I’m Here, So What?

The Value for Statistics of Swiss Geo-Localized Social Media

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16.09.2016

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Mobile social media

Linking the physical world and online activity

Google latitude

Places

Who. What. When. And now **Where.**

facebook

Share Where You Are

"Best. Concert. Ever."

Connect With Friends Nearby

"I'm just down the street!"

New: Find Local Deals

"I'm getting $20 off new jeans."

yelp

Real People. Real Reviews.


The talk
1. Geo-localized social data
What is the data about?
2. Opportunities
How does social data add value to research?
3. Challenges
What are the inherent limitations?

1.
Geo-localized social data

Home Notifications Mes

Barack Obama
@BarackObama

This account is run by Organizing for Action staff. Tweets from the President are signed -bo.

Joined March 2007

Barack Obama
@BarackObama

Follow

If we don't #ActOnClimate now, the sea level could rise by more than six feet by the end of the century: ofa.bo/uOB

Antarctic loss could double expected sea level rise by 2100, scientists say

If carbon emissions continue unabated, expanding oceans and massive ice melt would threaten global coastal communities, according to new projections.

washingtonpost.com

RETWEETS 1,417 LIKES 2,482

5:55 PM - 6 Apr 2016

© 2016 Twitter About Help
Cookies Ads Info

Tweet Attributes

```
[u'contributors',
 u'truncated',
 u'text',
 u'is_quote_status',
 u'in_reply_to_status_id',
 u'id',
 u'favorite_count',
 u'source',
 u'retweeted',
 u'coordinates',
 u'timestamp_ms',
 u'entities',
 u'in_reply_to_screen_name',
 u'id_str',
 u'retweet_count',
 u'in_reply_to_user_id',
 u'favorited',
 u'retweeted_status',
 u'user',
 u'geo',
 u'in_reply_to_user_id_str',
 u'possibly_sensitive',
 u'lang',
 u'created_at',
 u'filter_level',
 u'in_reply_to_status_id_str',
 u'place',
 u'extended_entities']
```

Entities

- Media
- Urls
- User Mentions (@)
- Hashtags (#)

Places are named locations with geo coordinates. Tweets associated with places are not necessarily issued from that location

Sources:

1. https://dev.twitter.com/overview/api/tweets
2. https://dev.twitter.com/overview/api/entities
3. https://dev.twitter.com/overview/api/places

Getting Data from Twitter

REST API

Public, Non-persistent, imposes clear rate limits

Streaming API

Public, Persistent

Monitor & process in real-time

Up to 1% of all tweets produced on Twitter (exact % unknown)

