Visualizing Data for Transportation Analytics

Dr. Sara Diamond, OCAD University

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,

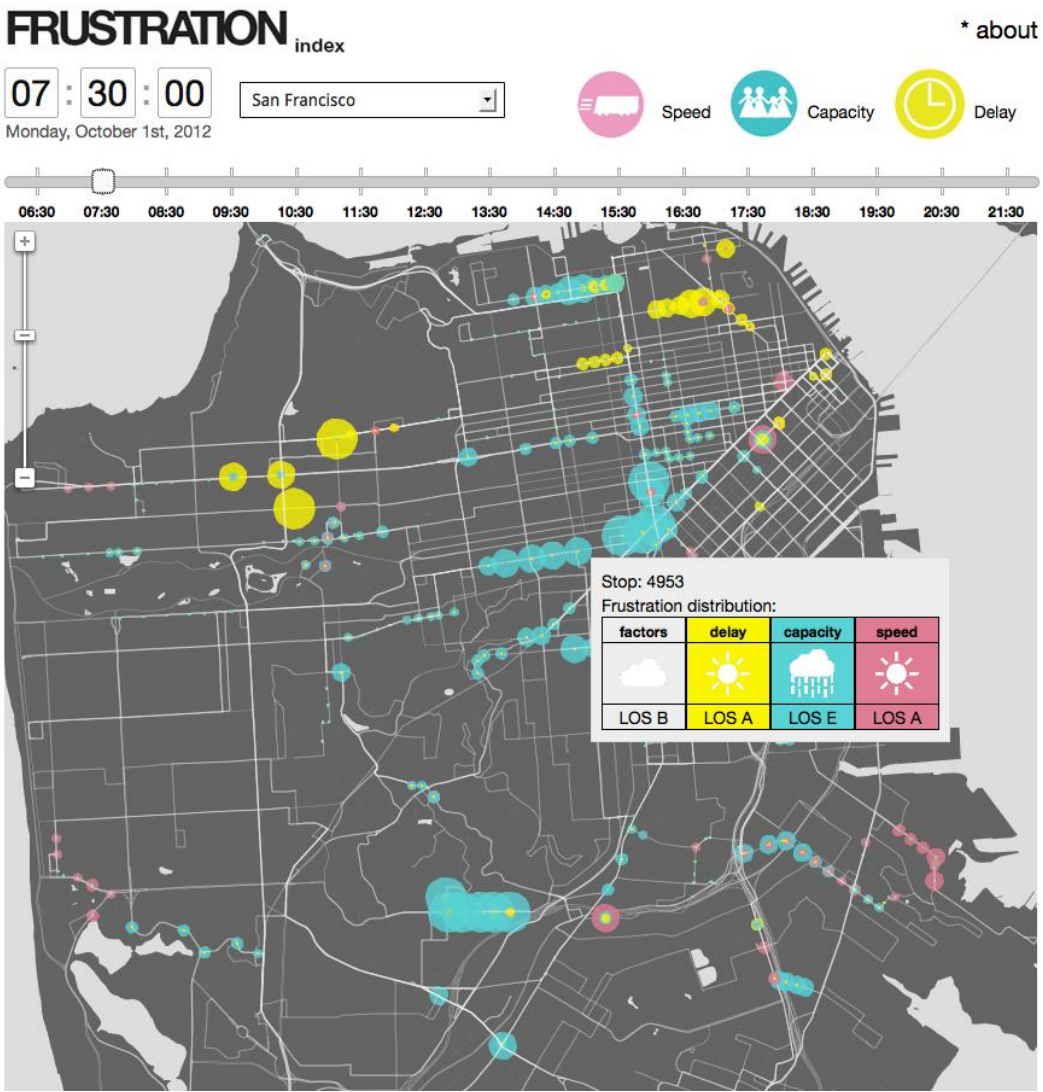
Adam Greenhall, Amelia Greenhall,
Jared McFarland

