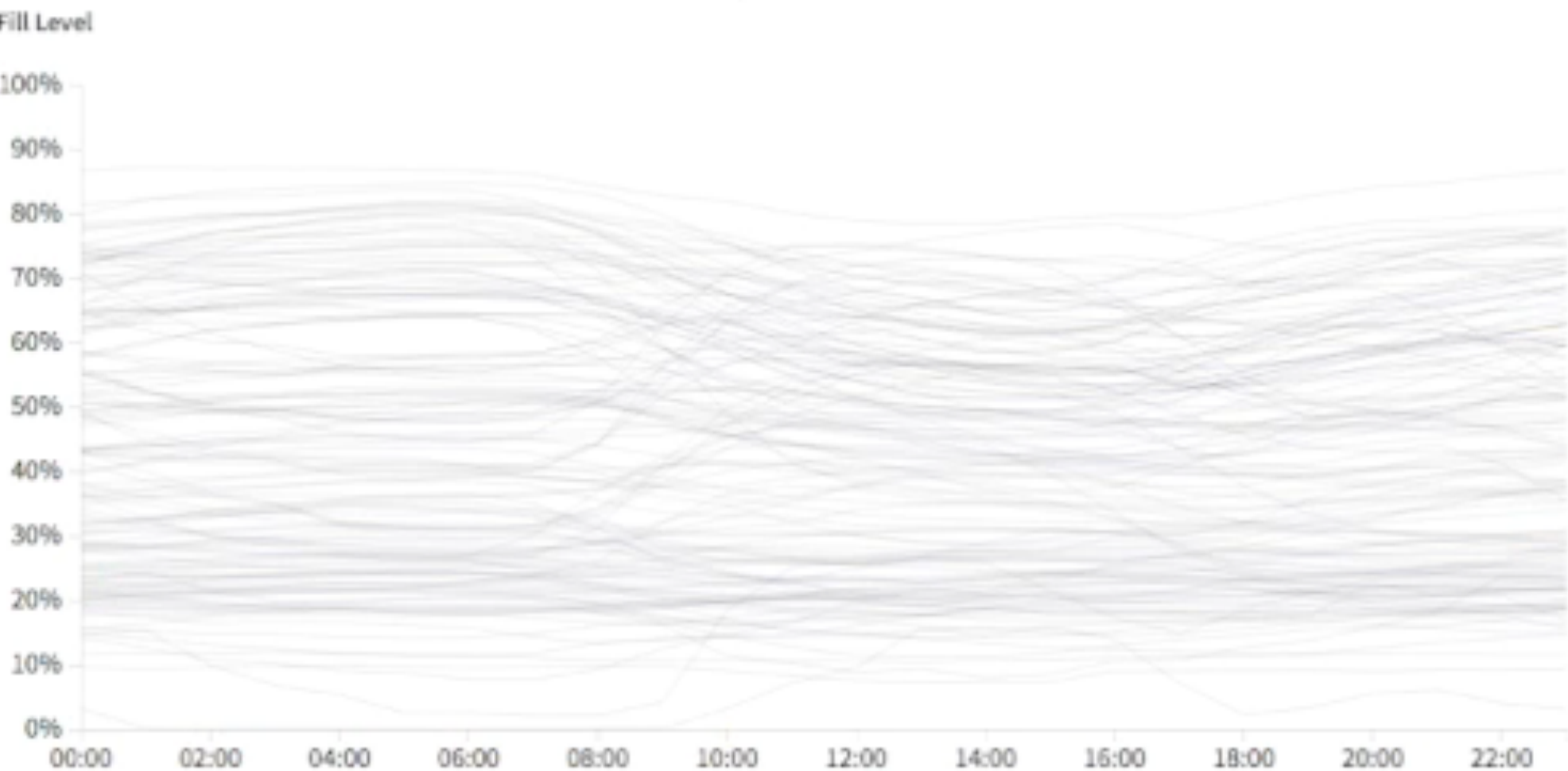
Vienna

Capital of Austria | 1.74mio inhabitants

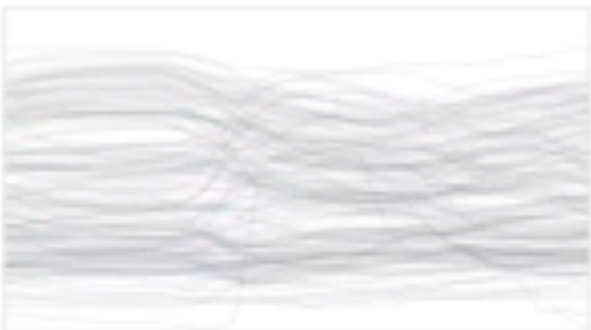
- Stations
- Route Planner
- Price
- Availability
- Network Activity
- Trips

