



The City  
University  
of  
New York

Data Analytics for Managers  
City University of New York  
Instructor: Richard Dunks  
Course Code: C4311

4 December 2015

**Datapolitan**

Data Solutions for the Modern Metropolis

**WELCOME**

## INTRODUCTIONS

Name

Office

One thing you hope to get out of today's class

## Goals for the Course

- Discuss the data-driven decision making process
- Explore the role of managers and analysts in the decision making process
- Introduce useful terminology around data and the data analytics process
- Get some hands-on experience analyzing data

## Key Takeaways for the Course

- Better understand using data in the decision-making process
- Better understand the analytics process
- Better understand the value of data, particularly open data
- Better understand the role of analysts and managers in the decision-making process

## Goals for this Morning

- Discuss the data analytics process
- Discuss the benefits and concerns around data analytics in operational decision making
- Apply an understanding of the analytic process to a New York City-specific problem
- Discuss the basics of statistics as they relate to the analytics process

# **DATA ANALYTICS? BUSINESS ANALYTICS? DATA SCIENCE?**



**Borough-Block-Lot:**  
**1010120015**

**Assessed Value:**  
**\$26,392,950**

**Community District:**  
**Manhattan 5**

**School District:** 2

**Latitude:** 40.75557  
**Longitude:** -73.98894

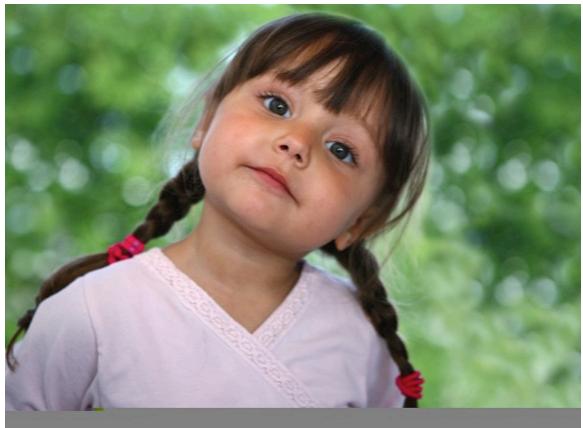
**Address:**  
**230 West 41<sup>st</sup> Street**  
**New York, NY 10036**

**Building ID Number:**  
**1080830**

**Census Tract:**  
**36061011300**

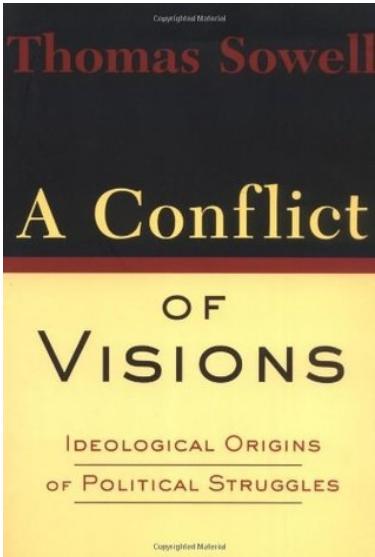
**Census Block:**  
**360610113001003**

**X:** 987313  
**Y:** 214552

<b>Name:</b> Miranda Jones	
<b>SSN:</b> 123-45-6789	<b>OSIS Number:</b> 987654321
	
<b>Home Address:</b> 123 East 4 <sup>th</sup> St. Brooklyn, NY	<b>Assigned School District:</b> 15

Facts do not "speak for themselves." They speak for or against competing theories. Facts divorced from theory or visions are mere isolated curiosities.

— Thomas Sowell,  
*A Conflict of Visions*

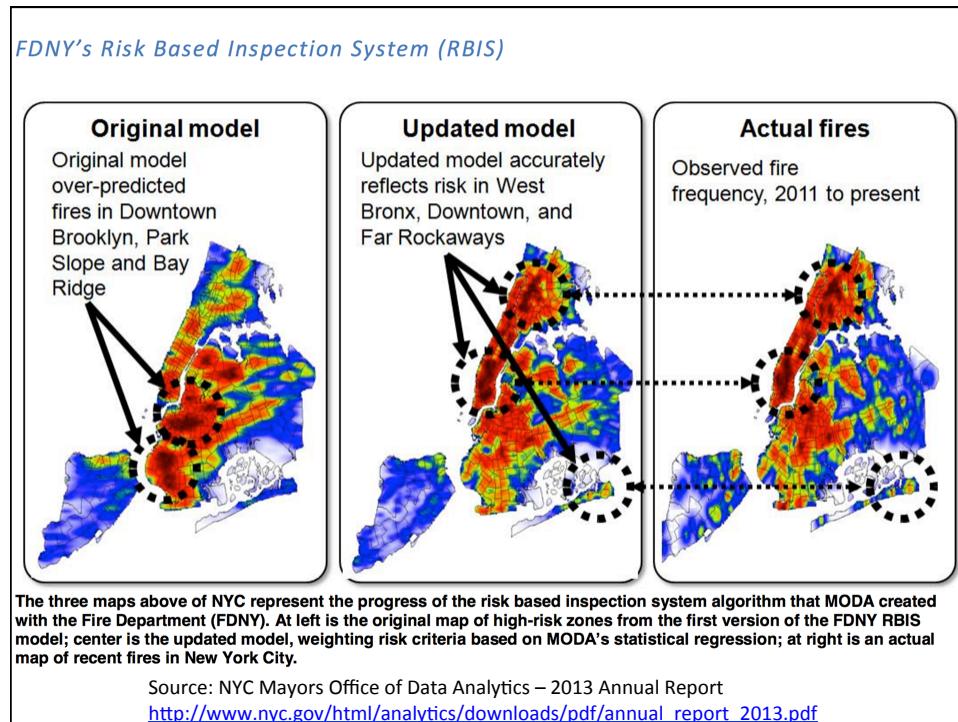


The book cover for "A Conflict of Visions" by Thomas Sowell features a dark top half and a yellow bottom half. The title "Thomas Sowell" is in red on the dark background, and "A Conflict" is in large gold letters on the yellow background. Below that is "OF" in smaller gold letters, followed by "VISIONS" in large black letters. At the bottom, it says "IDEOLOGICAL ORIGINS" and "OF POLITICAL STRUGGLES" separated by a horizontal line. The entire title is framed by two thin horizontal lines.

# **TYPES OF ANALYSIS**

## **1. Quantifying Needs**

- How much of X do I need?
  - Analyzing inputs (resources, people, etc.)
- How much does my need change given a different set of conditions?
  - What are the conditions that influence X?
- Important Considerations:
  - How does X play into my organization's mission and goals?
  - What's the most meaningful way of quantifying X?



## 2. Operational Analysis

- What is my organization doing?
  - Assessment
- How might my organization do things better?
- Important Considerations:
  - What are your organization's mission and goals?
  - How do your employees do their work?
  - What's the best way to measure this work?

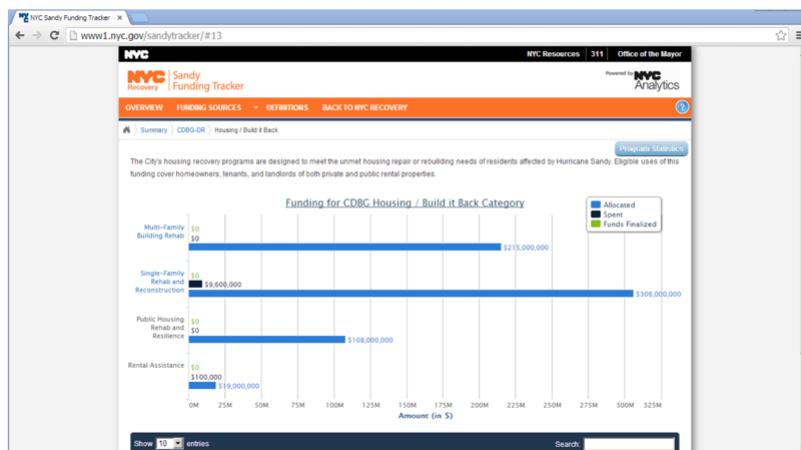
The Charlotte Observer logo at the top left includes a weather icon and '64°'. Navigation links 'Sign In | Subscribe' and a search icon are also present. The article is categorized under 'BUSINESS' and dated 'AUGUST 28, 2015'. The main headline reads: 'Cincinnati racks up more than \$130,000 in late fees to Duke Energy'. Below the headline, a text box contains: 'To address the issue, workers in Cincinnati's new Office of Performance and Data Analytics identified the impact the fees were having on the city and spent three days this summer with city department heads to come up with a solution, the station reported.' Another text box below states: 'City leaders spent time in what's known as the Innovation Lab, where they figured out a "new way" to pay bills on time and avoid such fees. It wasn't immediately clear what their solution was.' At the bottom of the article area, a source link is provided: <http://www.charlotteobserver.com/news/business/article32617293.html>

### 3. Performance Metrics

- How is my organization doing?
  - Monitoring and evaluation
- How do we make this data visible to the people who need it?
- Important Considerations:
  - What is most important to measure (think mission and goals)?
  - How do we best measure performance?

## Tracking Hurricane Sandy Relief Funds

Tracking information on Sandy recovery funds, built by NYC analytics, is available at [www1.nyc.gov/sandytracker](http://www1.nyc.gov/sandytracker)



Source: NYC Mayors Office of Data Analytics – 2013 Annual Report

[http://www.nyc.gov/html/analytics/downloads/pdf/annual\\_report\\_2013.pdf](http://www.nyc.gov/html/analytics/downloads/pdf/annual_report_2013.pdf)

If it won't change  
how you behave,  
it's a  
**bad  
metric.**



Source: <http://www.slideshare.net/Leananalytics/startup-metrics-toronto-march-19>

## 4. Prioritization

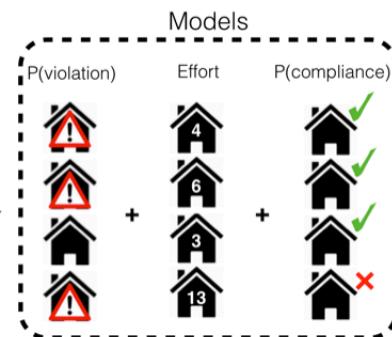
- How do I meet optimal outcomes with limited resources?
  - Optimizing allocation
- Important considerations:
  - Minimize disruption
  - Work within current workflow
  - Support existing business practices

## Cincinnati Blight Prevention Model

### Datasets

Home prices
Fires
Crime
Tax
Census
Water shutoff
Inspections

### Models



### Targeting priority

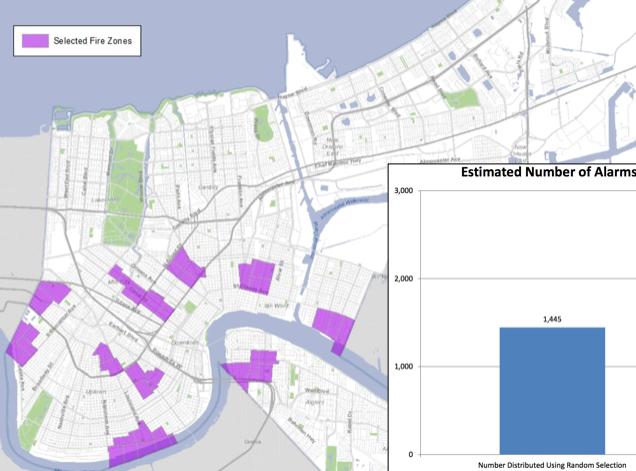
Deliverable: Ranked Inspection Priority



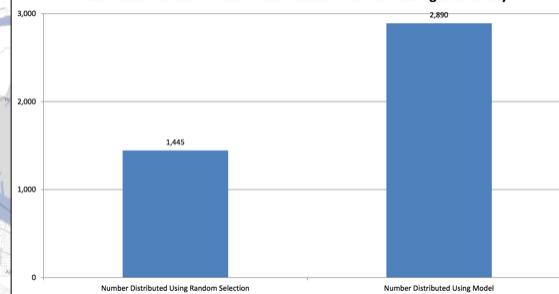
<http://dssg.uchicago.edu/2015/08/20/cincy-blight-prevention.html>

## New Orleans Smoke Alarm Targeted Outreach

**At-Risk Fire Zones Selected for Initial Outreach**



**Estimated Number of Alarms Distributed After Canvassing 10% of City**



<http://www.nola.gov/performance-and-accountability/nolalytics/files/full-report-on-analytics-informed-smoke-alarm-outr/>

## 5. Data Sharing/Empowering Stakeholders

- How could others benefit from my data?
- What other data can I use?
- Important Considerations:
  - Machine-readable formats
  - Make your data “fit” with other data sources
    - Unique IDs
    - Indexes
    - Key values

**WHAT KIND OF ANALYSIS DOES  
YOUR OFFICE DO?**

**4 TYPES OF CONCERNS TO  
BE MINDFUL OF**

## 1. Technical

- Having the right tools
- Having the people who can use them
- Making everything work together
- *Potential trap: having a solution in search of a problem*

## 2. Legal

- Laws
- Regulations
- Practices
- *Potential trap: not doing something because of mistaken assumptions*

**THE NEW YORK TIMES**

SUBSCRIBE **LOG IN**

528 COMMENTS

## Hipaa's Use as Code of Silence Often Misinterprets the Law

JULY 17, 2015

**Paula Span**  
THE NEW OLD AGE

How do people use, misuse or abuse Hipaa, the federal regulations protecting patients' confidential health information? Let us count the ways:

- Last month, in a continuing care retirement community in Ithaca, N.Y., Helen Wyvill, 72, noticed that a friend hadn't shown up for their regular swim. She wasn't in her apartment, either.

