Discovering People's Needs with Data Science

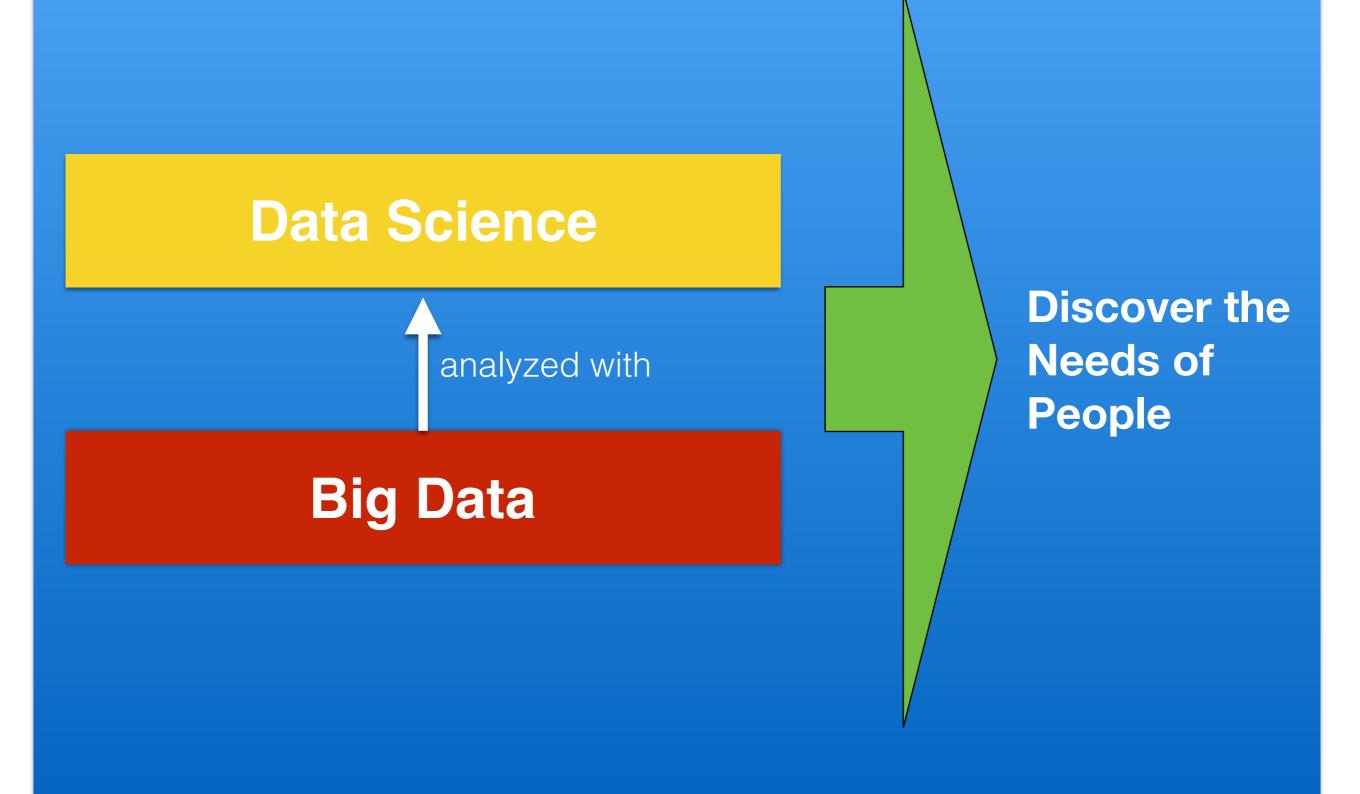
Harvey Alférez, Ph.D.

Director, Institute of Data Science School of Engineering and Technology Montemorelos University, Mexico https://icd.um.edu.mx/en/



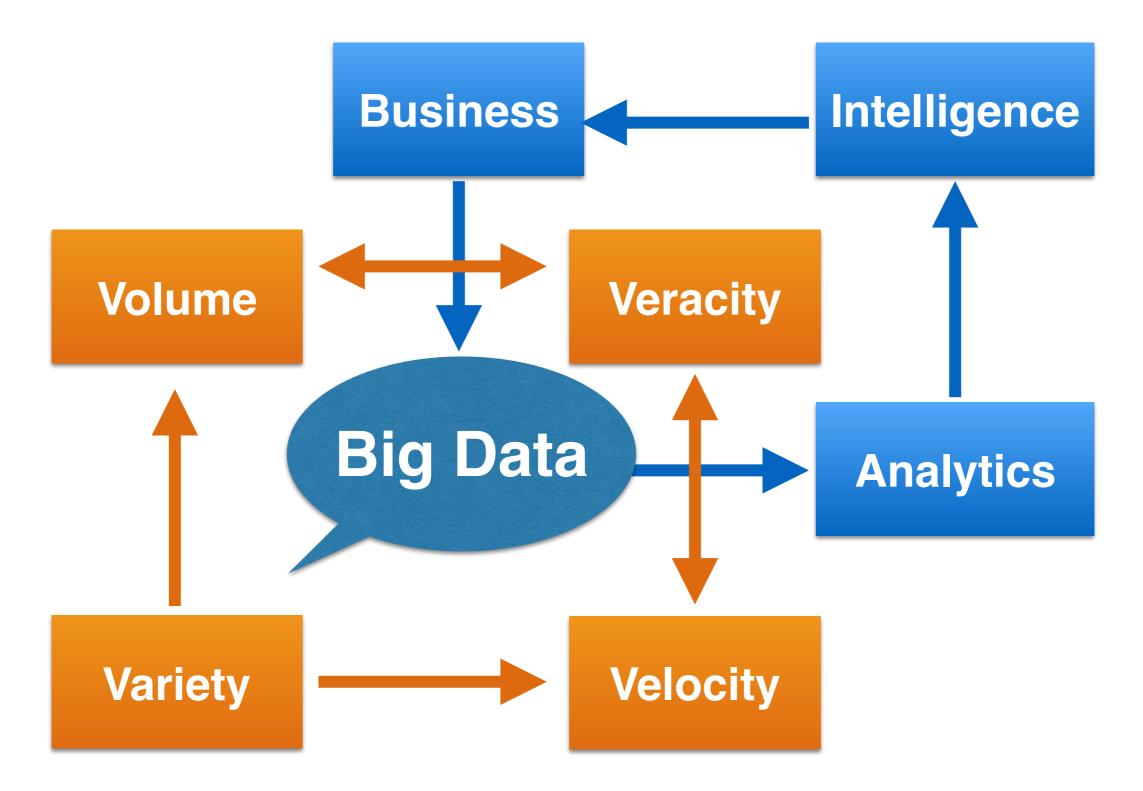
"the Savior mingled with men as one who desired their good. He showed His sympathy for them, *ministered to their <u>needs</u>*, and won their confidence. Then He bade them, 'Follow Me.'" [1]

1. E. G. White, The Ministry of Healing (Review & Herald, 1905), p. 143.



- Big data is a termed that can be used to describe data sets so large and complex that they become difficult to work with using standard techniques [1].
- Big data is the next big thing. <u>The new oil</u> [2].