Transit Quality and Equity,

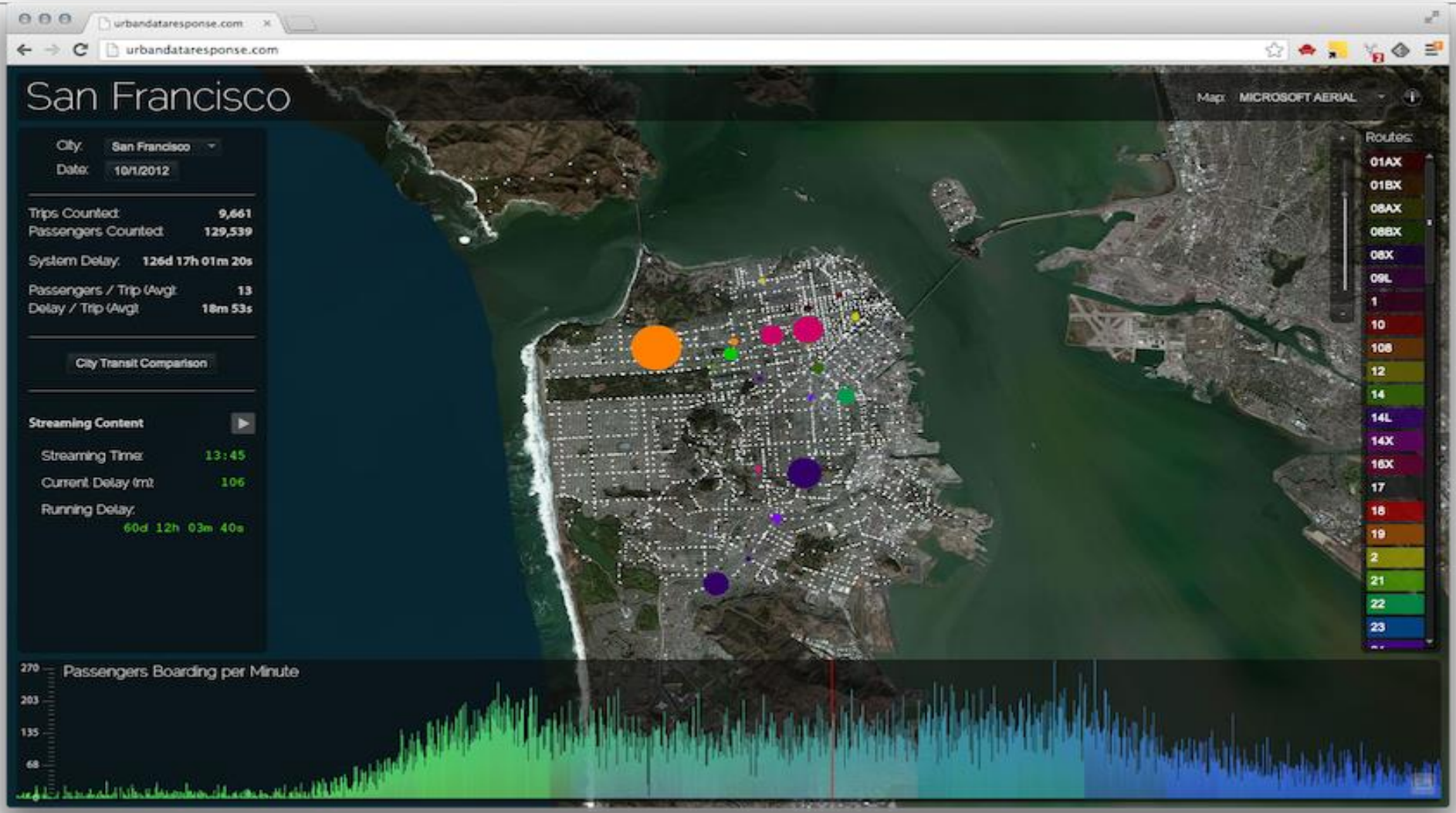
Raymon Sutedjo-The, Sandra Lee

Frustration Index,

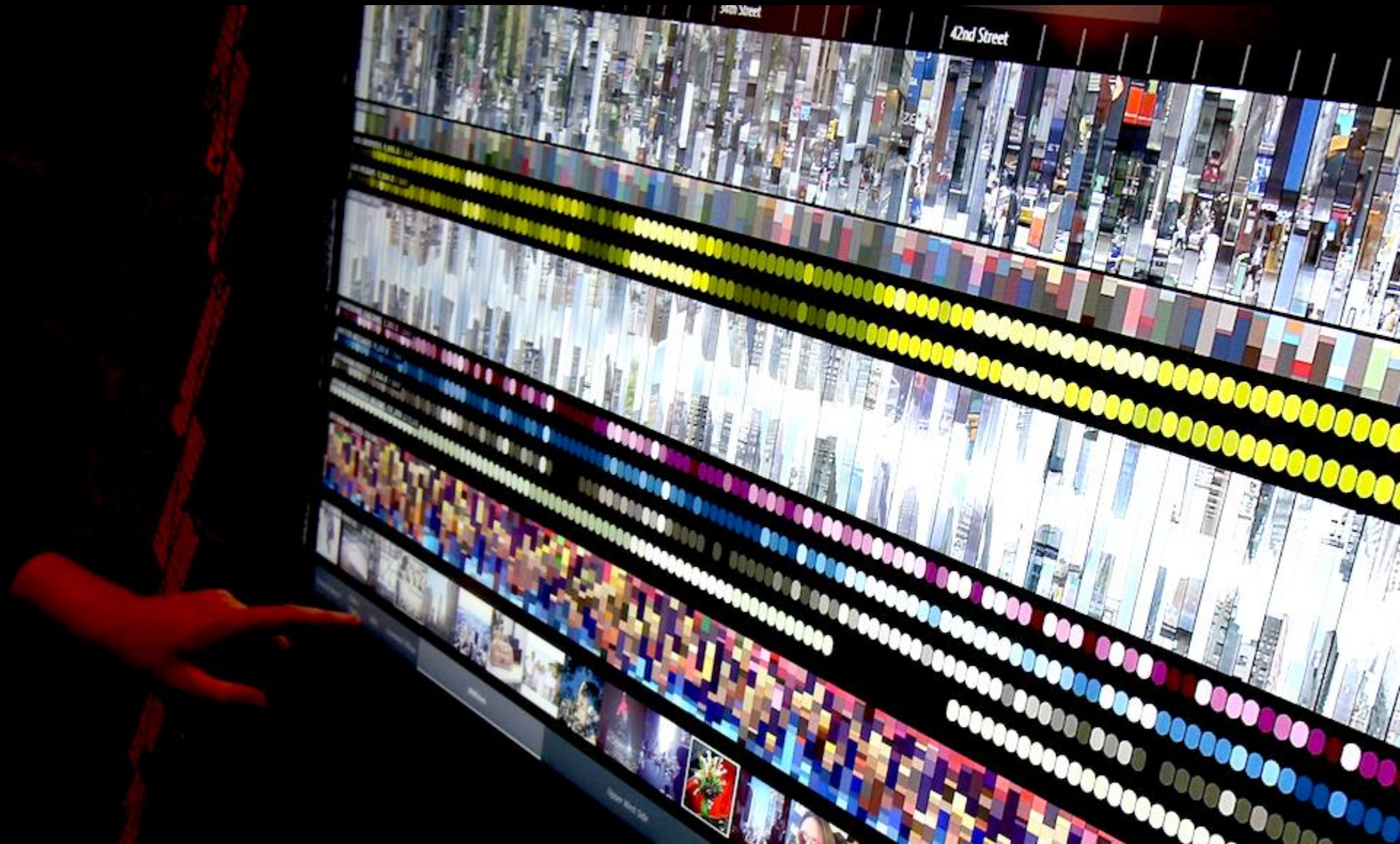
Srivinas Ashok, Daphne Dethier, Carmel Dudley, Steve Pepple



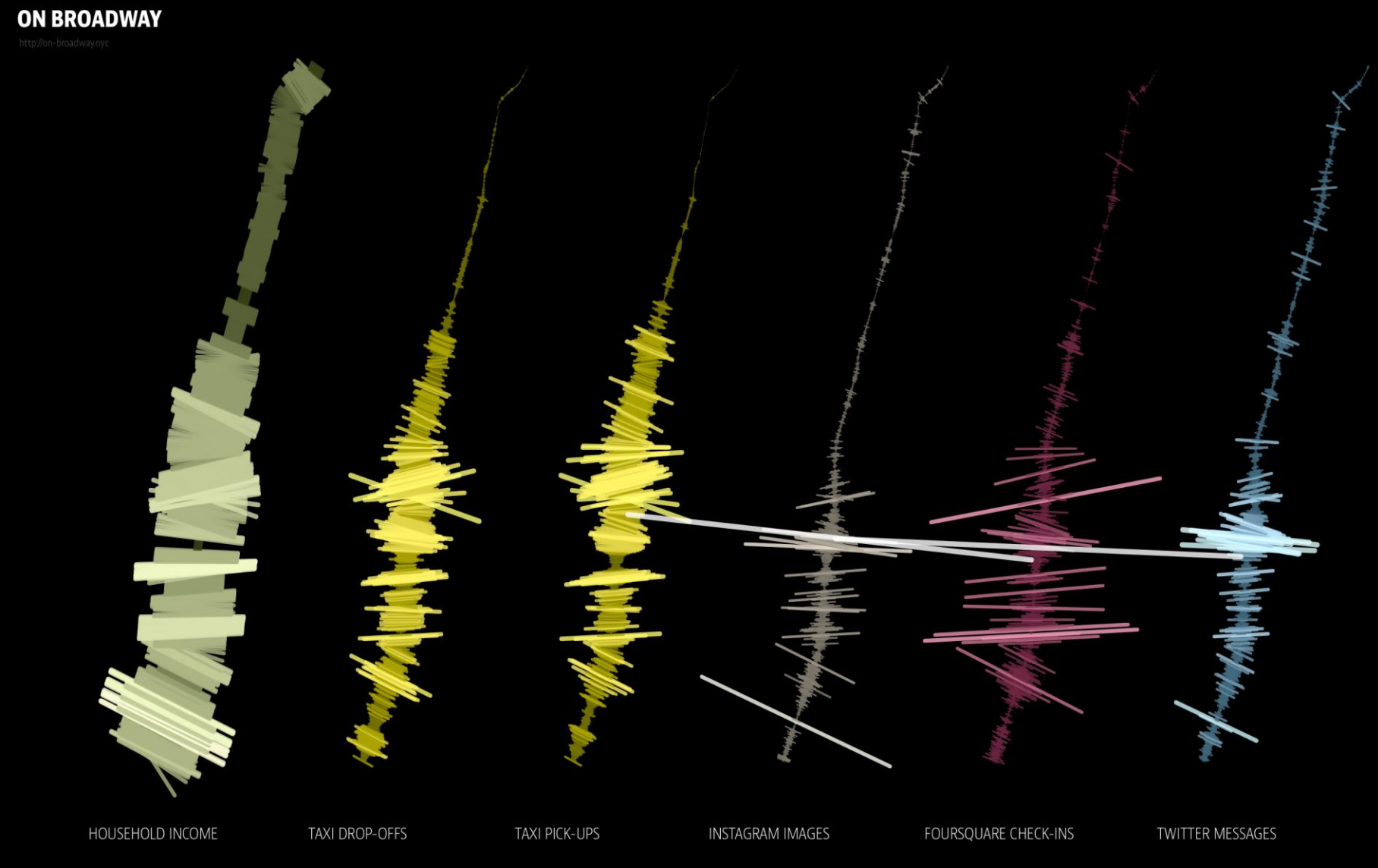
Urban Data Response, Matt Hill



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.

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.