☒ Draw & Select

Average utilization



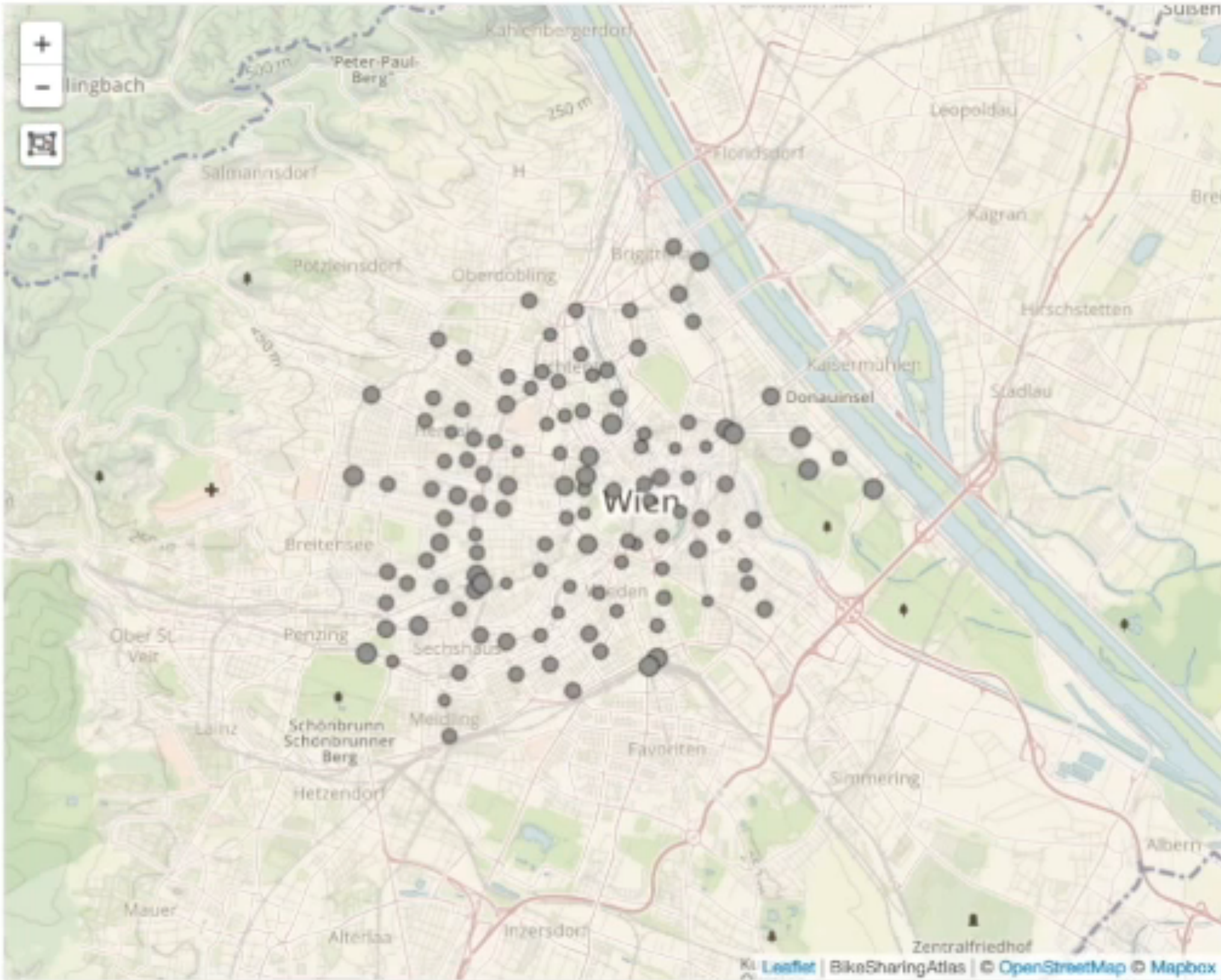
ALL



WEEK



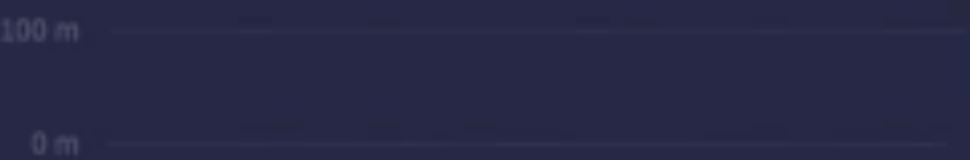
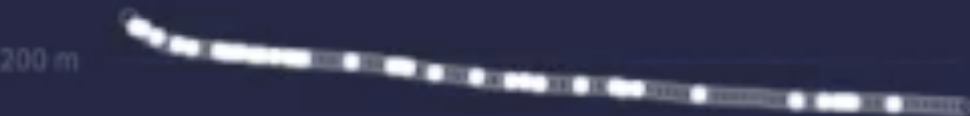
WEEKEND





CITYBIKE WIEN (121 STATIONS)