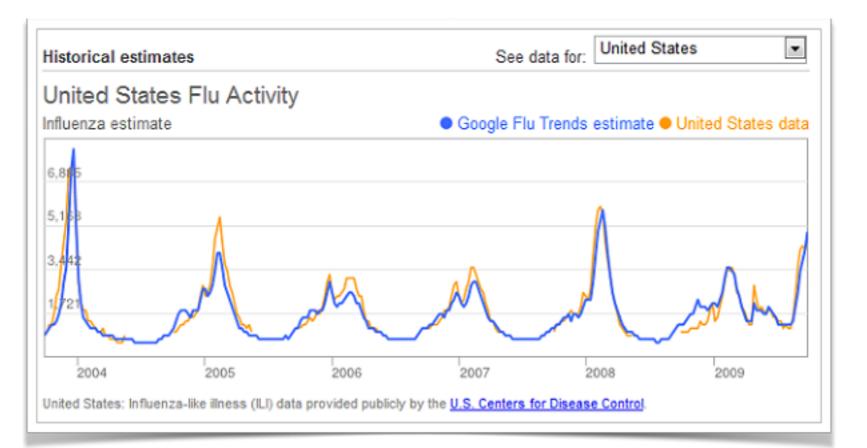
- 1. Snijders, C., Matzat, U., and Reips, U.-D. (2012). "Big data": Big gaps of knowledge in the field of Internet science. International Journal of Internet Science, 1(1):1–5.
- 2. Rotella, P. (2012). Is data the new oil? URL: <u>http://www.forbes.com/sites/perryrotella/2012/04/02/is-data-the-new-oil/</u>



3. Maheshwari, A. (2016). Big data essentials. Amazon Digital Services LLC.

Big Data Applications

Public Health Monitoring



Google Flu Trends better predicted flu outbreaks than U.S. Centers for Disease Control and Prevention (CDC) (2004-2012)

Big Data Applications

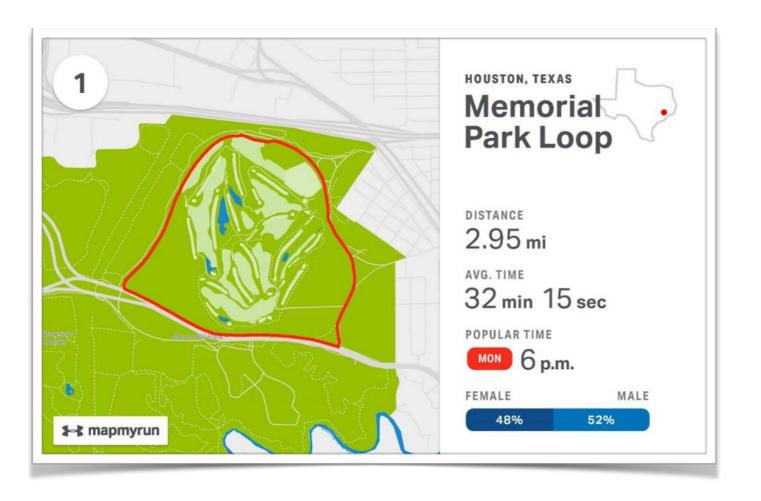
Predictive Policing

- Los Angeles Police
 Department + UC Berkeley
- Analyzed **13 million crimes** recorded over **80 years**
- The identified **hotspots of crimes** were likely to happen in the **future!**



• Reduce crime by 12% to 26% in different categories of crime

Big Data Applications



Under Armour knows:

- The most popular running route in the country.
- The most popular time for this route to be run is Monday at 6pm.
- Among the 20 most popular running routes in the country, 14 of them are next to or around a body of water (river or lake).



Data Science can be defined as the study of the generalizable extraction of knowledge from data [4].

4. V. Dhar, "Data science and prediction," Commun. ACM, 56 (12, 2013), pp. 64-73.







PAGE FROM A HIGH SCHOOL YEARBOOK, 8.5" X 12"

Big Data: The Management Revolution

DATA

Data Scientist: The Sexiest Job of the 21st Century



by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

5. Davenport, T.H. y Patil D.J. (2012). Data scientist: the sexiest job of the 21st century. URL: <u>https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century</u>

Data Analysis Results for Washington Conference

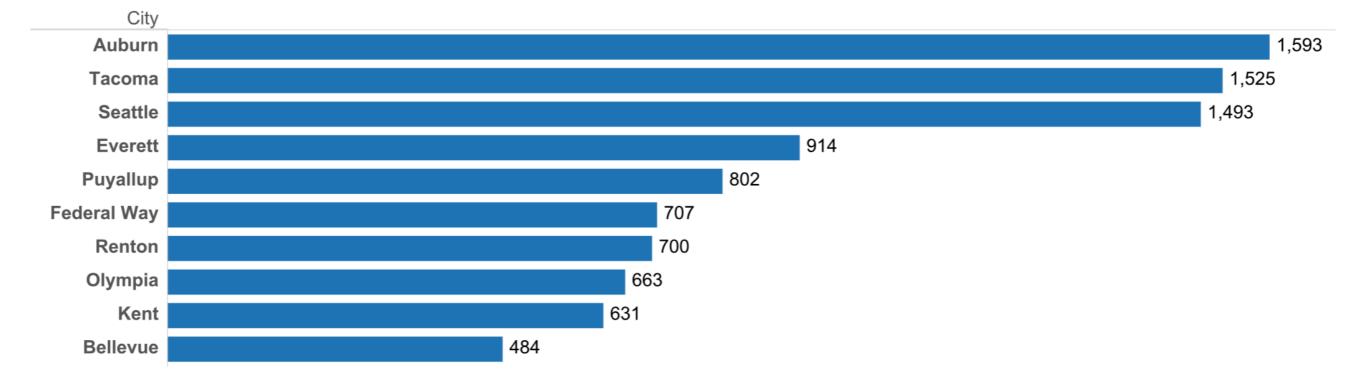
- Data related to church members, churches, schools, and social media activity in Washington Conference - close data.
- June 5-30, 2017.



