ARTIFICIAL INTELLIGENCE AND CITIES:
A PREAMBLE TO MAKING SMART CITIES SMARTER AND GIVING GOVERNMENT, BUSINESSES AND OTHER ORGANIZATIONS MORE INFORMATION ABOUT YOU THAN THEY ALREADY HAVE

Norm Peterson
Director, Government Relations

INTRODUCTION

ARTIFICIAL INTELLIGENCE IS NOT THE FUTURE — IT IS NOW

- Cities generate a lot of data—artificial intelligence is driven by data
- Fast, accurate analysis of data can enable cities to better allocate resources and services
- Exact amount of data generated by cities depends on size and willingness to use new technologies to make their cities smarter

Argonne NATIONAL LABORATORY

THE WALL STREET JOURNAL.

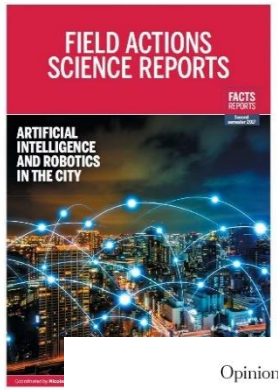
U.S. Edition ▾ | March 19, 2019 | Print Edition | Video

Home World U.S. Politics Economy Business Tech Markets Opinion Life & Arts Real Estate WSJ. Magazine

POLITICS

Artificial Intelligence Rules More of Your Life. Who Rules AI?

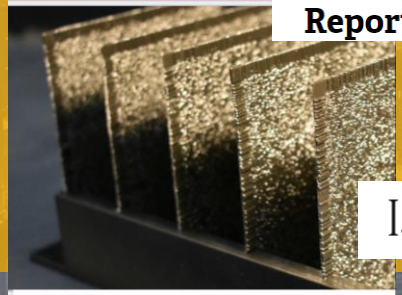
Tech companies are working on standards for the field, though critics see their efforts as attempts to stave off government



Forbes Billionaires Innovation Leadership Money Consumer Industry

How Cities Are Getting Smart Using Artificial Intelligence

TheScientist
EXPLORING LIFE, INSPIRING INNOVATION



AI Object Recognition System Operates at Speed of Light

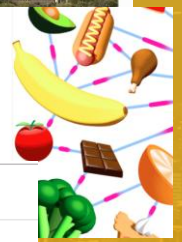
Chron Local Apollo 11 Project US & World Sports Business Entertainment Life

Report: Artificial intelligence to transform urban cities

Opinion

The A.I. Diet

Forget government-issued food pyramids. Let an algorithm tell you how to eat.



FEATURE

How Singapore is using artificial intelligence

The New York Times

Is Ethical A.I. Even Possible?

How Artificial Intelligence Is Edging Its Way Into Our Lives

Argonne NATIONAL LABORATORY

ARTIFICIAL INTELLIGENCE AND CITIES: WHAT'S ALREADY HAPPENING

Transportation

Health care

Work and life

Public safety

TRANSPORTATION

Autonomous vehicles

- Today's driverless cars will segue to self-driving delivery trucks and delivery drones
- Will our personal cars be replaced by “Cars as a Service”?
    - What will be the impact on public transportation, public parking spaces?
- Will these new impacts reduce urban congestion, vehicle emissions, commute time, etc.?

TRANSPORTATION

Traffic Planning

- Data from an increasing number of sensors is already enabling city planners and officials to monitor individual and vehicular movements
- This is already allowing cities to better plan for moving traffic more efficiently during times of congestion and in the event of a need for evacuation

