Smart Cities

Carlo Ratti

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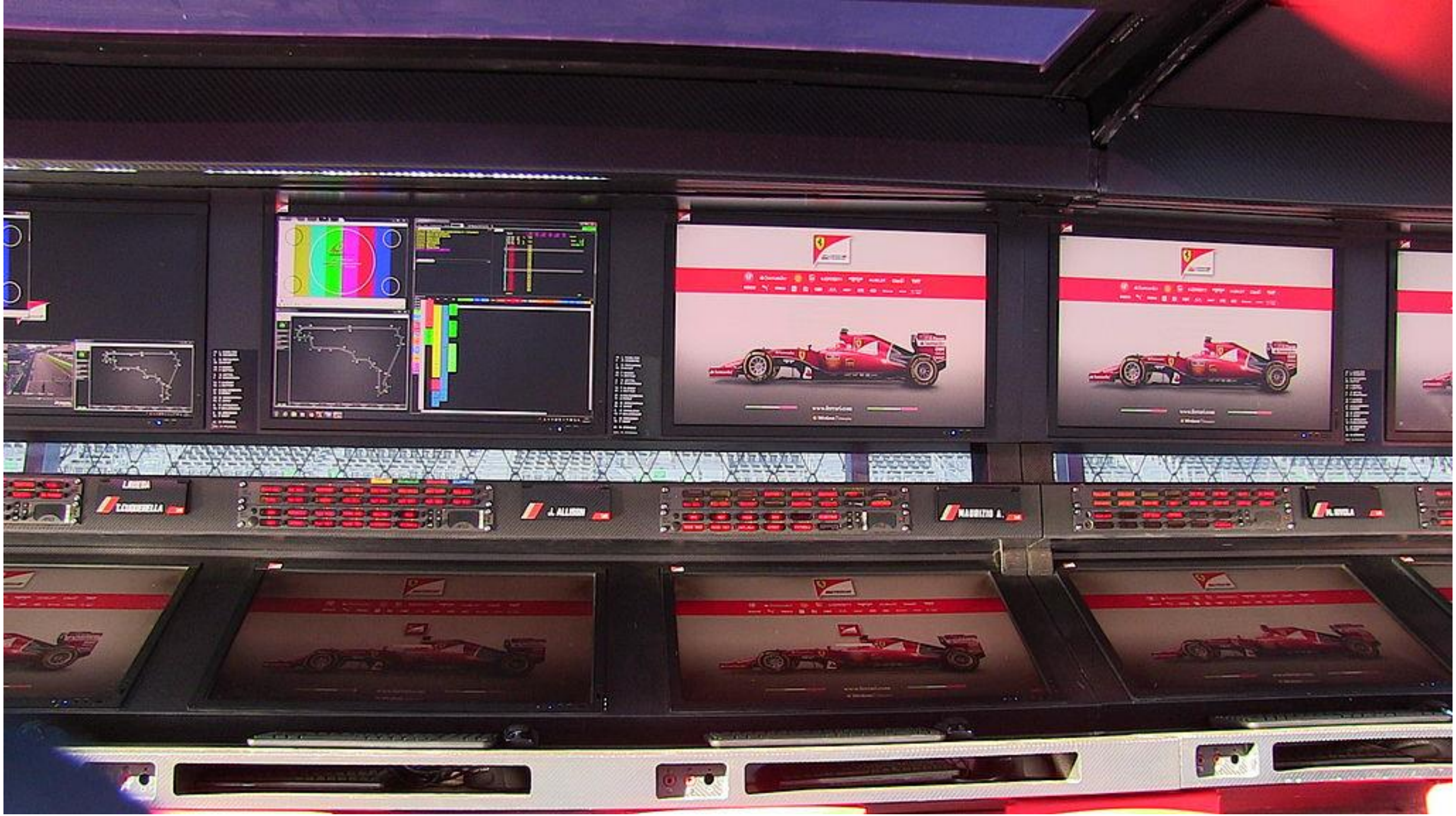
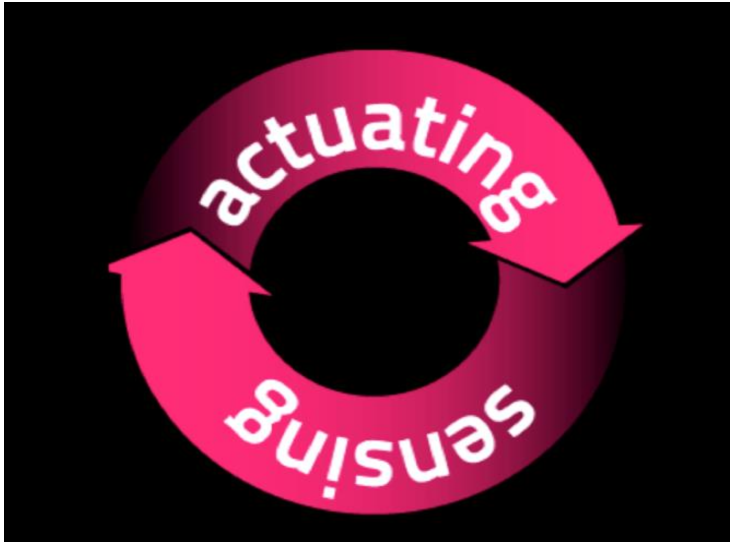
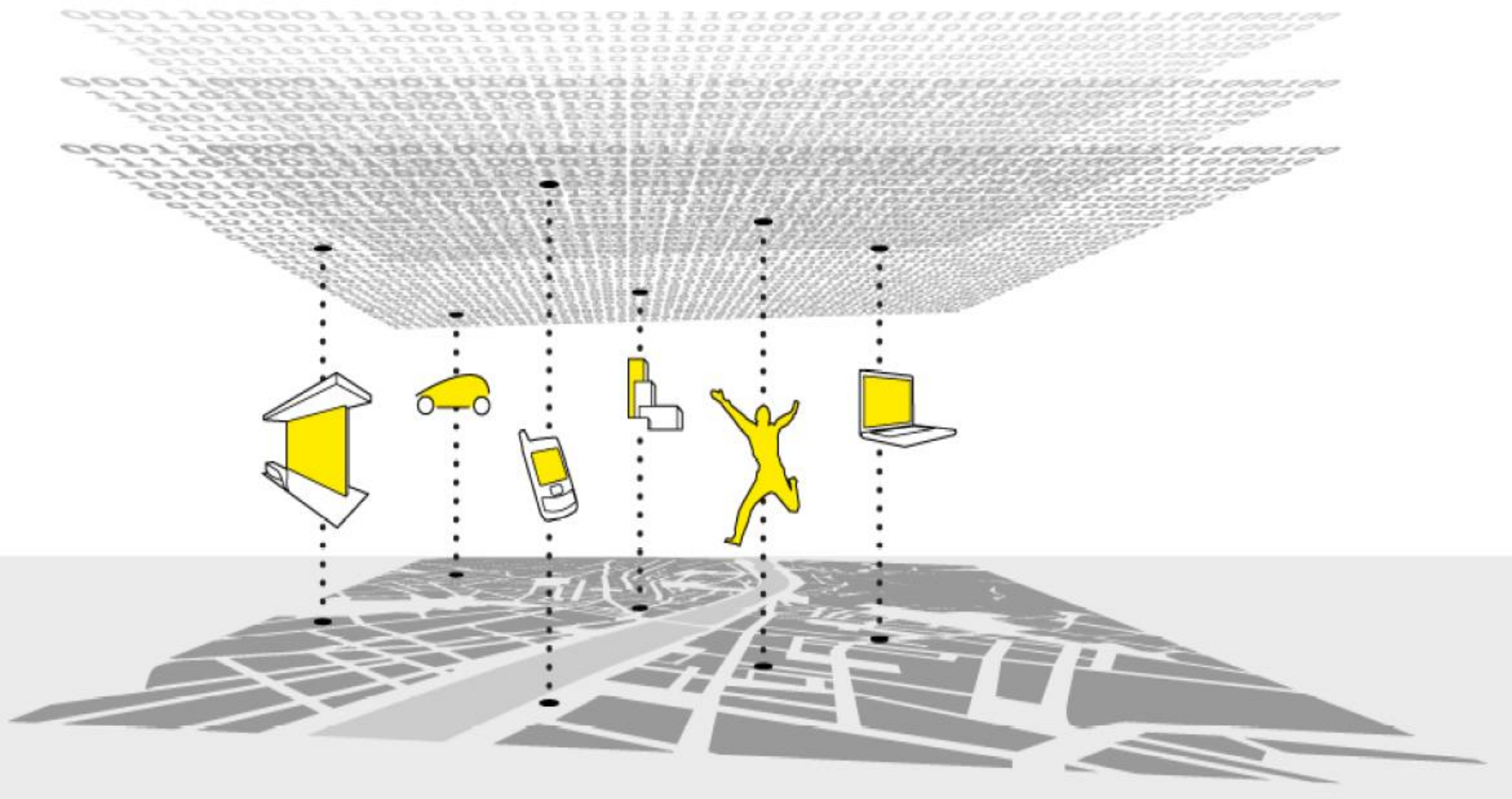
Massachusetts Institute of Technology

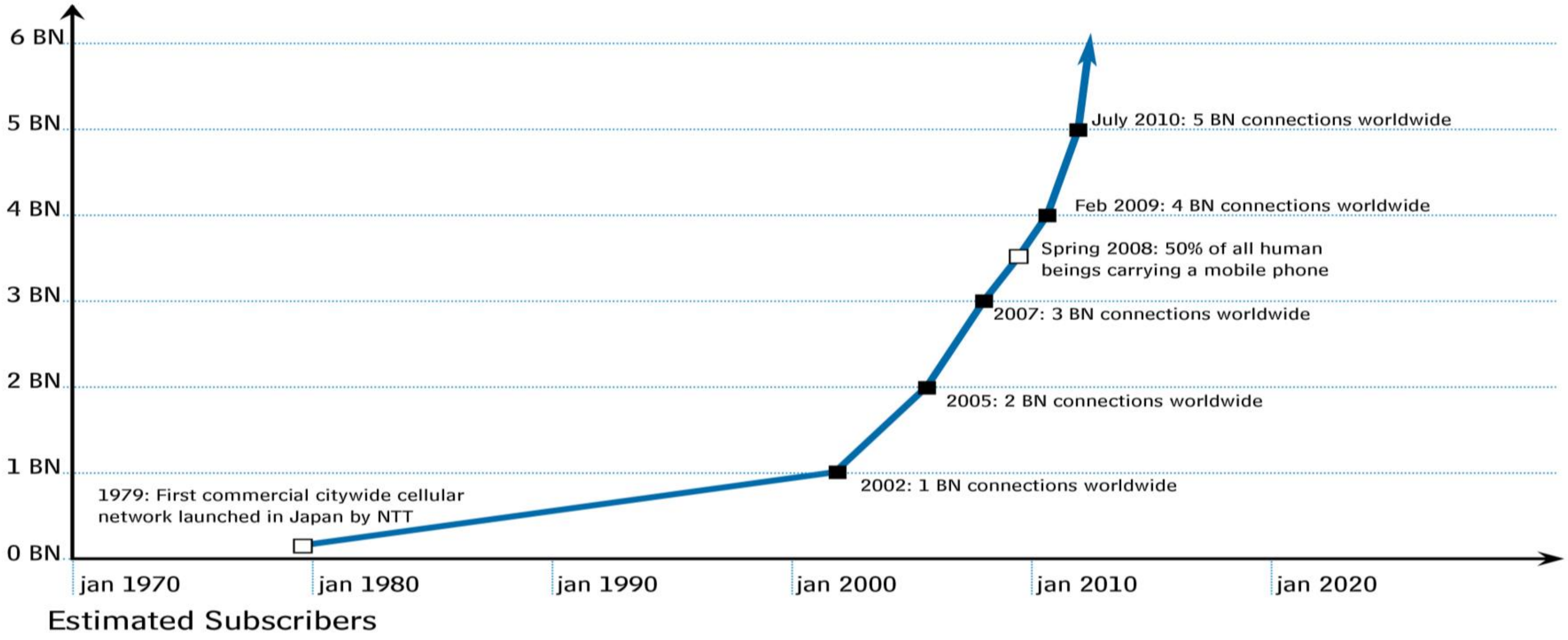
1. The city as a cyber physical system

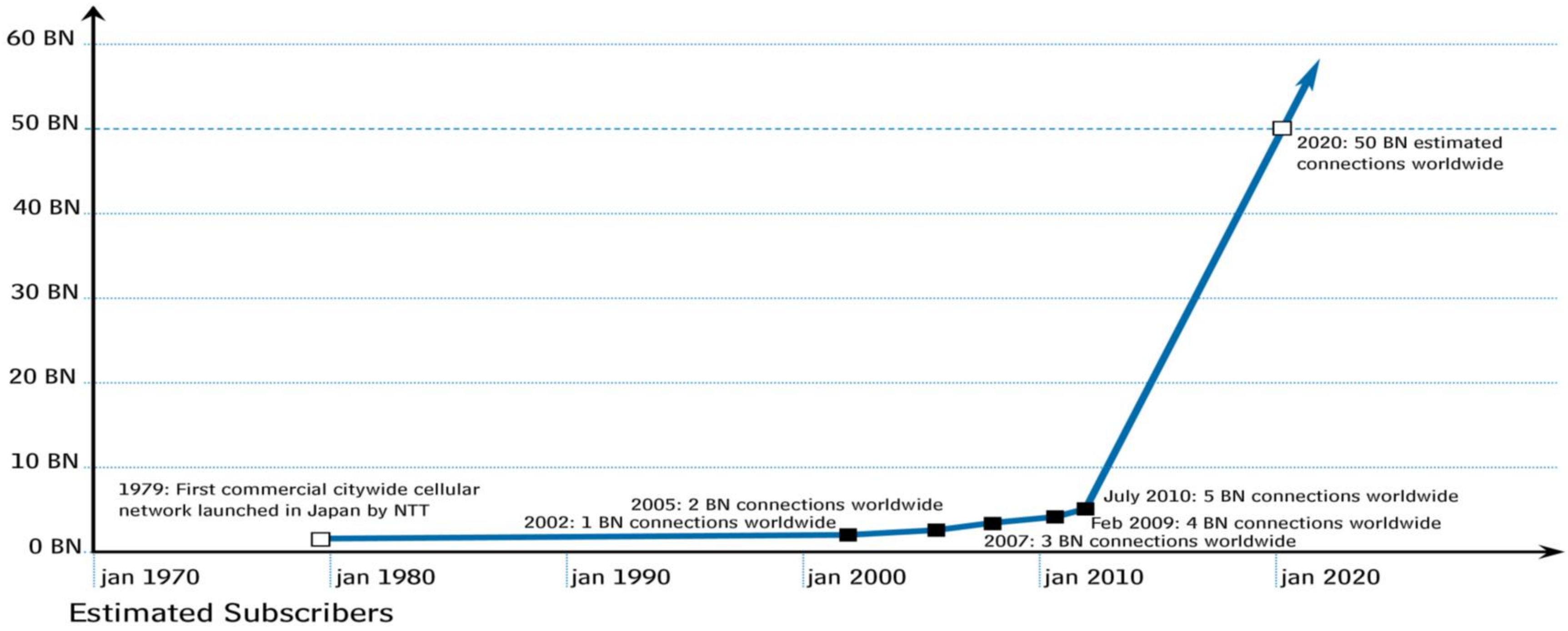

Santander
V-Power
Santander
Santander
V-Power



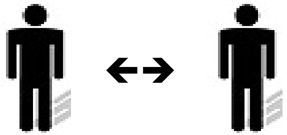

actuating
sensing




6 BN
5 BN
4 BN
3 BN
2 BN
1 BN
0 BN
July 2010: 5 BN connections worldwide
Feb 2009: 4 BN connections worldwide
Spring 2008: 50% of all human beings carrying a mobile phone
2007: 3 BN connections worldwide
2005: 2 BN connections worldwide
2002: 1 BN connections worldwide
1979: First commercial citywide cellular network launched in Japan by NTT
jan 1970
jan 1980
jan 1990
jan 2000
jan 2010
jan 2020
Estimated Subscribers


60 BN
50 BN
40 BN
30 BN
20 BN
10 BN
0 BN
2020: 50 BN estimated connections worldwide
1979: First commercial citywide cellular network launched in Japan by NTT
2005: 2 BN connections worldwide
2002: 1 BN connections worldwide
July 2010: 5 BN connections worldwide
Feb 2009: 4 BN connections worldwide
2007: 3 BN connections worldwide
jan 1970
jan 1980
jan 1990
jan 2000
jan 2010
jan 2020
Estimated Subscribers


NOKIA



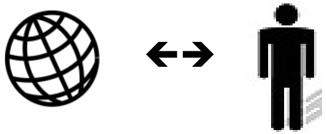


Photo by Vernon Chan, 2012

Photo by mustang255, 2009


CE0168
UC864-E
TYPE : UC864
Made in Korea
By Telit Wireless Solutions

End 1

2. Sensing the city

Big Data…

The amount of data produced from the dawn of civilization up until 2003 can be estimated in five exabytes. According to Google’s executive chairman Eric Schmidt, “today that same amount is created every two days” (http://techcrunch.com/2010/08/04/schmidt-data/, 2010).