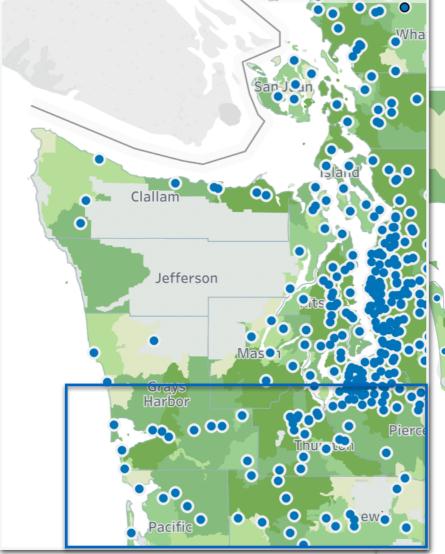
Datasets

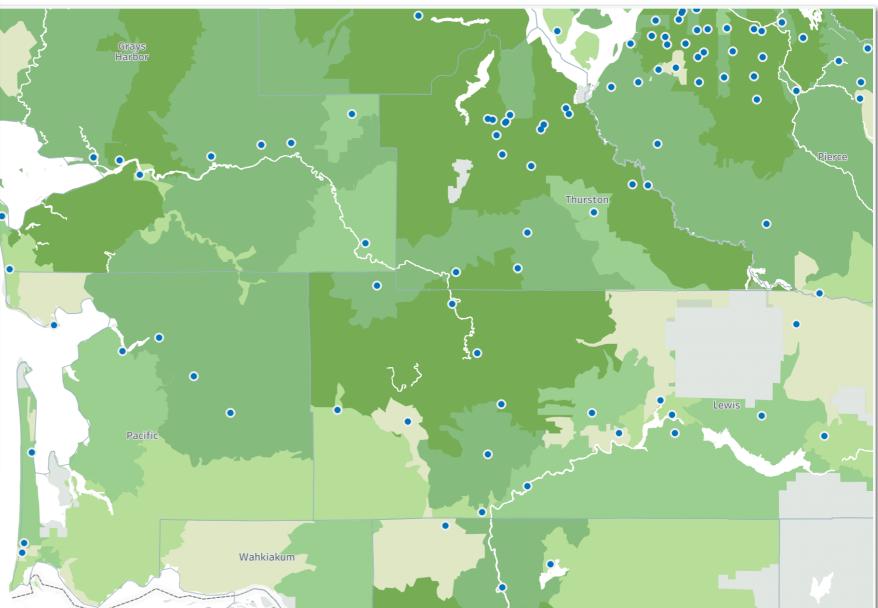
- TowerData: 31,013 records
- Directory (geolocation) of Seventh-day Adventist churches and schools in Washington Conference
- Data related to the activity in Washington Conference's Facebook page

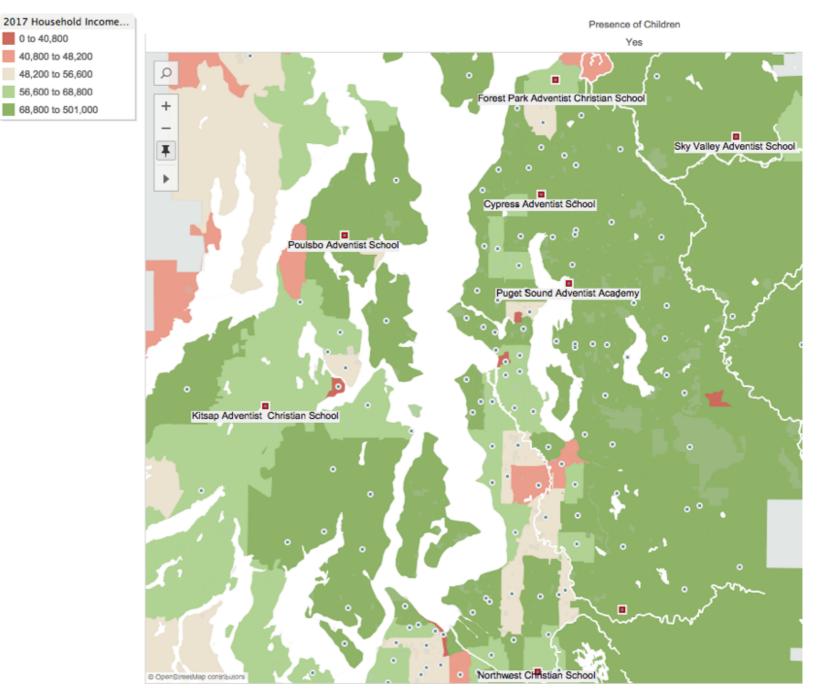
Top Ten Cities with the Highest Concentration of Church Members



Communities with No SDA Members









0 to 40 800

00 to 48.200

68 800 to 501 00

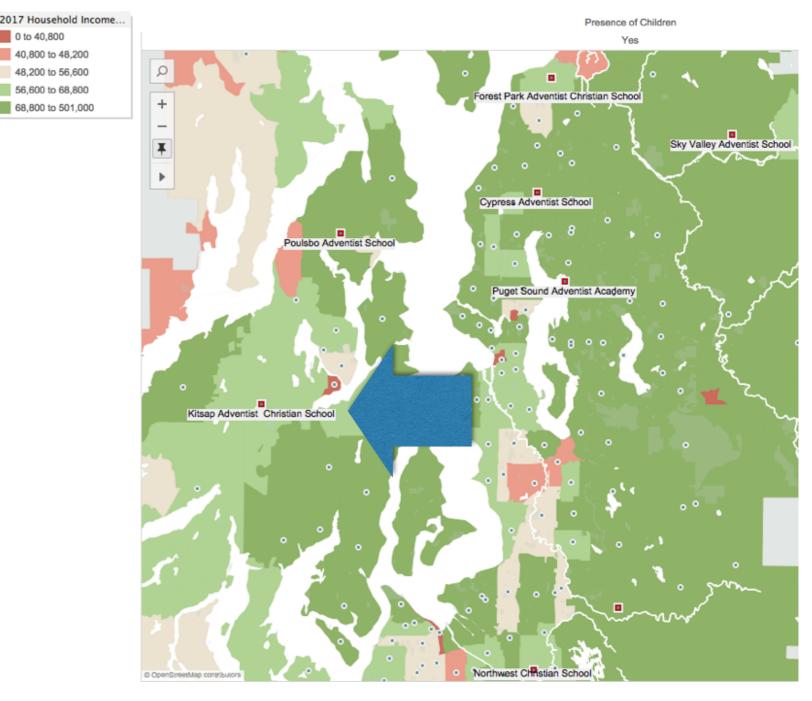
Kitsap Adventist Christian School is located in an area with the following household income: \$56,600 to \$68,800