Argonne NATIONAL LABORATORY

HEALTH CARE

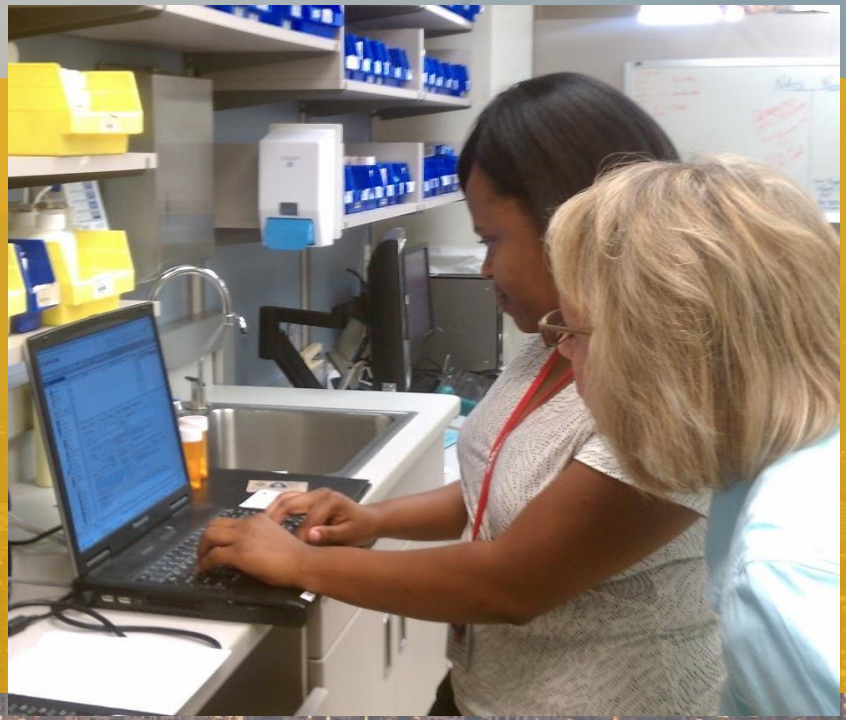
Hardware and Software

- Camera-based Al could determine if a person needs medical assistance
- Facial recognition technology may access a person's age, residence and medical records
- Intelligent walkers, wheelchairs, and other aids could help elderly patients increase their independence and improve their lifestyle

HEALTH CARE

Medical Records

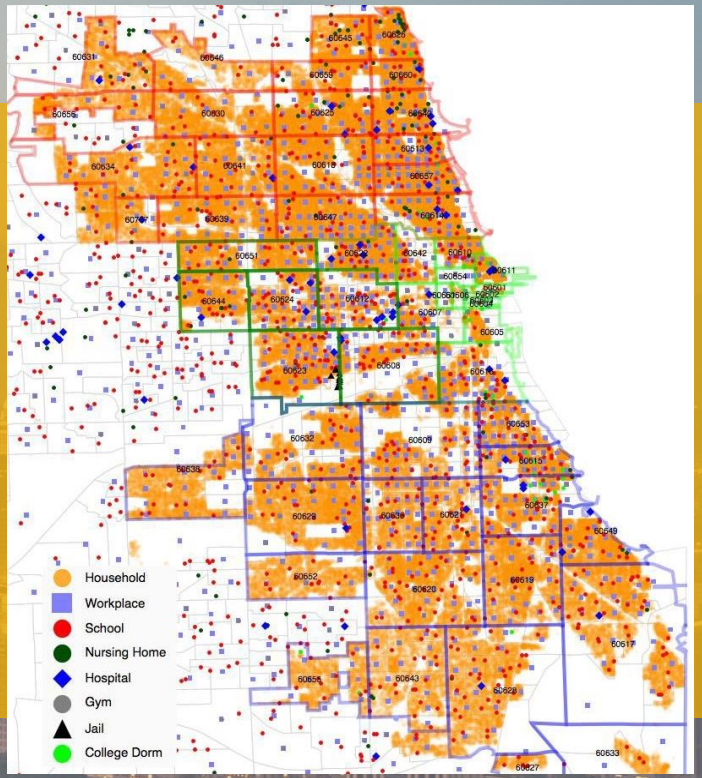
- AI could drive individual diagnostic solutions by mining patient records, studying symptoms and treatment protocols
- Impact depends more on regulation than on technology—access to large data sets required
  - Privacy issues unresolved
  - Access to individual patient data is major obstacle



