



# CITY OF #BIGDATA

TOM SCHENK JR.  
CHIEF DATA OFFICER, CITY OF CHICAGO  
@CHICAGOCDO



**IN CHICAGO, WE BELIEVE THAT THE  
POWER OF TECHNOLOGY IS DRIVEN  
BY THE PEOPLE WHO USE AND  
BENEFIT FROM IT.**







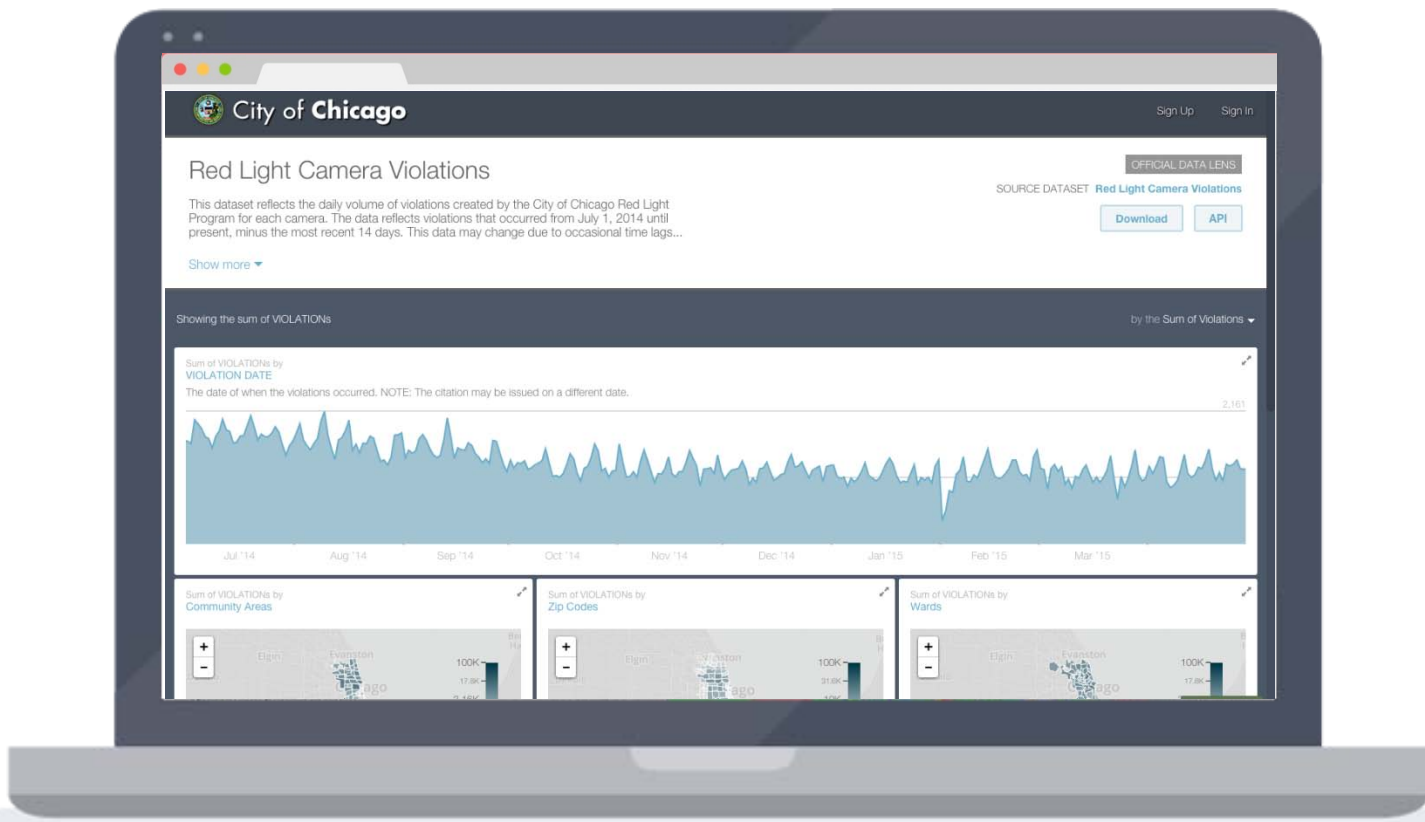


**City of Chicago** Data Portal

311 Service Requests - Pot Holes Reported  
The Chicago Department of Transportation (CDOT) oversees the patching of potholes on over 4,000 miles of arterial and residential streets in Chicago.

	CREATION DATE	STATUS	COMPLETION DATE	SERVICE REQUEST NUMBER	TYPE OF SERVICE REQUEST	CURRENT ACTIVITY	MOST RECENT ACTION
1	11/14/2014	Open		14-01987391	Pothole in Street		
2	11/13/2014	Open		14-01985287	Pothole in Street		
3	11/13/2014	Open		14-01954596	Pothole in Street		
4	11/13/2014	Open - Dup		14-01985890	Pothole in Street		
5	11/13/2014	Open		14-01984723	Pothole in Street		
6	11/13/2014	Completed	11/13/2014	14-01985227	Pothole in Street	Final Outcome	Pothole Patched
7	11/13/2014	Open		14-01984083	Pothole in Street		
8	11/13/2014	Open		14-01963203	Pothole in Street		
9	11/13/2014	Open		14-01984892	Pothole in Street		
10	11/13/2014	Open		14-01963403	Pothole in Street		
11	11/13/2014	Open		14-01964108	Pothole in Street		
12	11/13/2014	Open		14-01963368	Pothole in Street		
13	11/13/2014	Open		14-01964335	Pothole in Street		
14	11/13/2014	Open - Dup		14-01963610	Pothole in Street		
15	11/13/2014	Open		14-01964368	Pothole in Street		
16	11/13/2014	Open		14-01964183	Pothole in Street		
17	11/13/2014	Open		14-01964745	Pothole in Street		
18	11/13/2014	Completed	11/13/2014	14-01965383	Pothole in Street	Final Outcome	Pothole Patched
19	11/13/2014	Open		14-01964782	Pothole in Street		
20	11/13/2014	Open		14-01960594	Pothole in Street		
21	11/13/2014	Open		14-01964378	Pothole in Street		
22	11/13/2014	Open		14-01965179	Pothole in Street		
23	11/13/2014	Open		14-01984870	Pothole in Street		
24	11/13/2014	Open		14-01983405	Pothole in Street		
<b>Totals</b>		323428					

Data on potholes are reported by residents and city staff through the 311 system, which is then reported on the City's #opendata portal—updated daily.



**Chicago has released more #opendata, including important items such as red light and speed camera violations, problem landlords, and public chauffeurs.**

[data.cityofchicago.org/view/caas-knxs](https://data.cityofchicago.org/view/caas-knxs)