•18 members in an area of \$0 to \$48,200

 18 members in an area of \$48,200 to \$56,600

•109 members in an area of \$56,600 to \$68,800

 36 members in an area of \$68,800 to \$501,000



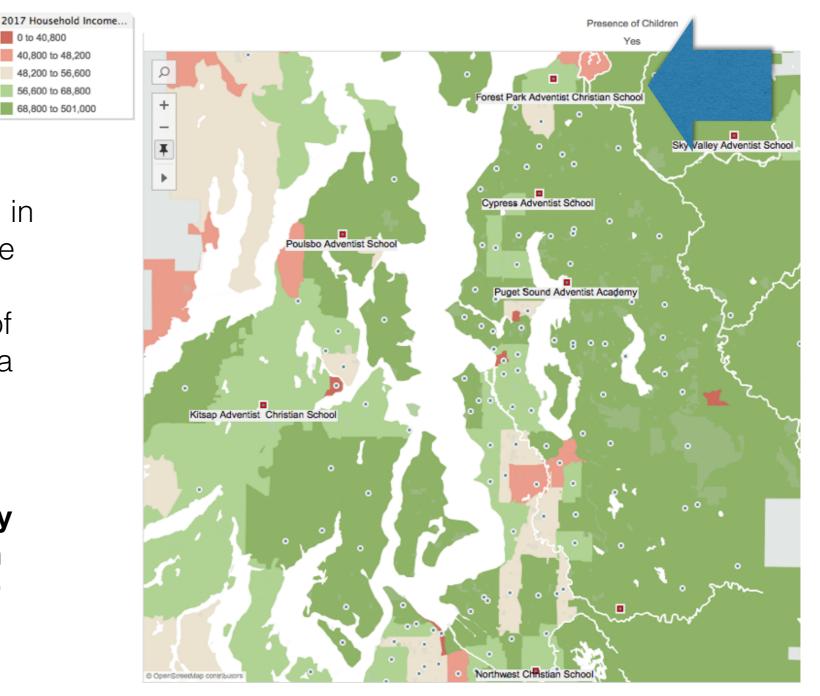


0 to 40,800 40,800 to 48,200 200 to 56,600 600 to 68,800

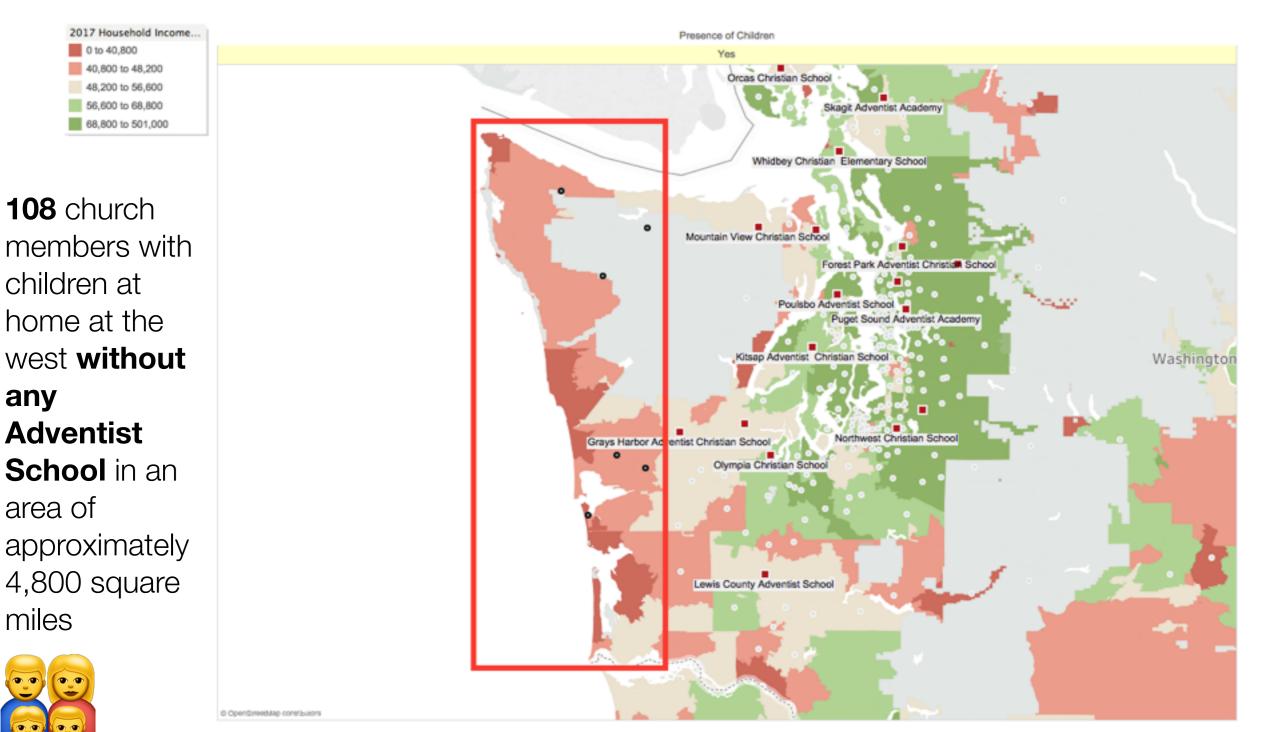
58,800 to 501.000

Forest Park Adventist Christian School is located in an area of household income values lower than the household income of most of the church members within a radius of 10 miles from this school

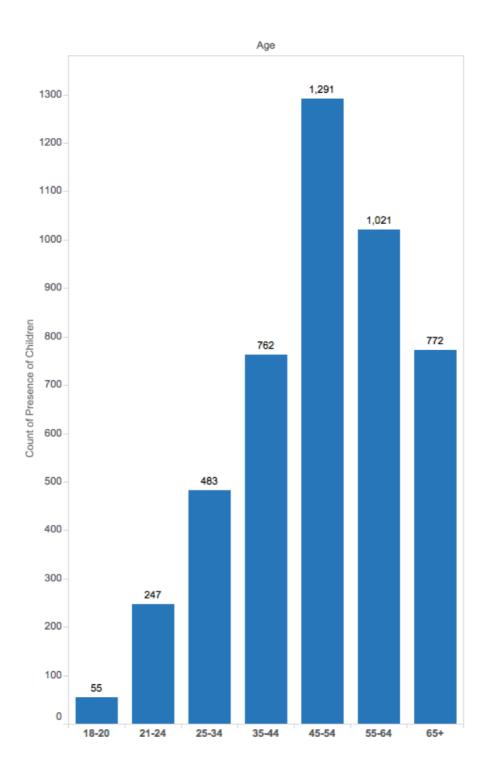
> **Does this school satisfy** the demands of church members with a higher household income?