Elevation Profile



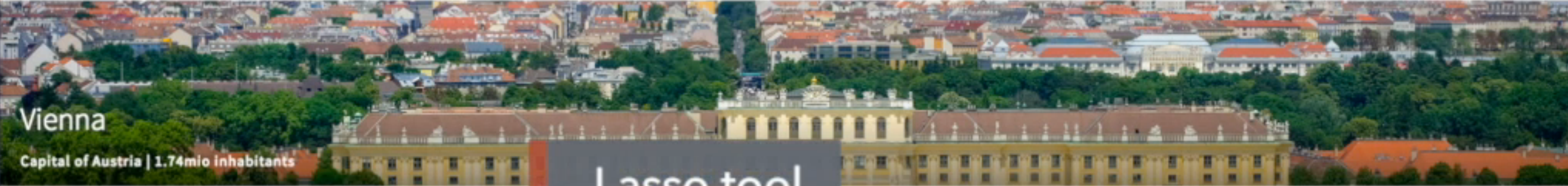
Weather



Avg. Temperature: 10 °C
Avg. Humidity: 78 %

Similar Networks

- Marseille, FR
- Dresden, DE
- Usedom, DE



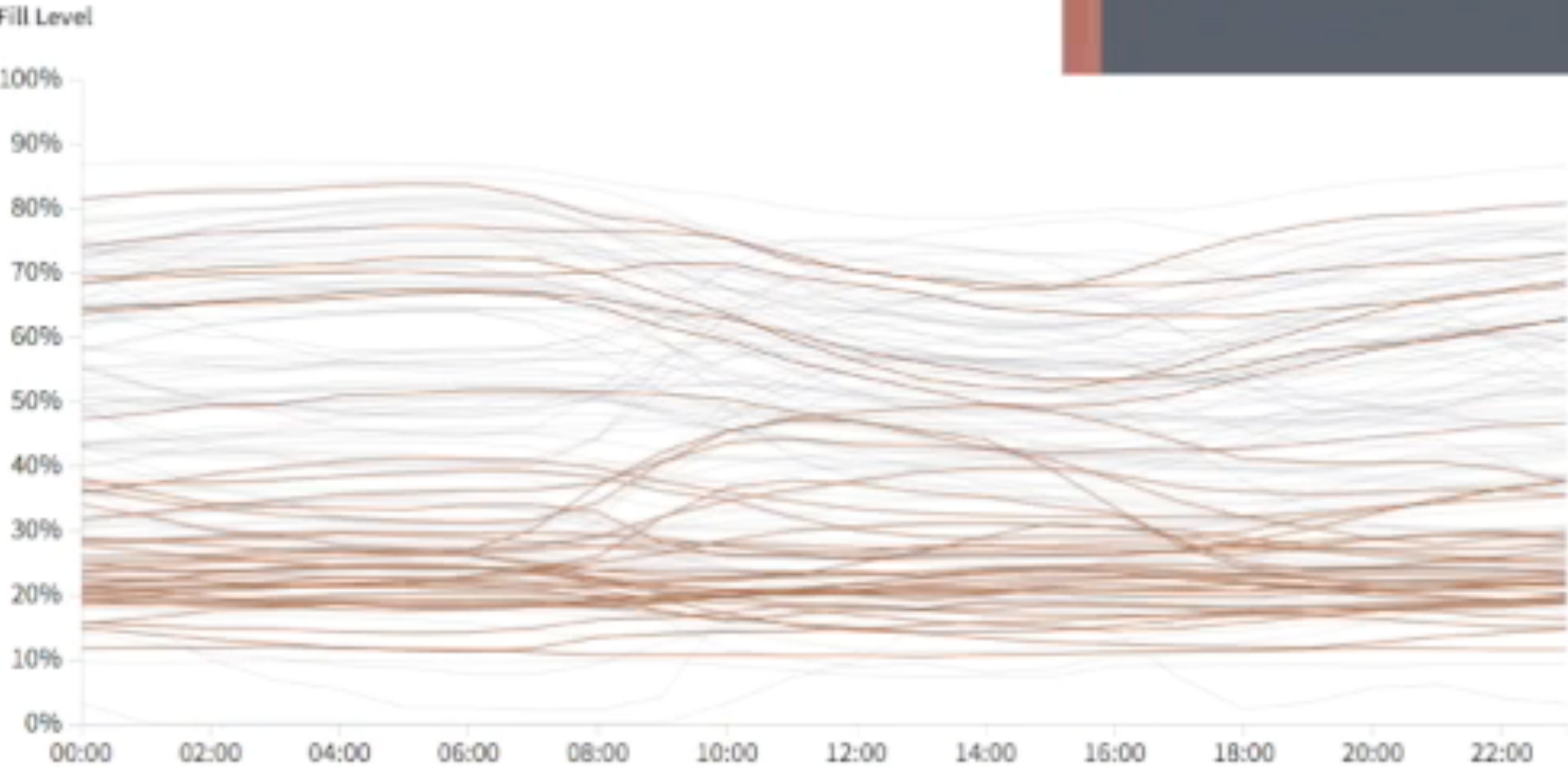
Vienna

Capital of Austria | 1.74mio inhabitants

- Stations Route Planner Price Availability Network Activity

Draw & Select