Big Data…

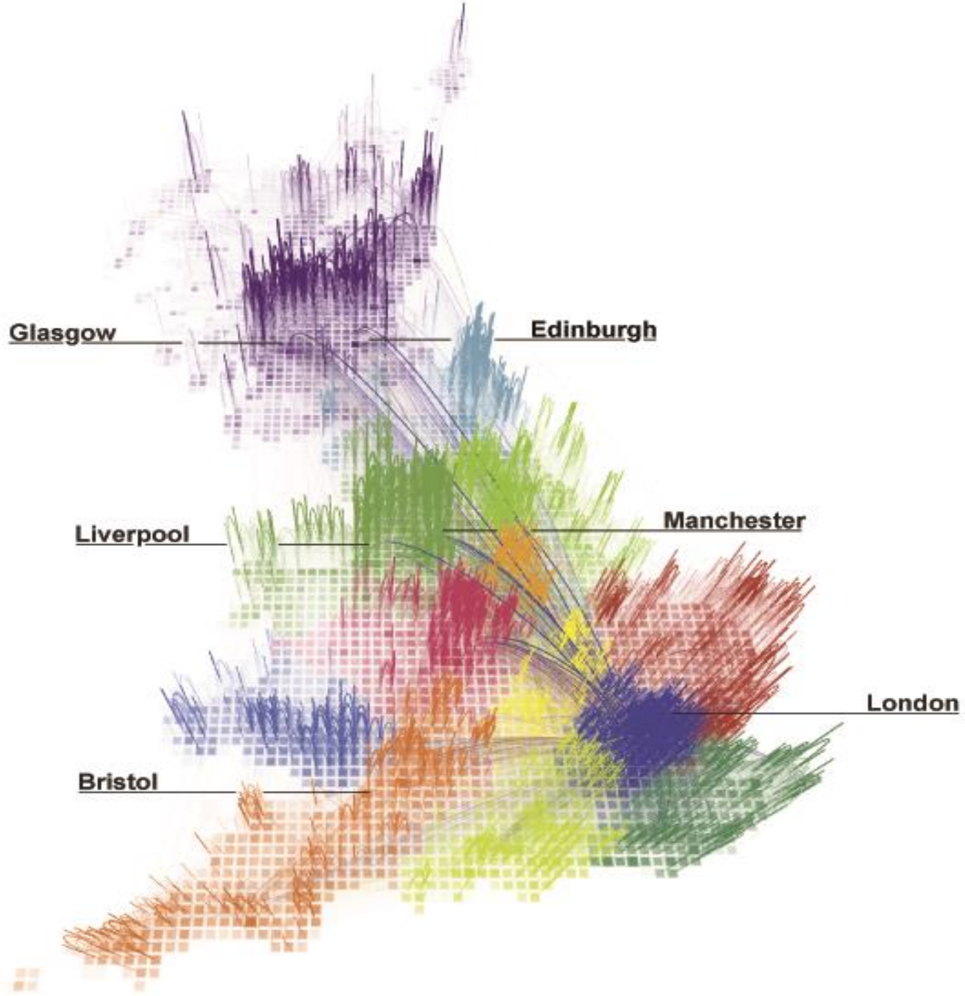
Big data is what you cannot put in an Excel spreadsheet

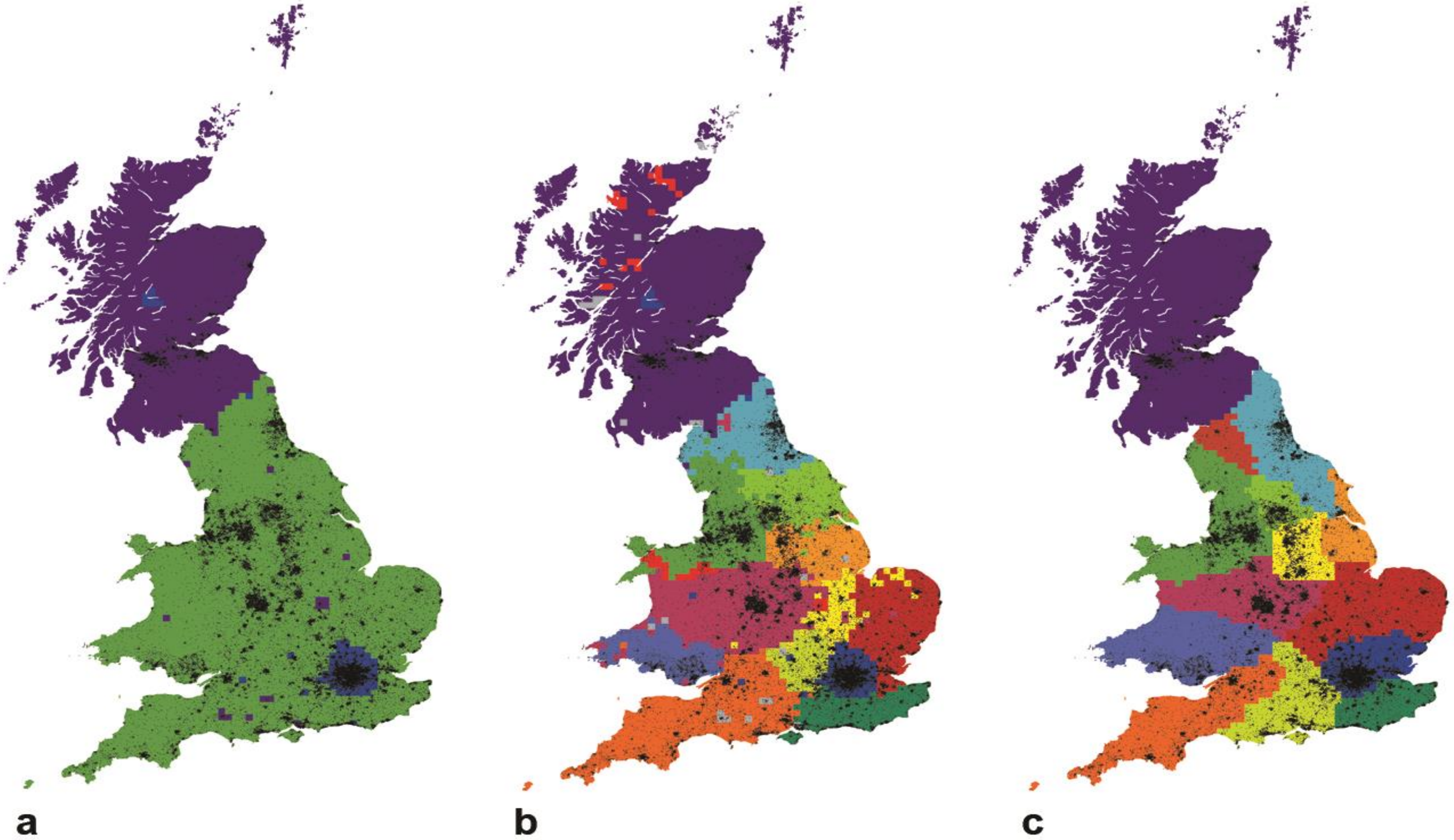
Big Data

/ opportunistic
/ user generated
/ purposely sensed

End 2

3. Opportunistic data


Glasgow
Edinburgh
Manchester
Liverpool
London
Bristol


a
b
c

DATA POINTS CARLO RATTI

Phone-Call Cartography

Carlo Ratti is the director of the M.I.T. SENSEable City Lab.

AMERICANS are more connected now than ever. Mobile phones allow people to maintain relationships with friends, family and colleagues across long distances.

If you analyze aggregated cellphone traffic — as researchers at M.I.T., AT&T and I.B.M. did with United States data from July of last year — interesting patterns emerge.

Cities become connective hubs as people move to them from nearby counties and from far across the country. As a result, many calls originate and end in cities, connecting urban citizens to their families back home.

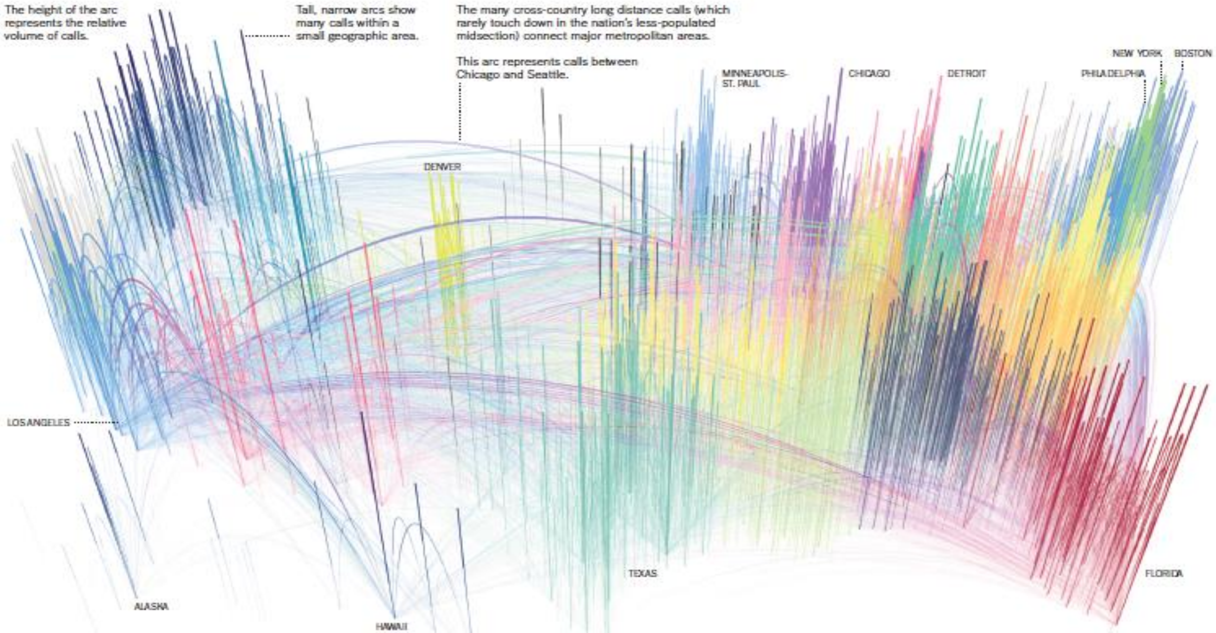
At the same time, communities emerge that have little to do with geographic boundaries. While some follow state lines, others split states in half or combine them.

There are sister states like Georgia and Alabama, and Mississippi and Louisiana. New Jersey and California, on the other hand, split in half because of the influences of large cities. Chattanooga, Tenn., communicates more with the Georgia-Alabama community than with the rest of Tennessee, and Pittsburgh splits from Pennsylvania to align with West Virginia. Texas remains whole, because the communication among Dallas, Houston, San Antonio and Austin is strong enough to hold it together.

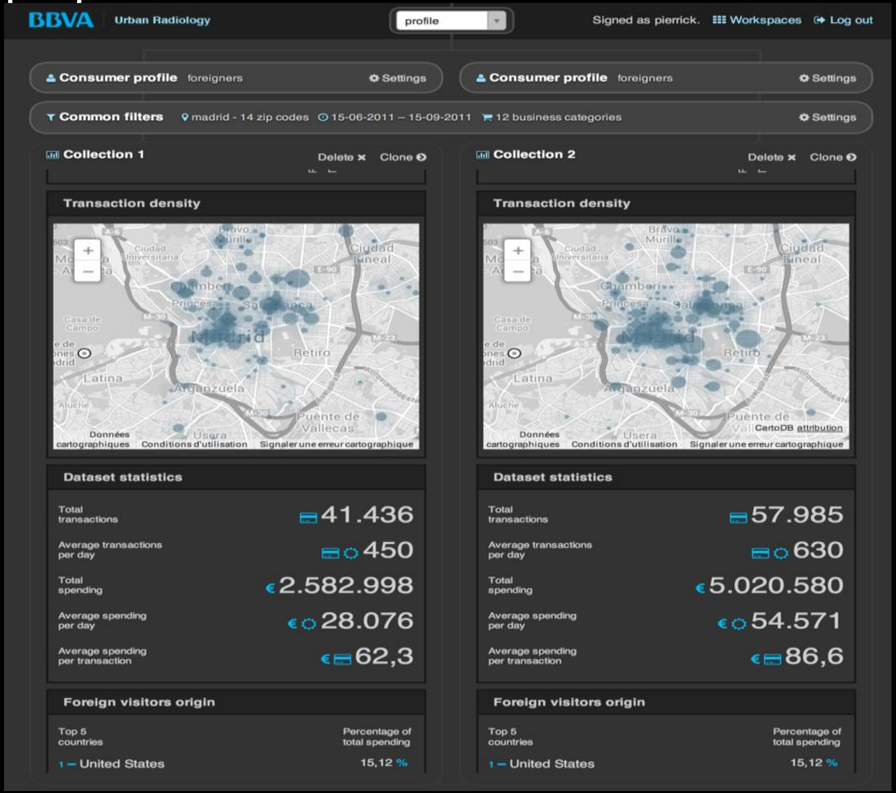
These patterns show that proximity is only one of many factors — both cultural and economic — that bring people together.

COMMUNITIES
Calling patterns reveal communities that don't necessarily correspond to geographic borders. Some follow state lines and others split states in half or combine them.

