Measuring the Pulse of the City through Shared Bicycle Programs

Jon Froehlich (UW)
Joachim Neumann (TiD) and Nuria Oliver (TiD)

design:
use:
build:
university of washington

Telefonica
Research

collecting **large volumes** of **real data** about **human mobility patterns** is a challenging yet high value problem

VIRTUAL WORLD
VIRTUAL WORLD

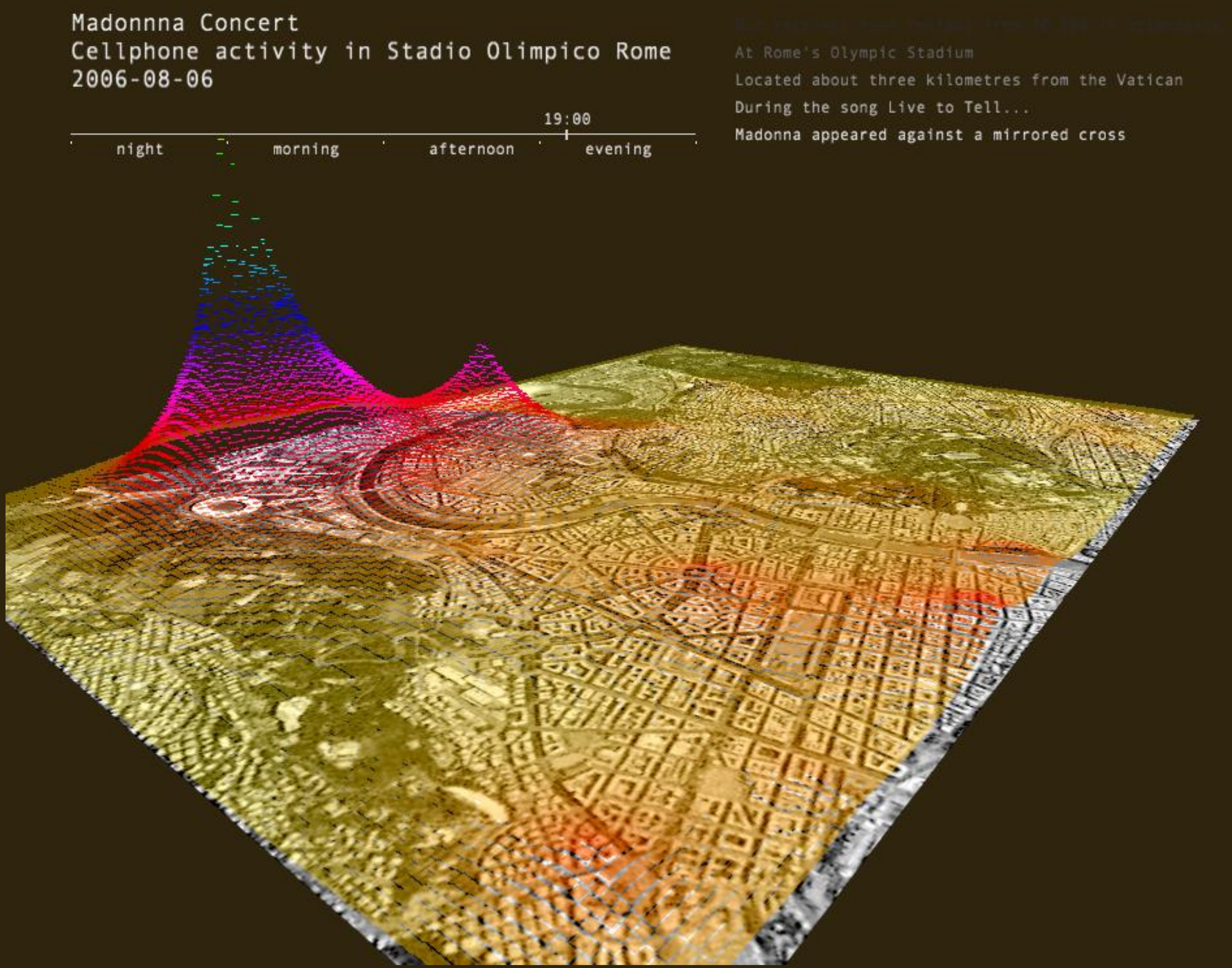
28
DAYS
LATER
THE QUARANTINE
ARTEDGECREATIVE
HTTP://ARTEDGE.COM.UA

bicing
3000

large volume human mobility datasets

real-time rome

MIT’s SENSEable City Lab, directed by Carlo Ratti



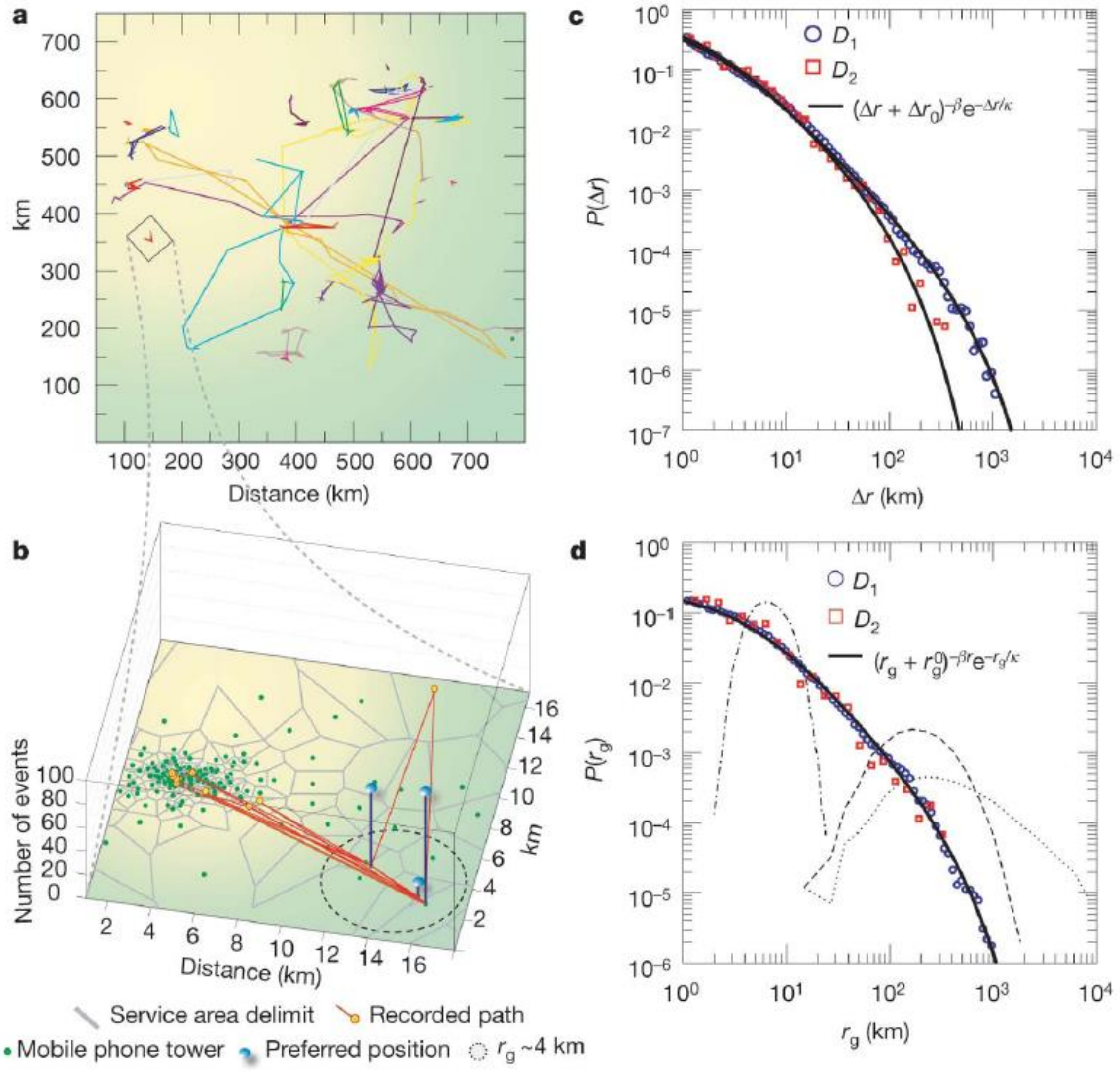
Madonnna Concert
Cellphone activity in Stadio Olimpico Rome
2006-08-06