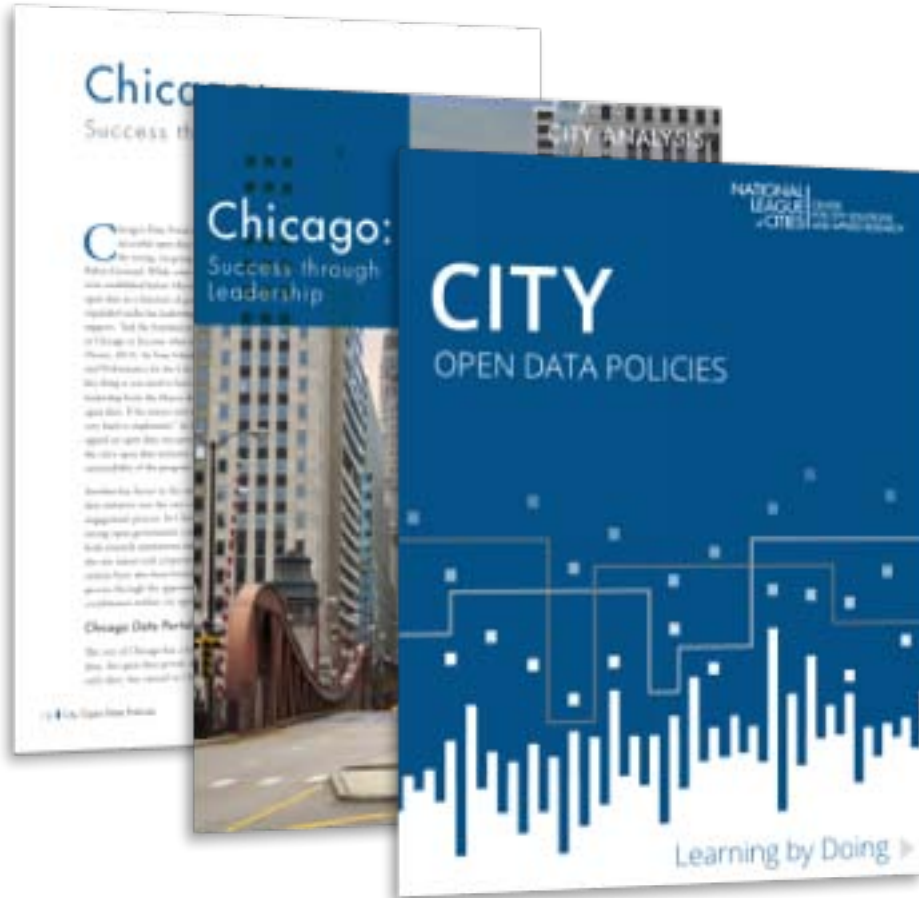
**#OPENDATA PROVIDES A MEANS  
TO CREATE AN ECOSYSTEM  
AROUND DATA, WHICH  
INCLUDES MULTIPLE  
STAKEHOLDERS AND  
INITIATIVES THAT EXTEND  
BEYOND TRANSPARENCY.**

Open Gov Hack Night

happy 1 year!







**National League of Cities**  
NLC issued a report discussing the role of Chicago's leadership in developing a leading #opendata portal. The first chapter reviews Chicago's open data program and its benefits to the city, residents, and others.



“Open data initiatives are an increasingly popular component of governance. At the national level, Chicago’s #opendata initiative has been held up as a model for cities that are seeking to start their own open data programs.”

**- National League of Cities, p. 22**





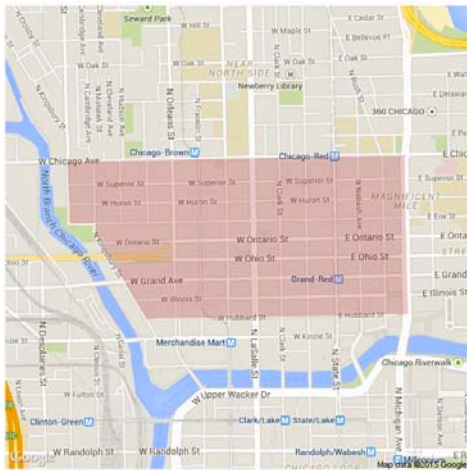
© Tom Schenk Jr, 2016. CC-BY

## **Civic Tech Community**

Chicago has a large, vibrant, **productive**, civic community. This is led by Chicago residents interested in technology and society. Smart Chicago Collaborative and non-profits provide assistance and city officials regularly engage in meetups and other activities. This group has produced several helpful apps using #opendata.

## Ward 42, Sweep Area 2

ARE THE DATES OF YOUR NEXT STREET SWEEPING



## Want to be reminded of upcoming street sweepings?

SweepAround.us has several options for being notified of street sweeping in this area: we can send you an email, a text message or you may subscribe to a calendar feed.<sup>1</sup>

✉ Enter your email address, and we'll send alerts directly to your inbox.

Subscribe

📱 Receive text message alerts on your phone. To subscribe, text **W42A2** to **(773) 675-1985**.<sup>2</sup>

📅 Download or subscribe to this area's sweep calendar in iCal, Google Calendar or Outlook.

## 2015 Sweep Schedule

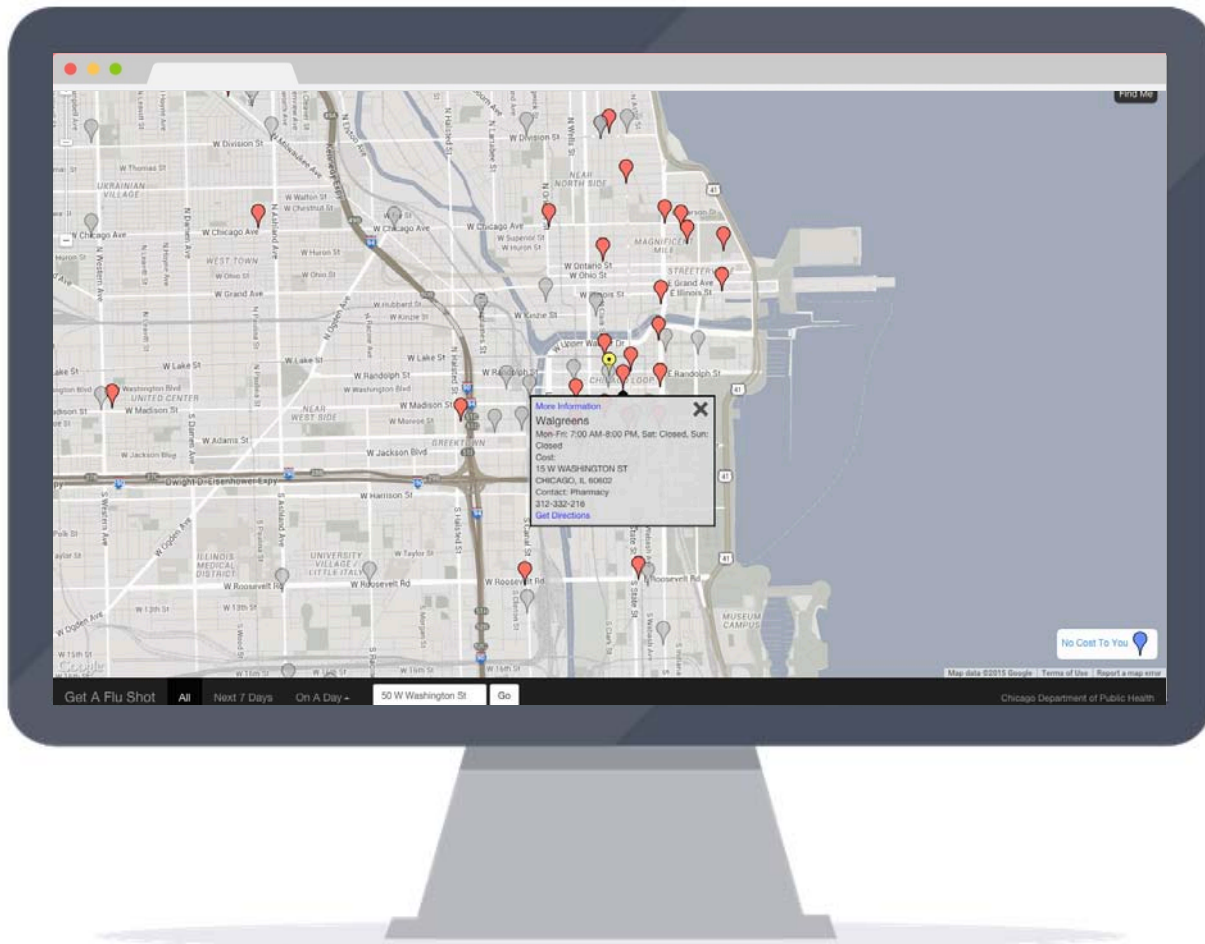
1. Email and text message alerts will be sent one week, and one day, prior to the beginning of street sweeping in this area.

2. Standard message and data rates may apply. To unsubscribe from alerts for this area, text STOP-W42A2.

# sweeparound.us

Using #opendata, this service developed by the civic community alerts individuals to street sweeping activity by providing email, text, or calendar alerts.