[http://www.nytimes.com/2015/07/21/health/hipaas-use-as-code-of-silence-often-misinterprets-the-law.html?\\_r=0](http://www.nytimes.com/2015/07/21/health/hipaas-use-as-code-of-silence-often-misinterprets-the-law.html?_r=0)

### 3. Cultural

- “We’ve always done it this way”
- “I’m not sure I understand how this works”
- *Potential trap: being afraid of rocking the boat*

## 4.Political

- Inter-departmental
- Intra-departmental
- *Potential trap: not putting the necessary effort into something that will pay dividends to the university and ultimately to the CUNY system as a whole*

### Political Example – inBloom

- Non-profit company founded in 2011 by Council of Chief State School Officers
  - Supported with funding from the Bill and Melinda Gates Foundation, among others
- Sought to provide an open-source platform for combining data from various education vendor products
- Educators could use data in one consolidated system to improve learning

## Political Example – inBloom

- Public concern over the potential use of the data by 3<sup>rd</sup> parties led states to cancel contracts
- The company began winding down operations in April 2014
- Lesson in how politics must be factored in – inBloom lost in the court of public opinion

<http://www.businessweek.com/articles/2014-05-01/inbloom-shuts-down-amid-privacy-fears-over-student-data-tracking>

## Benefits

- Time, money, lives saved

The image shows a press release document. At the top left is the logo for the NYC Business Integrity Commission, featuring the letters 'NYC' in a bold, black, sans-serif font. Below it, the text 'Business Integrity Commission' is written in a smaller, black, sans-serif font. At the top right is the logo for the NYC Environmental Protection Agency, featuring the letters 'NYC' in a blue, green, and white color scheme, with 'Environmental Protection' written below it in a smaller, blue, sans-serif font. The main body of the document is enclosed in a rectangular border. Inside, the text reads: 'FOR IMMEDIATE RELEASE', 'October 18, 2012', and 'No. 71'. Below this, a bold heading states: 'NEW YORK CITY BUSINESS INTEGRITY COMMISSION, DEPARTMENT OF ENVIRONMENTAL PROTECTION, AND MAYOR'S OFFICE OF POLICY AND STRATEGIC PLANNING LAUNCH COMPREHENSIVE STRATEGY TO HELP BUSINESSES COMPLY WITH GREASE DISPOSAL REGULATIONS'. A smaller text block follows, stating: 'Enforcement Effort Will Target Areas With Highest Concentration of Yellow Grease Production; DEP Launches Educational Video for Restaurant Industry on Proper Grease Disposal'. At the bottom of the document, a URL is provided: [http://www.nyc.gov/html/bic/downloads/pdf/pr/nyc\\_bic\\_dep\\_mayoroff\\_policy\\_10\\_18\\_12.pdf](http://www.nyc.gov/html/bic/downloads/pdf/pr/nyc_bic_dep_mayoroff_policy_10_18_12.pdf).

## Benefits

- Time, money, lives saved
- Better delivery of services to stakeholders
- More transparency
- More accountability

**WHAT CONCERNS DO YOU HAVE WITH  
RESPECT TO ANALYTICS IN YOUR JOB?**

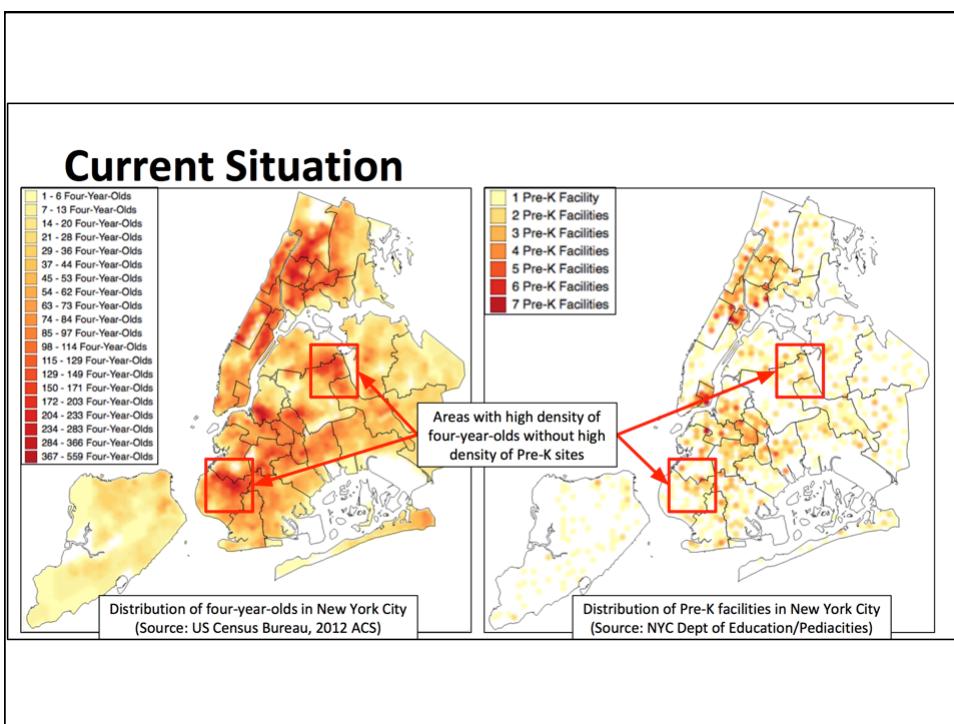
**WHAT ARE SOME OF THE BENEFITS OF  
GOOD ANALYTICS IN YOUR OFFICE?**

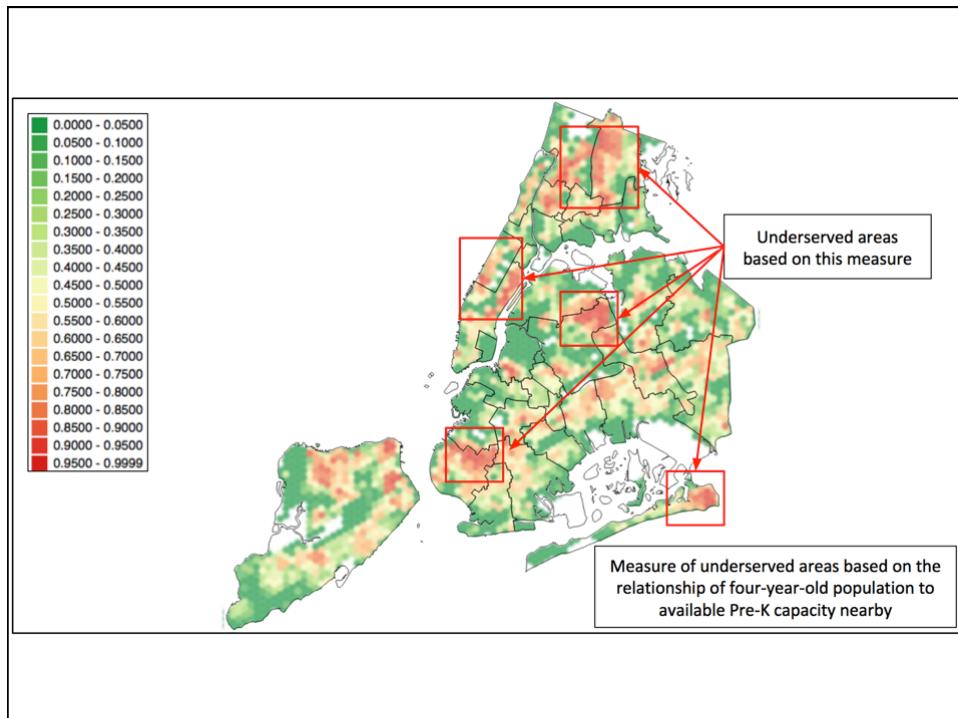
## 5 MIN BREAK

### Group Exercise – Universal Pre-K

- Define the analytical problem in one of these key areas
  - Capacity
  - Outreach
  - Enrollment (CBOs/Students)
  - Monitoring/Evaluation
- Situation
  - ~104,000 4-year olds in NYC
  - 58,528 current seats
  - 26,364 in public schools
  - 32,164 in community based organizations
- Goals
  - Increase enrollment by 30,000 for 2014-2015
  - Increase enrollment by 20,000 for 2015-2016

# PRESENTATIONS





**10 MIN BREAK**

# INTRODUCTION TO STATISTICS

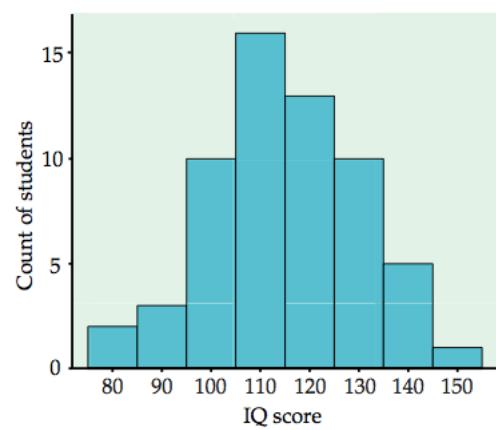
“We are drowning in information and  
starving for knowledge.”  
-Rutherford D. Roger

## Why Statistics?

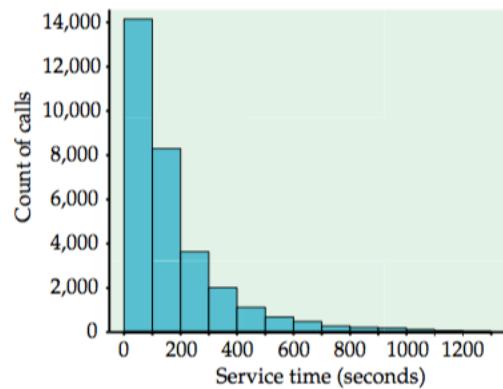
- Tools for extracting meaning from data
- Commonly understood ways of  
communicating meaning to others

# DATA DISTRIBUTIONS

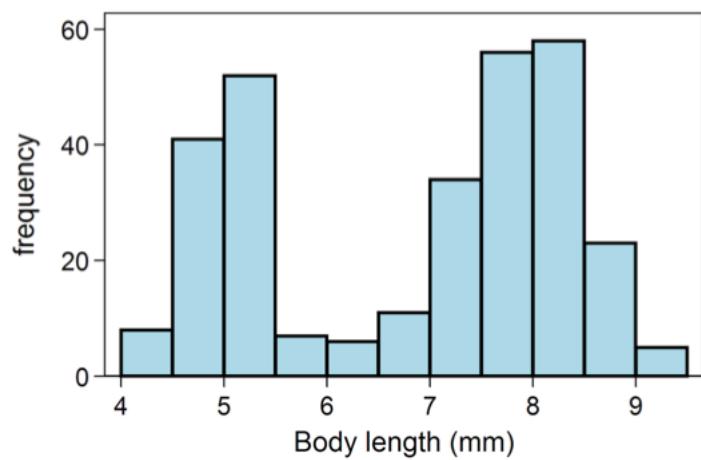
Normal Distribution



## Long-tail Distribution



## Bi-modal



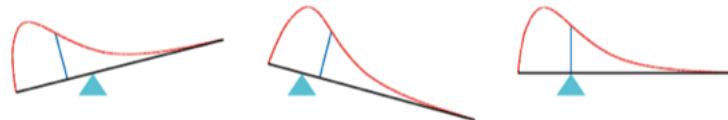
# DESCRIBING DATA

## Mean

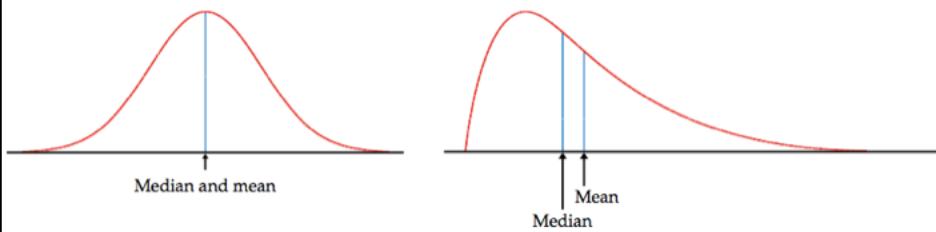
- A representative value for the data
- Usually what people mean by “average”
- Calculate by adding all the values together and dividing by the number instances
  - Example: Calculate mean height of everyone in class
- Sensitive to extremes