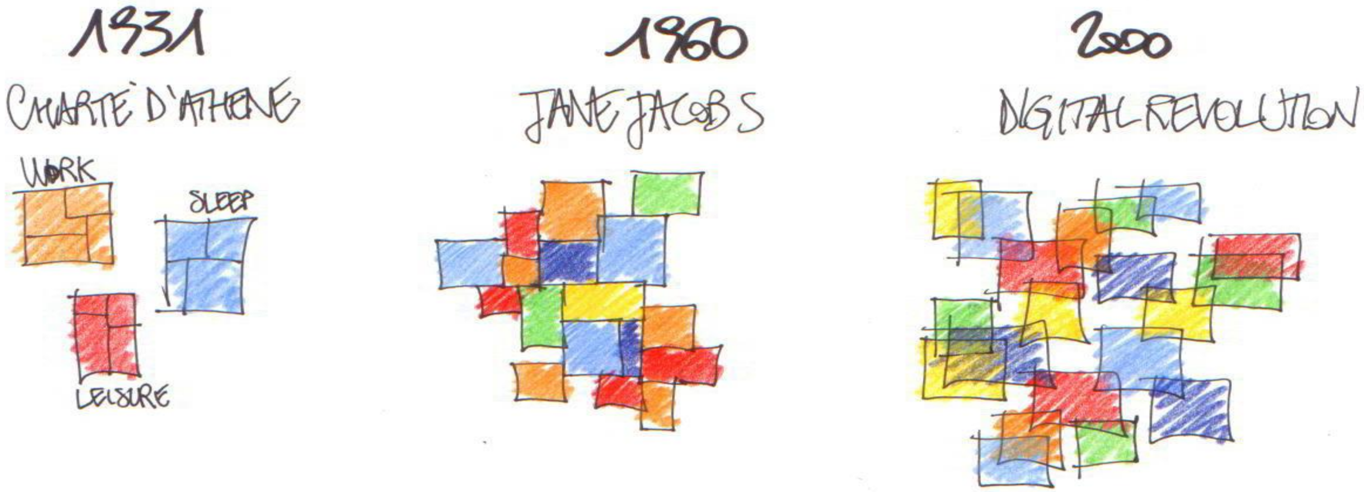
COMMUNICATION
This map shows the mobile connections between people, with each arc representing thousands of phone calls. The color of each arc is a mix between the colors of the communities on either end of the calls, corresponding to the map above.



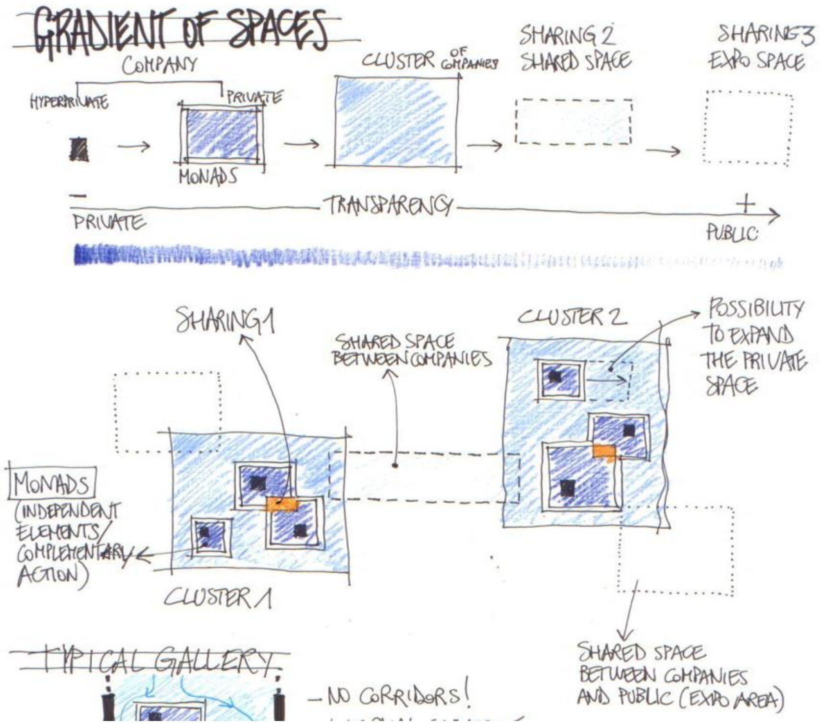
Urban Radiology project

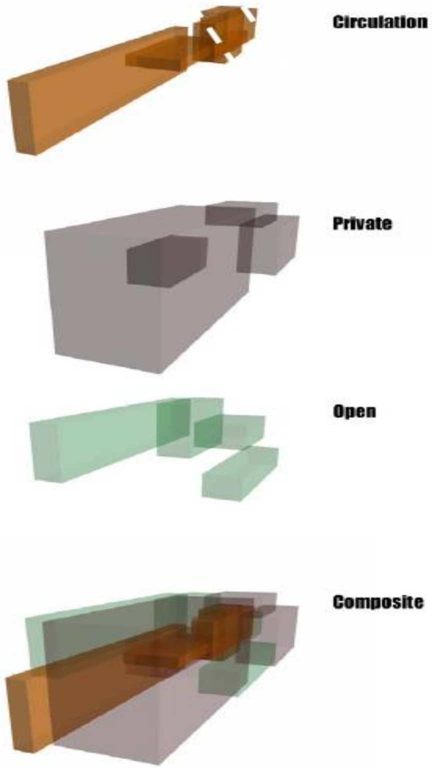


Running prototype (2013)
Now being developed as a product



1931
CHARTE D'ATHENE
WORK
SLEEP
LEISURE
1960
JANE JACOBS
2000
DIGITAL REVOLUTION


GRADIENT OF SPACES
COMPANY
HYPERPRIVATE
PRIVATE
MONADS
CLUSTER OF COMPANIES
SHARING 2
SHARED SPACE
SHARING 3
EXPO SPACE
−
TRANSPARENCY
+
PRIVATE
PUBLIC
SHARING 1
SHARED SPACE BETWEEN COMPANIES
CLUSTER 2
POSSIBILITY TO EXPAND THE PRIVATE SPACE
MONADS
(INDEPENDENT ELEMENTS/ COMPLEMENTARY ACTION)
CLUSTER 1
TYPICAL GALLERY
– NO CORRIDORS!
SHARED SPACE BETWEEN COMPANIES AND PUBLIC (EXPO AREA)


Circulation
Private
Open
Composite

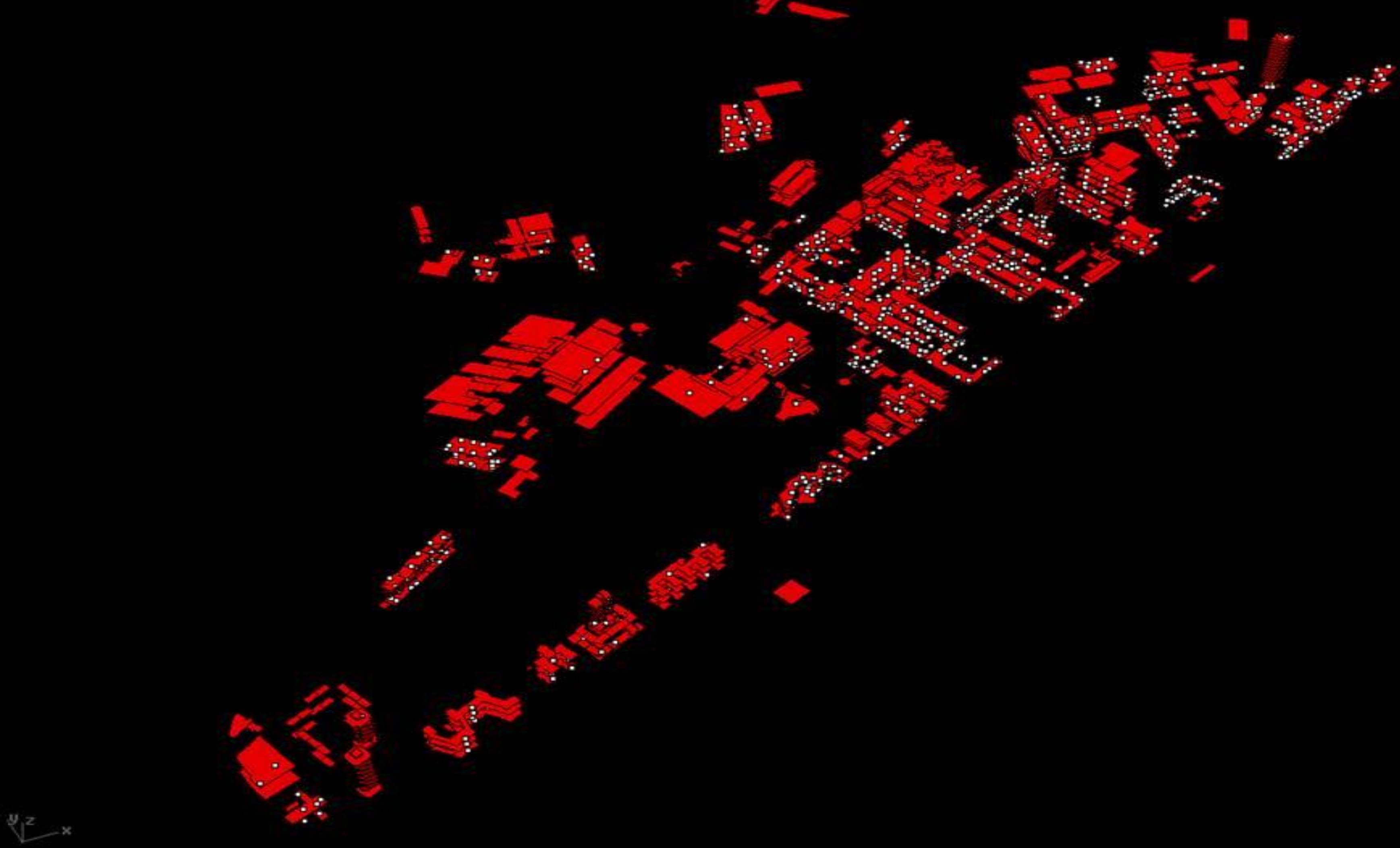
MIT campus
Location: Boston, MA
Area: 168 acres
People: 10,320 students and 9, 414 total employees
Buildings: over 190