Average utilization



ALL



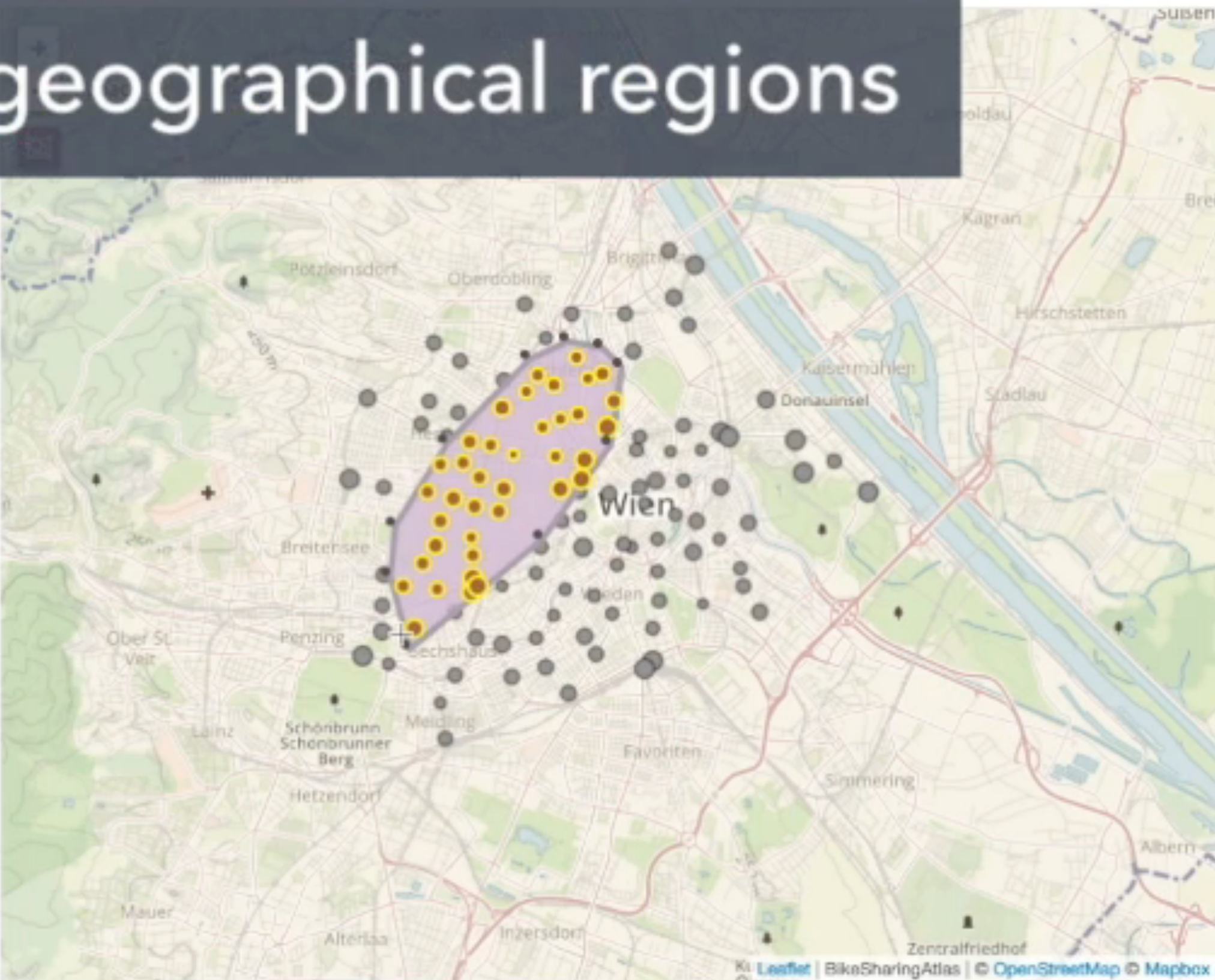
WEEK



WEEKEND

Lasso tool

Select geographical regions





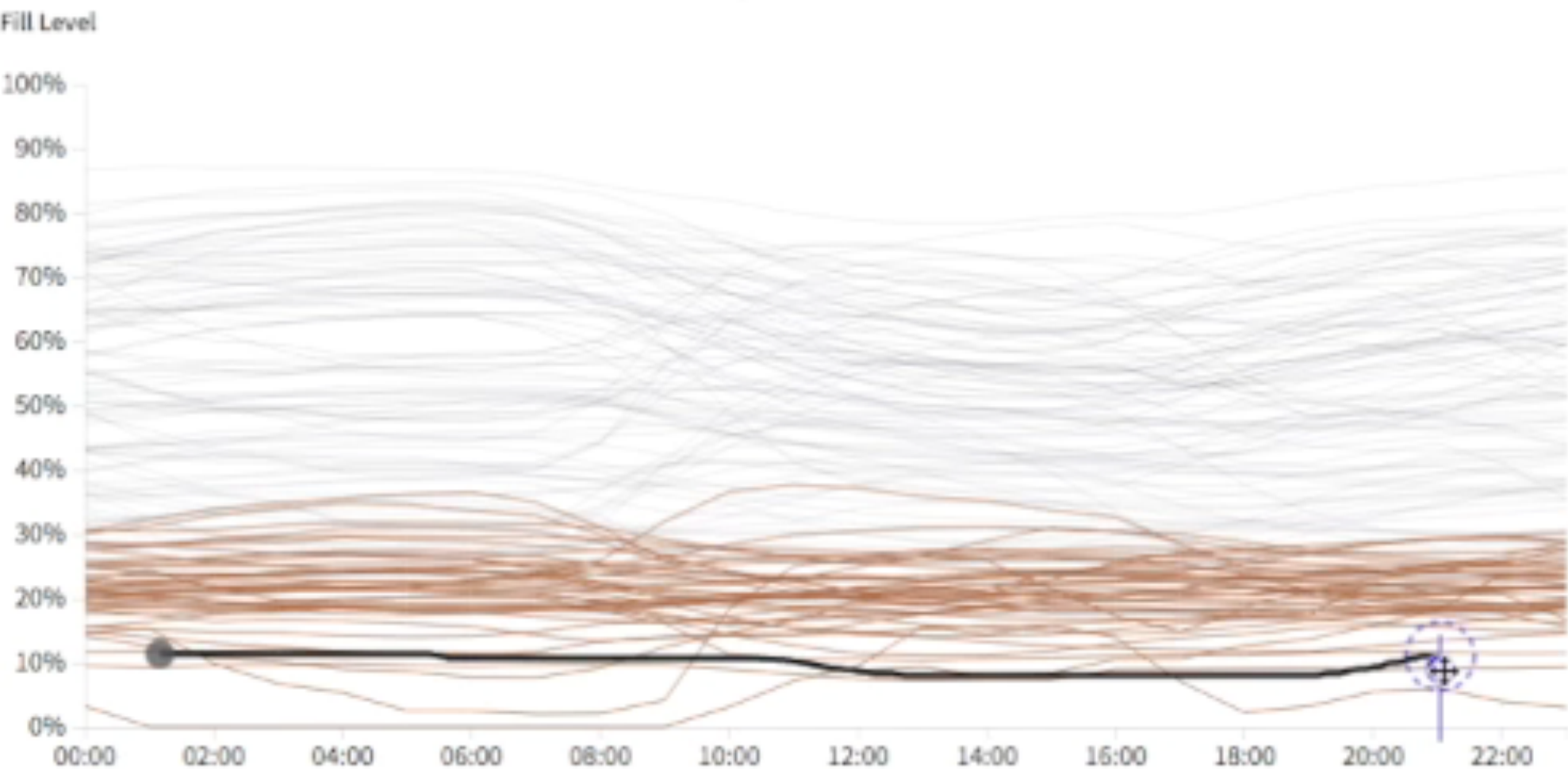
Vienna

Capital of Austria | 1.74mio inhabitants

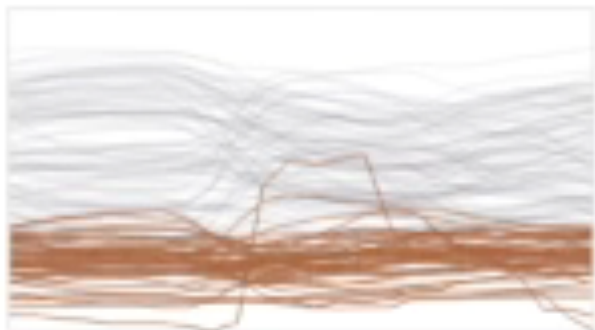
- Stations
- Route Planner
- Price
- Availability
- Network Activity
- Trips