Representativeness – Sample bias

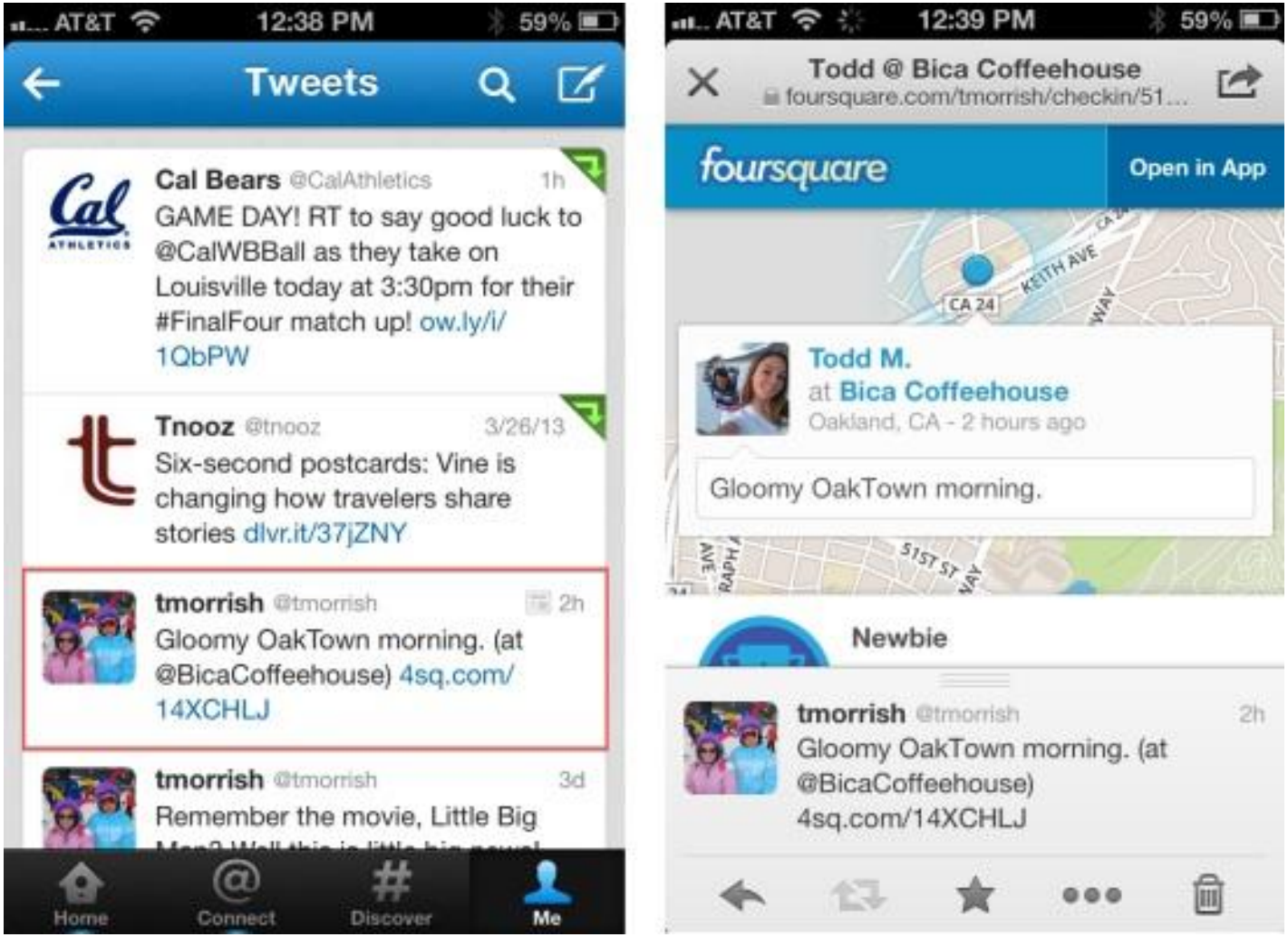
Firehose

100% of all public tweets

Expensive: financial and computing resources

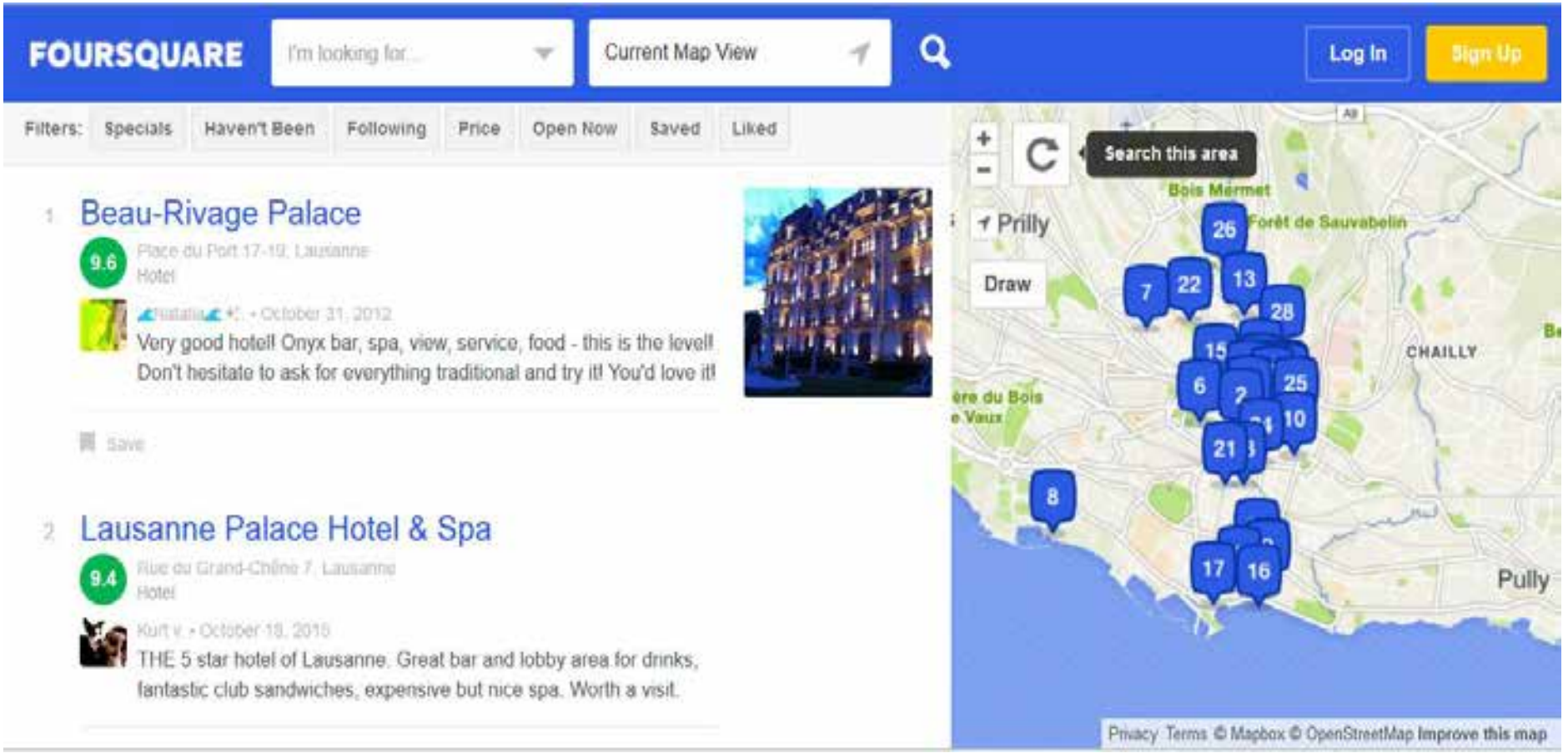
Source: https://dev.twitter.com/streaming/overview

Geo-localized tweets and Foursquare check-ins



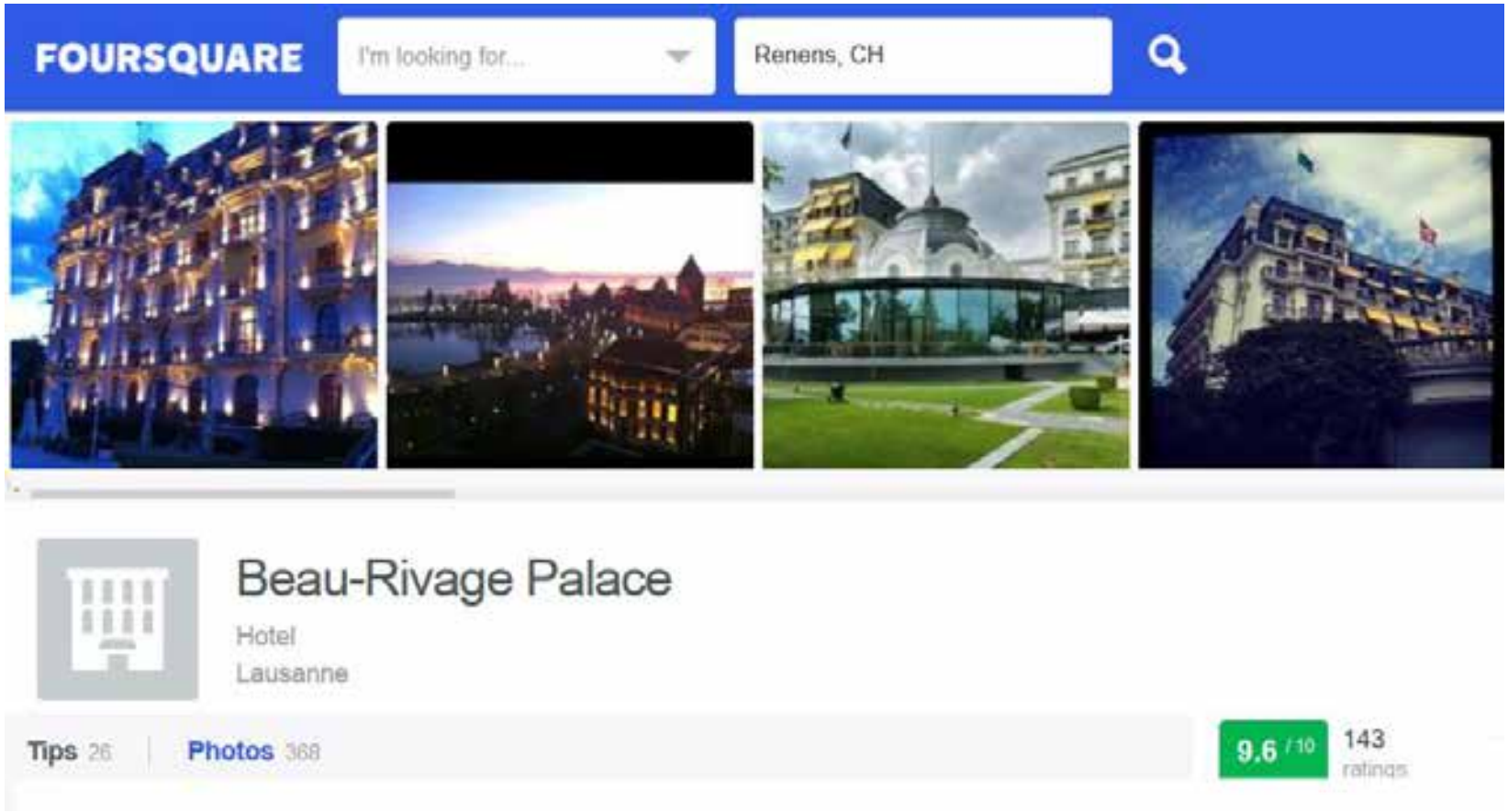
credit: https://www.tnooz.com/article/twitter-cards-travel-use-cases-you-need-to-know-about-and-how-to-do-it/

