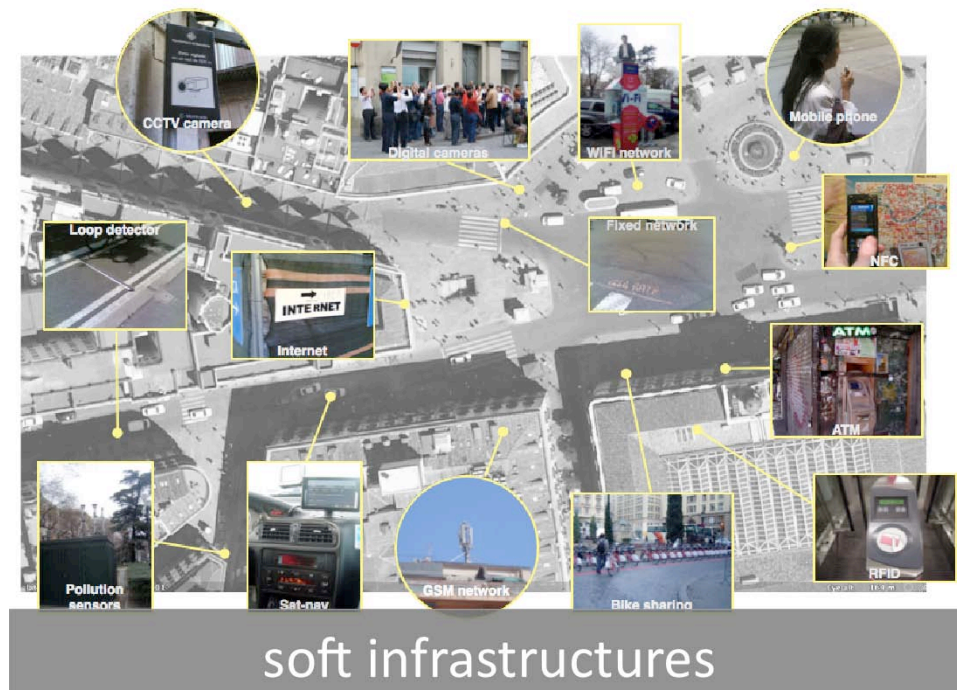


Analysis of Visitors from their Digital Activities



Hello, my name is Fabien Girardin, an engineer and researcher at Lift lab a research agency based in Geneva, Switzerland. The work I will present you today mainly comes from the PhD investigation I led at the Universitat Pompeu Fabra and MIT SENSEable City Lab. My background is slightly different than most of you in the audience. I know little about the processes to perform economic and tourism analysis. However, I have been developing tools and methods to analyse visitors of buildings, cities and countries from their digital activities. This talk aims at raising your awareness on innovative measures of tourism flows and on new indicators to evaluate strategies.

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In this conference we have been discussing about the hard/physical infrastructures that support tourism (roads, airports, hotels, restaurants). Yet nowadays, the experience and visit of a space such as a city is also greatly affected by the presence of soft infrastructures (i.e. the software and services present in ATMs, metro turnstiles, bike sharing rack, GSM network, digital cameras, satellite navigation systems, proximity sensors (sliding doors)). These soft infrastructures are not necessarily new (presence of the radio). However, there is now shift from the analog to the digital soft infrastructure. My proposal is that we have a lot to learn on how we design a space/service/experience from our interactions with these infrastructures, and particularly from the logs these interactions generate. I will go through a couple of examples to discuss the potential of this new kinds of visitor analysis.