☒ Draw & Select Selection: 32%

Average utilization



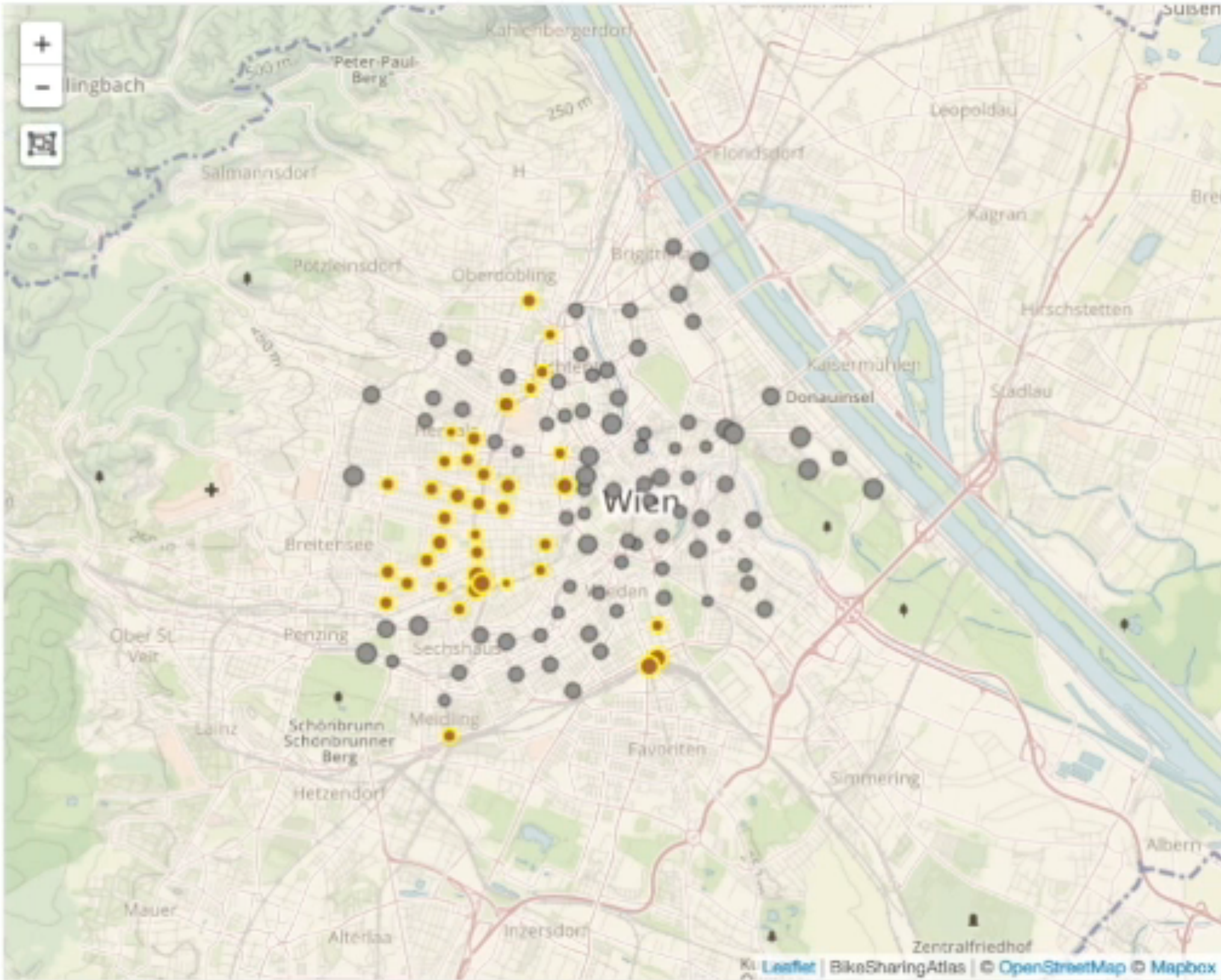
ALL



WEEK



WEEKEND



Elevation Profile



Weather



Similar Networks

- Marseille, FR
- Dresden, DE
- Usedom, DE

Linking & brushing

Vienna

Reveals the influence of elevation differences

CITYBIKE WIEN (121 STATIONS)