**chicagoflushots.org**

Chicago Flu Shots was developed to easily find flu-shot locations across Chicago. The code was created by a volunteer is #opensource so the site was adopted by Boston, Philadelphia, and San Francisco.

# OPEN DATA & INTERNET OF THINGS



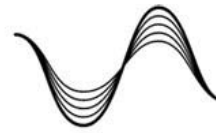
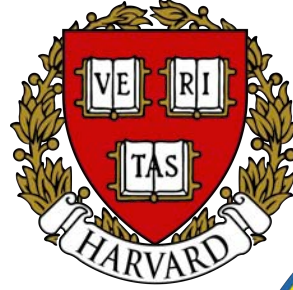
© 2015 Chris Metcalf

Open data has also spread to physical devices. @chrismetcalf used traffic congestion data from the open data portal to generate an imp to provide a red or green light to denote heavy or light traffic congestion.

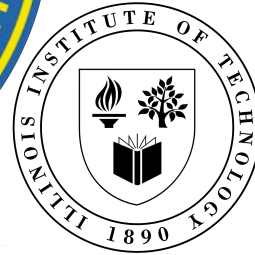


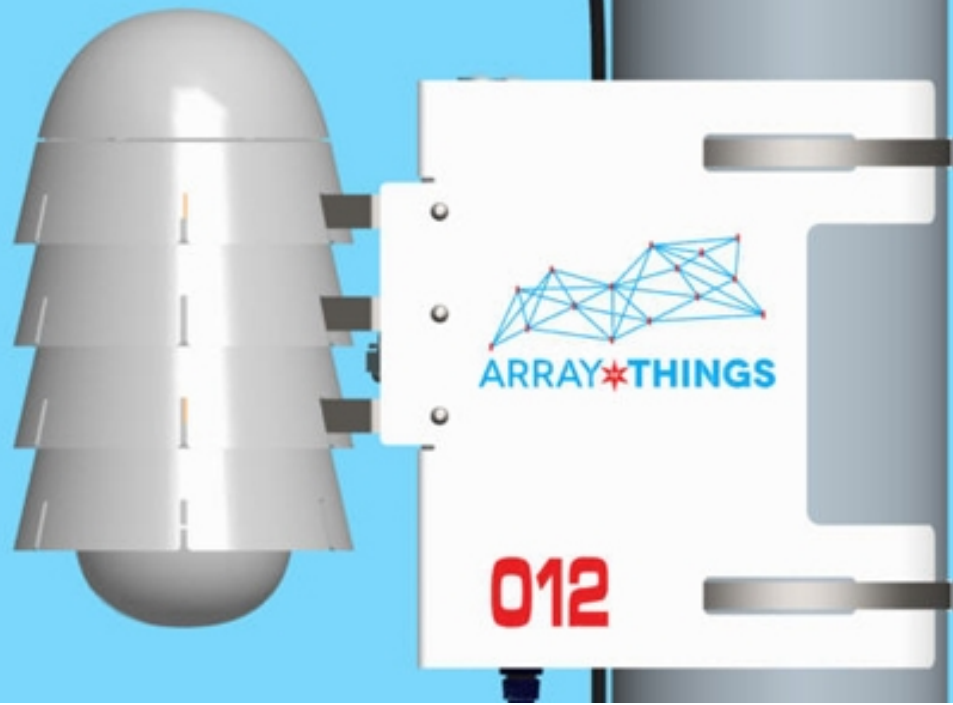
# Academia

The City of Chicago has a number of high-quality research universities and groups willing to engage in projects with the city. We can leverage open data portal and data itself to create cooperative relationships.



Data Science  
for Social Good





© 2015 University of Chicago

**Array of Things**  
[arrayofthings.github.io](https://arrayofthings.github.io)

University of Chicago has partnered with multiple institutions to build a mesh network of small sensors, dubbed the **Array of Things**, that will frequently post data for public consumption.

# Array of Things

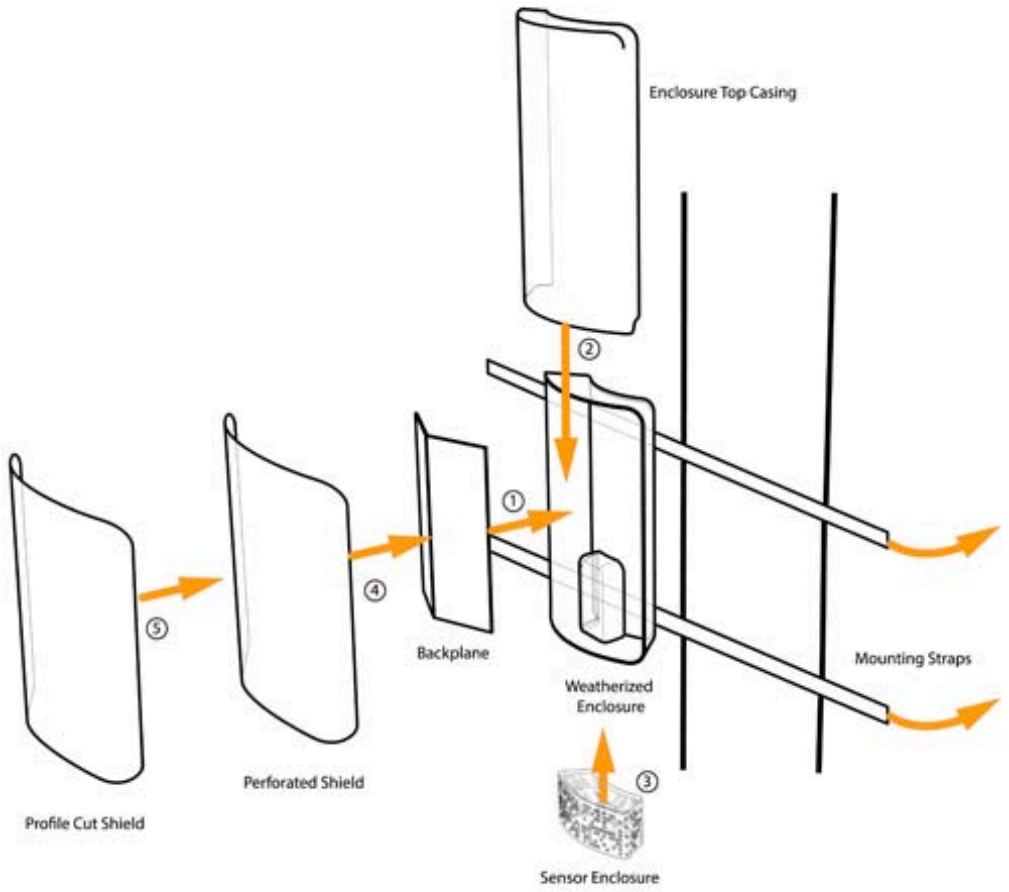
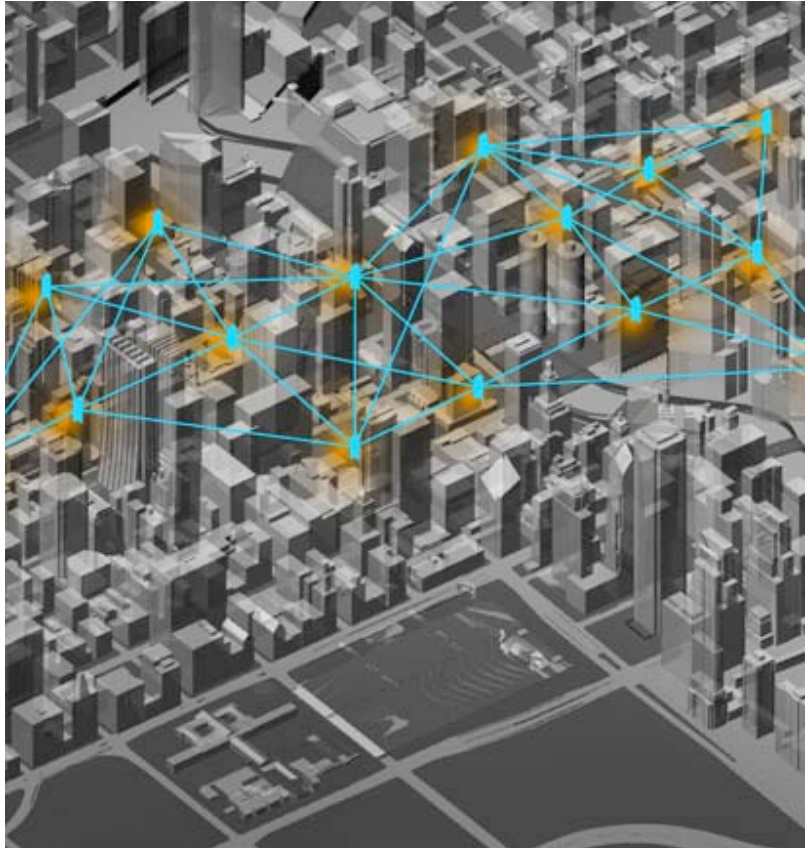