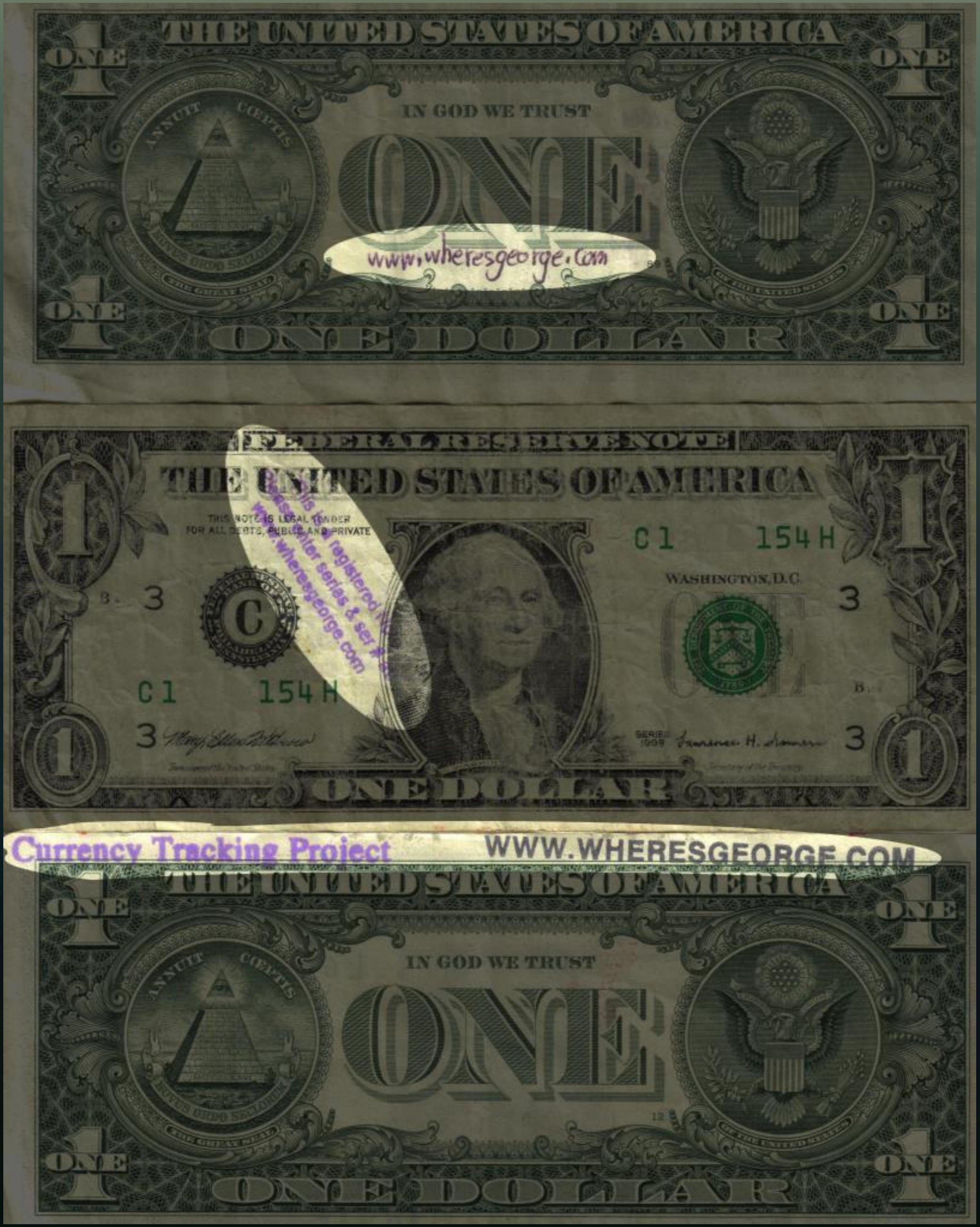
19:00
night
morning
afternoon
evening

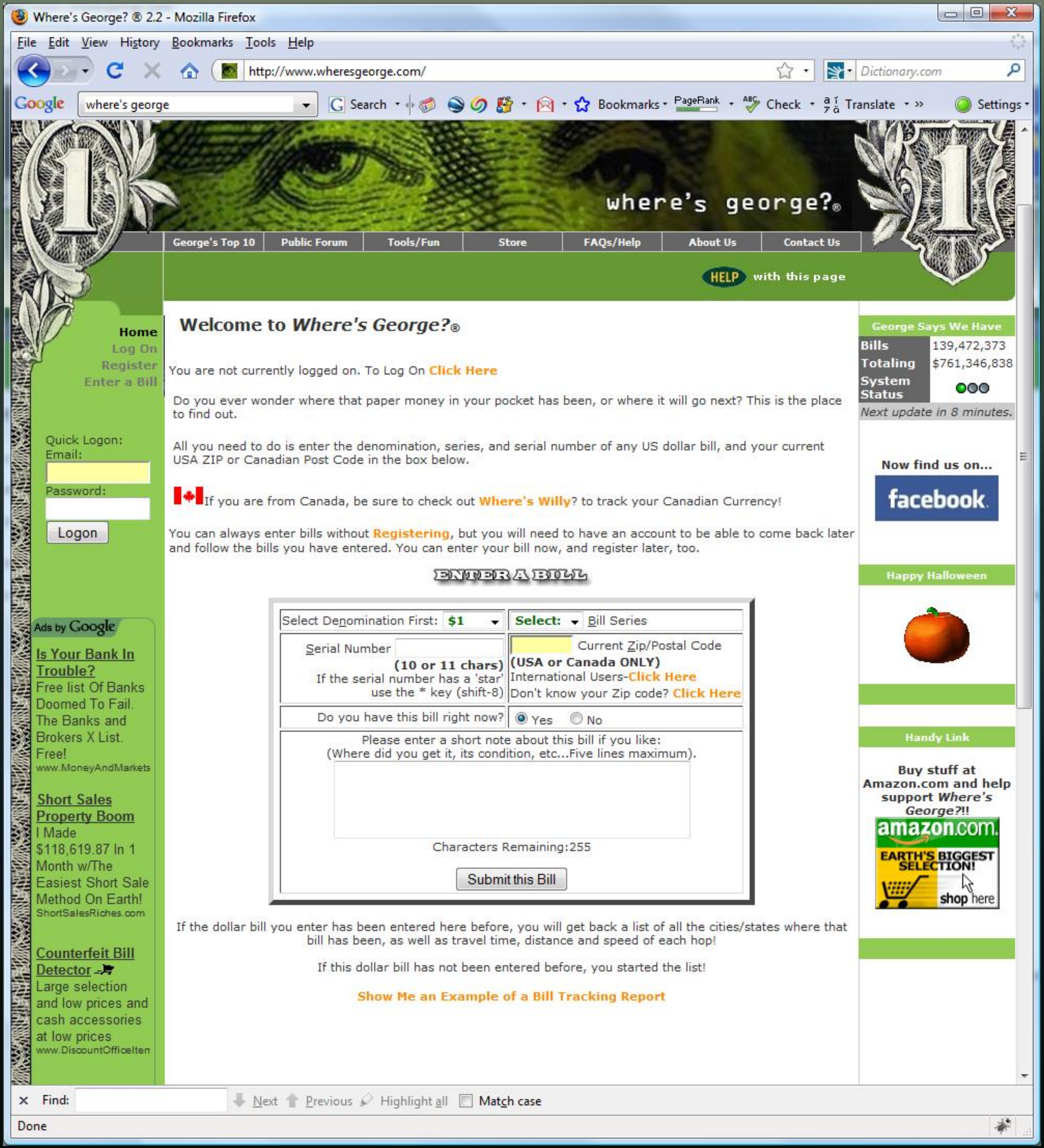
[illegible]
At Rome's Olympic Stadium
Located about three kilometres from the Vatican
During the song Live to Tell...
Madonna appeared against a mirrored cross

understanding human mobility patterns

Marta C. González, César A. Hidalgo & Albert-László Barabási, *Nature,* 5 June 2008




www.wheresgeorge.com
registered
series & ser #
www.wheresgeorge.com
Currency Tracking Project
WWW.WHERESGEORGE.COM


Where's George? ® 2.2 - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://www.wheresgeorge.com/
Dictionary.com
Google where's george Search Bookmarks PageRank Check Translate Settings
where's george?®
George's Top 10
Public Forum
Tools/Fun
Store
FAQs/Help
About Us
Contact Us
HELP with this page
Home
Log On
Register
Enter a Bill
Logon
ENTER A BILL
Submit this Bill
Find: Next Previous Highlight all Match case
Done

Welcome to *Where's George?*®

You are not currently logged on. To Log On **Click Here**

Do you ever wonder where that paper money in your pocket has been, or where it will go next? This is the place to find out.

All you need to do is enter the denomination, series, and serial number of any US dollar bill, and your current USA ZIP or Canadian Post Code in the box below.

If you are from Canada, be sure to check out **Where's Willy**? to track your Canadian Currency!

You can always enter bills without **Registering**, but you will need to have an account to be able to come back later and follow the bills you have entered. You can enter your bill now, and register later, too.

Quick Logon:
Email:
Password:

Select Denomination First: **$1**	**Select:** Bill Series
Serial Number **(10 or 11 chars)** If the serial number has a 'star' use the * key (shift-8)	Current Zip/Postal Code **(USA or Canada ONLY)** International Users-**Click Here** Don't know your Zip code? **Click Here**
Do you have this bill right now?	● Yes ○ No

Please enter a short note about this bill if you like:
(Where did you get it, its condition, etc...Five lines maximum).

Characters Remaining:255

If the dollar bill you enter has been entered here before, you will get back a list of all the cities/states where that bill has been, as well as travel time, distance and speed of each hop!

If this dollar bill has not been entered before, you started the list!

Show Me an Example of a Bill Tracking Report

George Says We Have

Bills	139,472,373
Totaling	$761,346,838
System Status	●●●

Next update in 8 minutes.

Now find us on...

facebook

Happy Halloween

Handy Link

Buy stuff at Amazon.com and help support *Where's George?*!!

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Free list Of Banks Doomed To Fail. The Banks and Brokers X List. Free!
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I Made $118,619.87 In 1 Month w/The Easiest Short Sale Method On Earth!
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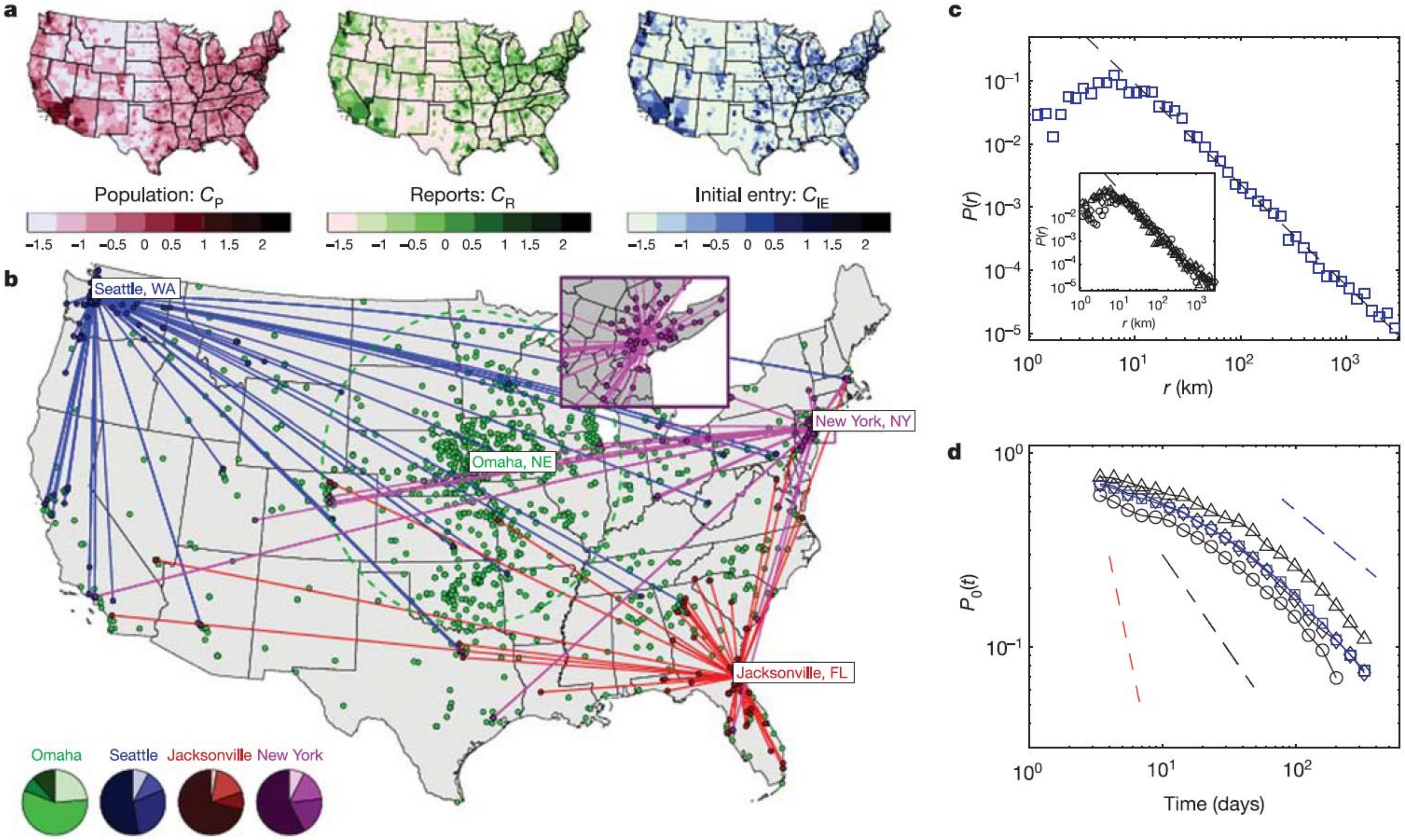
www.DiscountOfficeItem

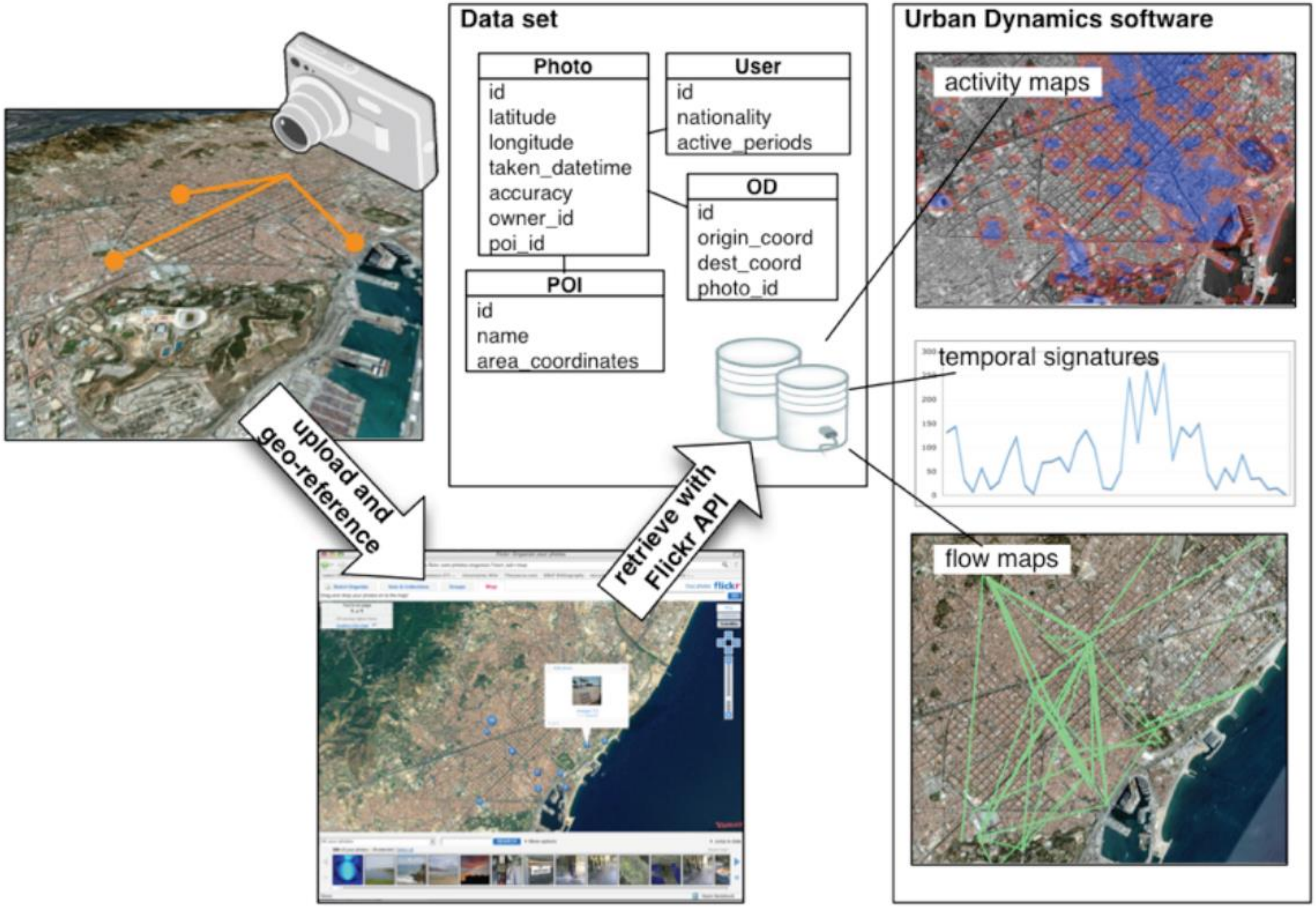
scaling laws of human travel

D. Brockmann, L. Hufnagel & T. Geisel, *Nature*, 26 Jan 2006



digital footprinting: uncovering tourists with user-generated content

Girardin, F., Calabrese, F., Dal Fiore, F. , Ratti, C., and Blat, J. (2008). *IEEE Pervasive Computing*


upload and
geo-reference
retrieve with
Flickr API
flickr
Data set
Photo
id
latitude
longitude
taken_datetime
accuracy
owner_id
poi_id
User
id
nationality
active_periods
OD
id
origin_coord
dest_coord
photo_id
POI
id
name
area_coordinates
Urban Dynamics software
activity maps
temporal signatures
300
200
150
100
50
0
flow maps

so why now?