Stations Route Planner News Availability Network Activity Trips

Elevation Profile



Weather

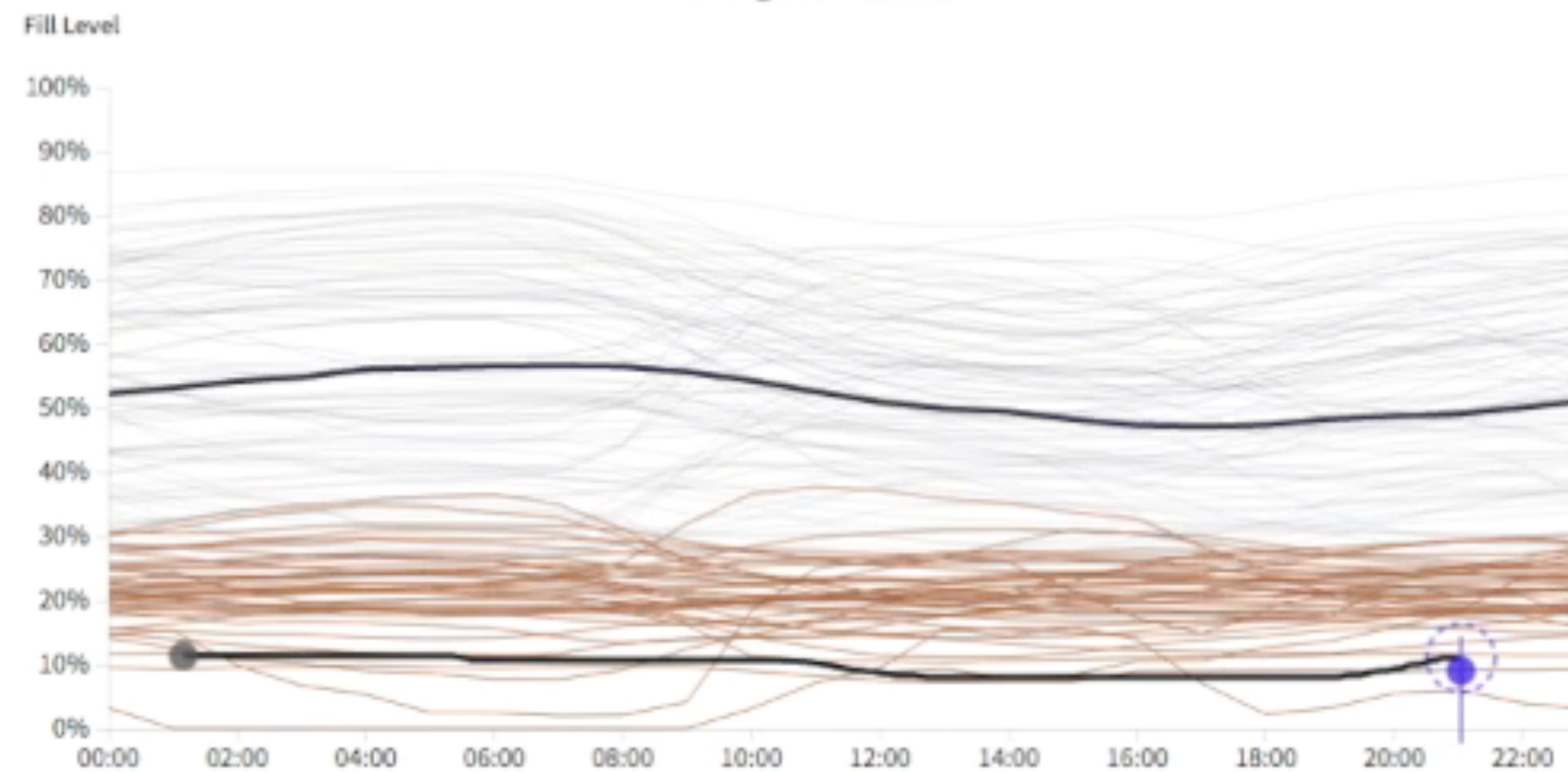


Similar Networks

- Marseille, FR
- Dresden, DE
- Usedom, DE

☒ Draw & Select Selection: 32%

Average utilization



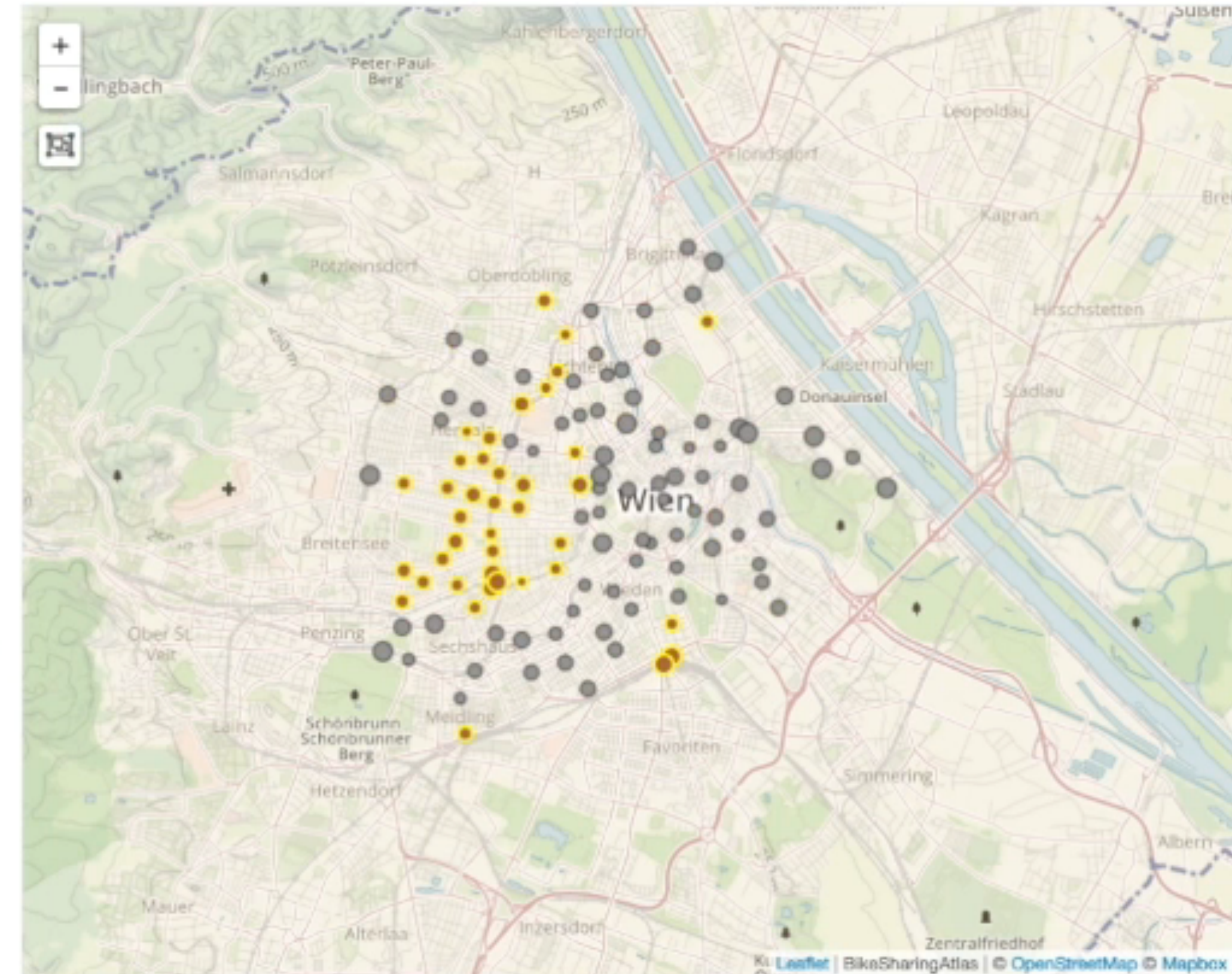
ALL



WEEK



WEEKEND



Networks

Explore bike-sharing networks worldwide.