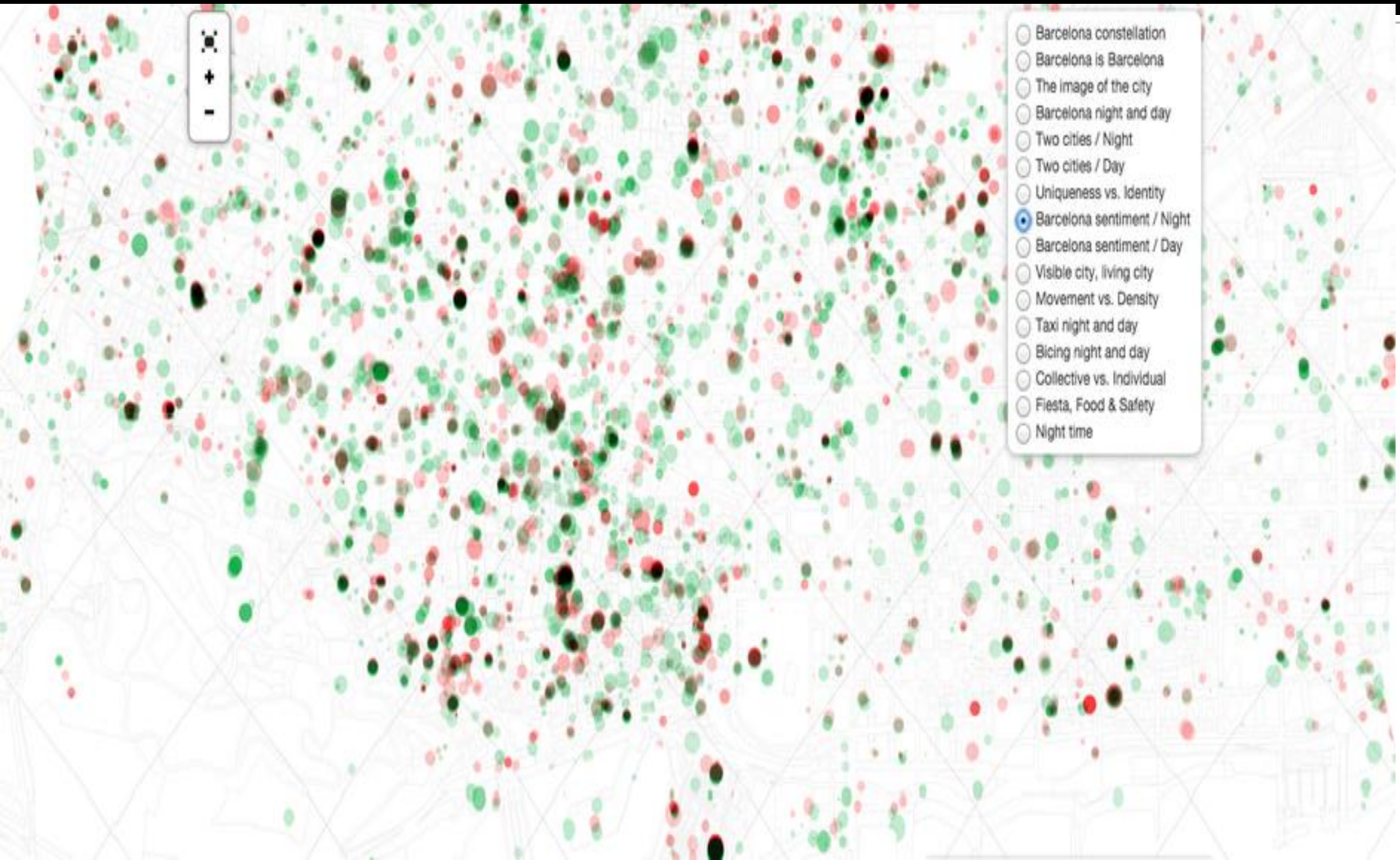
Liu Bolin, Hiding in the City

The Mobile City: A Fully Enabled Grid

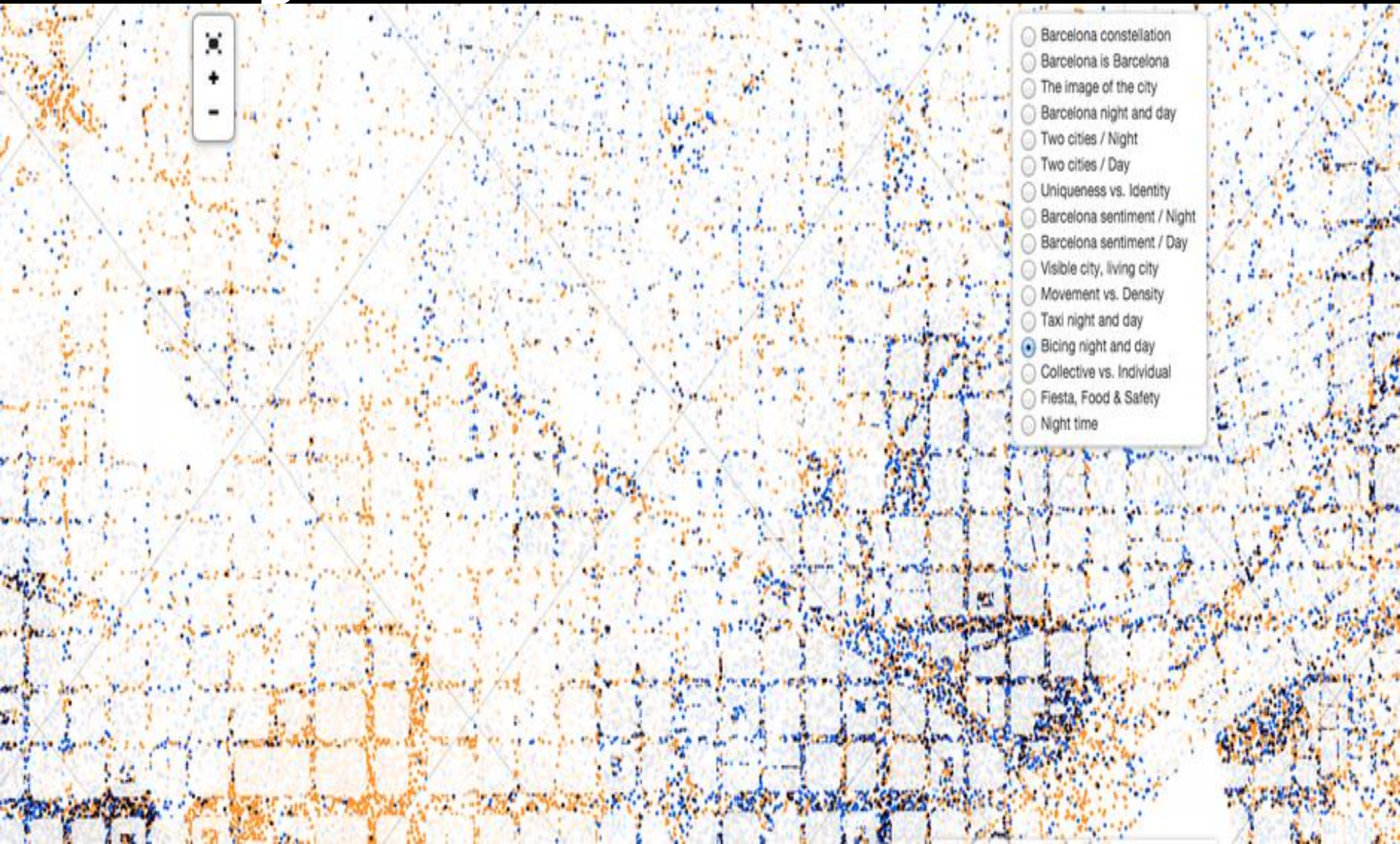
- Mobility is about the individual, not the device.
- The urban experience of ubiquitous connectivity, personalized and context-aware services and content that link us to daily activities and interests, regardless of time and place.
- Continual discovery, enhancement

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

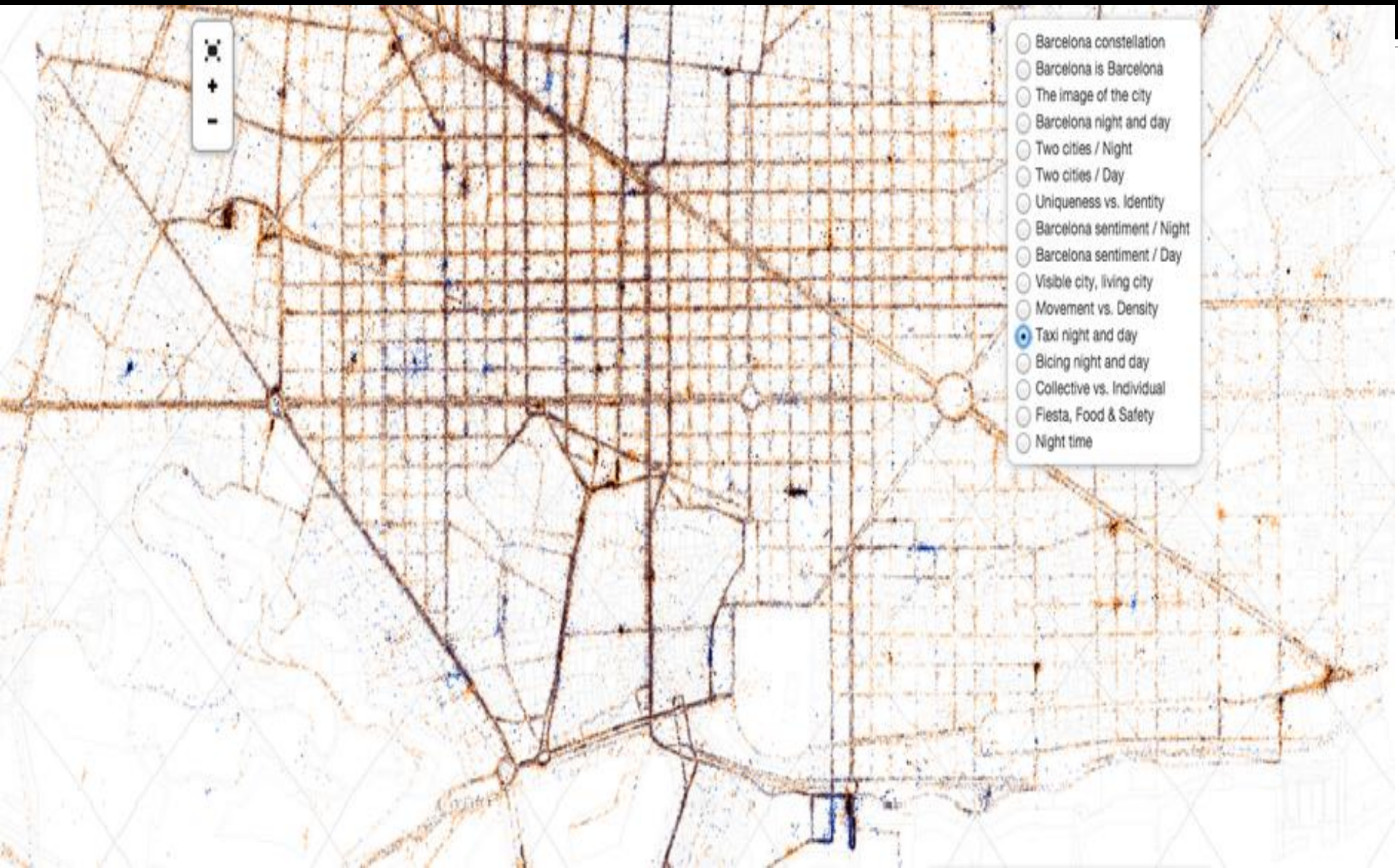
Designing the City, Tone of Social Media
http://www.atnight.ws/



