

GRIDSMART[®]
TECHNOLOGIES, INC.

Sooner or later, humanity must live sustainably or it won't go on living — that's what "sustainable" means.

We could shift to sustainability and save \$26 trillion. Why aren't we doing it?

The costs of the status quo keep rising; the costs of sustainable alternatives keep declining.

By David Roberts | @drvox | david@vox.com | Updated Sep 6, 2018, 9:29am EDT



SOME GRIDSMART HISTORY & FACTS

CO-FOUNDERS *Bill Malkes (CEO) & Vig Sherrill*

2007 STARTUP *Tired of sitting at traffic lights*

2011 RELEASE *The GRIDSMART System*

60 EMPLOYEES *More than 40 in Knoxville*

MADE IN USA *Only company in the industry*



**A UNIQUE SYSTEM FOR
INTERSECTION ACTUATION,
TRAFFIC DATA COLLECTION, AND
SITUATIONAL AWARENESS**

WHAT IS THE GRIDSMART SYSTEM?



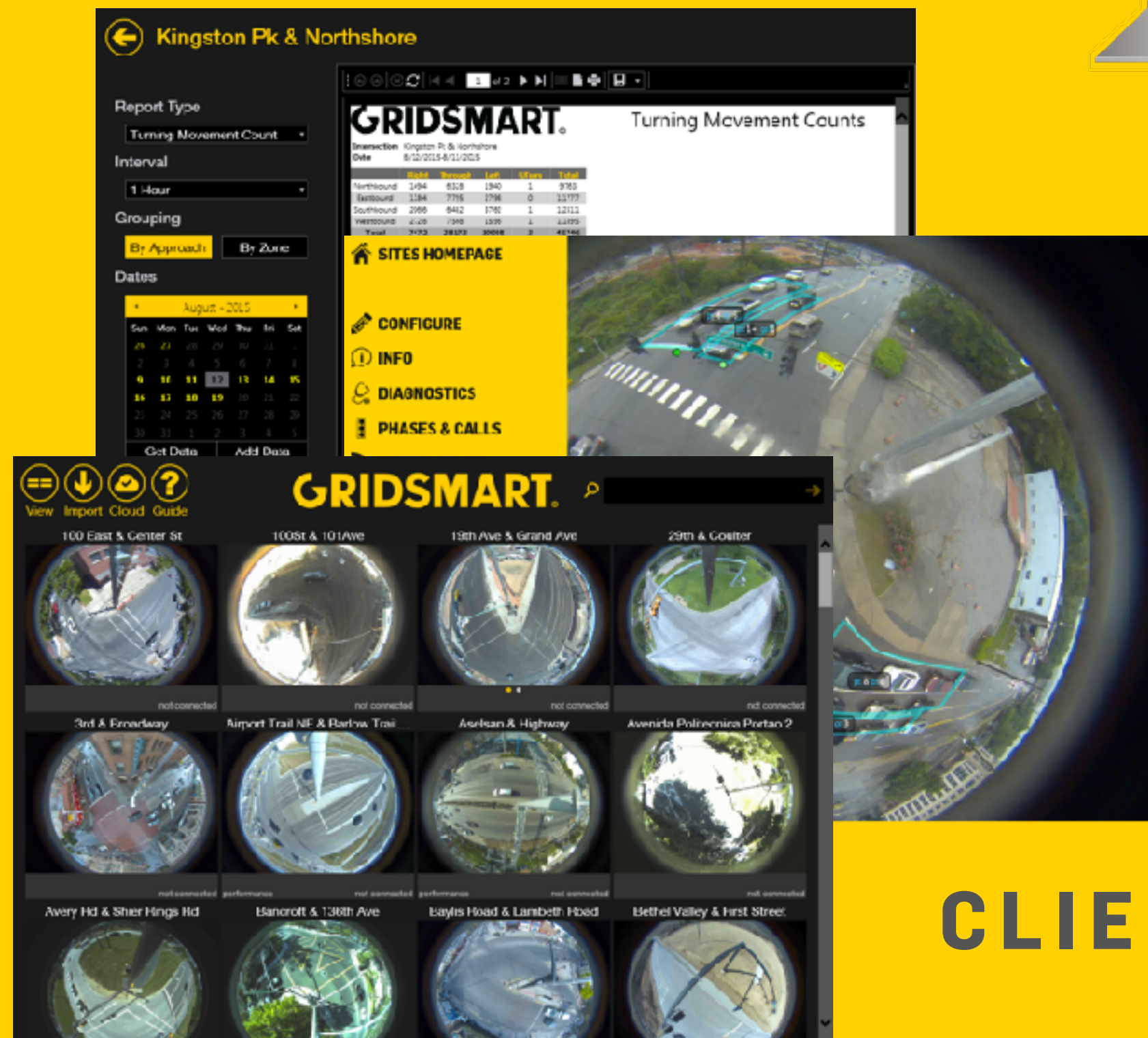
CAMERA



PROCESSOR

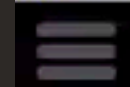


CLIENT



WHAT IS THE GRIDSMART SYSTEM?