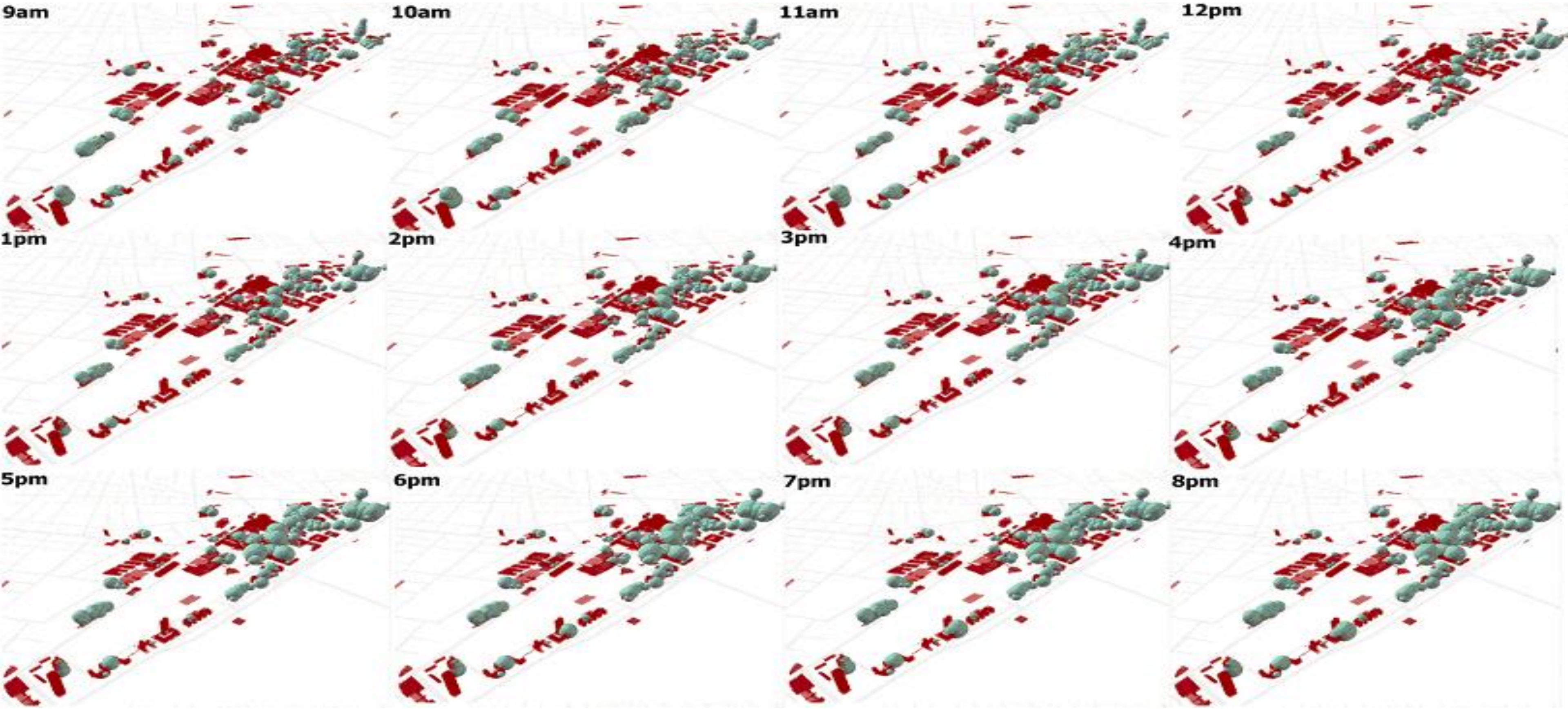
WiFi ™

ZONE

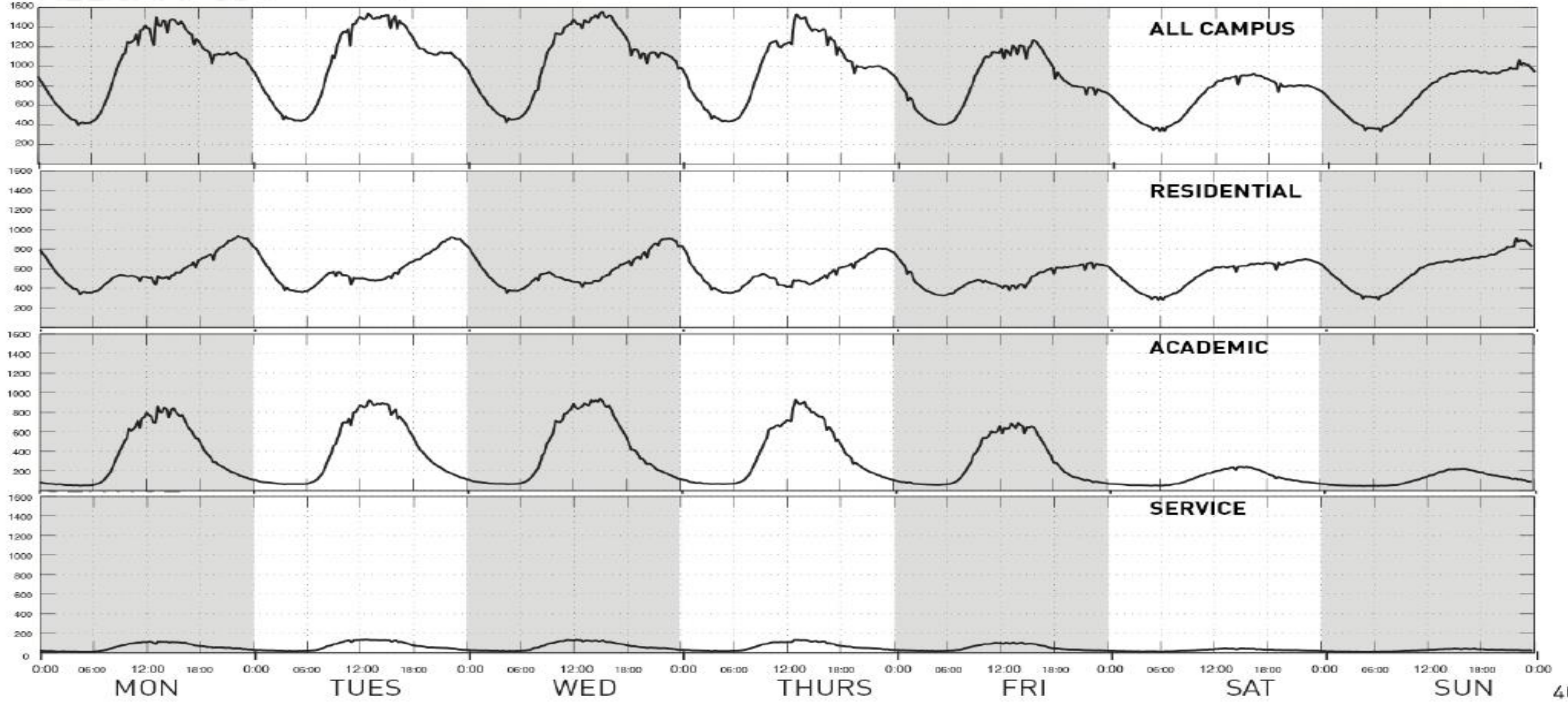
before

after



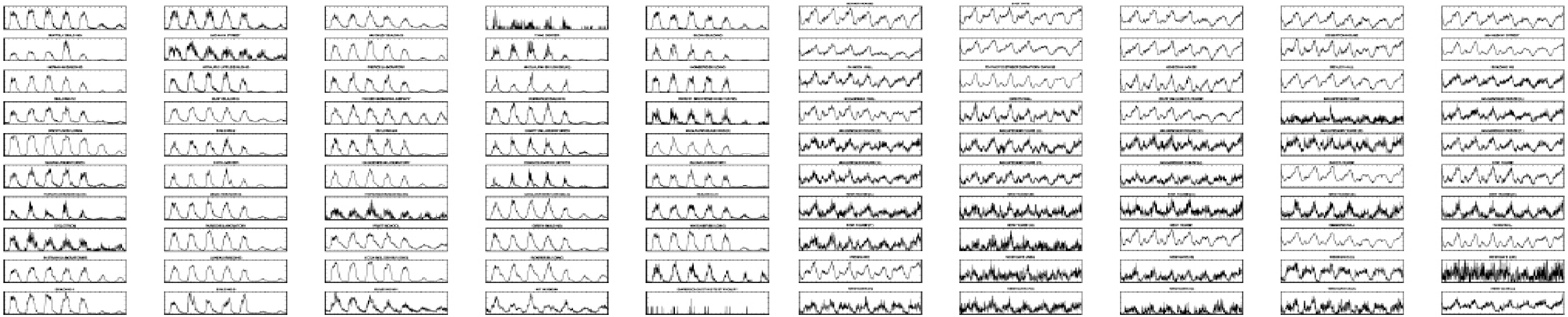

9am
10am
11am
12pm
1pm
2pm
3pm
4pm
5pm
6pm
7pm
8pm

Summary slide of the signals from the three program types discussed earlier - compared to the signature of the entire campus. The user number is the average weekly number of people connecting to the internet via WiFi.

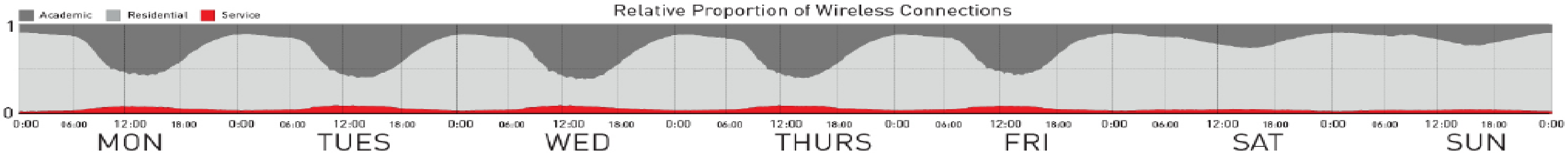


3. MIT CAMPUS

The average weekly WiFi signals from individual buildings give us a fingerprint of each building. Can these be correlated (calibrated?) to the type of people living in particular dorms? Do physicists have different WiFi usage than chemists?



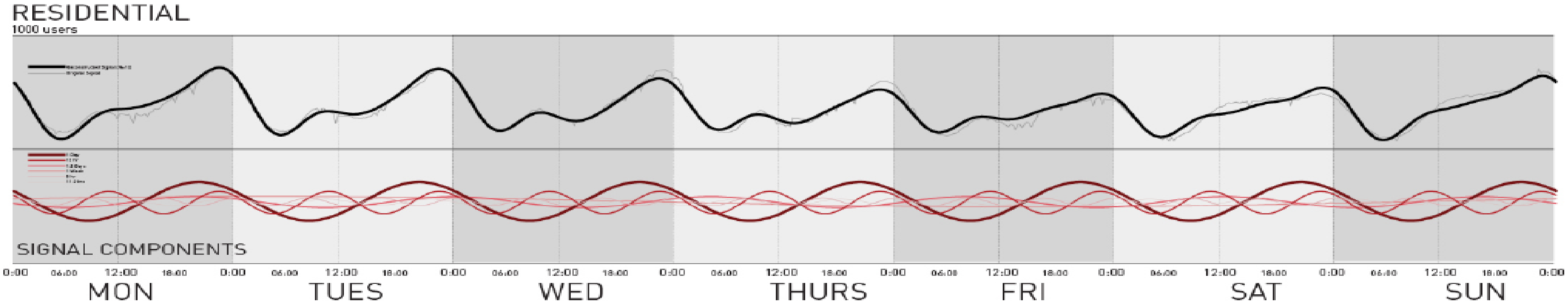
Calculating the average relative proportions of total WiFi connections among the three program types (academic/residential/service) over the course of a week revels characteristic WiFi behavior in the three program types. Although the service building WiFi use is much lower than the two other program types, in general, the service and academic buildings show a similar increase in WiFi use during normal daylight hours, while the residential use increases at night. This difference diminishes during the weekend.

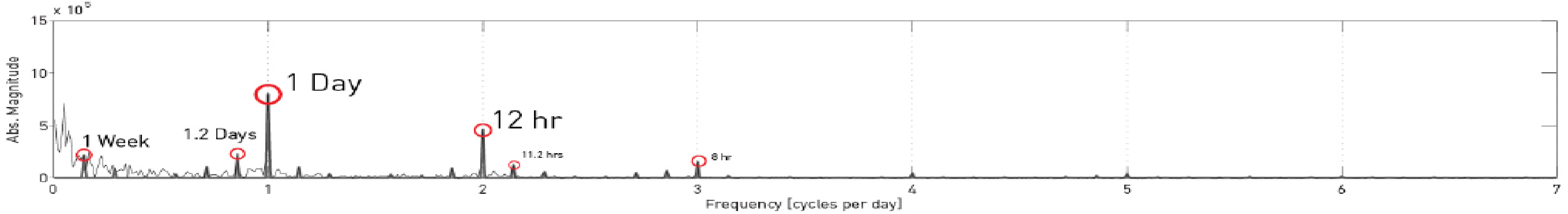


3.1 MIT FFT

Taking an FFT of the average weekly time series allows us to separate the WiFi signatures into individual components. Shown below are the original signature, the reconstructed signature, the six frequencies used to reconstruct the synthetic time series, and the spectral graph of the original time series. The thickness and color of the individual components are a function of the magnitude of the frequency shown in the lowermost plot. The primary frequencies for residential buildings correspond to periods of 1 day, 12 hours, 1.2 days, 8 hours, and 1 week. The diurnal cycle is as expected for people who sleep at night and work during the day. The 12hr and 8hr periods correspond to daily activities such as going to class and accessing the internet in the evening. Note the largest WiFi signal comes just before midnight. Since these are mostly students in dorms, it is not surprising.

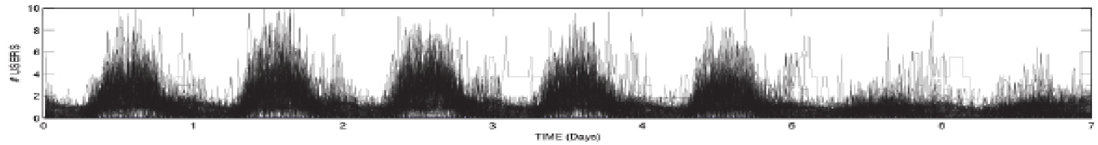
As can be seen below, the FFT technique is ideal for characterizing and extracting fundamental components of periodic behavior. Is a city periodic? I would say yes - it is governed by cycles and thus, unlike the eigenvector technique which is more interested in canonical forms (periodic or not), tends to make a ot of intuitive sense for urban analysis.

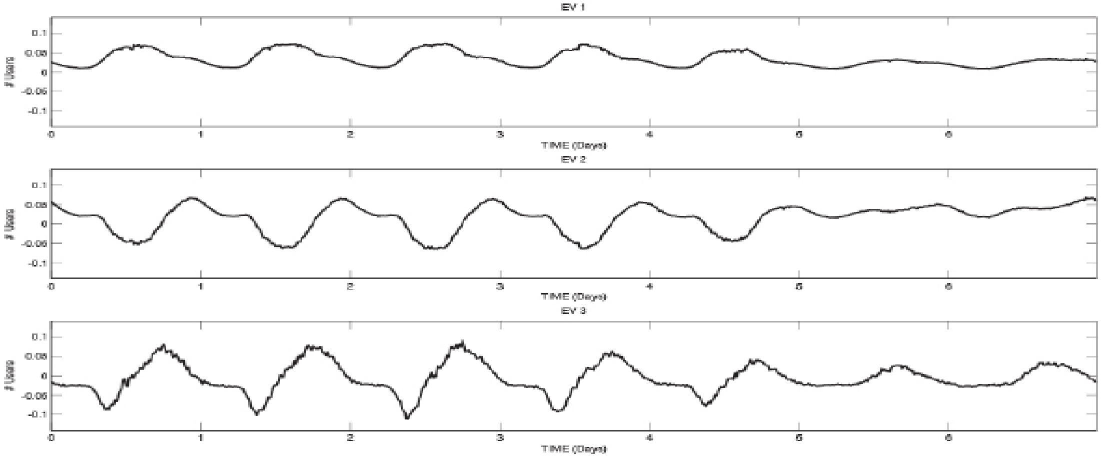


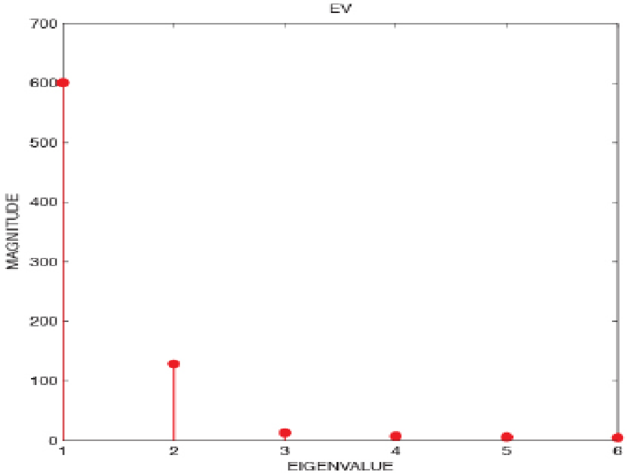


3.2 MIT EIGENVECTOR ANALYSIS AND K-MEAN CLUSTERING

The test of seeing whether WiFi antennas in Simmons Hall could be grouped according to very localized usage patterns was partially successful - there are still many uncertainties about the accuracy of the results - so it was decided to use all of the antennas on the MIT campus to determine the 14 week average signal and then calculate the eigenvectors /eigenvalues and k-mean clustering. Shown below are the results of the eigenvector analysis.







Science

By **Carlo Ratti and Matthew Claudel**

Vite fait

BANDE À PART

The characters in Jean-Luc Godard's 1964 film whizz through the Louvre in less than 10 minutes

MOBILITY

Why mapping is on the move

A recent study mapped the flow of visitors at the Louvre

CHRISTIAN MARQUARDT/GETTY IMAGES

How quickly can you visit the largest museum in the world? In Jean-Luc Godard's film *Bande à part* (1964), the three main characters run through the Louvre in nine minutes and 43 seconds, supposedly breaking the record for the fastest visit. The dash inspired similar endeavours – including another cinematic sprint in Bernardo Bertolucci's *The Dreamers* and one by the Swiss artist Beat Lippert, who ostensibly holds the fastest time to date: nine minutes and 14 seconds (in June 2010).

Lippert's claim could now be confirmed by an experiment recently carried out in the museum. Using new technologies for monitoring Bluetooth signals from mobile phones, researchers measured the flow of visitors over time – which galleries they explored, which paths they took, how long they spent looking at each artwork. The study provides us with a new way of seeing one of the world's greatest collections, focusing not on the art but on the people in front of it.

Analysis of this data, published in the journal Environment and Planning B*, shows that, far from sprinting in Godard's footsteps, most people prefer to meander through the museum, with 10 per cent of visits lasting more than five hours. Regardless of pace, visitors follow a well-trodden path past masterpieces such as Da Vinci's "Mona Lisa" and the "Nike of Samothrace". Only a fraction move quickly, leaving in less than an hour.

The study is based on a growing body of research that monitors signals from mobile phones. This data can provide an accurate understanding of human behaviour across many scales, from a museum to a city. Such knowledge has been sought throughout the history of urban planning. Ildefonso Cerdá, the father of modern Barcelona, was one of many who dreamt of a more

> Far from sprinting in Godard's footsteps, most people prefer to meander through the museum

quantitative urbanism: "The building of cities, if not so already, will soon become a genuine science that calls for major and profound search in every branch of human knowledge." During the second half of the 20th century, urbanist William H Whyte (right) used on-site cameras to capture human flow inside New York's buildings and public spaces. His methods were insightful but labour intensive. Today, with the diffusion of hand-held electronics, data collection is becoming effortless.

The ensuing knowledge of human movement could radically inform design. If architecture is a kind of "third skin" – after our biological one and clothing – it has long been a rigid one. Perhaps with better data, the built environment can adapt to us: a living, tailored architecture that is moulded on inhabitants.

Some industries are exploring such implementation. Many banks, for example, are downsizing their physical presence following extensive digitisation. Knowledge of occupancy patterns allows them to rebuild in a leaner and more efficient way. One bank is optimising the spatial distribution of branches in Milan based on mapping the commuting flows of its workforce. This has a potentially significant impact on citywide logistics, ecology and wellbeing.