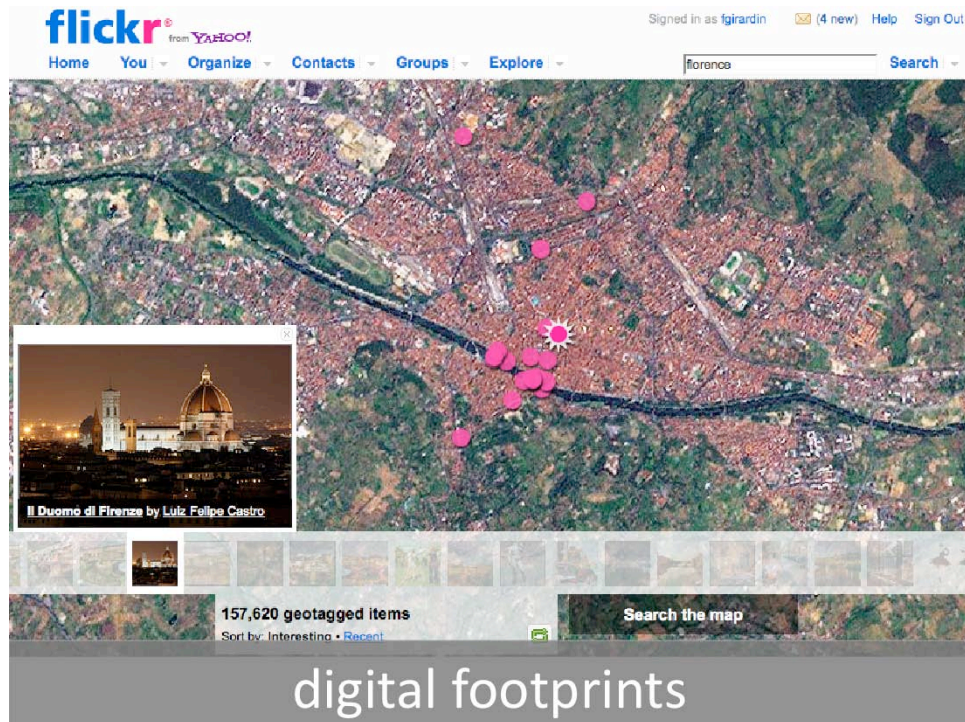
from shoeboxes to digital footprints



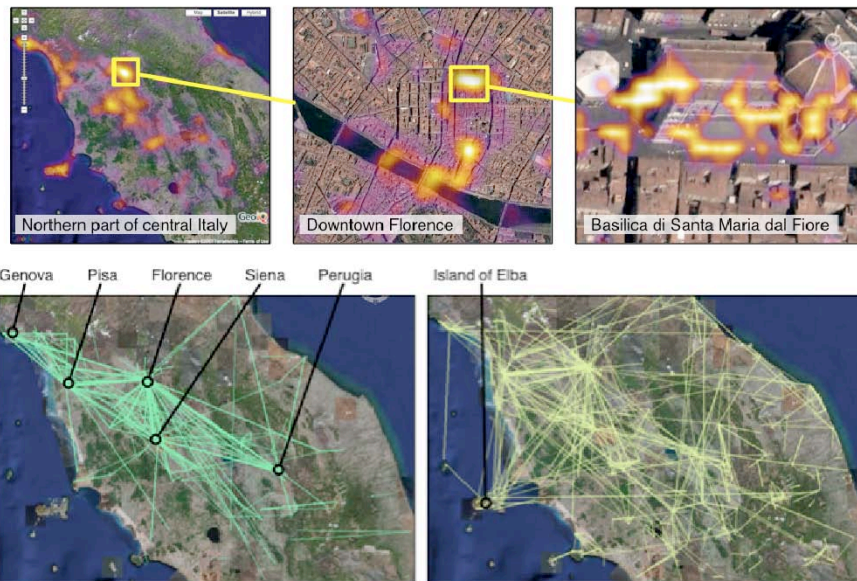
In this first project, we worked with the Province of Florence in Italy. Florence has difficulties in understanding the tourist dynamics that takes place in the region, because tourists generally come to the Province for the weekend and prefer to sleep in nearby cities. In consequence tourists leave very little indications of their presence and activities. Surveys are very expensive to perform and only provide temporary snapshots. In contrast, nowadays, instead of keeping their experience in shoeboxes, visitors leave traces online of their trips. Our approach exploits the georeferenced photos publically available on the photo-sharing web platform Flickr.

Reference:

Girardin, F., Fiore, F. D., Ratti, C., and Blat, J. (2008). Leveraging explicitly disclosed location information to understand tourist dynamics: A case study. *Journal of Location-Based Services* 2, 1, 41–54.



In the process we call “digital footprinting”, tourists take photos, upload them to Flickr to share and georeference them. Our system collects the public data and with data-mining techniques extract the photo metadata and user information and infers the types of tourists from their behaviors.



value of the act of communication

The visualization of this basic analysis generates activity and flow maps as well as temporal signatures. The basic mapping of this data enables to uncover the density of tourists at very different scales, such as region, city and point of interest. While cities are interested in understanding tourist dynamics within their boundaries, we found out that they were equally interested in understand how the “competitive” cities perform. This type of data allows comparisons.

Each photo contains a timestamp the digital cameras embeds when the photo is taken. So not only can we analyze the location of the photo but also its temporal context. With both location and time data we build a sequence of photos that forms the trails the tourists follow. The mapping these traces reveals main flows.

Flickr lets the opportunity to its users to set their home city or country. We found out that 60% of the users disclosed their home country. Taking advantage of this information, we were able to map the traces of american (left) and italian (right) visitors in Tuscany and its proximity.