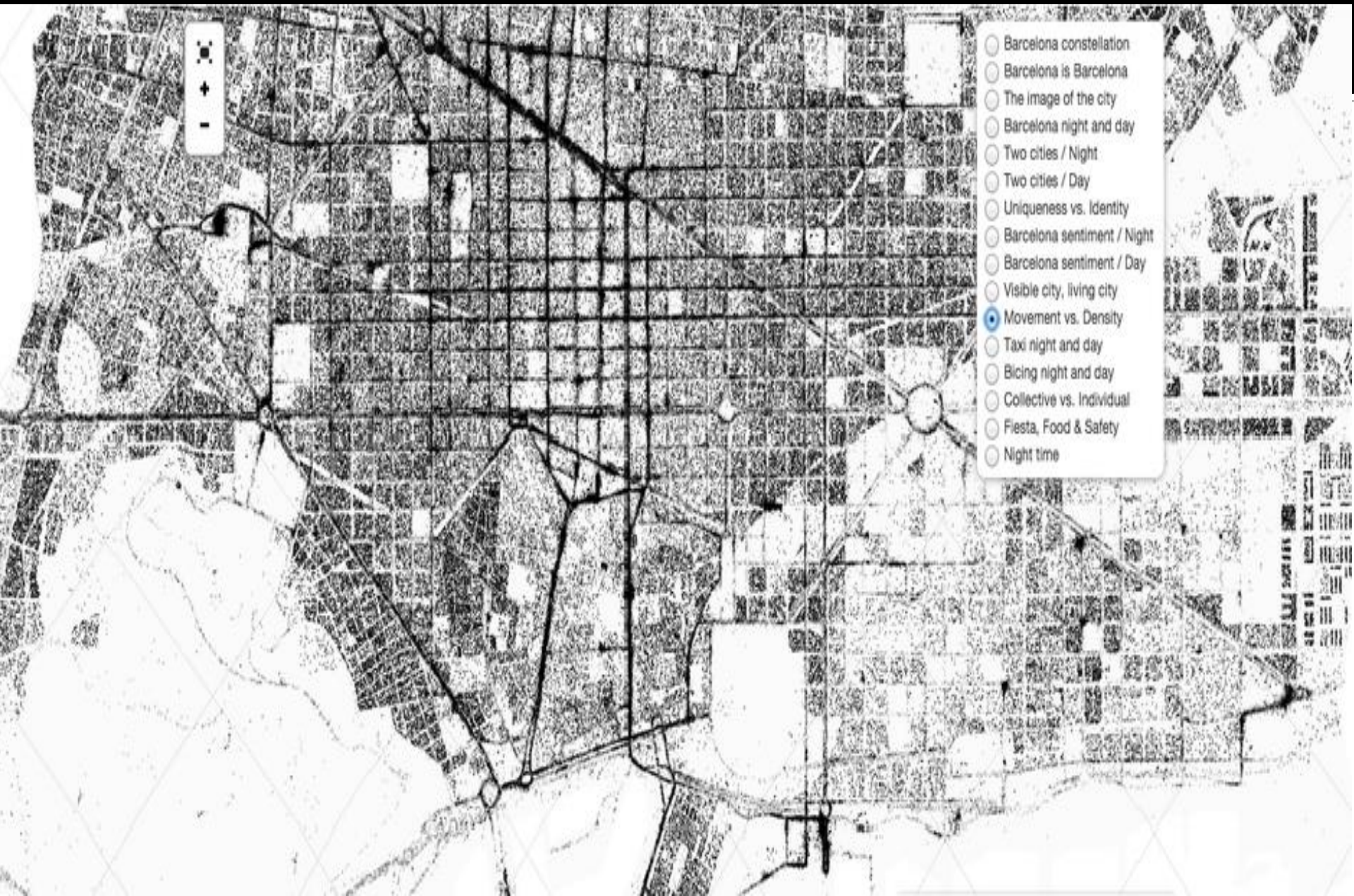
Designing the City at Night, bike storage data



Designing the City at Night, Taxis



Taxis vs Density



Visible Amsterdam (movement of crowds), Euro Beinat

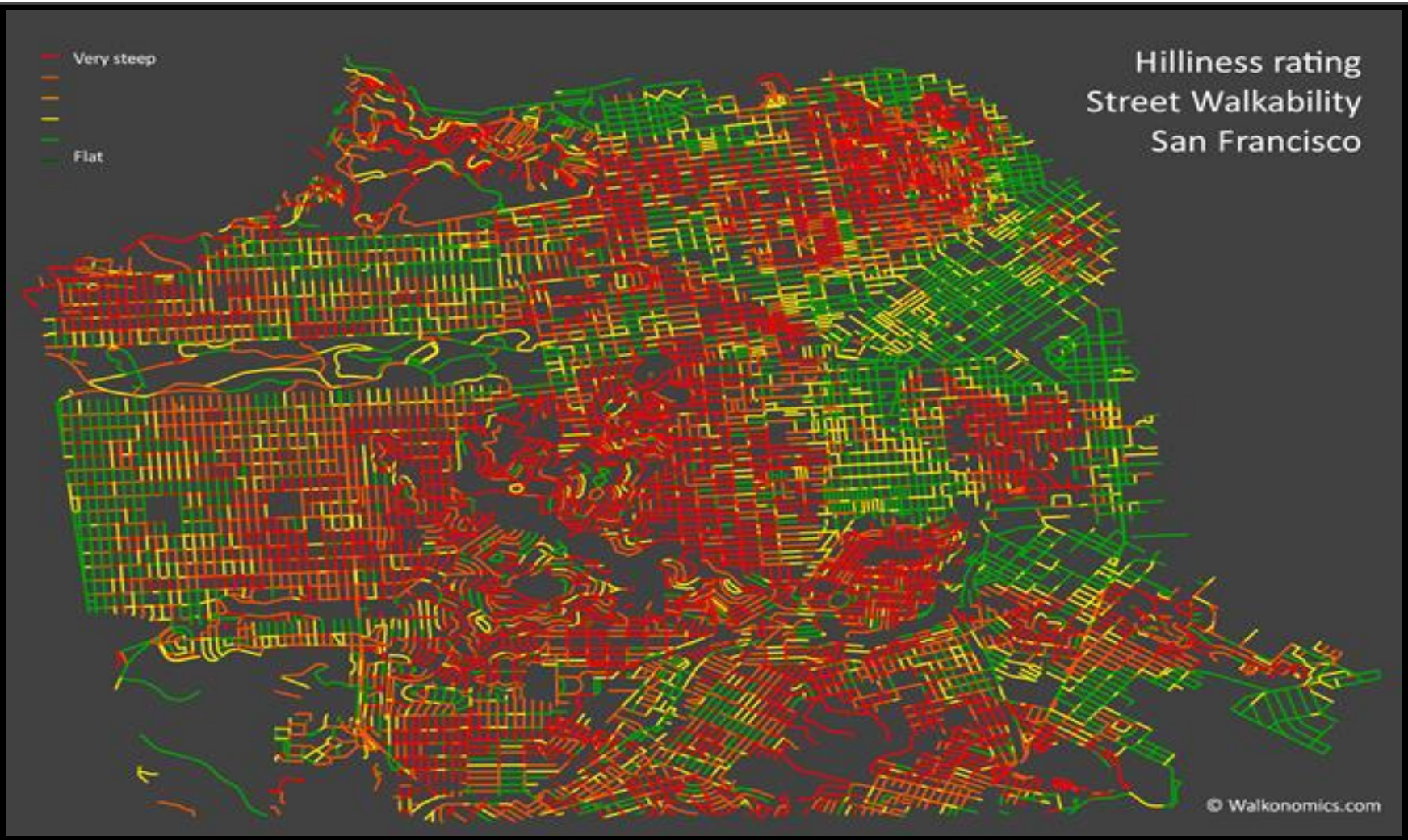
Walkable Streets Project

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

Walkable Streets Project

San Francisco

San Francisco



iCity concept of city systems as nested structures

Figure 2: Hierarchical Approach to Urban Systems

Meyer & Miller (2013)