## Median

- The “middle” value of a data set
  - Center value of a data set with an odd number of values
  - Sum of two middle values divided by 2 if the number of items in a data set is even
- Resistant to extreme values

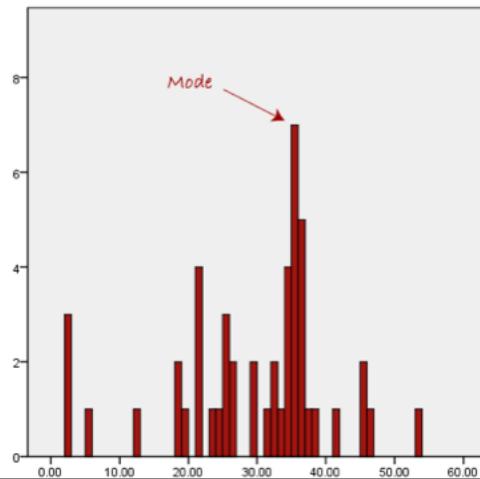


## Mean vs Median



## Mode

- The most frequent value in a dataset



## Measures of Central Tendency

- Quantitative data tends to cluster around some central value
- Mean is a more precise measure and more often used
- Median is better when there are extreme outliers
- Mode is used when the data is categorical (as opposed to numeric)

## Measures of Variability

- Describe the distribution of our data
- Help us understand how well the measures of central tendency represent the data

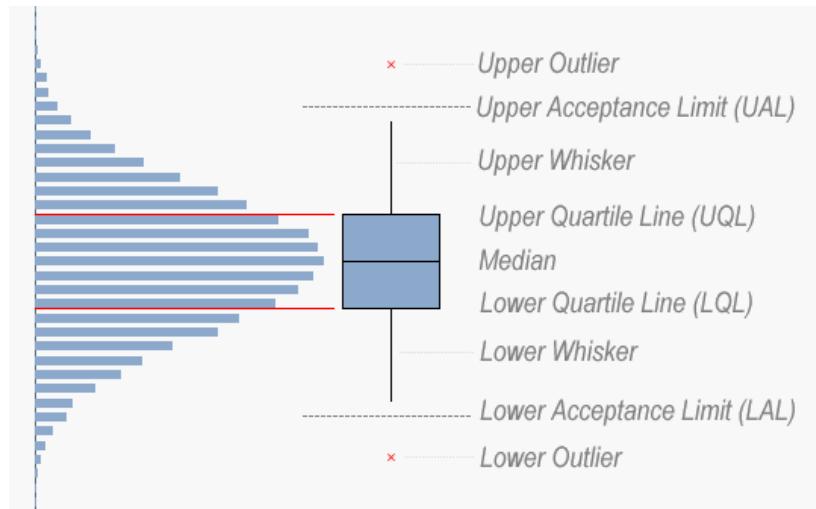
## Range

- The gap between the minimum value and the maximum value
- Calculated by subtracting the minimum from the maximum

## Quartiles

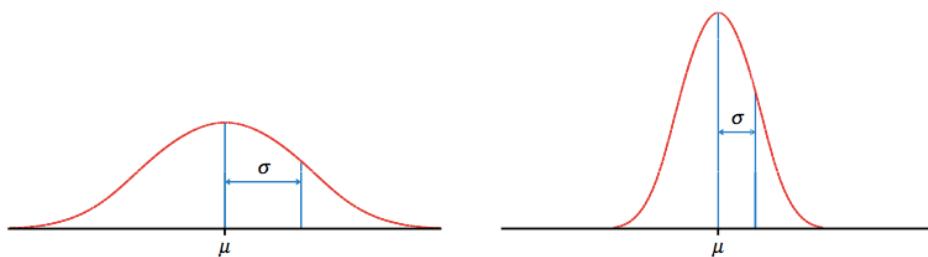
- Median splits the data set into two equal groups
- Quartiles split the data into four equal groups
  - First quartile is 0-25% of the data
  - Second quartile is 25-50% of the data
  - Third quartile is 50-75% of the data
  - Fourth quartile is 75-100% of the data

## Inter-Quartile Range

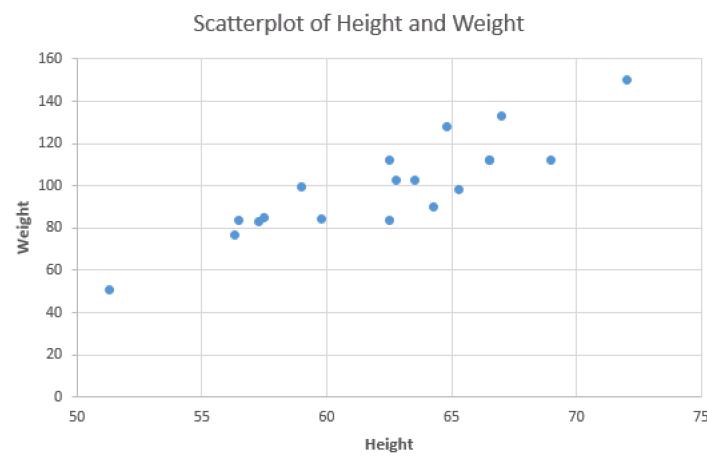


## Standard Deviation

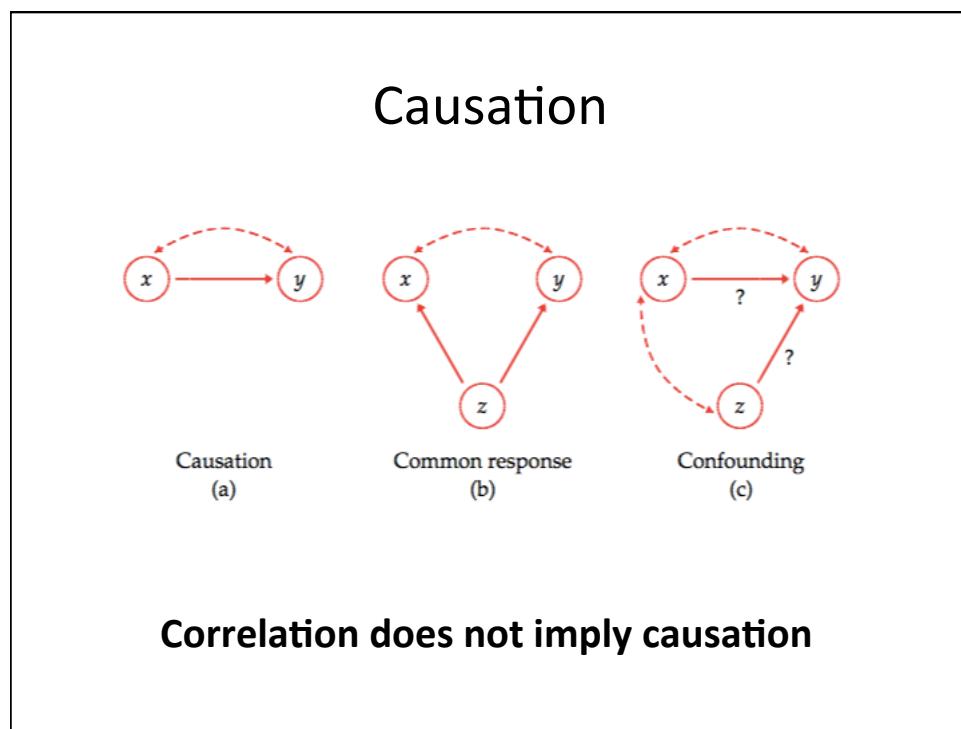
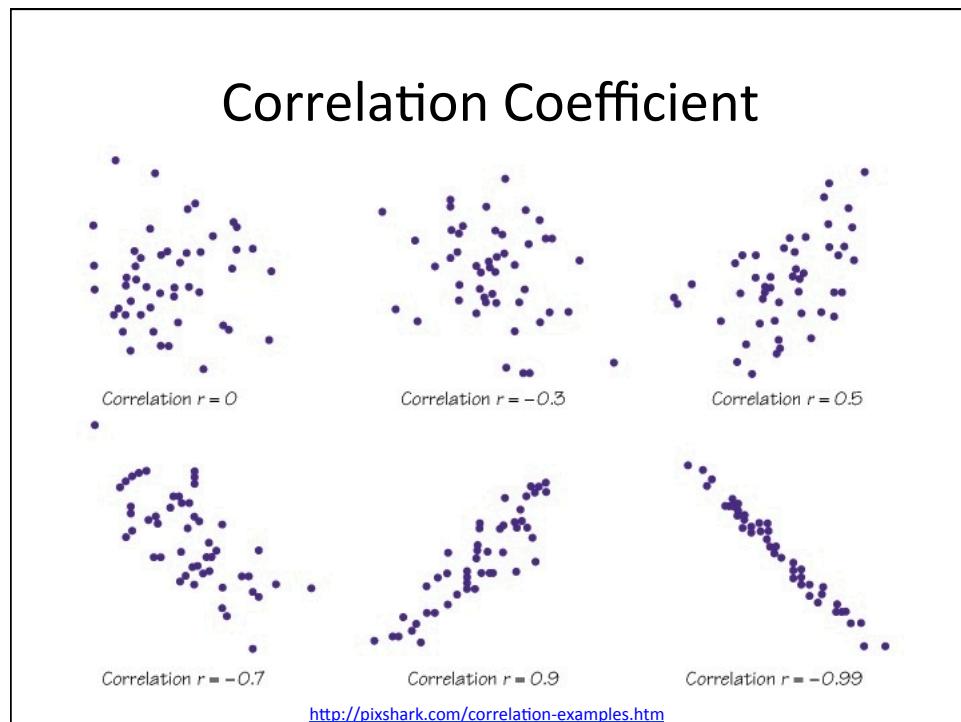
- The average distance of each data point from the mean
- Larger the standard deviation, the greater the spread

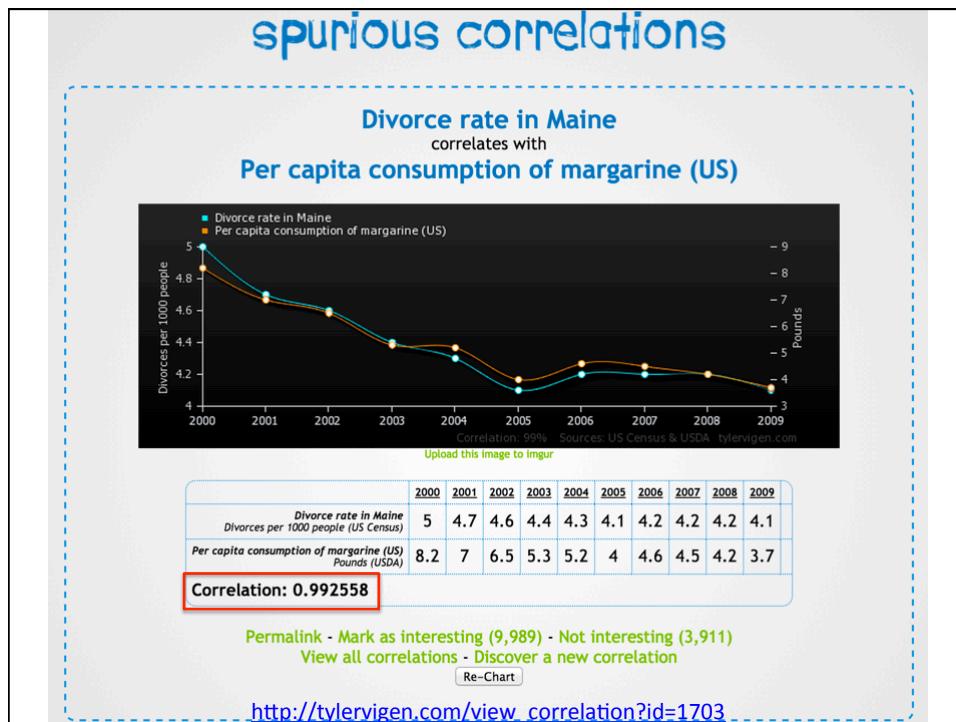


## Correlations



How do we measure this relationship?