Foursquare



credit: foursquare.com

Foursquare venues



credit: foursquare.com

Example: geo-localized tweets in Switzerland

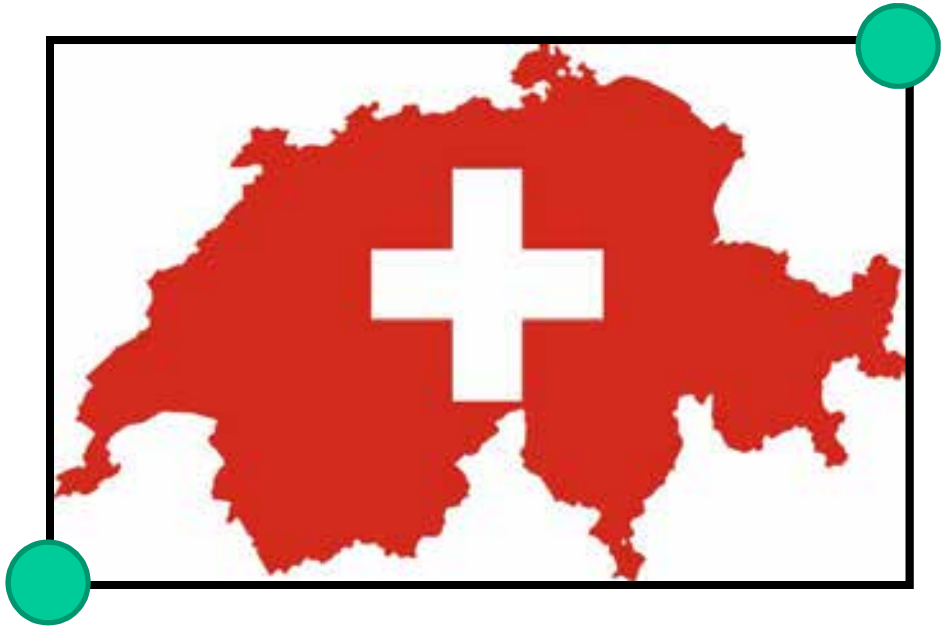
Data collection

Streaming API: bounding box parameters

22 million tweets (Dec 2011- Jan 2015)

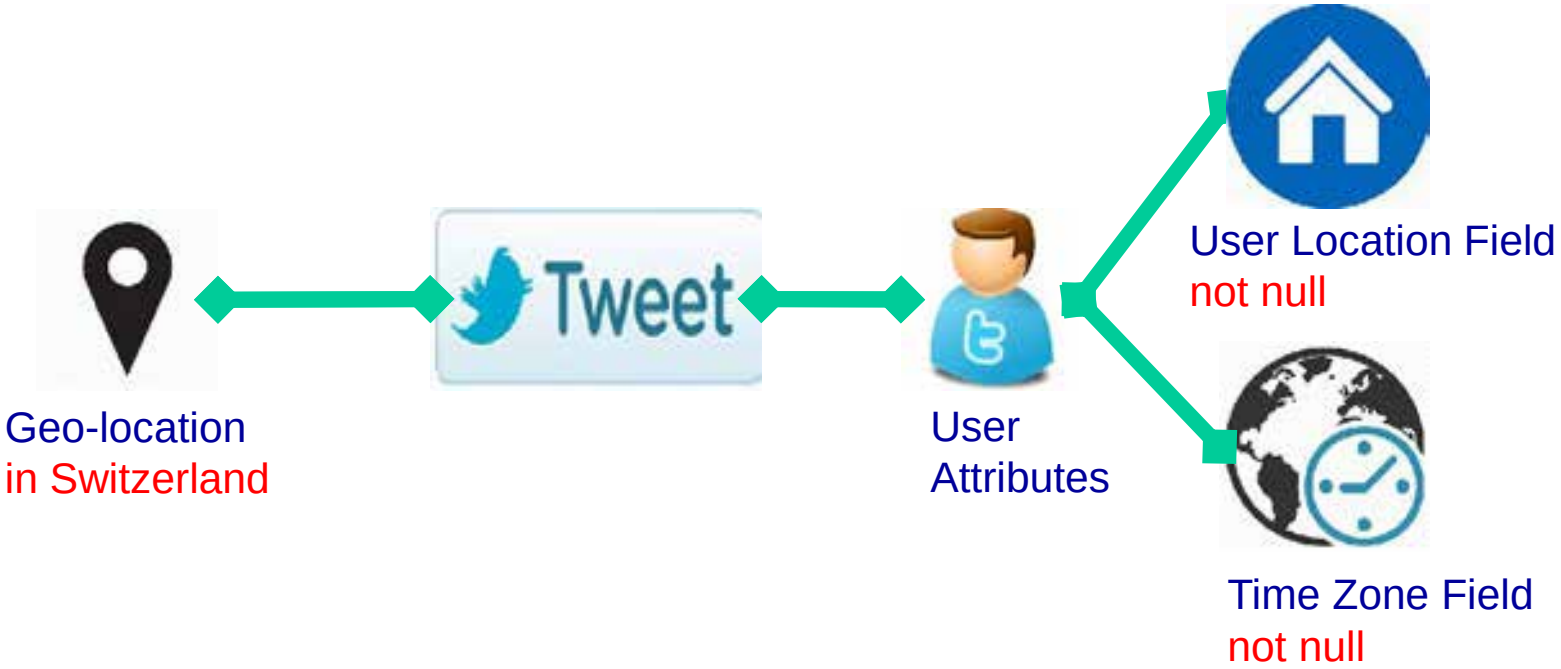
614,000 distinct users

Geo-localized Tweets are a **fraction** of all tweets (1-2%)