ONE CAMERA

Infinite Views
See Real Intersection



EASY TO INSTALL

75% Less Installation
& Maintenance Time



QUICK TO LEARN

Intuitive UI, Learn
In 30 Minutes



DATA & METRICS

Industry Best
Data & API



SIMPLE
FLEXIBLE
TRANSPARENT



**THE TECHNOLOGY IS GREAT
ONLY IF ANY CITY CAN USE IT**



**49
STATES**

**29
COUNTRIES**

**>6,000
INSTALLS**

**>1,000
CITIES**

**50M+ HOURS
OPERATION**

**43B+ CARS
COUNTED**



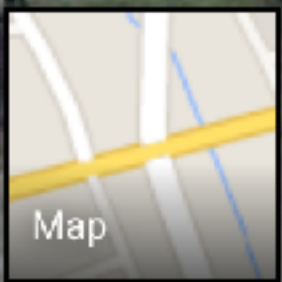


DATA & METRICS

Industry Best
Data & API

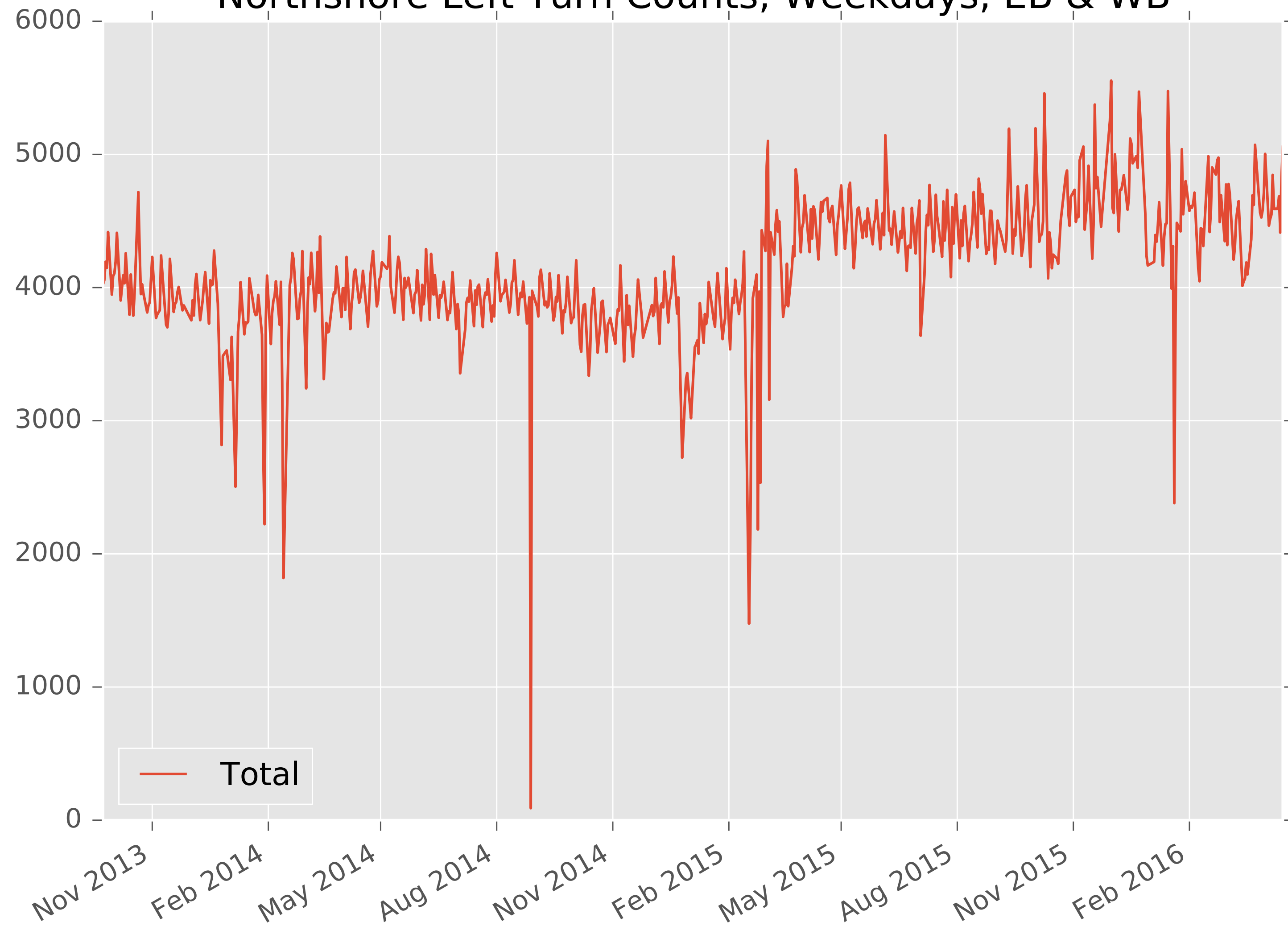


KINGSTON PK @ NORTHSORE DR

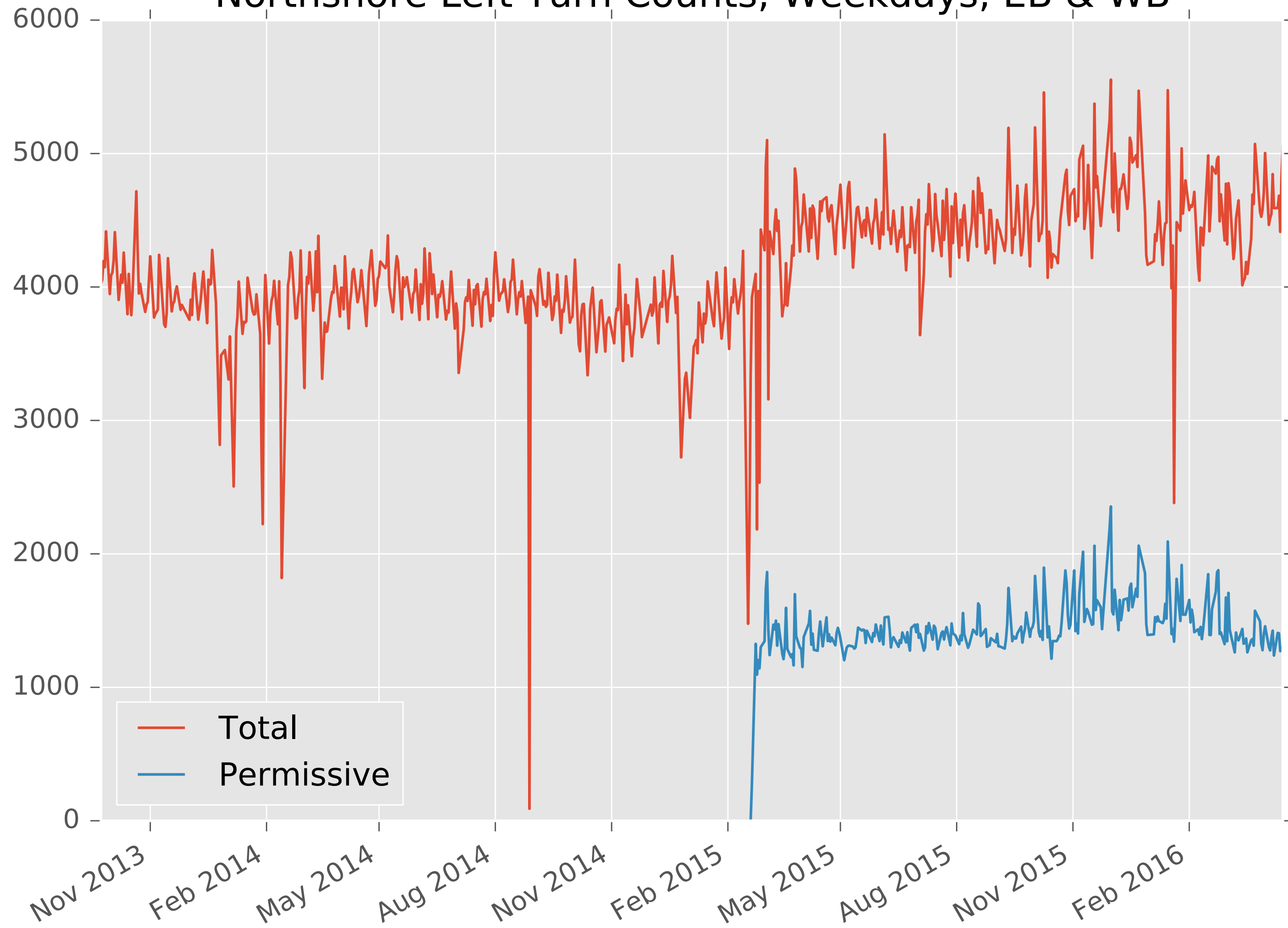


Google

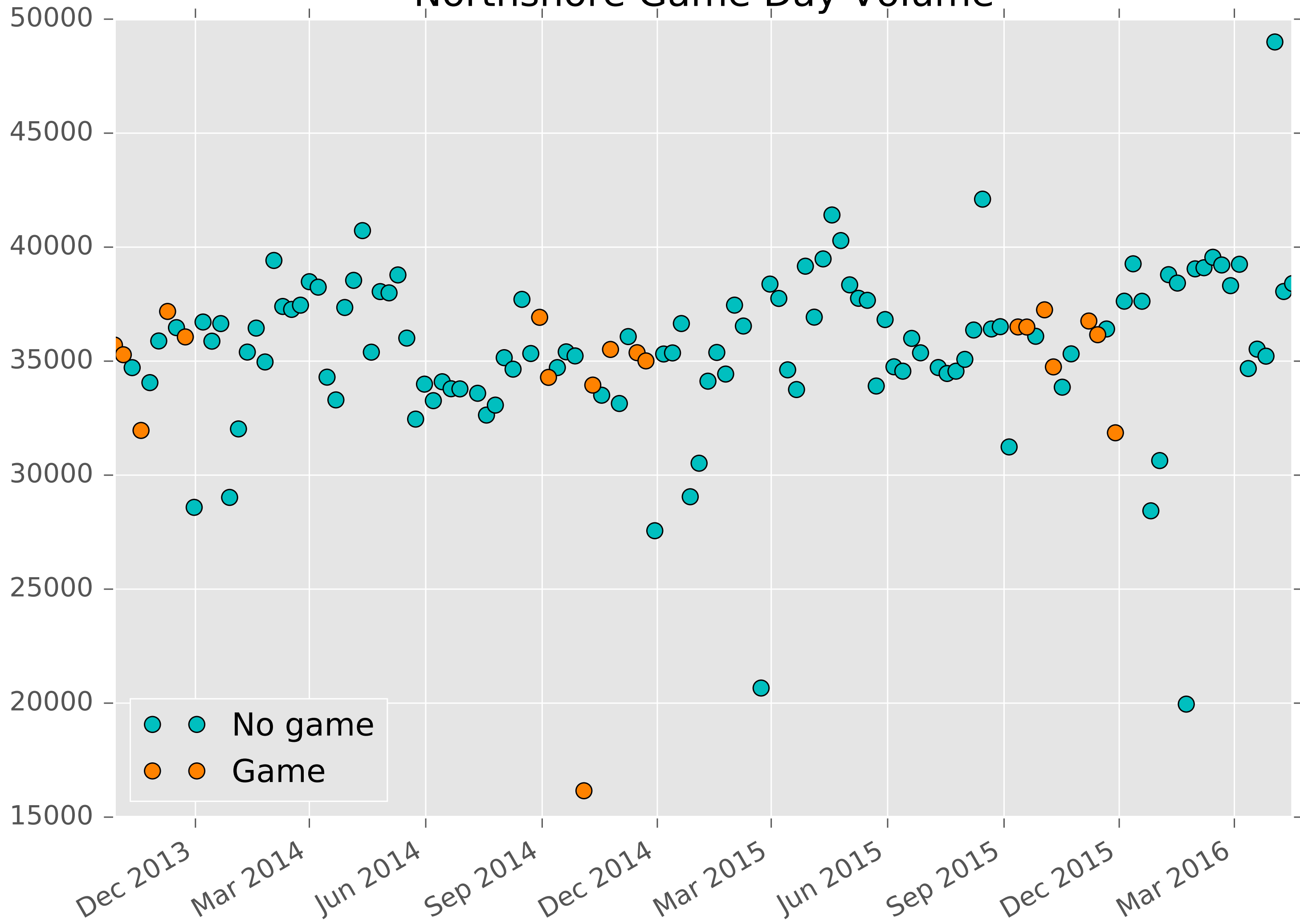
Northshore Left Turn Counts, Weekdays, EB & WB



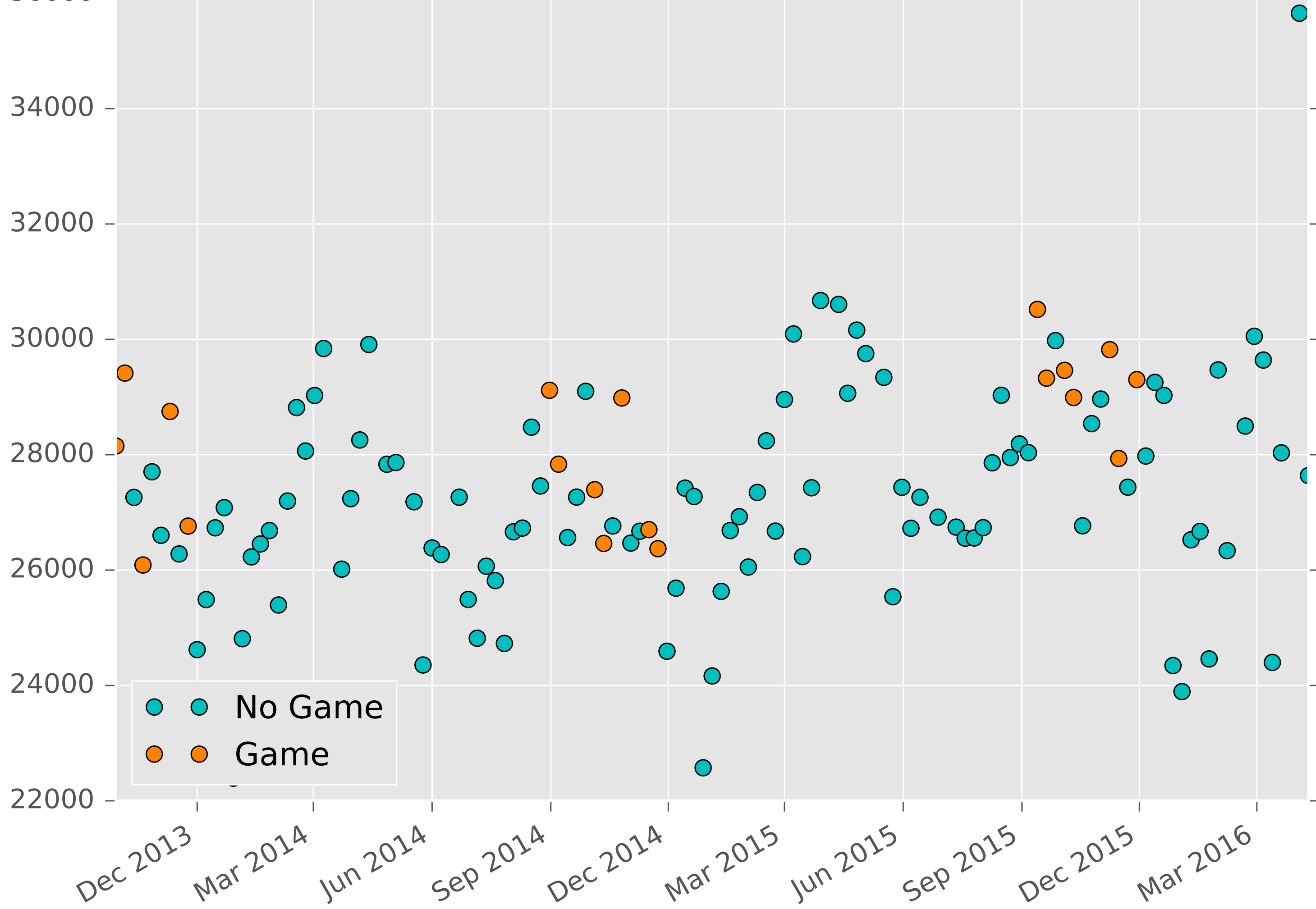
Northshore Left Turn Counts, Weekdays, EB & WB



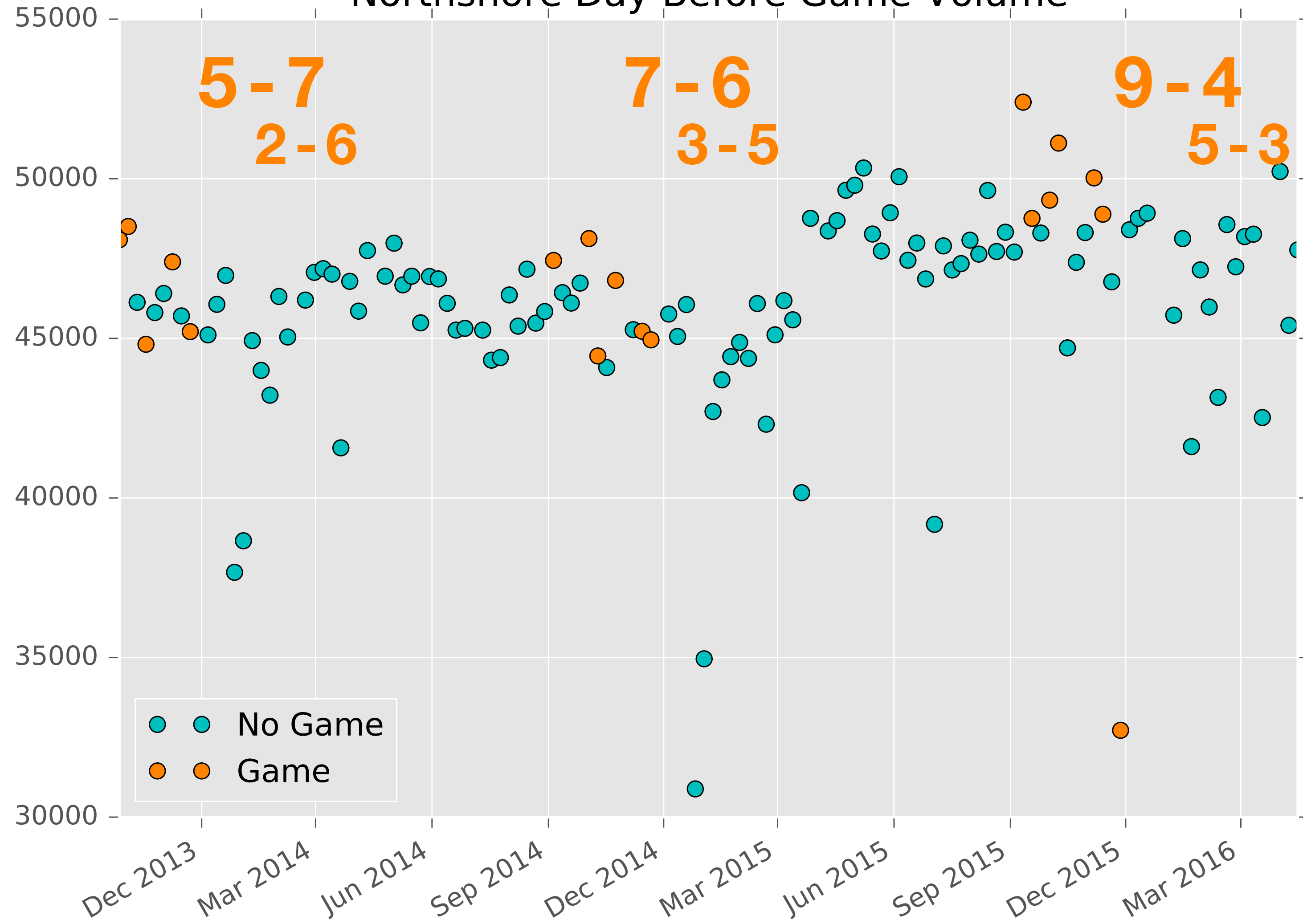
Northshore Game Day Volume



Northshore Day After Game Volume



Northshore Day Before Game Volume



I-40/75

KINGSTON PK @ MORRELL RD

Walgreens

Brixx Wood Fired Pizza

Taco Bell

Copper Cellar West

Texas Roadhouse

Old Navy

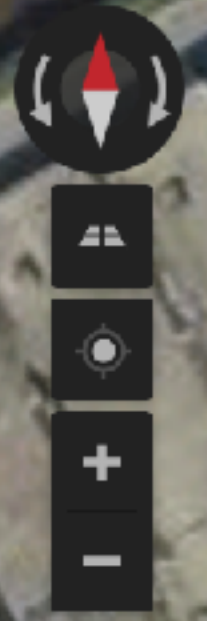
Sprint Store

buybuy BABY

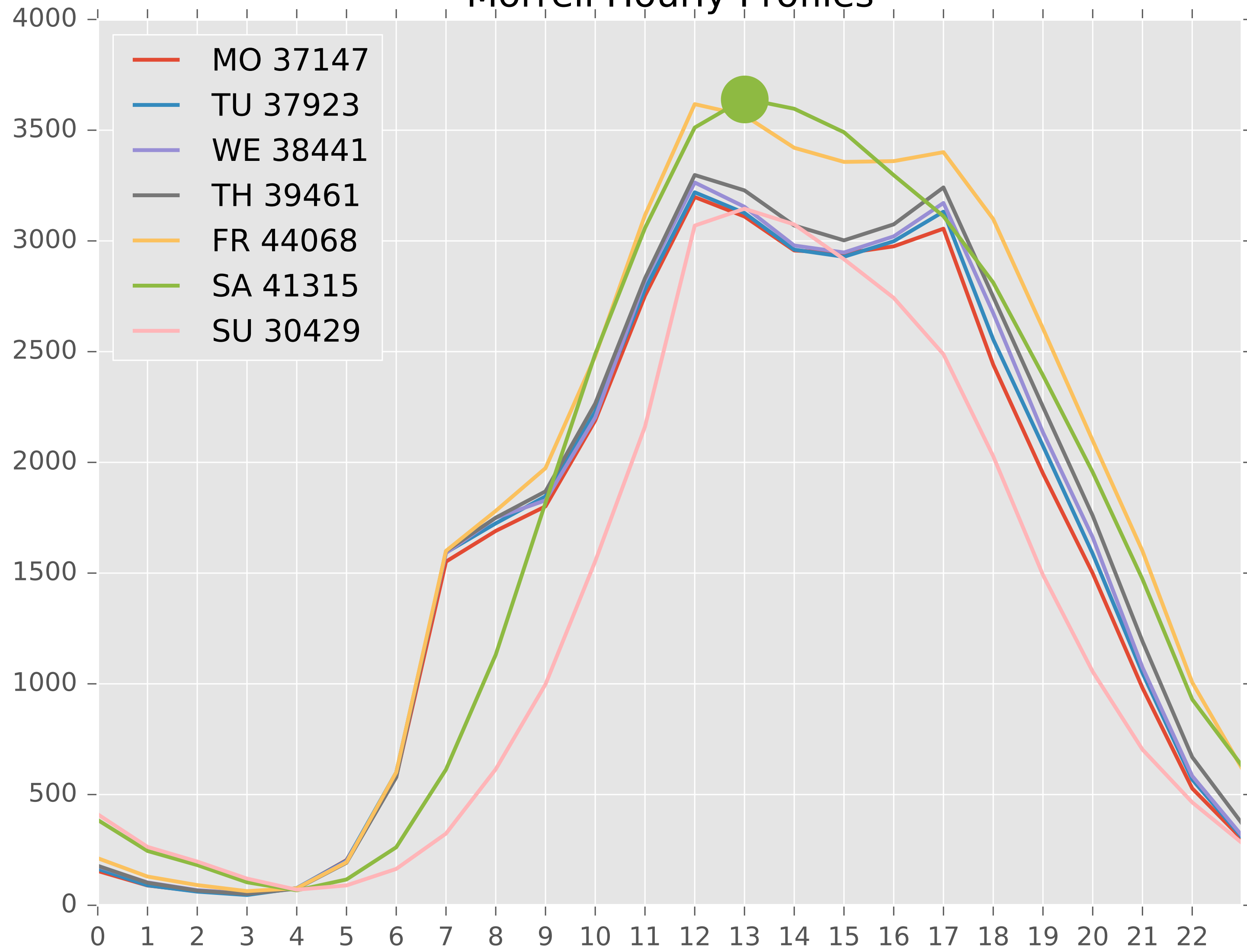
MALL

Belk

Google



Morrell Hourly Profiles



Over 877 days, 14 of top 50 peak hours
were associated with Valentine's Day.