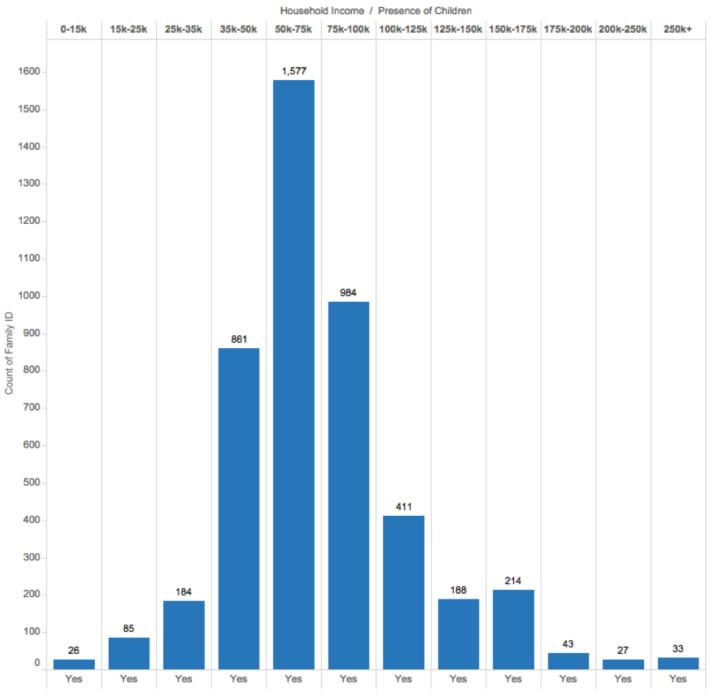


Parents' Age-Range



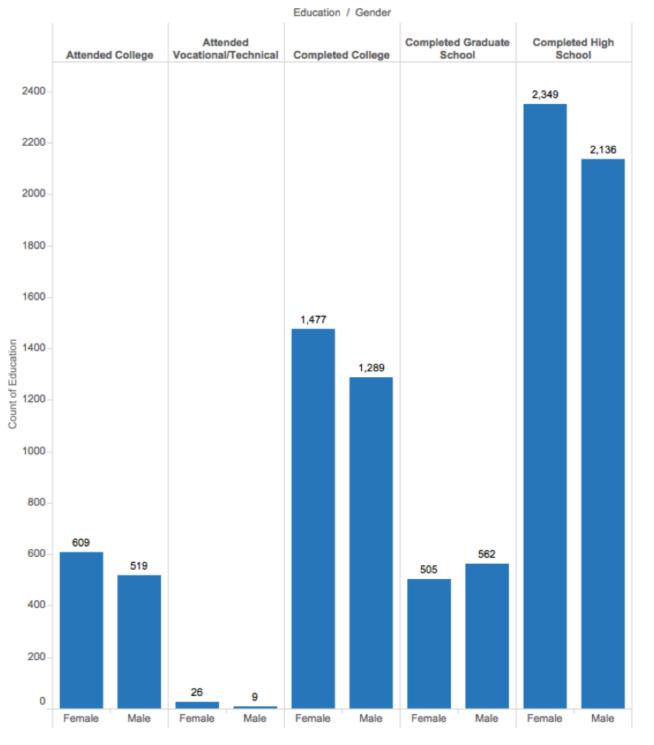


General Income of Families



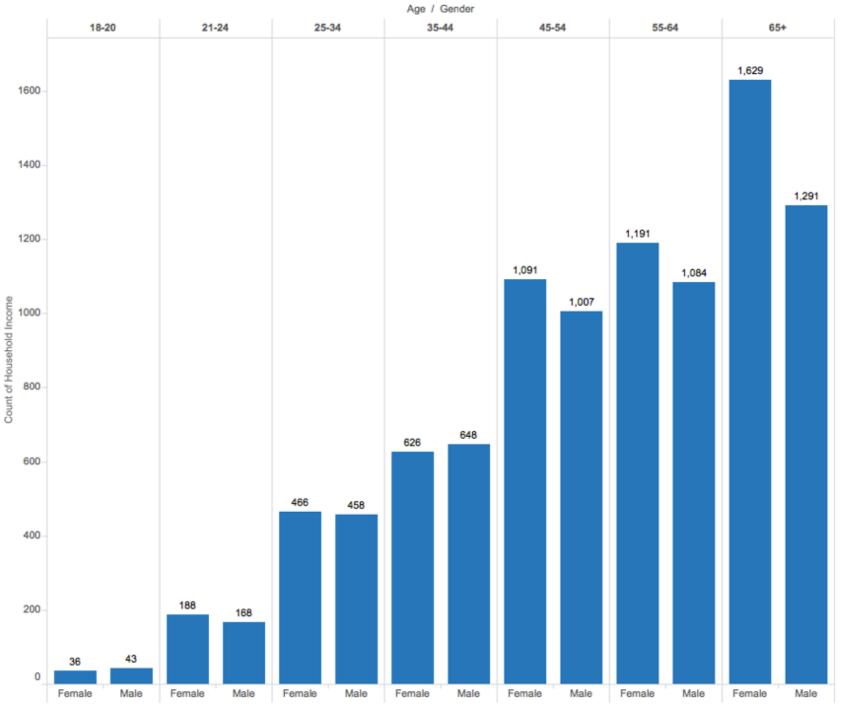


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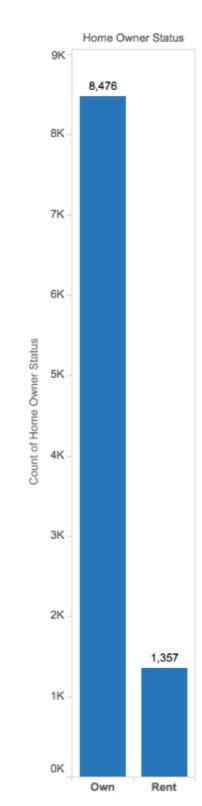