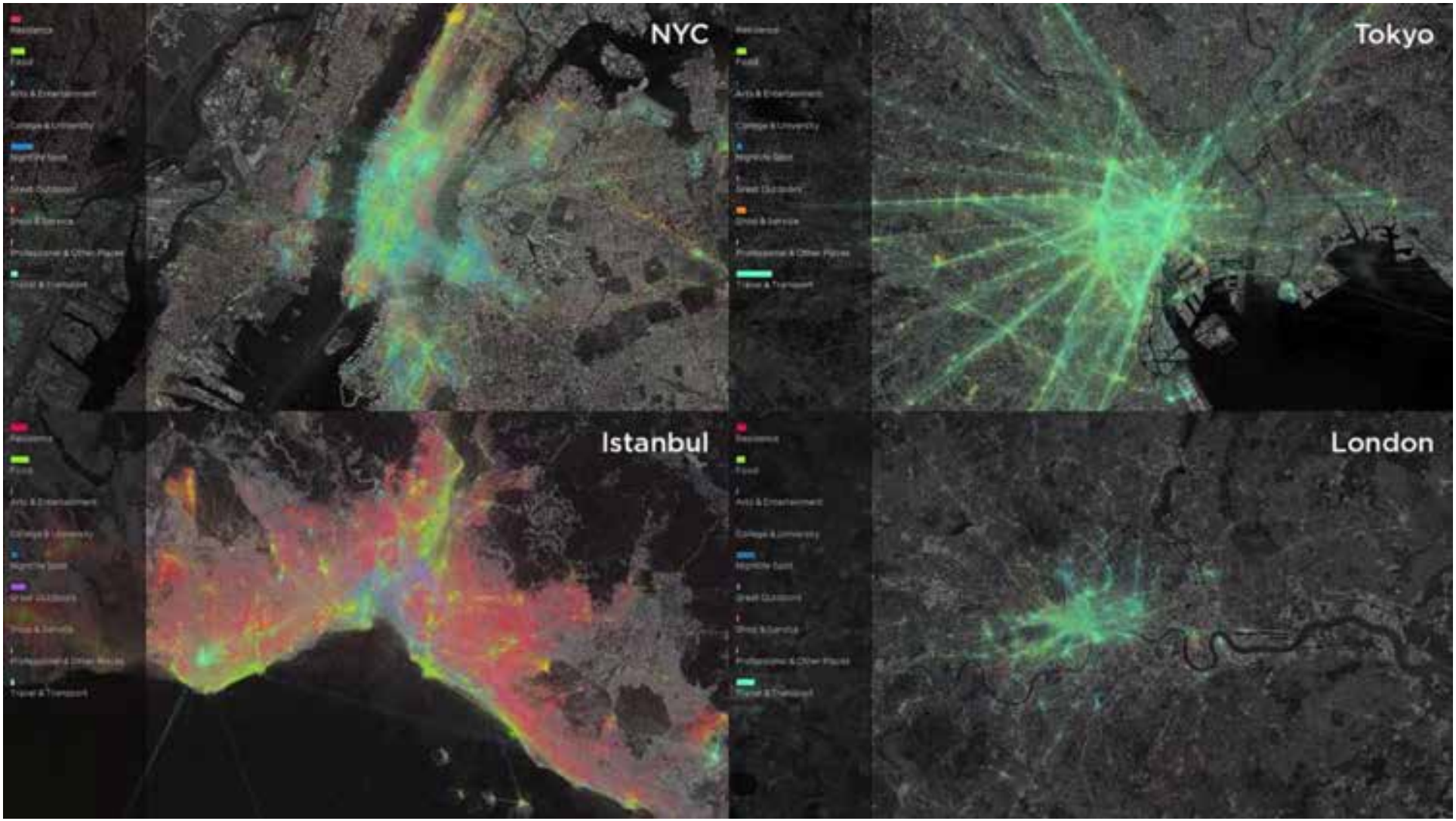
Data Filtering

Keep tweets having geo-location (latitude/longitude) in Switzerland polygon, non-null user location & time zone
4.6 million tweets
89,000 distinct users



2.
Opportunities & Challenges
Example: Mobility analysis

Mapping mobility in cities



credit: foursquare
https://vimeo.com/144409527

Human mobility models from check-ins

Gowalla: 6.4M check-ins, 196k users (02.2009-10.2010)
Brightkite: 4.5M check-ins, 58k users (04.2008-10.2010)

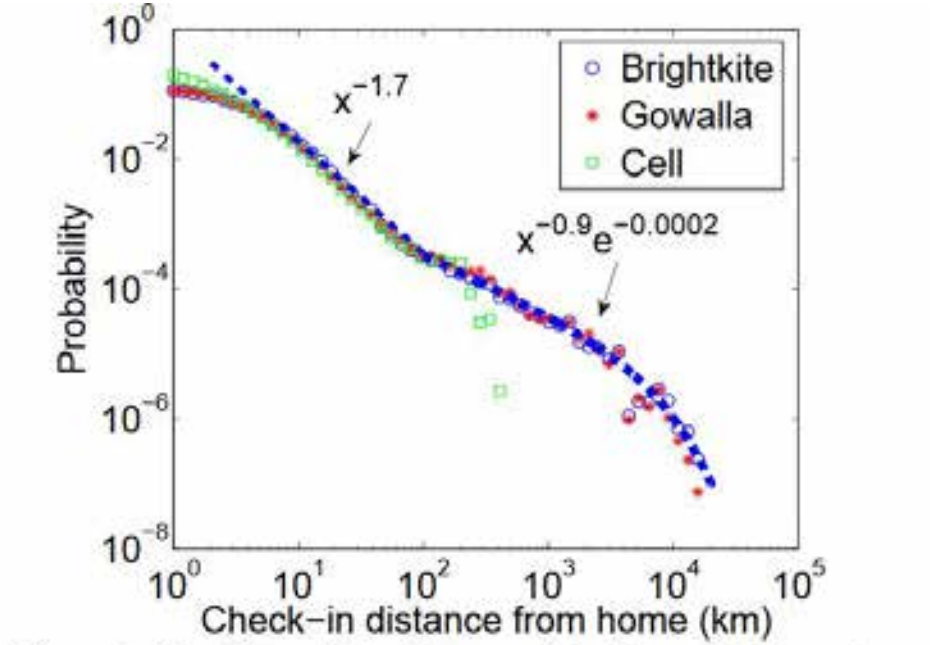


Figure 1: Fraction of check-ins as a function of distance traveled from home. Note the change in slope at around 100km.

