

Visualizing Data for Transportation Analytics

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The Virtual City: Data Rich, Data Producing

- An invisible grid made up of networks, packets and data
- Surveillance technologies, interactions, connected devices
- Mobile internet, applications and devices
- Energy and carbon consumption
- Transportation and movement
- Development and planning
- A city of open data as a base for applications

City as a Wealth of Data

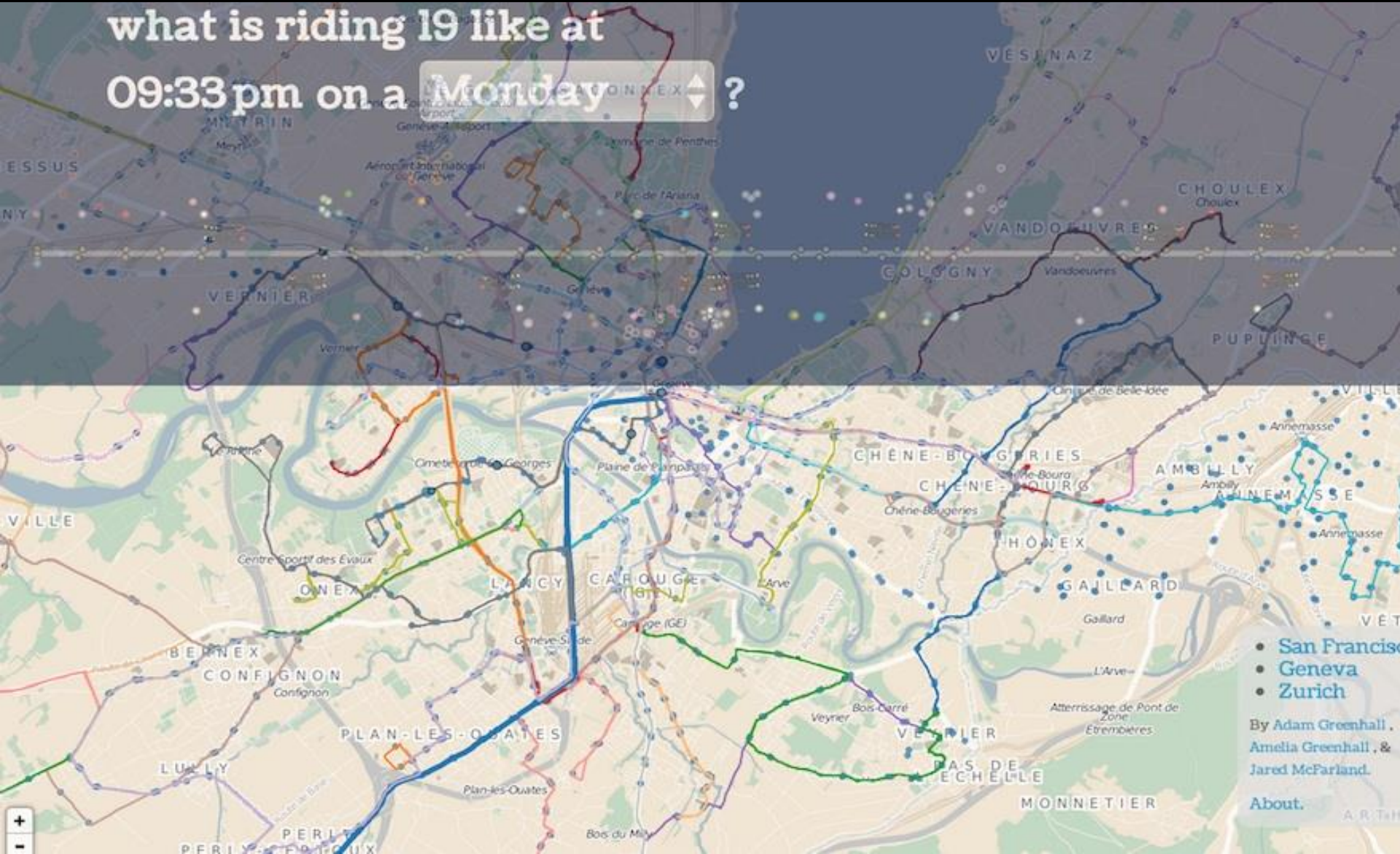
- <http://flowingcity.com/>: Visualizing the City built of data, Urban Data Visualizations of the City, making the city smarter with data
- Data sources: Government records, corporate records, community-generated data, Cameras, car GPS, GPS, Census data, Location apps, Mobile apps, RFID, sensors, social media, Wi-Fi antenna, WWW, etc.

Urban Prototyping Movement

- Urban Data Challenge
- Open data “hackathon”
- Merge and compare mobility data sets from three cities—San Francisco, Geneva, and Zurich—and draw meaningful insights.

Dots on the Bus, Adam Greenhall, Amelia Greenhall, Jared McFarland

what is riding 19 like at
09:33 pm on a Monday ?