The Array of Things will provide hyper-local, temporal data on using a variety of sensors:

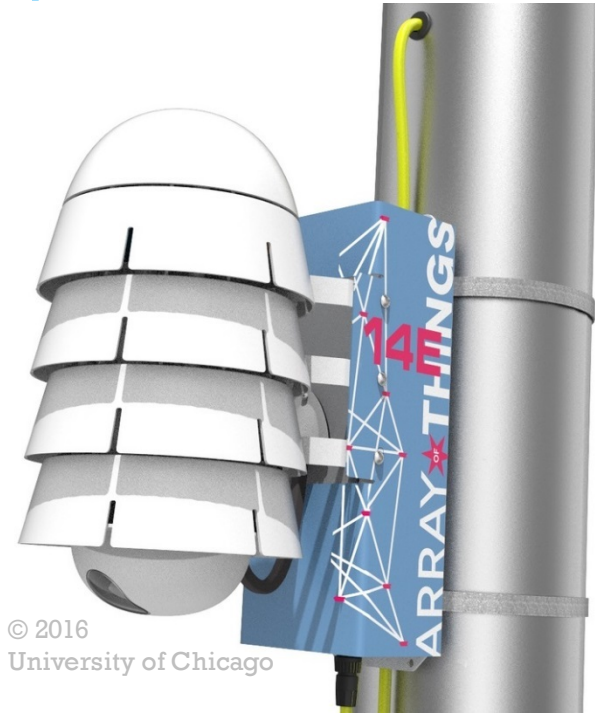
- **Sensors measuring sound and vibration**
- **Low-resolution infrared cameras** measuring sidewalk temperature
- **Climate and environmental data**, such as air-quality and temperature