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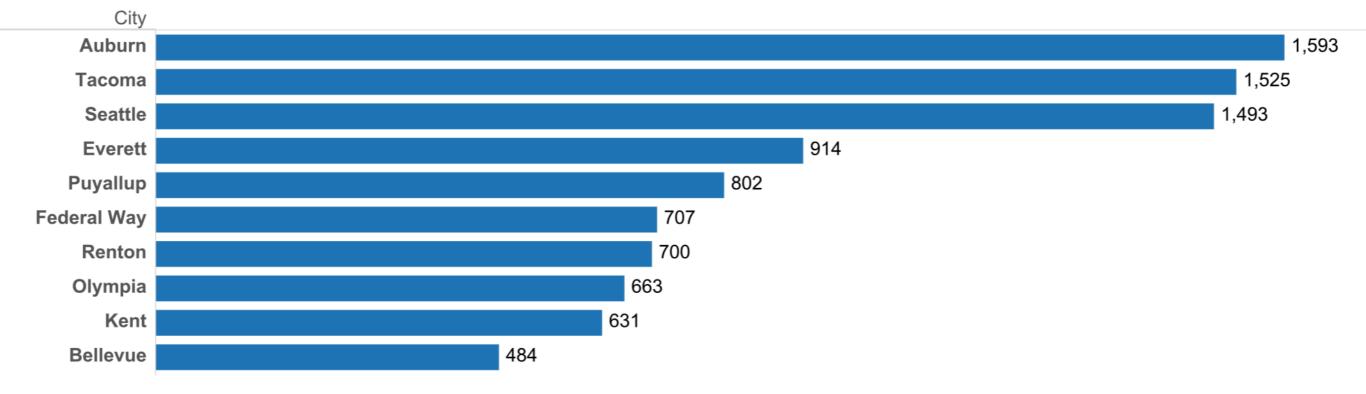






- Church members who have completed high school have a similar home market value and household income value than church members who have not finished their college degree.
- The spending score increases according to the level of education.
- Having terminated graduate school *does not* imply a higher income or a higher spending among church members.

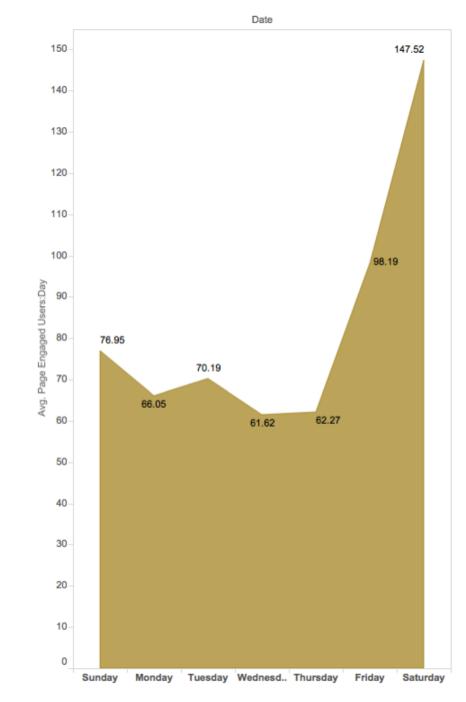
Around 17% of Members are Blue-Collar Workers



Key Members' Interests Based on Age

- Example: 65+ members have the following interests (which can be satisfied by the church):
 - news & current events (with news from Adventist News, Adventist Review or other publications)
 - kitchen & dining, garden, health & wellness, and cooking (with online courses on these areas)
 - **traveling** (with the organization of mission trips)
 - **books and magazines** (this is a key fact for ABC stores)
 - charitable donations (this is an interesting fact for fund raising campaigns)

Social Media Analysis



Facebook Page Activity of Washington Conference

Other Areas of Interest

- Evangelism: Understand the community, etc.
- **Church Treasury**: Analysis of tithes and offering, donors profiles, offering distribution, etc.
- Education: Student profiles, retention forecasting, etc.
- Media: Create profiles of TV/radio/Internet viewers or listeners (i.e., personas), etc.
- Geolocation Analysis: Demographic information, etc.

Big Data for Reaching a Big World



7. Alférez, G.H. (2015). Big Data for Reaching a Big World. Adventist Review, 192(11), 47-51

Use **big data analysis** to try to understand how **culture** perceives our **fundamental beliefs.**

Big Data and Our Church

 The full data set used in the experiments is available for download at:

https://books.google.com/ngrams

- This data set is composed of digitized texts containing about **4% of all books ever printed** between **1800** and **2008** (5,195,769 books).
- Books in English (361 billion words) and in Spanish (45 billion words)

Creation



Creationism vs. Theory of Evolution (Case Insensitive Search)

Healthy Living



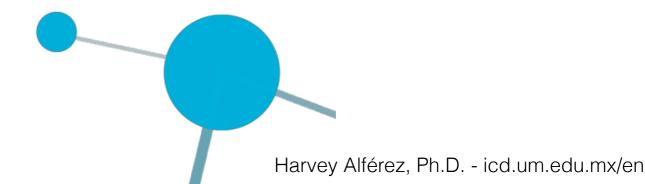
Increasing Interest in Healthy Living and Vegetarianism

Understanding the Needs of People in Big Cities through Data Science



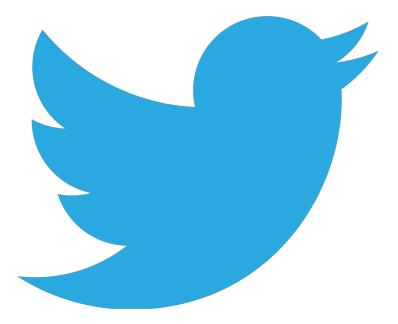


8. Alférez, G.H. (2016). Tweeting in New York City -Data Science Can Teach Us to Sympathize. Adventist Review, 193(2), 47-49



Use data science to understand the **needs** of people in **New York City**.

Listening Closely to the Birds



Over a period of **six weeks** (September 22 to November 3, 2015), we collected 2,084 tweets from New York City, 1,633 of them bearing positive sentiments and 451 expressing negative sentiments. Tweets with neutral sentiments were not collected.