HEALTH CARE

Agent-based modeling of disease spread

- Methods for modeling infectious disease: Ebola/pandemic/ infectious disease modeling at city scale
- Scalable computational simulations and tools
- chiSIM: large-scale social interaction model of Chicago



Argonne NATIONAL LABORATORY

HEALTH CARE

Bringing together AI, Computing & Data to Improve Veterans' Health Outcomes

Argonne NATIONAL LABORATORY

BERKELEY LAB

UCSF University of California San Francisco

Lawrence Livermore National Laboratory

Precision Diagnosis

Precision Treatment

Traumatic Brain Injury
PTSD
Prostate Cancer
Cardiovascular Disease
Suicide Prevention

Argonne NATIONAL LABORATORY

WORK AND LIFE

Work

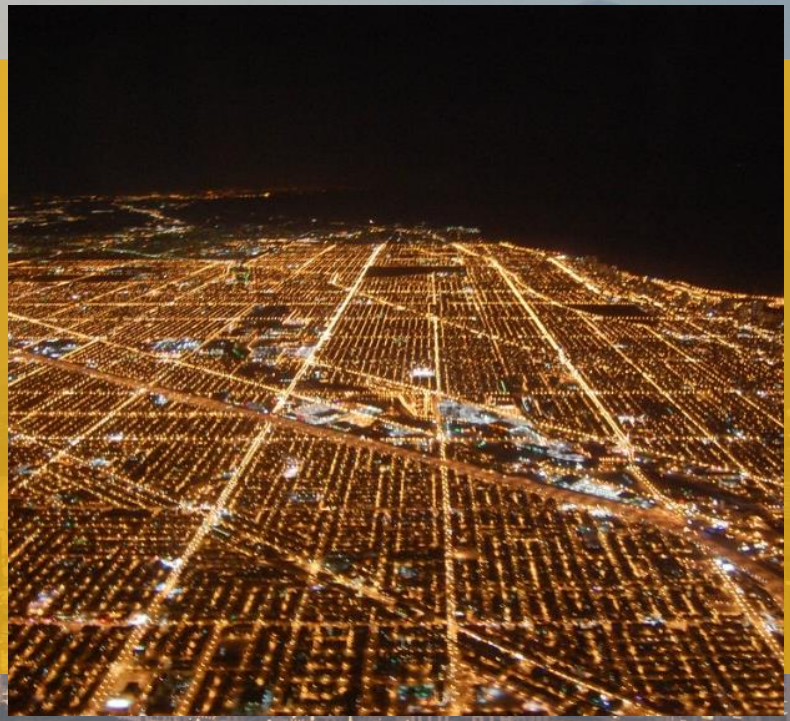
- Automation could impact a quarter of U.S. jobs in the next few decades*, as routine, predictable tasks become automatable and are eliminated
- AI may also create jobs
- Predictive models could help local governments connect real time resources to the underemployed

*Brookings Institute

WORK AND LIFE

City living

- AI could drive rapid response services such as streetlight replacement and trash collection
- Smart grids and other technologies already in use to manage power use and monitor water supply and demand



Argonne NATIONAL LABORATORY

WORK AND LIFE

Education

- AI can individualize student preferences and monitor individual progress, increasing efficiency

Food Security and Nutrition

- Algorithms connecting restaurants and households to food banks to better distribute food to individuals in need
- Algorithm that can determine what is the "optimal" diet for everyone?