# Array of Things



# OPEN INTERNET OF THINGS



Array of Things



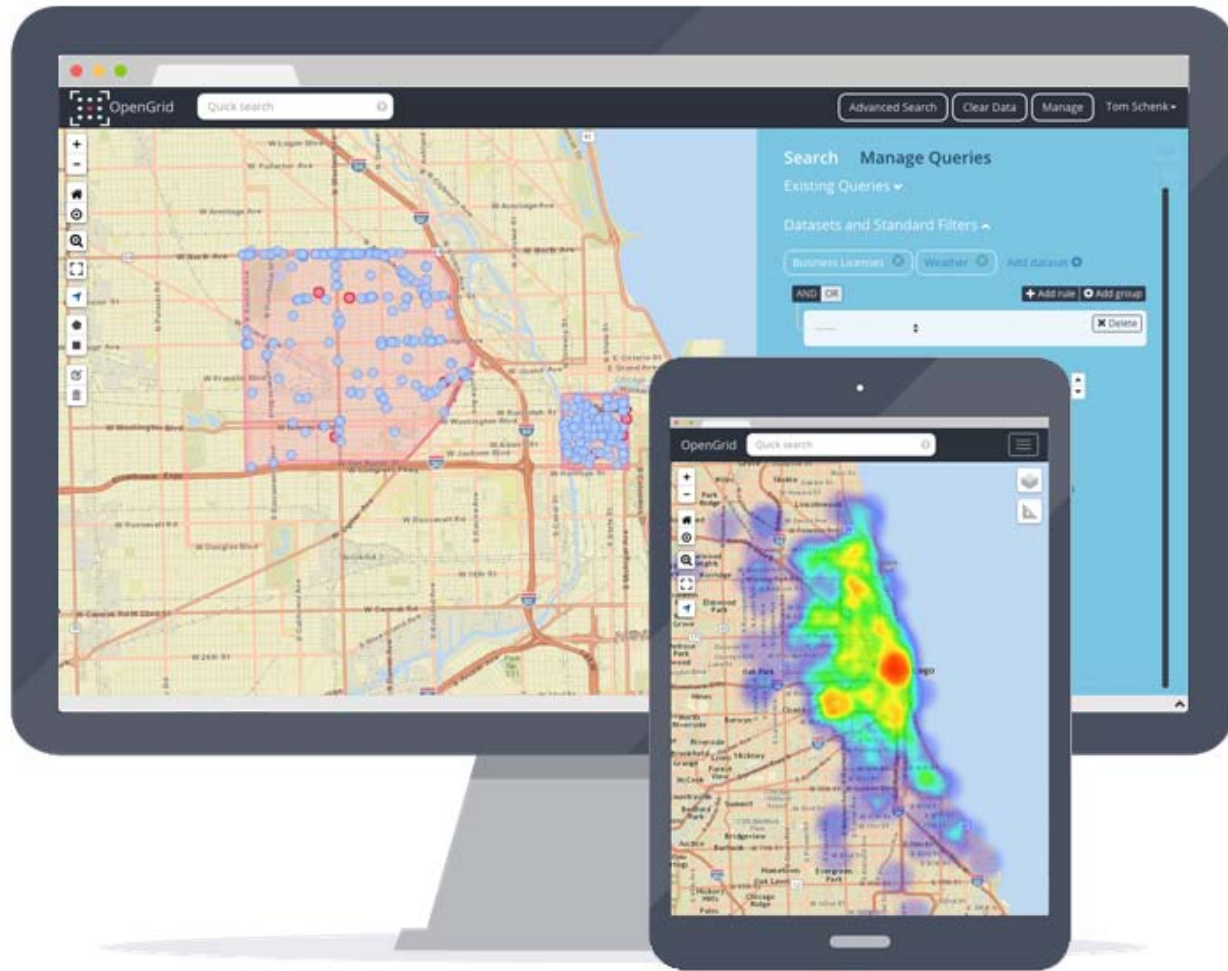
Chicago Open Data Portal







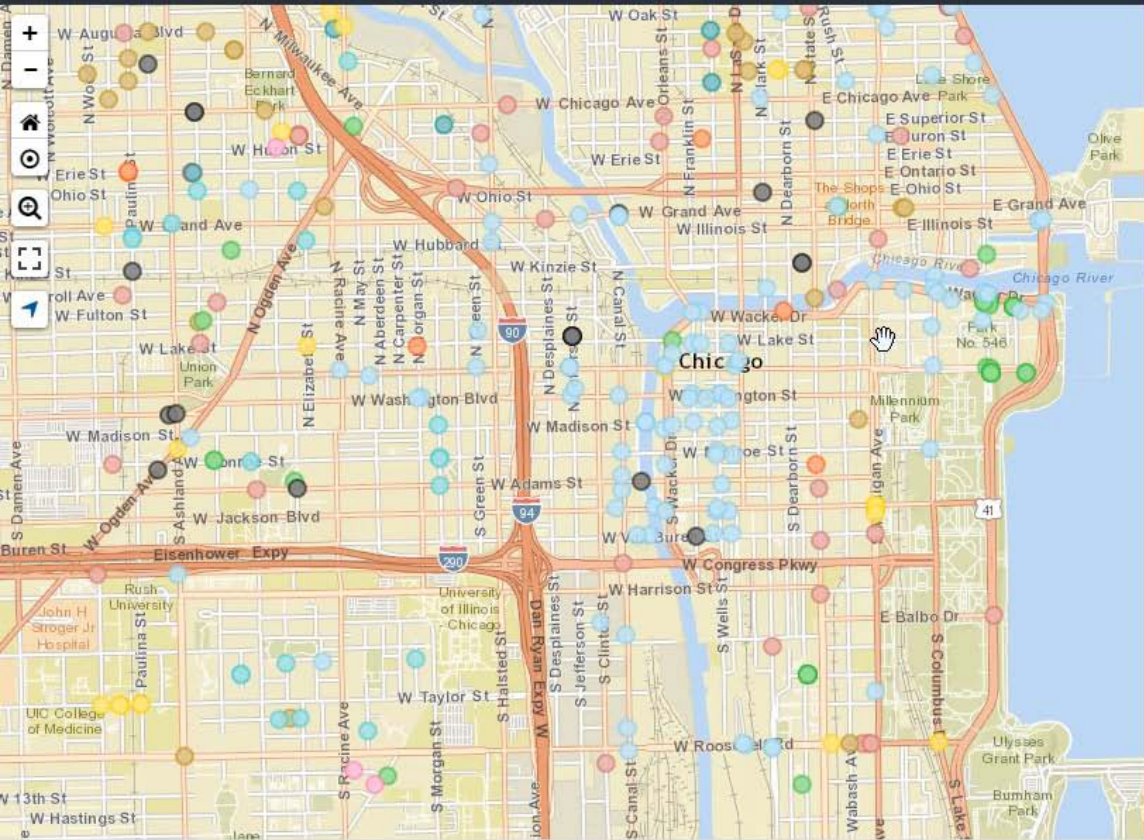




## OpenGrid.io

An #opensource platform which allows you to explore events such as 311 calls, crimes, permits, inspections, DIVVY trips in an interactive map. This software can be used by the public and an internal version drives situational awareness.





Search Manage Queries

Existing Queries ▲

COMMONLY USED QUERIES 311 Service Requests around you

Datasets and Standard Filters ▼

Additional/Geo-spatial Filters ▲

WITHIN Map Extent ▼

NEAR Me ▼

The Geo-location marker on the map will be used

WITH MAX. RADIUS OF 1/8  Feet  Miles

FROM CURRENT LOCATION

AUTO-REFRESH EVERY (SECONDS) 30 ▼

Submit

Reset



# ADVANCED ANALYTICS

## #Prediction

Using data and advanced research techniques to forecast and predict events in the city.

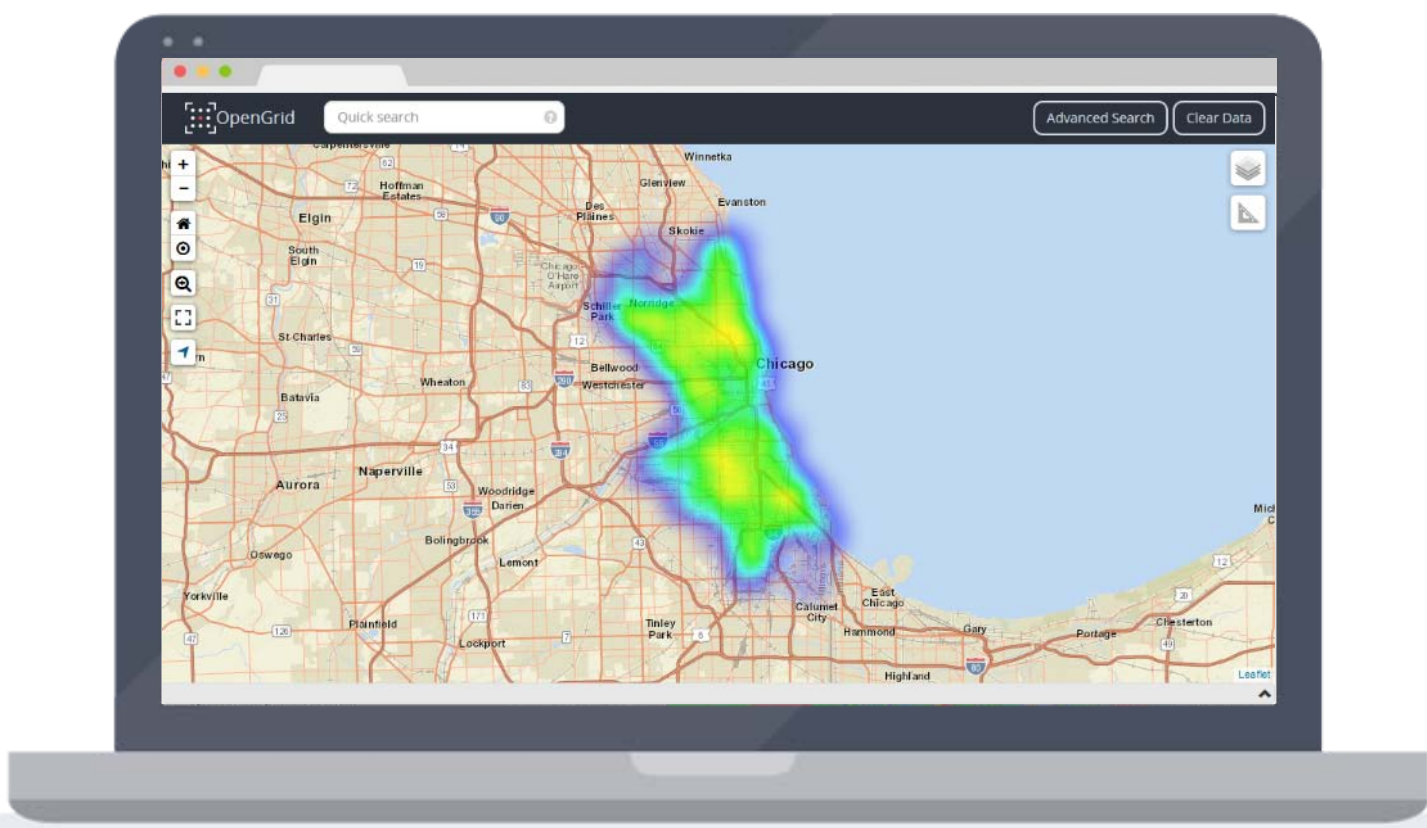
## #Evaluation

Evaluate the effectiveness of programs, including the effectiveness of advanced analytics.

## #Optimization

Optimizing the allocation of resources across the city to engage



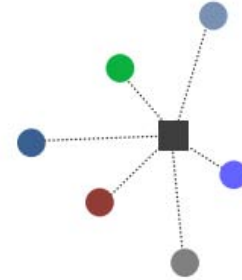


A map of rodent complaints across the city.

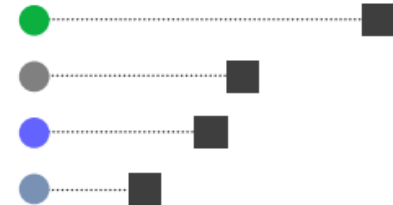


City of Chicago found 31 factors that predicted when and where rodent complaints are most likely in the next week. We used spatial-temporal relationships to create these #predictions, which started as an investigation of over 350 different factors.

Spatial Correlation



Temporal Correlation



Rodent Report for 06/24/2012 [Home](#) [Treatment Groups](#)

06/24/2012

District:24  
Score: 0.18123096000000005

Address	Block	Score	X	Y	Di
2514_W_BIRCHWOOD_AVE	202001000	0.00581086	1158200	1949710	24
3029_W_GRANVILLE_AVE	207005005	0.00517838	1154910	1940950	24
6962_N_CLARK_ST	107001013	0.00428247	1163480	1946340	24
6327_N_ROCKWELL_ST	208001003	0.00409735	1157860	1942020	24
6306_N_HERMITAGE_AVE	303001007	0.00393258	1163590	1941760	24
2905_W_GRANVILLE_AVE	207002001	0.0300252	1155630	1940080	24
6226_N_FAIRFIELD_AVE	208008005	0.0125533	1156630	1941340	24
2923_W_ROSEMONT_AVE	207006006	0.012346	1155630	1941620	24
6317_N_MOZART_ST	207001001	0.0114892	1158230	1941670	24
6052_N_FAIRFIELD_AVE	208007005	0.0104587	1156660	1940290	24
6450_N_LEAVITT_ST	205001010	0.00930737	1160420	1943000	24
6130_N_TALMAN_AVE	208002003	0.00258584	1157510	1940740	24
2711_W_ESTES_AVE	203004003	0.00258159	1156660	1946050	24

The #predictions generate a list of likely locations and published to an internal site used to route preventative baiting crews to bait likely locations.