It is important to note the value in the act of communication behind these data. Indeed, the fact that no American reports a trip to the Island of Elba does not mean they were not present, but rather that they do not find relevant to report about their trip there.

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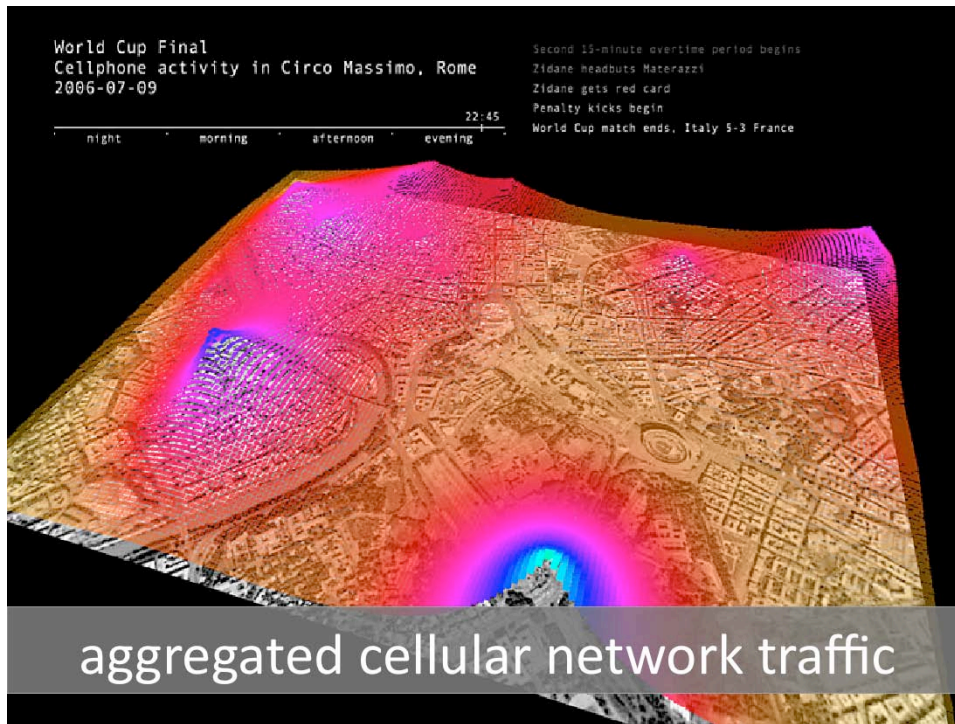


Georeferenced photos provide a new indicators on the experience of visitors with the ability to share and report what was relevant in their trip. We aimed at adding another perspective from another data source, more implicit in our visit of a city. The mobile phones we carry reports our presence on a cellular network every few minutes (depending on the operator and movements), the network following us as a digital shadow. It is a integral feature to make the overall system works.

Reference:

Girardin, F., Calabrese, F., Dal Fiore, F. , Ratti, C., and Blat, J. (2008b). Digital footprinting: Uncovering tourists with user-generated content. *IEEE Pervasive Computing*, 7(4):36–43.

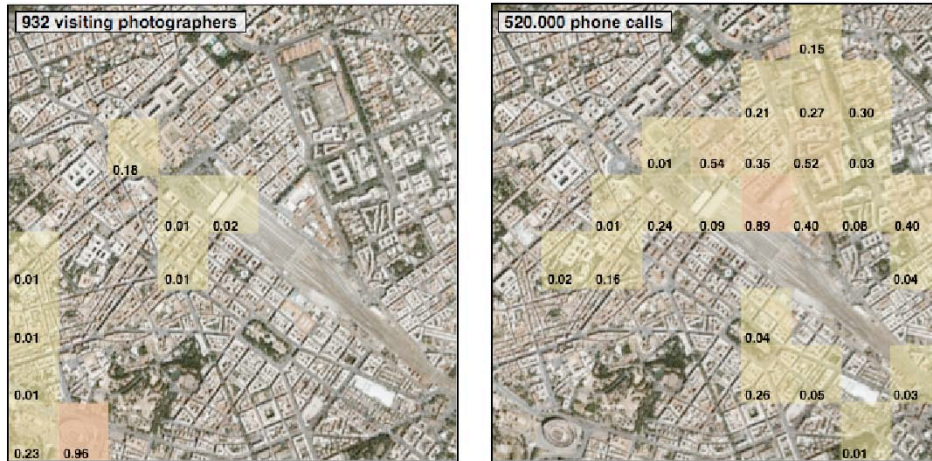
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In collaboration with the Italian mobile operator TIM, we synthesize the anonymized and aggregated logs of cellular network activity in Rome to understand patterns of daily life and special events in Rome. In this project, we particularly focused on the mobile users who “roam” in Rome.