Transit Quality and Equity, Raymon Sutedjo-The, Sandra Lee



San Francisco

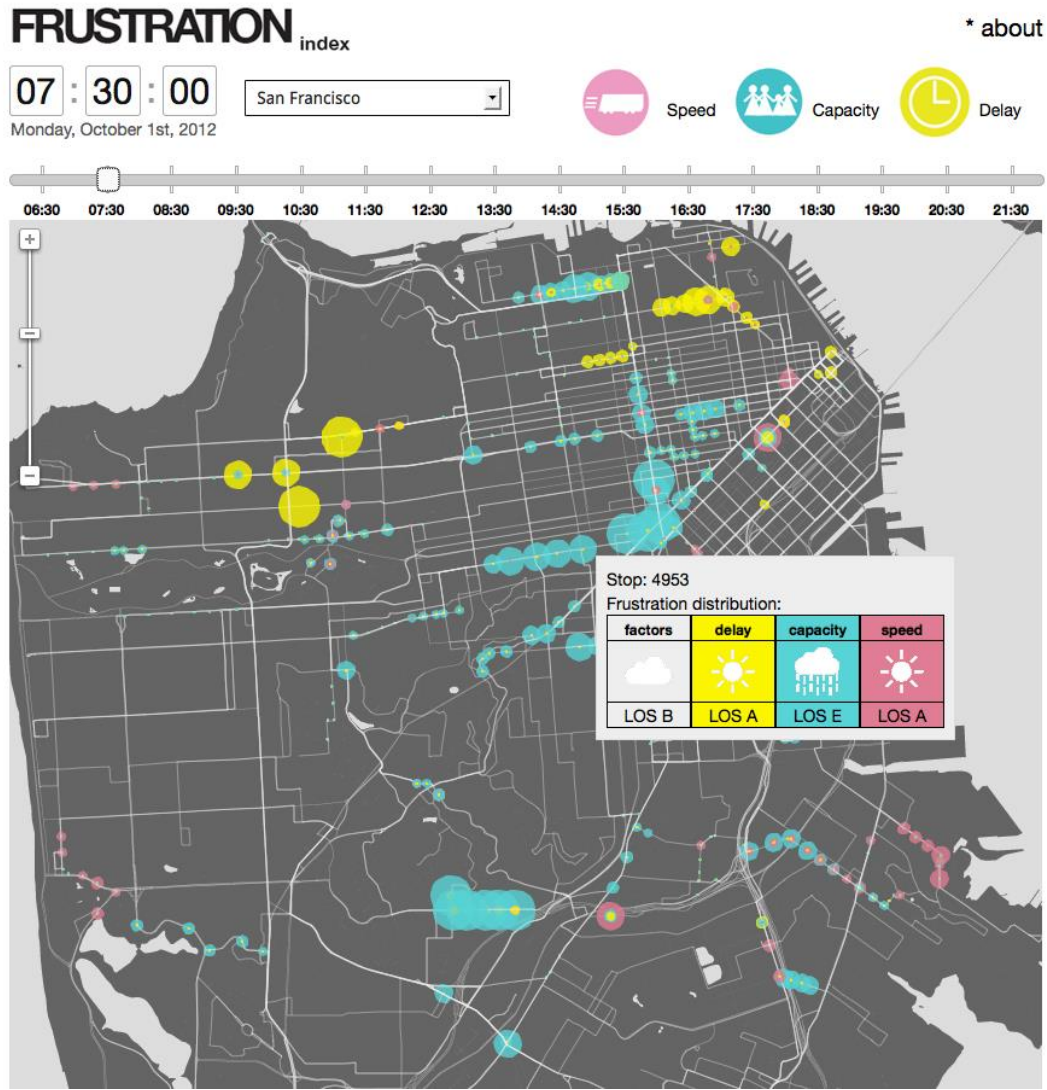
Economic Data

POVERTY LEVEL

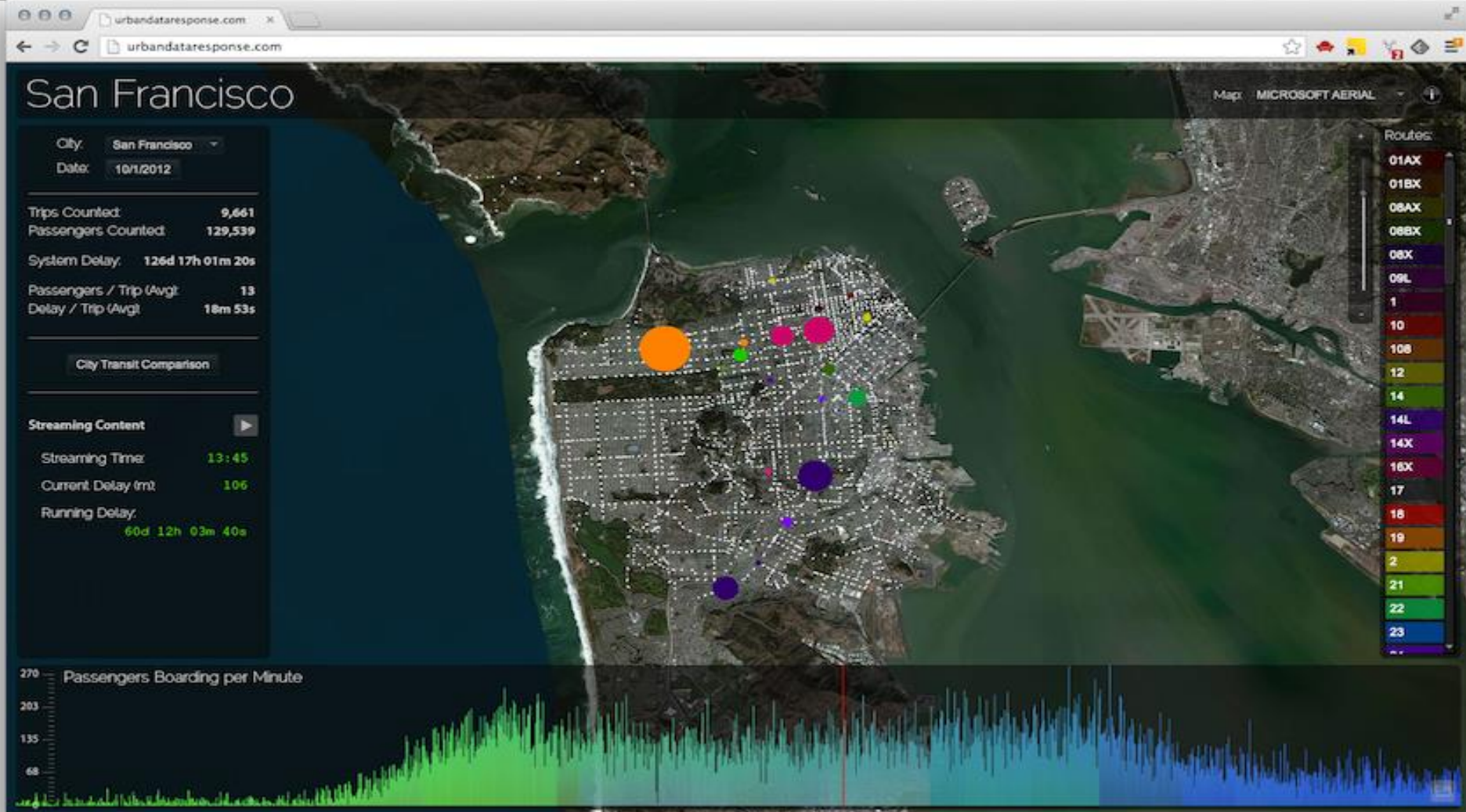
Routes

1	1X - 31X - 38X	2 - 3 - 4
5	6	8X
12	16X	19
28	14	14X/L
17	18	21
22	23	24
27	28	29
30	30X	31
33	35	36
37	38	39
41	43	44

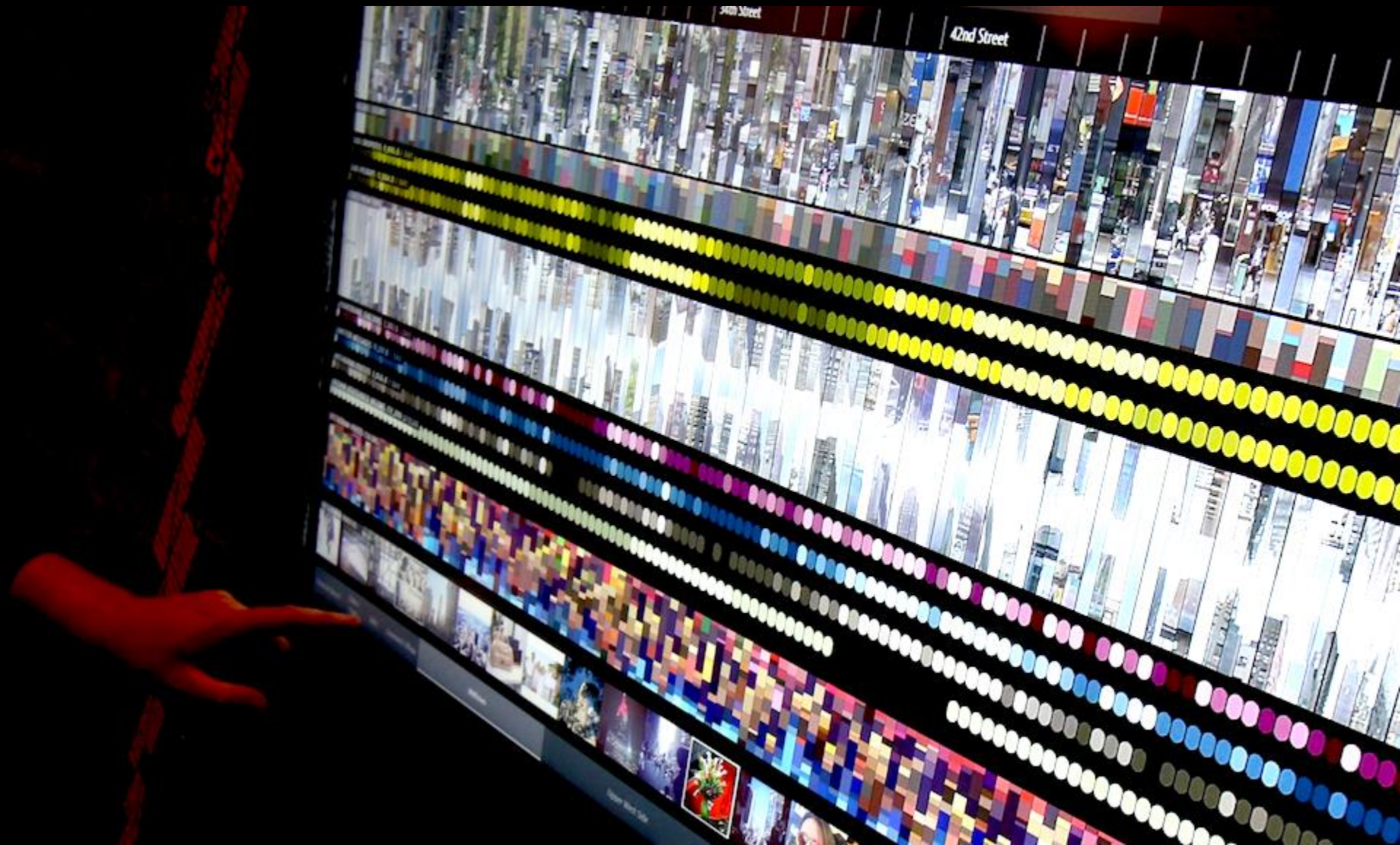
Frustration Index, Srivinas Ashok, Daphne Dethier, Carmel Dudley, Steve Pepple



Urban Data Response, Matt Hill



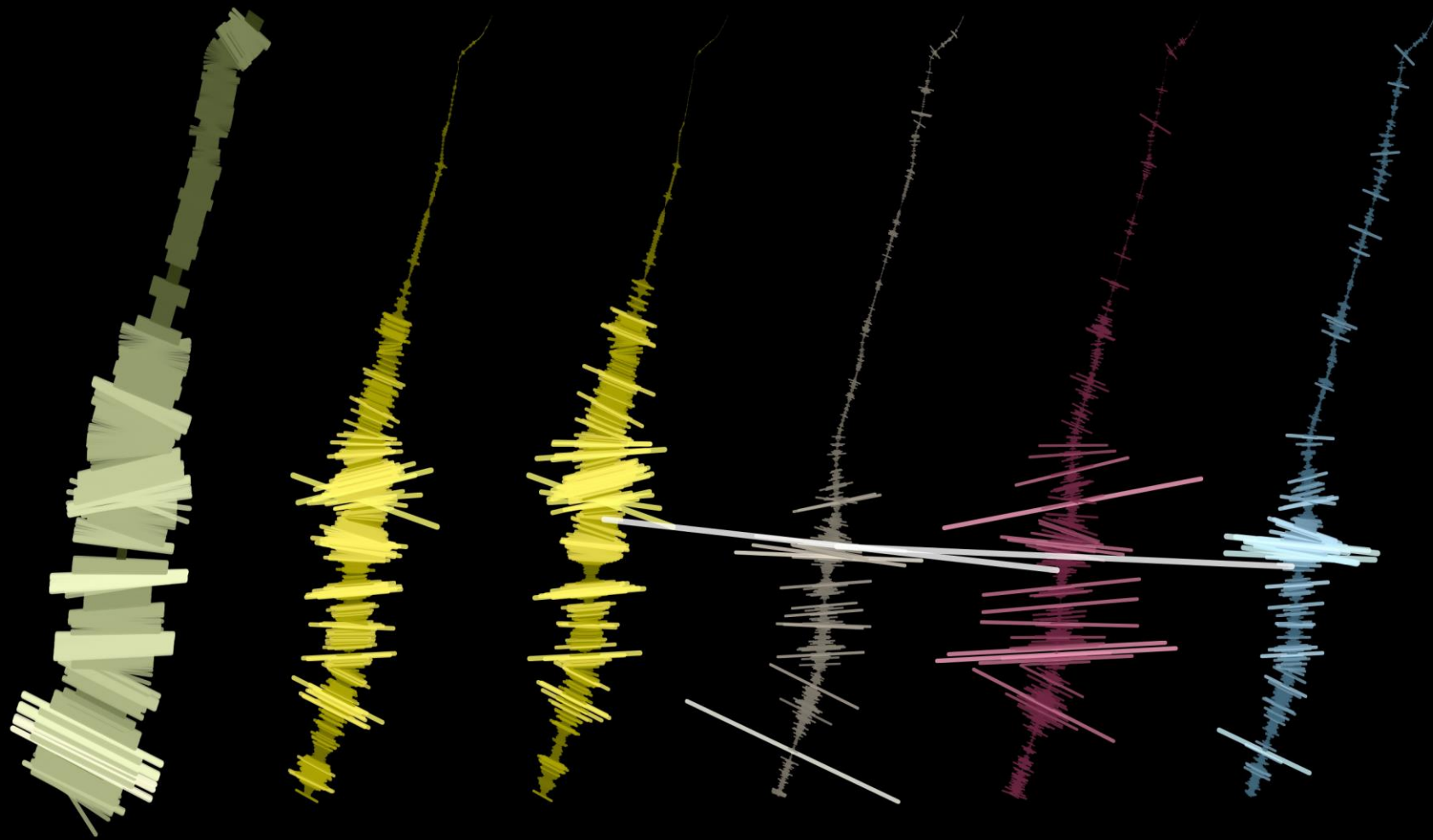
On Broadway, Manovich et al.



On Broadway

ON BROADWAY

<http://on-broadway.nyc>



HOUSEHOLD INCOME

TAXI DROP-OFFS

TAXI PICK-UPS

INSTAGRAM IMAGES

FOURSQUARE CHECK-INS

TWITTER MESSAGES

Data Canvas – Media Network to promote public awareness

- DIY sensor network to measure pollution, dust, light, sound, temperature, and humidity. Overall environmental quality but also relevant to transportation uses.
- Created an interactive map, opened the data, and asked participants to use it to narrate a story about their city.

SELECT A CITY

- Temperature (C) 0.
- Light (Lux) 0.
- Pollution (mV) 0.
- Humidity (%) 0.
- Dust (pcs/238mL) 0.
- Noise (mV) 0.
- Speech

Info ■

sonic particles 2.0

A sonification of real-time urban environmental data

Sonic Particles

- <http://datacanvas.org/project/sonic-particles-2-0/>
- Sonic Particles 2.0 is a real-time sonification
Updated every 5 seconds.
- Each city can be differentiated.