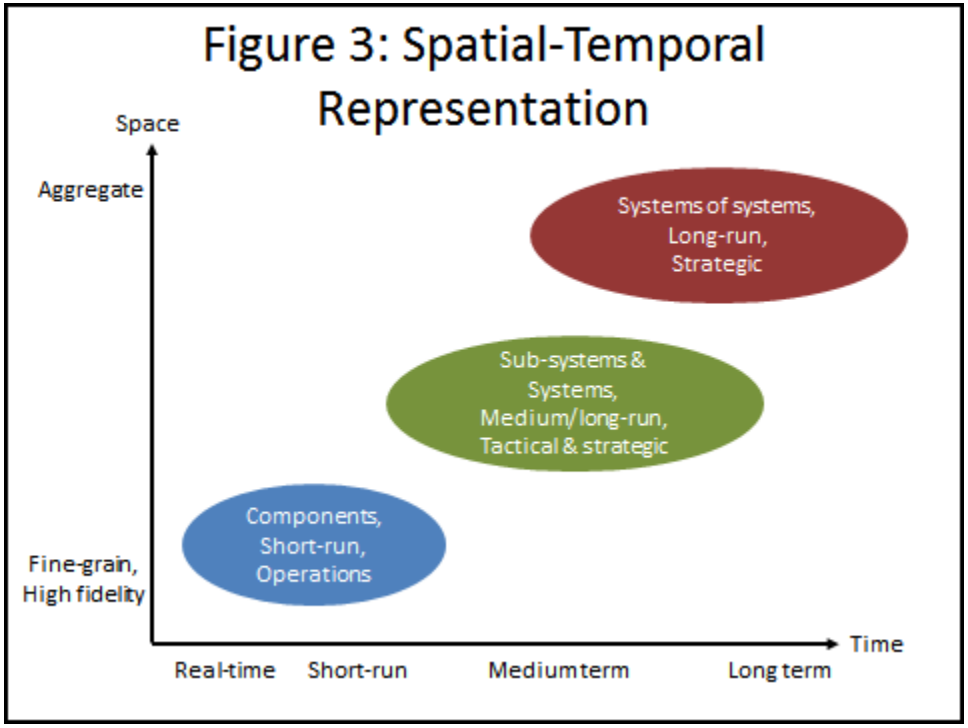
Each system decomposes into sub-systems; E.g., "the" transportation system consists of:

- 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



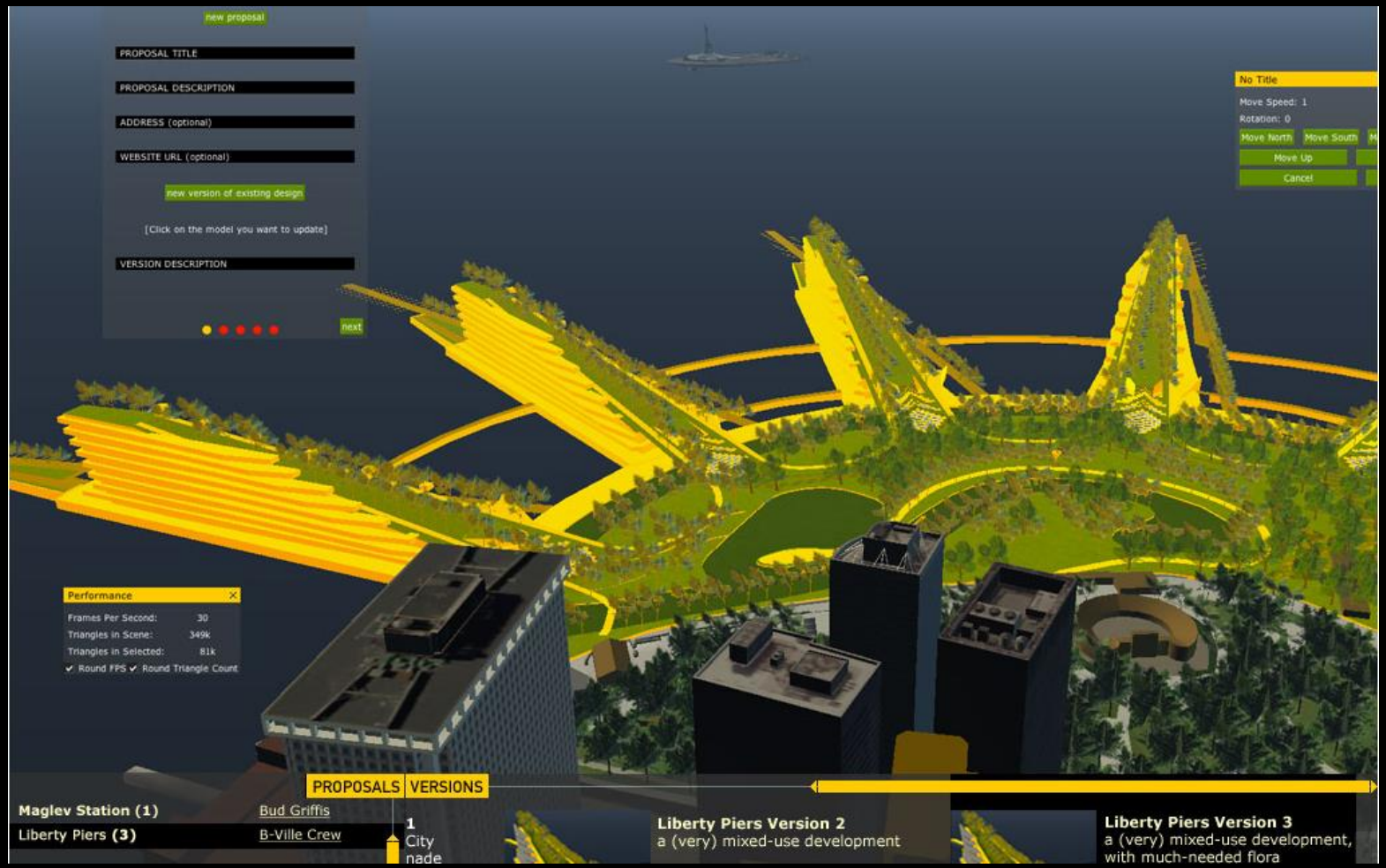
Betaville and Story Facets visualization tools