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multiple views on one phenomenon



Therefore were able to compare the density of tourists from their digital footprints (i.e. georeference photos) and digital shadows (i.e. aggregated cellular network traffic) they generate when visiting Rome. The spatio-temporal analysis revealed that georeference photo were a good proxy to capture the presence of tourists in their sightseeing activities. On the other hand cellular network traffic data were good indicators of space where tourists are on the move or in their accommodations.

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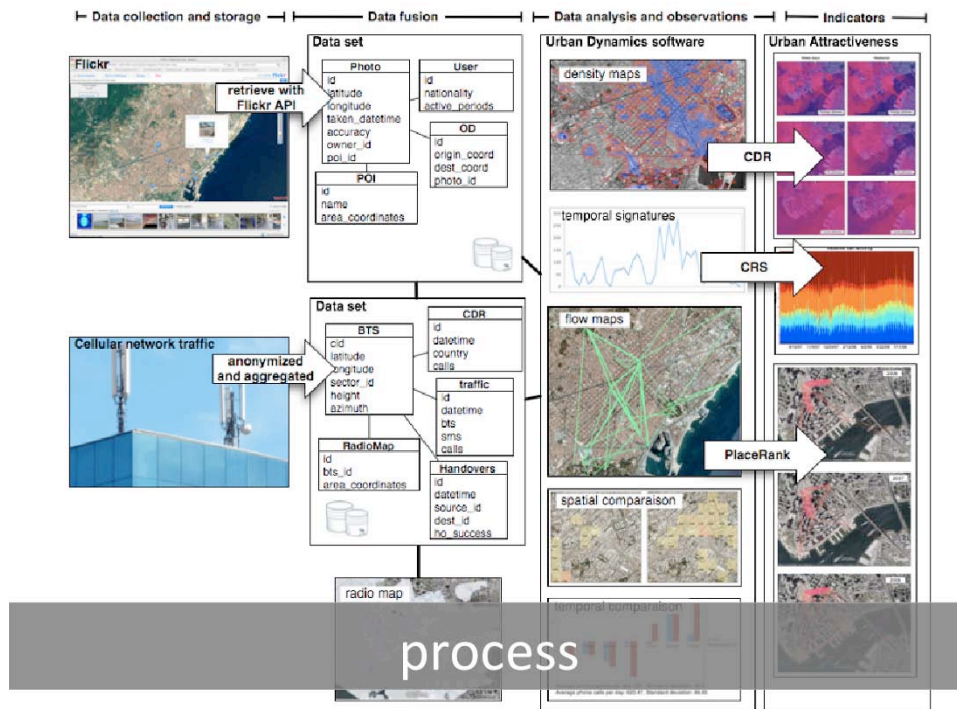


These projects in the Province of Florence and in Rome showed that visitors digital activities were indicators of presence and flows. These analysis have the merit to map these dynamics, but they do not necessarily reveal elements we were not aware before. Yet, an opportunity stands with the ability to monitor the evolution of the digital activity as indicators of attractiveness.

In summer 2008, the City of New York deployed 4 giant man-made waterfalls as part of a public art exhibit to attract locals and visitors back to the waterfront. Beside traditional economical impact studies, it is extremely difficult to evaluate the success of this strategy. So, we performed our studies on the characteristics of explicit (georeferenced photos) and implicit (aggregated cellular network traffic data) digital footprints to define indicators that measure the evolution of urban attractiveness.

Reference:

Girardin, F., Vaccari, A., Gerber, A., Biderman, A., and Ratti, C. (2009). Quantifying urban attractiveness from the distribution and density of digital footprints. *International Journal of Spatial Data Infrastructure Research*, 4.



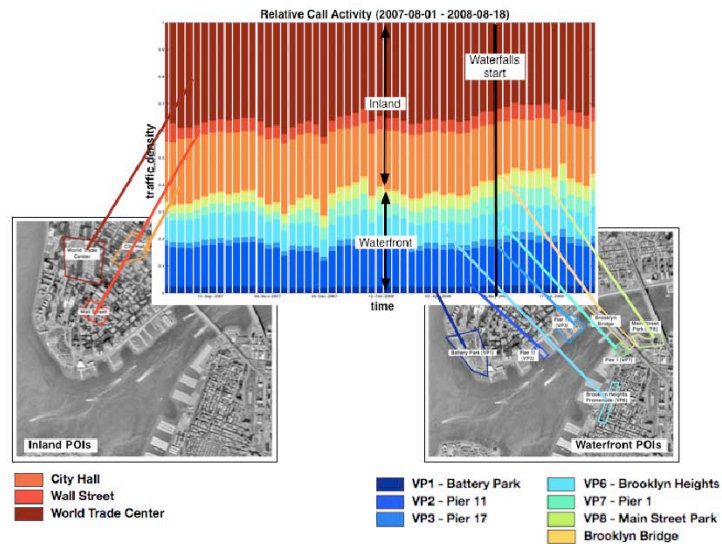
The process took 4 steps: 1) data collection, 2) data fusion with the generation of a radio map, 3) data analysis and exploration of the spatio-temporal dynamics and 4) definition of indicators based on the evolution of the digital activity.