39/384 NETWORKS

Number of stations 100 1226 Distance to nearest station 0m 7268m

Sort by Number of stations

Number of stations



Ø Distance to nearest station [m]



Population (urban area)



Paris, FR

Velib | 1226 Stations

London, GB

Santander Cycles | 734 Stations

New York, NY, US

Citi Bike | 511 Stations

Chicago, IL, US

Divvy | 475 Stations

Barcelona, ES

Bicing | 400 Stations

Montreal, QC, CA

Bixie | 400 Stations

Mexico City, MX

EcoBici | 444 Stations

Washington, DC, US

Capital BikeShare | 357 Stations

Network overviews with small multiples

Indicators for the size, structure and density

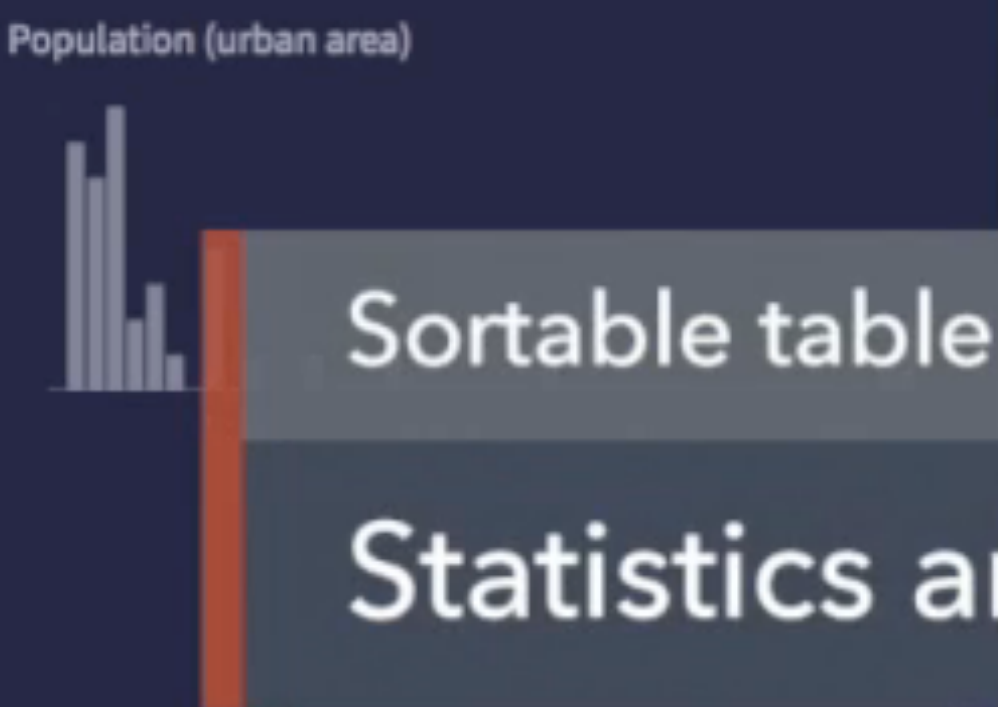
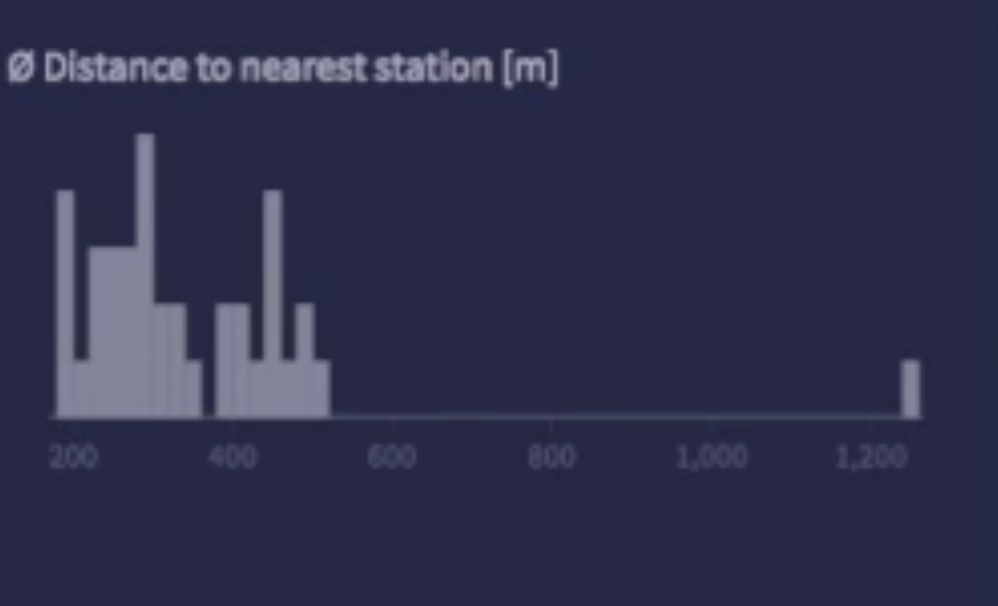
A person is riding a bicycle on a paved path in a park. In the background, there is a wooden fence, a bench with two people sitting on it, and a trash can. The scene is outdoors with trees and grass.

Networks

Explore bike-sharing networks worldwide.