E. Cho, S. A. Myers, and J. Leskovec. Friendship and mobility: user movement in location-based social networks. In Proc. ACM KDD 2011.

Foursquare: 35.2 M check-ins, 925k users (05.2010-11.2010)

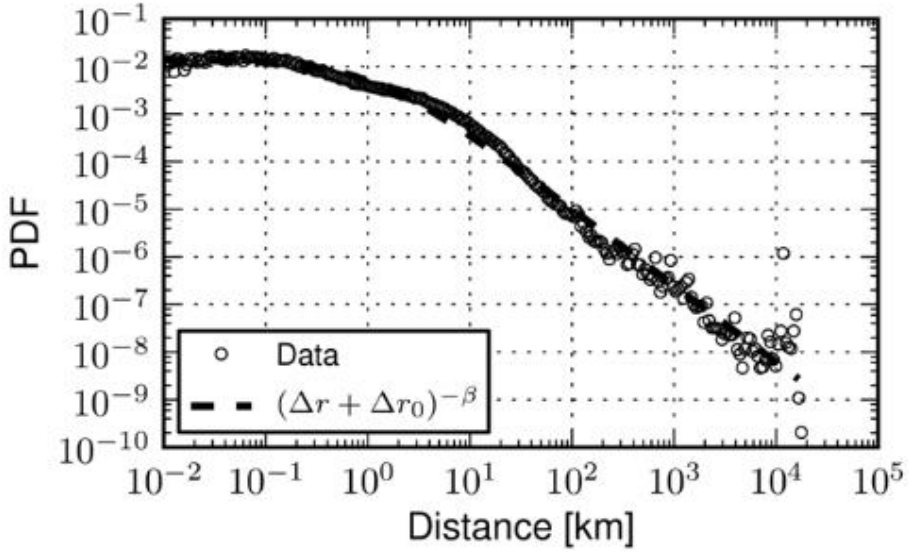
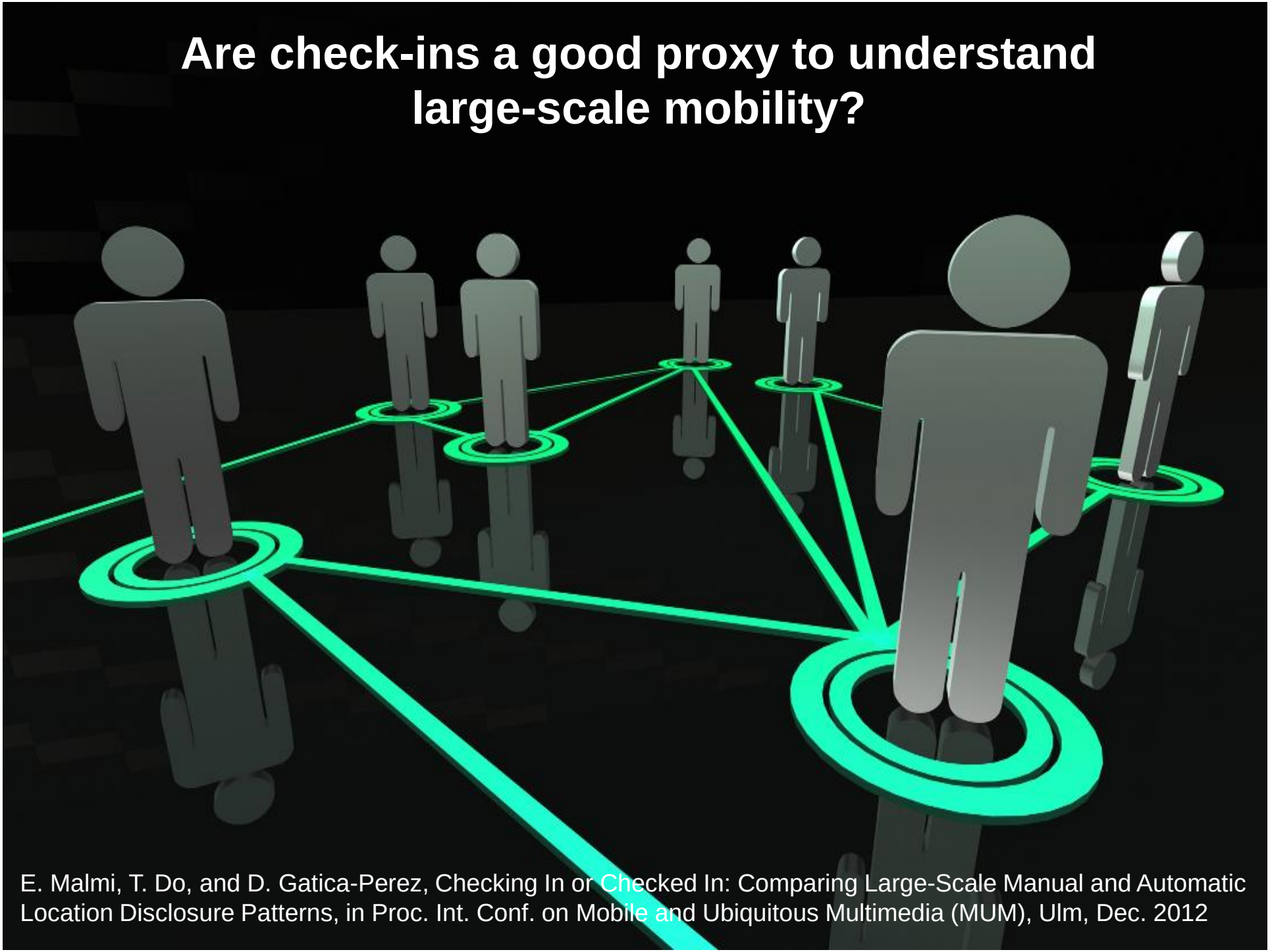


Figure 1. Global movements. The probability density function (PDF) of human displacements as seen through 35 million location broadcasts (check-ins) across the planet. The power-law fit features an exponent $\beta = 1.50$ and a threshold $\Delta r_0 = 2.87$ confirming previous works on human mobility data.

