

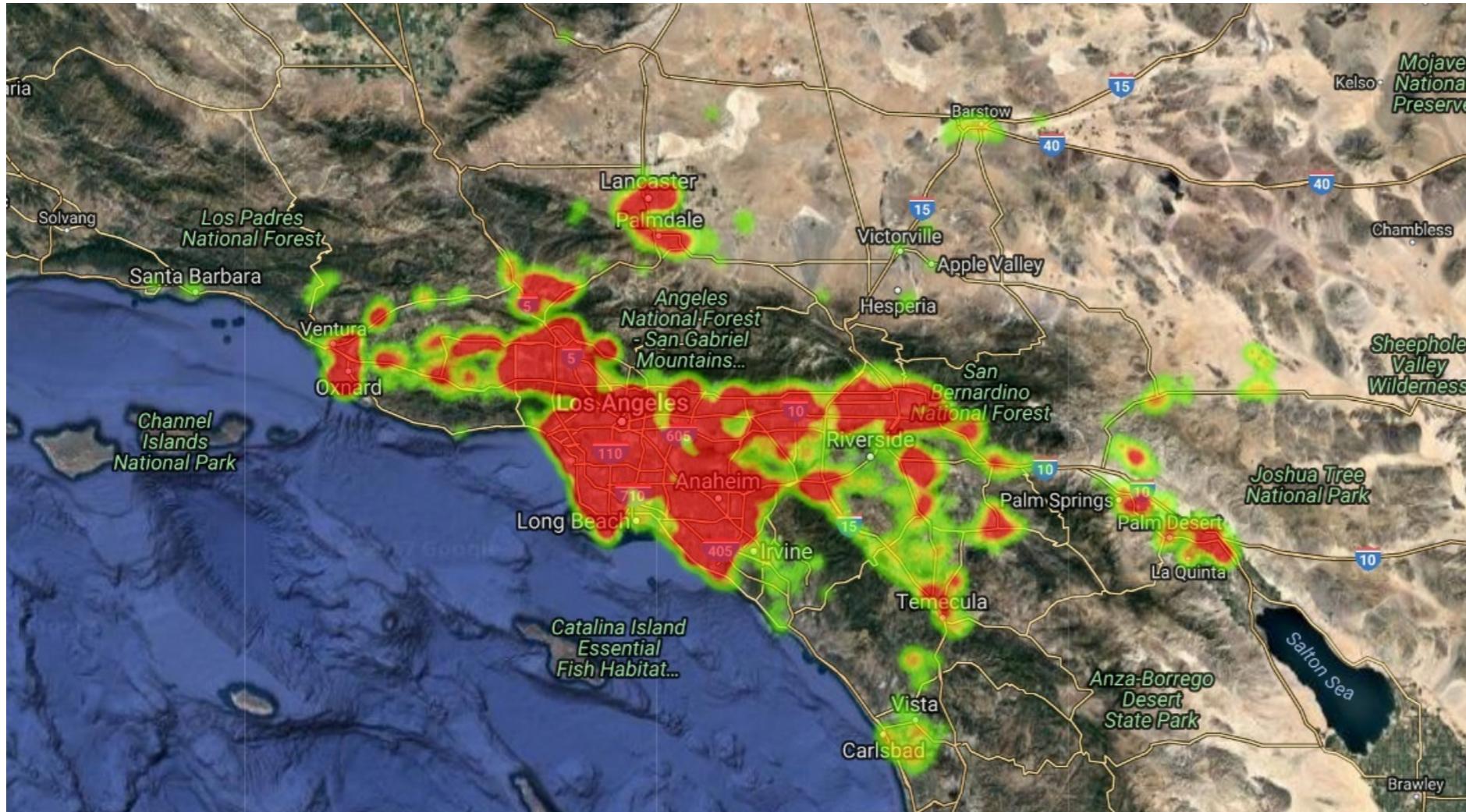
# Crowd-sourced Measurement from Mobiles: An Existence Proof