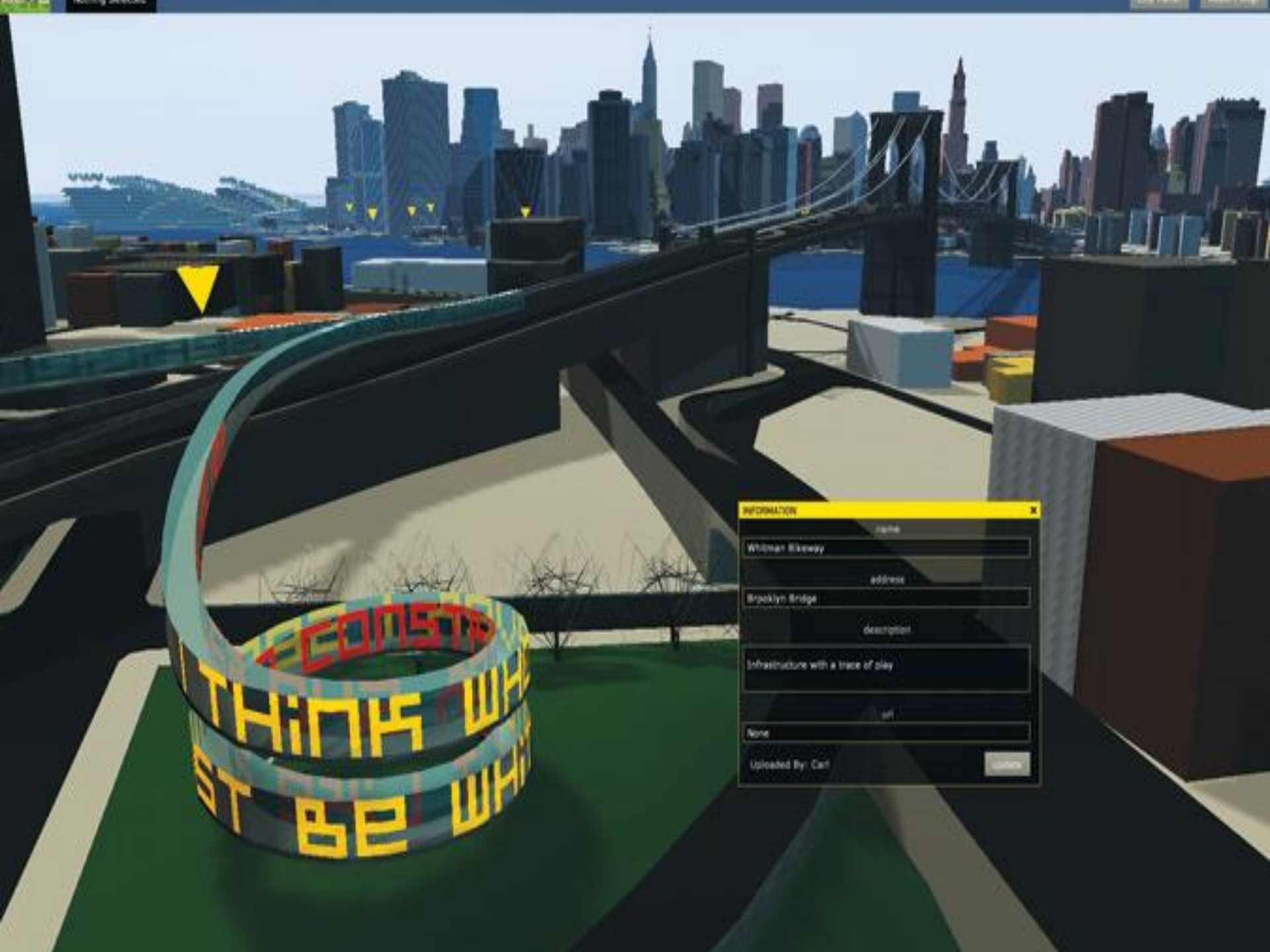
- *Design Approach*
  - Communication Centered
  - Collaboration- Minded
- *Visual Data/Model Integration*
  - Able to link qualitative data
  - Real-time "what-ifs"
  - Changing/historical data and data ontologies
  - Provenance

Betaville and StoryFacets

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

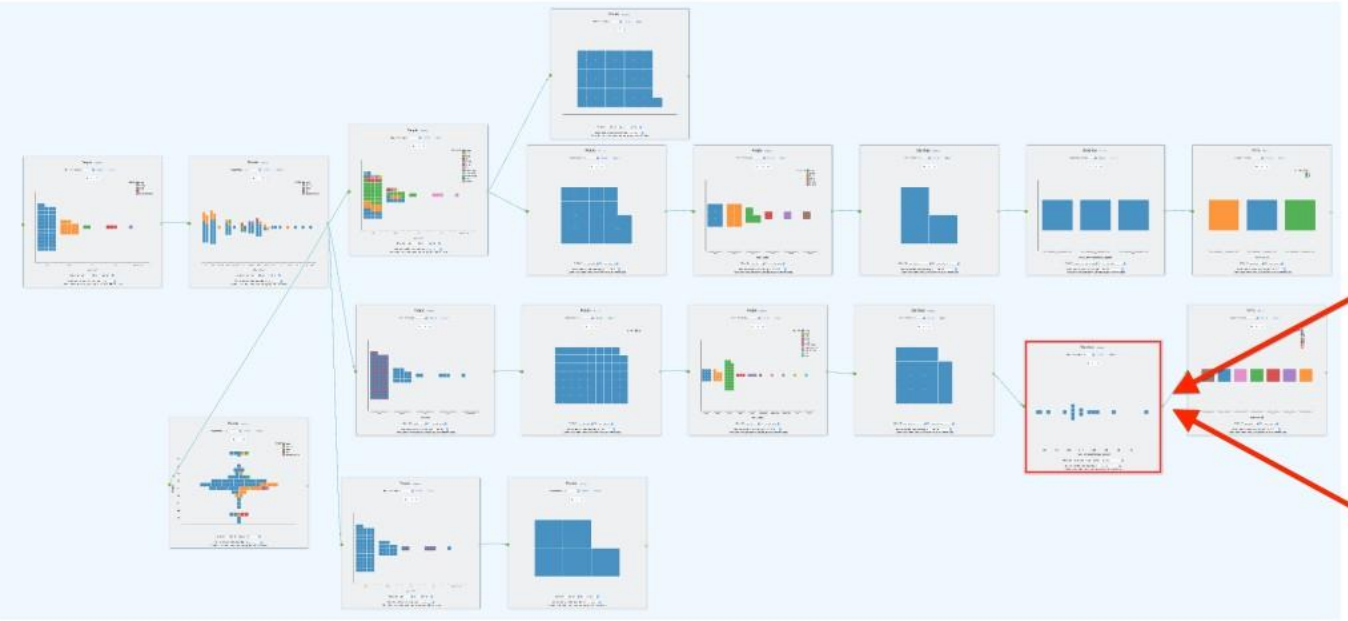
Betaville


new proposal
PROPOSAL TITLE
PROPOSAL DESCRIPTION
ADDRESS (optional)
WEBSITE URL (optional)
new version of existing design
[Click on the model you want to update]
VERSION DESCRIPTION
next
No Title
Move Speed: 1
Rotation: 0
Move North
Move South
Move Up
Cancel
Performance
Frames Per Second: 30
Triangles in Scene: 349k
Triangles in Selected: 81k
Round FPS
Round Triangle Count
PROPOSALS
VERSIONS
Maglev Station (1)
Bud Griffis
Liberty Piers (3)
B-Ville Crew
1
City
nade
Liberty Piers Version 2
a (very) mixed-use development
Liberty Piers Version 3
a (very) mixed-use development,
with much-needed flora

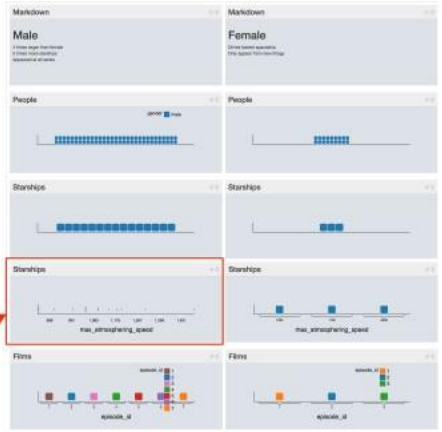

INFORMATION
name
Whitman Bikeway
address
Brooklyn Bridge
description
Infrastructure with a trace of play
url
None
Uploaded By: Carl
update