GOOD FOR
NYC
ONE FARE

扉にご注意！
かけこみは おやめください

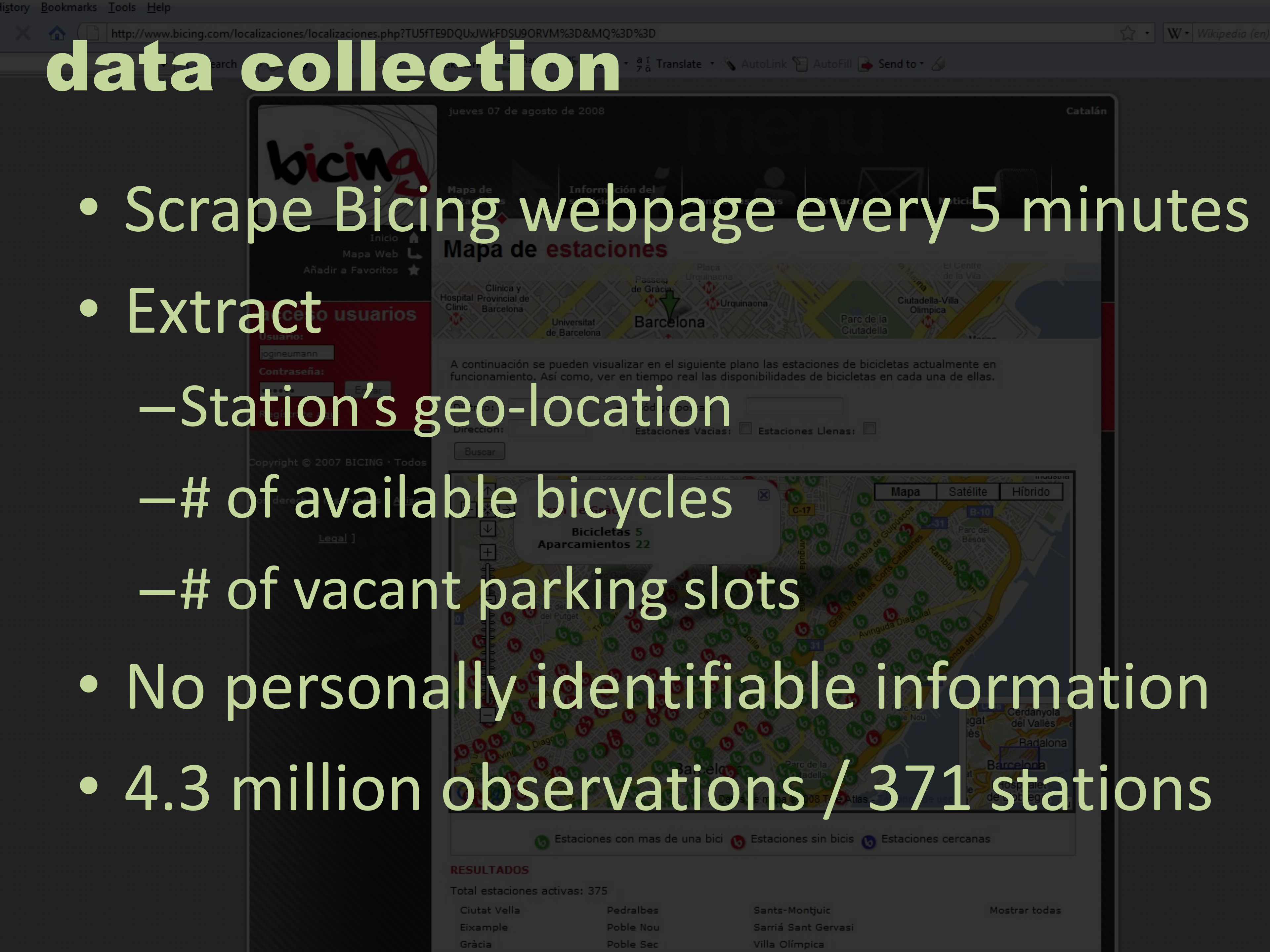
bicing
105
bicing

Launched March 2007

By Summer 2008:
- 373 stations
- 6,000 bicycles
- 150,000 subscribers

bicing
105
estacions
bicing
2178
bicing
217
estacions
bicing
bicing
10
Assegura't de tornar
la bicicleta correctament!
10
4
4
18
18

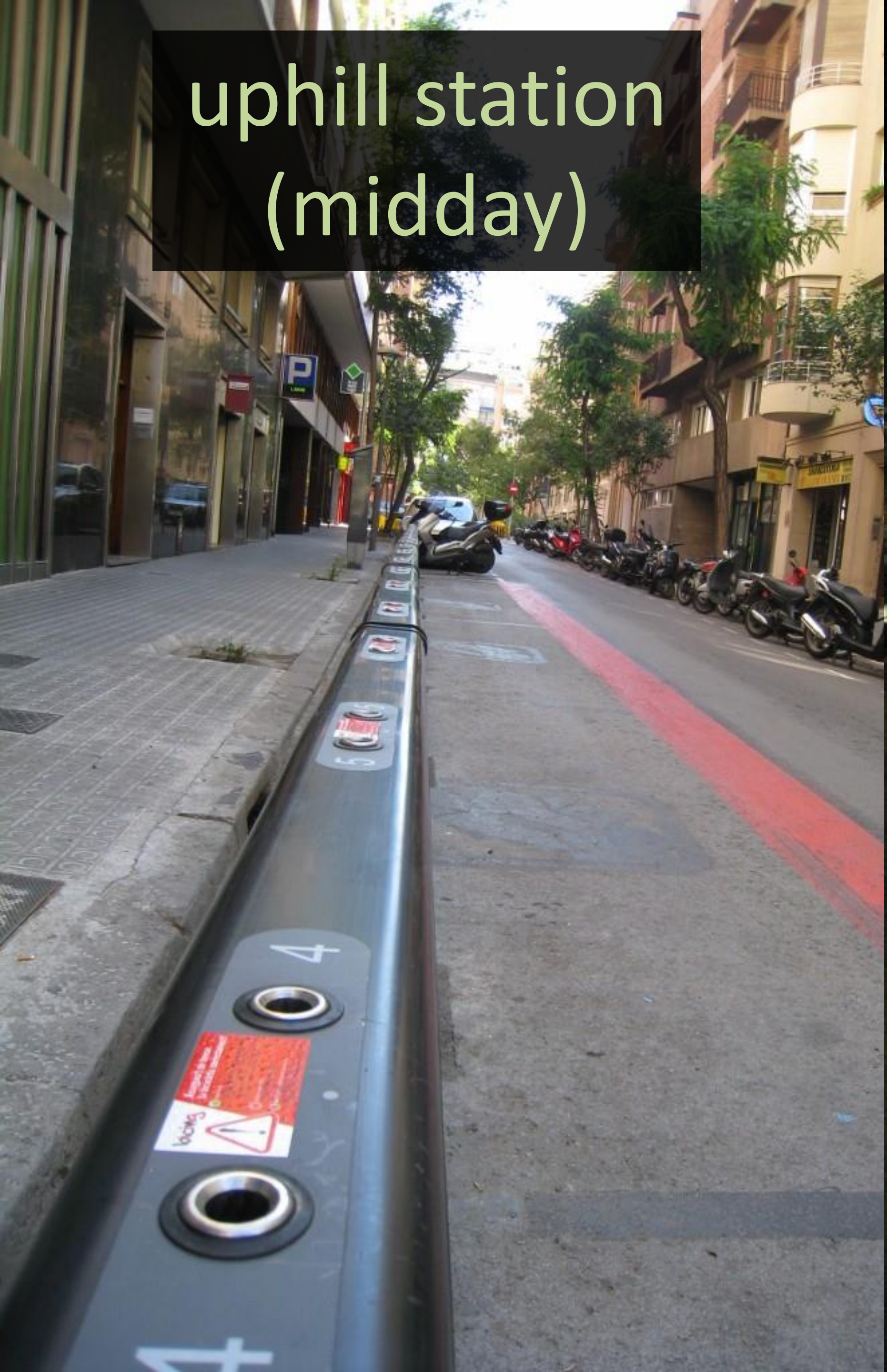
data collection


http://www.bicing.com/localizaciones/localizaciones.php?TU5fTE9DQUxJWkFDSU9ORVM%3D&MQ%3D%3D
jueves 07 de agosto de 2008
Catalán
bicing
Mapa de estaciones
Bicicletas 5
Aparcamientos 22
Mapa
Satélite
Híbrido
Estaciones con mas de una bici
Estaciones sin bicis
Estaciones cercanas
RESULTADOS
Total estaciones activas: 375

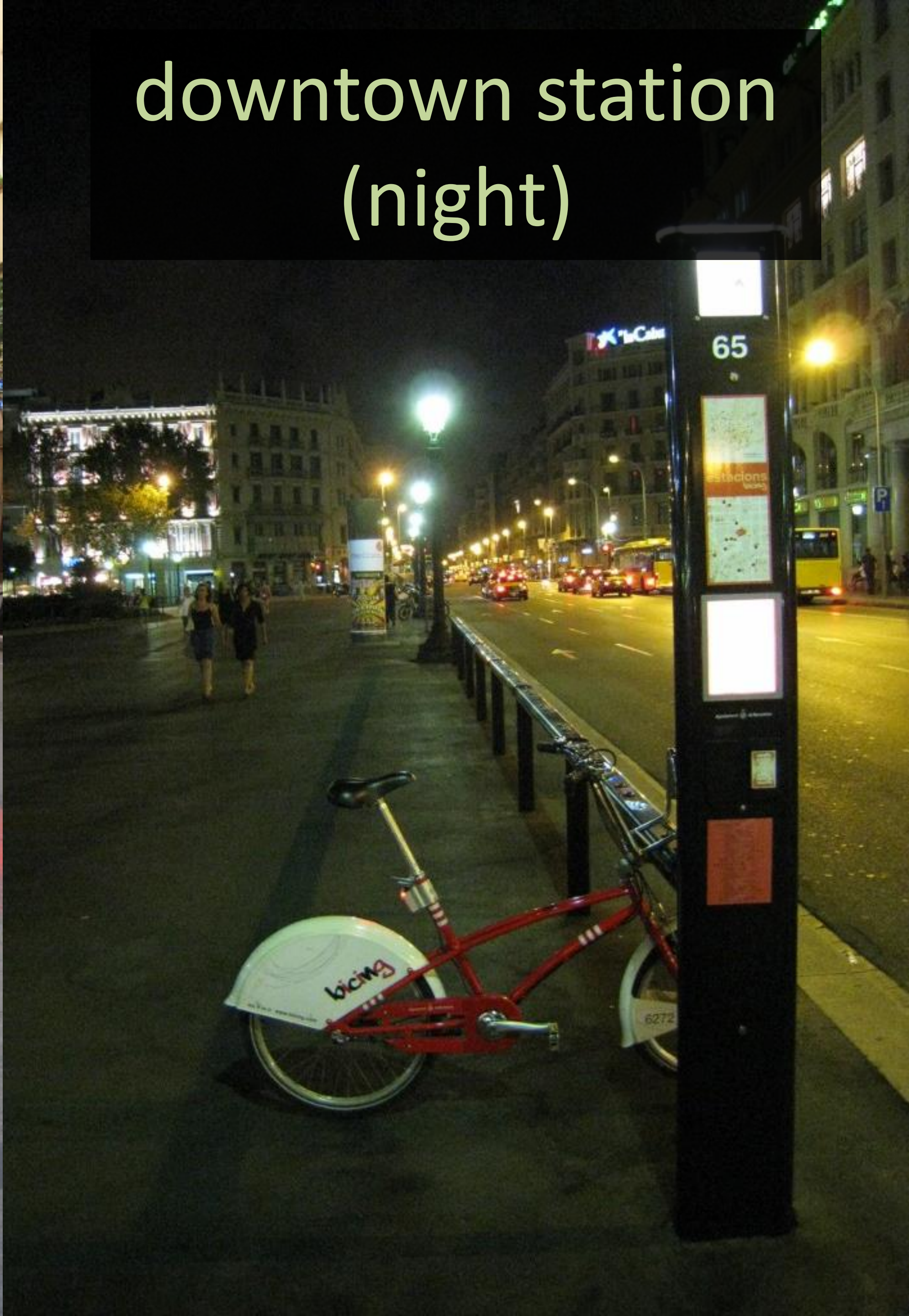
A continuación se pueden visualizar en el siguiente plano las estaciones de bicicletas actualmente en funcionamiento. Así como, ver en tiempo real las disponibilidades de bicicletas en cada una de ellas.