Number of stations Distance to nearest station

38/384 NETWORKS



Sortable table

Statistics and network characteristics

#	Focus 📍	Docking Station 📍	Country	City	Network	Operator	Number of stations 📈	Network activity 📈	Ø Distance to nearest station [m]	Ø Number of stations in a 2km radius 📈	Correlation (temperature - network activity) 📈	Ø Trip duration [min]	Ø Trips per station 📈	Max. Elevation difference [m]
1	📍	✓	GB	London	Santander Cycles	Serco Ltd	734	25.48	213	87.6	-0.08	21	14.72	49.32
2		✓	US	New York, NY	Citi Bike		511	29.67	248	75.89	0.43			47.13
3	📍	✓	US	Chicago, IL	Divvy		475	12.37	440	37.54	0.67	20	8.51	11.9
4		✓	ES	Barcelona	Bicing	ClearChannel	465	40.46	169	107.53	0.07			119.51
5		✓	CA	Montreal, QC	Bixi	PBSC	461	1.95	285	80.77	0.45			104
6	📍	✓	MX	Mexico City	EcoBici	ClearChannel	444	34.2	183	100.27	0.04	14	47.68	61.93
7	📍	✓	US	Washington, DC	Capital BikeShare		357	16.18	403	29.5	0.53	17	17.75	146.32
8		✓	FR	Lyon	Vélo'V	JCDecaux	346	35.98	254	79.18	0.02			123.65
9		✓	BE	Bruxelles	villo	JCDecaux	343	12.18	387	39.81	0.07			102.48
10		✓	DE	Frankfurt am Main	Call-A-Bike Frankfurt	DB Rent GmbH	305	6.55	290	57.88	0.38			64.99
11		✓	RU	Moscow	Velobike		300	0.52	381	29.57	0.34			131.08
12		✓	FR	Toulouse	Vélo	JCDecaux	279	29.35	261	77.56	-0.23			72.83
13		✓	ES	Valencia	Valençà	JCDecaux	278	36.1	284	73.76	-0.06			53.11
14		✓	IT	Rome	Liberty	Liberty	269	27.23	280	75.06	0.16			32.54
15		✓	ES	Sevilla	Sevici	JCDecaux	259	27.97	254	67.63	-0.22			27.54
16		✓	BR	Rio de Janeiro	BikeRio		255	20.34	335	27.25	0.11			59.77



Vienna



Mexico City

New York City

London

Vienna

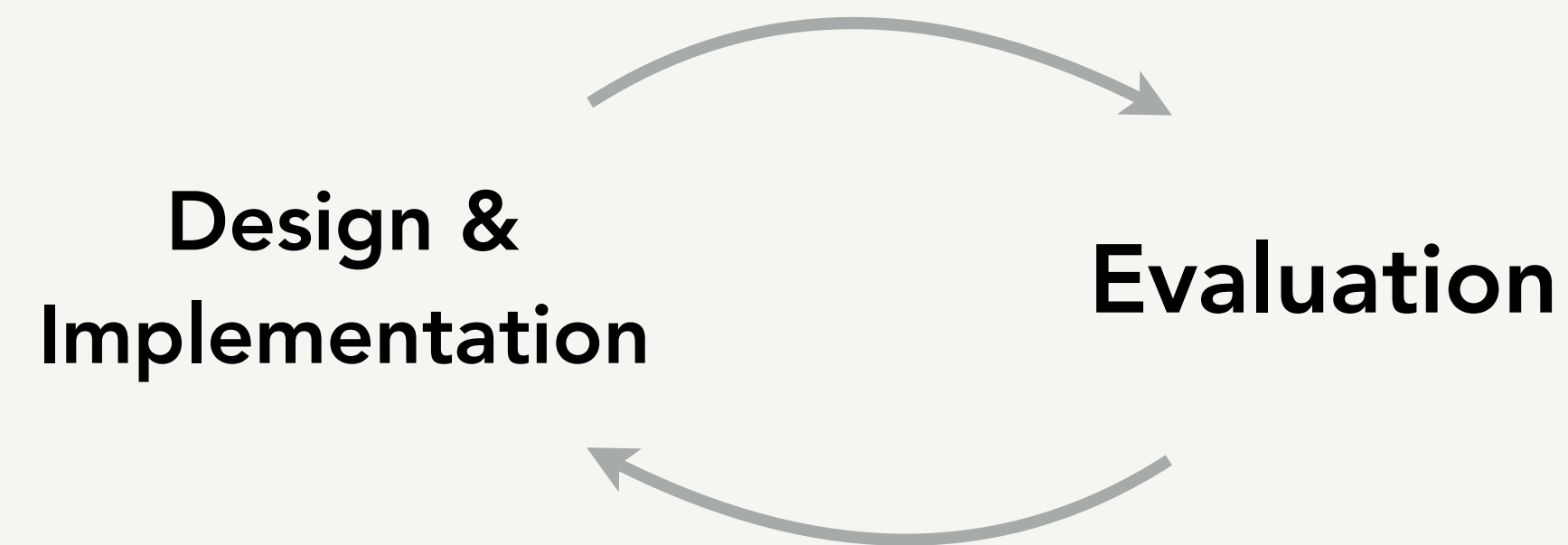


Worldwide trend with shared opportunities and challenges.

Existing solutions take a rather **narrow/local** view.

A **global** perspective on bike sharing networks.

Methodological Approach



Dec 2015

Data acquisition and preprocessing

2017

Usage Scenarios

Expert Interviews / Chaffeuired Demos



**Bike Sharing
Operator**



Public Authorities



City Planners



**Urban Sociology
Researchers**



**General Public
Users**

Think-Aloud Studies

Implementation

Preprocessing

Python

Data Storage

MySQL,
CSV files

Web Application

PHP

HTML, CSS,
Javascript

Visualization

D3.js
(visualization,
interactions)

Leaflet
(interactive maps)

Discussion

- Beyond classical user-centered design
- Leverage the global scale of the data
- Use the recorded data for other in-depth analyses
- Examine general applicability (car sharing, smart city)

Thank you!

bikesharingatlas.org

Michael Oppermann, Michael Sedlmair, Torsten Möller

michaeloppermann.com