**DO YOU USE STATISTICS MUCH IN YOUR WORK?**

**WHAT STATISTICS OR METRICS ARE IMPORTANT IN YOUR OFFICE?**

**WRAP-UP**

**LUNCH**

# WELCOME BACK

## Goals for this session

- Explore real-world applications of data to operational problems
- Familiarize you with exploratory data analysis and question-driven analysis
- Practice communicating analytical findings
- Become familiar with sources of data available online

## **6 ANALYTICAL STEPS**

### **1. Problem Formulation**

- What question or need am I trying to answer?
- What's my organization's mission and goals?
- How can I best apply data to this task?

## 2. Data Gathering/Preliminary Analysis

- What data do I think I'm going to need?
- What condition is it in?
- Does it tell me what I need?
- What other data might I need?
- How much work do I need to put into the data?

## 3. Data Cleaning/Data Munging

- Make the data usable and compatible
- Takes up the most amount of time
- May require more sophisticated tools depending on the state and size of the data

≡ SECTIONS ⌂ HOME 🔎 SEARCH

The New York Times

TECHNOLOGY

## For Big-Data Scientists, ‘Janitor Work’ Is Key Hurdle to Insights

By STEVE LOHR AUG. 17, 2014



Monica Rogati, Jawbone's vice president for data science, with Brian Will, a senior data scientist.  
Peter DaSilva for The New York Times

<http://www.nytimes.com/2014/08/18/technology/for-big-data-scientists-hurdle-to-insights-is-janitor-work.html>

## 4. Hypothesis Testing

- Am I getting the results I'd hoped for?
- What other questions come up?

## 5. Verification

- Do my results make sense?
- Did I make a simple mistake?
- Check twice and you'll sleep easier

## 5. Verification – London Whale

- \$6.2 billion lost by JP Morgan Chase & Co



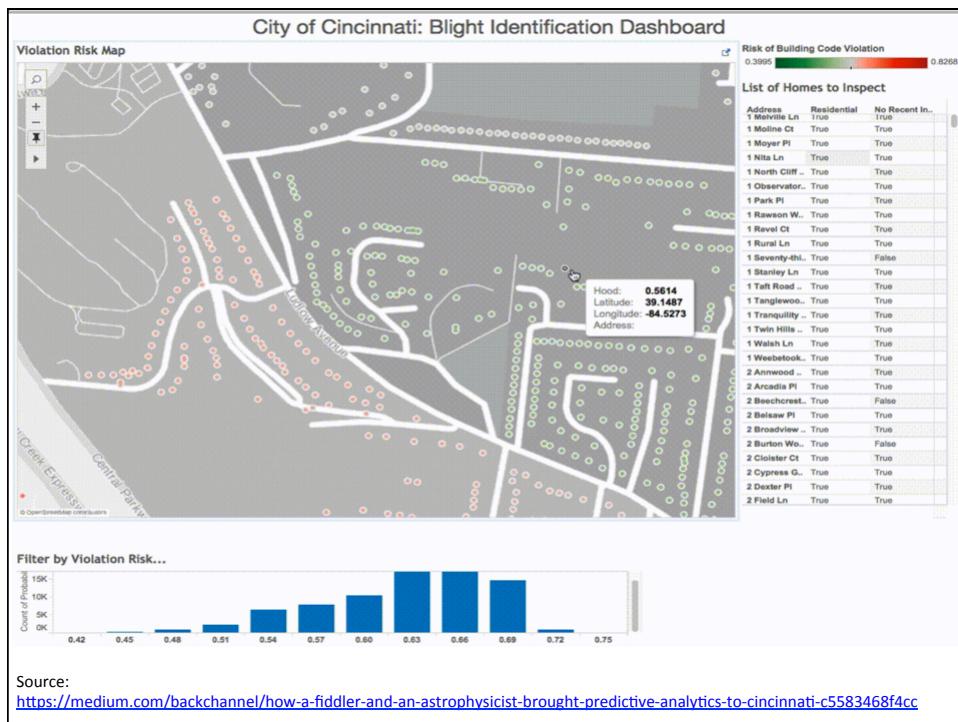
<http://www.businessinsider.com.au/excel-partly-to-blame-for-trading-loss-2013-2>

## 5. Verification – London Whale

- Caused largely by Excel mistakes:
  - Manual data errors
  - Manual copy and paste
  - Simple formula error that hid volatility
- Fined over \$1 billion for poor internal oversight of trading activities

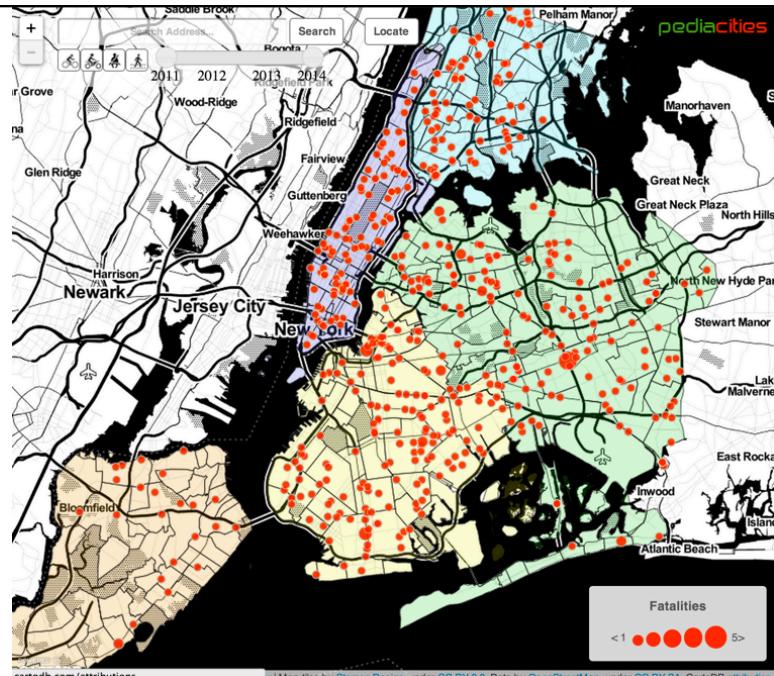
## 6. Visualization

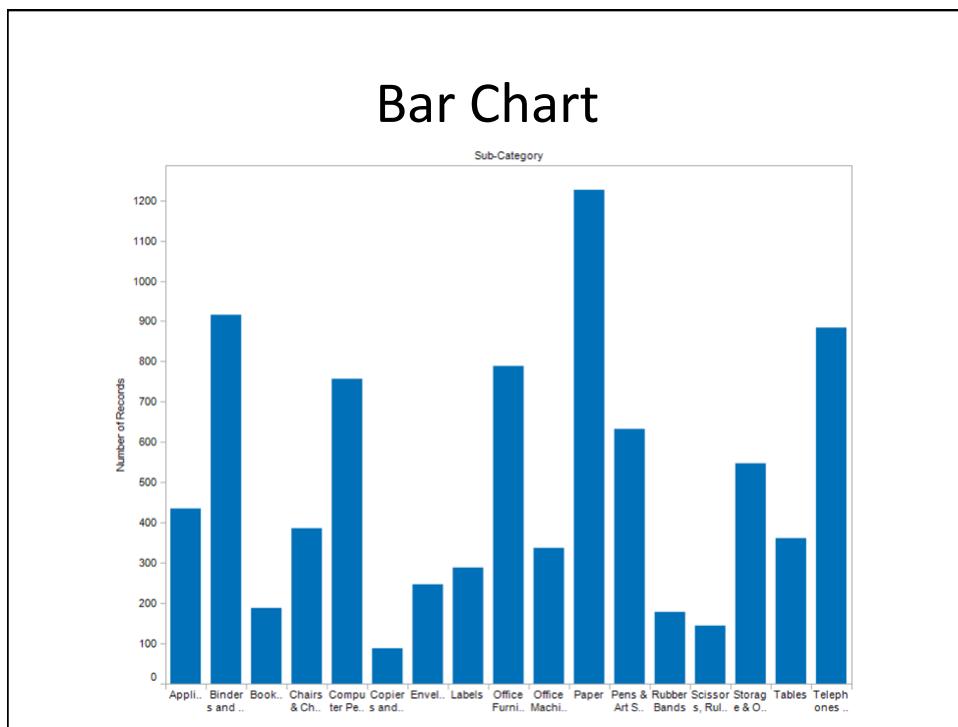
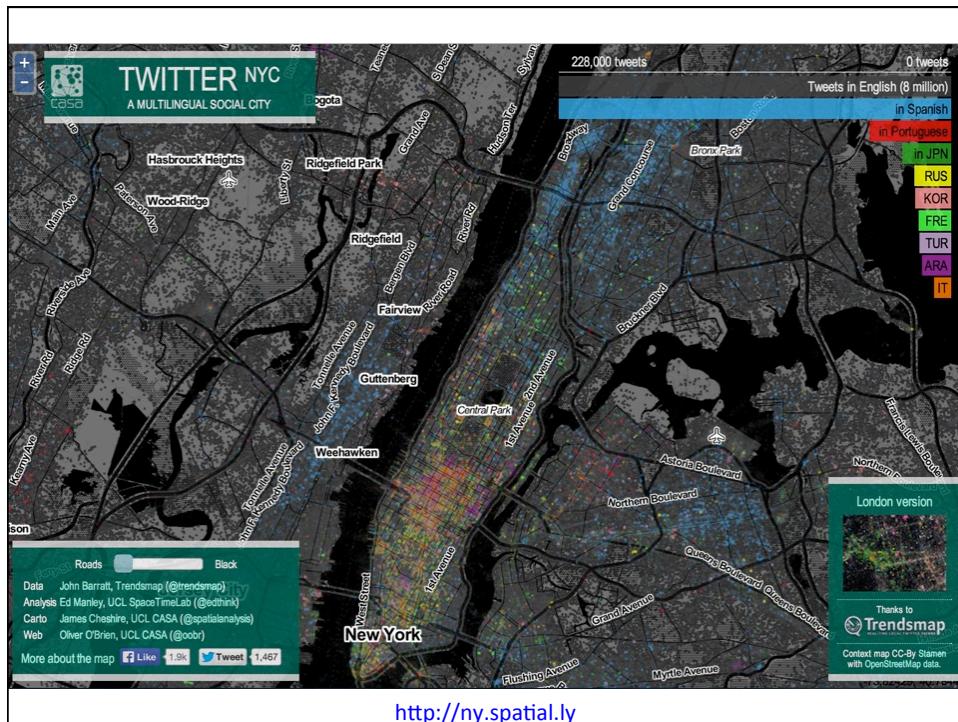
- “A picture is worth a thousand words”
- Communicate results clearly and concisely
- Help to better understand your data
- The eyes have a much higher bandwidth into the brain