	total	day



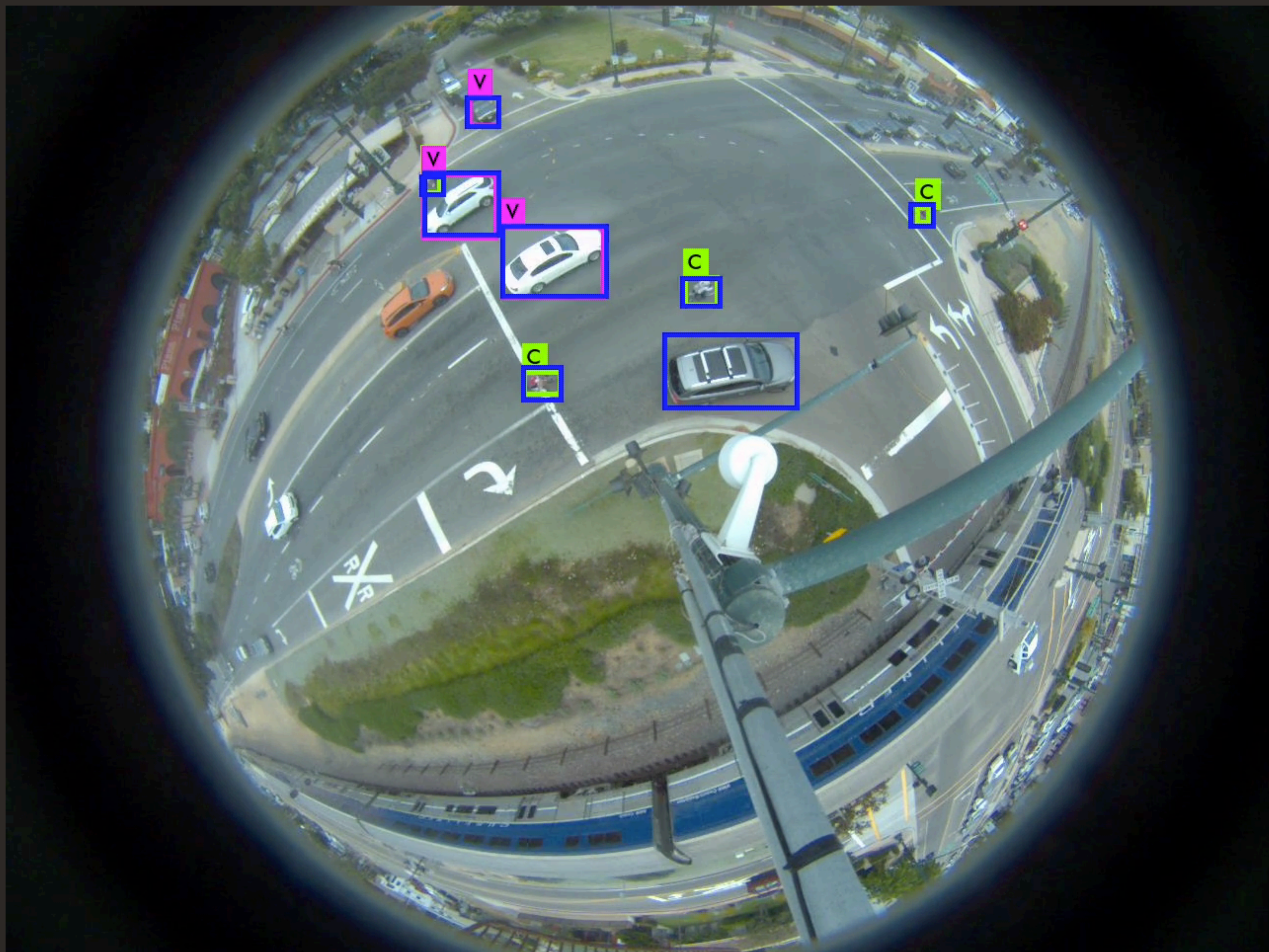
ONE CAMERA

Infinite Views
See Real Intersection









 **STREETSMART**



WHAT IS STREETSMART?

WiFi-capture data collection device & service

Travel time, origin/destination, delay ...

Easy-to-use web interface

Installs and begins collecting data in minutes



EDUCATION



6098 US-70
Knoxville, Tennessee



Google, Inc.

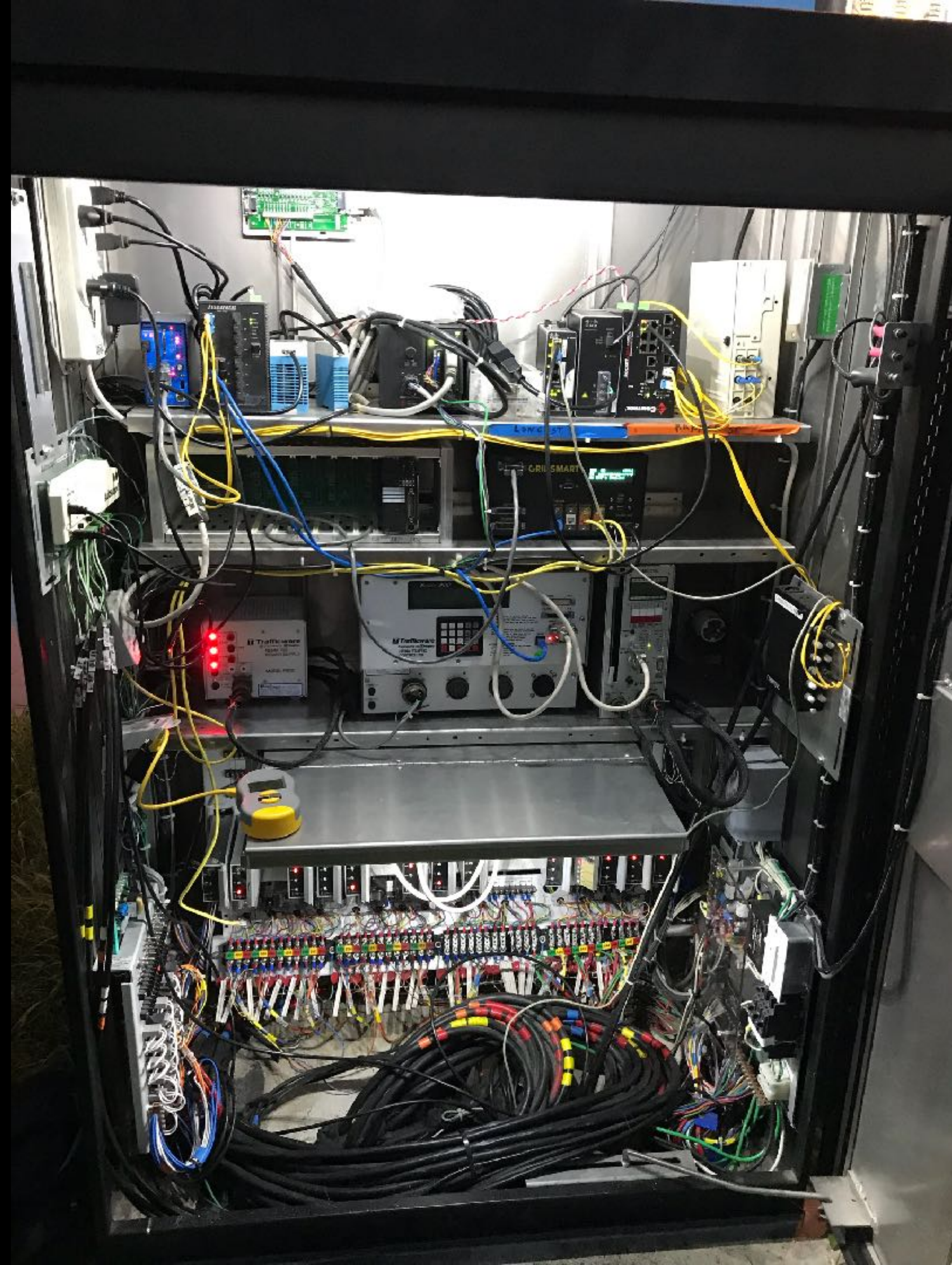
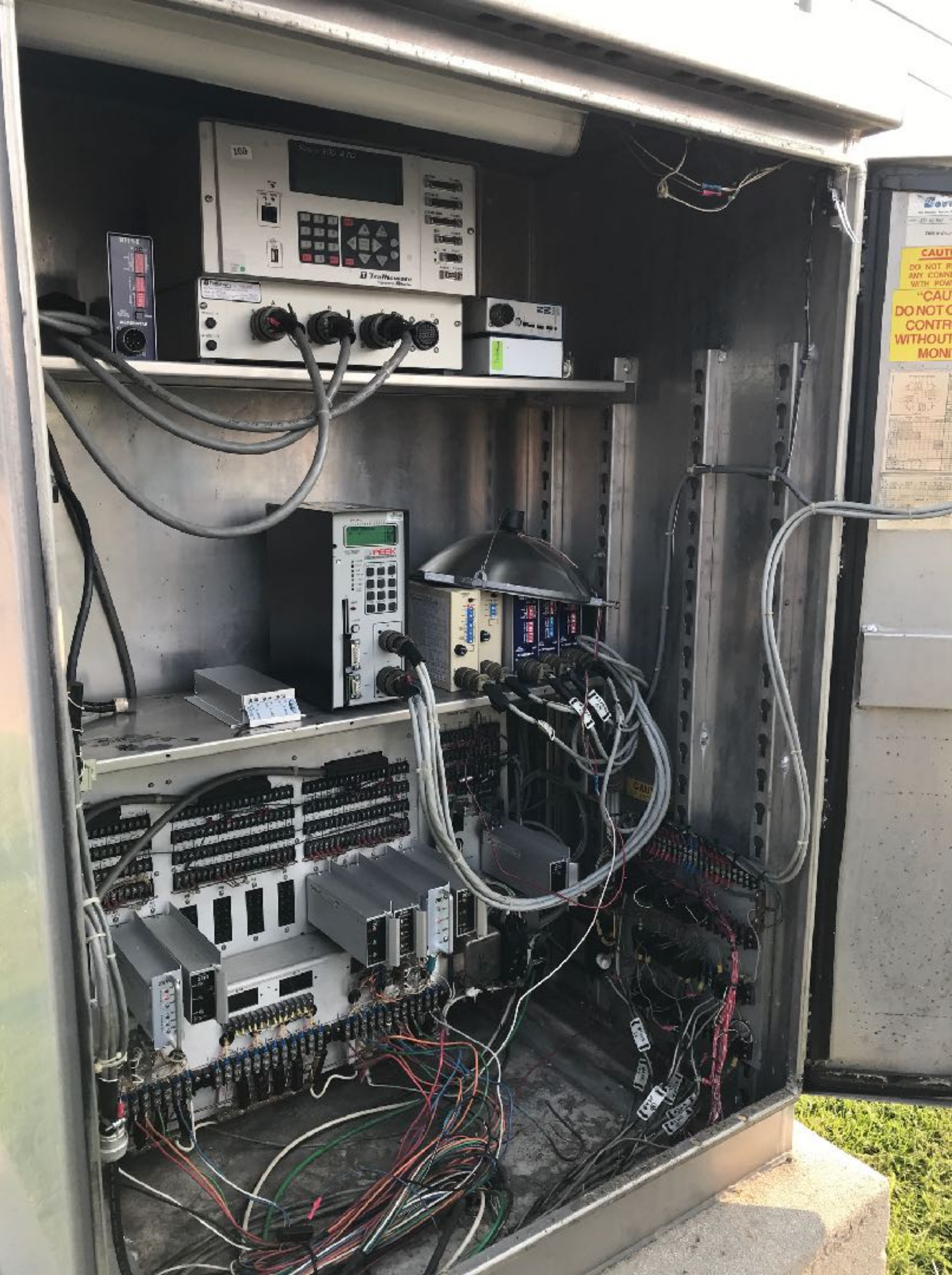


Street View - Jan 2018



Google





**ELECTRICAL INFRASTRUCTURE
BECOMING
INFORMATION INFRASTRUCTURE**





Mobility is changing the world. Grow your digital technology skills.
Learn Information Engineering. Be The NEXT ITS Workforce.

NEXT ITS

— WORKFORCE —

by The NEXT Education & GRIDSMART Technologies, Inc.

*State of the art training,
developed the way you learn.*

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Designing, building, leveraging, and supporting the transportation infrastructure at the heart of your community requires continuous learning. The NEXT ITS Workforce certification program will teach you how to understand the evolving technology impacting your town's transportation infrastructure. You will develop deep expertise in formerly uncharted areas such as fiber and wireless communications, cybersecurity, and intelligent infrastructure. The NEXT ITS Workforce ensures you meet technology demands to stay at the top of your profession. Join us to be the workforce that makes a difference!

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LEARN THE WAY YOU LEARN, *not in a standardized testing format*
AFFORDABLE — *GRIDSMART customers get their first module free*



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Intelligent Transportation, Mobility, Autonomy, and Cybersecurity



The NEXT Education prepares tradespeople to succeed in the 21st-century workforce. The NEXT ducation offers compelling real-world learning solutions that prepare organizations and individuals to compete in this new and forever changing frontier.