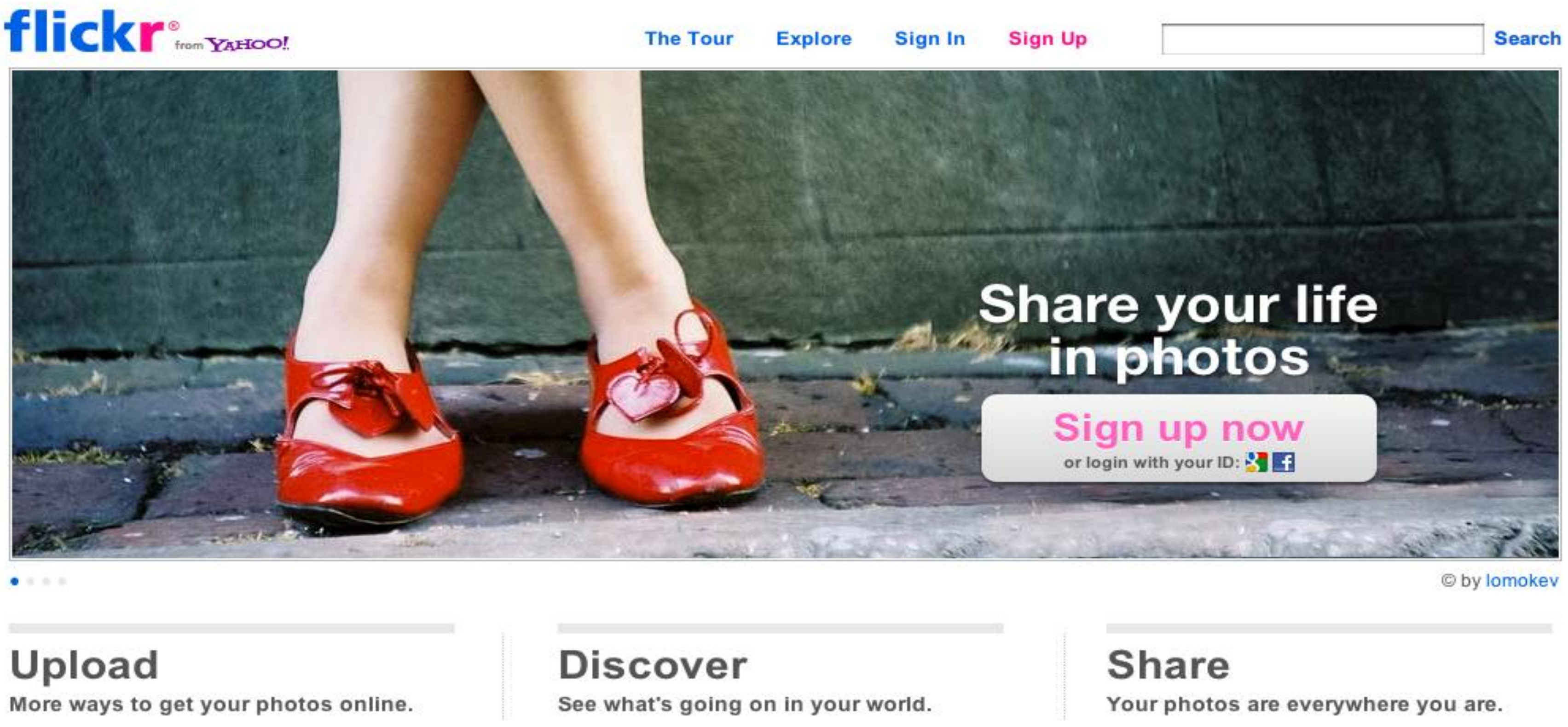
Mobile phone-based mapping of human flows is not without questions. Issues of privacy must be addressed; in the Louvre study we used anonymised data. Quantitative data must be put in context so that they do not undermine those intangible qualities of space that architects strive for. However, if implemented correctly, analysis of occupancy and movement promises to revolutionise our built environment. Data allow architects to take into account patterns of users, helping them respond to every demographic – even those inspired to careen through the Louvre by Godard. FT

*Architect Carlo Ratti directs the Massachusetts Institute of Technology's Senseable City Lab. Matthew Claudel is a research fellow at the lab. *Yoshimura Y et al, 2014, "An analysis of visitors' behavior in The Louvre Museum: a study using Bluetooth data"*

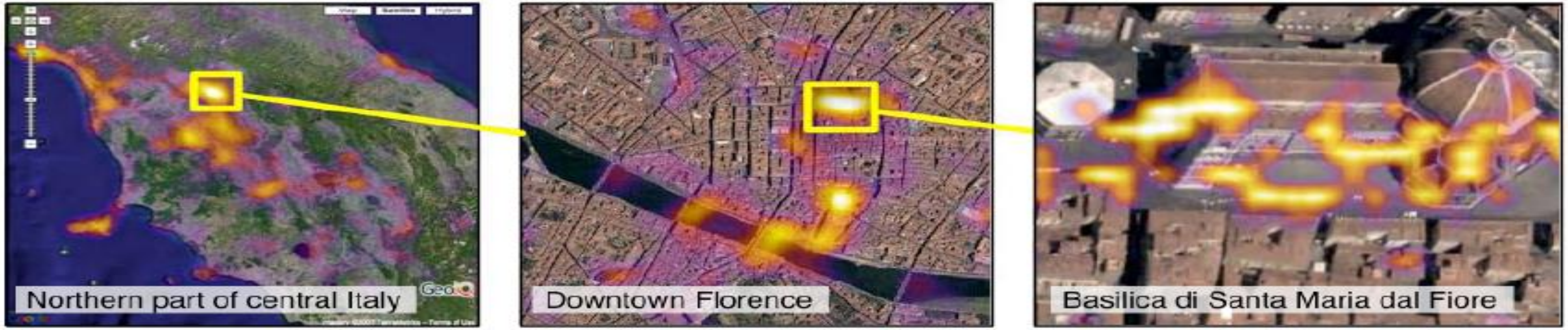
Mind

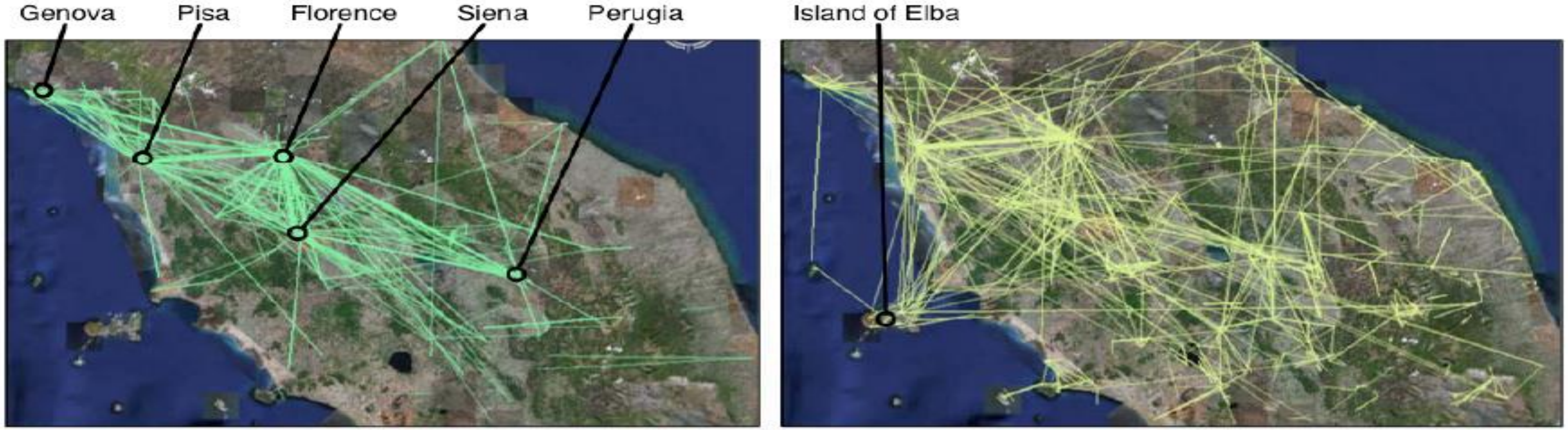
End 3

4. User generated data

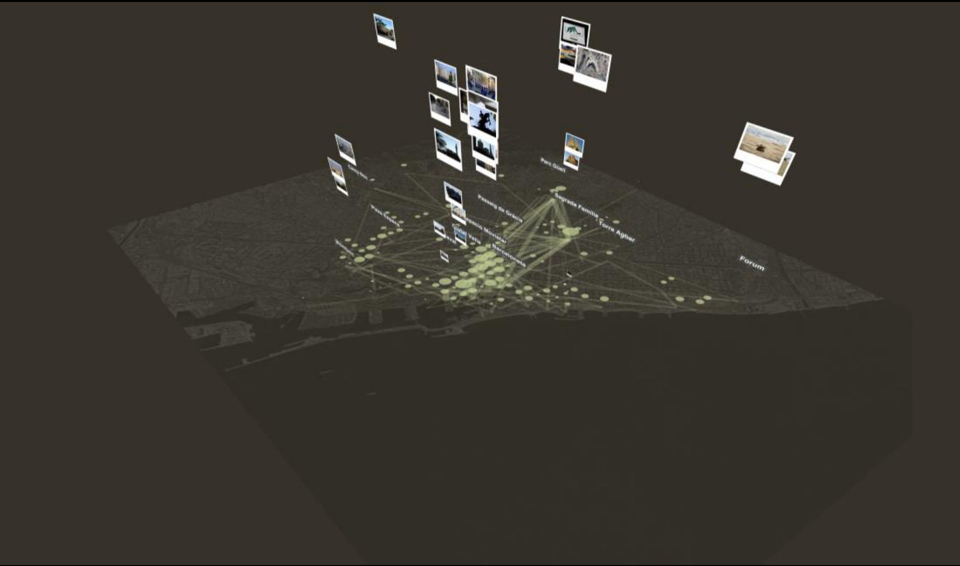

flickr from YAHOO!
The Tour
Explore
Sign In
Sign Up
Search
Share your life in photos
Sign up now
or login with your ID:
© by lomokev
Upload
More ways to get your photos online.
Discover
See what's going on in your world.
Share
Your photos are everywhere you are.

presence of people in florence

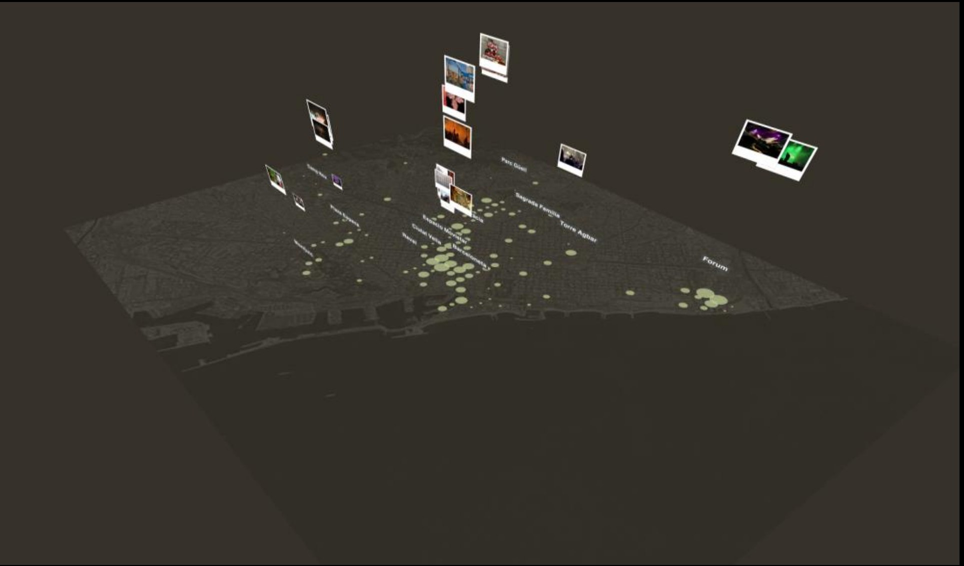




patterns of movement of italians vs. americans



britons



parties

End 4

5. Ad-hoc sensed data


Sourcemap
Greenland
Iceland
Россия
Russia
Canada
United States
México
North Pacific Ocean
North Atlantic Ocean
Suomi Finland
Sverige Sweden
Norge Norway
United Kingdom
Polska Poland
España Spain
Italia Italy
Türkiye Turkey
Kazakhstan
Mongolia
Iran
Iraq
Afghanistan
Pakistan
India
Algeria
Libya
Egypt
Saudi Arabia
Mauritania
Mali
Niger
Chad
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Angola
Namibia
Botswana
South Africa
Madagascar
Venezuela
Colombia
Perú
Brasil
Brazil
Bolivia
Chile
Argentina
South Atlantic Ocean
South Pacific Ocean
Indian Ocean
Indonesia
Papua New Guinea
Australia
New Zealand
7
13
14
20
28
32
34
37
38
41
42
44
45
47
48
49
50


SERIES 9
SAMSUNG


Greenland
Iceland
Suomi
Finland
Sverige
Sweden
Norge
Norway
United Kingdom
Polska
Poland
Россия
Russia
Kazakhstan
Mongolia
Canada
United States
North Pacific Ocean
North Atlantic Ocean
España
Spain
Italia
Italy
Türkiye
Turkey
Ukraine
Iran
Iraq
Afghanistan
Pakistan
India
México
Algeria
Libya
مصر
Egypt
Saudi Arabia
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Angola
Namibia
Botswana
Madagascar
South Africa
Venezuela
Colombia
Brasil
Brazil
Perú
Bolivia
Chile
Argentina
Indonesia
Papua New Guinea
Australia
New Zealand
Indian Ocean
South Pacific Ocean
South Atlantic Ocean
50
45
20
7
47
38
49
14
35
37
13
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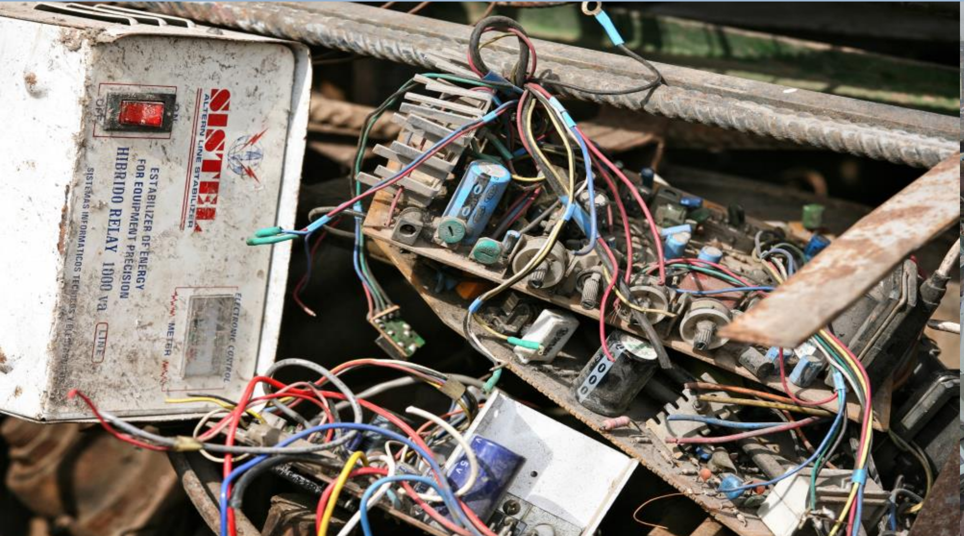
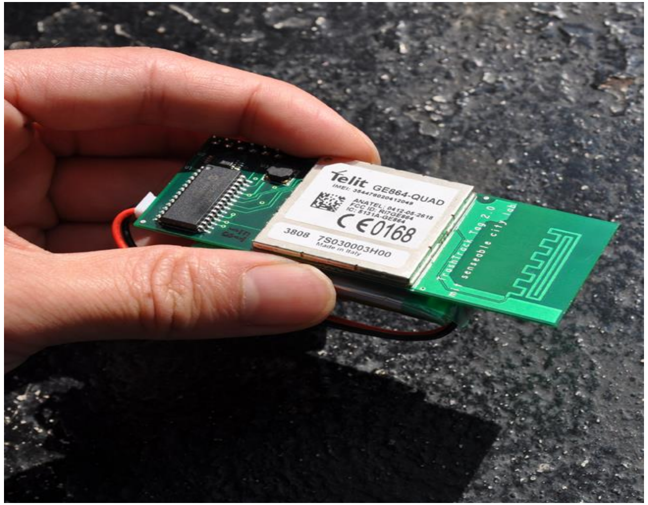
44
34
41
42
28


SISTEL
ALTERN LINE STABILIZER
ESTABILIZER OF ENERGY
FOR EQUIPMENT PRECISION
HIBRIDO RELAY 1000 va
METER
ELECTRONIC CONTROL