The Mobile City: A Fully Enabled Grid

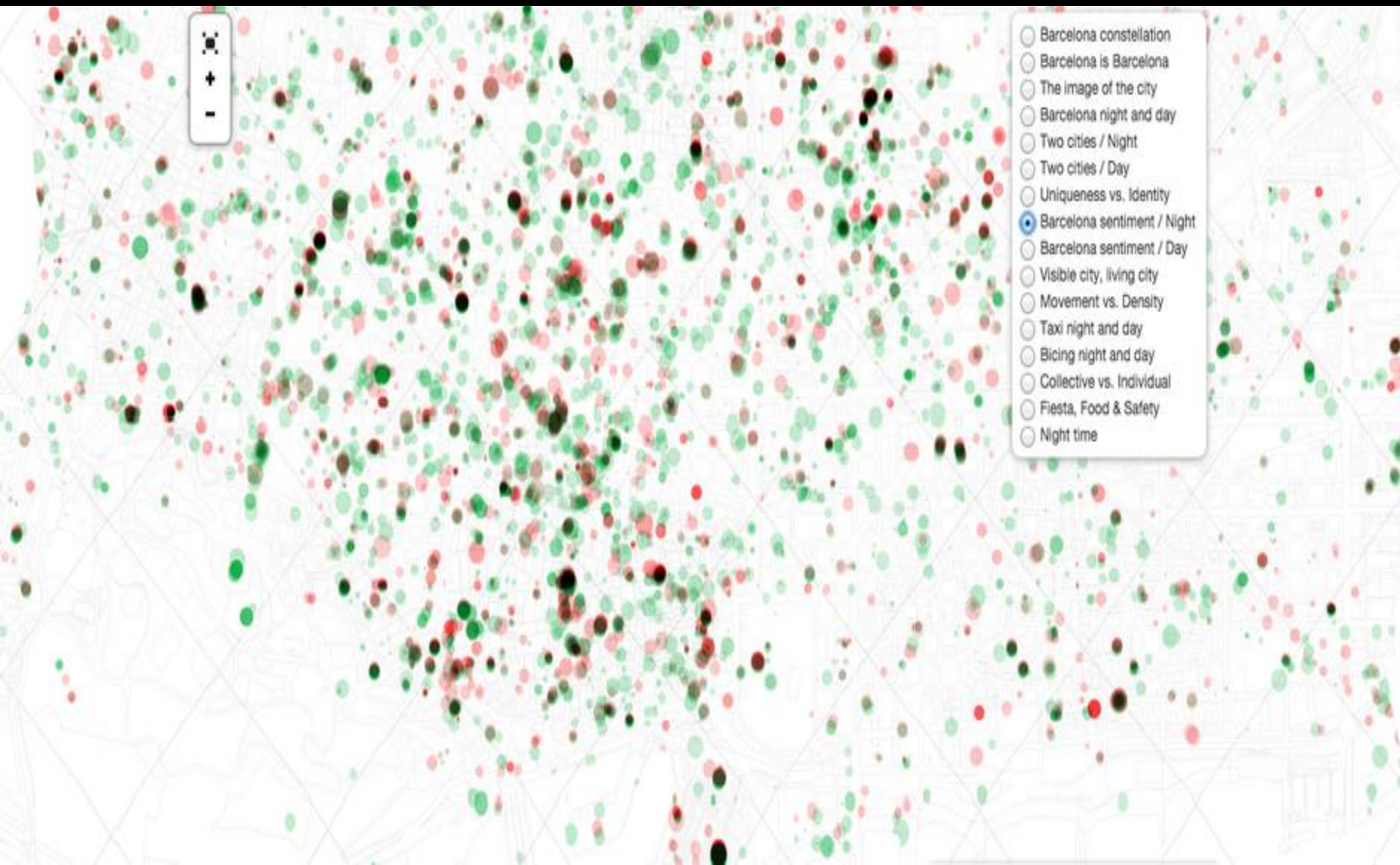
- Mobility is about the individual, not the device.
- The urban experience of ubiquitous connectivity, personalized and context-aware services and content that link us to daily activities and interests, regardless of time and place.
- Continual discovery, enhancement

Designing the City at Night, Barcelona (social media, open data, light), I -Varis, Diez & Corbero