We Are Building the NEXT Mobility Workforce



**V21 and
Infrastructure
Basics**

[START LEARNING](#)



**Connected Vehicle
Fundamentals**

[START MORE](#)



**FAAs UAV Remote
Pilot Certification**

[START FLYING](#)



**Securing
Automotive
Systems**

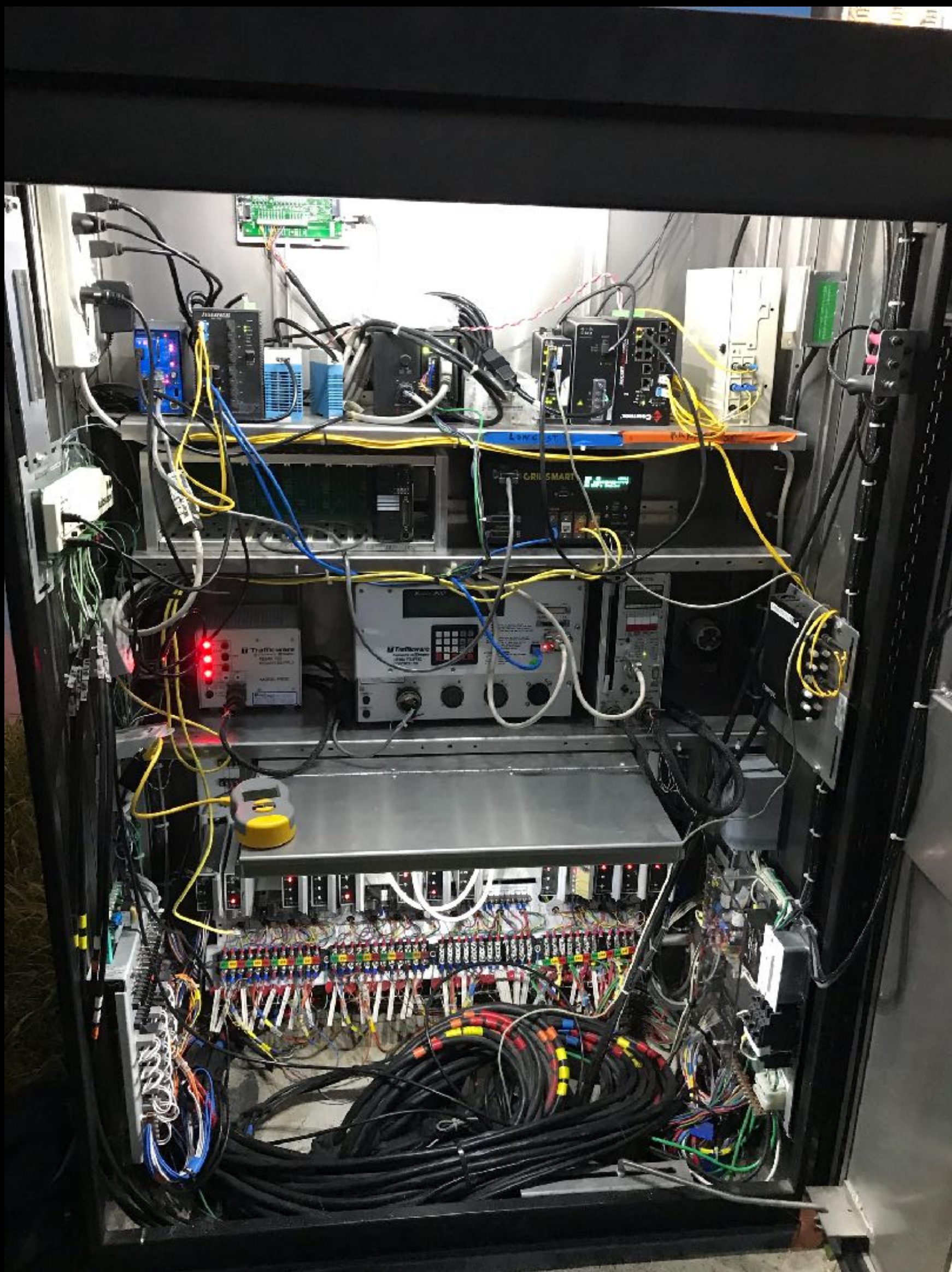
[START HOW](#)

thenexted.com



SECURITY







GRIDSMART.

INFORMATION SECURITY & THREAT INTELLIGENCE

THE ISTI DIVISION

- Pen-testing, passive network assessment
- Employee training, disaster recovery planning
- Total transparency, work with city IT staff



POLICYSMART



POLICYSMART PODCAST



gridsmart.com/policysmart

CATEGORY ARCHIVES: POLICYSMART

POLICYSMART #23: Featuring Jack Gillis, Executive Director of the Consumer Federation of America

August 28, 2018

What does the consumer think about all things autonomous? What is their advocate telling state and federal lawmakers and regulators? On this edition of POLICYSMART, we asked Jack Gillis, Executive Director of the Consumer Federation of America to give us...

Published on August 28, 2018 by [Nikki Sneed](#)

Posted in [POLICYSMART](#)

POLICYSMART #22: Featuring Lyndsay Digneo, Aviation STEM Manager for FAA's William J. Hughes Technical Center

August 28, 2018

Lyndsay Digneo is the aviation STEM (science, technology, engineering, and math) manager for the FAA's William J. Hughes Technical Center in Atlantic City. An engineer and the daughter of educators, she entered the field of transportation to reach those in...

Published on August 28, 2018 by [Nikki Sneed](#)

Posted in [POLICYSMART](#)

POLICYSMART #21: Looking Backward to Look Forward with Elaina Farnsworth, CEO of The NEXT Education

August 28, 2018

How can we prepare the transportation workforce for the next generation of mobility? What are the next steps in certifications and training to keep today's workers competitive in the landscape of tomorrow? Elaina Farnsworth, CEO of The NEXT Education, tackles these...

Published on August 28, 2018 by [Nikki Sneed](#)

Posted in [POLICYSMART](#)



INTERSECT & #talkITS



IT'S TIME TO GET OUR HANDS DIRTY.

OCTOBER 16-18, 2018

Join us at INTERSECT₁₈ as we build
transportation's foundation for the
future.

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intersectconference.com



#talkITS

ISSUE 1 / WINTER 2018



Hon. Mary Peters,
Former Secretary,
U.S. Department of
Transportation

A DEC OF ITS

17

GRIDSMART.

INTERSECT

#talkITS

ISSUE 2 / SUMMER 2018

INTRODUCING GRIDSMART
INFORMATION SECURITY
& THREAT INTELLIGENCE
(ISTI) DIVISION

p. 7, 26



MICHIGAN DOT STRIVES
TOWARD ZERO DEATHS
WITH AUTOMATED
VEHICLES

By Kirk Steudle, MDOT

THE FUTURE OF
MOBILITY DEMANDS WE
MAKE TRANSPORTATION
INVESTMENT A
PRIORITY

By Jill Ingrassia, AAA

THE IMPORTANCE
BEHIND THE "V"
ACRONYMS

By Shailen Bhatt, ITS America



HPC4MOBILITY



REINFORCEMENT LEARNING-BASED TRAFFIC CONTROL TO OPTIMIZE ENERGY USAGE AND THROUGHPUT



- HPC4Mobility Cooperative Research & Development Agreement with U.S. Department of Energy Vehicle Technologies Office.
- ORNL researchers:
 - teaching GRIDSMART cameras to estimate fuel consumption.
 - developing adaptive traffic light control using reinforcement learning to improve fuel economy.



THINGS I'M INTERESTED IN
THINGS I HAVE QUESTIONS ABOUT
THINGS THAT TICK ME OFF



DEEP LEARNING & AI



What is Machine Learning?

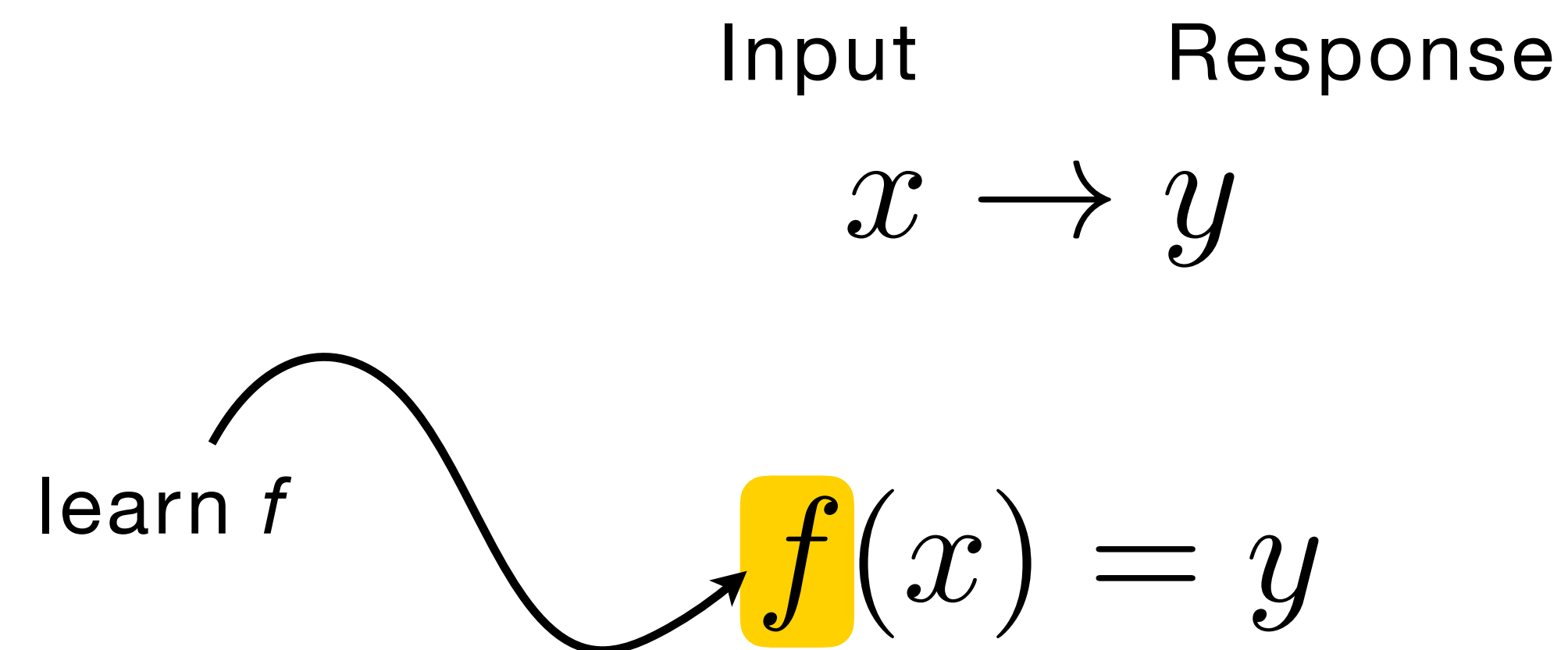
What is Supervised Learning?

What is a Neural Network?



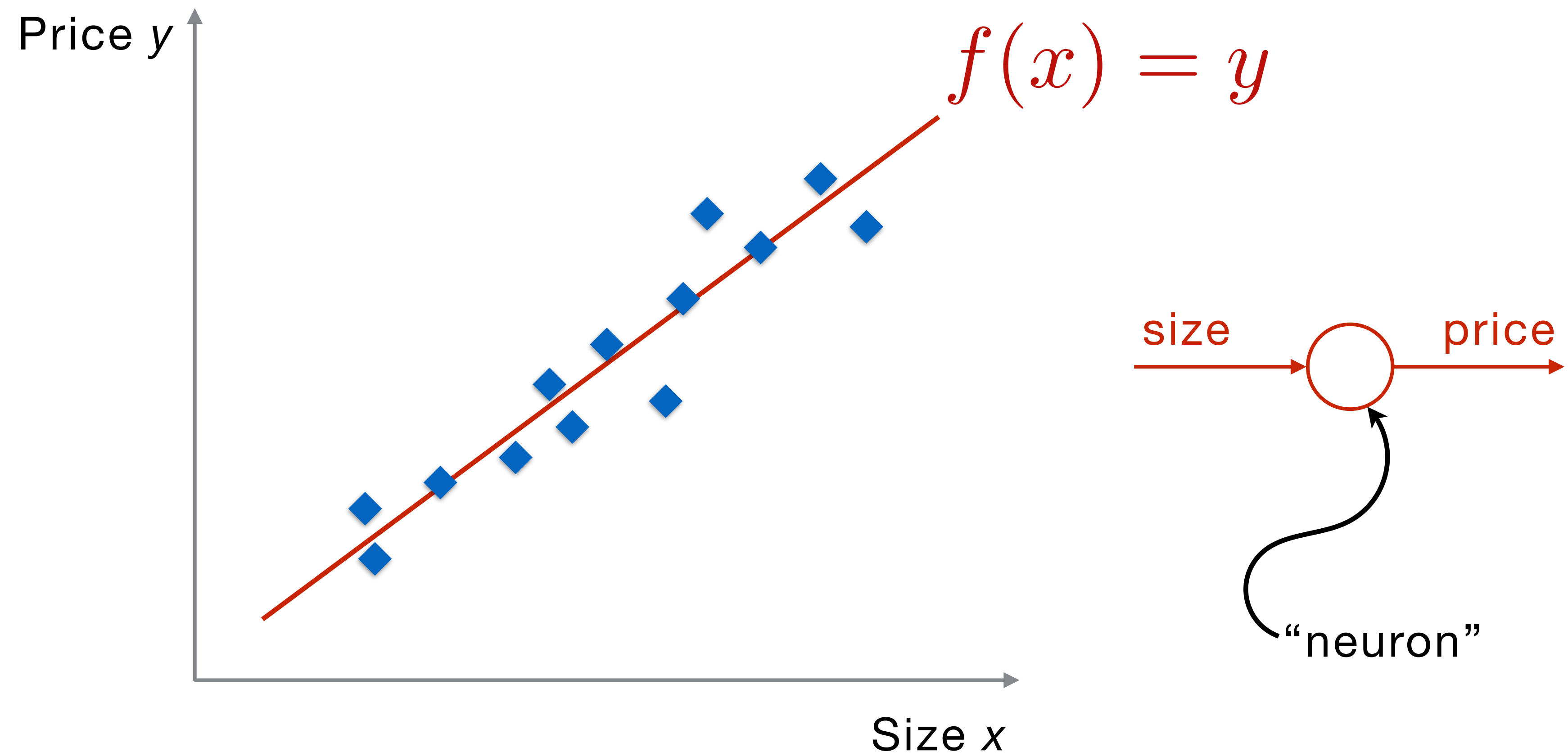
Input: x	Response: y
Email	Spam (0 or 1)?
Image	What object (1,...,N)?
Audio	Transcript
English text	French text
Image	Text description