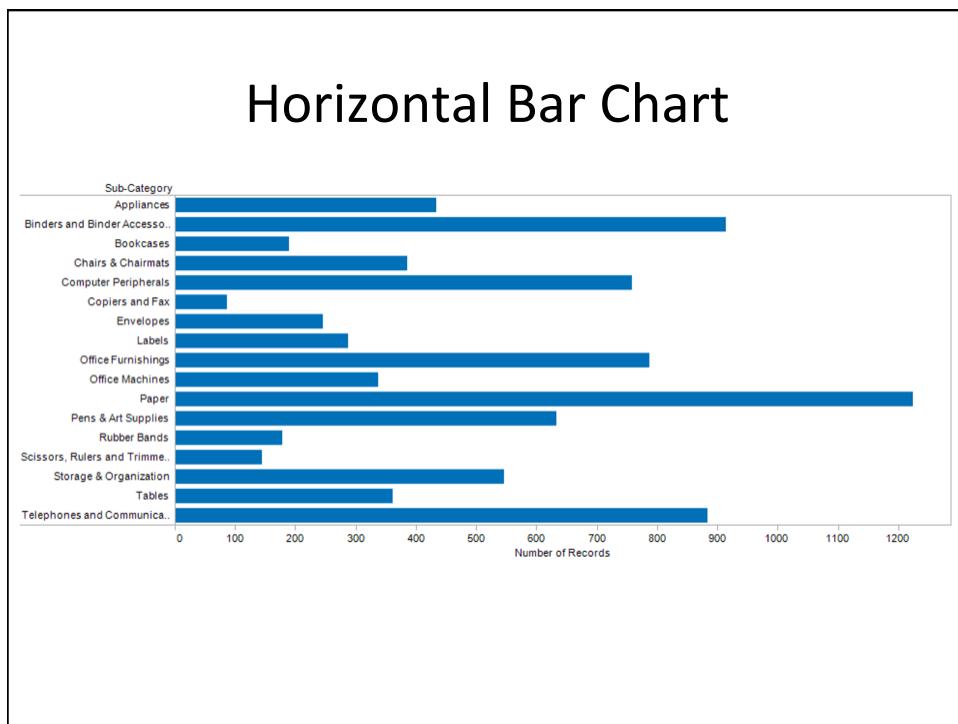
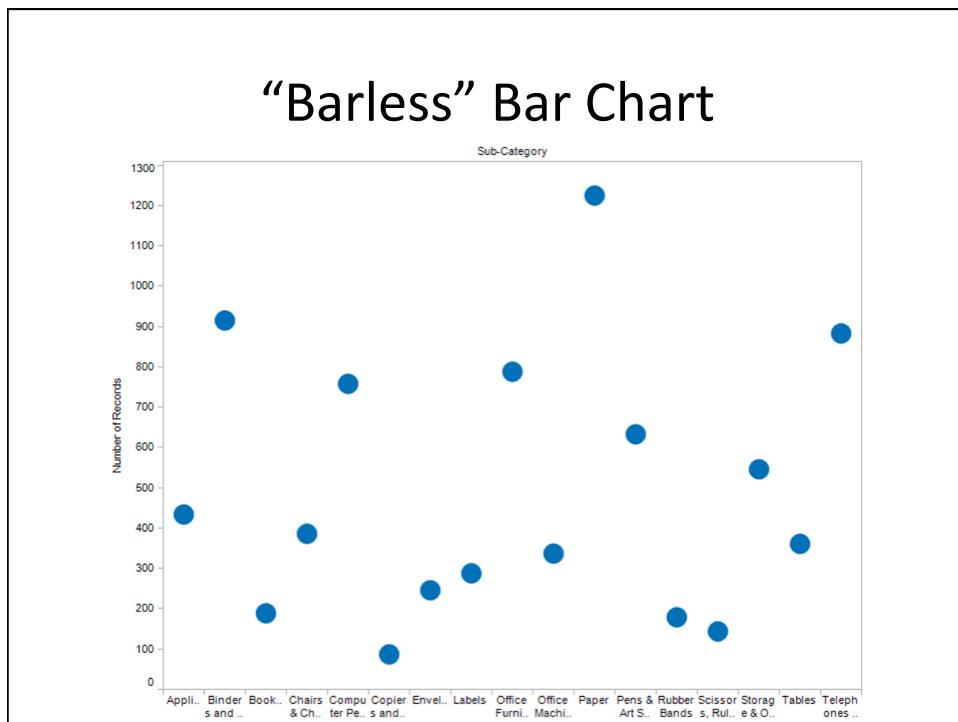


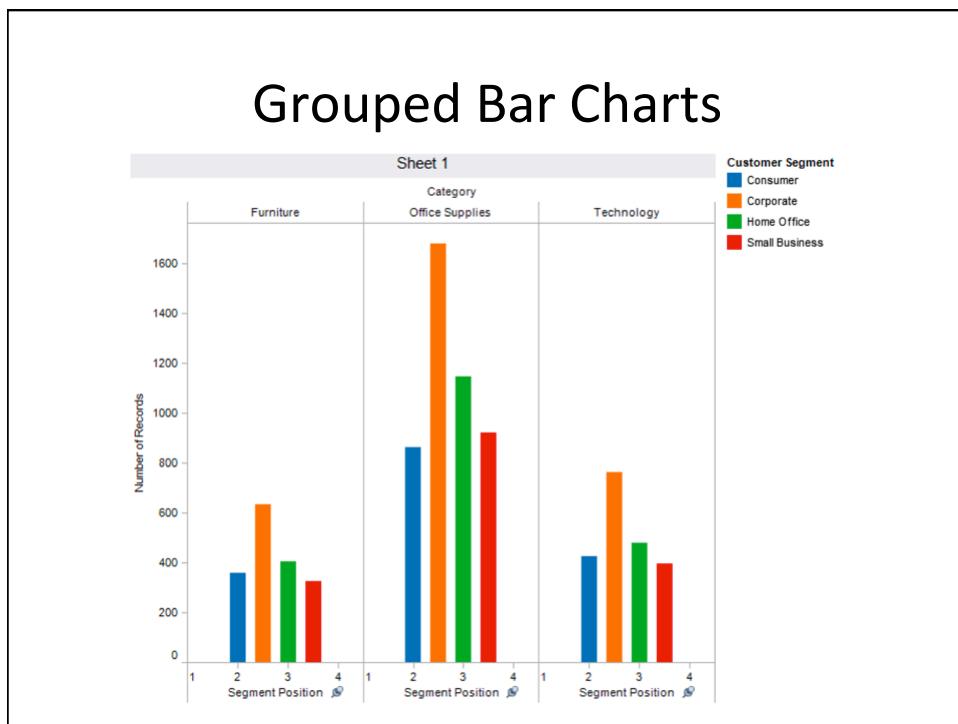
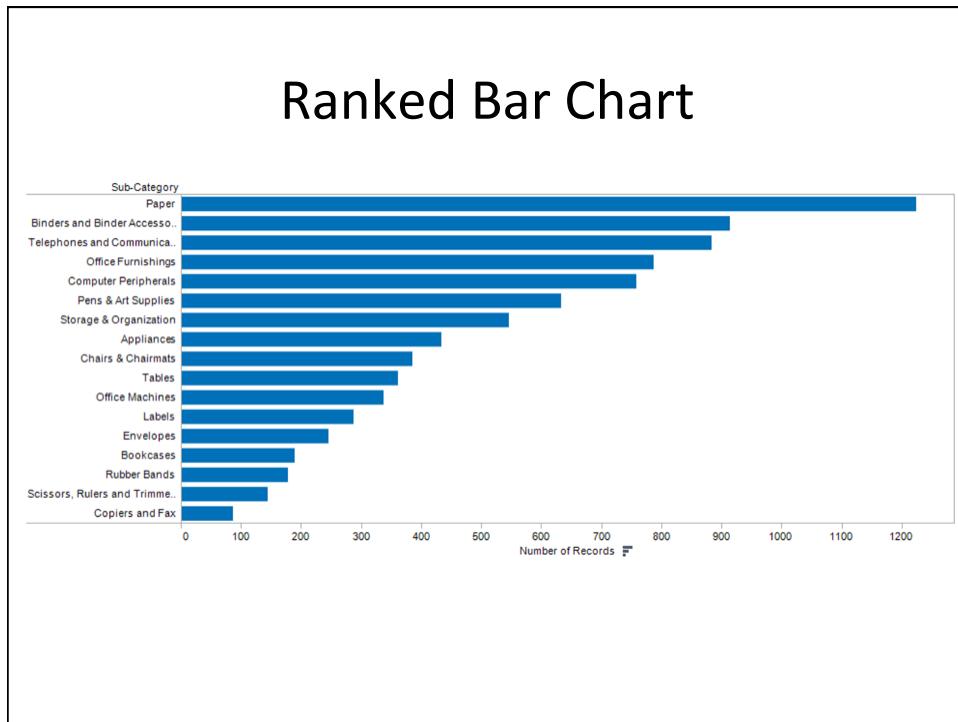
**HOW DOES YOUR OFFICE ANALYZE DATA?**

## LET'S TALK MORE ABOUT VISUALIZATION

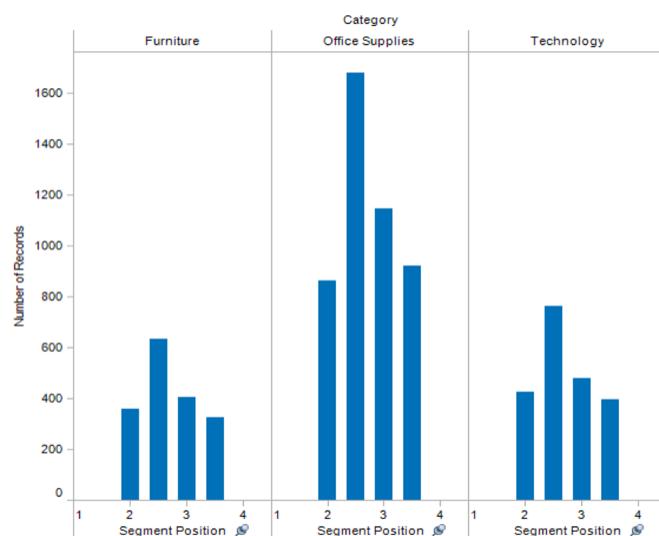




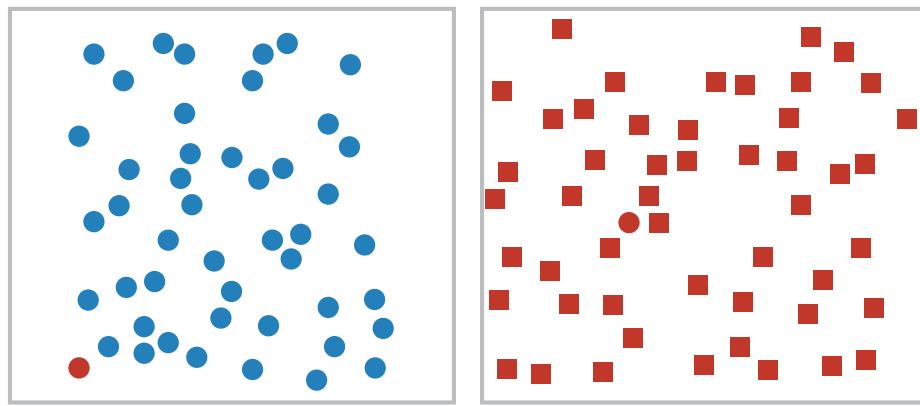


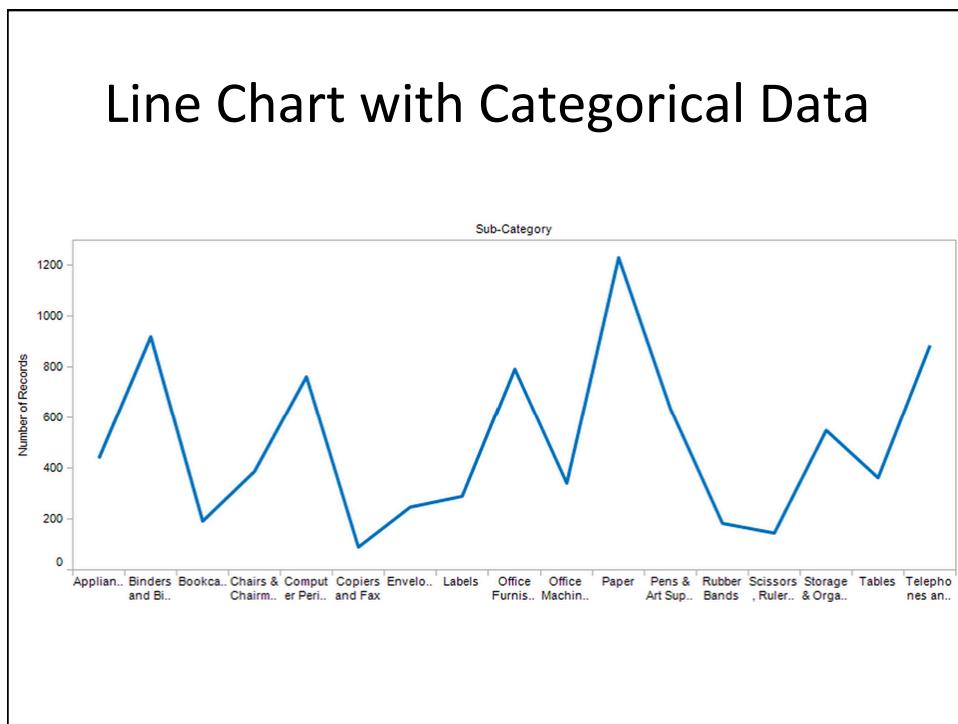
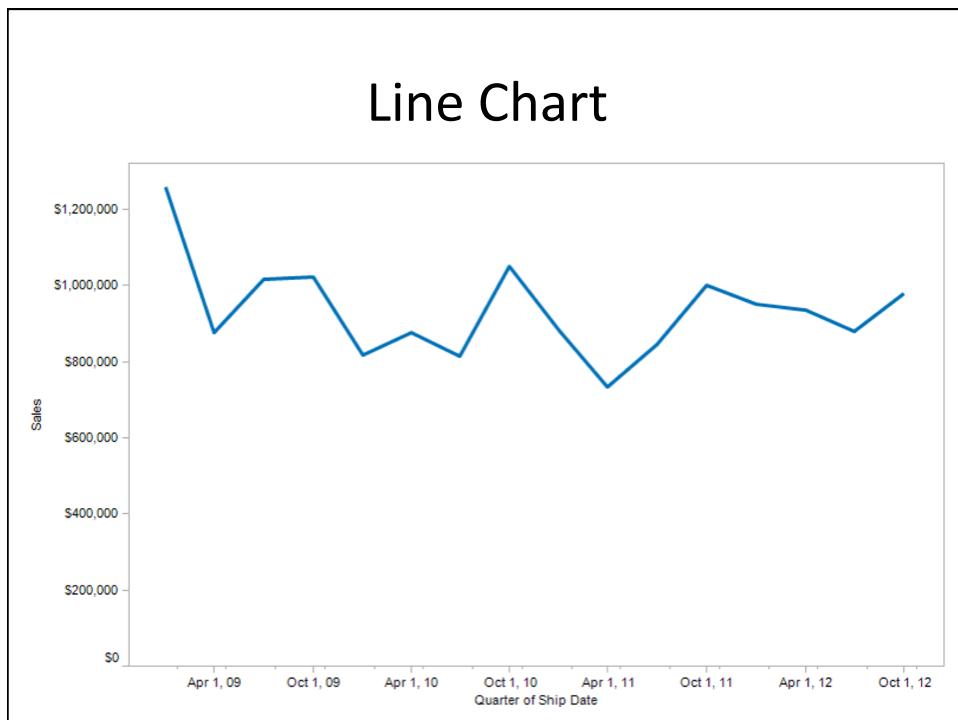