- Scrape Bicing webpage every 5 minutes
- Extract
  - Station's geo-location
  - # of available bicycles
  - # of vacant parking slots
- No personally identifiable information
- 4.3 million observations / 371 stations

pause for video



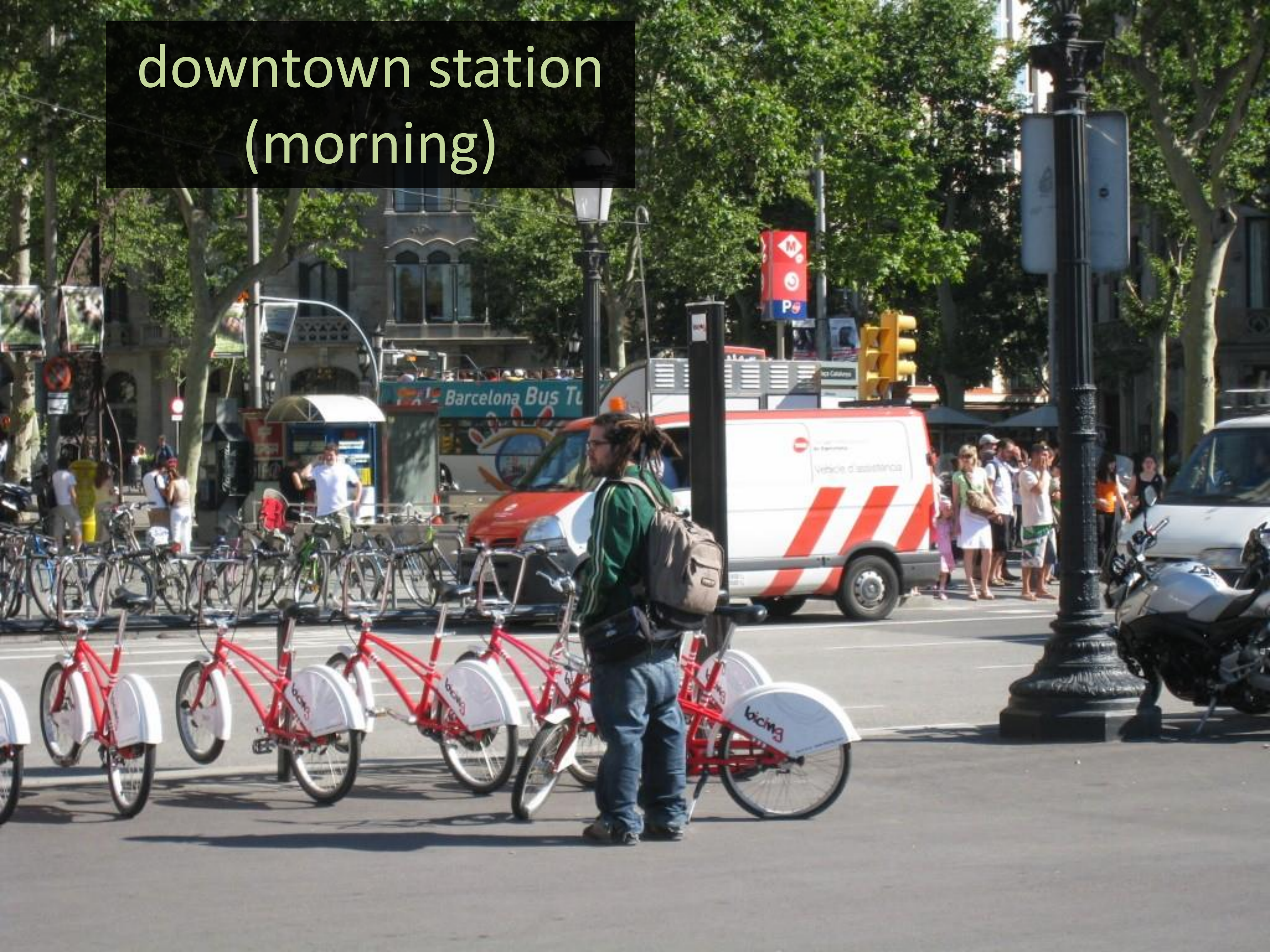
uphill station
(midday)



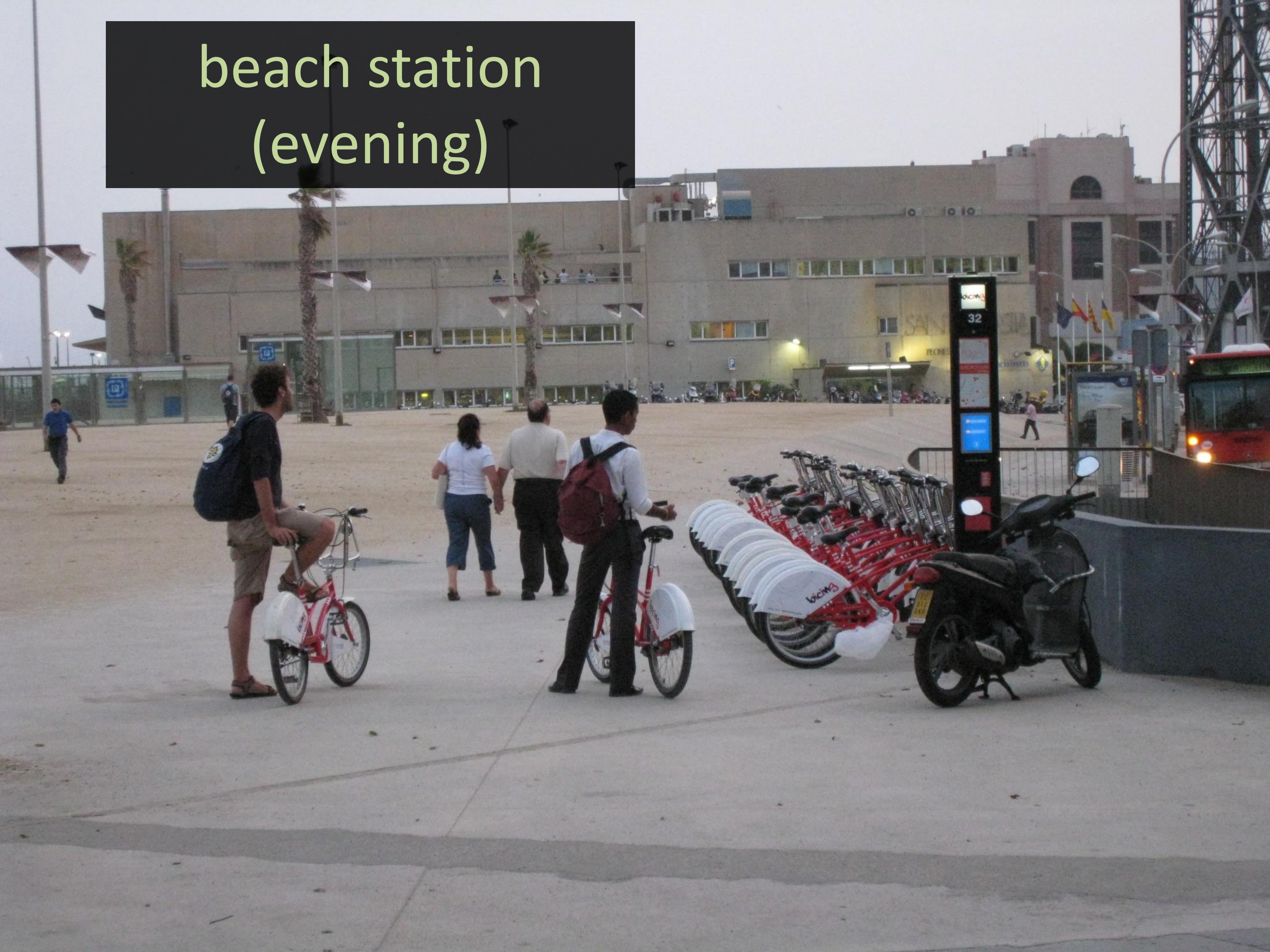
downtown station
(night)

65
estacions
bicing
6272

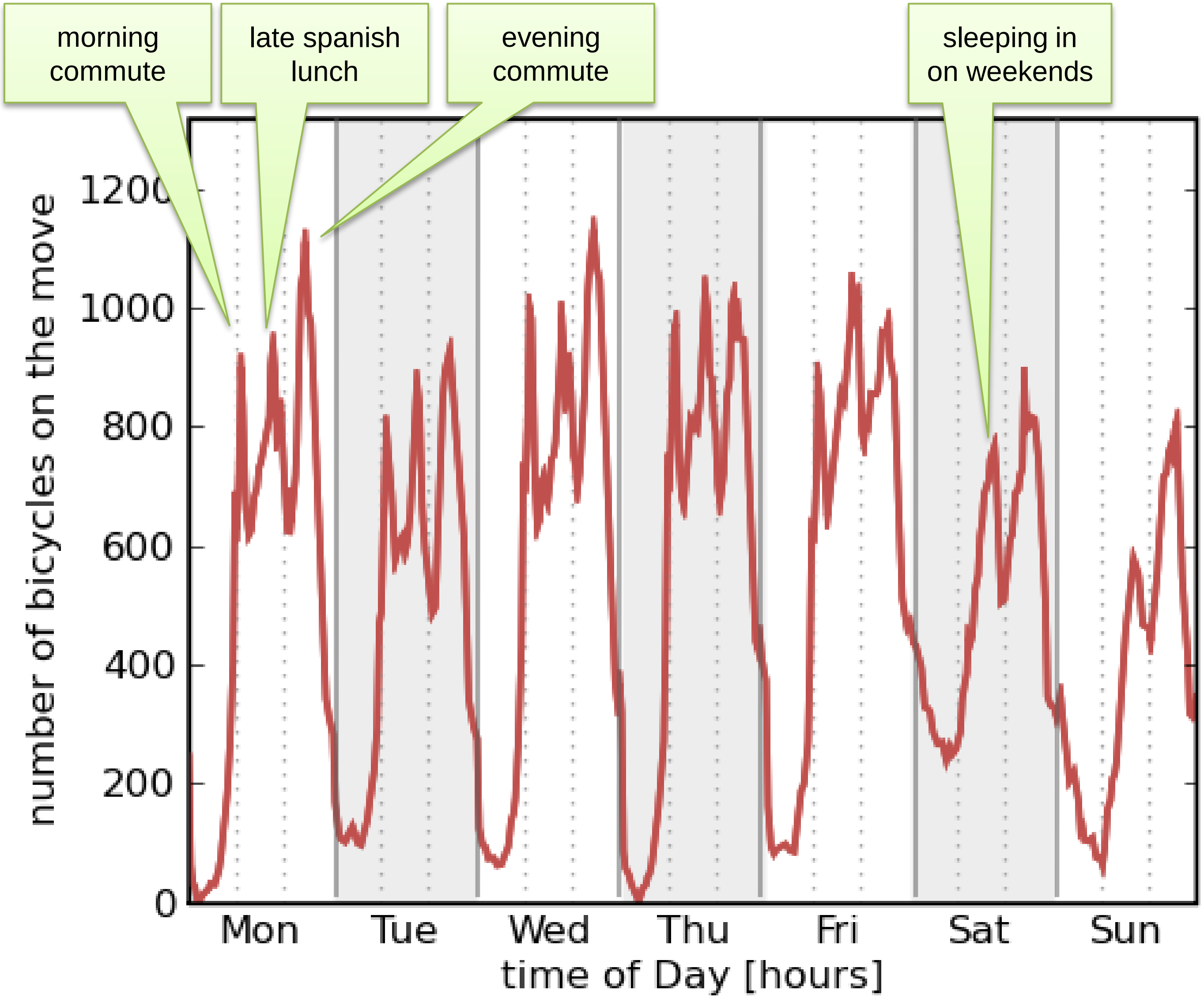
downtown station (morning)