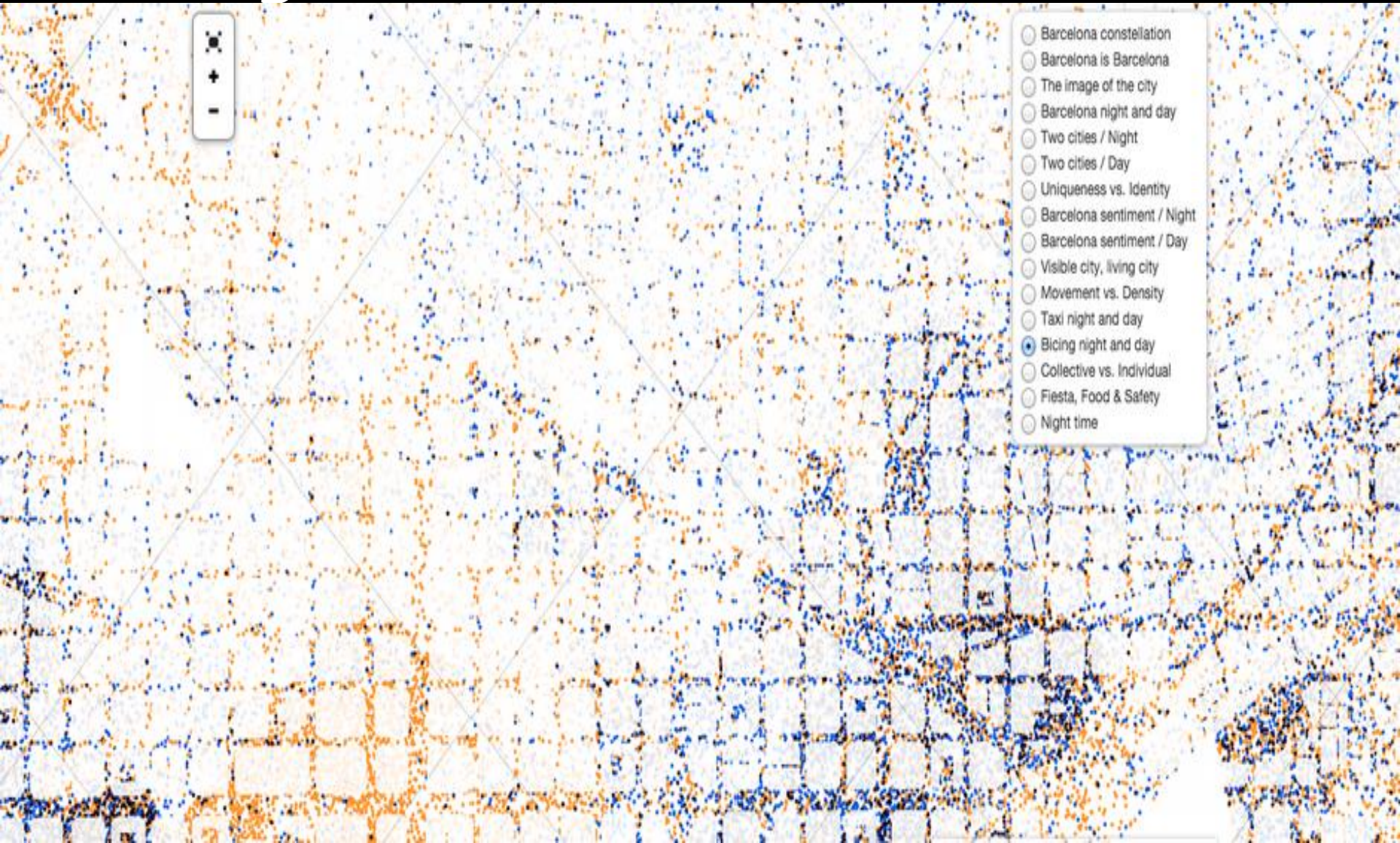


Designing the City, Tone of Social Media

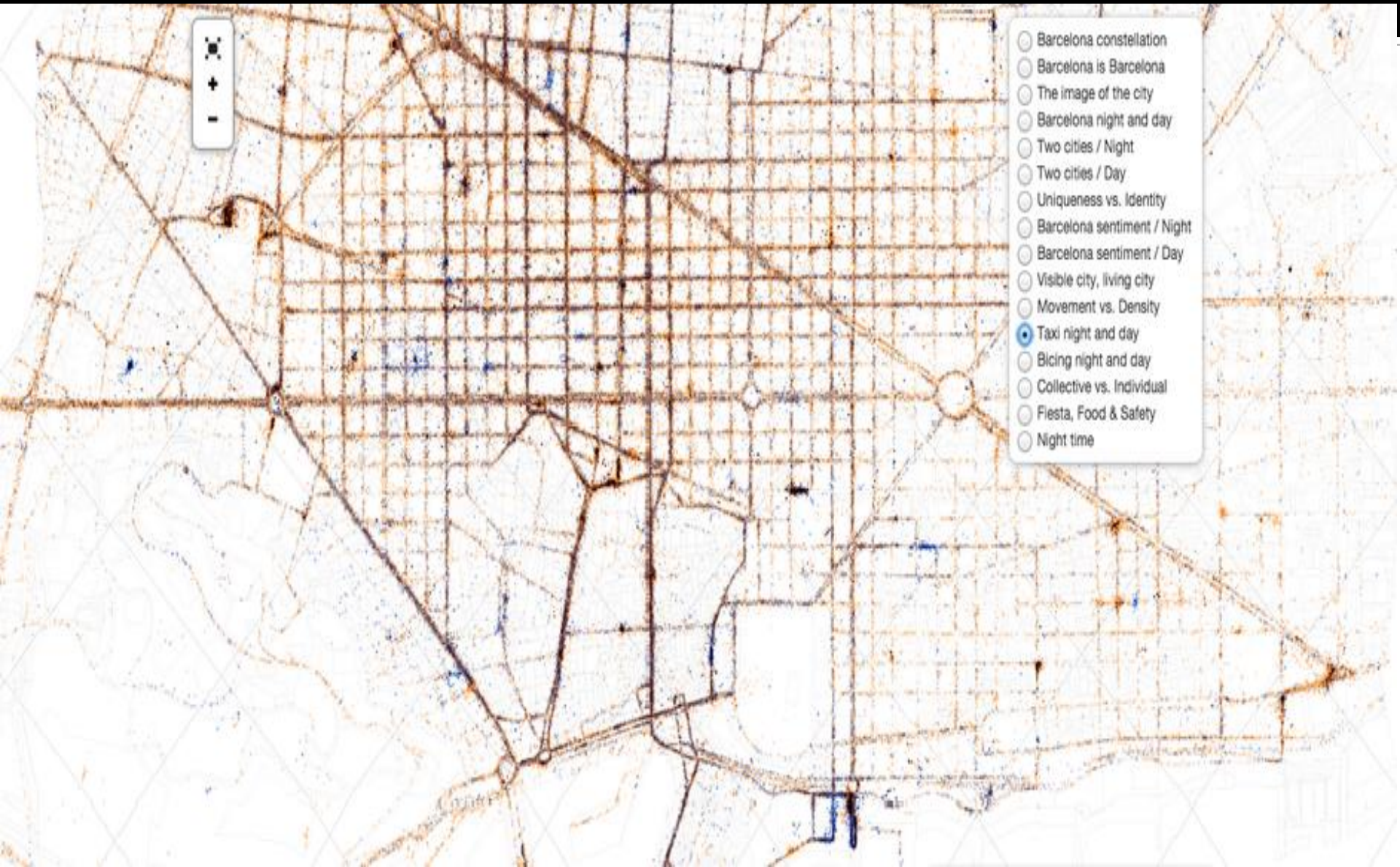
<http://www.atnight.ws/>



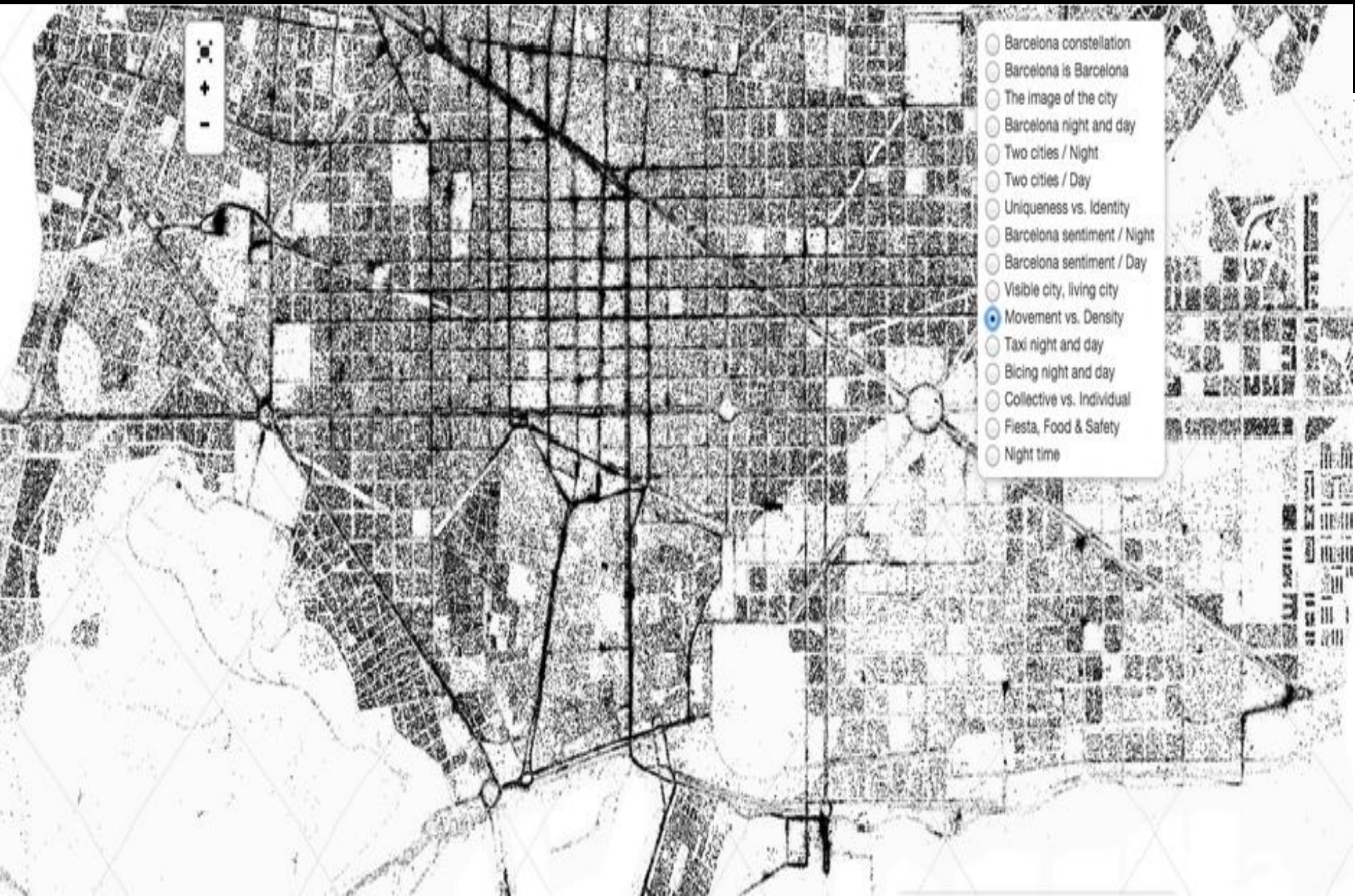
Designing the City at Night, bike storage data