Telit GE864-QUAD
CE0168
TrashTrack Tag 2.0
senseable city lab


QUALCOMM
On / Off
UNITED STATES OF AMERICA
LIBERTY
IN GOD WE TRUST
QUARTER DOLLAR

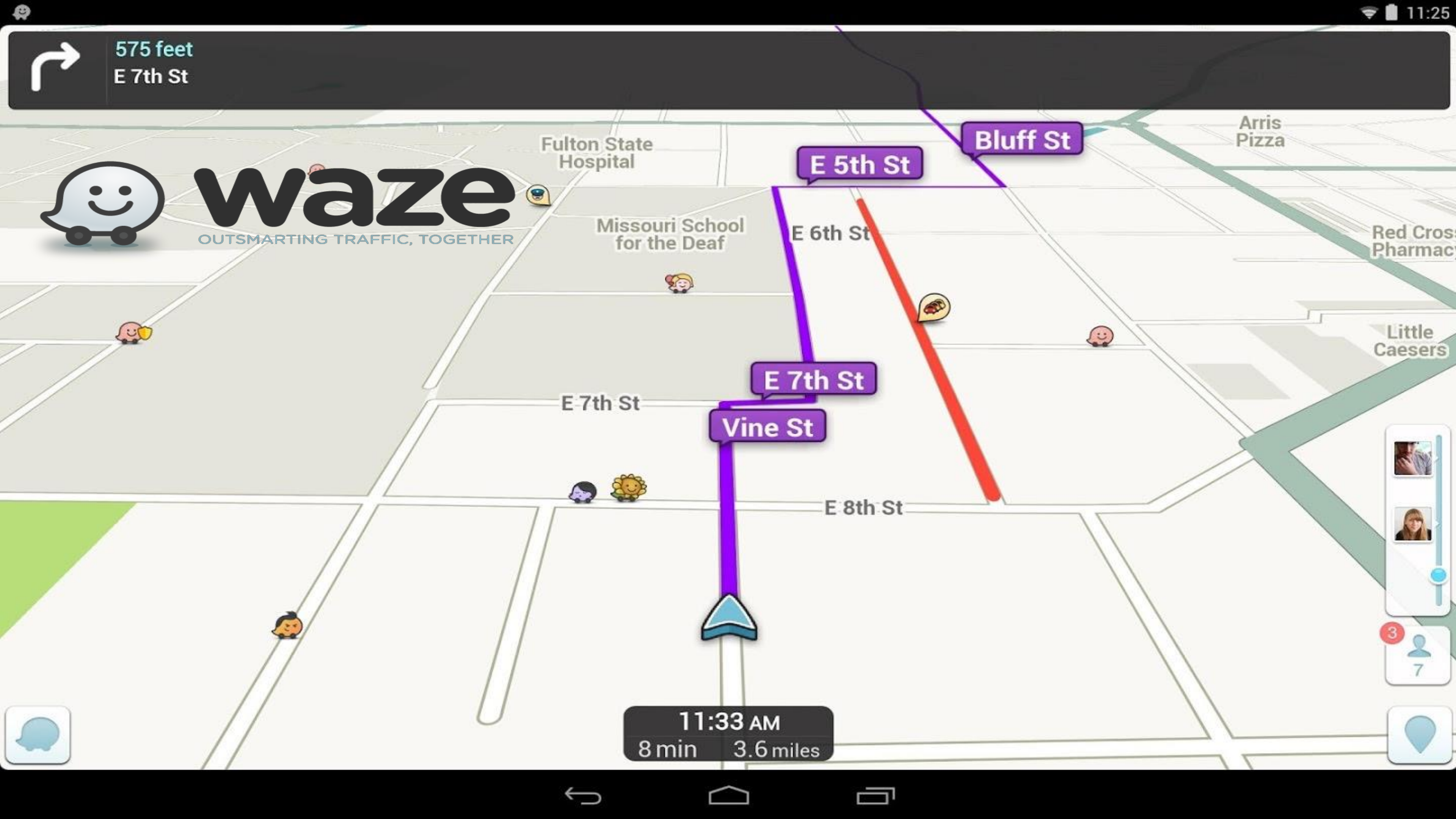
End 5

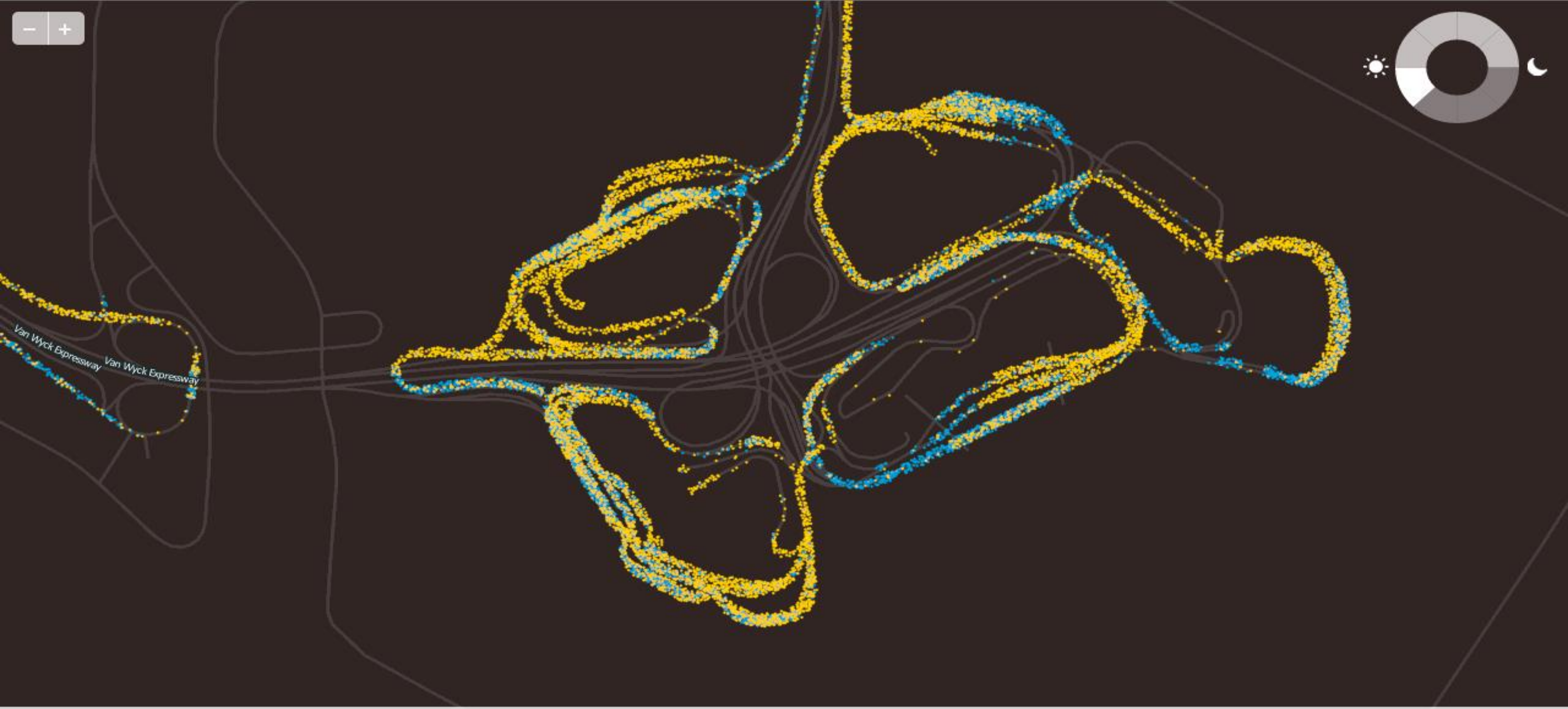
6. Combining data


DATACOLLIDER
a new language for data visualization

End 6

7. Actuating: transportation


11:25
575 feet
E 7th St
waze
OUTSMARTING TRAFFIC, TOGETHER
Fulton State Hospital
Missouri School for the Deaf
Bluff St
E 5th St
E 6th St
Arris Pizza
Red Cross Pharmac
Little Caesers
E 7th St
E 7th St
Vine St
E 8th St
3
7
11:33 AM
8 min
3.6 miles



hubcab

HubCab is an interactive visualization that invites you to explore the ways in which over 150 million taxi trips connect the City of New York in a given year. Show me how it works.

Taxi Pickup

Taxi Dropoff

Learn more about the project ↓

hubcab

MIT senseable city lab

HubCab is an interactive visualization that invites you to explore the ways in which over 150 million taxi trips connect the City of New York in a given year. Show me how it works.

Taxi Pickup

Taxi Dropoff

Learn more about the project ↓


Sharing benefits
3,160,172 $
1,052,627 mi
445,261 kg
225k
214k
hubcab
MIT senseable city lab
HubCab is an interactive visualization that invites you to explore the ways in which over 150 million taxi trips connect the City of New York in a given year.
Show me how it works.
Taxi Pickup
Reset
West 15th Street
Total Pickups: 1069
Average duration: 12.4 min
Average distance: 3 mi
Taxi Dropoff
Reset
East 54th Street
Total Dropoffs: 1053
Average duration: 10.2 min
Average distance: 2.38 mi
Learn more about the project

CrossMark click for updates

Quantifying the benefits of vehicle pooling with shareability networks

Paolo Santi[a,b], Giovanni Resta[b], Michael Szell[a,1], Stanislav Sobolevsky[a], Steven H. Strogatz[c], and Carlo Ratti[a]

[a]Senseable City Laboratory, Massachusetts Institute of Technology, Cambridge, MA 02139; [b]Istituto di Informatica e Telematica del Consiglio Nazionale delle Ricerche, 56124 Pisa, Italy; and [c]Department of Mathematics, Cornell University, Ithaca, NY 14853

Edited* by Michael F. Goodchild, University of California, Santa Barbara, CA, and approved July 25, 2014 (received for review March 3, 2014)

Taxi services are a vital part of urban transportation, and a considerable contributor to traffic congestion and air pollution causing substantial adverse effects on human health. Sharing taxi trips is a possible way of reducing the negative impact of taxi services on cities, but this comes at the expense of passenger discomfort quantifiable in terms of a longer travel time. Due to computational challenges, taxi sharing has traditionally been approached on small scales, such as within airport perimeters, or with dynamical ad hoc heuristics. However, a mathematical framework for the systematic understanding of the tradeoff between collective benefits of sharing and individual passenger discomfort is lacking. Here we introduce the notion of shareability network, which allows us to model the collective benefits of sharing as a function of passenger inconvenience, and to efficiently compute optimal

At the basis of a shared taxi service is the concept of ride sharing or carpooling, a long-standing proposition for decreasing road traffic, which originated during the oil crisis in the 1970s (6). During that time, economic incentives outbalanced the psychological barriers on which successful carpooling programs depend: giving up personalized transportation and accepting strangers in the same vehicle. Surveys indicate that the two most important deterrents to potential carpoolers are the extra time requirements and the loss of privacy (7, 8). However, the lack of correlations between socio-demographic variables and carpooling propensity (8), the design of appropriate economic incentives (9), and recent practical implementations of taxi-sharing systems in New York City (http://bandwagon.io) give ample hope that many social obstacles might be overcome in newly emerging "sharing economies" (10, 11).

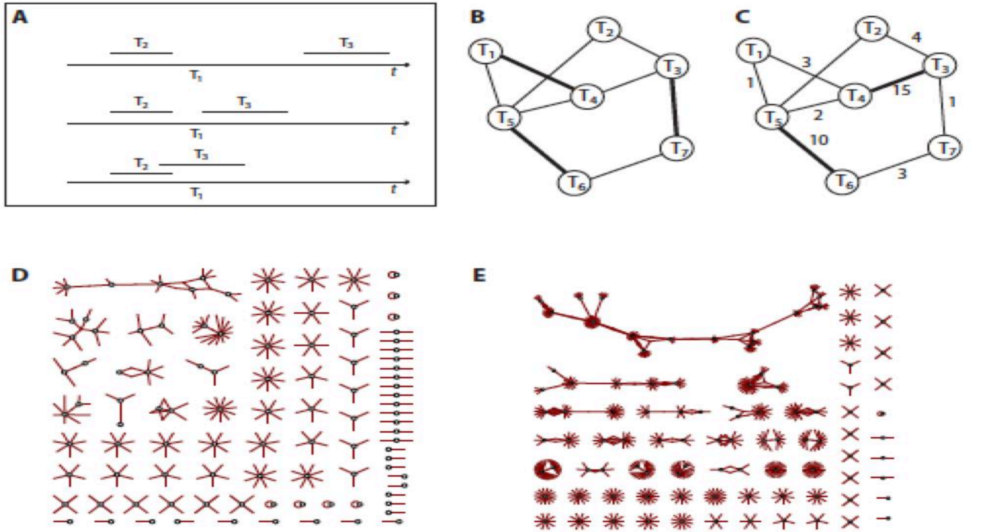
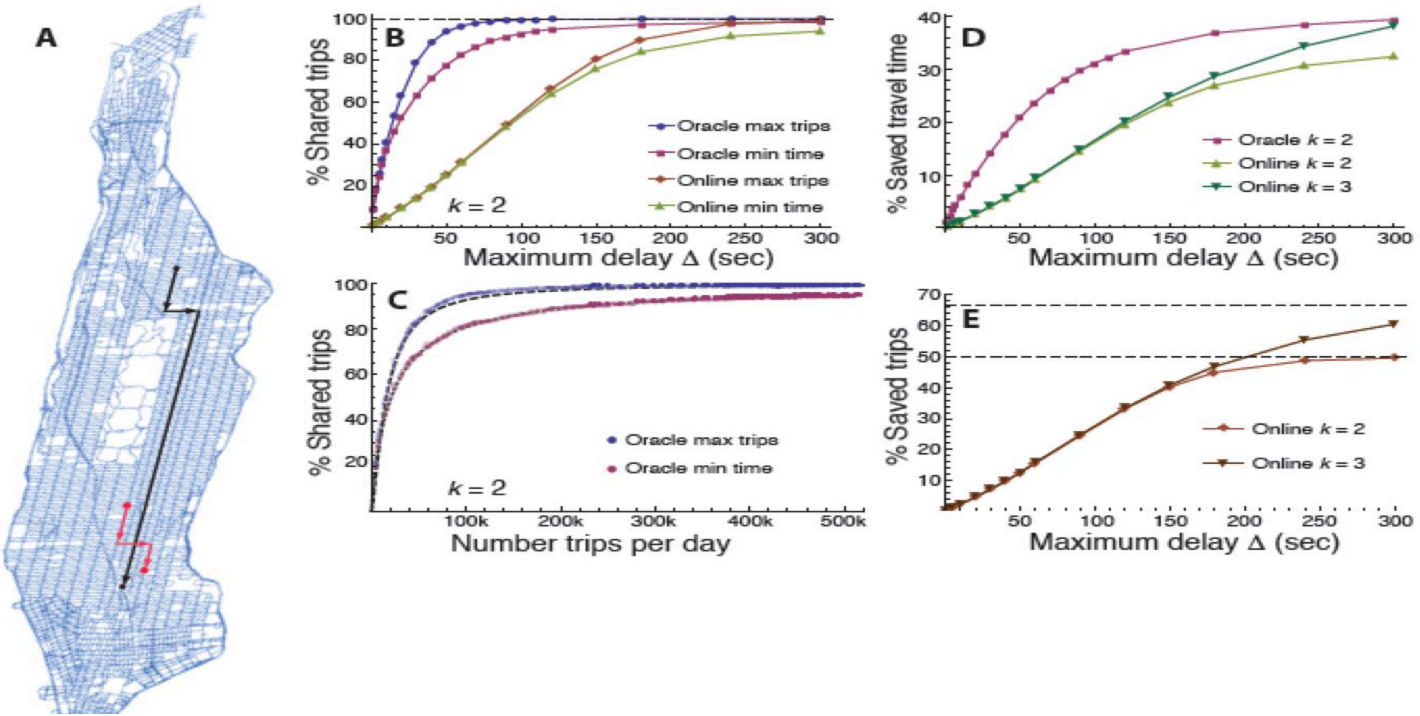
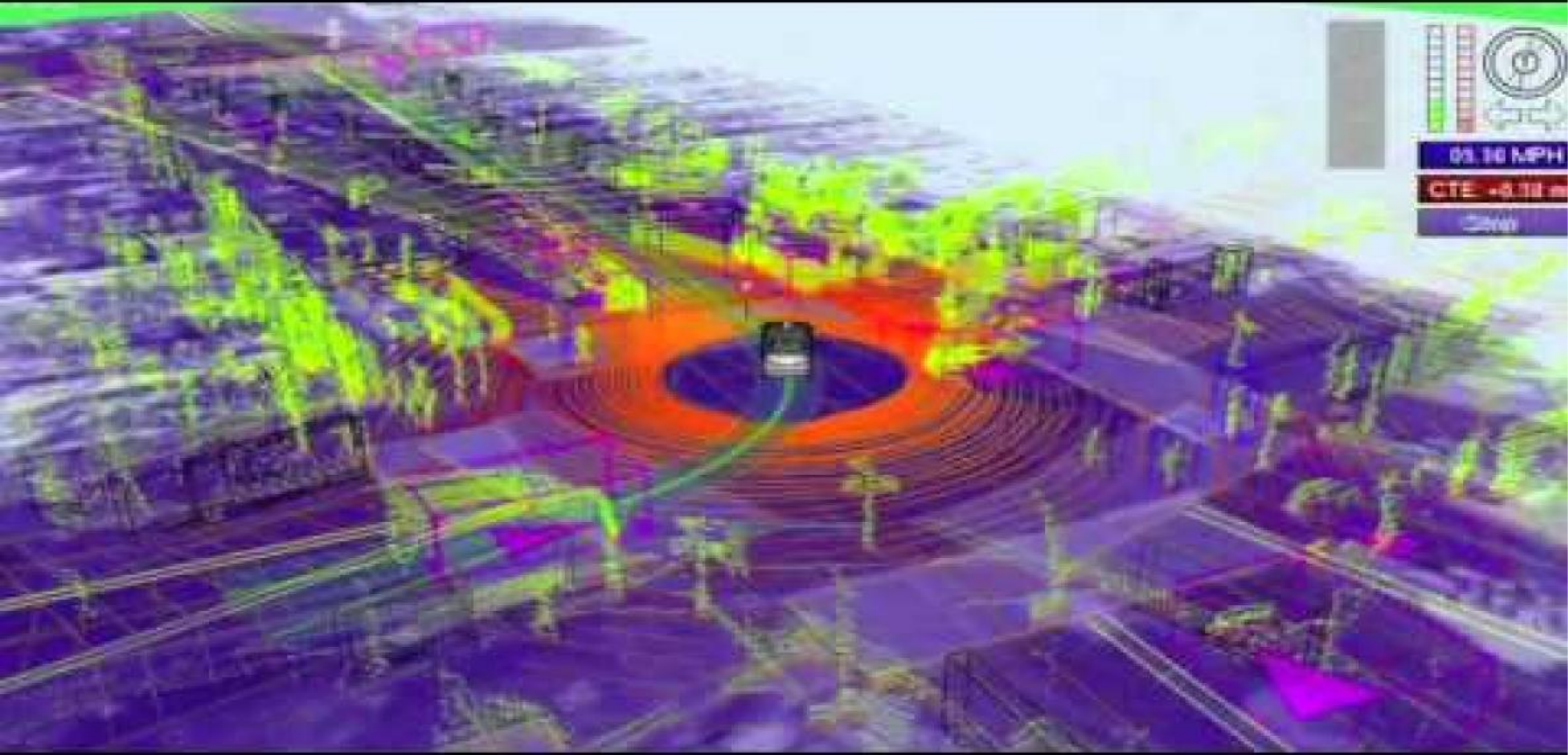