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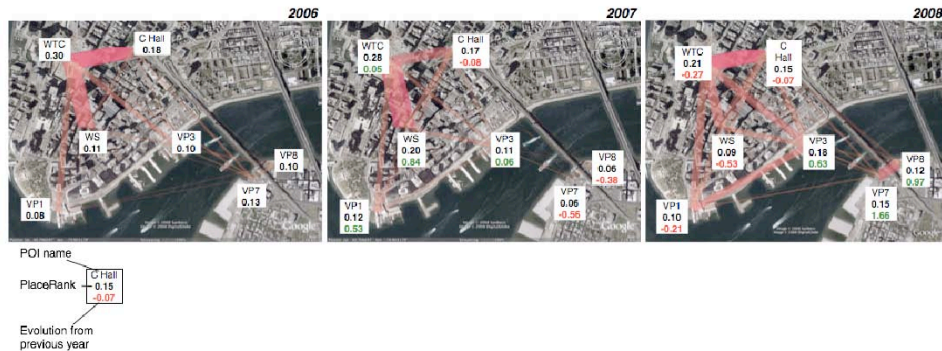
We collected the digital activity of visitors and locals at key places in Lower Manhattan and West Brooklyn. Some of the places had no relations with the Waterfalls (e.g. City Hall, World Trace Center area, Wall Street) and the other were the official vantage points of the Waterfalls.

comparative relative strength



We hypothesized that the density of the digital activity visitors generate gives an indication of the importance of places that, for instance, have beneficial features for work, social interaction, or sightseeing purposes. Therefore, we developed several indicators to compare the evolution of the attractiveness of different areas around the waterfront and of areas of interest in proximity of the exhibit, based on their Comparative Relative Strength (CRS). This indicator showed a 17% increase in cellular network activity in the waterfront compared to inland.

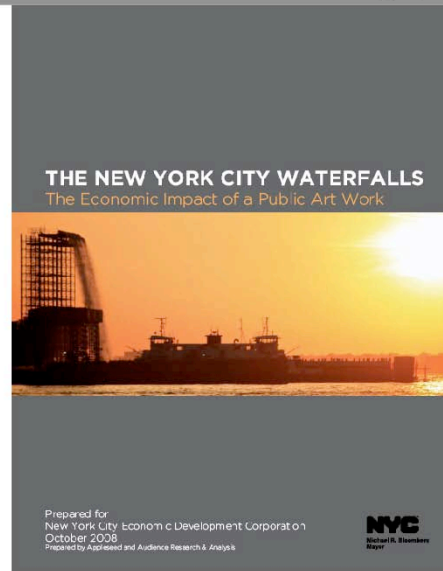
place rank



Similarly, we assessed the popularity of an area of interest by studying its ties with other areas in the city. The stronger the ties, the more frequently an area is accessible from other places as it becomes part of a popular route. This was measured by applying network analysis techniques to study the connectivity of a network in which the nodes represent areas of interest and the arches represent flows of people between them. Flows were estimated by analyzing consecutive time stamps tagged to Flickr photos in conjunction with the reported location at which a photo was taken.

The PlaceRank indicator, inspired by the PageRank indicator developed by Google to order the importance of Web pages, determines the centrality of a location within a set of areas of interest based on the amount of digital footprints generated in each area and the traces that connect them. In particular, if more visitors visit place A than place B, then we can say that the former is more popular than the latter. Once again, our analysis shows a stronger digital activity in the waterfront (except Battery Park) compared to inland.

integration into existing practices



An important aspect of this study was that it was integrated into the traditional economic impact study, as a clear sign in the value of our indicators to extend the evaluation of an urban strategy. Future works certainly aim at integrating these new data sources and innovative techniques into the existing practices of measuring, analyzing and evaluation of tourism strategies. So, we are meant to meet again!

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thank you!
gracias!
eskerrik asko!

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Thanks to CICtourGUNE and particularly to Ibon for the invitation!