Listening Closely to the Birds

30 specified keywords:

Adventist, addiction, Bible, children, Christ, church, contamination, divorce, education, elderly, exercise, family, God, health, Jesus, obesity, peace, poverty, religion, rest, safety, salvation, Savior, stress, teenagers, teens, terrorism, vegetarian, violence, youth

1. Collects

elif int(j["polarity"]) == 4: elif int(j["polarity"]) == 4: positive_tweets += 1 #print "Positive" + str(j["username"]) +"^ "+str(j["screen_name"]) +"^ "+str(j["date"])+"^ "+ j["text"] +"^ "+ (str(j["coordinates"]).split(",")[1])+"^ "+ str(j["coordinates"]).split(",")[2] fd = open('DataSets/'+user_city+'_'+EXPRESSION+'.csv', 'a') fd.write("Positive" + "*"+ str(j["postId"])+"*"+ str(j["username"]) +"*"+ str(j["username"]) +"*"+ str(j["date"])+"*"+ i["text"] replace(")^" "") +"*"+ str(j['det'].replace("\n", "") +"*"+
str(j["coordinates"]).split(",")[1].split("[")[1]+"*"+
str(j["coordinates"]).split(",")[2].split("]")[0] +"\n") fd.close() return negative_tweets, positive_tweets def main(argv): global user_city global EXPRESSION global radio try: python opts, args = getopt.getopt(argv,"he:c:r:l:",["expr=","city=","ra except getopt.GetoptError: print os.path.basename(__file__) + ' -e <expression> -c <city> pass for opt, arg in opts: if opt == '-h': print os.path.basename(__file__) + ' -e <expression> -c <cit
sys.exit()</pre>

3. Stores

elif opt in ("-e", "--expr"):

THEFTER

fd.close()

str(j["coordinates"]).split(",")[1].split("[")[1]+"*"+
str(j["coordinates"]).split(",")[2].split("]")[0] +"\n")

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Positive*650 let's give it up for @_sotor24 's https://t.co/4s3shuytyH*-73.9839783* 40.7439308 Positive*65019060069916672*103855993*Funubk718diva*2015-10-04 03:53:24*19xeera ain't nothing like familyIII ILOVE MY COUSINSIII #familyfirst https://t.co/QZnmVChIME*-73.96116732* 40.71674563 Positive*65045805034774294178032*FLP_NVC*2015-10-04 02:51:29*Family affair happy 50th Simon and BsnK\$ happy 200th old man https://t.co/AcT29pQFxU*-74.0064468* 40.7406578 Positive*650438057322832352*428652238*7ames4be*2015-10-04 02:51:20*CoCGDG933u*-73.9807189* 40.7301443 Positive*650438057322832352*428652528*7ames4be*2015-10-04 02:51:00**Appy wedding anniversary my man president B Obama. You're a great role model. May the Lord continue 2 strengthen you and bless your family*-73.8413014* 40.87 Positive*650481094605597696*16570056*kathykattenburg*2015-10-04 01:25:46*@DelilahNo85zone agree family is nice. (2/2)*-74.13895387* 40.7747777 Positive*65048289566781440*15042927*GeorgeGSmithJr*2015-10-04 02:51:55*The most important part of today is Friends and FamilyThat's sweetwaitYou're talking https://t.co/BuNgv95f11*-73.96762272* 40.762187 Positive*650458069240033280*104421174*mastdon_1*2015-10-03 23:51:03*Dninks with my BFFI #family #loveher #saturdaynight @ Maja's Tapas Bar https://t.co/RS1patMCKV*-73.9275208* 40.8659515	1920*248939856*DANTHEMANBABY*2015-10-04 06:36:38*SQUAD UP FAMILY RIGHT HERE HAPPY BDAY RICK I LOVE YOU KID #UnionDjsInc #UnionDjsIncManagement https://t.co/IUboNhTNnL*-73	3.91515992* 40.760	÷.
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2. Classifies

+ and -

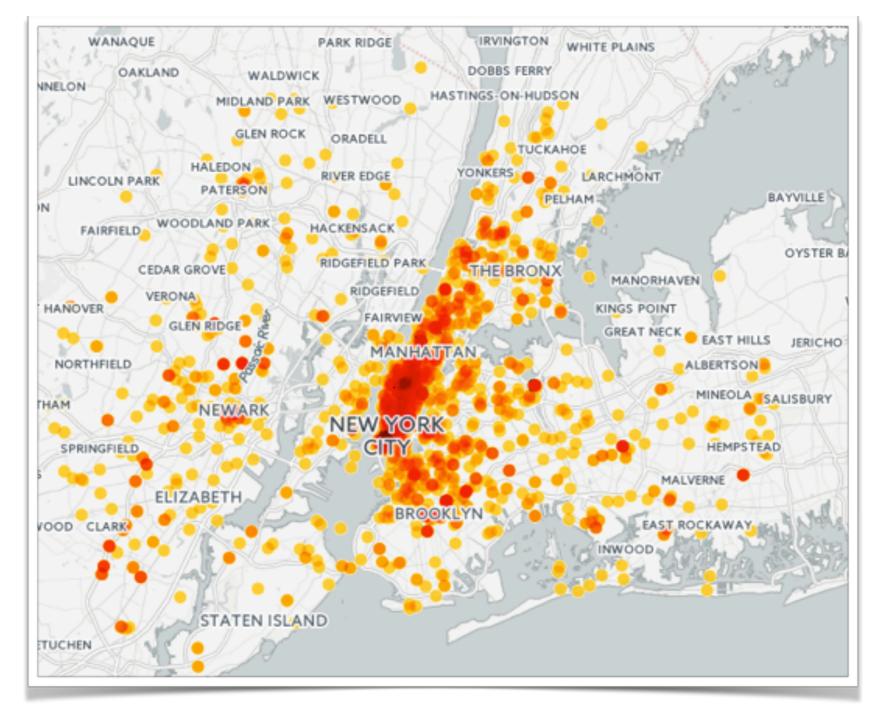
Positive Tweet about Vegetarian Food

- Positive
- her*
- 2015/10/02 02:08:16
- I want to be vegetarian. I really do. @arrogantswine @ East Williamsburg Brooklyn https://t.co/rpatPGyhXw\
- -73.939 (longitude)
- 40.714 (latitude)

Negative Tweet about Family

- Negative
- And*
- 11/10/15 18:48
- My ex has made them hate me, but I still see the children in my dreams.
- -73.74663446 (longitude)
- 40.69729011 (latitude)