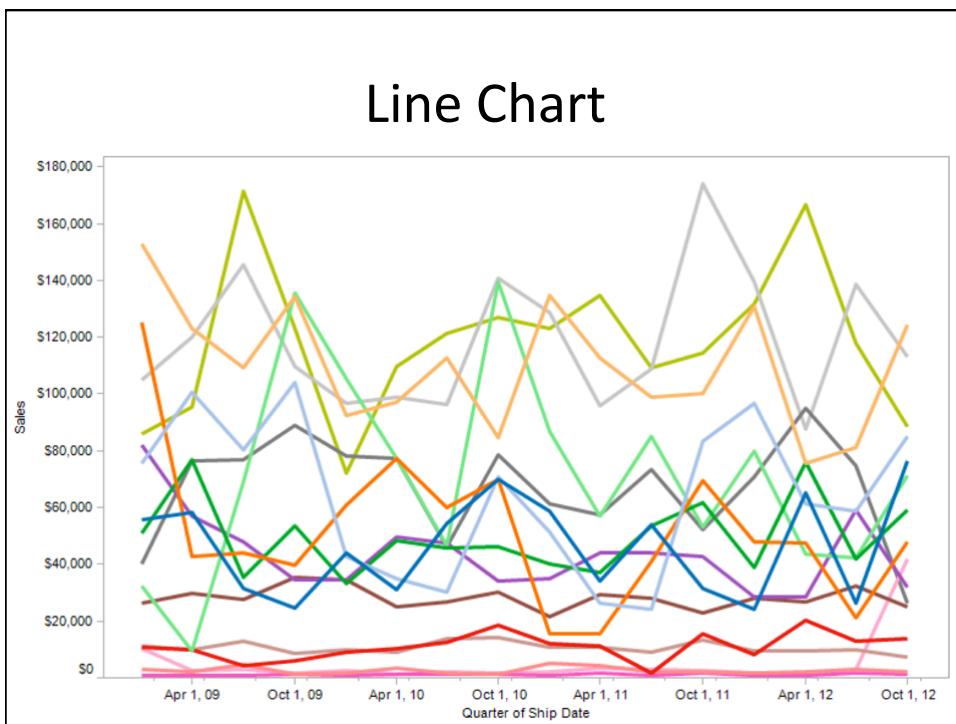
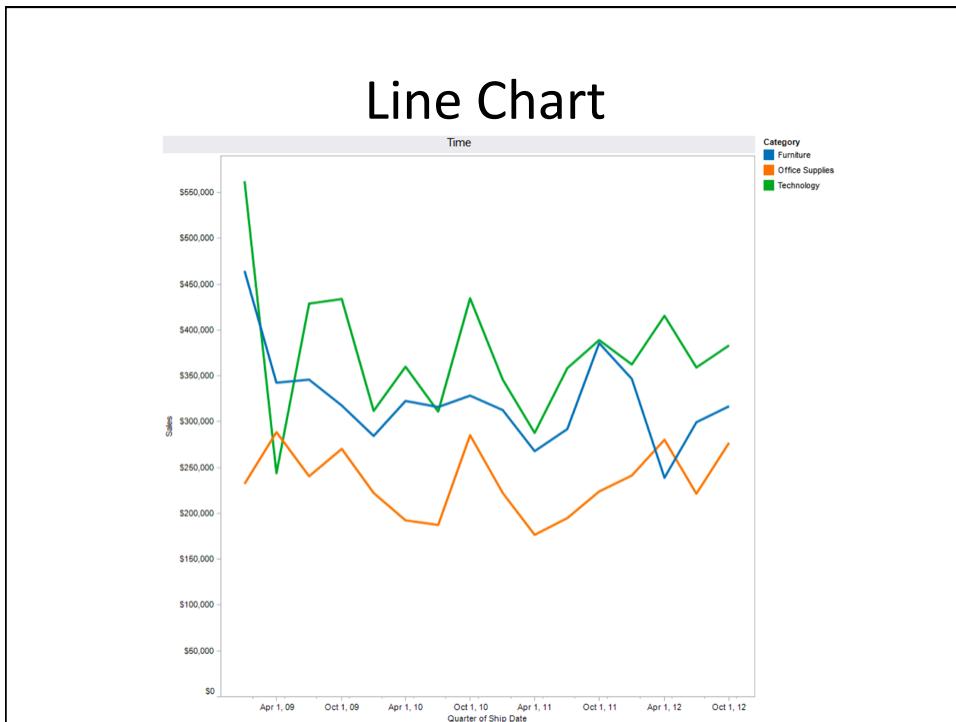
## Grouped Bar Charts



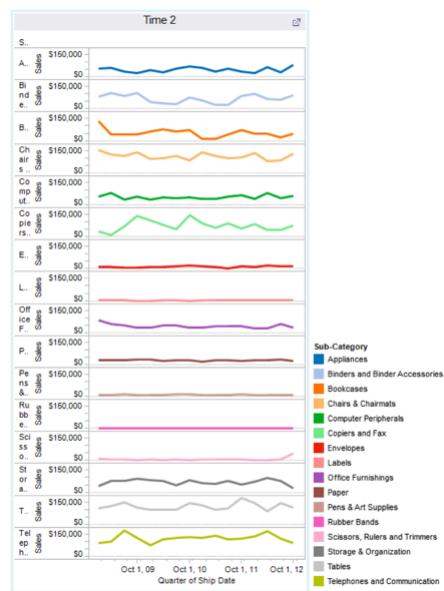
## Precognitive Processing





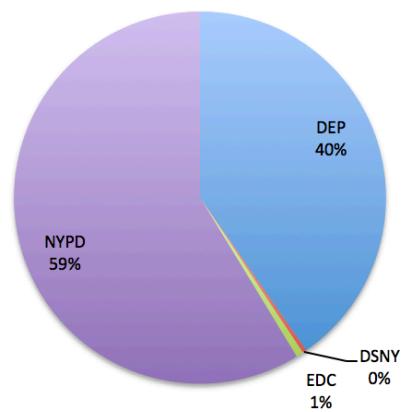


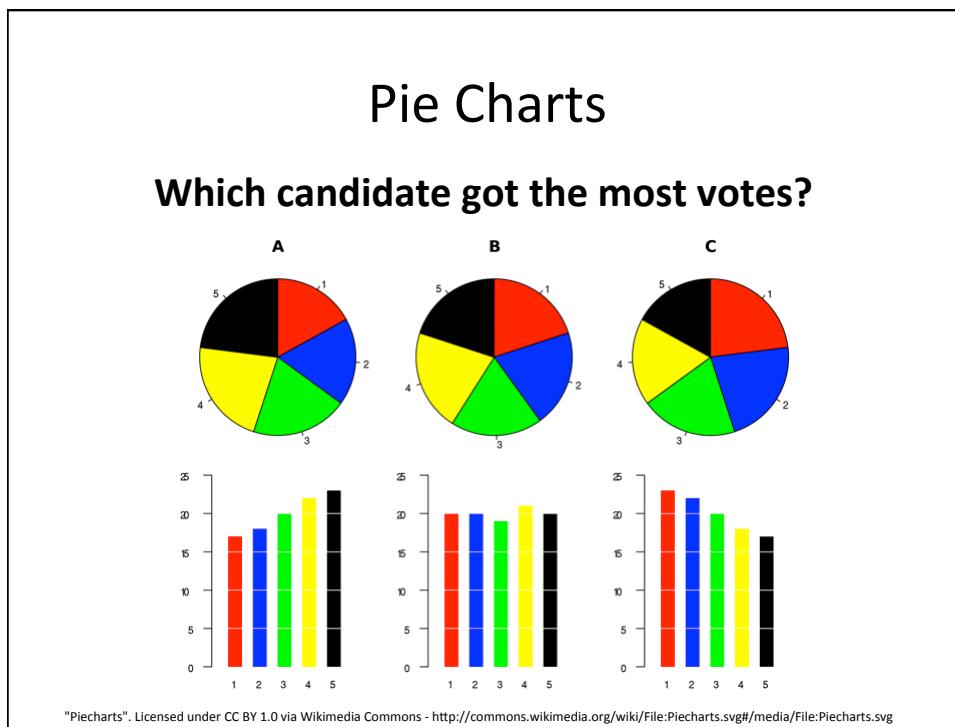
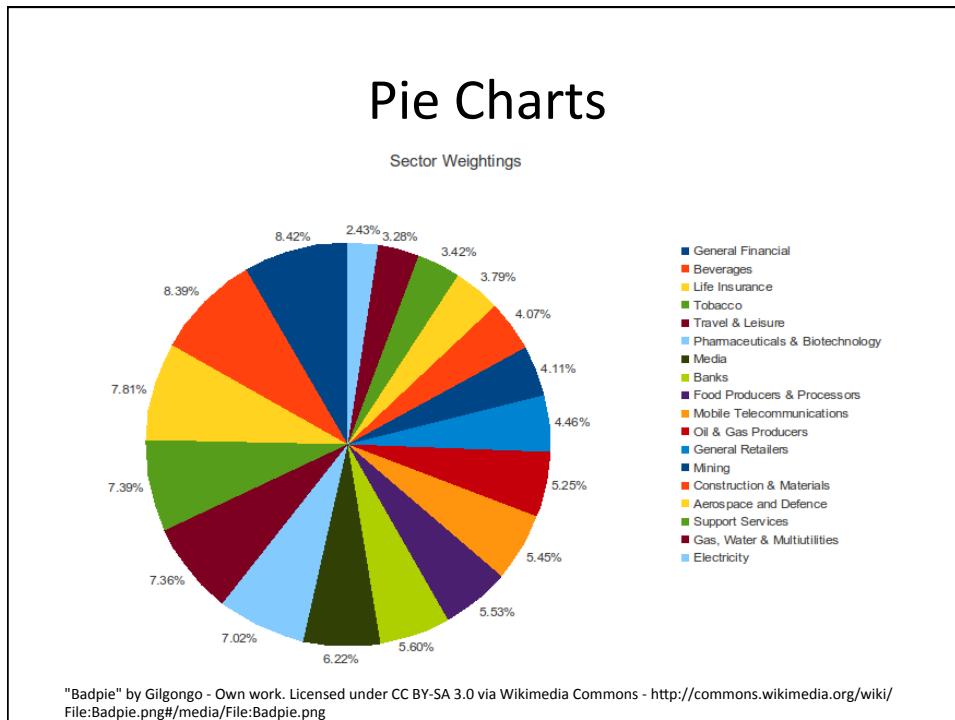
## Small Multiples



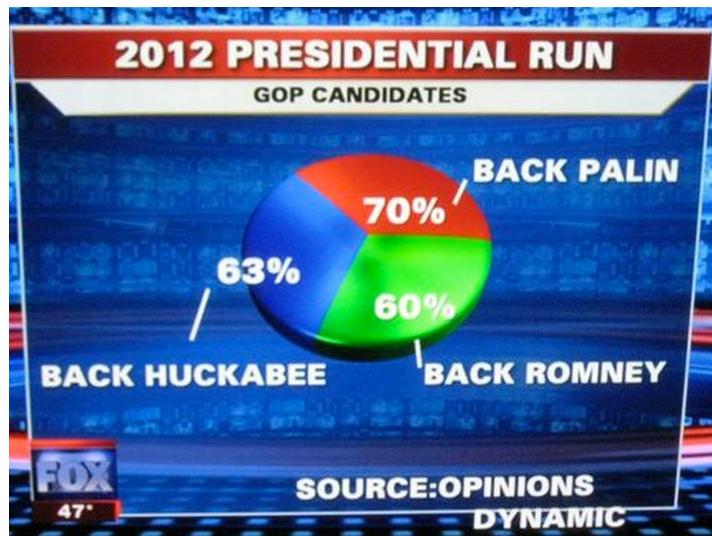
## Pie Charts

**Noise Complaints by Agency Responsible  
1 Jan 2015 - 18 March 2015**





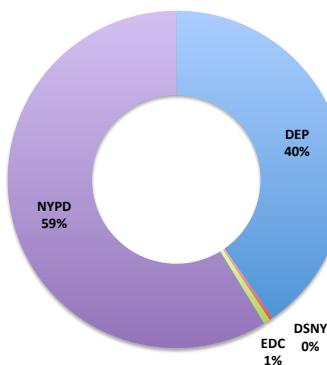
## Pie Charts



<http://simplystatistics.org/2012/11/26/the-statisticians-at-fox-news-use-classic-and-novel-graphical-techniques-to-lead-with-data/>

## Donut Charts

Noise Complaints by Agency Responsible  
1 January 2015 - 18 March 2015



## Design Tip

How do you learn to make good charts?