Designing the City at Night, Taxis



Taxis vs Density



Visible Amsterdam (movement of crowds), Euro Beinat

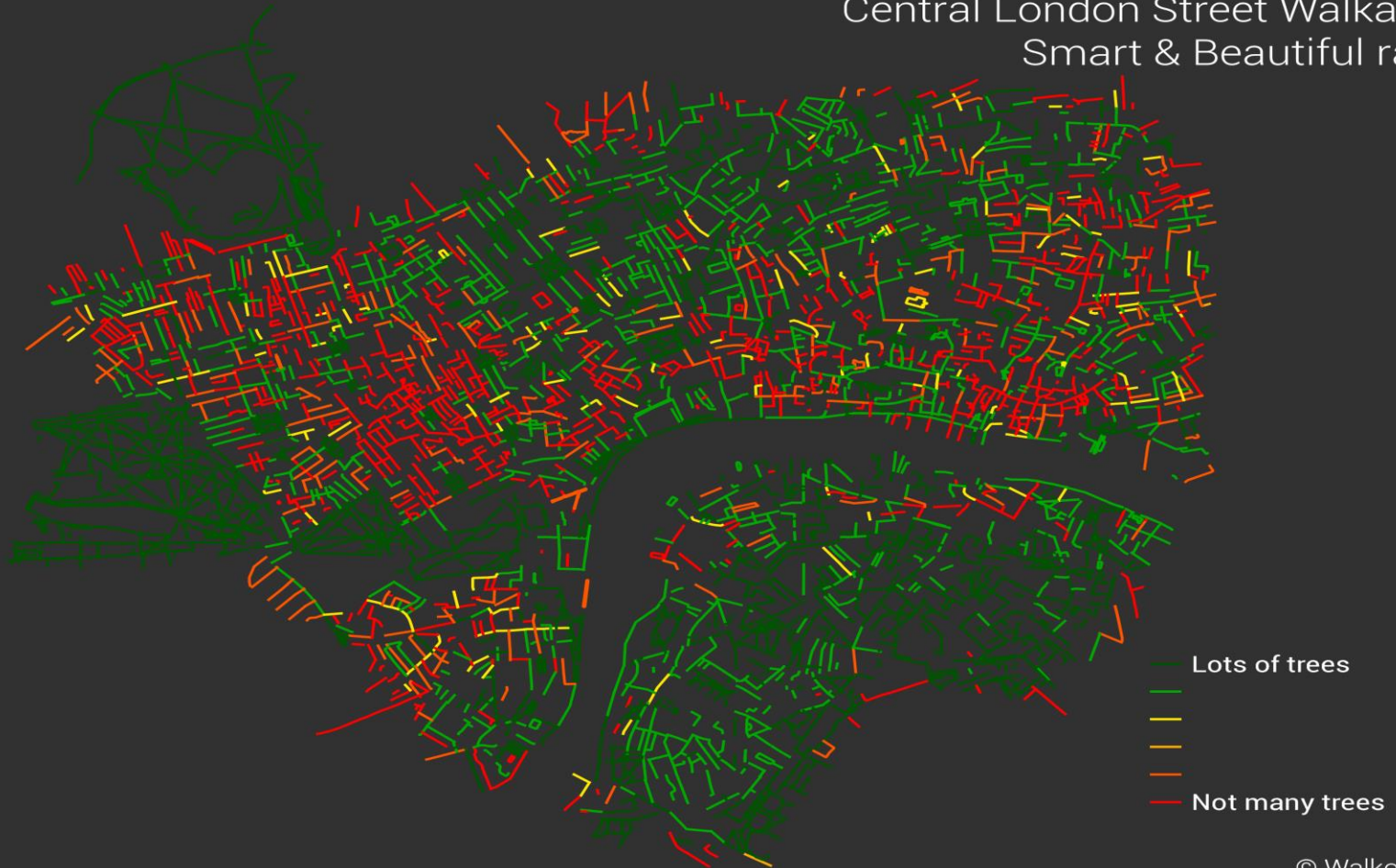


Walkable Streets Project

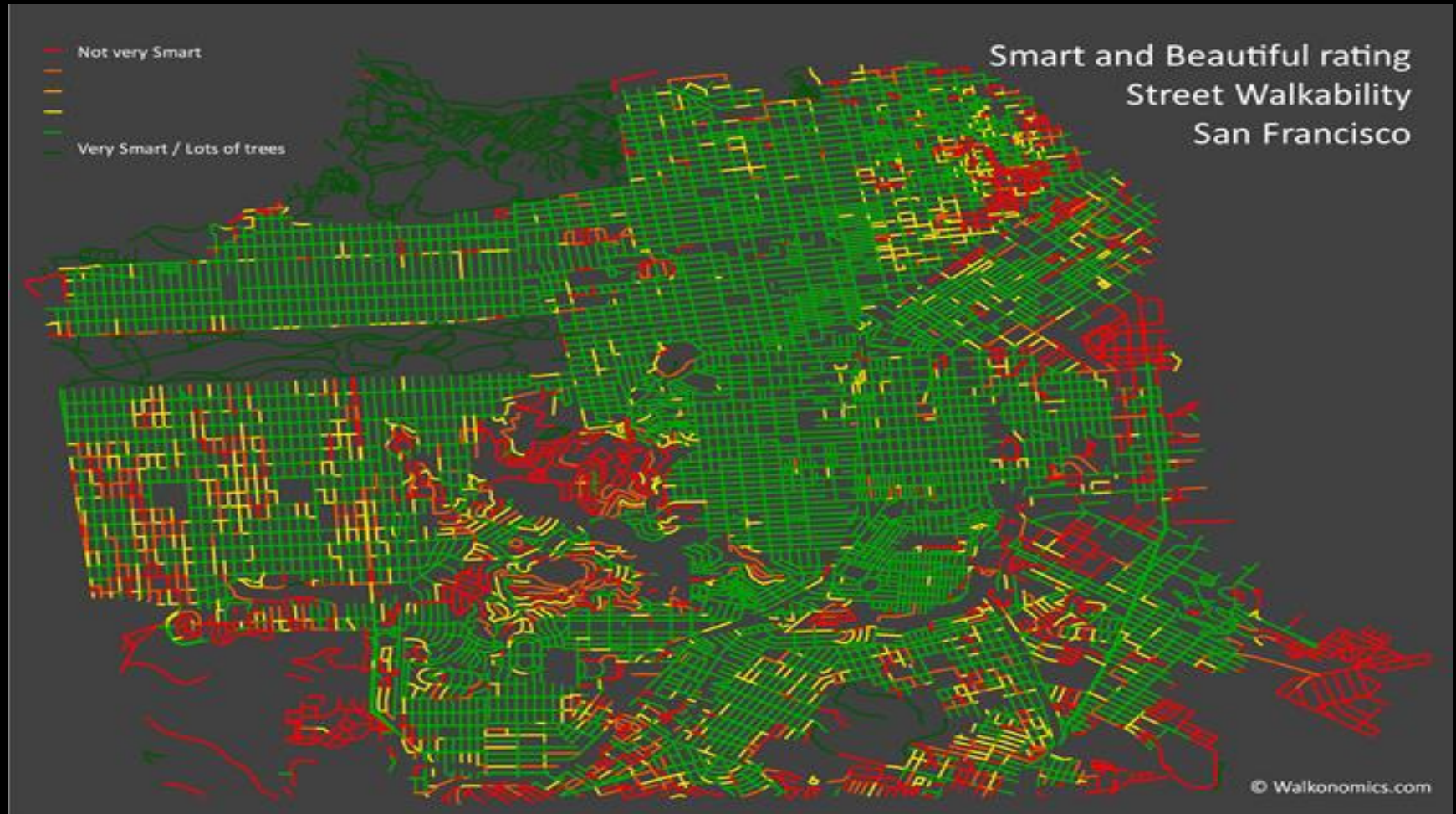
- ESRI is also involved in modeling walkable streets, for example as a project with the City of Halton
- Complete Streets

Walkable Streets Project

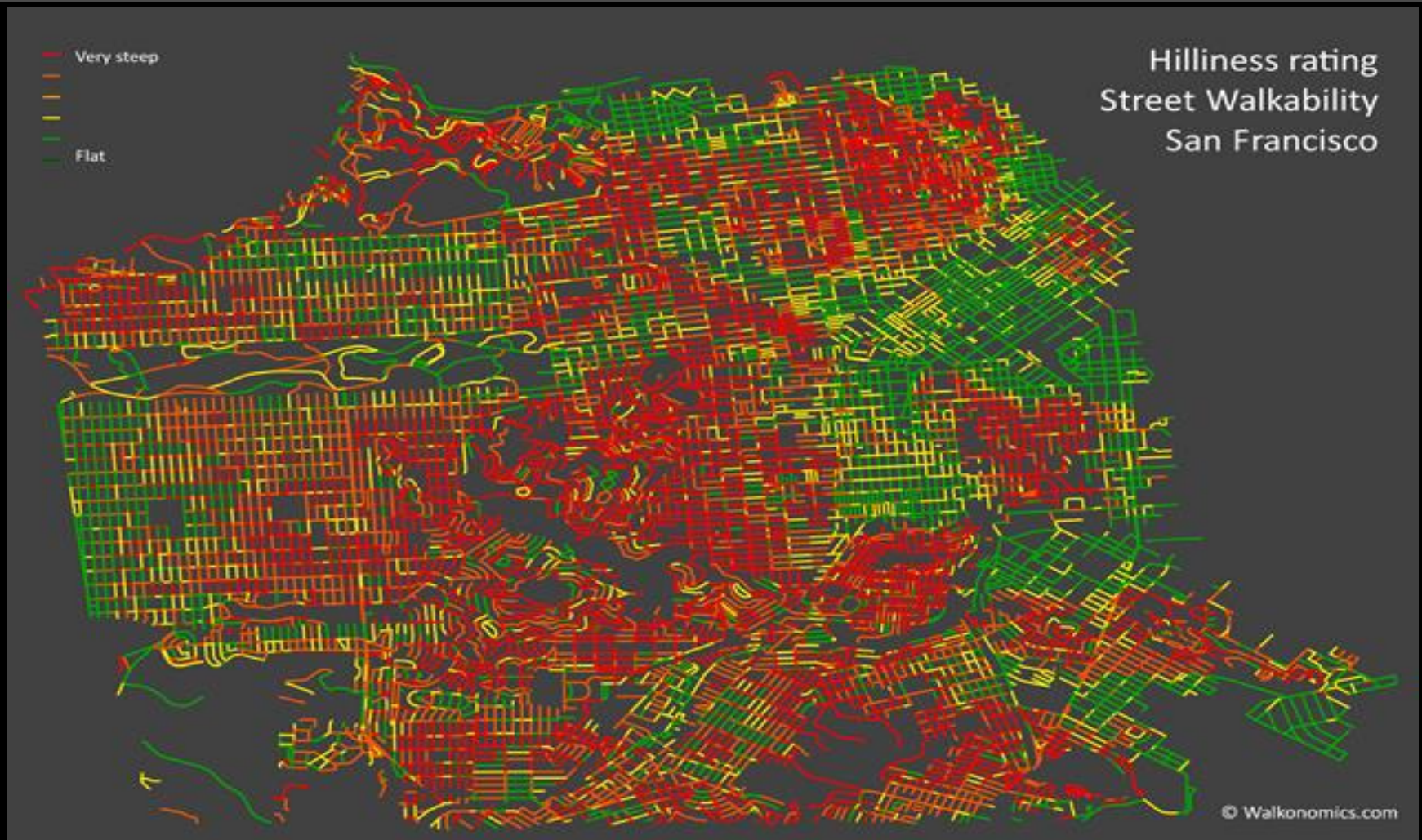
Central London Street Walkability
Smart & Beautiful rating



San Francisco

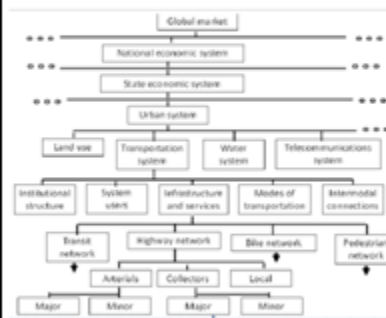


San Francisco



iCity concept of city systems as nested structures

Figure 2: Hierarchical Approach to Urban Systems



Meyer & Miller (2013)

Each system decomposes into sub-systems; E.g., “the” transportation system consists of:

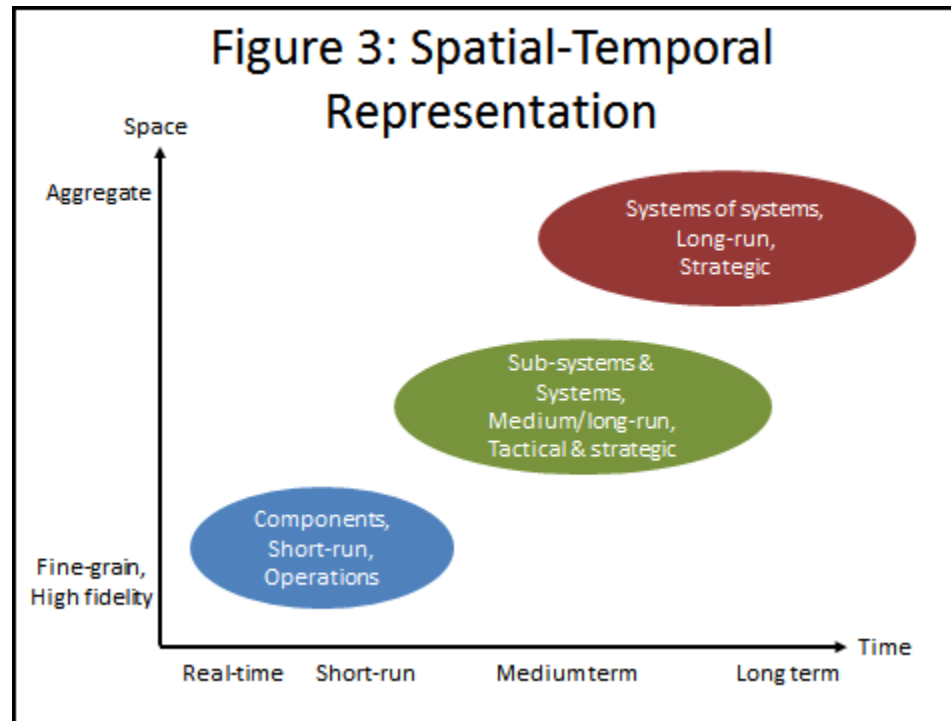
- The road system
- Transit system
- Active transportation system
- Operating agencies
-

Each “system” interconnects & interacts with other systems



Cities (urban regions) are “systems of systems”.

Modeling systems relationships



Betaville and Story Facets visualization tools

- *Design Approach*
 - Communication Centered
 - Collaboration- Minded
- *Visual Data/Model Integration*
 - Able to link qualitative data
 - Real-time “what-ifs”
 - Changing/historical data and data ontologies
 - Provenance

Betaville and StoryFacets

- *Visualization Techniques*
 - Interactive Computing
 - Overview + Detail
 - Geospatial Visualization
 - Info vis
 - Comparative Visualization
- *White Boxes*
 - Ontology
 - Models – transparency
 - Provenance - retrievability

Betaville

The screenshot displays a 3D architectural visualization of a city development project named 'Betaville'. The central focus is a large, futuristic building complex with multiple towers and green-roofed sections, rendered in a semi-transparent yellow/gold color. The surrounding environment includes other city buildings, trees, and a body of water in the background.

On the left side, there is a 'new proposal' form with the following fields:

- PROPOSAL TITLE
- PROPOSAL DESCRIPTION
- ADDRESS (optional)
- WEBSITE URL (optional)
- new version of existing design
- [Click on the model you want to update]
- VERSION DESCRIPTION

Below the form is a 'next' button and a progress indicator with five red dots.