A. Noulas, S. Scellato, R. Lambiotte, M. Pontil, C. Mascolo A Tale of Many Cities: Universal Patterns in Human Urban Mobility. PLoS ONE 7(5): (2012)

Are check-ins a good proxy to understand large-scale mobility?

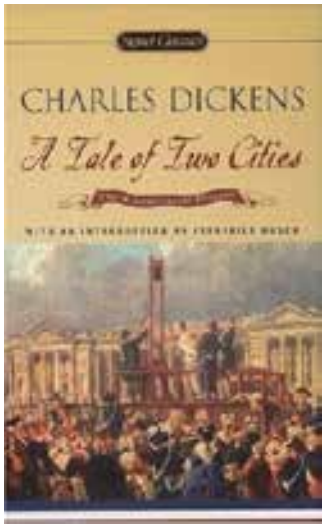


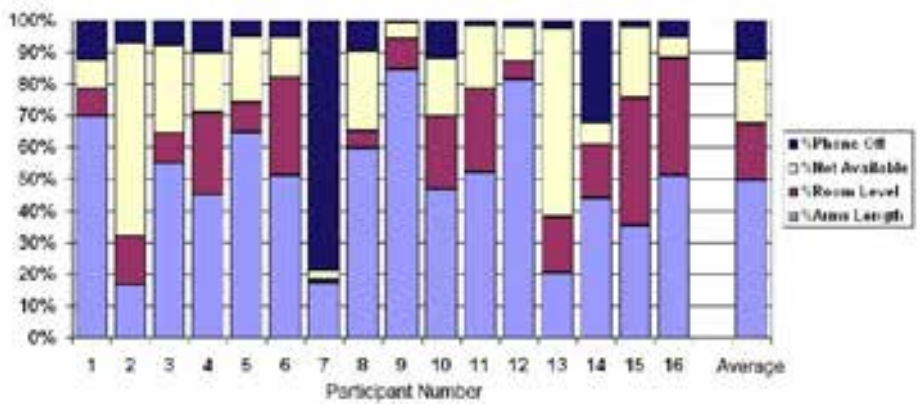
E. Malmi, T. Do, and D. Gatica-Perez, Checking In or Checked In: Comparing Large-Scale Manual and Automatic Location Disclosure Patterns, in Proc. Int. Conf. on Mobile and Ubiquitous Multimedia (MUM), Ulm, Dec. 2012

What about the assumptions?

(Gonzalez, Nature 2008)
cell phone records (CDRs)
100 000 users, 6 months
0.91 call/sms per day

(Noulas, PLoS ONE 2012)
foursquare data
925 000 users, 6 months
0.21 check-ins per day





(Patel, Ubicomp 2006)
Bluetooth connectivity only 70% of time user & phone are in same room

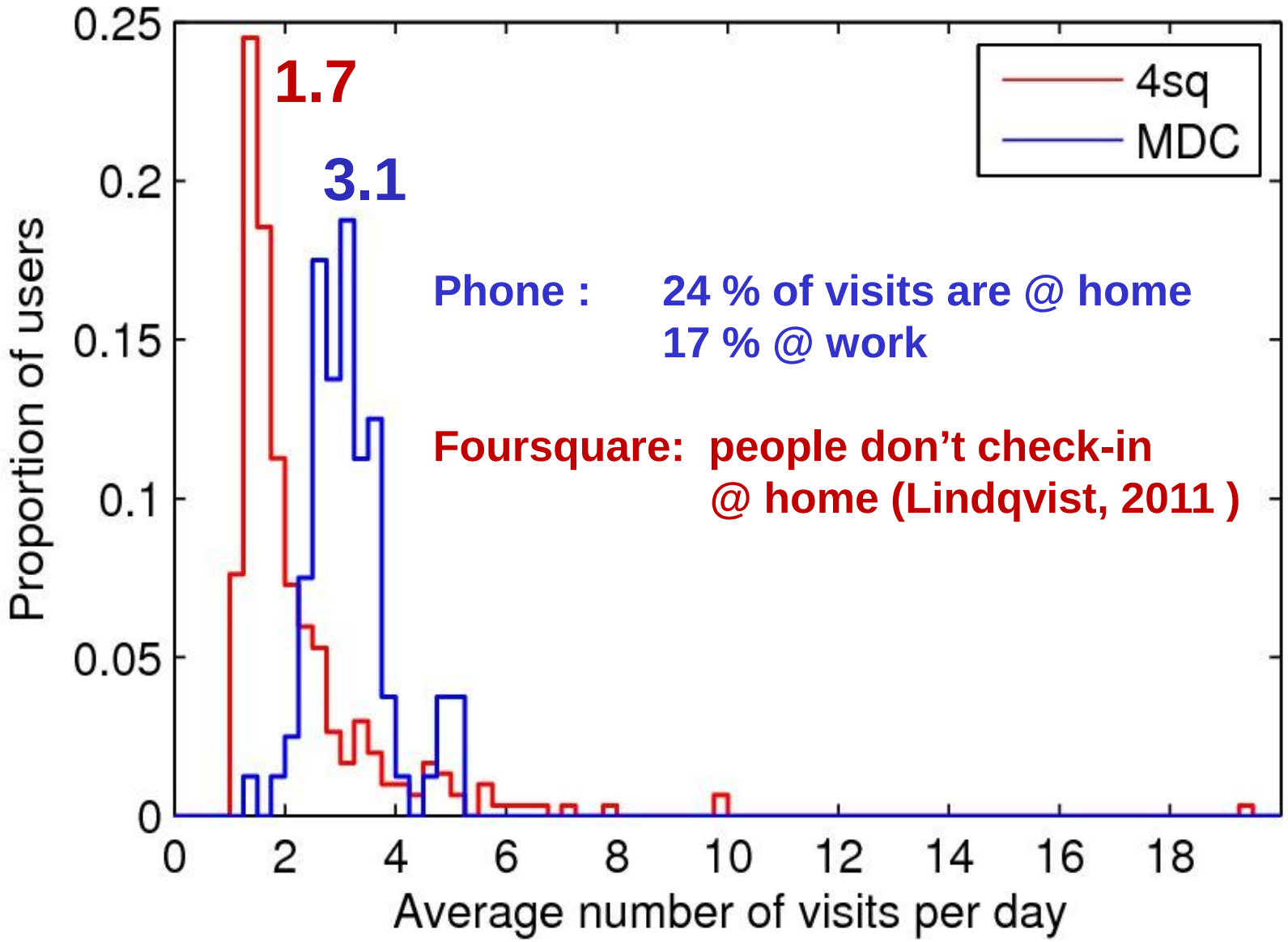
Inferred check-ins from smartphone sensors: Mobile Data Challenge (MDC)