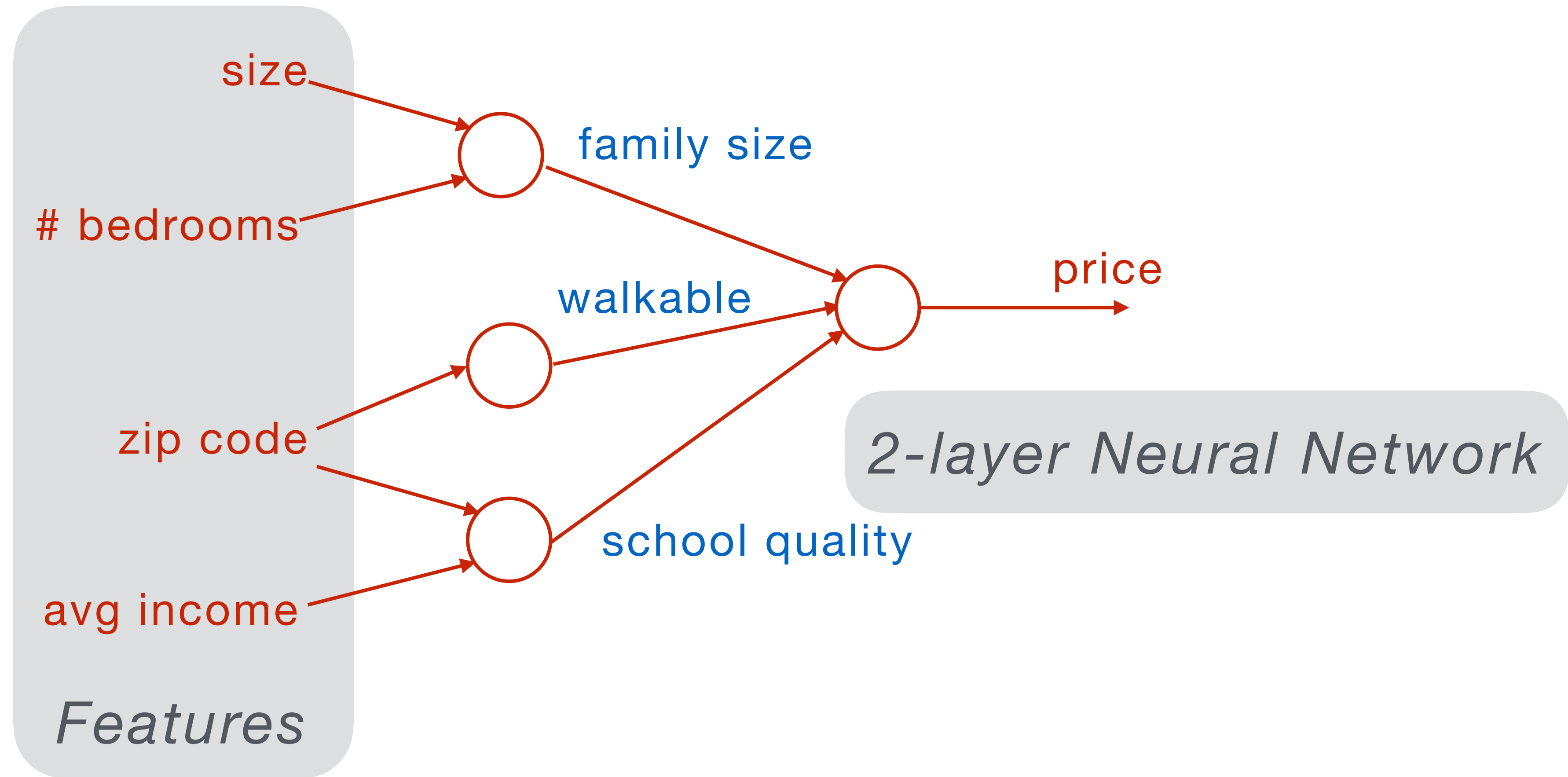
Inferring a function from labeled training data.



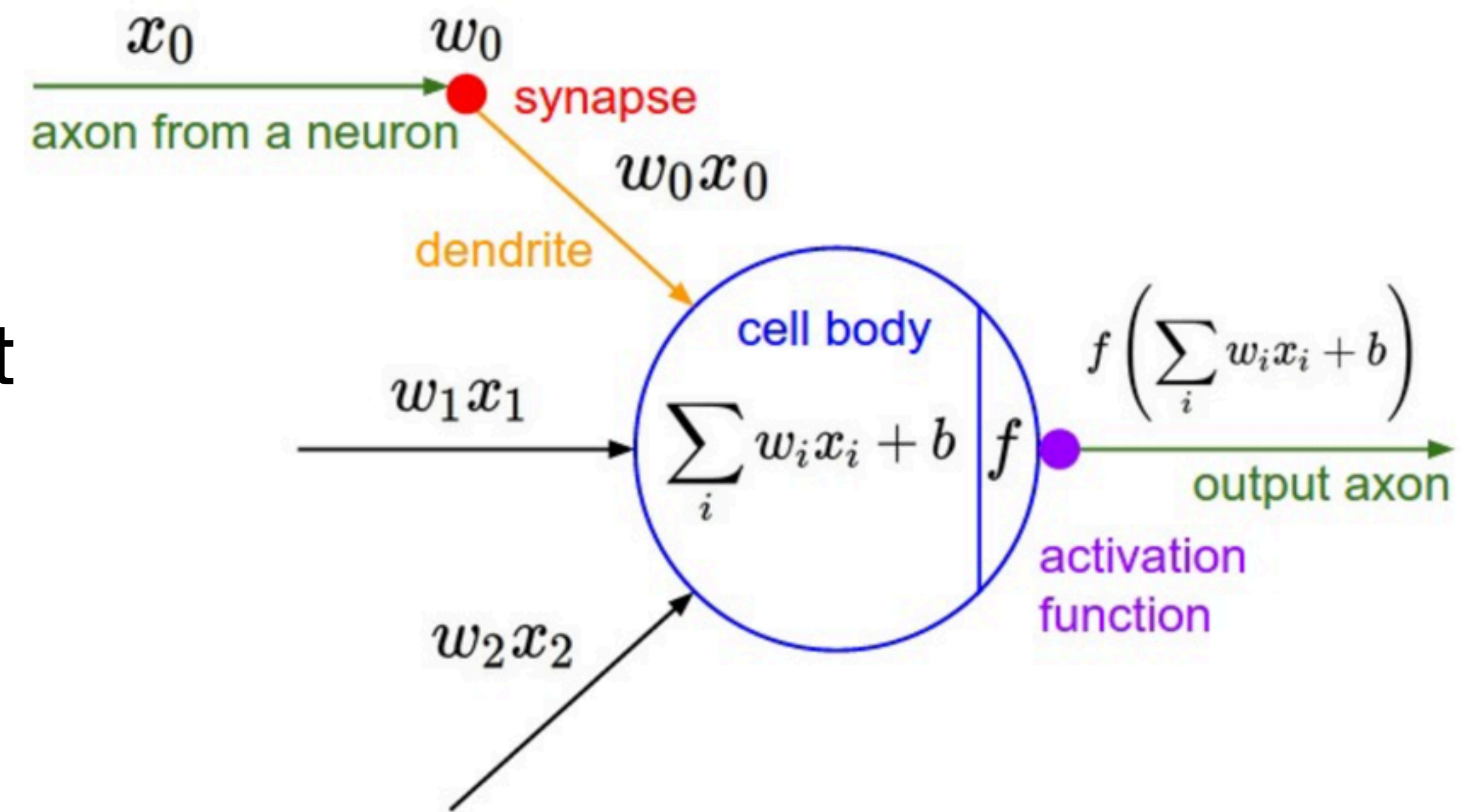


Input x

Response y

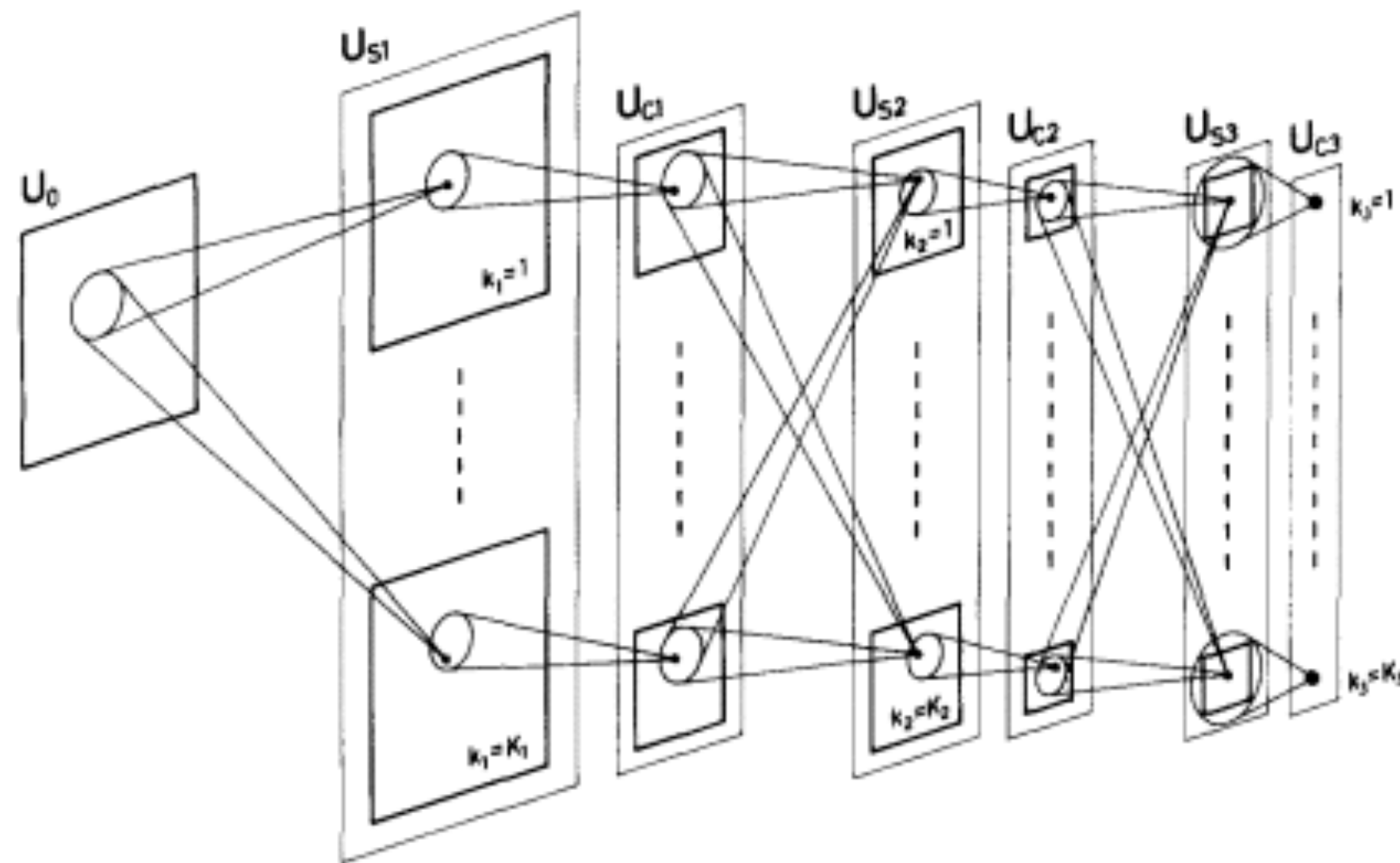


- McCulloch & Pitts neuron model 1943.
- Marvin Minsky creates first ANN at Princeton in 1951.
- Frank Rosenblatt creates Mark I Perceptron in 1958.



- The excitement and value over last few years has primarily been driven by the success of Convolutional Neural Networks (CNNs or ConvNets).
- In particular, these have made a tremendous impact on computer vision (and speech recognition).





Yann LeCun et al (1989): *Backpropagation Applied to Handwritten Zip Code Recognition*, Neural Computation, 1(4):541-551.

K. Fukushima (1980):
*Neocognitron: A Self-organizing
neural network model for a
mechanism of pattern recognition
unaffected by shift in position.*

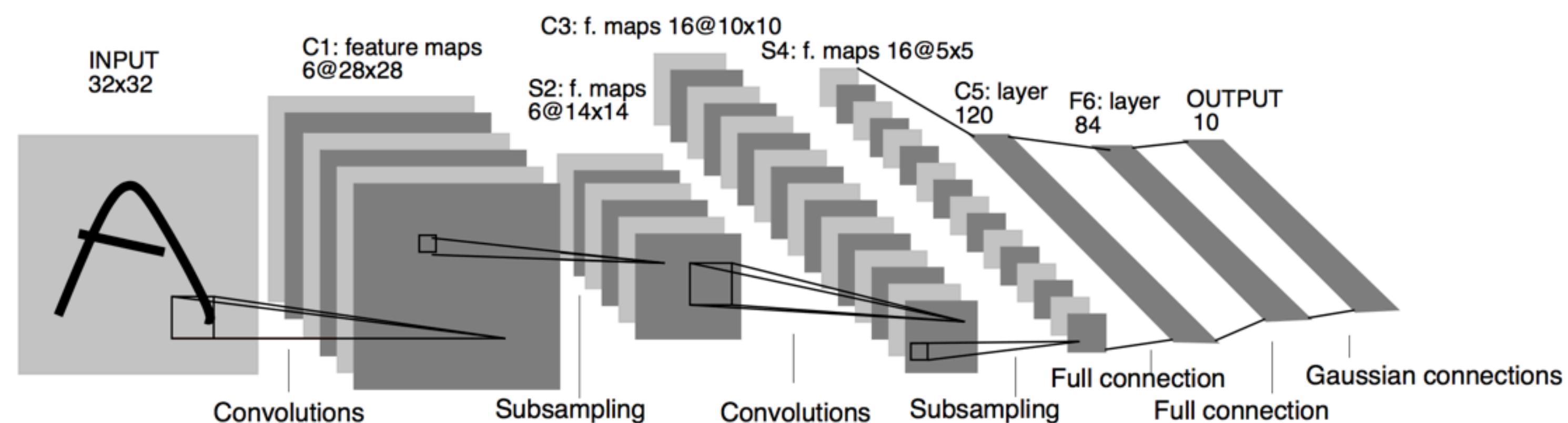


Fig. 2. Architecture of LeNet-5, a Convolutional Neural Network, here for digits recognition. Each plane is a feature map, i.e. a set of units whose weights are constrained to be identical.



IMAGENET Large Scale Visual Recognition Challenge (ILSVRC)

1.2M images, 1000 object categories

Minibus

A light bus (4 to 10 passengers)

Numbers in brackets: (the number of synsets in the subtree).

- ImageNet 2011 Fall Release (3232)
 - plant, flora, plant life (4486)
 - geological formation, formation
 - natural object (1112)
 - sport, athletics (176)
 - artifact, artefact (10504)
 - instrumentality, instrumenta
 - device (2760)
 - implement (726)
 - container (744)
 - hardware, ironware (0)
 - equipment (479)
 - ceramic (6)
 - means (0)
 - toiletry, toilet articles (5)
 - conveyance, transport (0)
 - vehicle (519)
 - dolly (0)
 - roll-on roll-off (0)
 - sidecar (0)
 - dolly (0)
 - shipping, cargo ships, litter (6)
 - public transport (21)
 - express, limited (0)
 - train, railroad train
 - local (0)
 - bus, autobus, coach
 - trolleybus, trolle
 - minibus (0)

Meerkat, mierkat

A mongoose-like viverrine of South Africa

Numbers in brackets: (the number of synsets in the subtree).