PUBLIC SAFETY

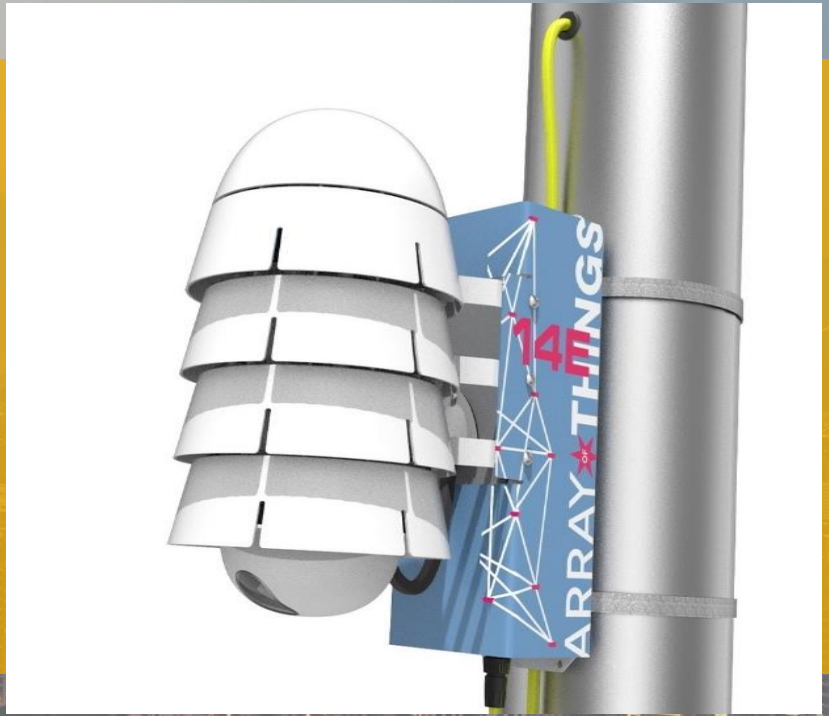
Surveillance and Predictive Policing

- Existing sensor technologies already being deployed
- Violate resident privacy and eliminate discriminatory targeting? – AI prediction tools could help reduce or remove human bias
- Proliferation of city cameras is going to continue to grow (1B by 2020, according to Nvidia)

PUBLIC SAFETY

Array of Things urban sensing project

- Network of interactive modular sensor boxes installed in Chicago and elsewhere to collect real-time environment, infrastructure, and activity data
- Data available for research and public use
- Serves as urban 'fitness' tracker, measuring liveability factors



Argonne NATIONAL LABORATORY

PUBLIC SAFETY

Array of Things data

Environment

- Solar load on buildings
- Traffic safety
- Idling trucks
- Construction effects
- Noise pollution/sources
- Urban heat island
- Mold exposure

Air Quality

- Asthma
- Traffic impact on AQ
- Asthma
- Industrial air pollutants
- Fossil fuel emissions
- Hydrogen sulfide
- Fuel leaks
- Flammable hazards

Urban Activity

What we can see: Vehicle mix and flow, cloud cover, early detection of street flooding; signal light timing optimization; pedestrian safety improvements; public space investment planning

What we can hear: Sources of noise pollution; potential health-impacting localized noise event logging

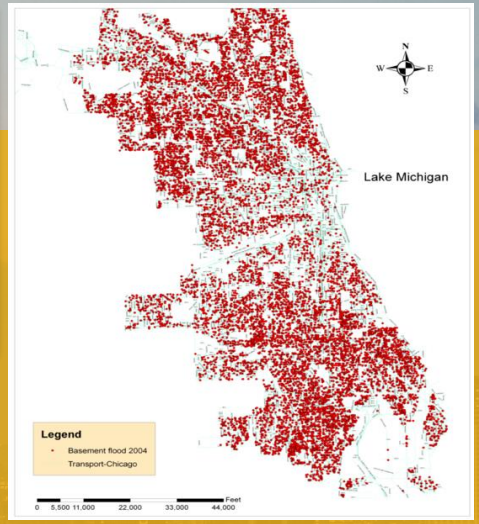
PUBLIC SAFETY

Array of Things projects

Private industry and federal agencies are funding projects to integrate additional sensors with very high data rates, requiring edge computation to analyze the data and to detect specific patterns.

Quantify air, road, rail, public transit traffic into and surrounding O'Hare International Airport, in concert with transportation modeling and data from diverse sources.

Integrate data with Argonne coupled multiscale urban modeling capabilities to evaluate policy and infrastructure interventions, including normal and emergency operations (weather, threats, attacks).