Barcelona Bus Tu
bicing
M
P

beach station (evening)



bicycles on the move



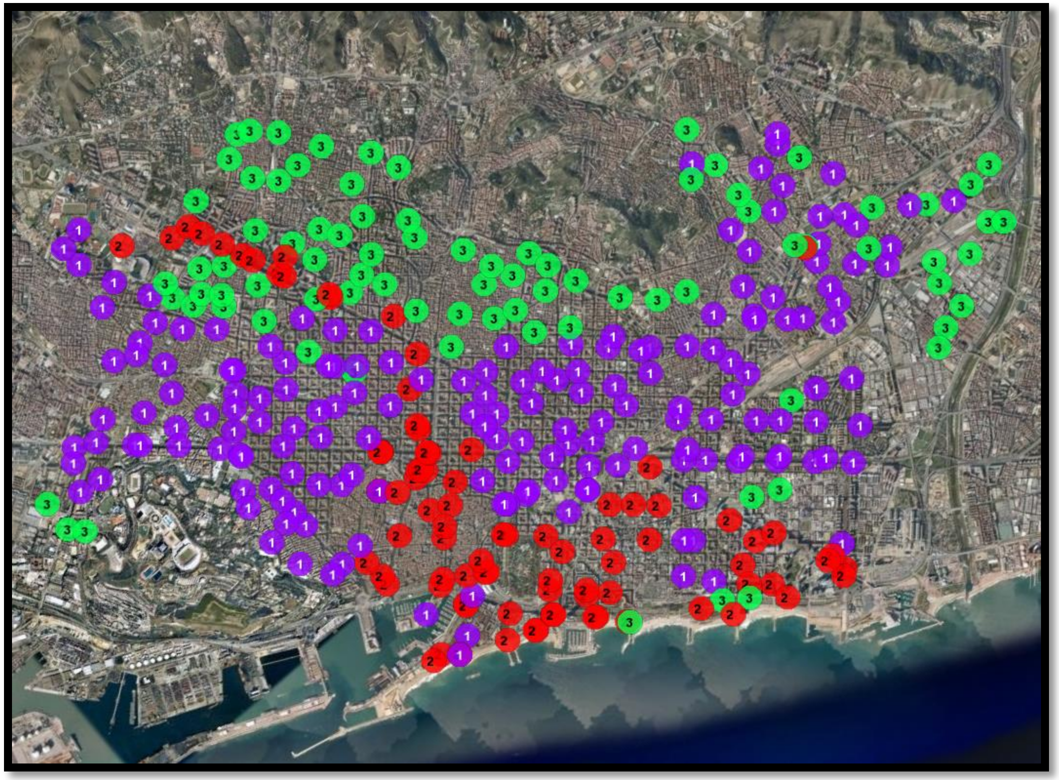
morning commute

late spanish lunch

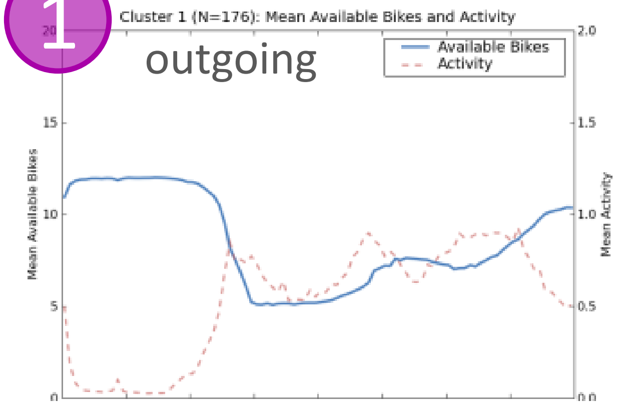
evening commute

sleeping in on weekends

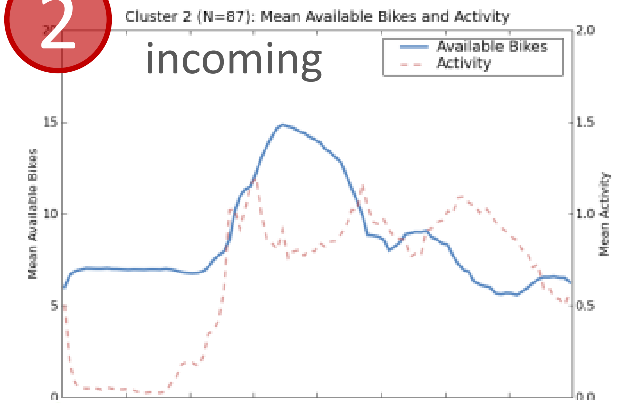
neighborhoods



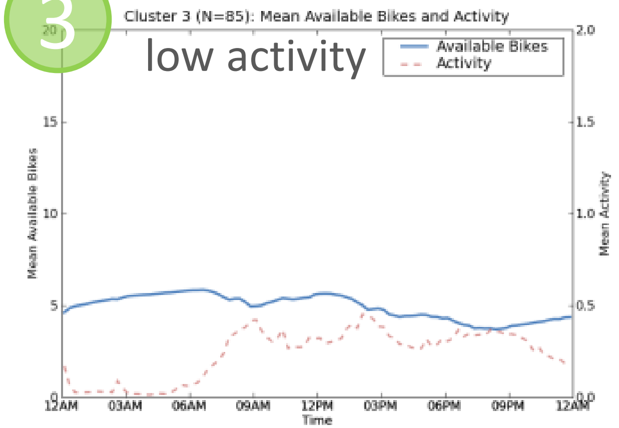
1 outgoing



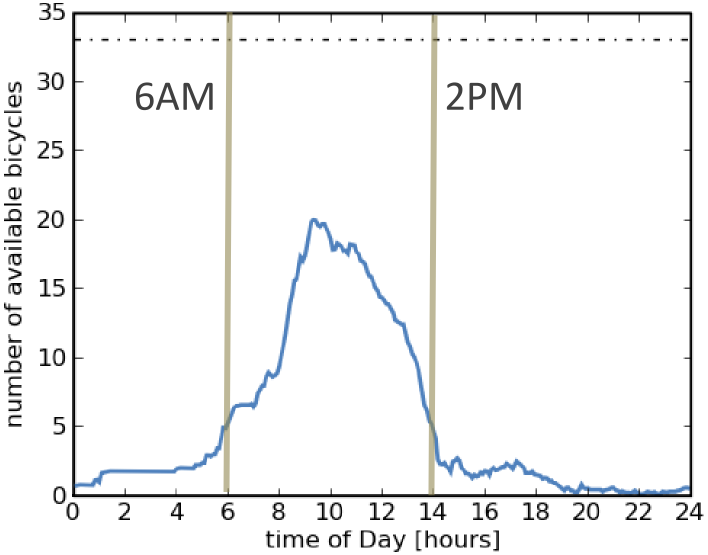
2 incoming

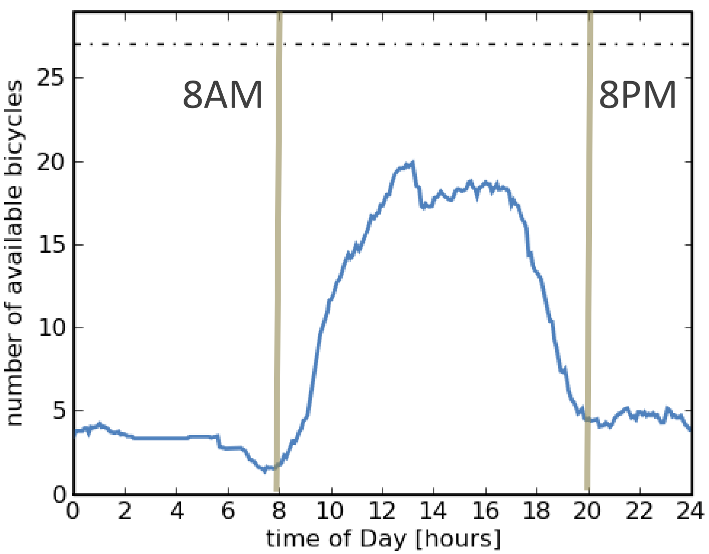


3 low activity

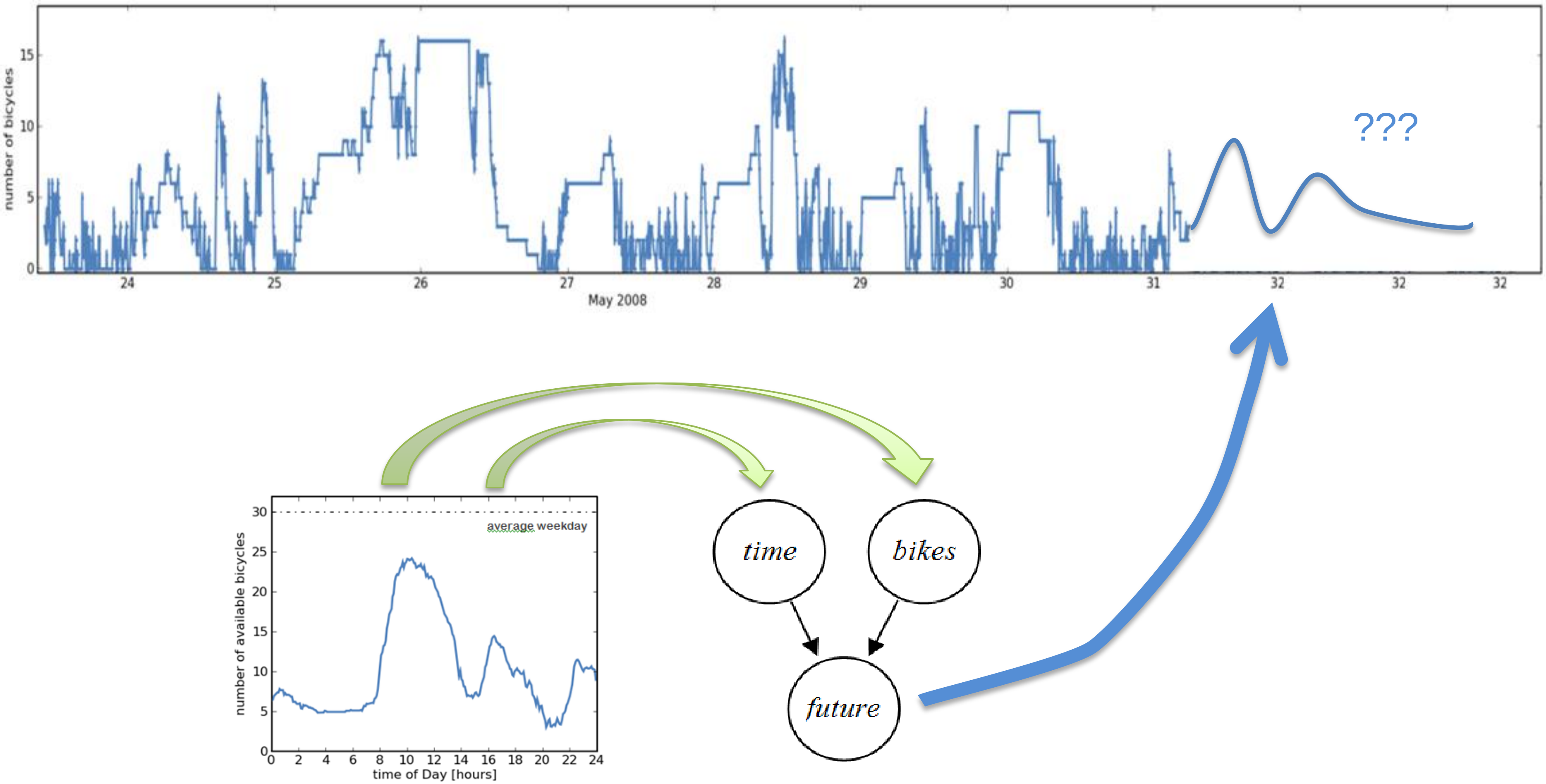


subtle differences


Commercial District (Station 203)