Scott Kirkpatrick, Hebrew University CS

with thanks to:

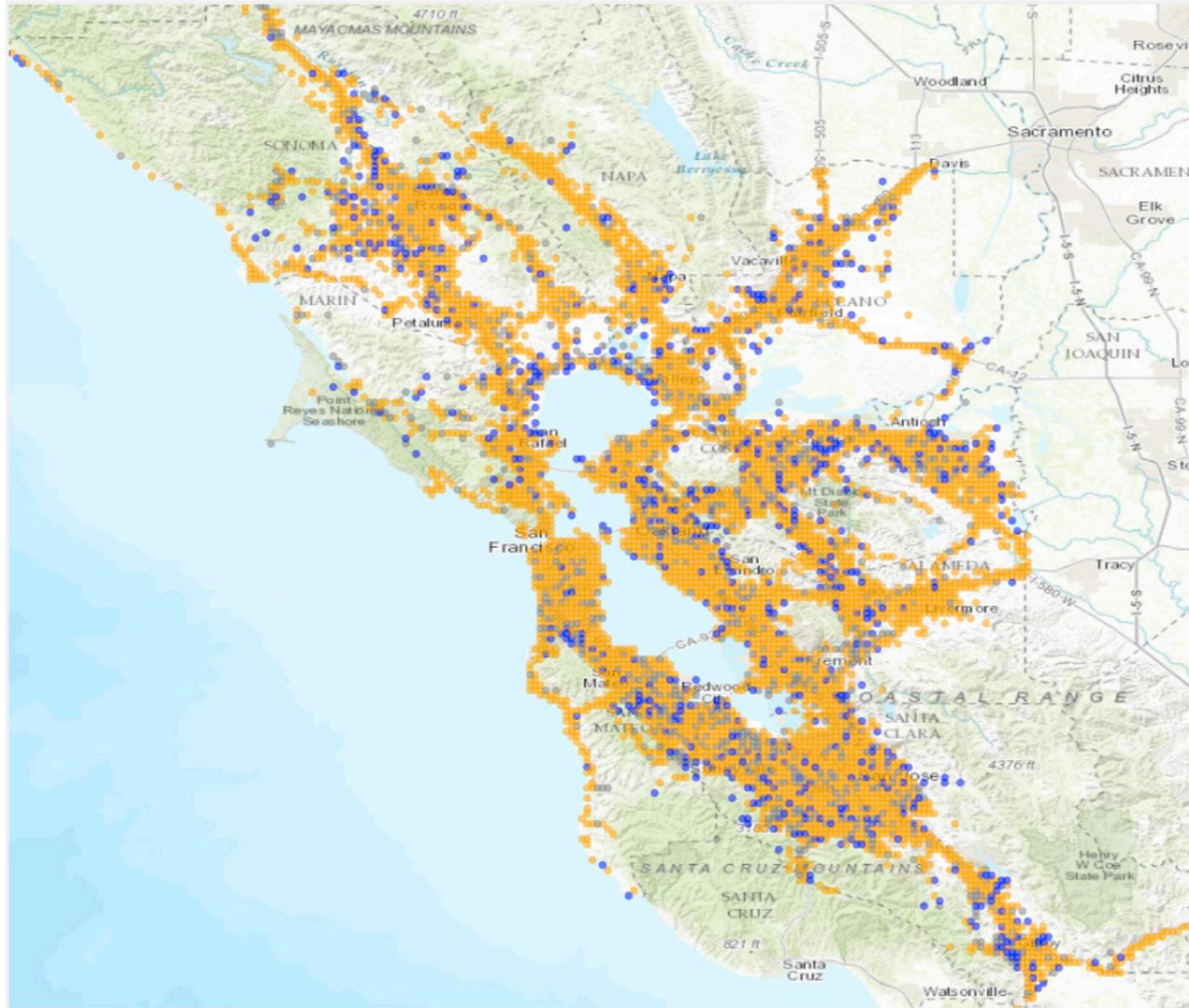
Danny Bickson, Alex Zaidelson, Orpaz Goldstein,  
Francesco Malandrino, Carla Chiasserini,  
Ron Bekkerman and Adi Zmirli