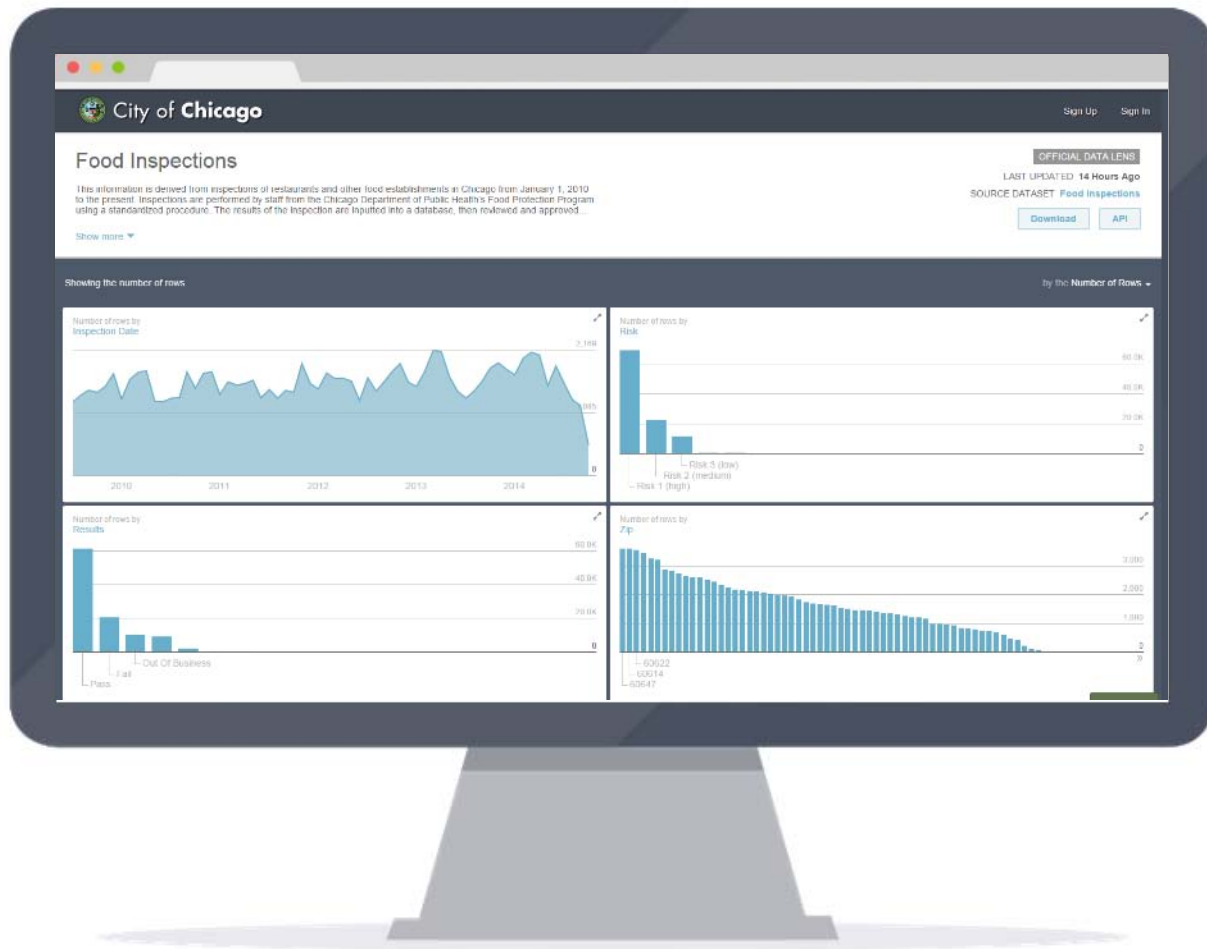
23  
%

14%

7%

11  
%

15  
%



## USING OPEN DATA

Chicago leveraged the #opendata portal to share data with external researchers, leveraging the city's premiere method of sharing data and saving time on data-sharing agreements to create #predictions.

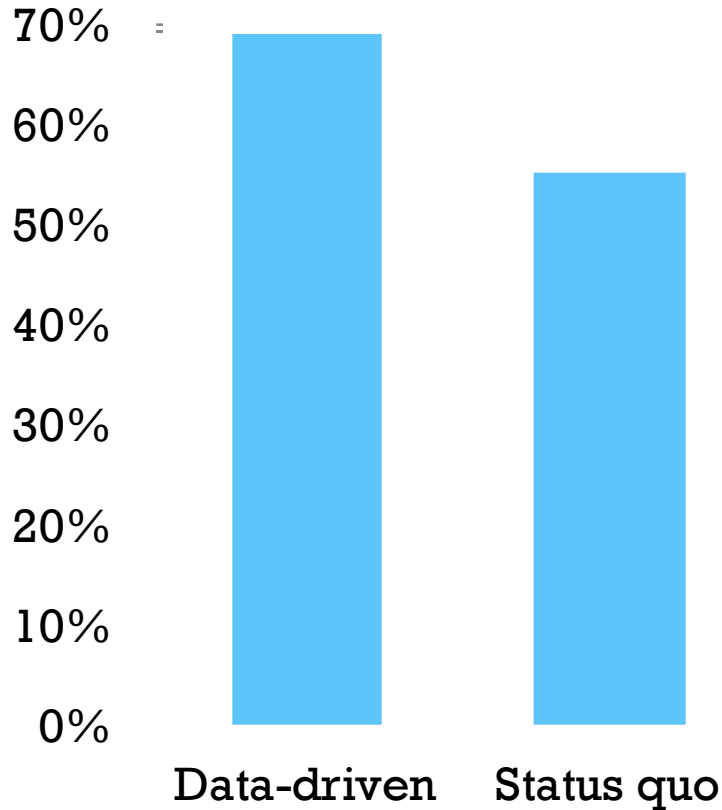
The model predicts the likelihood of a food establishment having a critical violation, a violation most likely to lead to food borne illnesses. Over a dozen #opendata sources were used to help define the model. Ultimately, ten different variables proved to create #predictions of critical violations.

## **Significant Predictors:**

- Restaurants with previous critical violations
- Three-day average high temperature
- CDPH risk level
- Location of restaurant
- Nearby garbage and sanitation complaints
- Type of facility
- Nearby burglaries
- Whether the establishment has a tobacco or has an incidental alcohol consumption license.
- Length of time since last inspection.
- Length of time the restaurant has been inspecting.



## Critical violations



The #predictions revealed an opportunity to find deliver results faster. Within the first half of work, 69% of critical violations would have been found by inspectors using a data-driven approach. During the same period, only 55% of violations were found using the status quo method.