Beach (Station 170)

predicting human behavior

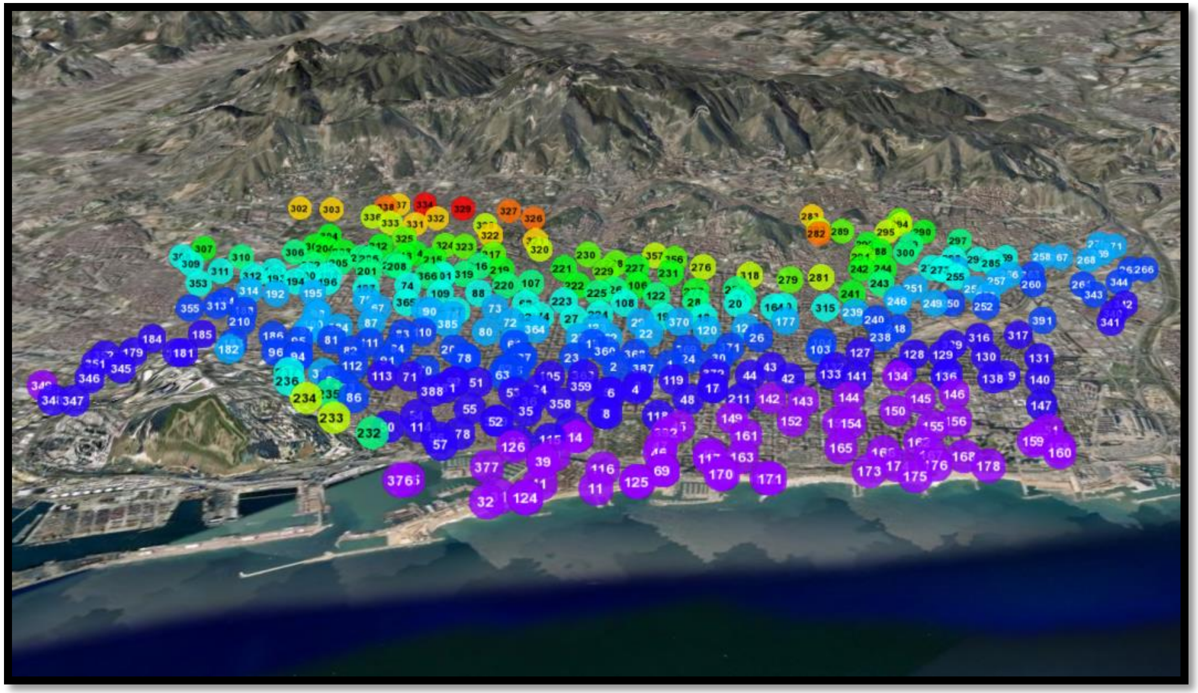


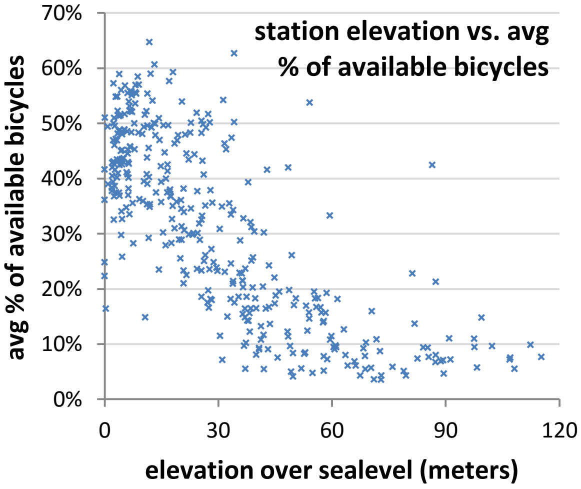
self-sustainable system

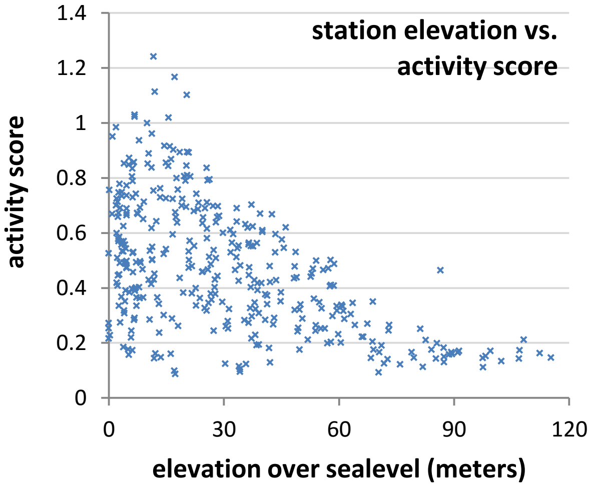
bicing
0174 FMB
ClearChannel
bicing
Servei de Manteniment
23
Ajuntament de Barcelona
ClearChannel
bicing
3209
7145

promote usage

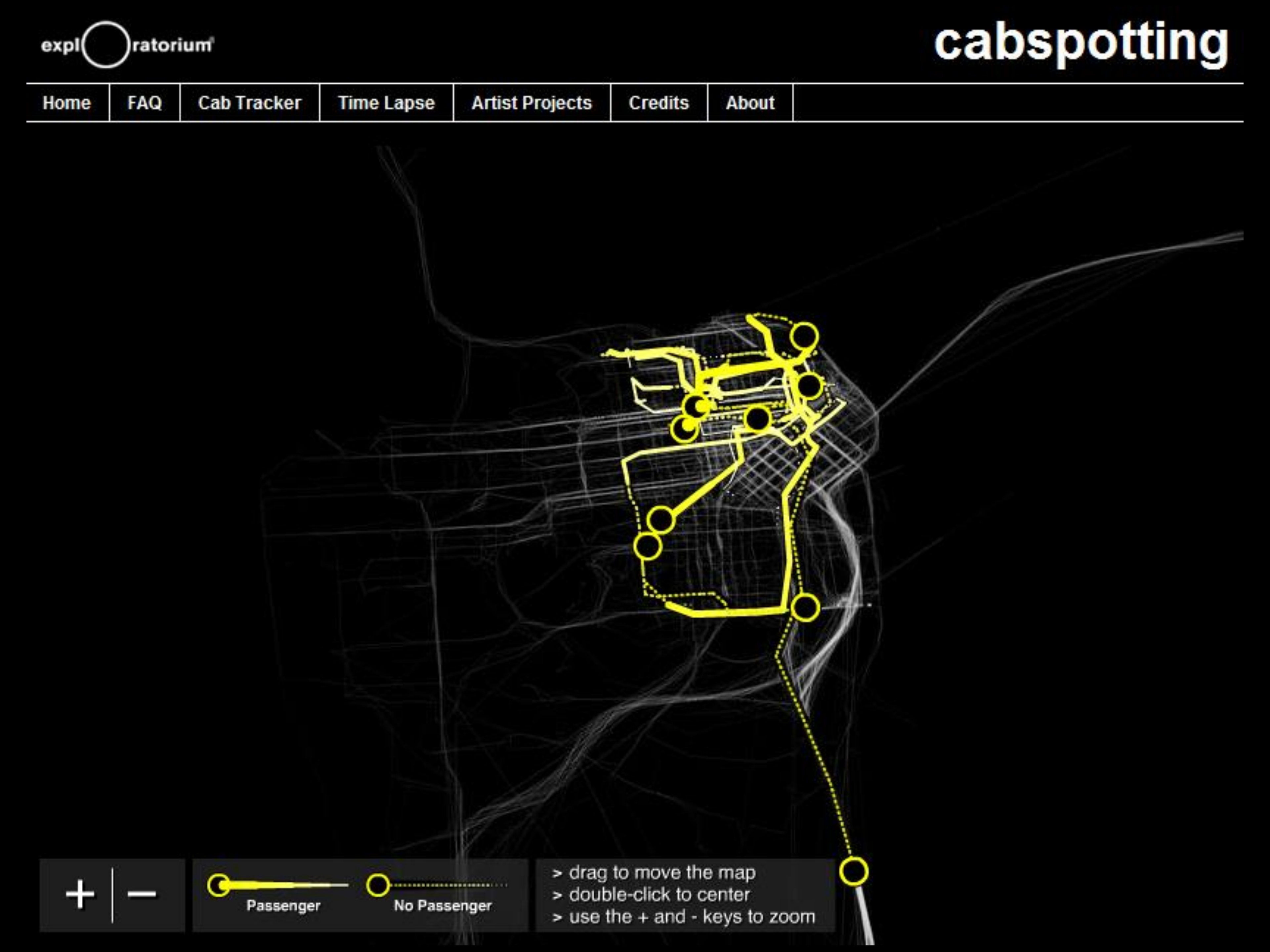
limitations...




station elevation vs. avg
% of available bicycles
avg % of available bicycles
70%
60%
50%
40%
30%
20%
10%
0%
0
30
60
90
120
elevation over sealevel (meters)