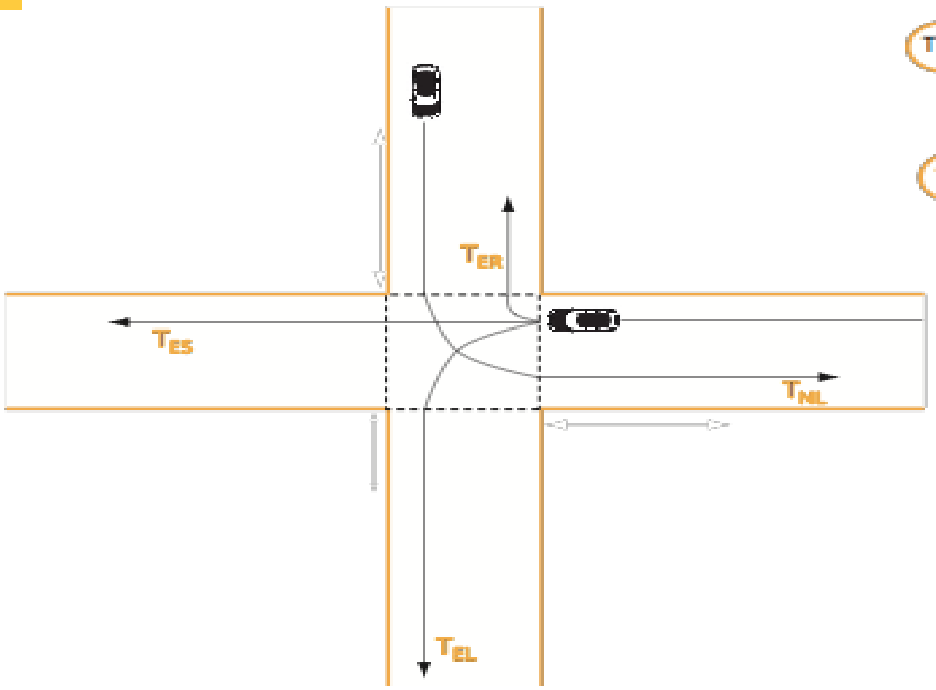
Figure 1: **Shareability networks.** **(A)** Trip sharing model and taxi capacity. Each of the three cases involves three trips T_1, T_2, and T_3 to be shared, but ordered differently in time t. The top case corresponds to a feasible sharing according to our model with $k = 2$, and the trips can be accommodated in a taxi with capacity ≥ 2. The middle case corresponds to a model with $k = 3$ since three trips are combined; notice that the three trips can be combined in a taxi with capacity two since two of the combined trips are non-overlapping. The bottom case corresponds to $k = 3$, but here a taxi capacity ≥ 3 is needed to accommodate the combined trips. **(B)** Example of maximum matching (*4*) in a simple shareability network. The links belonging to the maximum matching are displayed in bold. **(C)** Example of maximum weighted matching (*4*). **(D)** Exemplary subset of the shareability network corresponding to 100 consecutive trips for values of $\Delta = 30\,\text{sec}$ and **(E)** $\Delta = 60\,\text{sec}$, showing network densification effects and thus an increase of sharing opportunities with longer time-aggregation. Open links point to trips outside the considered set of trips. Isolated nodes are represented as self-loops. Node positions are not

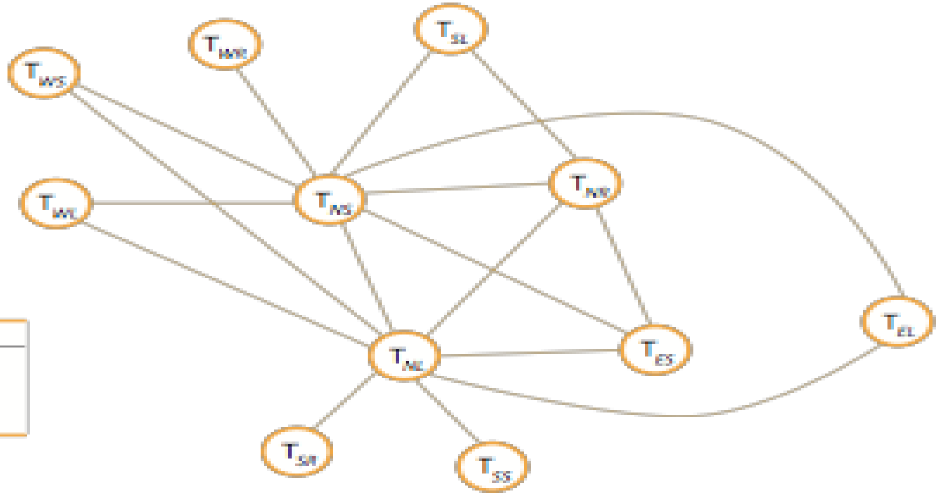

A
B
% Shared trips
k = 2
Oracle max trips
Oracle min time
Online max trips
Online min time
Maximum delay Δ (sec)
C
% Shared trips
k = 2
Oracle max trips
Oracle min time
Number trips per day
D
% Saved travel time
Oracle k = 2
Online k = 2
Online k = 3
Maximum delay Δ (sec)
E
% Saved trips
Online k = 2
Online k = 3
Maximum delay Δ (sec)



CityDrive

Incompatibility Network



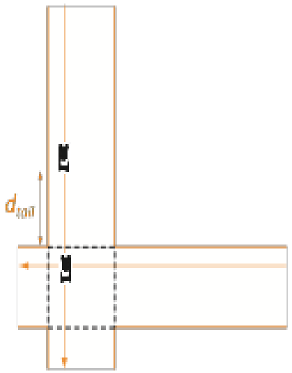


Incompatibility Network

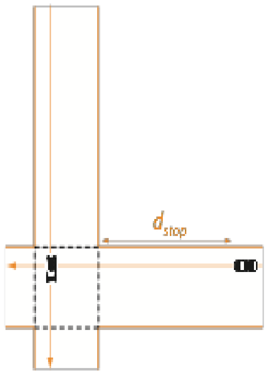
CityDrive

safety constraints

Safety constraint



$d_{tail} < d_{stop}$



End 7

8. Actuating: buildings

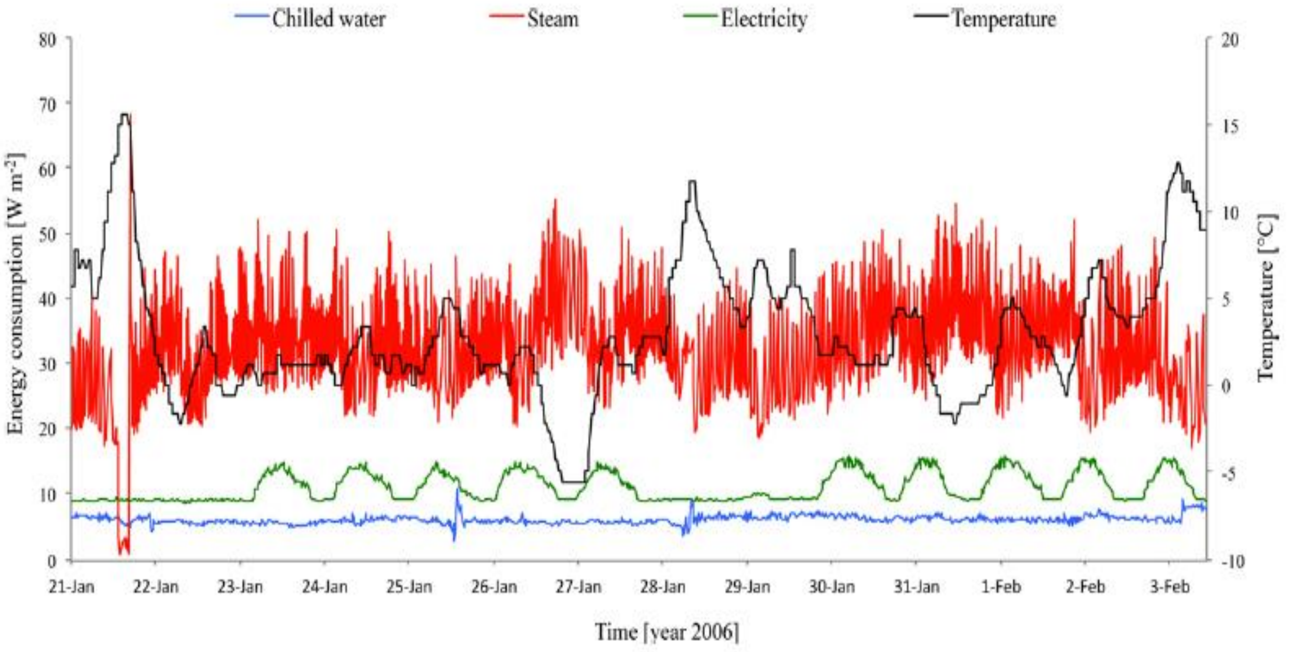
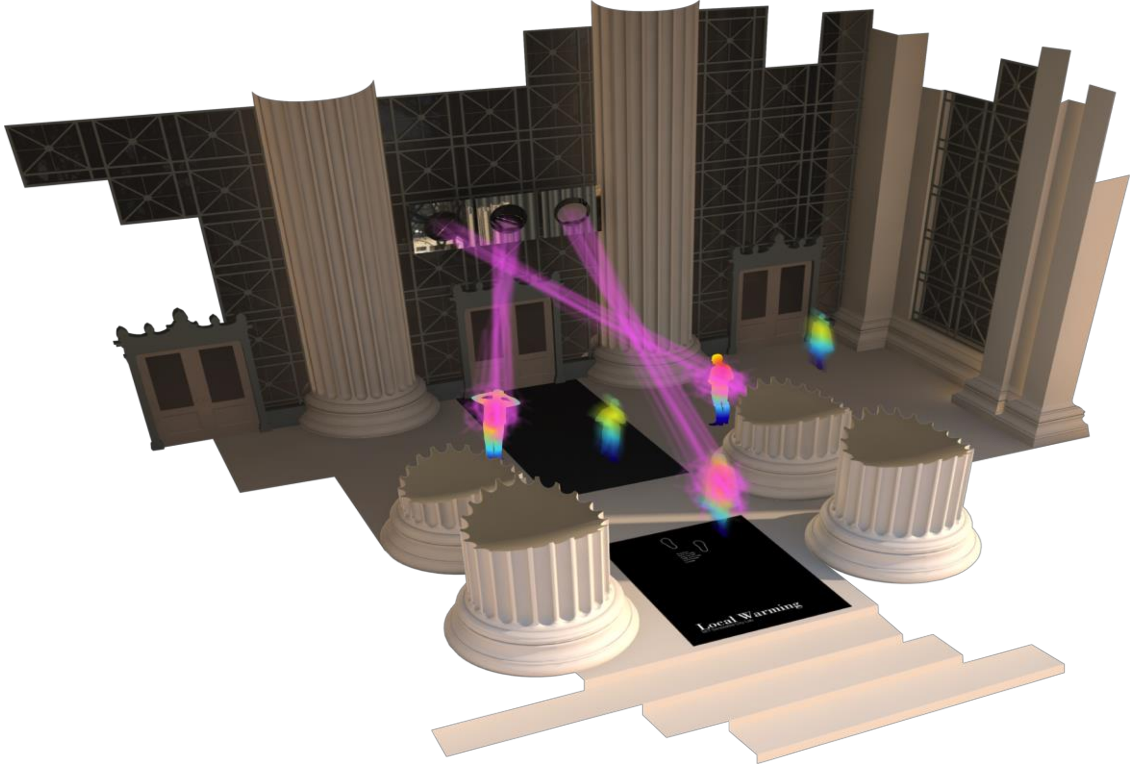