IMPROVEMENT

**7 days**

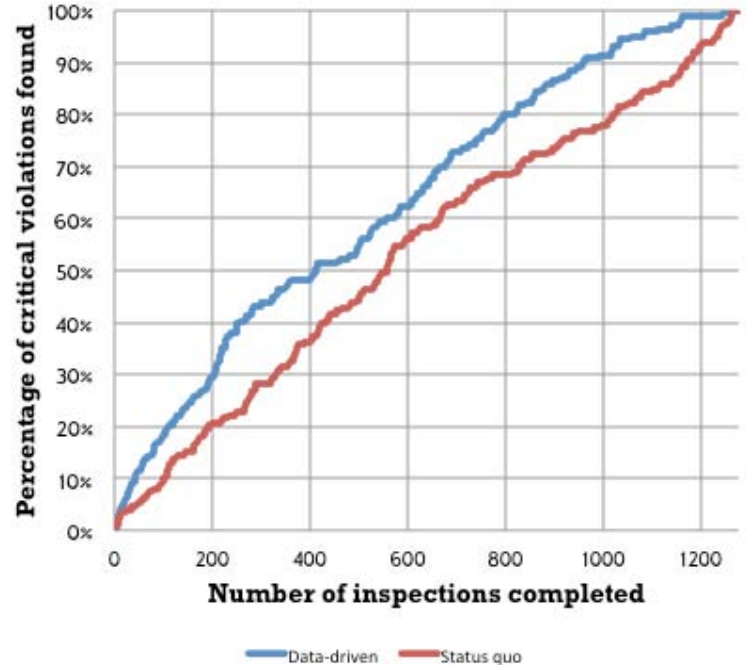
**The food inspection model is able to deliver results faster.**

After comparing a data-driven approach versus the status quo, the rate of finding violations was **accelerated** by an average of 7.4 days in the 60 day pilot. That means the #predictions led to more violations would be found sooner by inspectors.

# OPTIMIZING FOOD INSPECTIONS

Discovering critical violations sooner rather than later reduces the risk of patrons becoming ill, which helps reduce medical expenses, lost time at work, and even a limited number of fatalities.