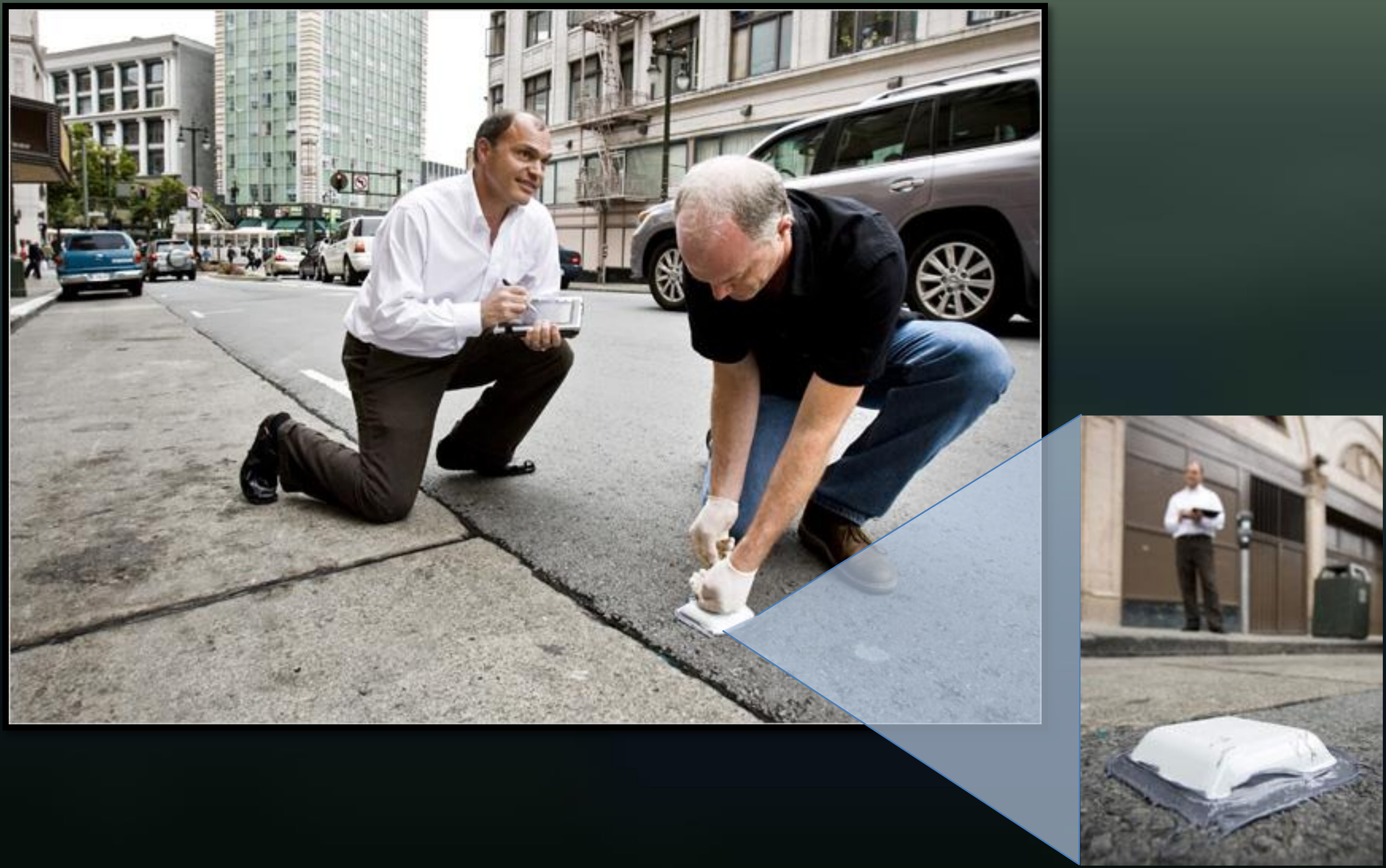


54 ALASKA JCT
3697
METRO

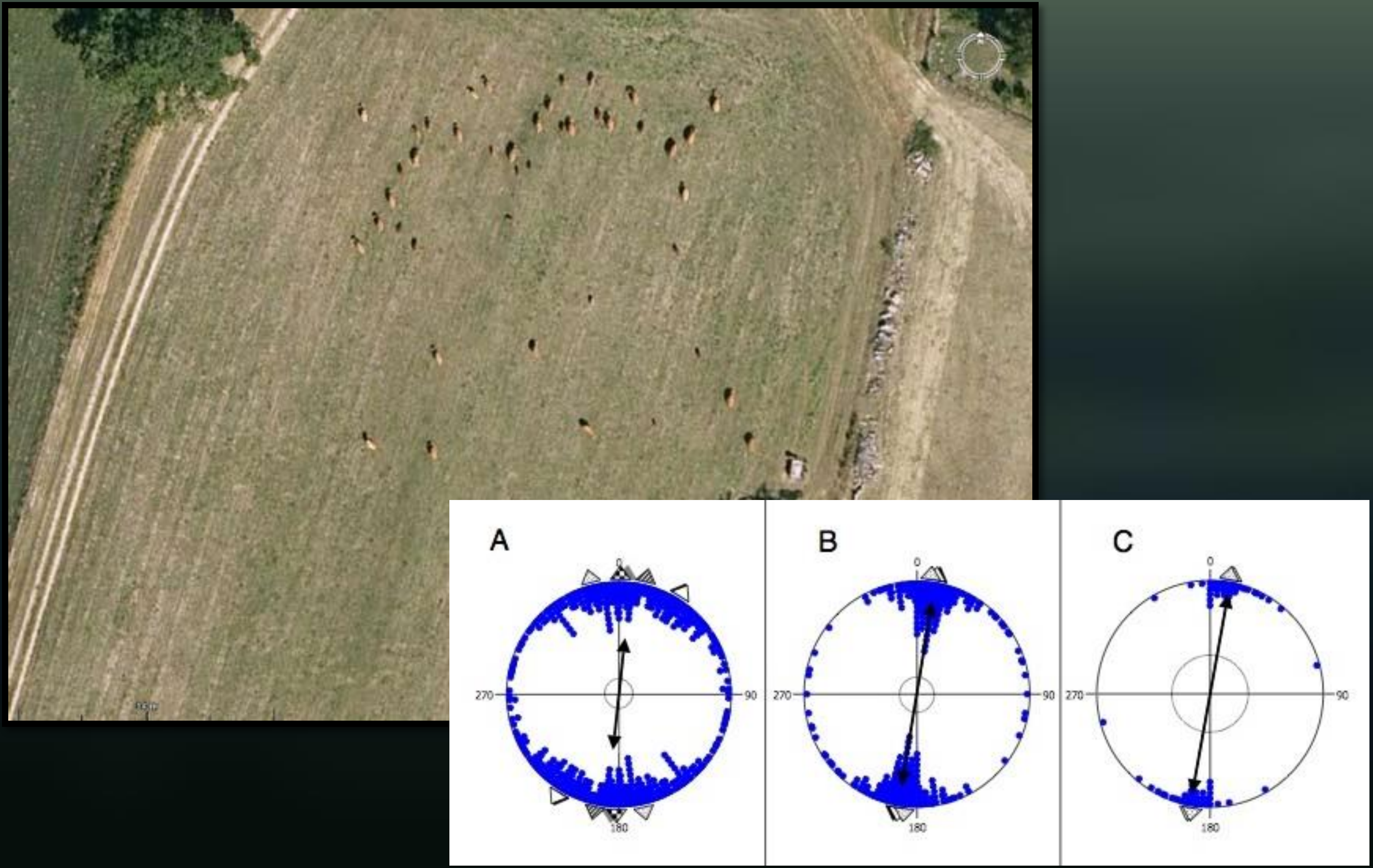

expl◯ratorium
cabspotting
Home
FAQ
Cab Tracker
Time Lapse
Artist Projects
Credits
About
+
−
Passenger
No Passenger

> drag to move the map
> double-click to center
> use the + and - keys to zoom

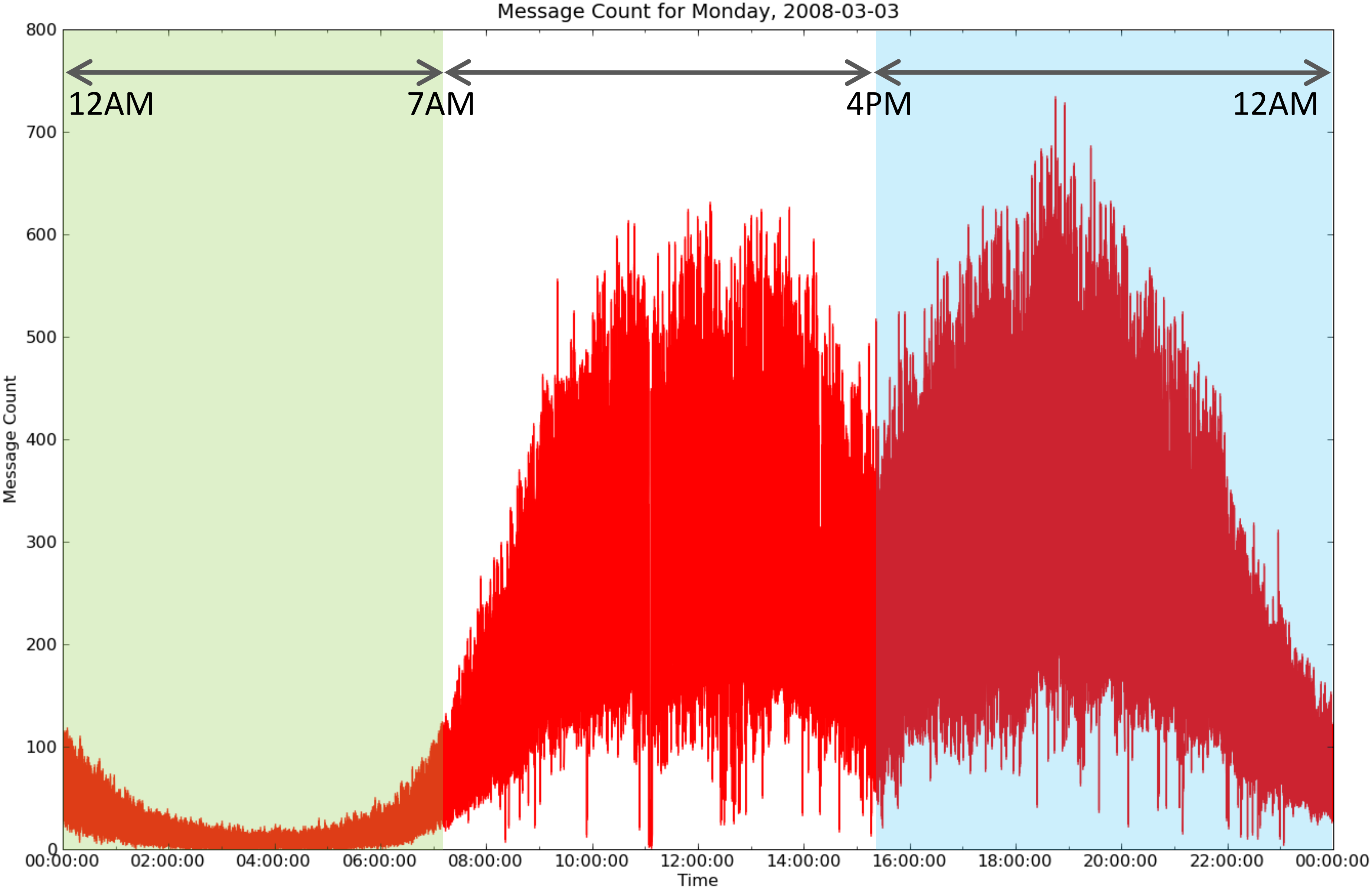
streetline: sfpark



satellite imagery



barcelona cellular network



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Titulaire d'une carte velib' 1 an ou d'un passe NAVIGO ®
Posez votre badge contre le lecteur
Titulaire d'un ticket velib' courte durée
Tapez 1
Autres choix tapez :
2 S'abonner
3
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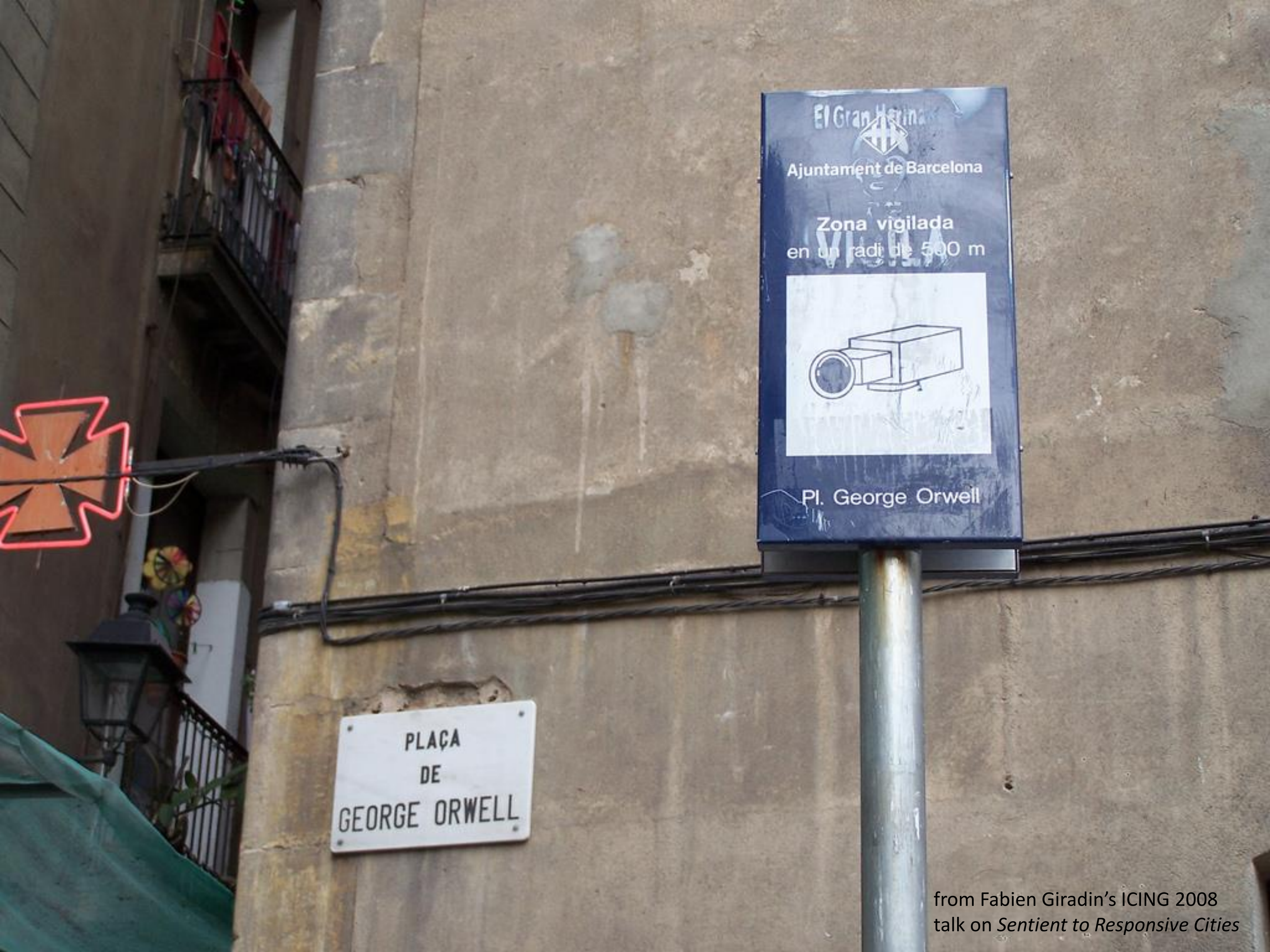
Faites un choix
Posez votre carte d'abonné sur le lecteur
RÉCÉPISSÉ
CARTE BANCAIRE

Mercure
HOTEL
AROQUINIER
AU VRAI SELLIER
velib'


Ajuntament de Barcelona
Zona vigilada
en un radi de 500 m
Pl. George Orwell
PLAÇA
DE
GEORGE ORWELL

from Fabien Giradin’s ICING 2008
talk on *Sentient to Responsive Cities*

final slide

- the digitalization of urban infrastructure can be leveraged to:
  - further our understanding of human behavior
  - create new services
- how can data sources be tied together?
- what tools/viz need to be built?
- what other sources of data await us?
- how can we protect our own traces?

Thank you!