...Make a lot of bad charts

**5 MINUTE BREAK**

## Definition of Open Data

- Definition:
  - Open data is data that can be freely used, shared and built-on by anyone, anywhere, for any purpose
- Key Features
  - Availability and access
  - Reuse and redistribution
  - Universal participation

<http://blog.okfn.org/2013/10/03/defining-open-data/>

## Open Data Benefits

- Transparency

**I Quant NY**

MAILING LIST RSS ARCHIVE

Quantitative Analysis of NYC Open Data: Every data set that the city releases tells a story. This blog is all about telling those stories, one data set at a time.

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JUNE 2, 2014

## Success: How NYC Open Data and Reddit Saved New Yorkers Over \$55,000 a Year

Before Open Data:



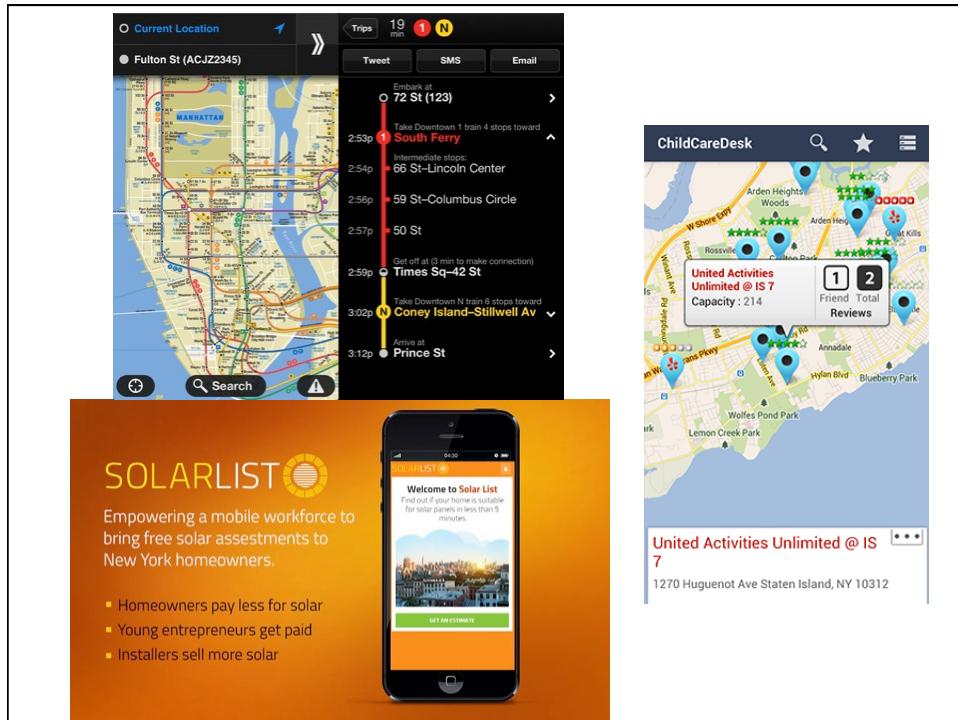
After Open Data:



<http://iquantny.tumblr.com/post/87573867759/success-how-nyc-open-data-and-reddit-saved-new>

## Open Data Benefits

- Transparency
- Releasing social and commercial value



## Open Data Benefits

- Transparency
- Releasing social and commercial value
- Participation and engagement



<https://www.votinginfoproject.org/>

## Open Data Concerns

- Privacy
  - Personally identifiable information (PII)
  - Mosaic Effect



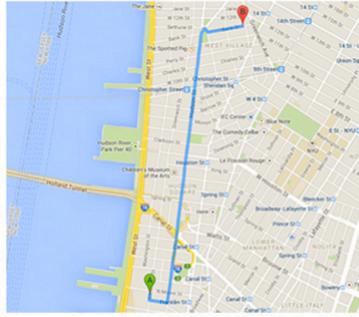
**GAWKER**

Log in / Sign up

## Public NYC Taxicab Database Lets You See How Celebrities Tip

J.K. Trotter  
Filed to: DATA 10/23/14 1:00pm

138,411 ⚡ 18 ★ ▾

BRADLEY COOPER

JULY 8, 2013 • 7:34 PM - 7:44 PM  
376 GREENWICH ST. TO 13 BANK ST.  
\$9.00 FARE • CASH; UNKNOWN TIP • ©SPLASH

<http://gawker.com/the-public-nyc-taxicab-database-that-accidentally-track-1646724546>

## Open Data Concerns

- Privacy
  - Personally identifiable information (PII)
  - Mosaic Effect
- Confidentiality
- Security

## LINKS TO OPEN DATA PORTALS

NYC Open Data Portal - <https://data.cityofnewyork.us/>

NYS Open Data Portal - <https://data.ny.gov>

US Federal Government Open Data Portal - <http://www.data.gov/>

## Exploratory Data Analysis

- Goal -> Discover patterns in the data
- Approach
  - Understand the context
  - Summarize fields
  - Use graphical representations of the data
  - Explore outliers

Tukey, J.W. (1977). Exploratory data analysis. Reading, MA: Addison-Wesley.

## **EXPLORING 311 NOISE COMPLAINTS**

**10 MINUTE BREAK**

## Question-Driven Analysis

- Goal -> Answer a specific problem or concern
- Approach
  - Have a question or problem in mind when analyzing data
  - “I need to know X”
  - Problem-focused discovery with the data

## Question Driven Analysis

### Vision Zero (dB)

#### Tasks:

- Given 311 noise complaint data, assist enforcement efforts by identifying community districts that have a high volume of noise complaints and the time frame enforcement resources should be deployed to combat the noise issue at its peak
- Identify the prevalent types of noise complaints in these areas to guide enforcement in each community district

# PRESENTATIONS

## NYC Community Districts



## Analytical Resources

- BigApps – <http://nycbigapps.com>
  - Competition held every year to NYCEDC to challenge developers, engineers and designers to help solve NYC's toughest challenges
- BetaNYC – <http://betanyc.us>
  - NYC's civic technology and open government vanguard
  - A network of civic-minded volunteers who contribute their skills toward government and community service
- DataKind – <http://www.datakind.org>
  - Create teams of pro bono data scientists who work together with non-profit organizations to understand the need, find a solution, and collaborate to tackle the problem with data science

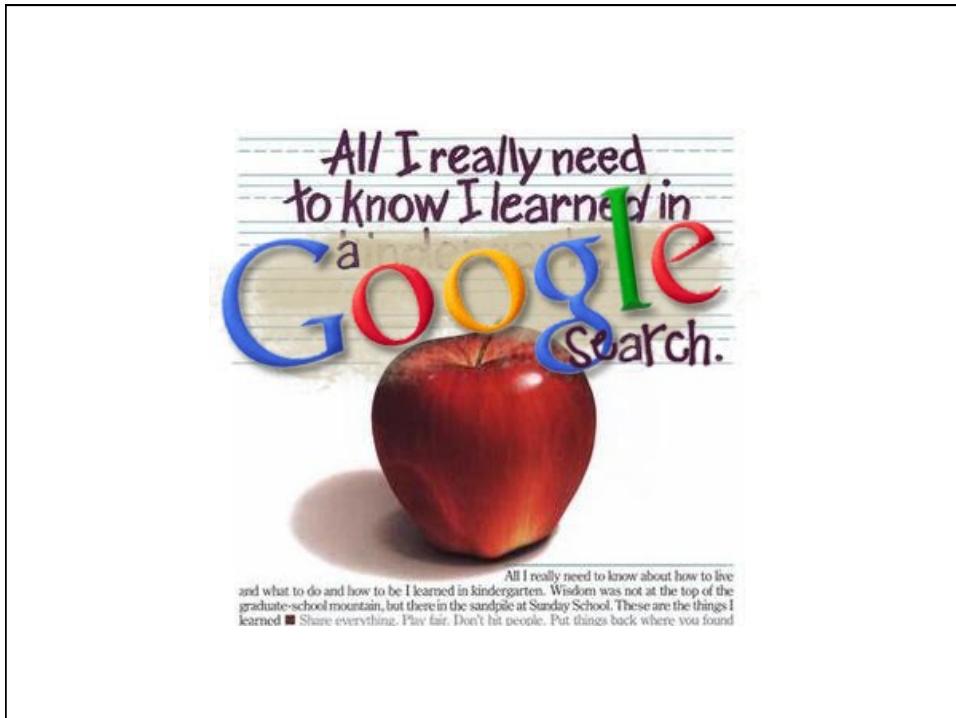
## Analytical Resources

- Meetup Groups – <http://www.meetup.com>
  - GeoNYC - <http://www.meetup.com/geonyc/>
    - Focused on sharing geospatial ideas and projects
  - MapTime – <http://www.meetup.com/Maptime-NYC/>
    - Focused on developing geospatial projects with knowledgeable professionals
- Academic Institutions
  - NYU
  - Columbia
  - CUNY

## WRAP-UP

### What We've Covered

- 5 types of analysis
- 4 concerns to be mindful of
- Benefits of good analysis
- 6 analytical steps
- How to design charts and graphs
- Definition of open data
- Exploratory data analysis with 311 data



All I really need  
to know I learned in  
kindergarten.  
and what to do and how to be I learned in kindergarten. Wisdom was not at the top of the  
graduate-school mountain, but there in the sandpile at Sunday School. These are the things I  
learned ■ Share everything. Play fair. Don't hit people. Put things back where you found  
them.

## Technical Resources

- Stack Overflow
  - <http://stackoverflow.com/>
  - One of the best Q&A sites for technical questions of all kinds
- Microsoft Office Support
  - <http://office.microsoft.com/en-us/support/>
  - Documentation on various MS Office products
- Excel Tips
  - <http://excel.tips.net/>
  - Various tips and tricks for using Excel

## Goals for the Course

- Discuss the data-driven decision making process
- Explore the role of managers and analysts in the decision making process
- Introduce useful terminology around data and the data analytics process
- Get some hands-on experience analyzing data

## Key Takeaways for the Course

- Better understand the decision-making process with data
- Better understand the analytics process
- Better understand the value of data, particularly open data
- Better understand the role of analysts and managers in the decision-making process

## Contact Information

### Instructor

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- Website: <http://www.datapolitan.com>
- Blog: <http://blog.datapolitan.com>
- Twitter: @rdunks1/@datapolitan

**THANK YOU!**

# REFERENCE SLIDES

(Not presented in class)

**NYC Open Data Portal**

The screenshot shows the NYC Open Data Portal homepage. At the top, there's a banner with the NYC OpenData logo and a yellow button that says "1100+ Datasets Available". Below the banner, there are social media icons for YouTube, Facebook, Twitter, and Next, along with "Sign Up" and "Sign In" buttons. A navigation bar below the banner includes dropdown menus for "All Types" and "All Categories", and a "Hide Tiles" button. The main area is titled "Data Catalog" and features a search bar with a magnifying glass icon and sorting options for "Most Relevant". A table lists five datasets:

Name	Type	Popularity
1. <a href="#">Wifi Hotspot Locations</a> Recreation	doitgis, doitgis, wifi, wireless, map, ...	70,224 views
2. <a href="#">311 Service Requests from 2010 to Present</a> SocialServices	big apps, bigapps, 311, 311 service requests, ...	42,221 views
3. <a href="#">Subway Entrances</a> Transportation	mta, metropolitan transportation authority, ...	40,868 views
4. <a href="#">MTA Data</a> Transportation	traffic, vehicles, route, schedules, clean web	14,794 views
5. <a href="#">Restaurant Inspection Results</a> Health	restaurant inspection results, ...	25,724 views

At the bottom of the page, there's a link: <https://nycopendata.socrata.com/data>

# NYC Open Data Portal – 311 Data

**NYC OpenData** 1100+ Datasets Available

311 Service Requests from 2010 to Present All 311 Service Requests from 2010 to present. This information is >

Unique Key	Created Date	Closed Date
1 29097371	10/19/2014 02:57:13 AM	
2 29098073	10/19/2014 02:29:15 AM	
3 29096227	10/19/2014 02:13:44 AM	
4 29096249	10/19/2014 02:13:30 AM	
5 29094817	10/19/2014 02:13:26 AM	10/19/2014 0
6 29093575	10/19/2014 02:09:32 AM	
7 29095900	10/19/2014 02:06:57 AM	10/19/2014 0
8 29094006	10/19/2014 02:06:00 AM	
9 29097010	10/19/2014 02:05:21 AM	
10 29097687	10/19/2014 02:05:20 AM	
11 29094997	10/19/2014 02:04:52 AM	
12 29096621	10/19/2014 02:04:31 AM	10/19/2014 0
13 29094357	10/19/2014 02:02:08 AM	10/19/2014 0

**Filter**

Conditional Formatting ▾

Sort & Roll-Up ▾

**Filter**

Filter this dataset based on contents.