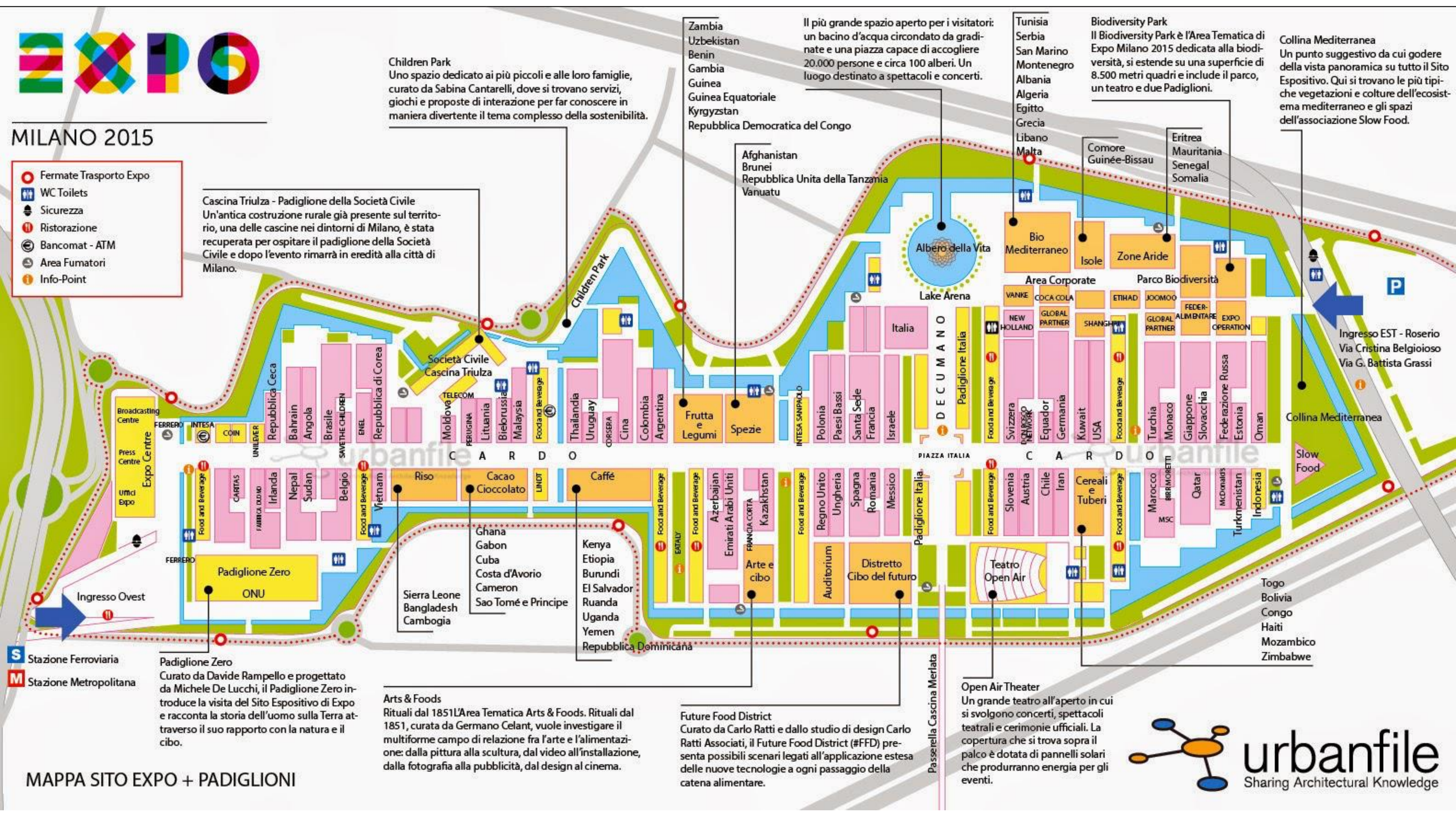
Fig. 2. Time series of energy consumption (steam, chilled water and electricity in W m^{-2}) for E52 over 21st January–3rd February 2006 [18], alongside external air temperature (°C) [16].

Lo•cal Warm•ing ['lōkəl'wôrming]

noun

a research project by the MIT Senseable City Laboratory that dynamically controls highly localized heating: It is a system that puts the heat where the people are.


Local Warning



EXPO
MILANO 2015
Fermate Trasporto Expo
WC Toilets
Sicurezza
Ristorazione
Bancomat - ATM
Area Fumatori
Info-Point
Children Park
Uno spazio dedicato ai più piccoli e alle loro famiglie, curato da Sabina Cantarelli, dove si trovano servizi, giochi e proposte di interazione per far conoscere in maniera divertente il tema complesso della sostenibilità.
Cascina Triulza - Padiglione della Società Civile
Un'antica costruzione rurale già presente sul territorio, una delle cascine nei dintorni di Milano, è stata recuperata per ospitare il padiglione della Società Civile e dopo l'evento rimarrà in eredità alla città di Milano.
Zambia
Uzbekistan
Benin
Gambia
Guinea
Guinea Equatoriale
Kyrgyzstan
Repubblica Democratica del Congo
Afghanistan
Brunei
Repubblica Unita della Tanzania
Vanuatu
Il più grande spazio aperto per i visitatori: un bacino d'acqua circondato da gradinate e una piazza capace di accogliere 20.000 persone e circa 100 alberi. Un luogo destinato a spettacoli e concerti.
Tunisia
Serbia
San Marino
Montenegro
Albania
Algeria
Egitto
Grecia
Libano
Malta
Biodiversity Park
Il Biodiversity Park è l'Area Tematica di Expo Milano 2015 dedicata alla biodiversità, si estende su una superficie di 8.500 metri quadri e include il parco, un teatro e due Padiglioni.
Comore
Guinée-Bissau
Eritrea
Mauritania
Senegal
Somalia
Collina Mediterranea
Un punto suggestivo da cui godere della vista panoramica su tutto il Sito Espositivo. Qui si trovano le più tipiche vegetazioni e colture dell'ecosistema mediterraneo e gli spazi dell'associazione Slow Food.
Children Park
Società Civile
Cascina Triulza
Albero della Vita
Lake Arena
Bio Mediterraneo
Isole
Zone Aride
Area Corporate
Parco Biodiversità
Italia
DECUMANO
Padiglione Italia
PIAZZA ITALIA
CARDO
CARDO
Broadcasting Centre
Press Centre
Uffici Expo
Expo Centre
FERRERO
INTESA
COIN
UNILEVER
Repubblica Ceca
Bahrain
Angola
Brasile
SAVE THE CHILDREN
ENEL
Repubblica di Corea
TELECOM
Moldova
PERUGINA
Lituania
Bielorussia
Malaysia
Food and Beverage
Thailandia
Uruguay
CORSERA
Cina
Colombia
Argentina
Frutta e Legumi
Spezie
INTESA SANPAOLO
Polonia
Paesi Bassi
Santa Sede
Francia
Israele
Svizzera
DON BOSCO NETWORK
Equador
Germania
Kuwait
USA
Turchia
Monaco
Giappone
Slovacchia
Federazione Russa
Estonia
Oman
VANKE
COCA COLA
NEW HOLLAND
GLOBAL PARTNER
SHANGHAI
ETIHAD
JOOMOO
GLOBAL PARTNER
FEDERALIMENTARE
EXPO OPERATION
Collina Mediterranea
Slow Food
Ingresso EST - Roserio
Via Cristina Belgioioso
Via G. Battista Grassi
CARTAS
FABBRICA DEL DUOMO
Irlanda
Nepal
Sudan
Belgio
Vietnam
Riso
Cacao Cioccolato
LINDT
Caffè
EATALY
Azerbaijan
Emirati Arabi Uniti
FRANCIA CORTA
Kazakhstan
Regno Unito
Ungheria
Spagna
Romania
Messico
Padiglione Italia
Slovenia
Austria
Chile
Iran
Cereali e Tuberi
Marocco
BIRRA MORETTI
MSC
Qatar
McDonald's
Turkmenistan
Indonesia
FERRERO
Padiglione Zero
ONU
Ingresso Ovest
Ghana
Gabon
Cuba
Costa d'Avorio
Cameron
Sao Tomé e Principe
Kenya
Etiopia
Burundi
El Salvador
Ruanda
Uganda
Yemen
Repubblica Dominicana
Sierra Leone
Bangladesh
Cambogia
Arte e cibo
Auditorium
Distretto Cibo del futuro
Teatro Open Air
Togo
Bolivia
Congo
Haiti
Mozambico
Zimbabwe
Stazione Ferroviaria
Stazione Metropolitana
Padiglione Zero
Curato da Davide Rampello e progettato da Michele De Lucchi, il Padiglione Zero introduce la visita del Sito Espositivo di Expo e racconta la storia dell'uomo sulla Terra attraverso il suo rapporto con la natura e il cibo.
Arts & Foods
Rituali dal 1851L'Area Tematica Arts & Foods. Rituali dal 1851, curata da Germano Celant, vuole investigare il multiforme campo di relazione fra l'arte e l'alimentazione: dalla pittura alla scultura, dal video all'installazione, dalla fotografia alla pubblicità, dal design al cinema.
Future Food District
Curato da Carlo Ratti e dallo studio di design Carlo Ratti Associati, il Future Food District (#FFD) presenta possibili scenari legati all'applicazione estesa delle nuove tecnologie a ogni passaggio della catena alimentare.
Passerella Cascina Merlata
Open Air Theater
Un grande teatro all'aperto in cui si svolgono concerti, spettacoli teatrali e cerimonie ufficiali. La copertura che si trova sopra il palco è dotata di pannelli solari che produrranno energia per gli eventi.
urbanfile
Sharing Architectural Knowledge
MAPPA SITO EXPO + PADIGLIONI


ffd
FUTURE FOOD DISTRICT
coop
EXPO
MILANO 2015

Total
Chex
KIX
ALLEY CAT
Fresh Step
whiskas
Friskies

"Dietro ogni formaggio c'è un pascolo d'un diverso verde sotto un diverso cielo (...) Questo negozio è un museo: il signor Palomar visitandolo sente, come al Louvre, dietro ogni oggetto esposto la presenza della civiltà che gli ha dato forma e che da esso prende forma."

(Italo Calvino)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Scan QR Code
2. Scan items right here
Use barcode icon
3. Continue Shopping
in our app
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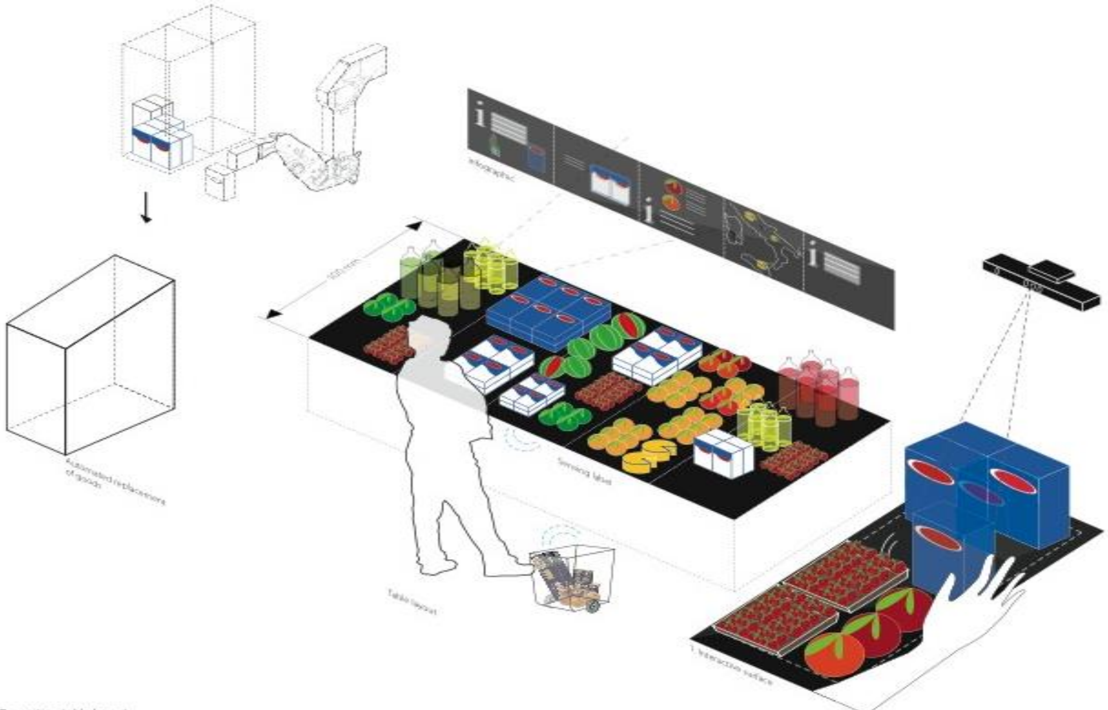
60 Days Free Delivery
Use Promo Code "CTARAIL"
HUGGIES
Tide
Charmin



Exposition table layout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Golden
1.97 € / Kg


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VERDURE
VEGETABLES
LEGUMI
LEGUMES
FRUTTA
FRUIT
LATTICINI
MILK PRODUCTS
CARNE
MEAT
PESCE
FISH
CAFFE'
COFFEE
COLONIALI
COLONIAL


casse
cash counters
VINO
wine
CARNE e PESCE
meet and fish
L'ESSENZA
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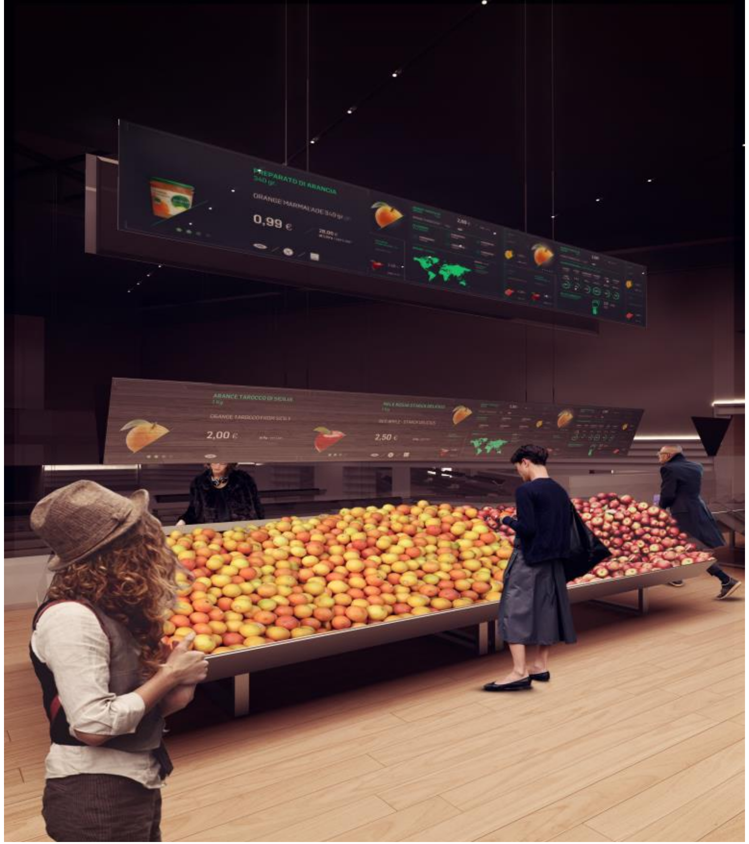
0,99 €
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MIT PROFESSIONAL EDUCATION

The Internet of Things: Roadmap to a Connected World

CSAIL


21,090
total visitors
321


casse
cash counters


ORTO-FRUTTA E VINO
FRUIT&VEGETABLES AND WINE
casse
cash counters
ABB
ABB
ABB
OLIVE VERDI DOLCI NOCELLARA DOP
SWEET GREEN OLIVES NOCELLARA PDO
3,49 €
2,49 €
1,99 €
2,99 €
1,99 €
1,99 €

Expo Filiera Carne


Che ce ne importa di ciò
che è la domanda

THANK YOU!

Carlo Ratti

Professor of the Practice, Director, MIT Senseable City Lab

Computer Science and Artificial Intelligence Laboratory (CSAIL)
Massachusetts Institute of Technology

END OF MODULE - Applications