StoryFacets

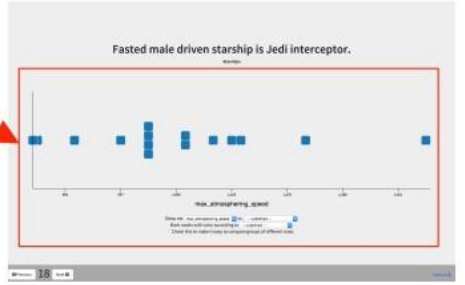
Overview



(a) Trail Facet



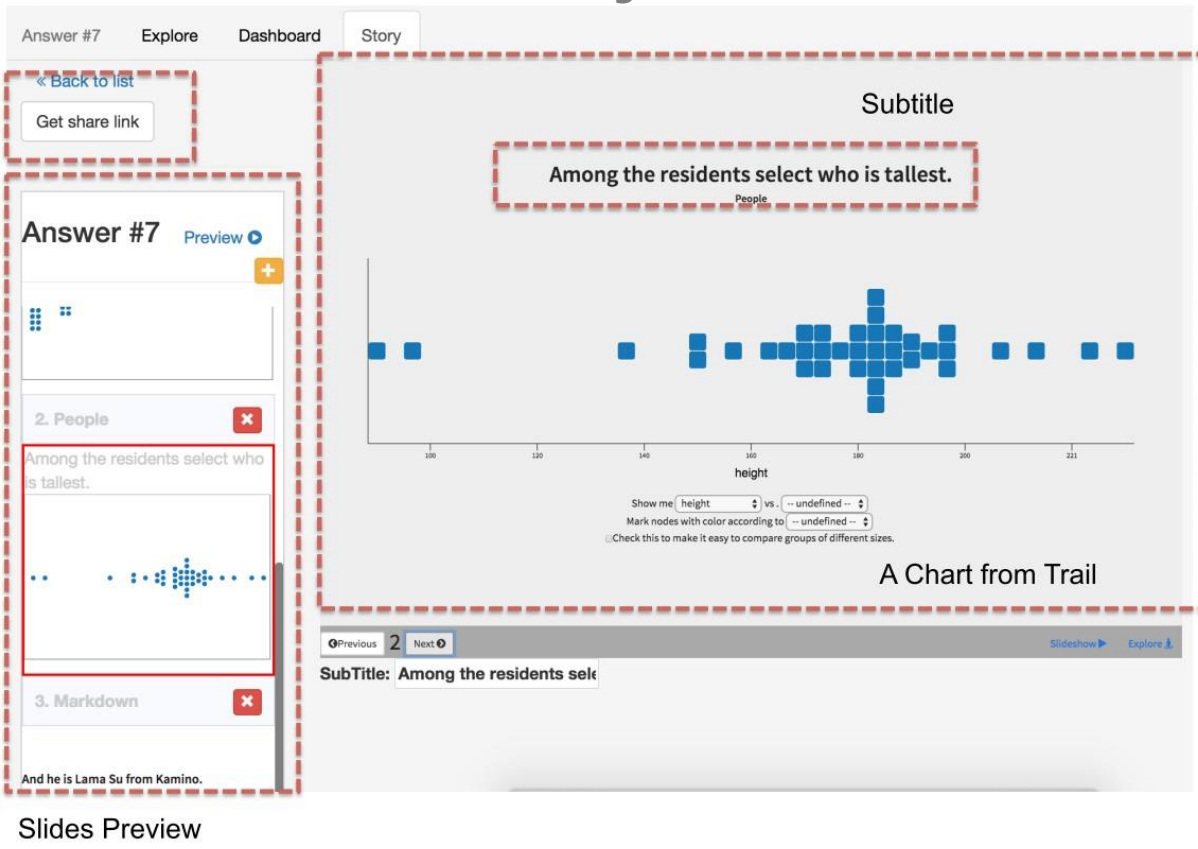
(b) Dashboards or Info Graphics Facet



(c) Story Facet

StoryFacets

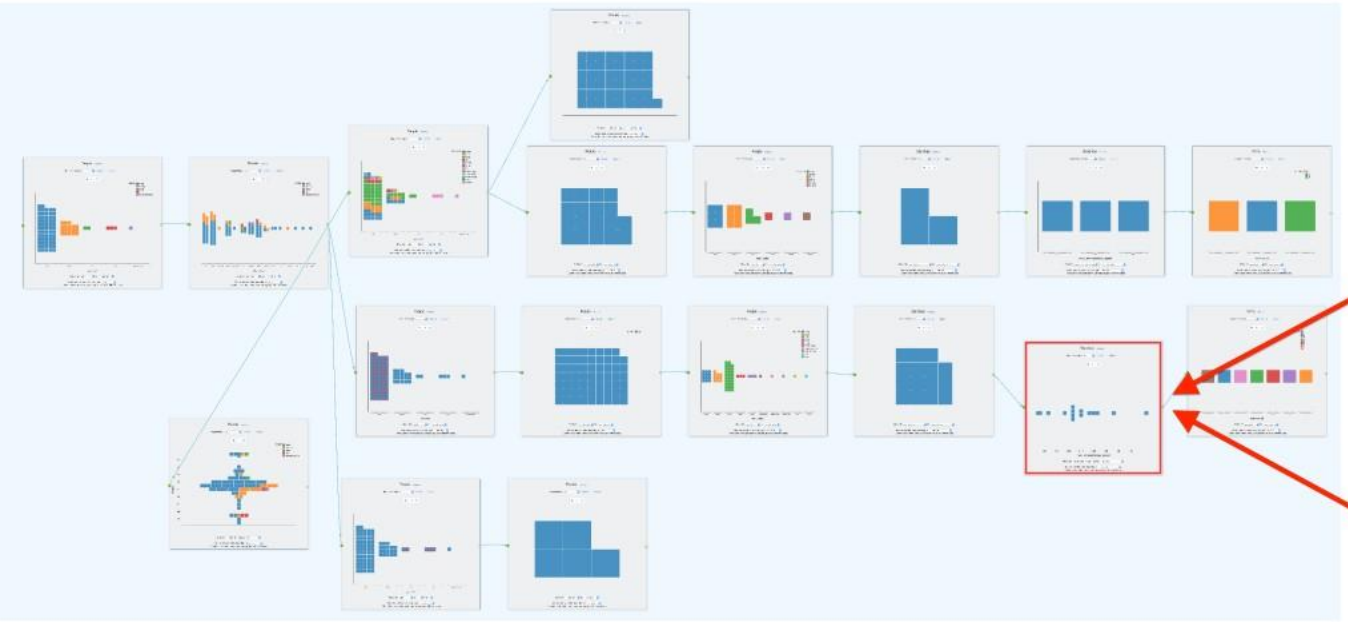
Story (slideshow) facet – Star Wars character height



