



Institut Informatika & Bisnis
DARMAJAYA
Yayasan Alfian Husin



**Kampus
Merdeka**
INDONESIA JAYA

**MERDEKA
BELAJAR**

DATA SCIENCE DARMAJAYA
“YOUR BEST FUTURE IN DATA”

MEETING: [17]

An Introduction to Analysis and Data Visualization using **TABLEAU SOFTWARE**

BY: HENDRA KURNIAWAN



ANALYTICS AND DATA VISUALIZATION USING TABLEAU

1. What is Tableau?
- 2. What is Data Visualization?**
3. General Overview of Tableau
4. Use for Reporting - Examples
5. Use for Storytelling - Examples
6. Use for Analysis – Examples
7. Advanced Feature – Examples

What is Tableau Software?

- Software company Founded in 2003 from Stanford research
- Intent is to bring 'data to the people' through easy to use data visualization software
- Would be classified as a hybrid business intelligence (BI) / analytics software company
- Used by many of the largest companies in the world and most large companies in West Michigan

tableau Products Solutions Learning Community Support About

Changing the way you think about data

THE TABLEAU PLATFORM SEE IT IN ACTION

Harness the power of your data. Unleash the potential of your people. Choose the analytics platform that disrupted the world of business intelligence. Choose Tableau.

What is Tableau Software?

- Similar tools to Tableau include Microsoft Power BI, Qlik, Tibco Spotfire, and Looker – these are all data visualization tools



What is Tableau Software?

We believe in power for the people

Building a company that fundamentally changes how people see and understand data requires a different philosophy. So Tableau founders imbued their company with disruptive points of view.

Liberate Data
Empower People
Design for People

Courtesy: www.Tableau.com

The main focus of Tableau software is for you to better understand your datasets, especially large datasets.

BI software in the past required highly technical IT skills and took a long time to build dashboards. Tableau has changed that paradigm.

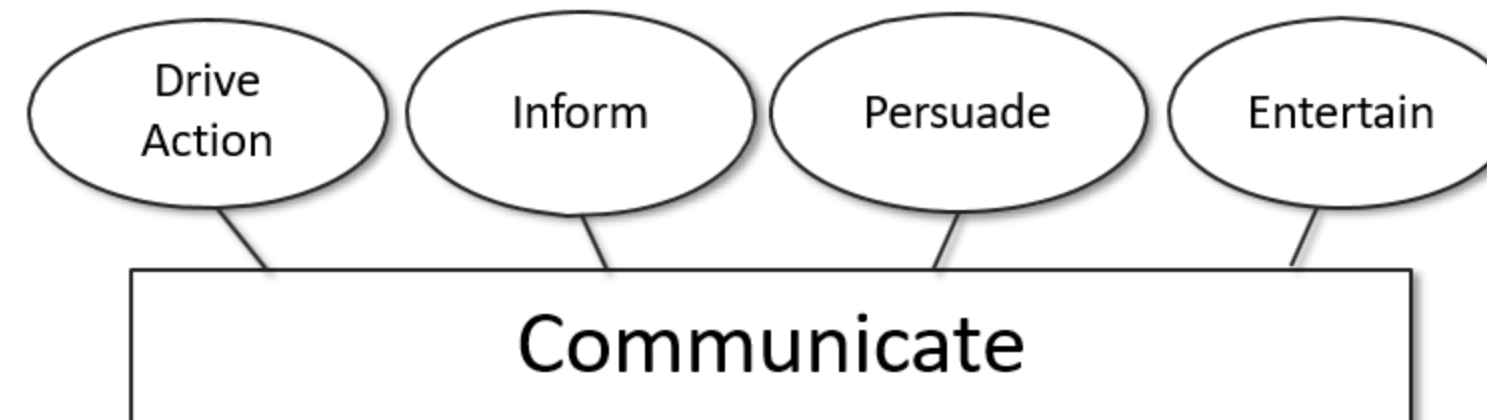
Tableau invests a lot of research time into developing intuitive software. They approach software design from the human perspective.



What is Data Visualization?

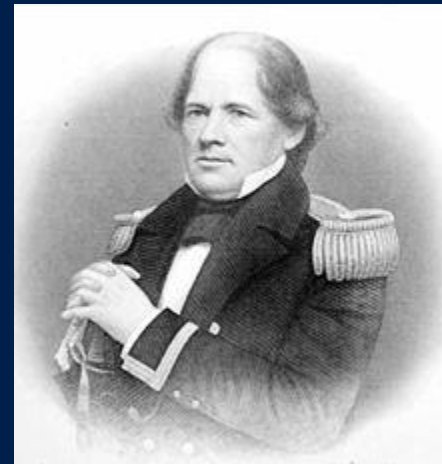
What is Data Visualization?

What is the Purpose of Data Visualizations?



What guides the design process?
How do we judge success?

What is Data Visualization?