Detect pre-flooding and flooding events such as street floods that lead to basement flooding (map shows 2004 basement flood reports).

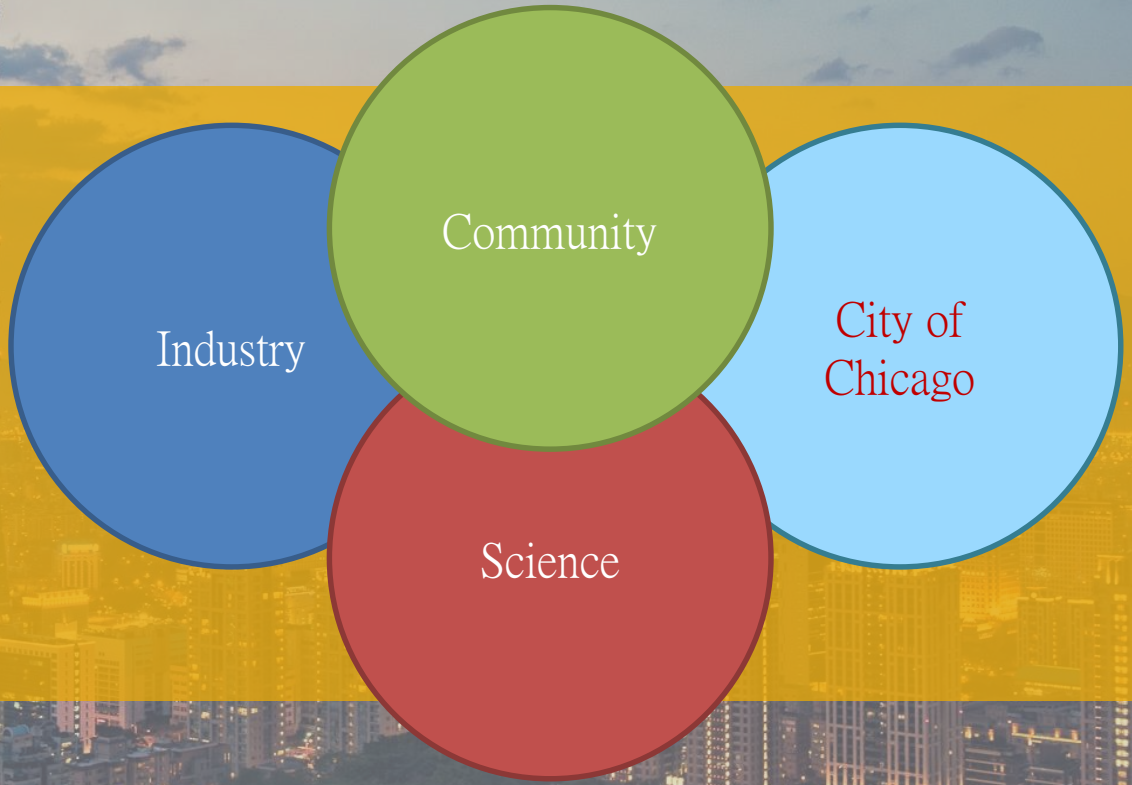
Illinois Department of Transportation

Quantify the impact of at-grade crossings on roadway operations. Edge-enabled image processing to measure key factors such as crossing start/end, duration of impact (traffic returns to steady-state), number of vehicles affected, emergency vehicles affected, etc.