On the right side, there is a control panel with the following elements:

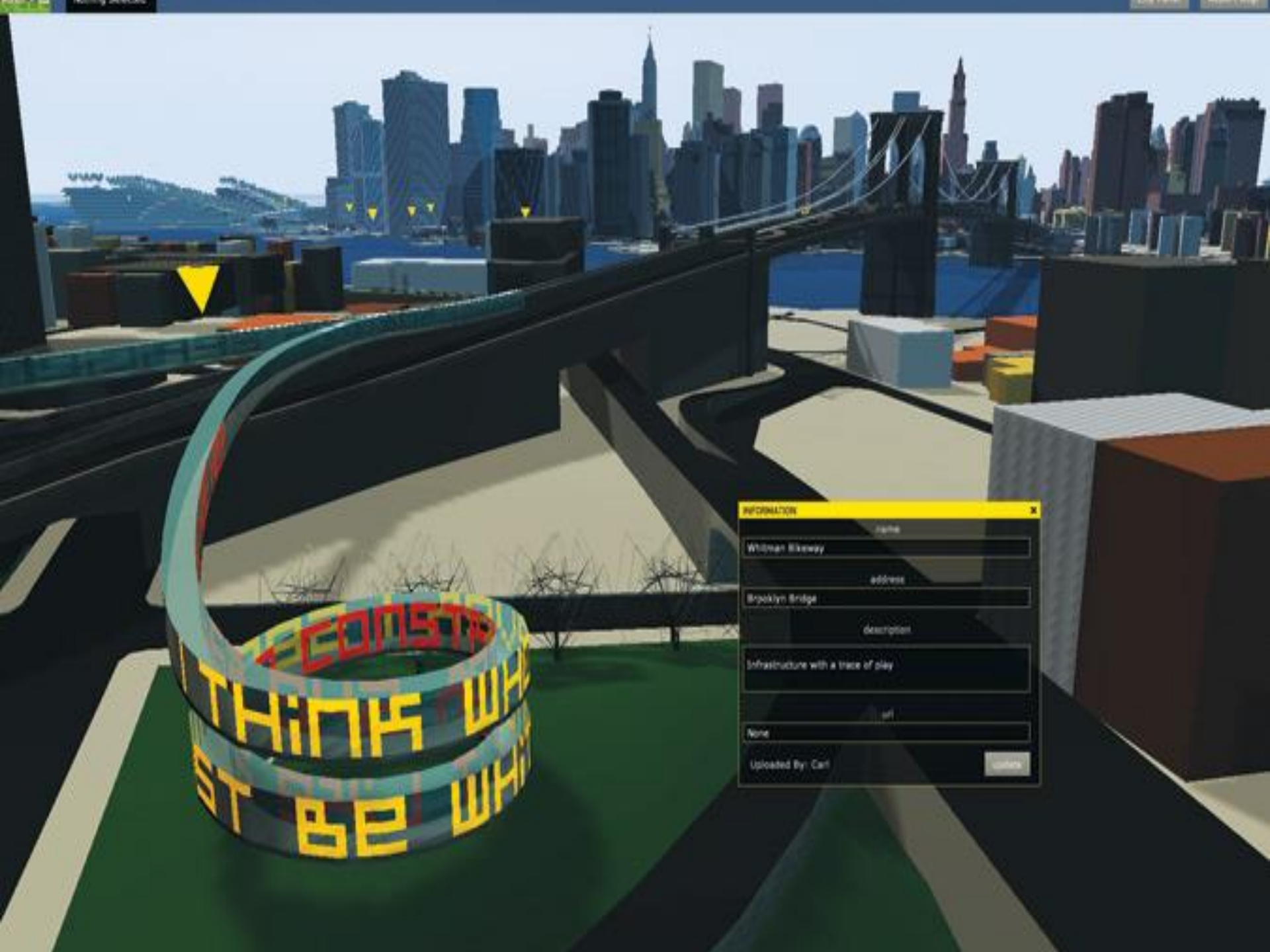
- No Title
- Move Speed: 1
- Rotation: 0
- Move North
- Move South
- Move Up
- Cancel

In the bottom-left corner, a 'Performance' window displays the following data:

- Frames Per Second: 30
- Triangles in Scene: 349k
- Triangles in Selected: 81k
- ✓ Round FPS ✓ Round Triangle Count

At the bottom of the interface, there is a navigation bar with two tabs: 'PROPOSALS' and 'VERSIONS'. Below this bar, three proposal entries are listed:

- Maglev Station (1)** by Bud Griffis
- Liberty Piers (3)** by B-Ville Crew
- Liberty Piers Version 2** by 1 City nade, described as 'a (very) mixed-use development'
- Liberty Piers Version 3** by 1 City nade, described as 'a (very) mixed-use development, with much-needed flora'

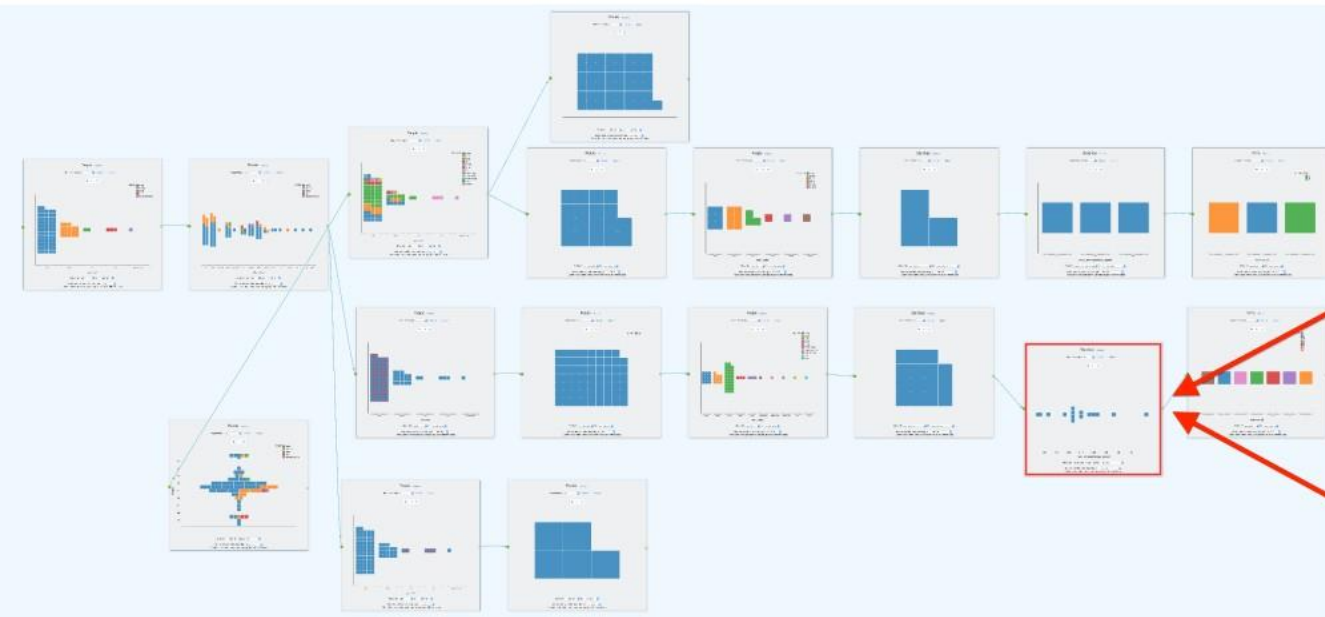


INFORMATION ✕

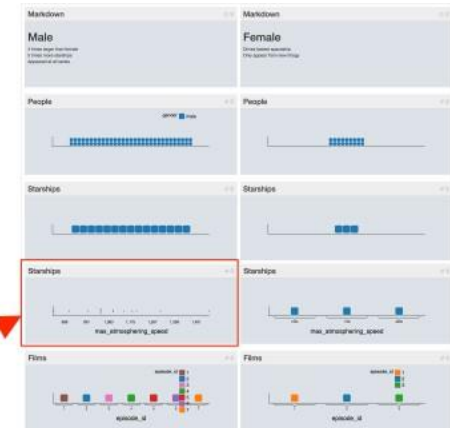
name
Whitman Ekway
address
Brooklyn Bridge
description
Infrastructure with a trace of play
url
None
Uploaded By: Carl