- ImageNet 2011 Fall Release (3232)
 - plant, flora, plant life (4486)
 - geological formation, formation
 - natural object (1112)
 - sport, athletics (176)
 - artifact, artefact (10504)
 - fungus (308)
 - person, individual, someone, son
 - animal, animate being, beast, br
 - invertebrate (766)
 - homeotherm, homoiotherm, t
 - work animal (4)
 - darter (0)
 - survivor (0)
 - range animal (0)
 - creepy-crawly (0)
 - domestic animal, domesticat
 - molt, moult (0)
 - varmint, varment (0)
 - mutant (0)
 - critter (0)
 - game (47)
 - young, offspring (45)
 - poikilotherm, ectotherm (0)
 - herbivore (0)
 - peeper (0)
 - pest (1)
 - female (4)
 - insectivore (0)
 - pet (0)

Espresso

Strong black coffee brewed by forcing hot water under pressure through finely ground coffee beans

Numbers in brackets: (the number of synsets in the subtree).

- ImageNet 2011 Fall Release (3232)
 - plant, flora, plant life (4486)
 - geological formation, formation
 - natural object (1112)
 - sport, athletics (176)
 - artifact, artefact (10504)
 - fungus (308)
 - person, individual, someone, son
 - animal, animate being, beast, br
 - Misc (20400)
 - julienne, julienne vegetable (0)
 - raw vegetable, rabbit food (0)
 - pulse (0)
 - goa bean (0)
 - kidney bean (0)
 - navy bean, pea bean, white b
 - pinto bean (0)
 - frijole (0)
 - black bean, turtle bean (0)
 - snap bean, snap (0)
 - string bean (0)
 - Kentucky wonder, Kentucky v
 - scarlet runner, scarlet runner
 - haricot vert, haricots verts, F
 - green bean (5)
 - wax bean, yellow bean (0)
 - Fordhooks (0)
 - lima bean (1)
 - sieva bean, butter bean, butt
 - fava bean, broad bean (0)

*Images of children synsets are not included. All images shown are thumbnails. Images may be subject to copyright.

1274 pictures

76.72% Popularity Percentile

ing P Wordnet IDs

Treemap Visualization

Images of the Synset

Downloads



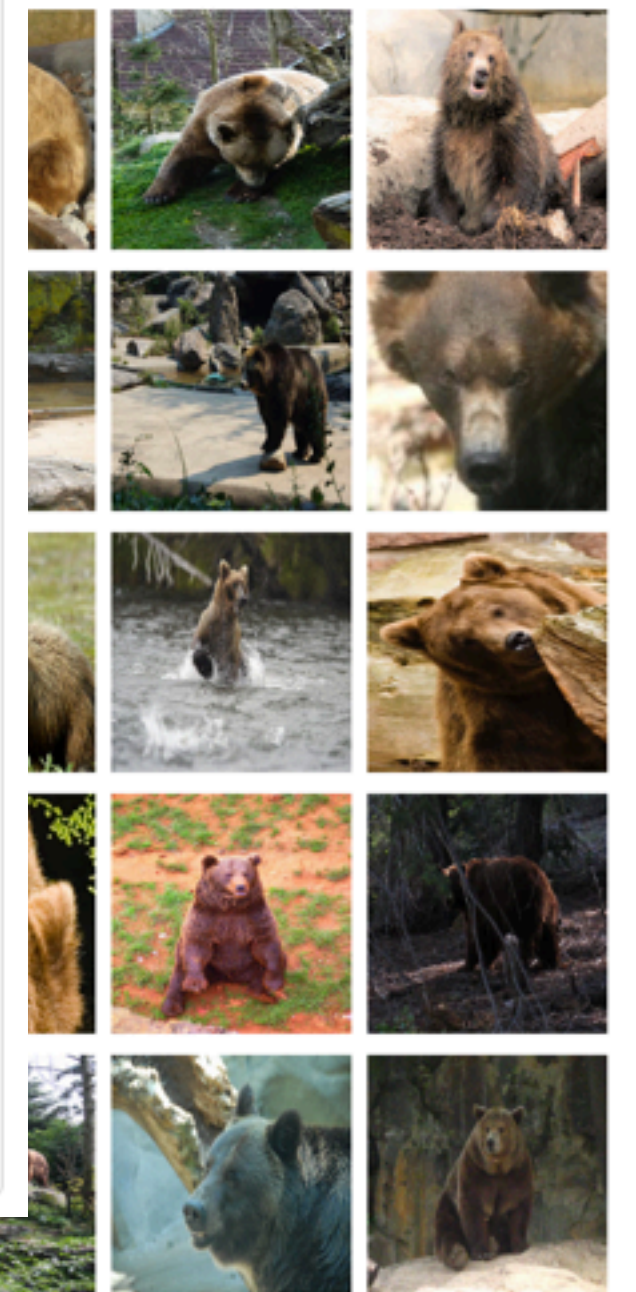
*Images of children synsets are not included. All images shown are thumbnails. Images may be subject to copyright.

Prev 1 2 3 4 5 6 7 8 9 10 ... 37 38 Next

1774 pictures

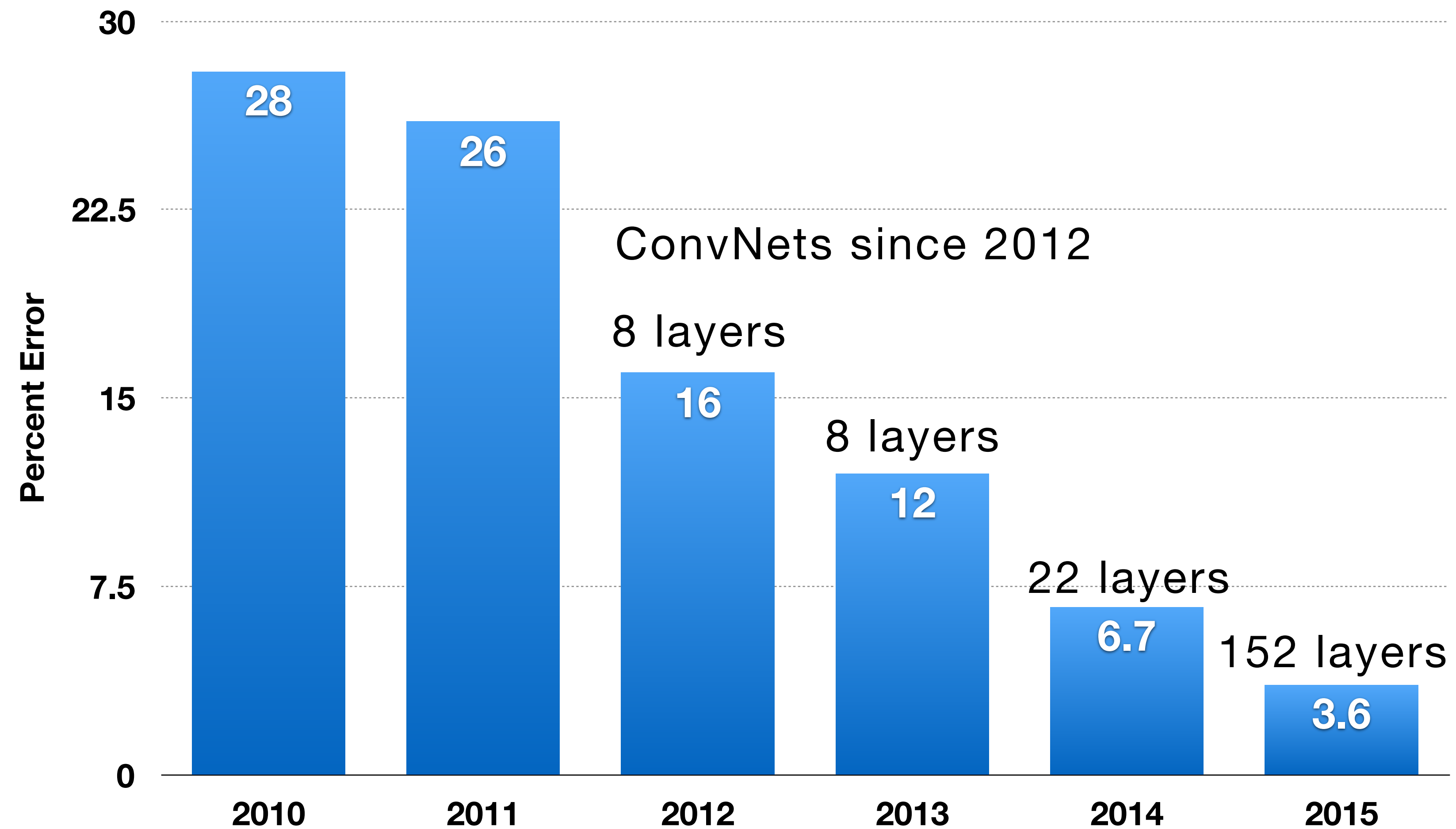
71.11% Popularity Percentile

ing P Wordnet IDs



*Images of children synsets are not included. All images shown are thumbnails. Images may be subject to copyright.

Prev 1 2 3 4 5 6 7 8 9 10 ... 80 81 Next



**SO WHERE DOES
THAT GET US?**



**“Now! *That* should clear up
a few things around here!”**

(Shamelessly stolen joke from Prof. Todd Hylton, UCSD)



Q & A

To Build Truly Intelligent Machines, Teach Them Cause and Effect

💬 52 | 📄

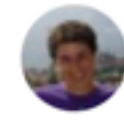
Judea Pearl, a pioneering figure in artificial intelligence, argues that AI has been stuck in a decades-long rut. His prescription for progress? Teach machines to understand the question why.



Judea Pearl

2011 Turing Award Winner

*All the impressive
achievements of deep
learning amount to
just curve fitting.*



David Brailovsky

Follow

Jan 12 · 11 min read

Recognizing Traffic Lights With Deep Learning

How I learned deep learning in 10 weeks and won \$5,000

Top highlight

94.955% ON 500,000 TEST IMAGES



VANITY FAIR

HIVE

BUSINESSPOLITICS**TECHNOLOGY**THE PLAYERSSIGN IN/UP

From the Magazine

ELON MUSK'S BILLIONAIRE APOCALYPSE

Elon Musk is famous for his intelligence scares him. And the rapidly advancing field and

BY MAUREEN DOWD
APRIL 2017

Approximately Correct

Technical and Social Perspectives on Machine Learning

The AI Misinformation Epidemic



Zachary C. Lipton

March 28, 2017

Journalism

Politics, Social Media

f Facebook

t Twitter

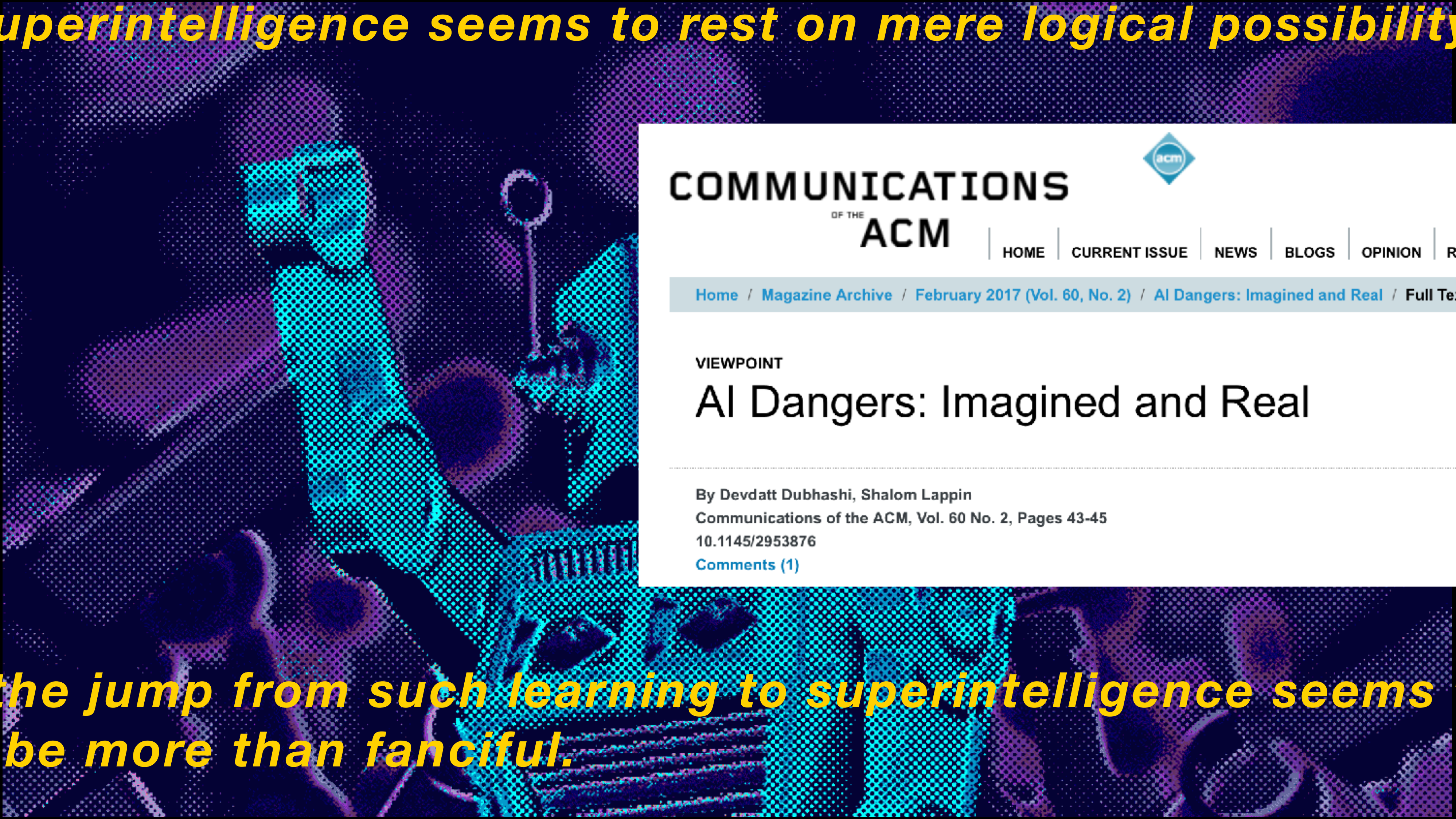
G+ Google+

P Pinterest

Interest in machine learning may be at an all-time high. Per *Google Trends*, people are searching for *machine learning* nearly five times as often as five years ago. And at the University of California San Diego (UCSD), where I'm presently a PhD candidate, we had over 300 students enrolled in both our graduate-level recommender systems and neural networks courses.

... a masterclass in low-quality, opportunistic journalism.

Much, if not all of the argument for existential risks from superintelligence seems to rest on mere logical possibility.