Data used: From WeFi, Inc.  
Five US cities, 2014 to 2016  
(No longer being collected at this scale)



- LA basin, Feb-May 2015
- Location data set — 131K users, lat/lon/time to ,0001 degree, 835 M measurements in 3 months
- Application data set — 91K users, lat/lon/time (by hour), app in use, data rates up/down type of connection, 422M measurements in one month

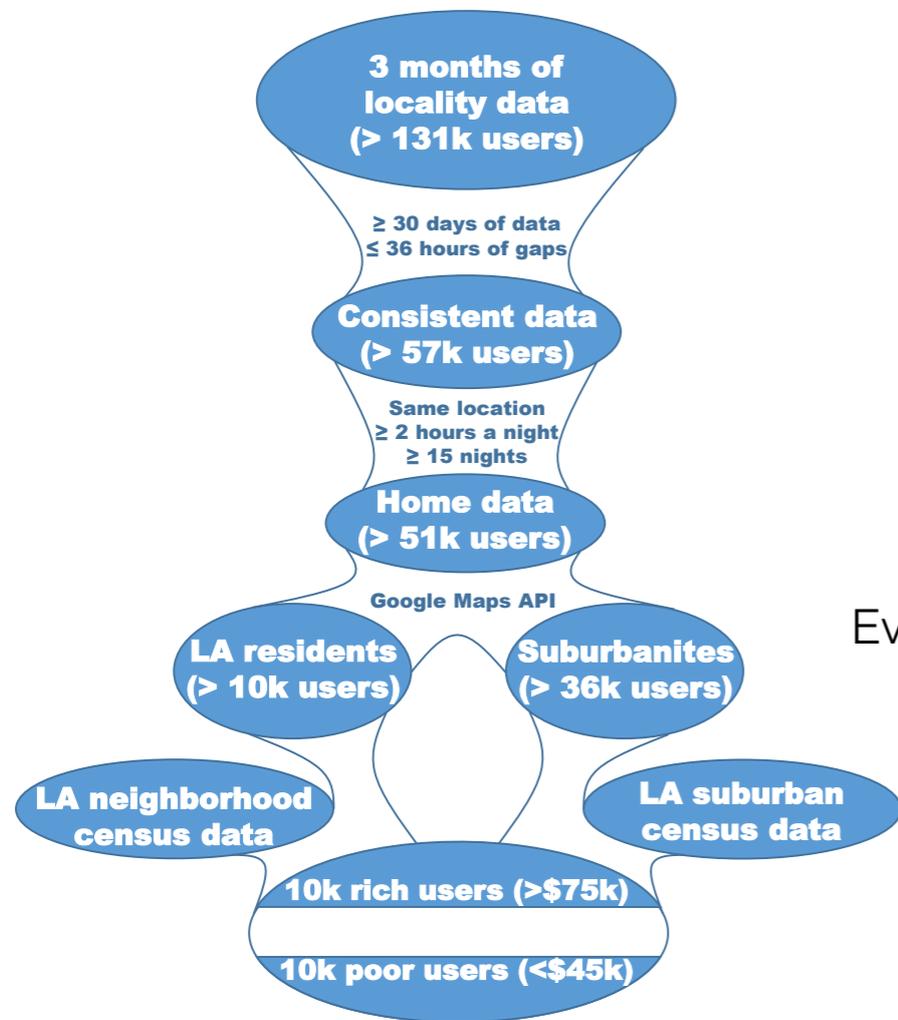
# Other cities: Boston, Brooklyn, Atlanta, San Francisco Bay area



In the map above, blue points are covered by OpenSignal better than by WeFi. Grey points are covered marginally better by WeFi, with at most three times more records than OpenSignal. Orange points are covered much better by WeFi, with more than three times as many records as OpenSignal.