StoryFacets

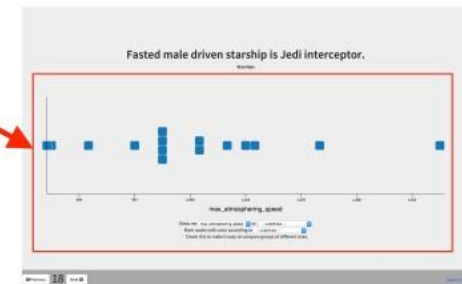
Overview



(a) Trail Facet



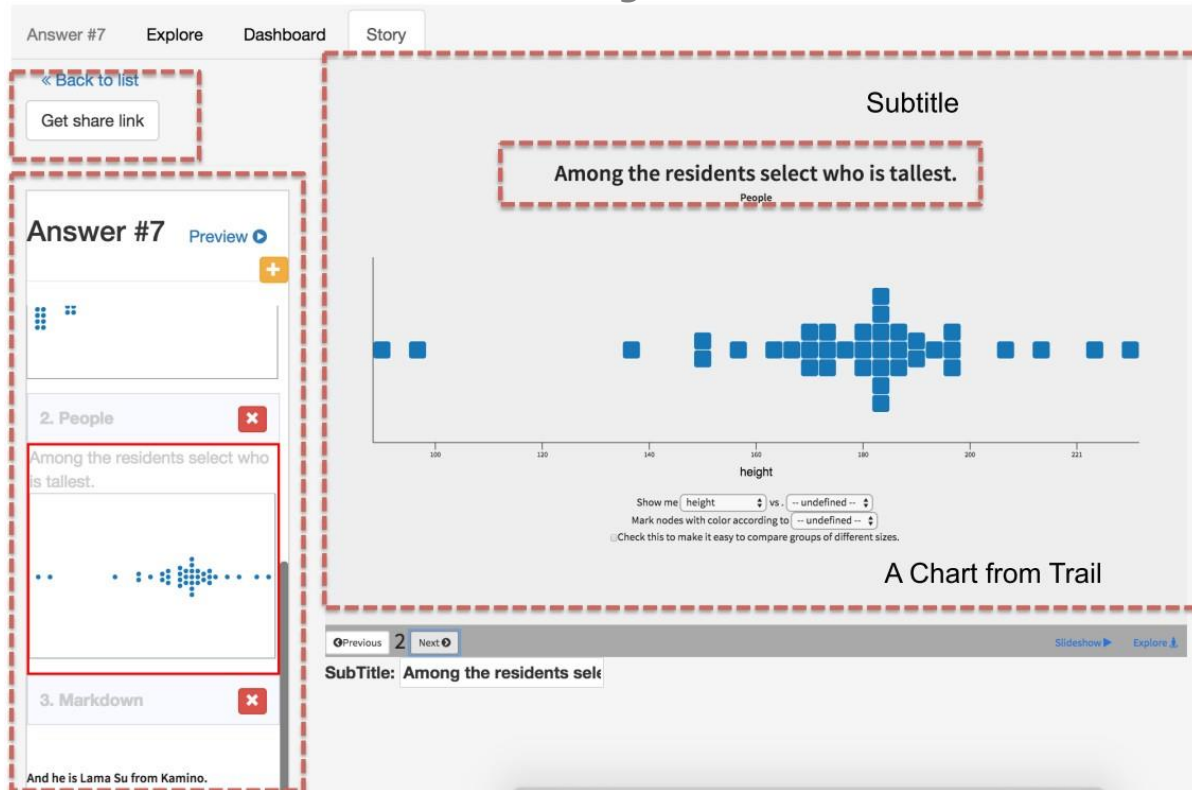
(b) Dashboards or Info Graphics Facet



(c) Story Facet

StoryFacets

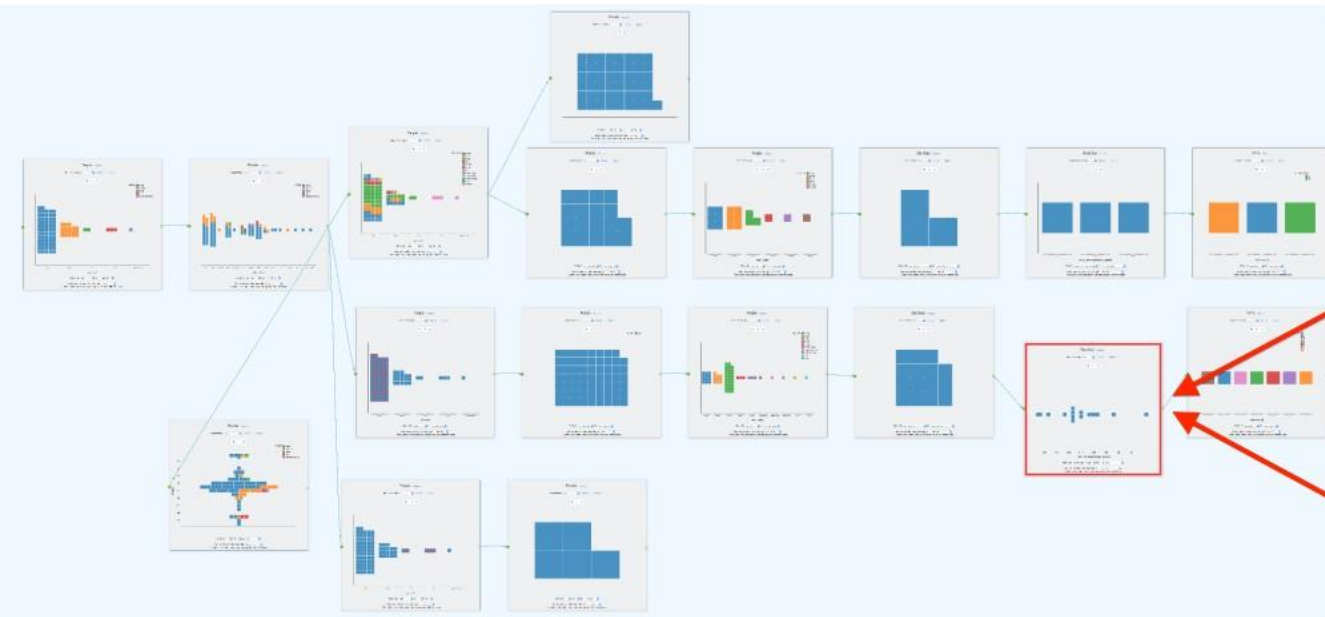
Story (slideshow) facet – Star Wars character height



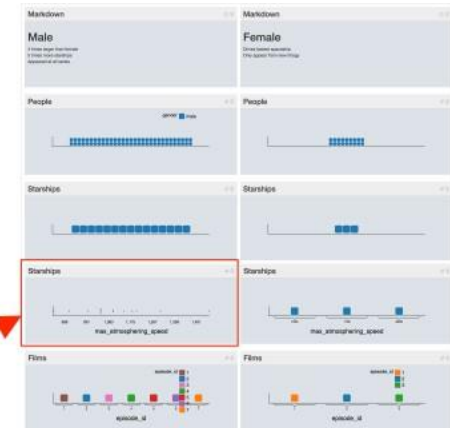
Slides Preview

StoryFacets

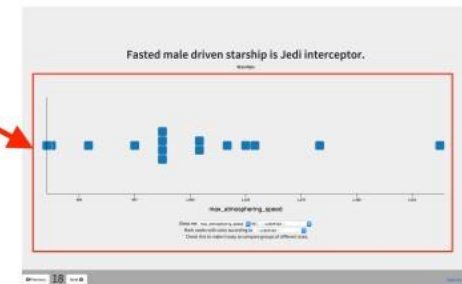
Linked back to trail facet



(a) Trail Facet



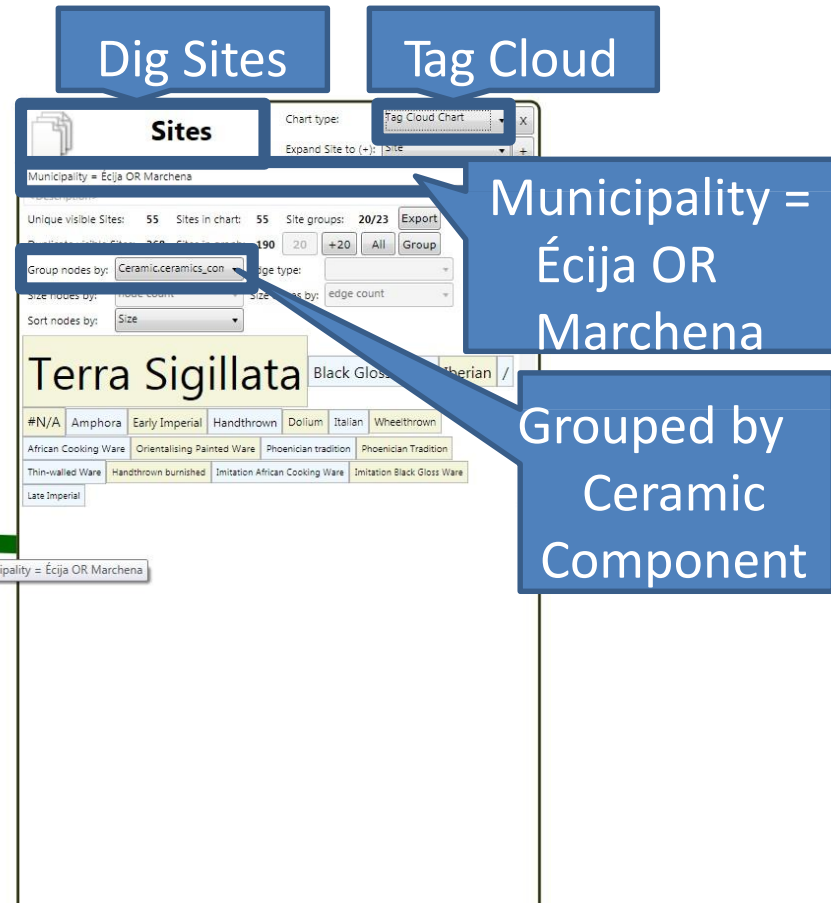
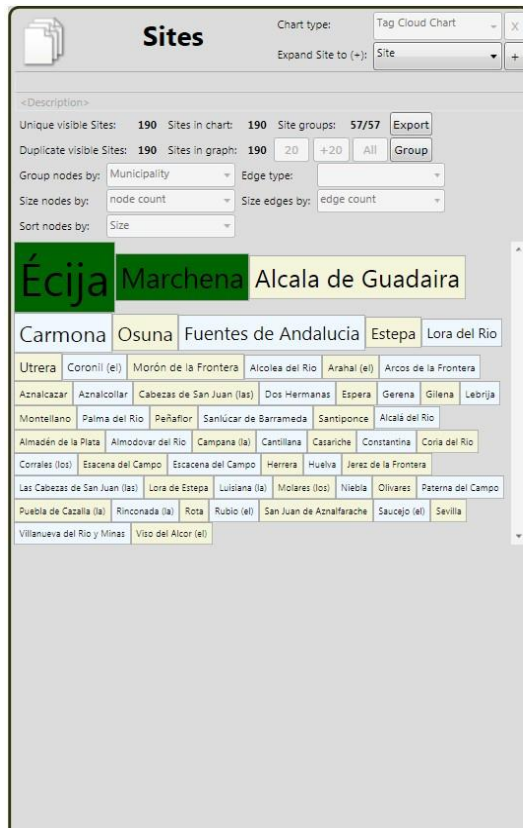
(b) Dashboards or Info Graphics Facet