Listening Closely to the Birds



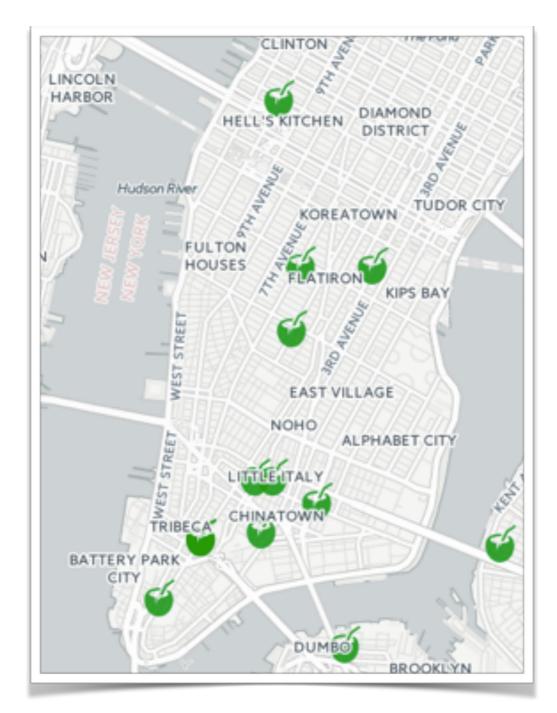
Intensity of tweets in New York City

Listening Closely to the Birds



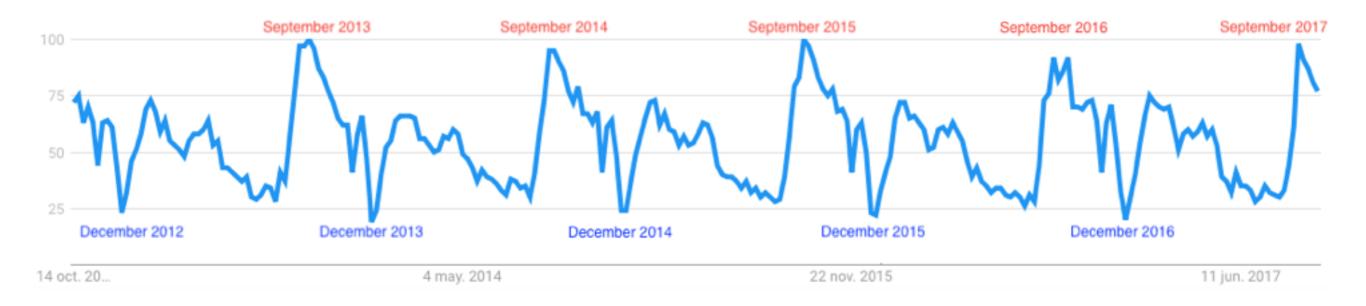
Areas with negative tweets in Manhattan

Upbeat and Downbeat



Positive tweets about vegetarian food in Manhattan

Living in the Age of Anxiety as Revealed in Google's Big Data



Searches for "uncertainty" in the US in the past 5 years

9. Alférez, G.H. (2017). Living in the Age of Anxiety as Revealed in Google's Big Data. ADvindicate. URL: <u>http://</u> <u>advindicate.com/articles/2017/11/23/living-in-the-age-of-anxiety-as-revealed-in-googles-big-data</u>

Media Recommender Based on Big Data



Using Deep Learning to Discover the Emotions of People when Watching Videos



2017-11-01 18:27:03.809365: W tensorflow/core/framework/op_def_util.cc:333] Op B atchNormWithGlobalNormalization is deprecated. It will cease to work in GraphDef version 9. Use tf.nn.batch_normalization().

Feliz (score = 0.81066) Neutro (score = 0.17384)



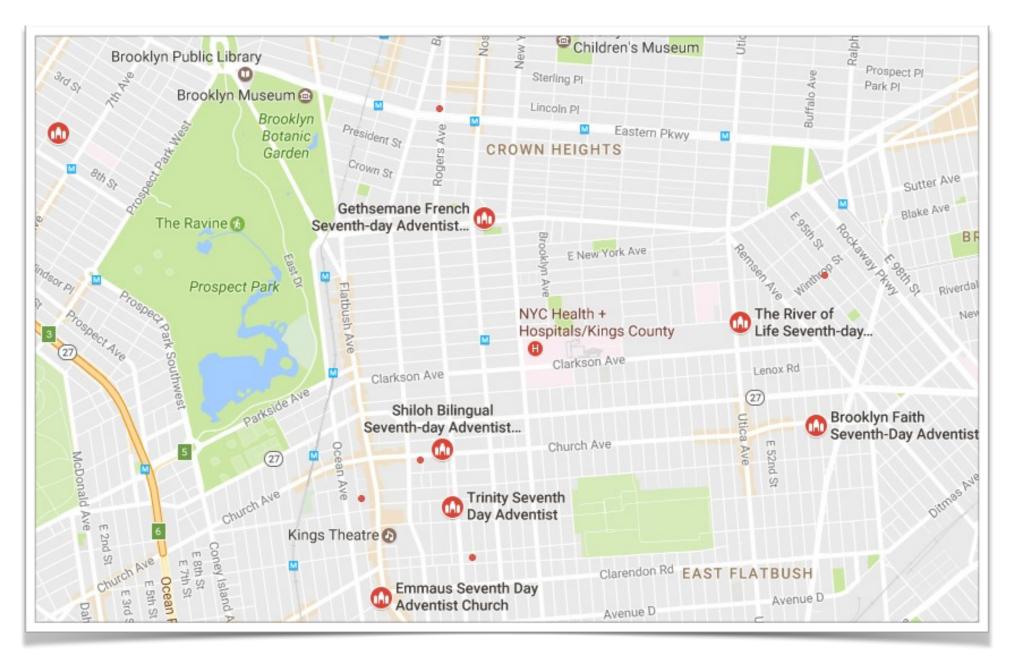
6. US Government (n.d.). Data.gov. URL: <u>https://www.data.gov</u>

Discovering Mission-Oriented Patterns with Open Data in New York City

- We analyzed an open dataset of motor vehicle collisions in NYC (2014-2016), which is *freely* provided by NYPD.
 932,904 registered incidents with 30 variables. We applied the K-Means algorithm to this dataset.
 - On Thursdays, Fridays, and Saturdays, drivers tend to drive aggressively. This situation increases the number of accidents during those days.
 - On Fridays, around Prospect Park, Brooklyn, there are several pedicab accidents.

10. Alférez, G.H. (2017). Discovering Mission-Oriented Patterns with Open Data in New York City. Social Media and Big Data Services, North American Division of the Seventh-day Adventist Church. URL: <u>http://www.sdadata.org/blog/discovering-mission-oriented-patterns-with-open-data-in-new-york-city</u>

Discovering Mission-Oriented Patterns with Open Data in New York City



10. Alférez, G.H. (2017). Discovering Mission-Oriented Patterns with Open Data in New York City. Social Media and Big Data Services, North American Division of the Seventh-day Adventist Church. URL: <u>http://www.sdadata.org/blog/discovering-mission-oriented-patterns-with-open-data-in-new-york-city</u>

Data science has the potential to help us understand the **people** in an **unprecedented way**.



Discovering People's Needs with Data Science

Harvey Alférez, Ph.D.

Director, Institute of Data Science School of Engineering and Technology Montemorelos University, Mexico https://icd.um.edu.mx/en/

harveyalferez@um.edu.mx