Unique Key ▾ is

+ Add a New Filter Condition

Never created a filter before? Watch a short tutorial video [here](#).

# Download 311 Data

**Filter**

Filter this dataset based on contents.

Created Date ▾ is between ▾

06/01/2014 12:00:00 AM and  
09/01/2014 12:00:00 AM

and

options

Complaint Type ▾ is ▾

noise

and

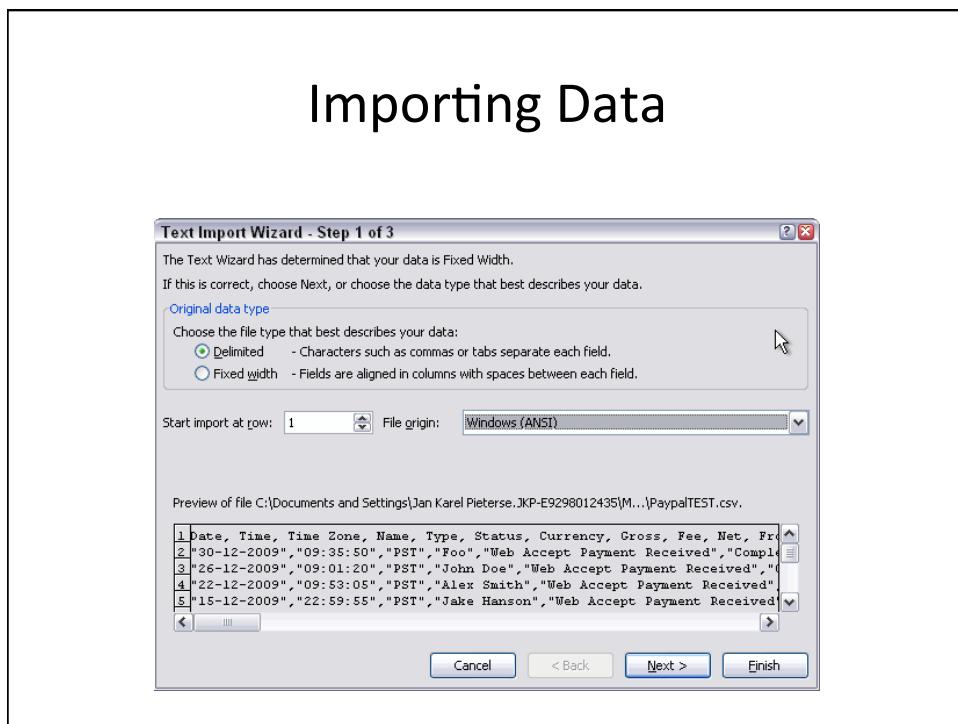
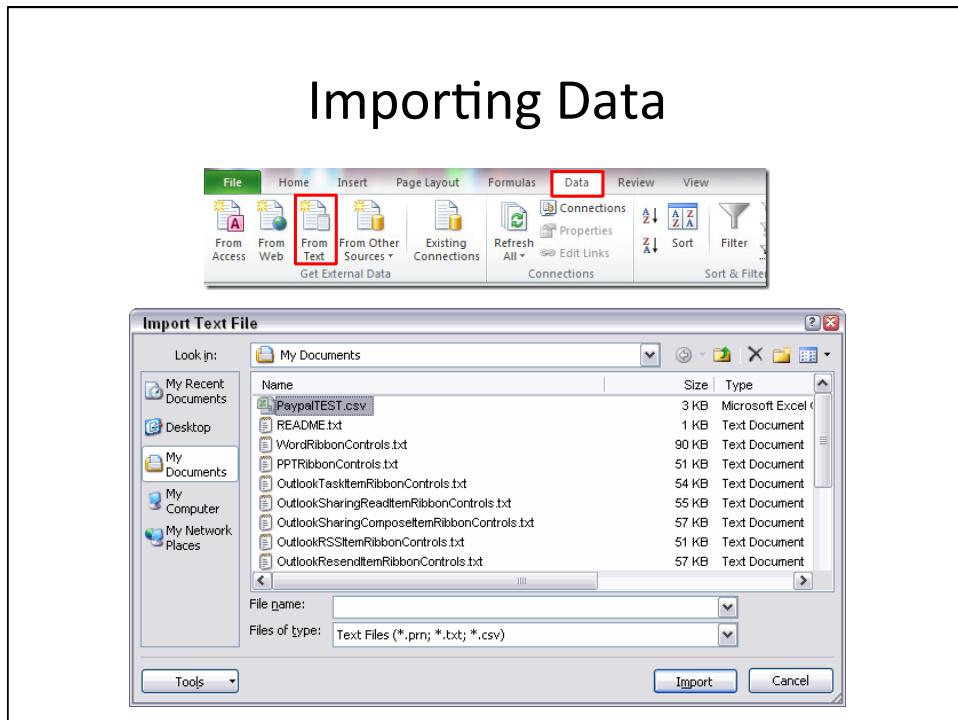
options

## Download 311 Data

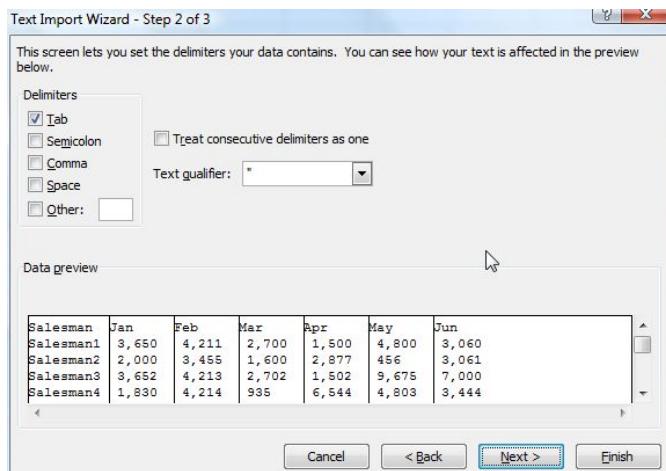


## IMPORTING DATA

The following slides are for reference  
following the live demo in class



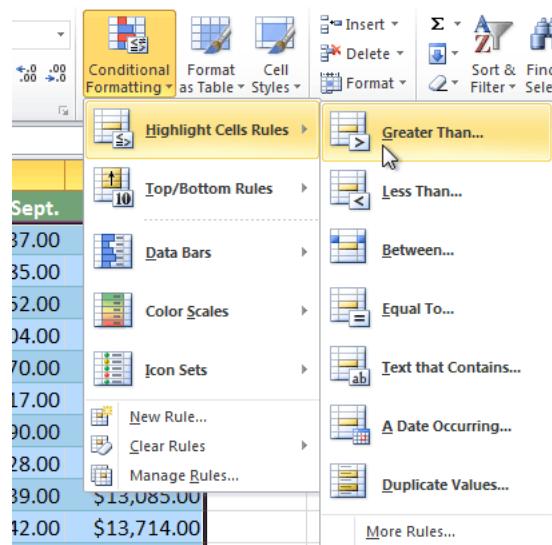
## Importing Data



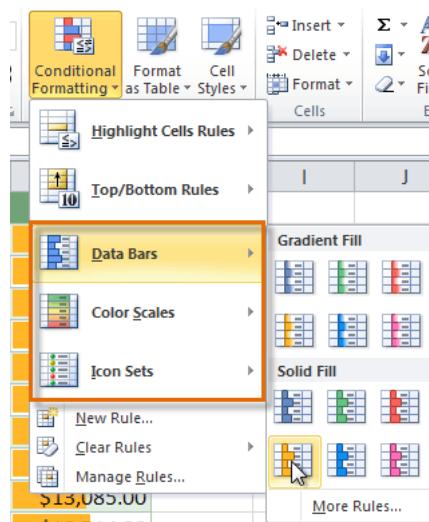
## Conditional Formatting

- Format cells based on value or add content to cells that visually describe the content
- Great for quickly visualizing data
- Makes tables more “presentation-ready”

## Conditional Formatting



## Conditional Formatting



## Conditional Formatting - Examples

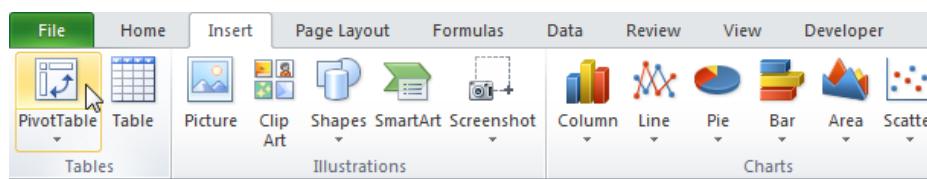
\$3,863.00	\$1,117.00	\$8,237.00	\$8,690.00
\$9,355.00	\$1,100.00	\$10,185.00	\$18,749.00
\$6,702.00	\$2,116.00	\$13,452.00	\$8,046.00
\$4,415.00	\$1,089.00	\$4,404.00	\$20,114.00

\$3,863.00	\$1,117.00	\$8,237.00	\$8,690.00
\$9,355.00	\$1,100.00	\$10,185.00	\$18,749.00
\$6,702.00	\$2,116.00	\$13,452.00	\$8,046.00
\$4,415.00	\$1,089.00	\$4,404.00	\$20,114.00

⬇ \$3,863.00	⬇ \$1,117.00	⬇ \$8,237.00	⬇ \$8,690.00
⬇ \$9,355.00	⬇ \$1,100.00	⬇ \$10,185.00	⬆ \$18,749.00
⬇ \$6,702.00	⬇ \$2,116.00	⬇ \$13,452.00	⬇ \$8,046.00
⬇ \$4,415.00	⬇ \$1,089.00	⬇ \$4,404.00	⬆ \$20,114.00

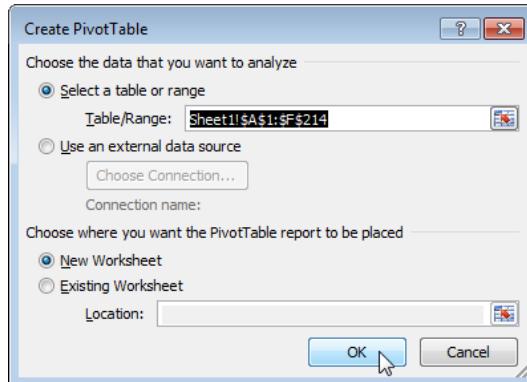
## PivotTables

- What is a PivotTable?
  - A data summarization tool for quickly understanding and displaying the data you’re analyzing
- How do I find it?



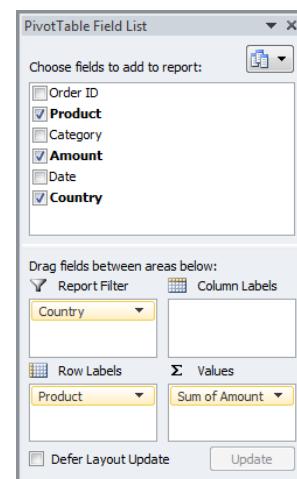
## PivotTables

- Selecting range and destination



## PivotTables

- Drag and drop fields to visualize
  - Row labels
  - Values
  - Filter
  - Column Labels



# PivotTables