COMMUNICATIONS
OF THE
ACM

HOME | CURRENT ISSUE | NEWS | BLOGS | OPINION | RESEARCH | PRACTICE

Home / Magazine Archive / February 2017 (Vol. 60, No. 2) / AI Dangers: Imagined and Real / Full Text

VIEWPOINT

AI Dangers: Imagined and Real

By Devdatt Dubhashi, Shalom Lappin
Communications of the ACM, Vol. 60 No. 2, Pages 43-45
10.1145/2953876
[Comments \(1\)](#)

...the jump from such learning to superintelligence seems to us to be more than fanciful.



... computer science may well be just one conceptual breakthrough away from being able to build an artificial general intelligence.

... may well be just one conceptual breakthrough away from being able to build a .



COMPLEXITY



The world has lots of very stupid ideas in it. One of them, one of the most harmful, is the prevailing idea of what it means for one thing to be technologically superior to another.



How Not To Make Coffee
adequateman.deadspin.com

It is not a machine engineered to improve anything or to resolve a problem, but only and entirely the pretext for a sales pitch, a means to separate someone from their money.



AUTONOMY, MICROMOBILITY, ETC



AUTONOMOUS VEHICLES

- Can roadways handle more cars?
- Ride-share as precursor?
- NY Report (Schaller) on 9 major cities:
 - Rides up 37% 2017 YoY, +2.6B
 - +5.7B Vehicle Miles Traveled (VMT)
- UC Davis (Clewlow):
 - 49-61% of trips would not have been made at all or by walking, biking, transit.





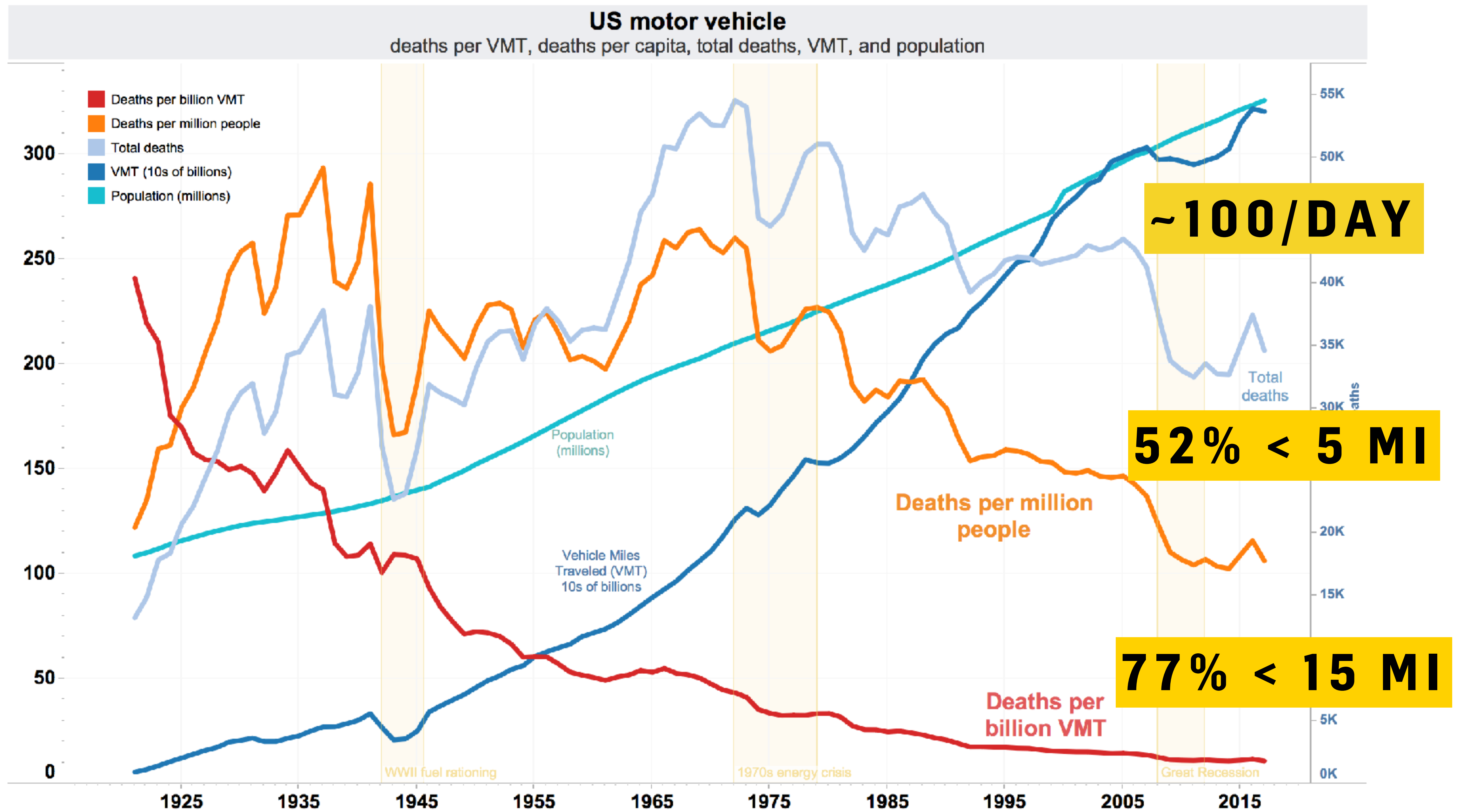
THE SELF-DRIVING CAR THAT WILL NEVER ARRIVE

Self-driving cars are delusional tech optimism rooted in greed, sorry

Casey Johnston, Aug 20 2018

theoutline.com/post/5964/the-self-driving-car-that-will-never-arrive





source: Dennis Brantland
https://en.wikipedia.org/wiki/Motor_vehicle_fatality_rate_in_U.S._by_year

SO WHY DID THE AUTOMOBILE WIN?

I think it has done more for women than anything else.
- Susan B. Anthony



What was the first form of personal mobility?

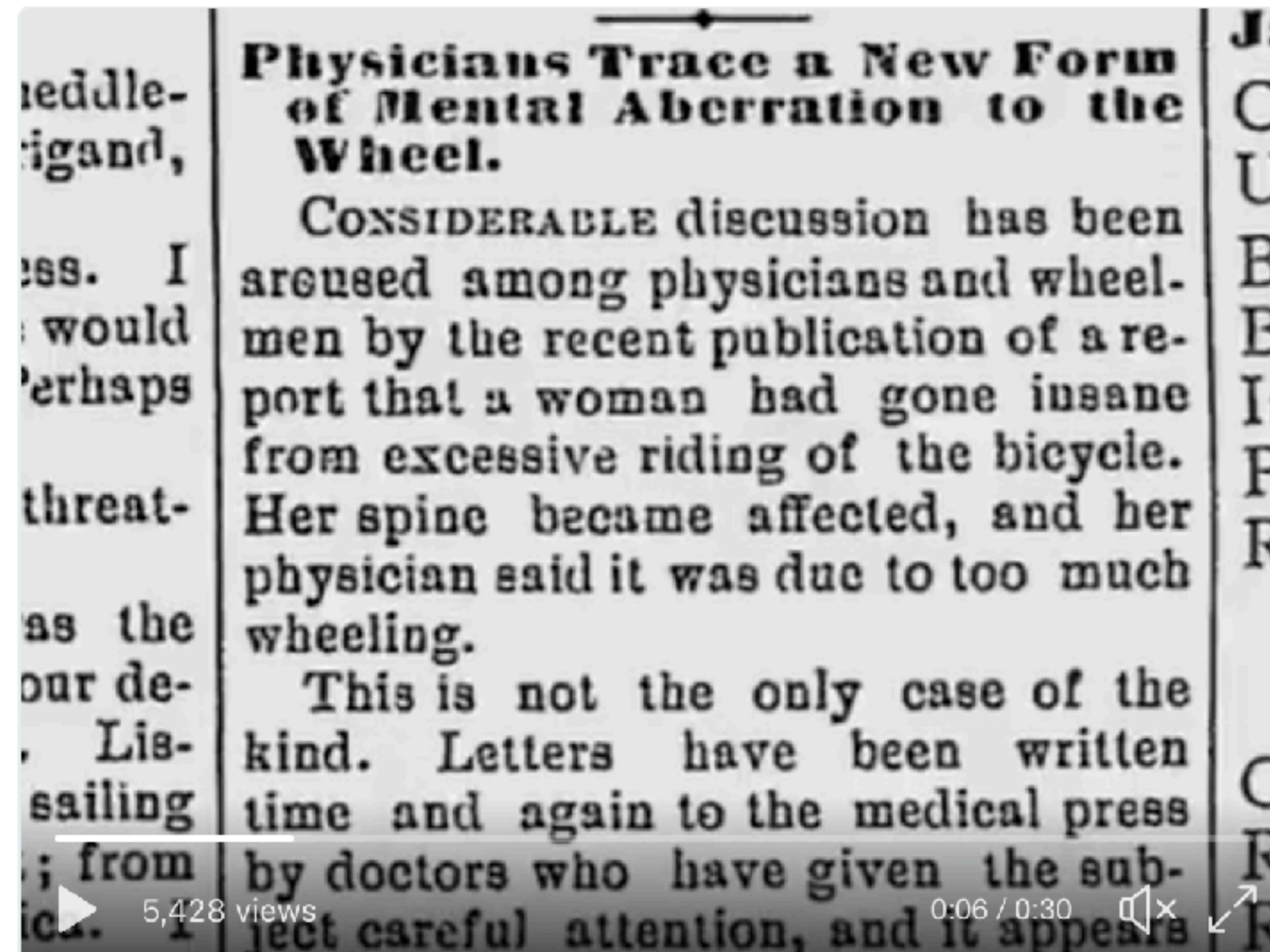


Pessimists Archive Podcast

@PessimistsArc

Follow

Bikes were blamed for insanity in 1896.
Read entire original article in scrolling in this scrolling video:



6:09 AM - 2 Jun 2018

Have smooth streets?



Department's new diesel buses.



The PC bundled; the
smartphone unbundled.

iTunes unbundled the song;
streaming subscriptions
bundled. (Napster)

THE AUTOMOBILE BUNDLED PERSONAL MOBILITY

The car bundled trips;
multimodal unbundles the
trip, but not the convenience.

Cable TV bundled; apps
(over-the-top) unbundled.



<500kg, utilitarian
E-bikes, scooters, etc.



asymco.com

asymcar.com

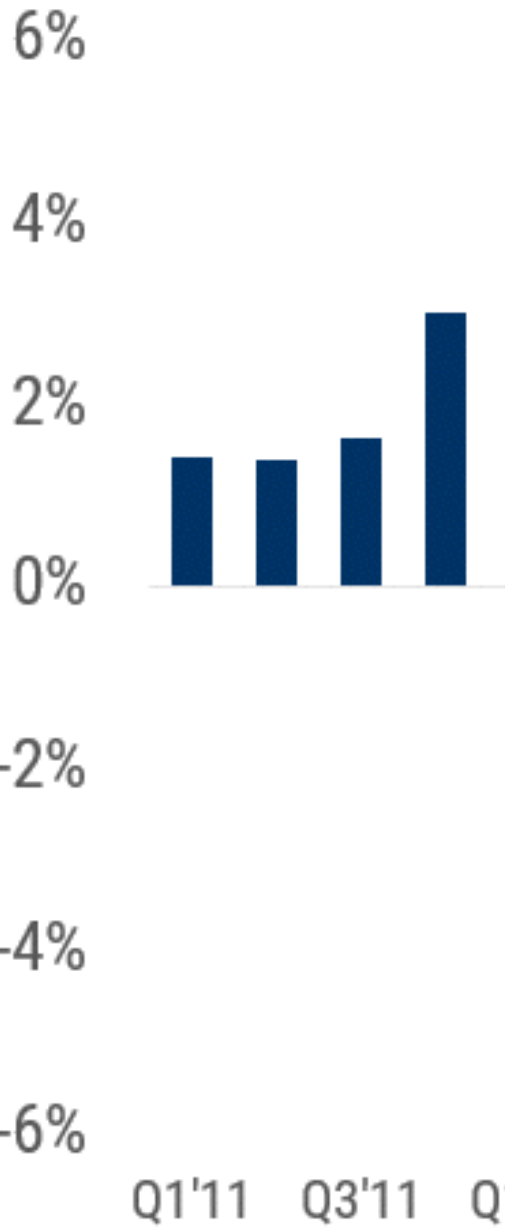
medium.com/micromobility



60% Trips in US Are 5 Miles Or Less

Fewer people are using public transit

Year-over-year change



Source: American Public Transportation

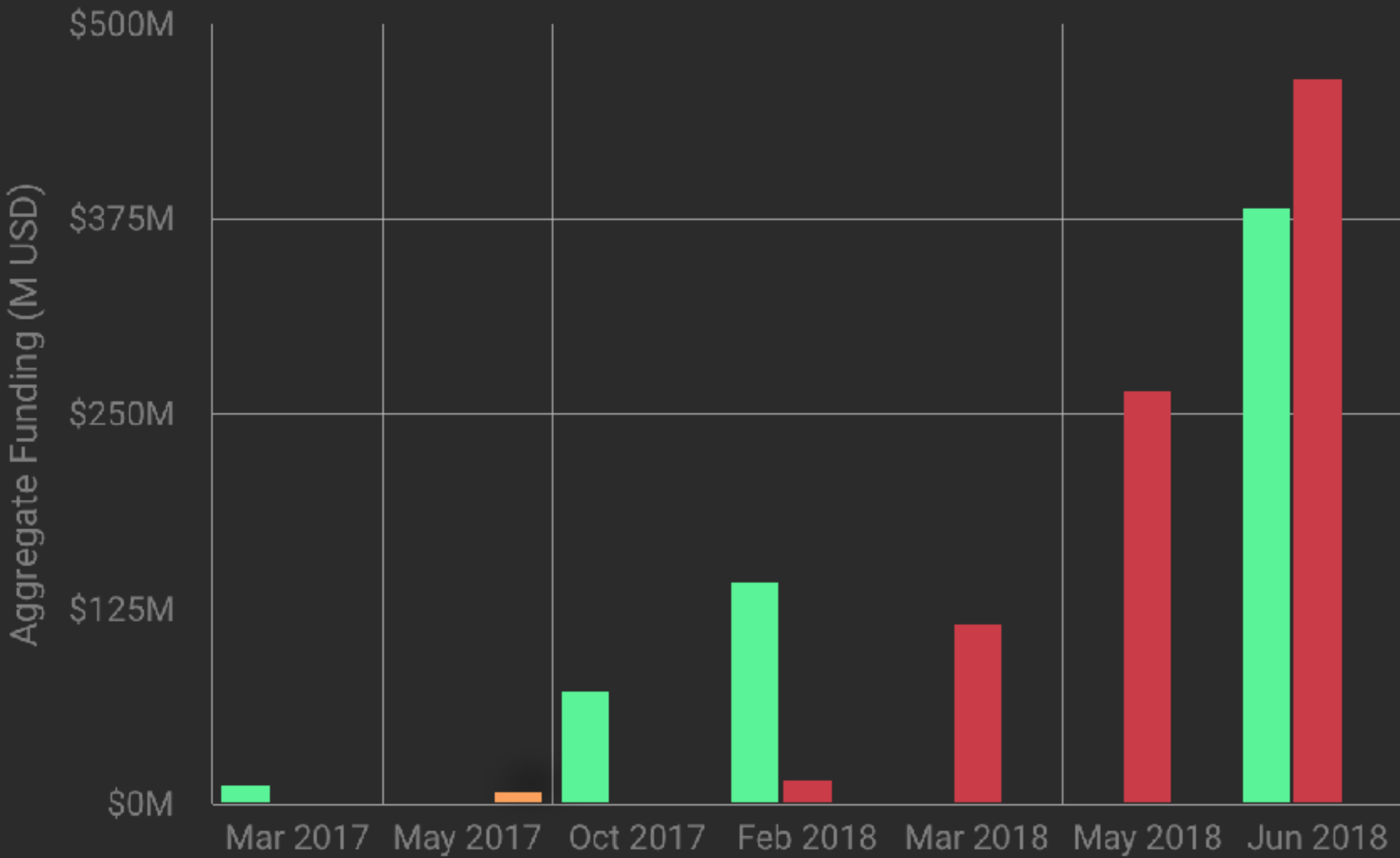
Proportion of trips



U.S. Scooter Startup Funding

Funding for U.S. scooter companies beginning with Lime's Series A in March 2017. Data inclusive of Bird and Lime's unconfirmed funding rounds from March and June 2018.