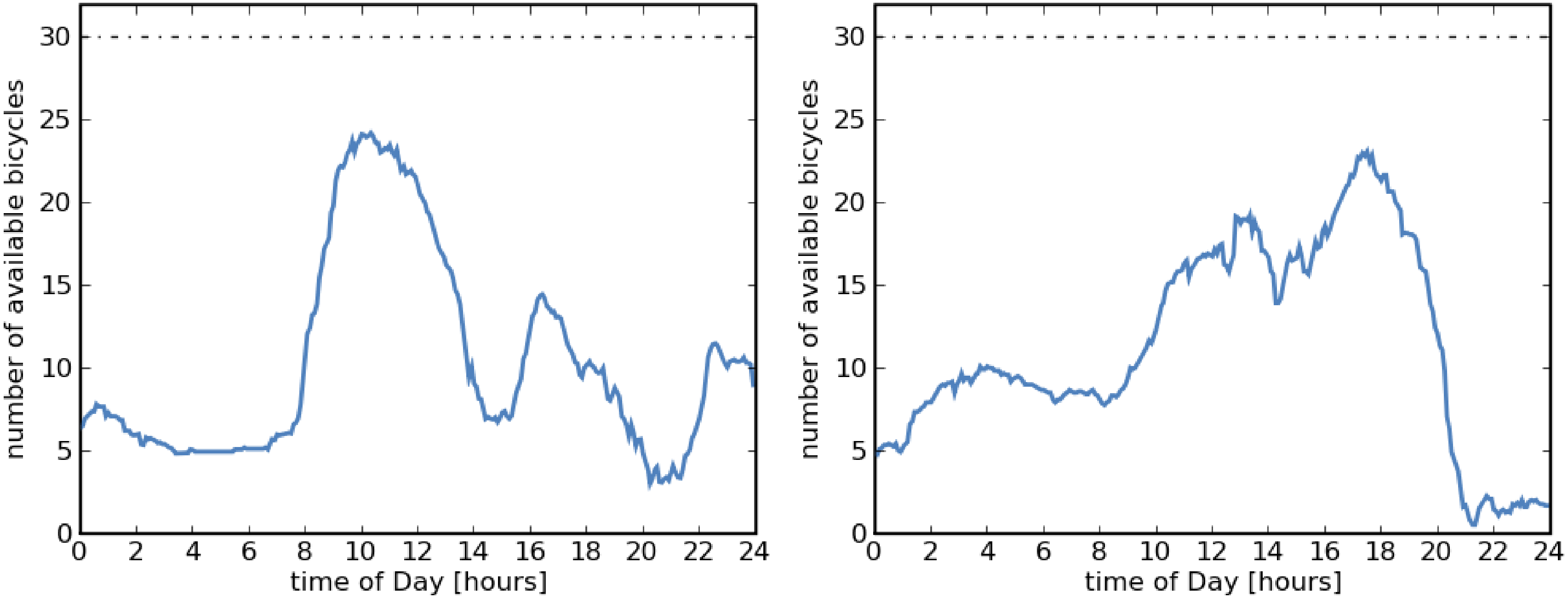
jonfroehlich@gmail.com

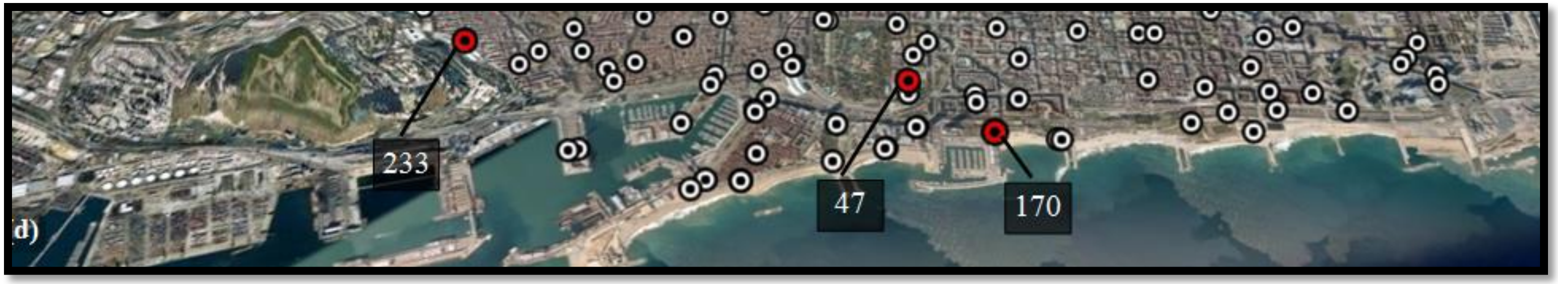
dub design: use: build:
university of washington

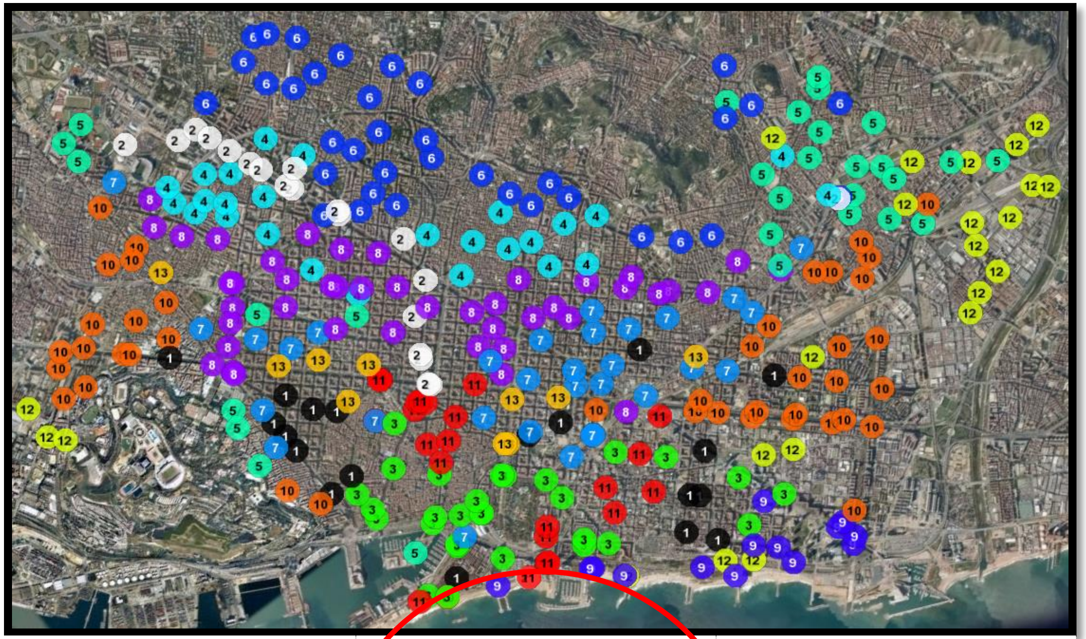
Telefonica Research

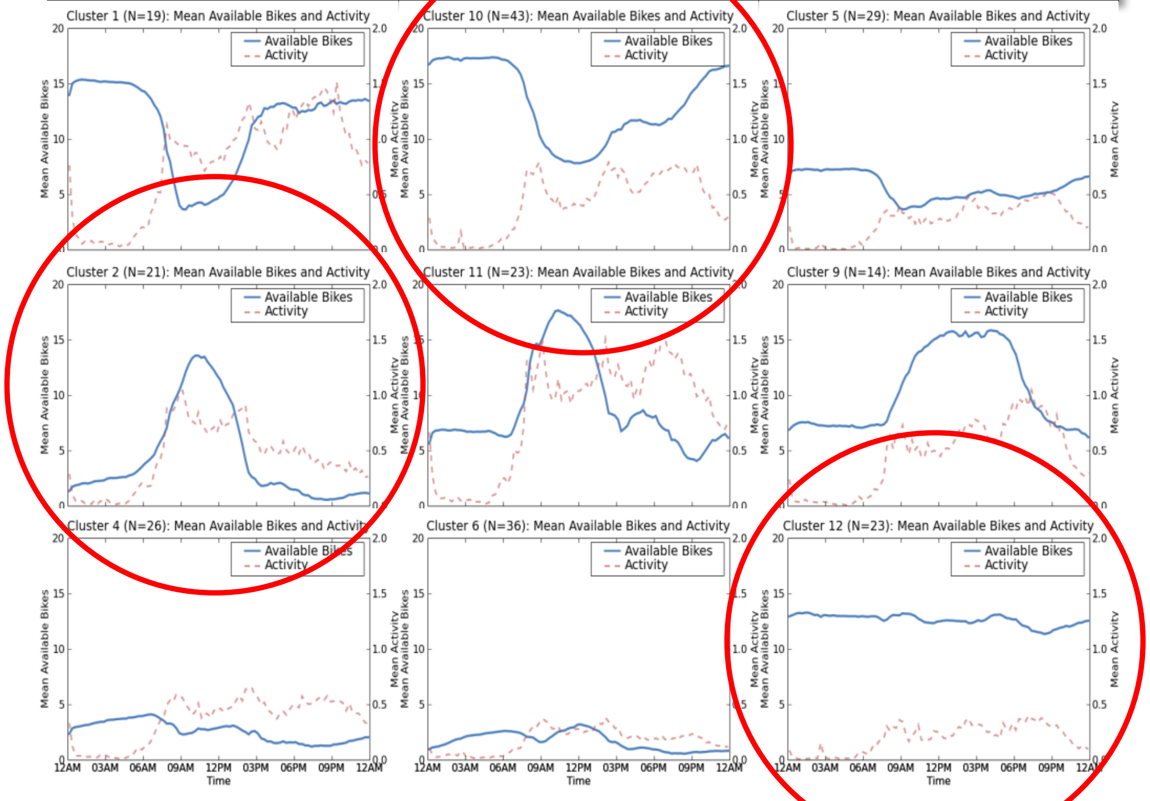
weekday vs. weekend

Station 47, Ramon Trias Fargas

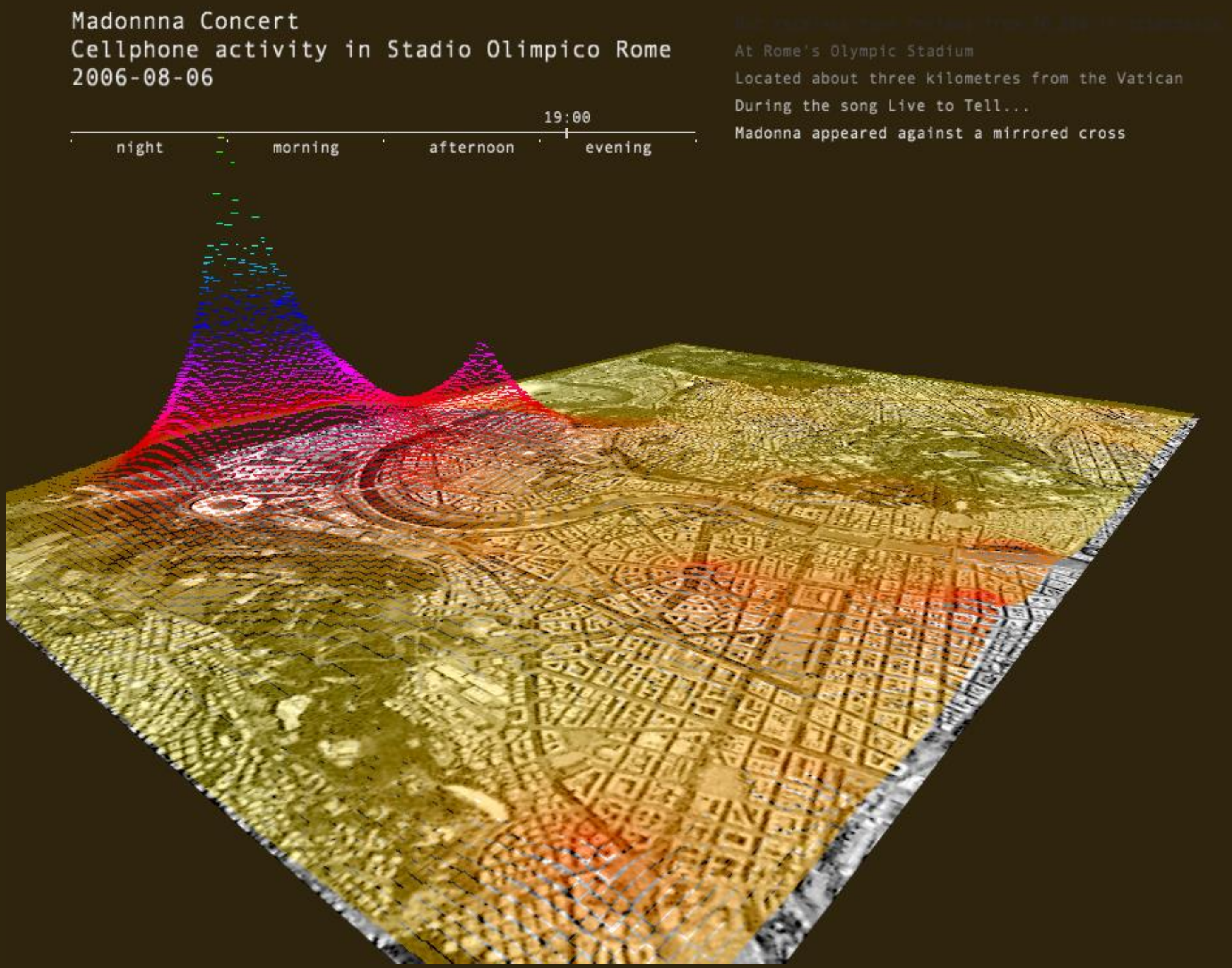







Cluster 1 (N=19): Mean Available Bikes and Activity
Cluster 10 (N=43): Mean Available Bikes and Activity
Cluster 5 (N=29): Mean Available Bikes and Activity
Cluster 2 (N=21): Mean Available Bikes and Activity
Cluster 11 (N=23): Mean Available Bikes and Activity
Cluster 9 (N=14): Mean Available Bikes and Activity
Cluster 4 (N=26): Mean Available Bikes and Activity
Cluster 6 (N=36): Mean Available Bikes and Activity
Cluster 12 (N=23): Mean Available Bikes and Activity
Available Bikes
Activity
Mean Available Bikes
Mean Activity
Time
12AM
03AM
06AM
09AM
12PM
03PM
06PM
09PM
12AM

cellular network data



Madonnna Concert
Cellphone activity in Stadio Olimpico Rome
2006-08-06

19:00
night
morning
afternoon
evening

[illegible]
At Rome's Olympic Stadium
Located about three kilometres from the Vatican
During the song Live to Tell...
Madonna appeared against a mirrored cross