## Impact





Chicago Food Inspections

Restaurants Inspectors

Show 25 entries

Search

Click to Download Filtered Data

Download

Filter by Zip Code

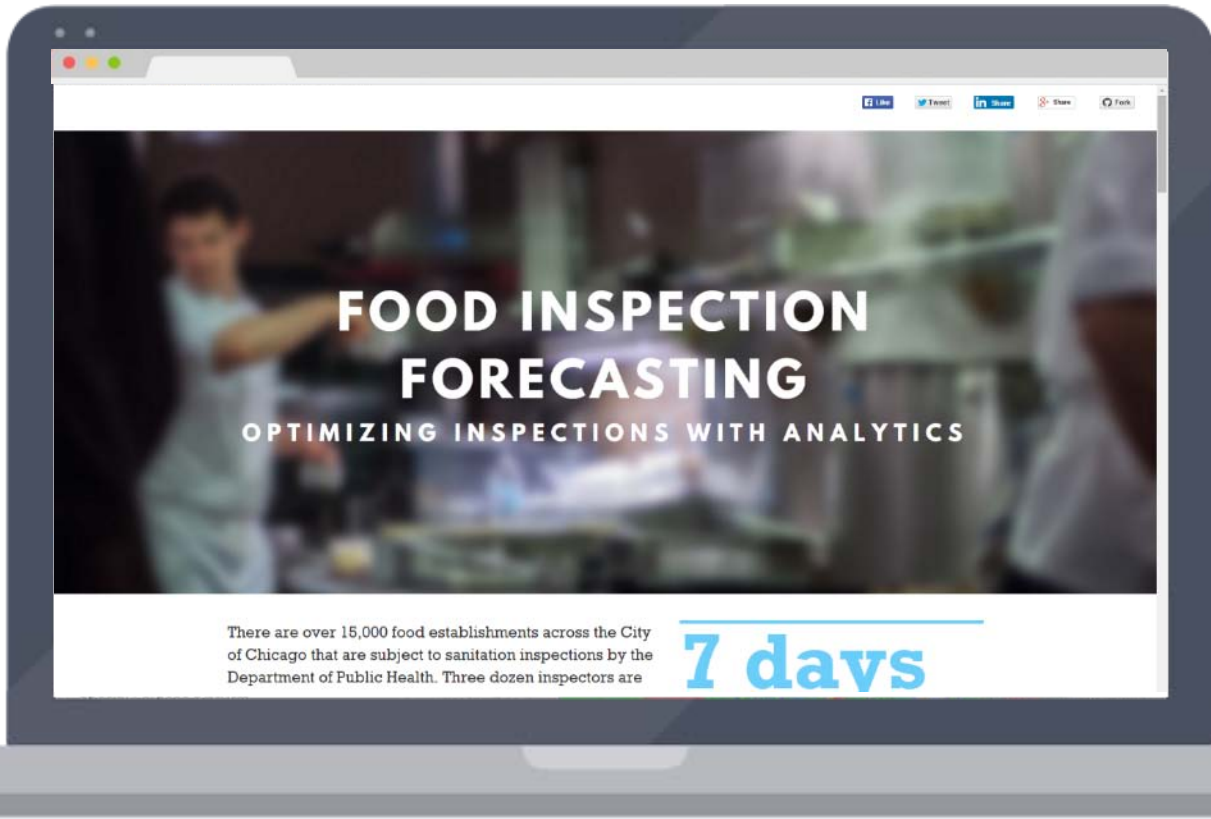
all

Filter by Inspector

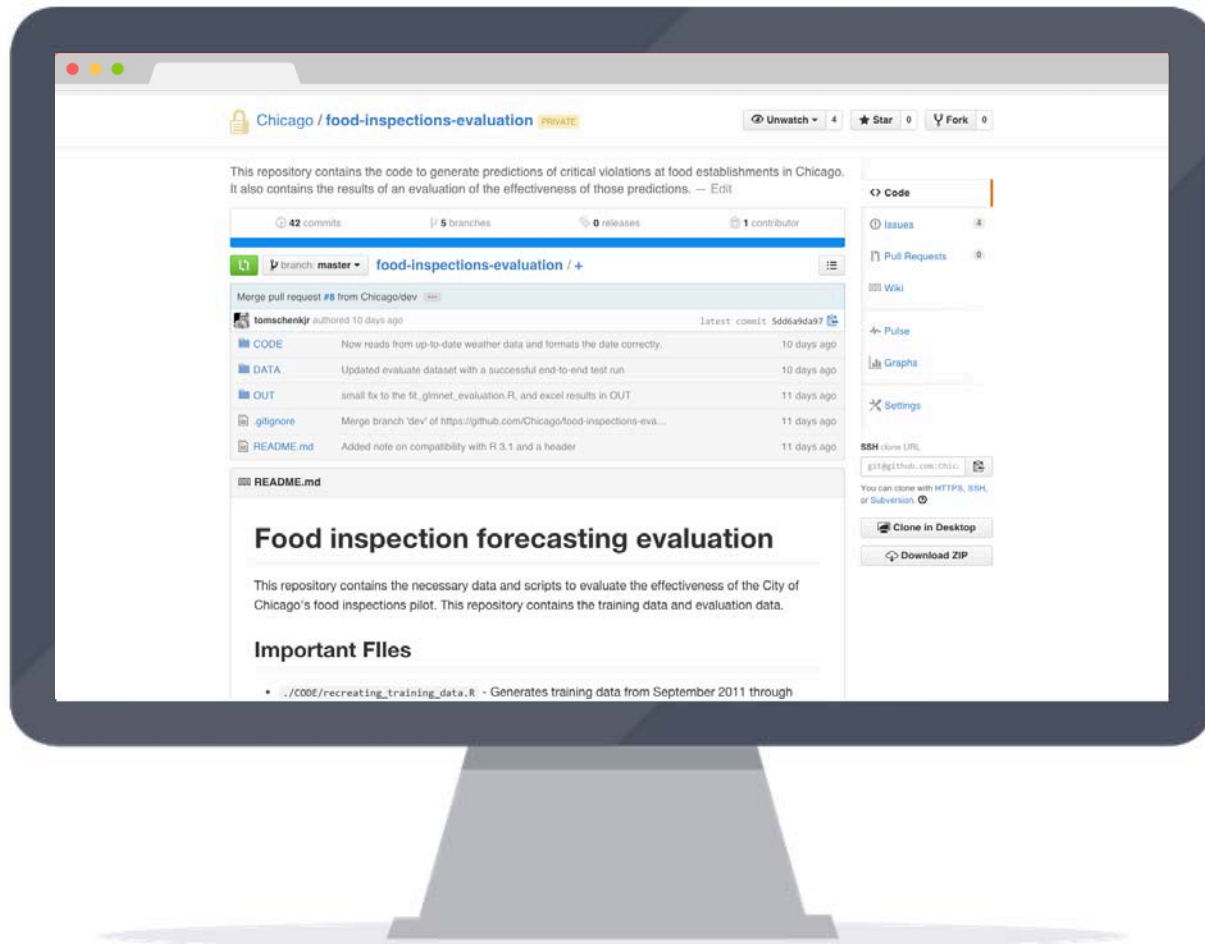
all

License	Doing Biz As	AKA Name	Facility Type	Risk	Address	City	Zip	Prediction	License Code
2	COSI	COSI	Restaurant	Risk 1 (High)	230 W MONROE ST	CHICAGO	60509	0.05423376	1009
9	XANDO COFFEE & BAR / COSI SANDWICH BAR	XANDO COFFEE & BAR / COSI SANDWICH BAR	Restaurant	Risk 1 (High)	116 S MICHIGAN AVE	CHICAGO	60603	0.16524516	1006
48	COSI	COSI	Restaurant	Risk 1 (High)	233 N MICHIGAN AVE	CHICAGO	60601	0.09158954	1006
62	XANDO COFFEE & BAR / COSI SANDWICH BAR	XANDO COFFEE & BAR / COSI SANDWICH BAR	Restaurant	Risk 1 (High)	230 W WASHINGTON ST	CHICAGO	60609	0.09011859	1009
99	XANDO COFFEE & BAR / COSI SANDWICH BAR	COSI	Restaurant	Risk 1 (High)	203 N LA SALLE ST	CHICAGO	60601	0.09994210	1009
116	JOHN SCHALLER	JOHN SCHALLER	Restaurant	Risk 1 (High)	3714 S HALSTED ST	CHICAGO	60609	0.09250459	1006
149	FOX'S BEVERLY PUB	FOX'S BEVERLY PUB	Restaurant	Risk 1 (High)	8586 S WESTERN AVE	CHICAGO	60643	0.12944078	1006
158	BURWOOD TAP	BURWOOD TAP	Restaurant	Risk 2 (Medium)	724 W WILSHIRE AVE	CHICAGO	60614	0.13499741	1006
164	POTASH BROS SUPERMARKET	POTASH BROS SUPERMARKET	Grocery Store	Risk 1 (High)	1525 N CLARK ST	CHICAGO	60610	0.16195854	1006
207	HIVLR SHANNON	HIVLR SHANNON	Restaurant	Risk 2 (Medium)	422 W AHMEL AVE	CHICAGO	60614	0.08928912	1006

The data science team has built a website which lets CDPH prioritize inspections based on projected risk.



<http://chicago.github.io/food-inspections-evaluation/>



## #OPENSOURCE

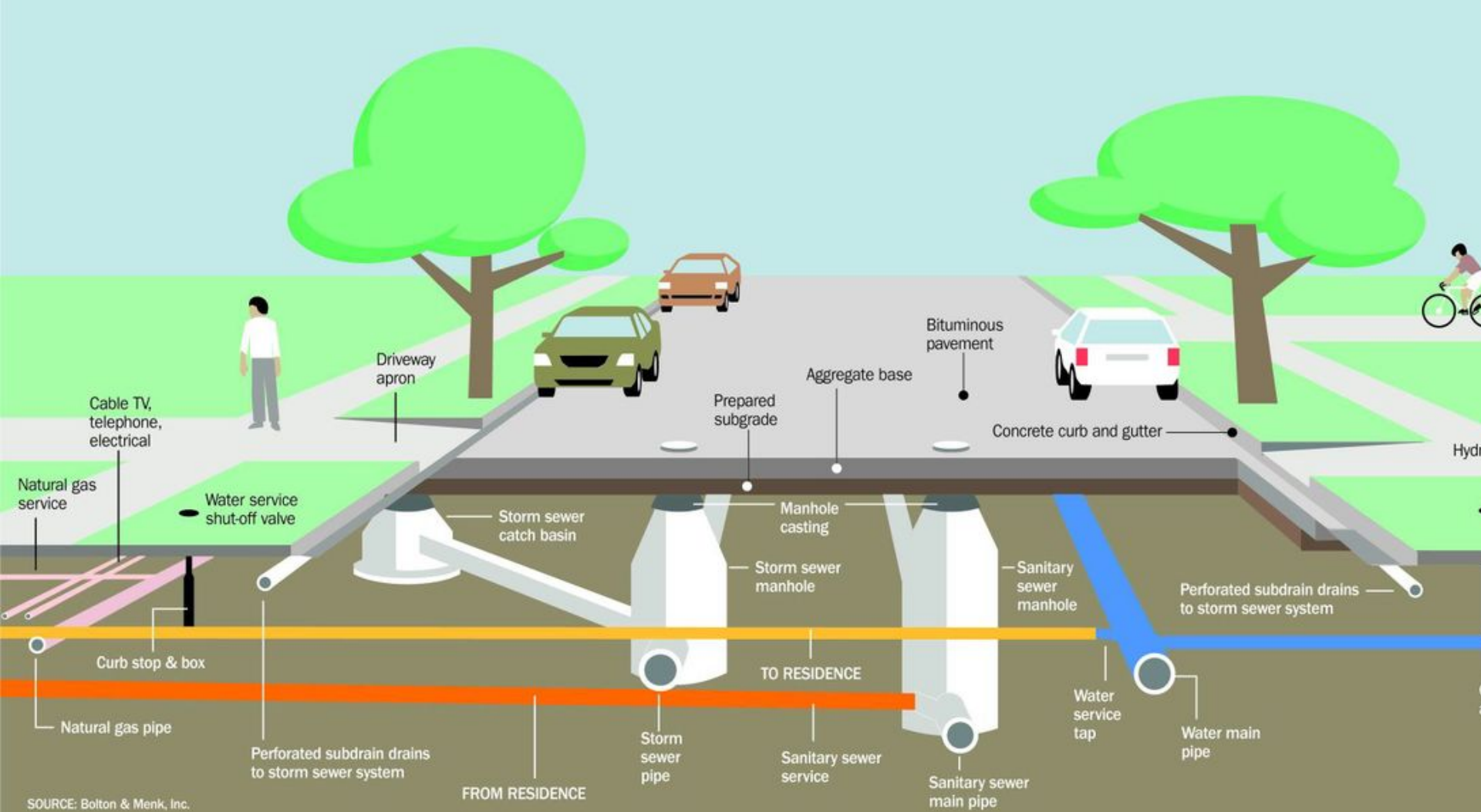
The analytical model will be released as an open source project on GitHub, allowing other cities to study or even adopt the model in their respective cities. No other city has released their analytic models before this release.

<http://github.com/Chicago/food-inspections-evaluation>





**UNDERGROUND  
INFRASTRUCTURE IS HIT ON  
AVERAGE EVERY 60 SECONDS.  
THE TOTAL COST TO THE  
NATIONAL ECONOMY IS  
ESTIMATED TO BE \$1.6 BILLION**



SOURCE: Bolton & Menk, Inc.



## Underground Map

Using off-the-shelf DSLR cameras, photos are stitched together to create a 3-D model of the city's underground infrastructure. City Digital, City of Chicago and a consortium of partners are piloting the tech.



# THANK YOU



## **Tom Schenk Jr.**

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City of Chicago

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## **Websites:**

Data @ [data.cityofchicago.org](http://data.cityofchicago.org)  
News @ [digital.cityofchicago.org](http://digital.cityofchicago.org)  
Maps @ [opengrid.io](http://opengrid.io)  
Strategy @ [techplan.cityofchicago.org](http://techplan.cityofchicago.org)  
Slides @ [speakerdeck.com/tomschenkjr](http://speakerdeck.com/tomschenkjr)