180 volunteers, 12 months, Suisse Romande

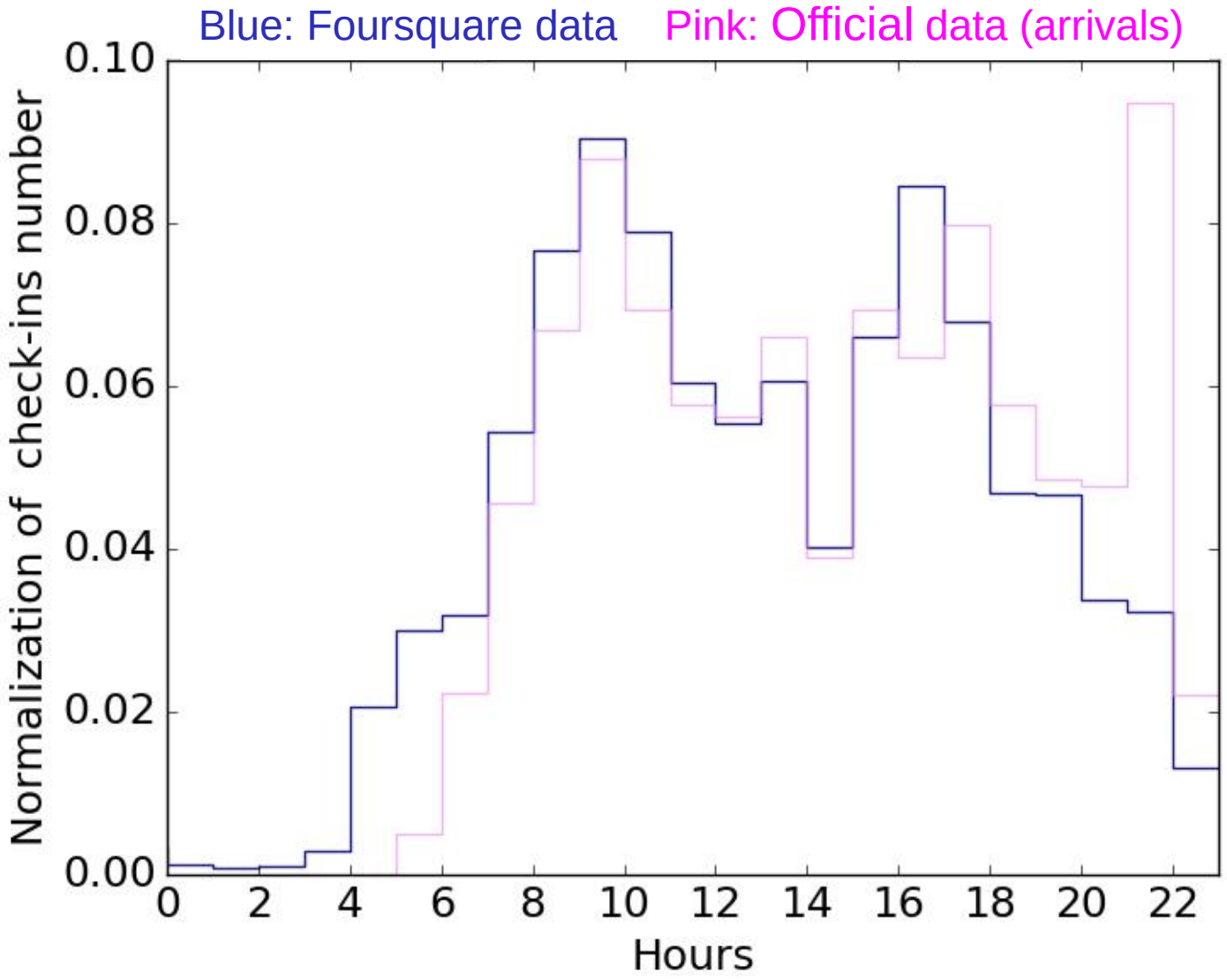
Location and other sensors

credit: icopythat@flickr

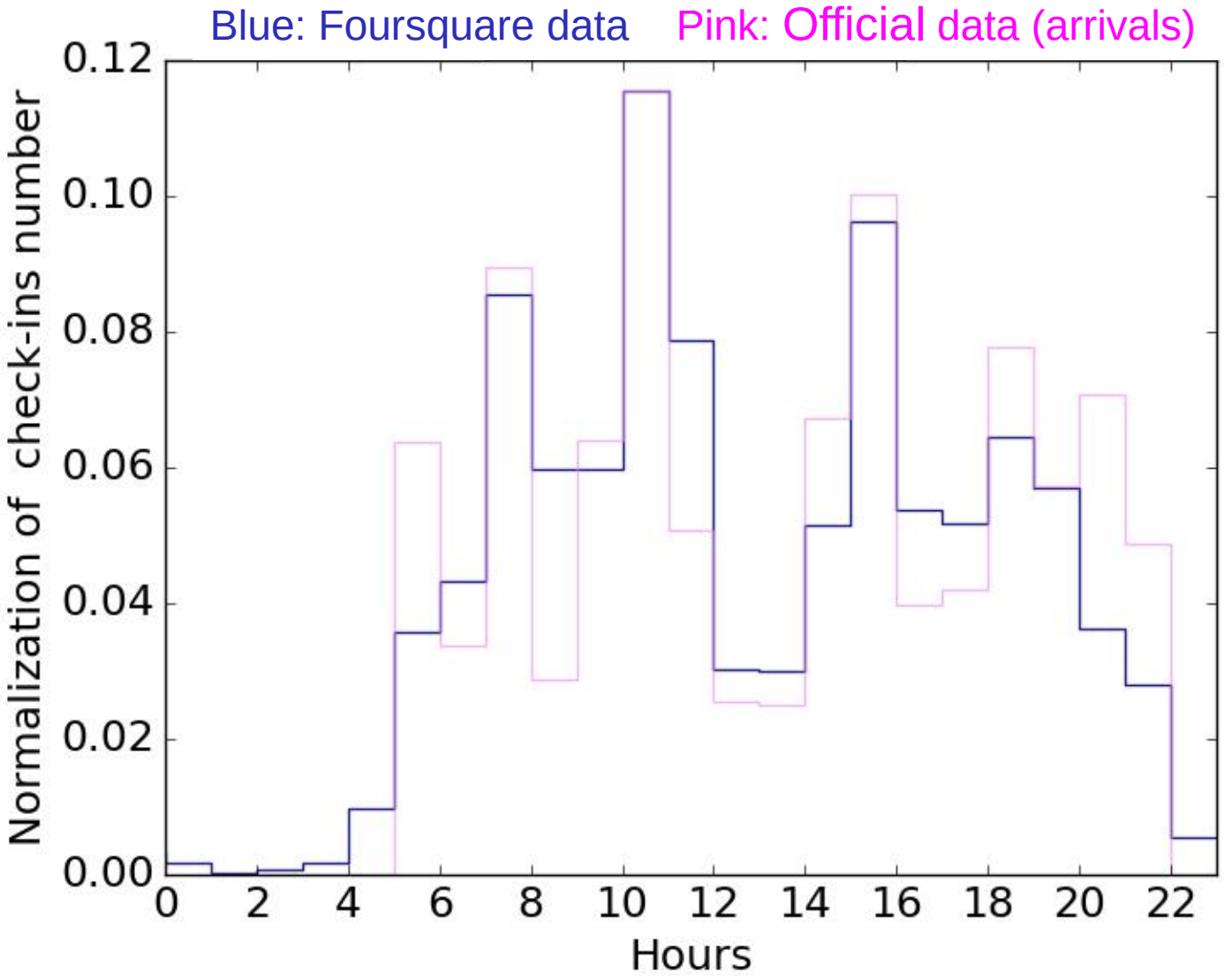
Daily “check-in” distributions: comparing phone sensors and Foursquare