Argonne NATIONAL LABORATORY

PUBLIC SAFETY

ARRAY OF THINGS AS A PARTNERSHIP



Argonne NATIONAL LABORATORY

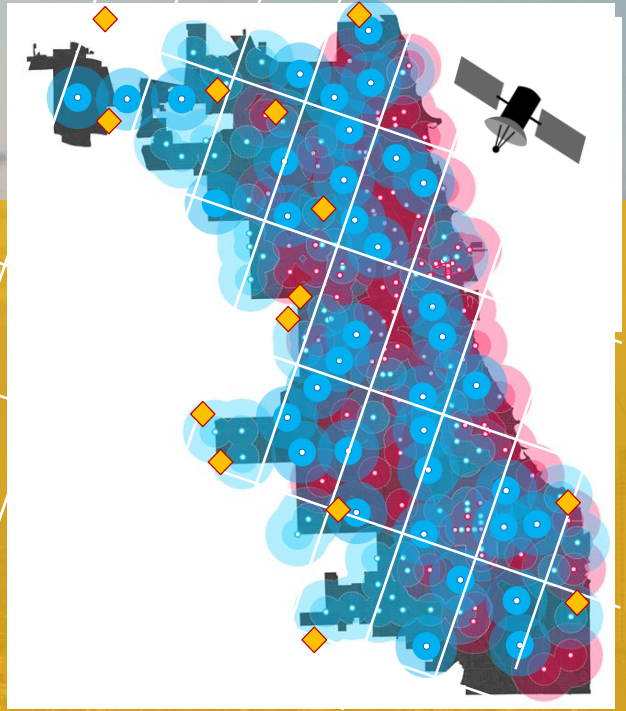
PUBLIC SAFETY

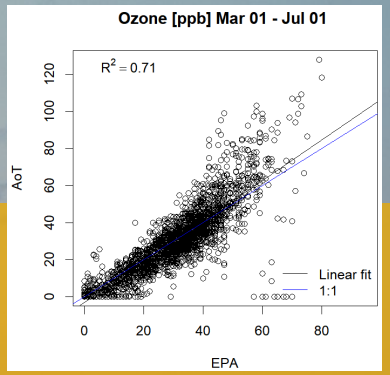
Array of Things Chicago map

Red circles show 100 operating nodes, with 1km and 2km coverage shown.

Blue circles show node locations for an additional 100 nodes to be installed beginning January 2019.

Combined, the map shows that 99% of Chicago's population will have a node measuring conditions within 2km of their home, and 70% will have measurements within 1km.





Air quality measurements are compared with EPA (graph at right and yellow diamonds on map), satellite measurements (4-hr averages for each cell in grid on map), and surrounding nodes.

THE CENTER FOR SPATIAL DATA SCIENCE THE UNIVERSITY OF CHICAGO

Argonne NATIONAL LABORATORY

NSF

THE UNIVERSITY OF CHICAGO

Argonne NATIONAL LABORATORY

PUBLIC SAFETY

Array of Things: A Growing Partnership Program

Seattle/UW
Portland/PSU
Palo Alto/Stanford
Denver/Panasonic/NREL

Chicago/UChicago/ANL
Chattanooga/UT-Dallas
Syracuse/SyracuseU
Chapel Hill/UNC
Detroit/ANL
Nashville/Vanderbilt
Atlanta/GaTech
Santo Domingo/INTEC

Tokyo/Riken
Taichung/NARlabs
Melbourne/CSIRO
Hong Kong / UChicago

AoT partners with local research institutions who have formed teams with their cities to identify one or more policy or science questions for which an AoT installation makes sense. Typical installations are 4-20 nodes, and all nodes are “turnkey” with management and data services provided by the University of Chicago.

- Installations underway
- 2H-2018 Partners
- 1H-2019 Partners
- Under discussion

Argonne NATIONAL LABORATORY

CONCLUSION

BARRIERS TO DEPLOYING AI TECHNOLOGY TO SMART CITIES

- AI is intervening into many aspects of our lives, whether we want it or not
- As AI continues to be deployed in cities, will there be a significant added cost to operational budgets?
    - Will these investments eventually save cities money?
- Data is becoming a modern commodity that can be bought or stolen by unknown individuals and organizations

BARRIERS TO DEPLOYING AI TECHNOLOGY TO SMART CITIES

- Who has access to the data that is collected by AI platforms?
  - Who is accountable if an AI machine starts making decisions on its own?
- Policy makers, elected officials and residents must all contribute to developing regulations to make the most out of AI technologies


Every city is unique and will
have to work at its own pace.


THANK YOU
谢谢