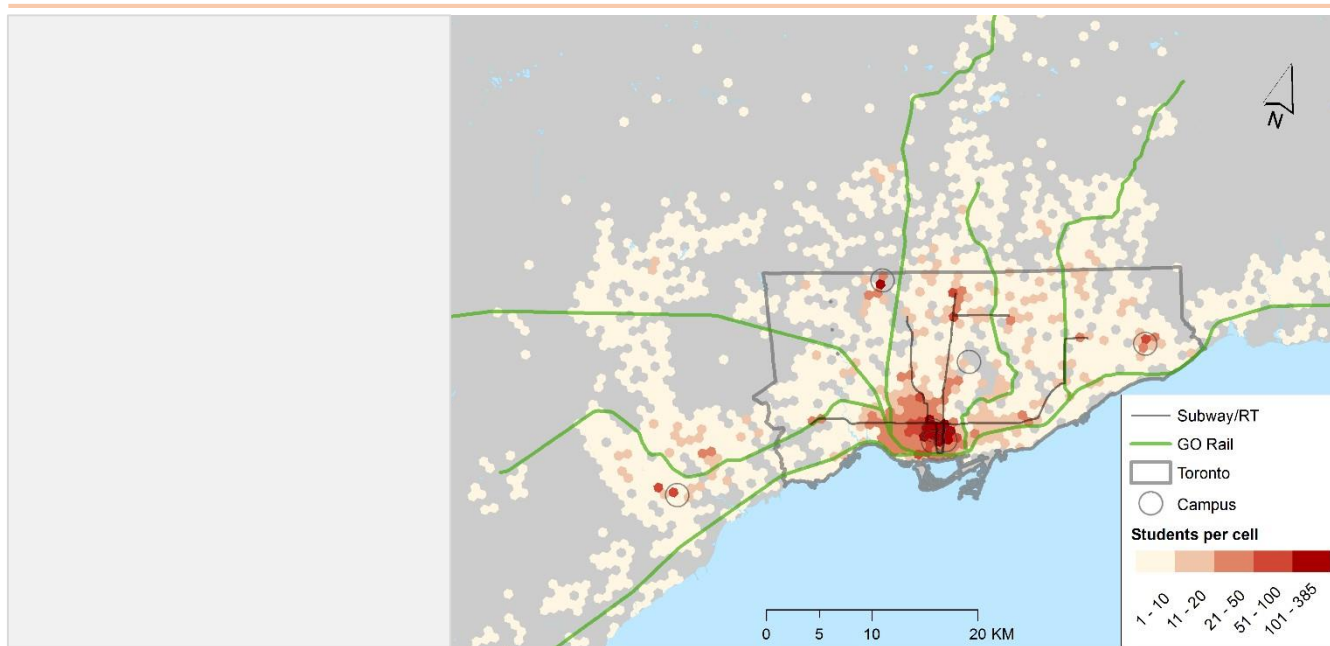
(c) Story Facet

GraphTrail

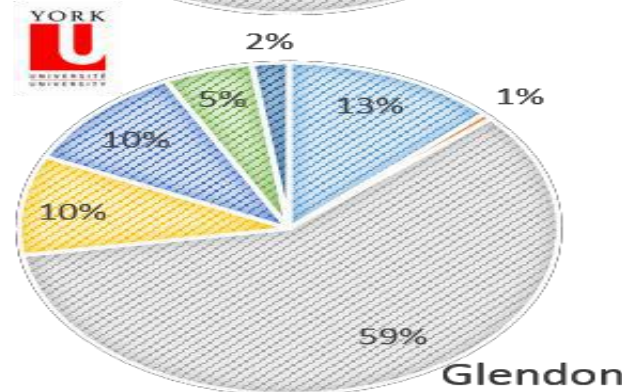
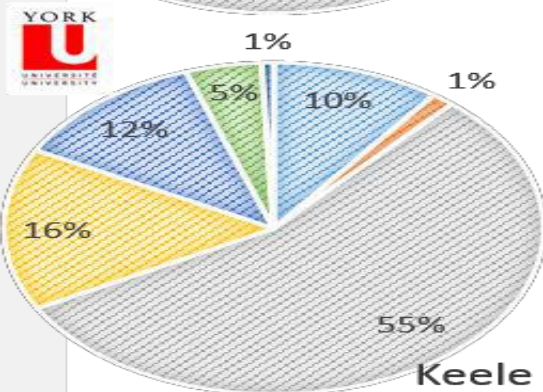
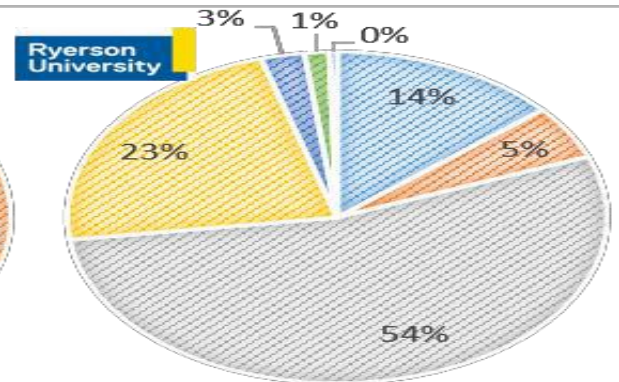
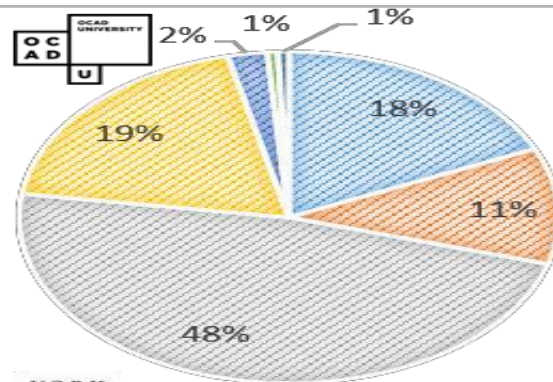
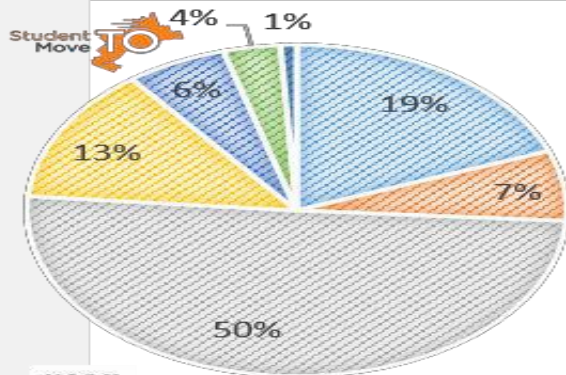
Provenance & chart parameterization



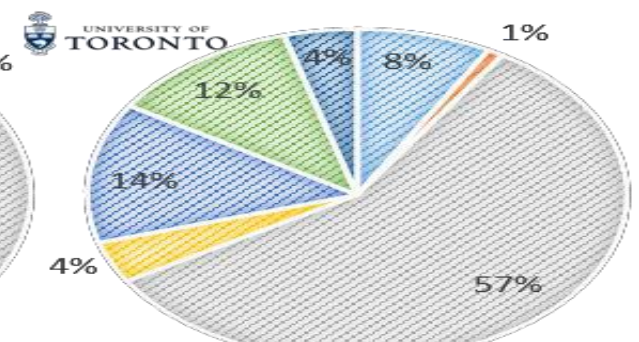
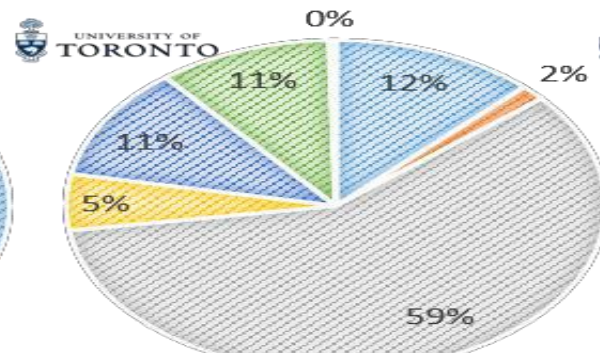
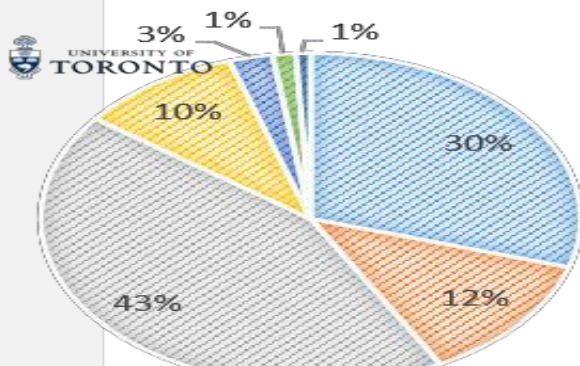
Home Location of Respondents



StudentMove TO



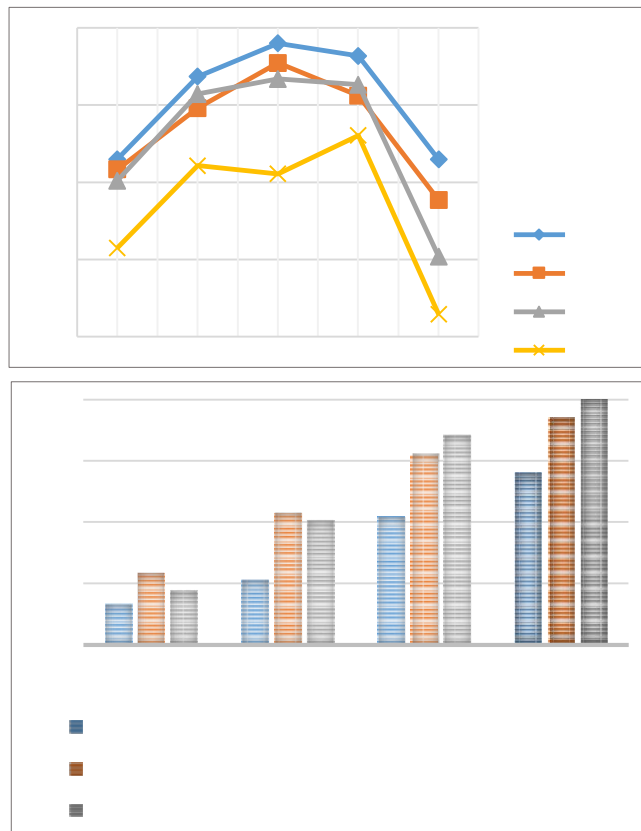
- Walk
- Bike
- Local Transit
- Regional Transit
- Solo Driver
- Rideshare
- Other



Reason for Recent Moves

Cost of housing	24.1%
The decision was out of my control	20.7%
Ability to walk or bike to campus	15.9%
Housing qualities (space, yard, ...)	9.2%
Proximity to public transit	8.1%
Being near friends and family	7.4%
Amenities of neighbourhood (shops, parks, houses, ...)	6.3%
Other	4.4%
Walkability of neighbourhood	2.4%
Crime and safety	1.4%

Relationships commute time and school engagement



- Percentage coming to campus daily by distance of commute
- One way commute and involvement in school: pick courses by commute time, commute discourages coming to campus, commute discourages extracurricular activity

Work/Drivers of Change

PERCENTAGE WHO WORK

Do not work	46%
Work part time (<10 hours per week)	20%
Work part time (11-20 hours per week)	19%
Work part time (21-30 hours per week)	7%
Work 31-40 hours per week	4%
Work > 40 hours per week	3%
Work 31-40 hours per week	4%
Work > 40 hours per week	3%

MODE CHANGE MOTIVATIONS

Change in household location	59%
Improvements to transit	26%
Decreased transit costs	21%
Increased transit costs	20%
Worse congestion	15%
Decreased parking costs	15%
Nothing, Will not change	14%
Improved bike lanes	9%
To improve health	7%
Environmental concerns	6%
Roadwork disruptions	6%
Improved pedestrian environment	4%
Increased parking costs	3%
Added bike storage	3%

Video Student MoveTO

- Betaville – where are students located and what is their destiny?
- StoryFacets – factors in considering a new home...