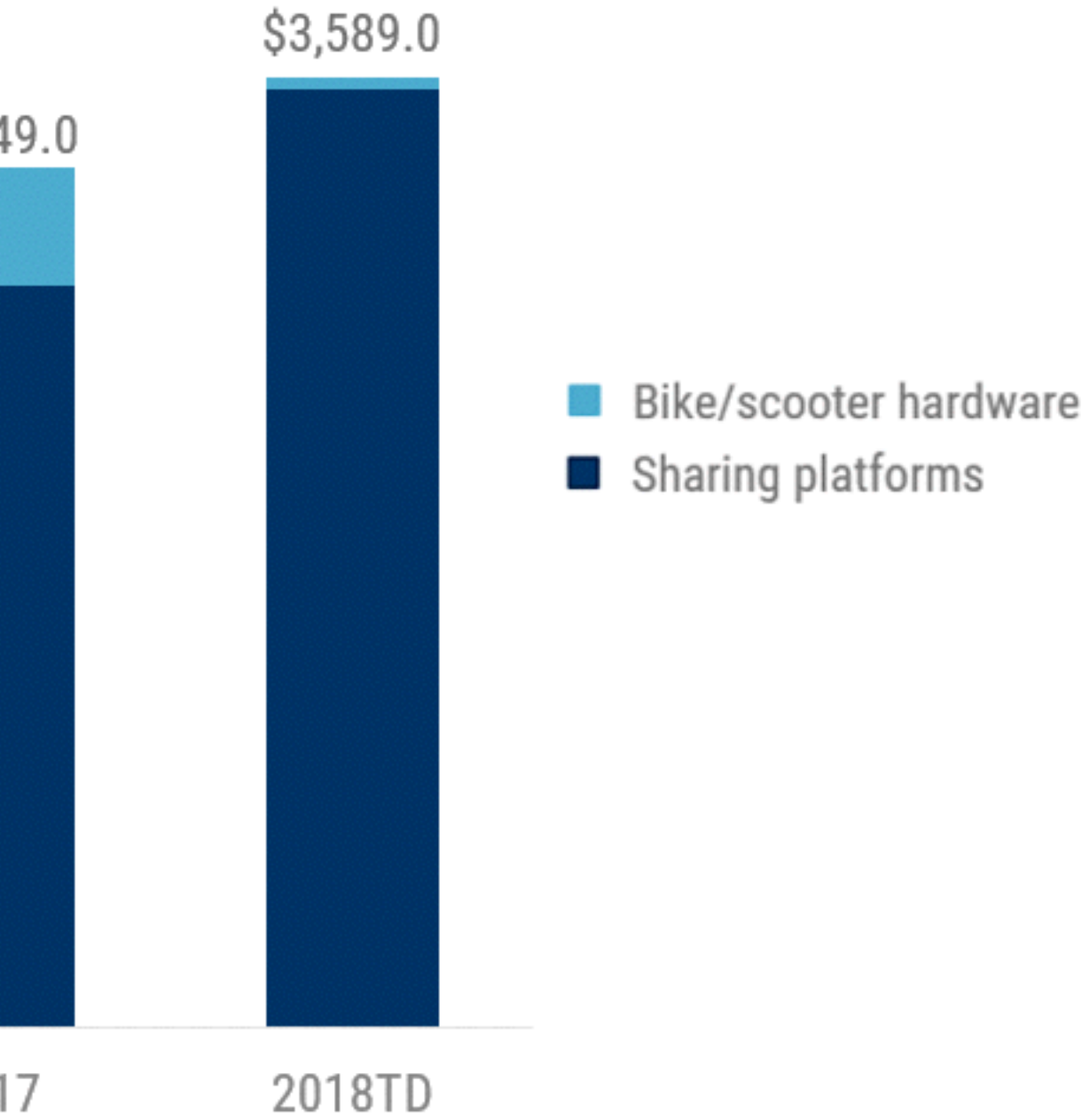
Lime Bird Spin



crunchbase news

of bike/scooter funding

8) in millions



CBINSIGHTS





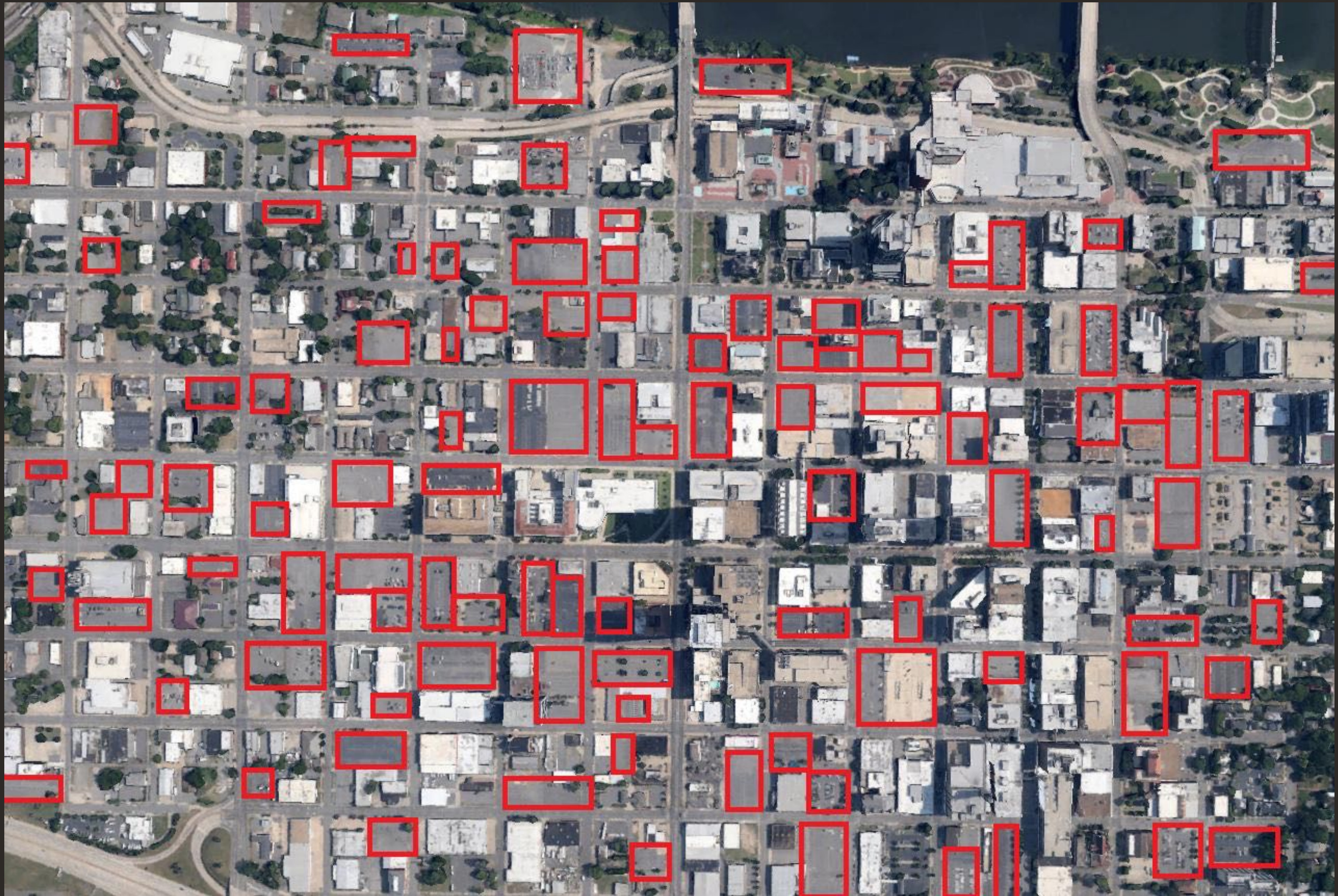
INFRASTRUCTURE?

People think that this is some big deal to ask for infrastructure for bikes or micromobility, but we've been asking for infrastructure for new modalities for 200 years. ...

We always have had demands on these streets coming from new modes and they've been met usually with reluctance, but they've been met because you have demand. ...

– Horace Dediu, Micromobility Episode 1







- Do you pay to park at the grocery store or movie theater?
- In 1946, 17% of cities had parking requirements in zoning ordinances.
- In 1951, that number was 71%.
- Cost is diffused into taxes, real estate, product, and service fees.
- "The High Cost of Free Parking" by Donald Shoup.



318,000 M² OFFICE

325,000 M² PARKING



1 PARKING SPACE PER 285 SQ FT OFFICE SPACE





IS CONGESTION BAD?



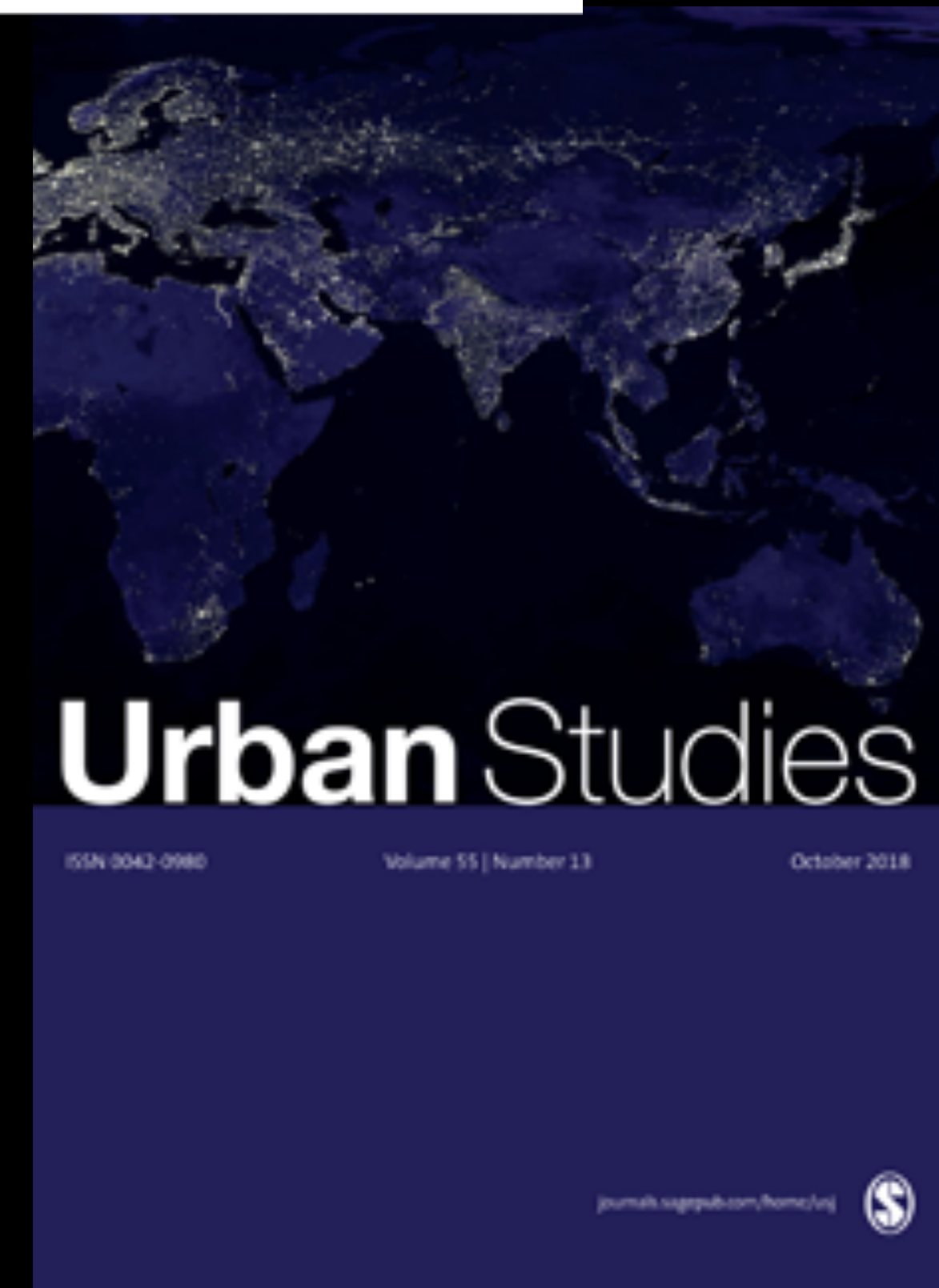
Traffic Congestion's Economic Impacts: Evidence from US Metropolitan Regions

Matthias Sweet,

First Published October 10, 2013 | Research Article | 

<https://doi.org/10.1177/0042098013505883>

- Higher-levels of congestion are initially associated with economic growth, but becomes drag above a threshold.
- Job growth slows above 35hr delay per commuter per year (>4.5min per 1-way trip).
- Similarly, growth slows in over-saturation (>11,000 ADT per lane).





GRIDSMART®

STUDENTS OF THE MONTH



GIVESMART

Dedicated to improving the human condition by supporting efforts to improve education, nutrition, health, and quality of life for the people of the world community regardless of race, creed, color, age, or gender.

gridsmart.com/givesmart



THANK YOU!