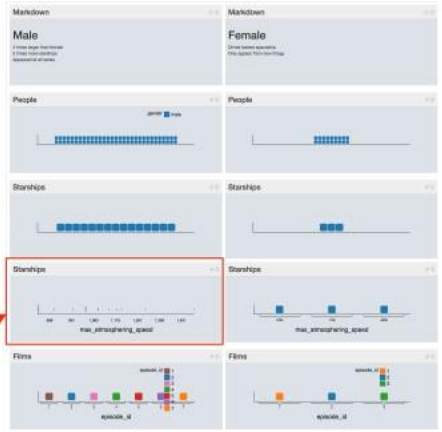
Slides Preview

StoryFacets

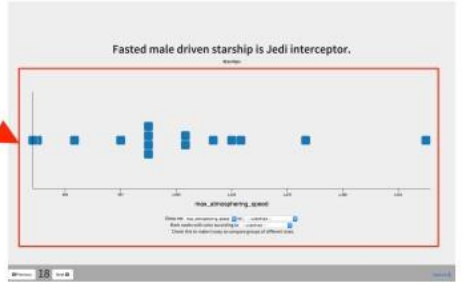
Linked back to trail facet



(a) Trail Facet



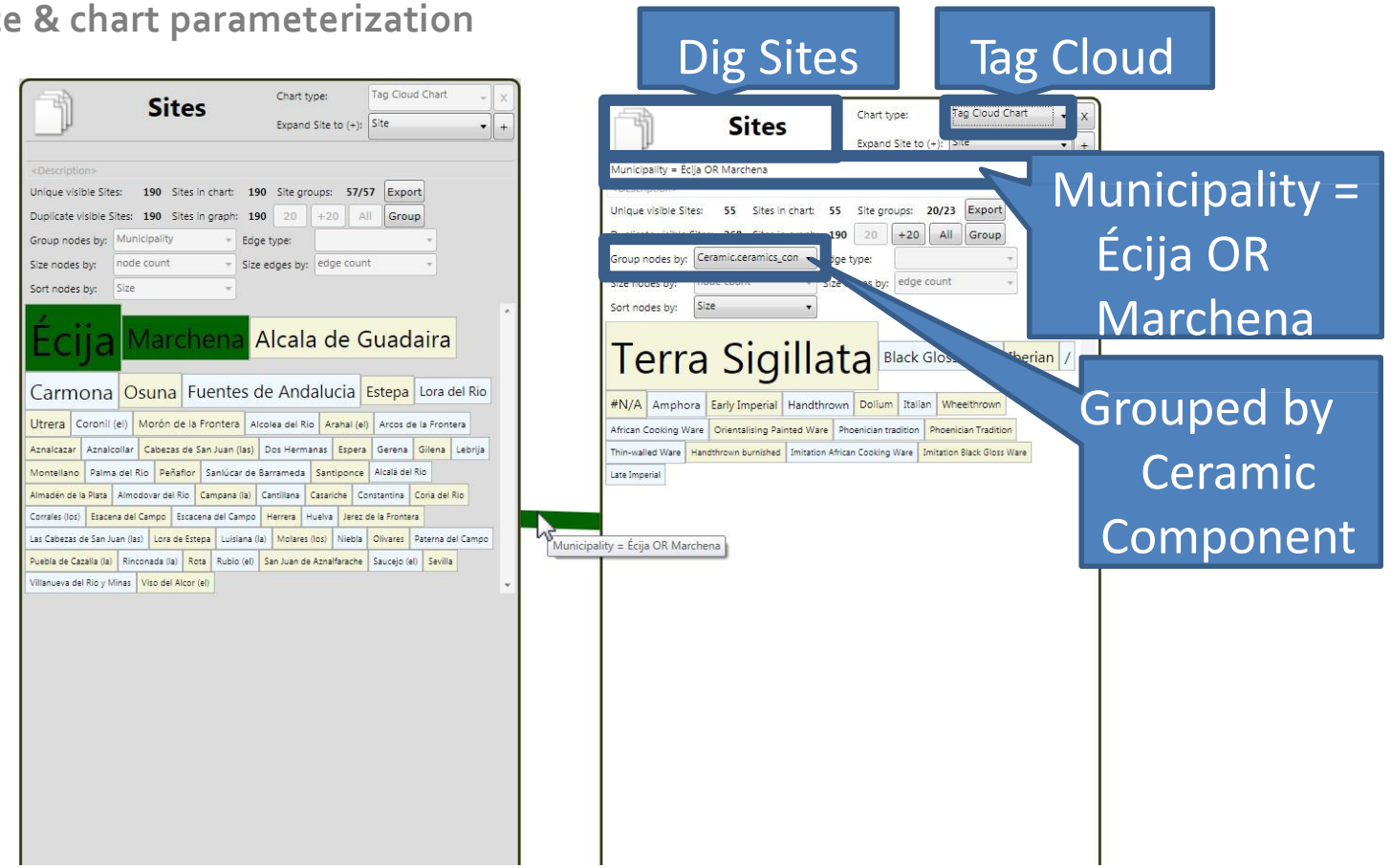
(b) Dashboards or Info Graphics Facet



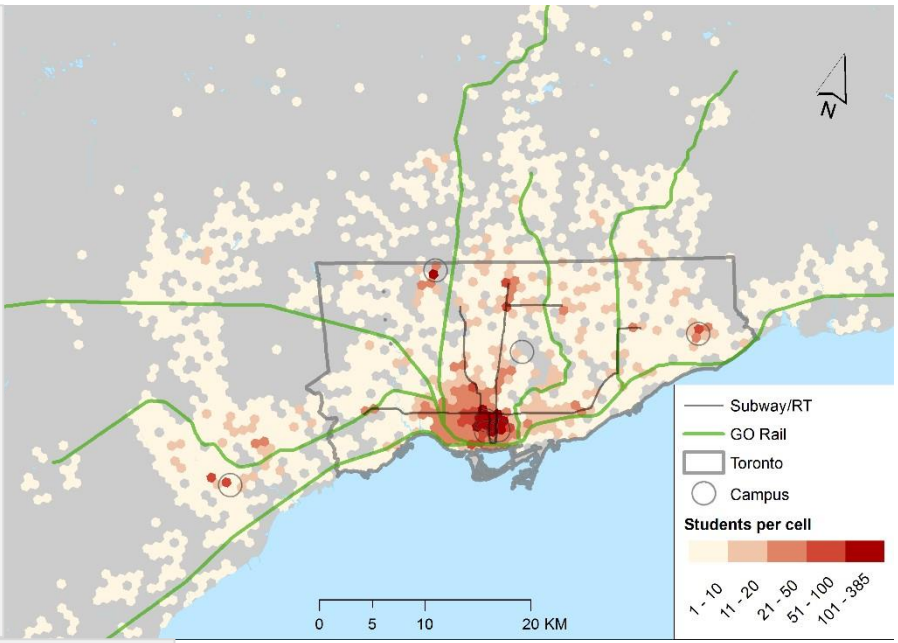
(c) Story Facet

GraphTrail

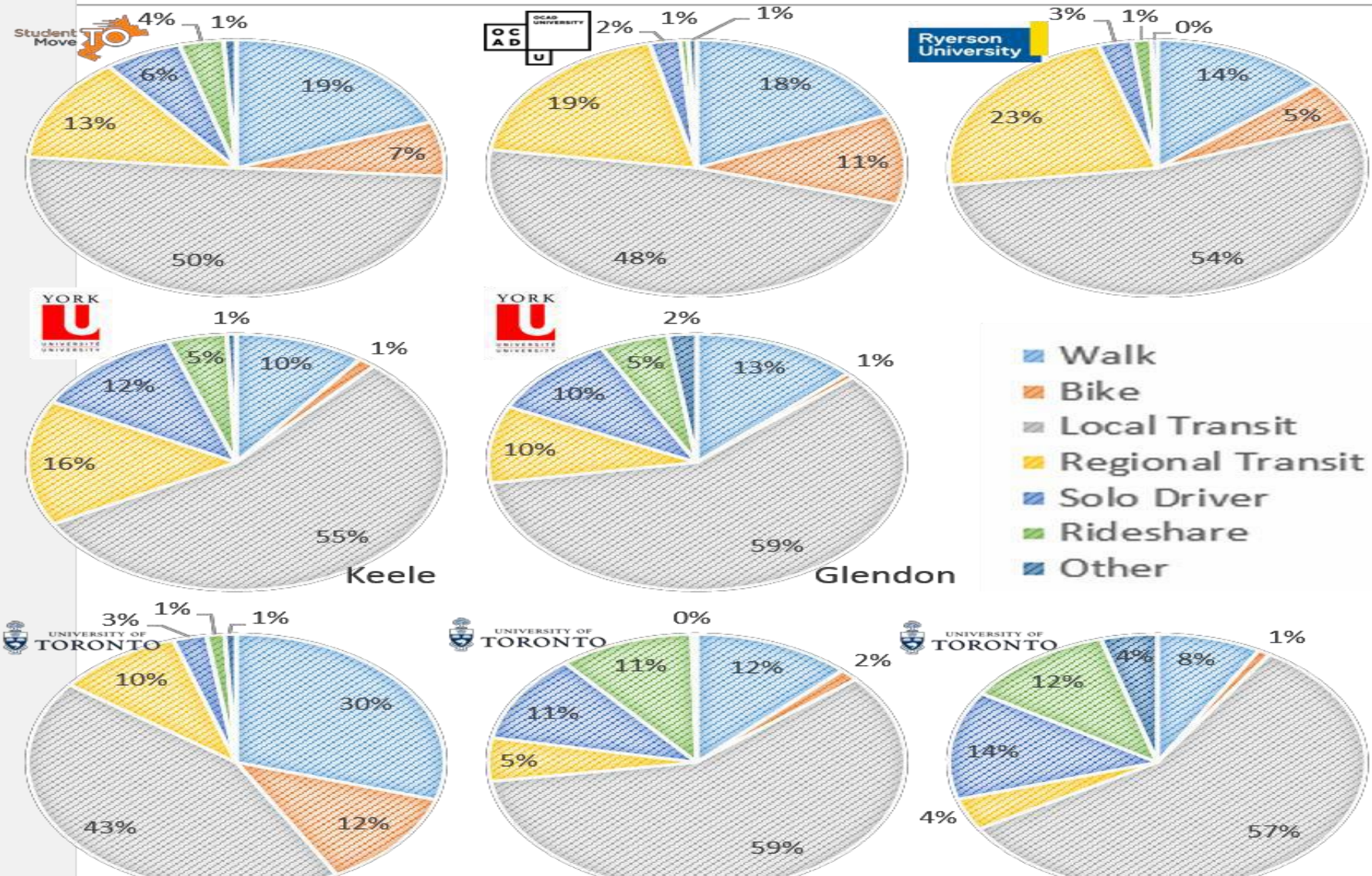
Provenance & chart parameterization



Home Location of Respondents



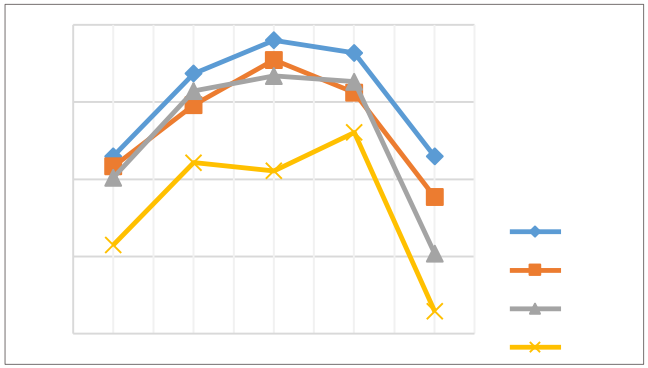
StudentMove TO

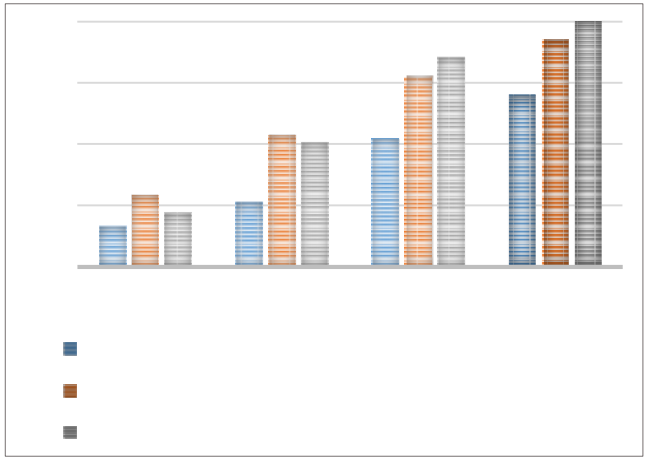


Reason for Recent Moves

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…