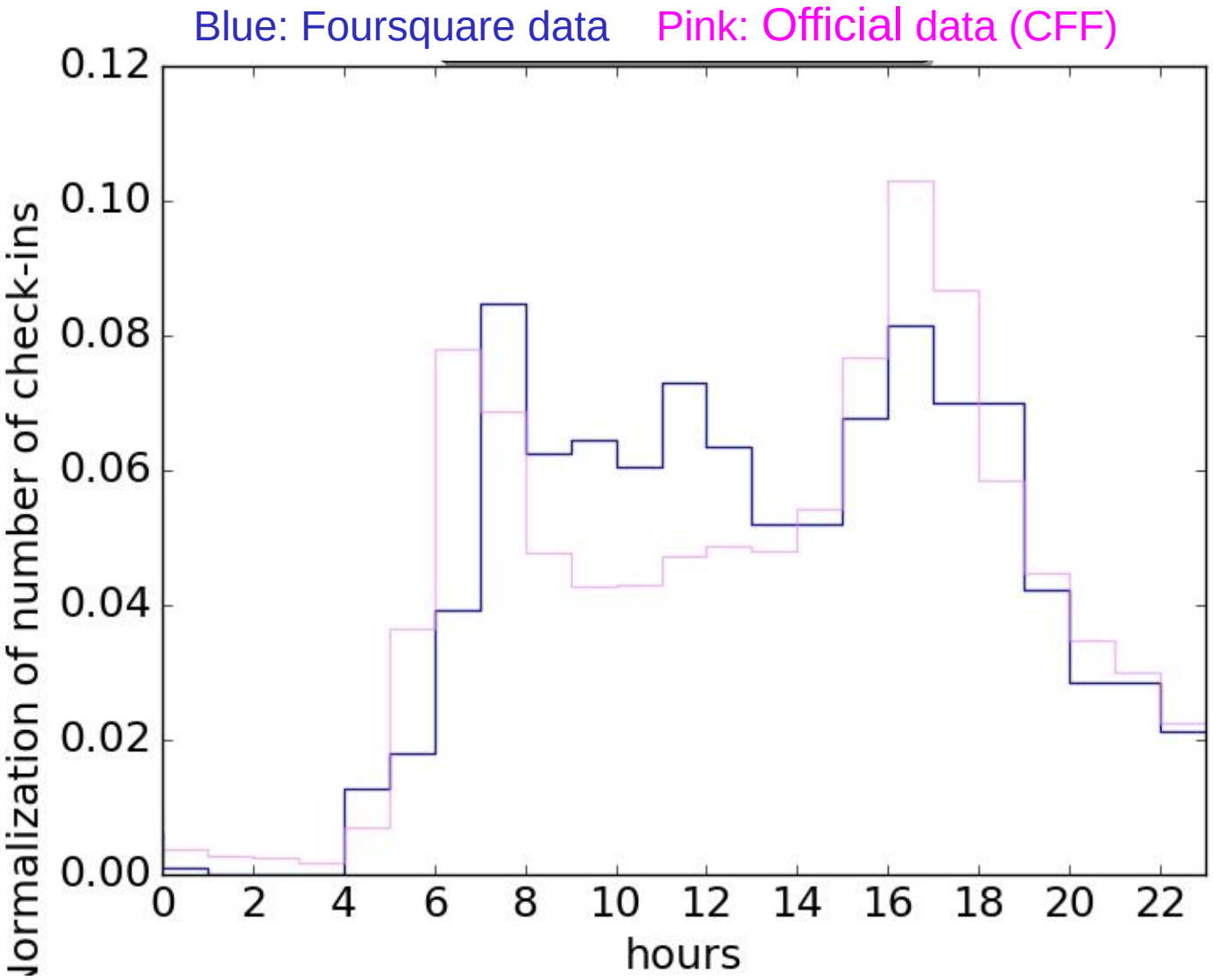
Check-in hourly activity, Geneva airport



Check-in hourly activity, Zurich airport



Check-in activity, Zurich train station



Youth@Night project

200 young volunteers (16-25 yo) documenting Swiss nightlife
Recruitment on the street was done using “social media maps”

D. Santani, J.-I. Biel, F. Labhart, J. Truong, S. Landolt, E. Kunstche, and D. Gatica-Perez
The Night is Young: Urban Crowdsourcing of Nightlife Patterns
in Proc. ACM Int. Joint Conf. on Pervasive and Ubiqiutous Computing (Ubicomp), Sep. 2016

Urban biases in geo-localized social media

People in urban and rural areas use tech differently
e.g. telephone network

Social media research has focused on urban areas
More data produced in cities

Study: aggregate geo-localized social media at county level & compare with US Census

Systematic bias towards urban vs. rural areas +
5 times more Tweets per capita

B. Hecht & M. Stephens, A Tale of Cities: Urban Biases in Volunteered Geographic Information, in Proc. AAAI ICWSM, Jun. 2014

Photo: Daniel Gatica-Perez

Conclusion

Geo-localized social data

- Informative source of certain phenomena
- Increasingly used in social media research
- Challenges: biases, privacy implications

Social media research needs official statistics

- Understand quality of social data
- Assess validity of findings
- Integrate multiple sources

Could statistical offices benefit from social data?

Thank you

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