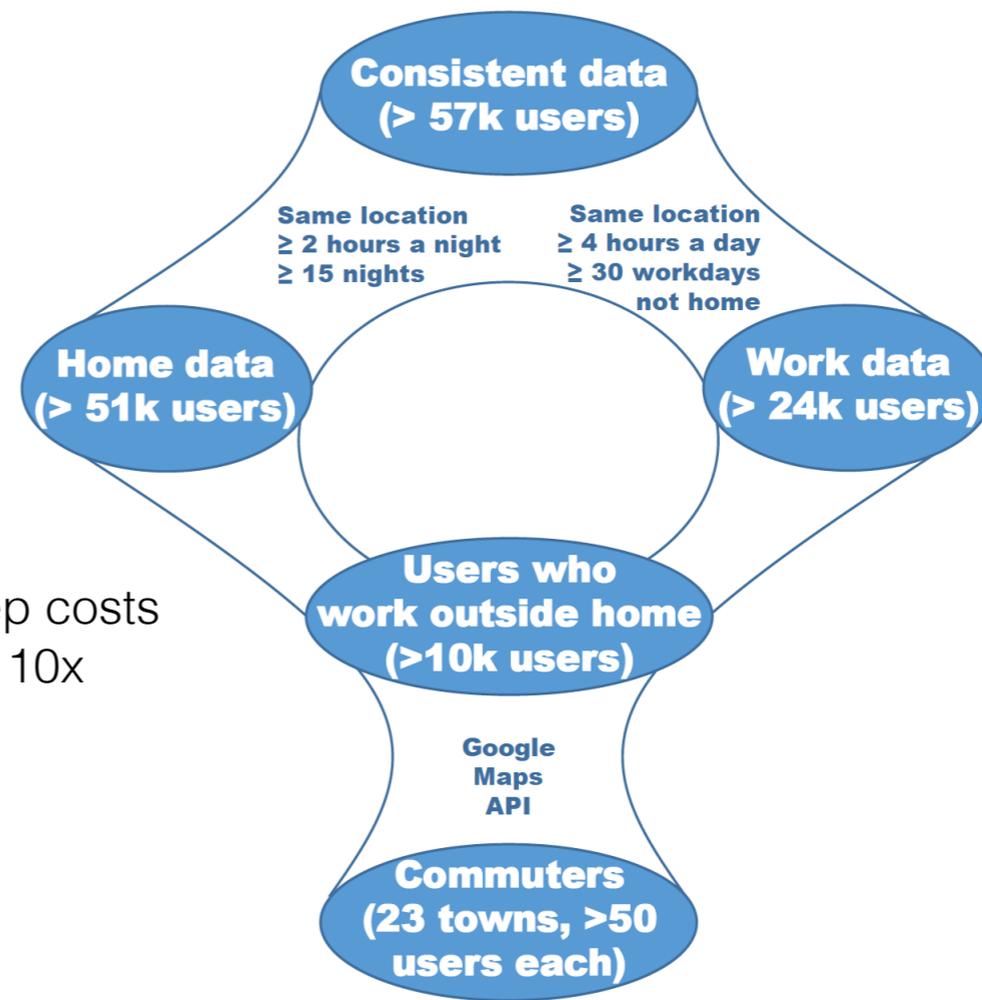
With very few exceptions, WeFi still seems to be a superset of OpenSignal.

# Human mobility data is traditionally used to study social needs and issues



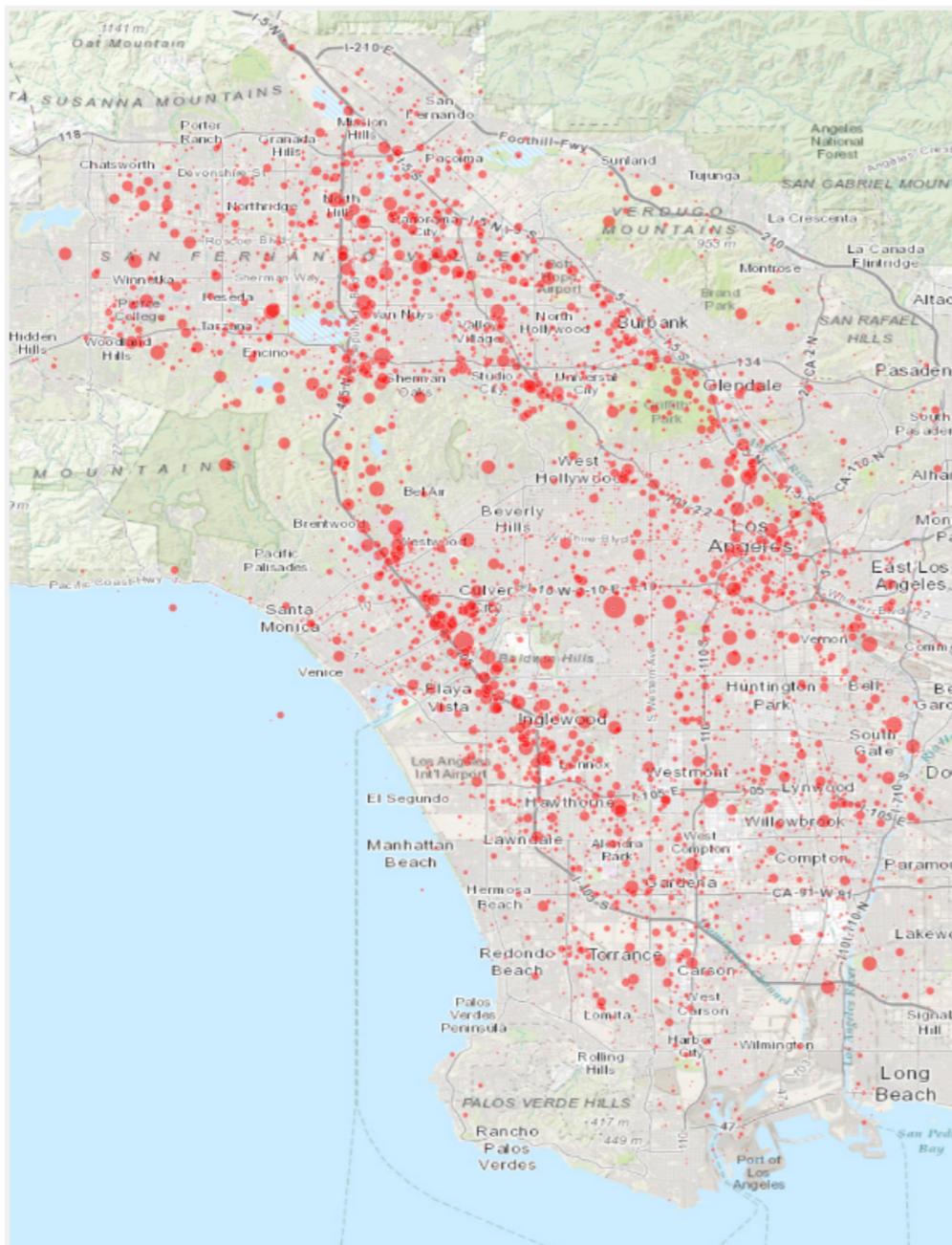
Demographics added

Every filter step costs a factor of 10x

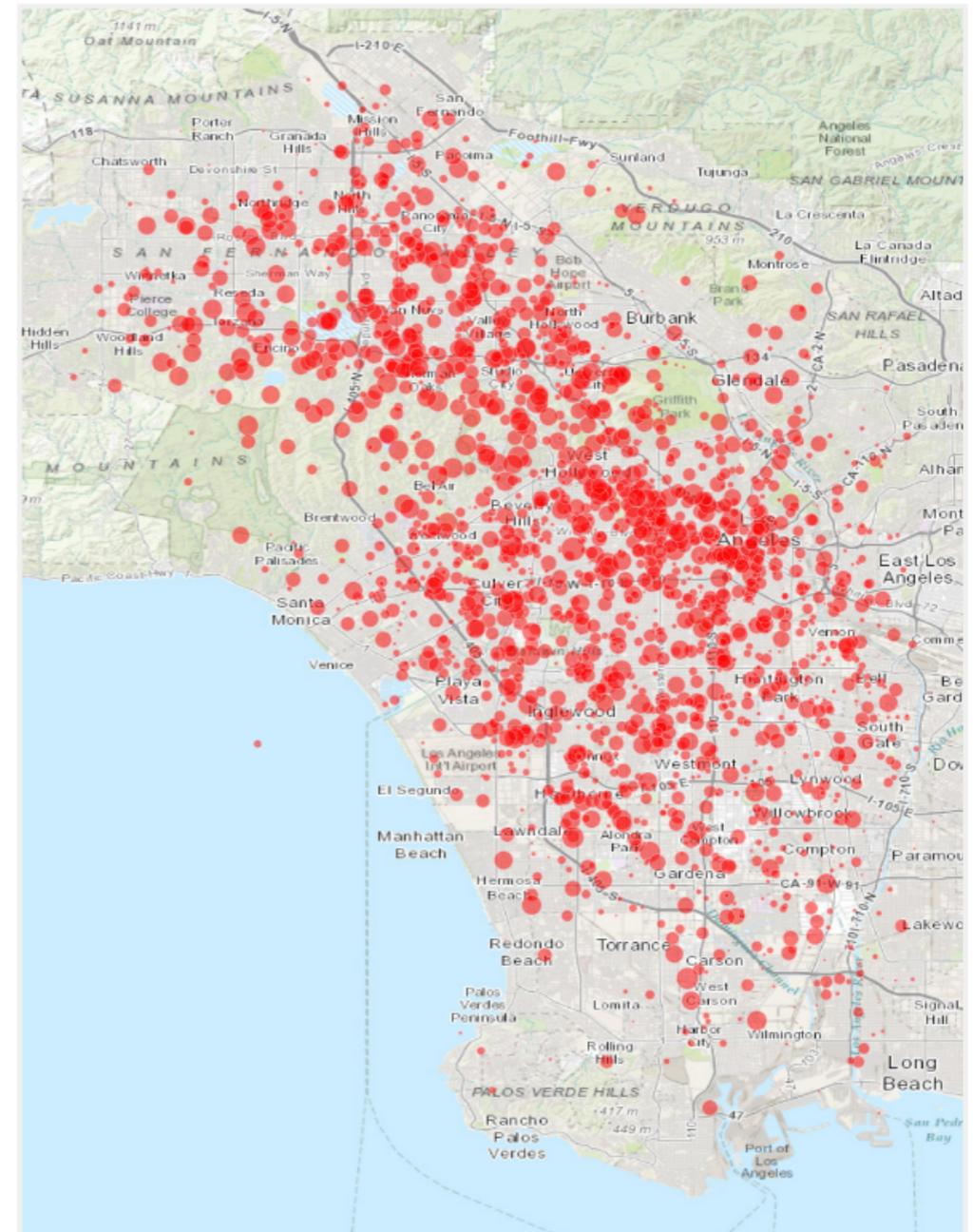


Compare commuting distances, work hours as function of estimated income.

We also know where the cell towers are,  
who is using them, and what for:  
Fog computing possibilities?



ATT



Verizon

# This opportunity has ended; Is there a future? In Europe perhaps...

- Series of European Commission studies have called for public archive of crowd-sourced measurements of “edge of Internet performance.” Testbeds for wired, broadband and 5G are funded. All come from an overarching “digital agenda.”
- Such an archive is being built. Curation, standards, and analysis of the archive is still open.
- “Performance” is still defined as bandwidth, coverage, jitter. QOE measurements are a stated objective.
- Observation of congestion in the interior from edge measurements is possible, but still not part of EC strategy.