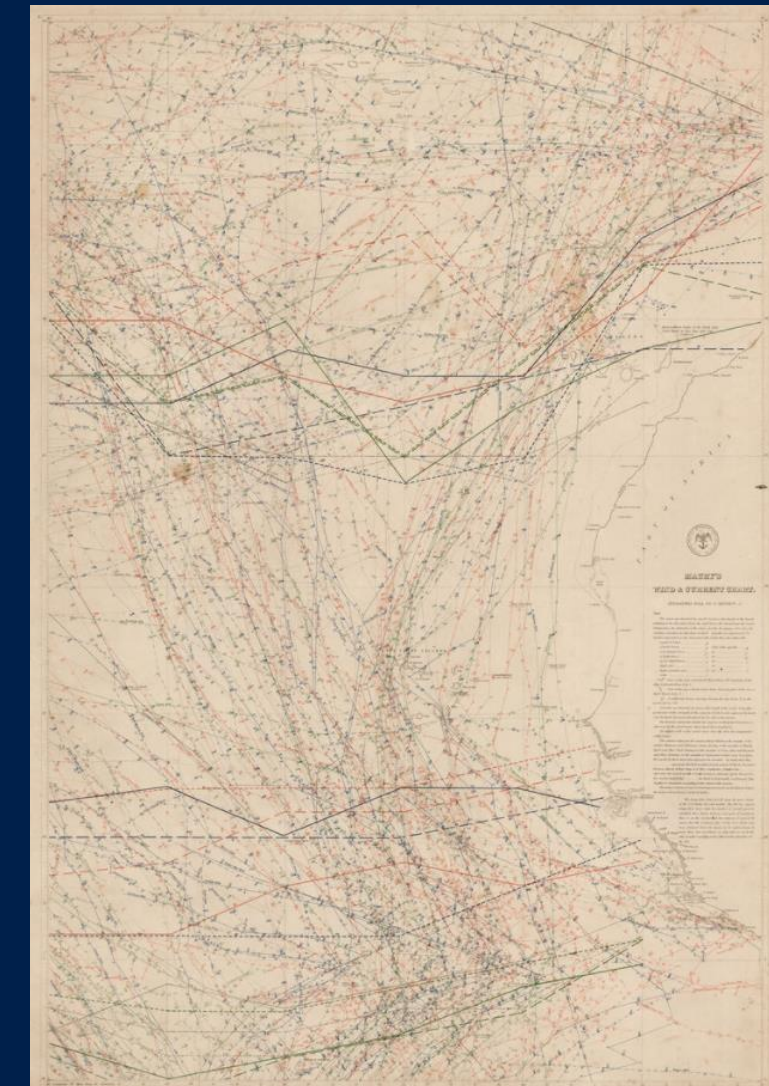
https://en.wikipedia.org/wiki/Matthew_Fontaine_Maury

Matthew Fontaine Maury

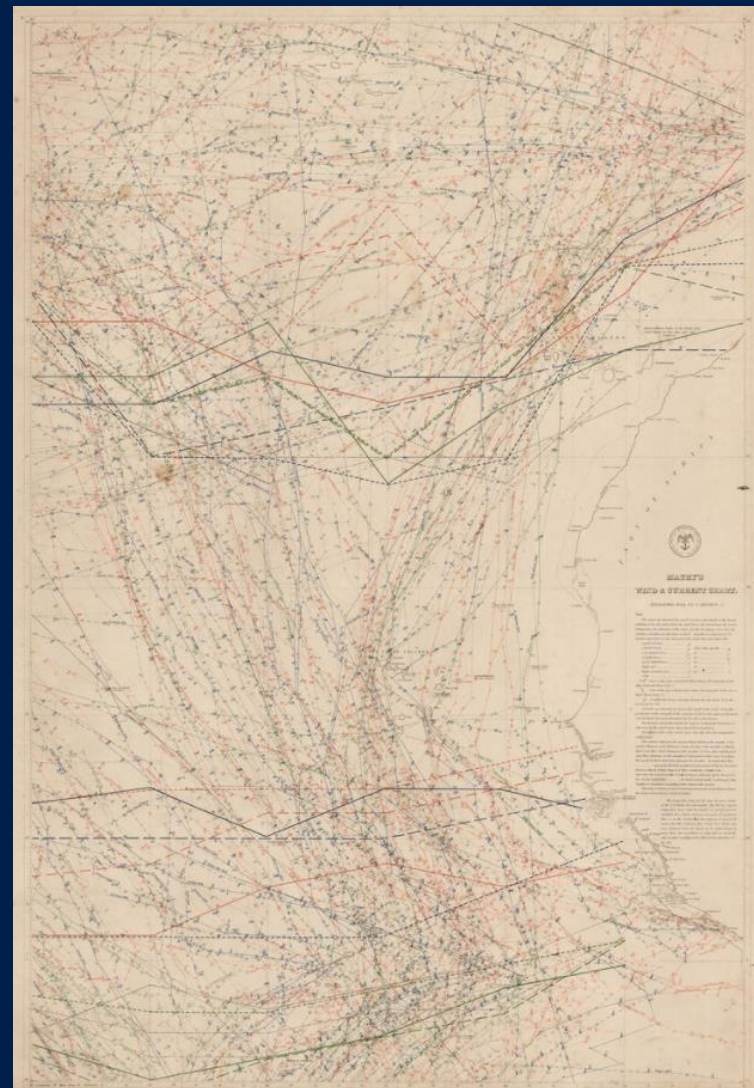
- Unfit for duty due to a leg injury
- Sent to Depot of Charts and Instruments
- Vault of logs from every ship in US Navy
- Hundreds of thousands of observations available in written logs
- Manual 'data mining' with his team
- Standardized collection moving forward (form)

Ref. (The Clipper Ships – Time Life Books)

Ref. (Wind & Current Charts -1847)



What is Data Visualization?



Wind & Current Charts - 1847

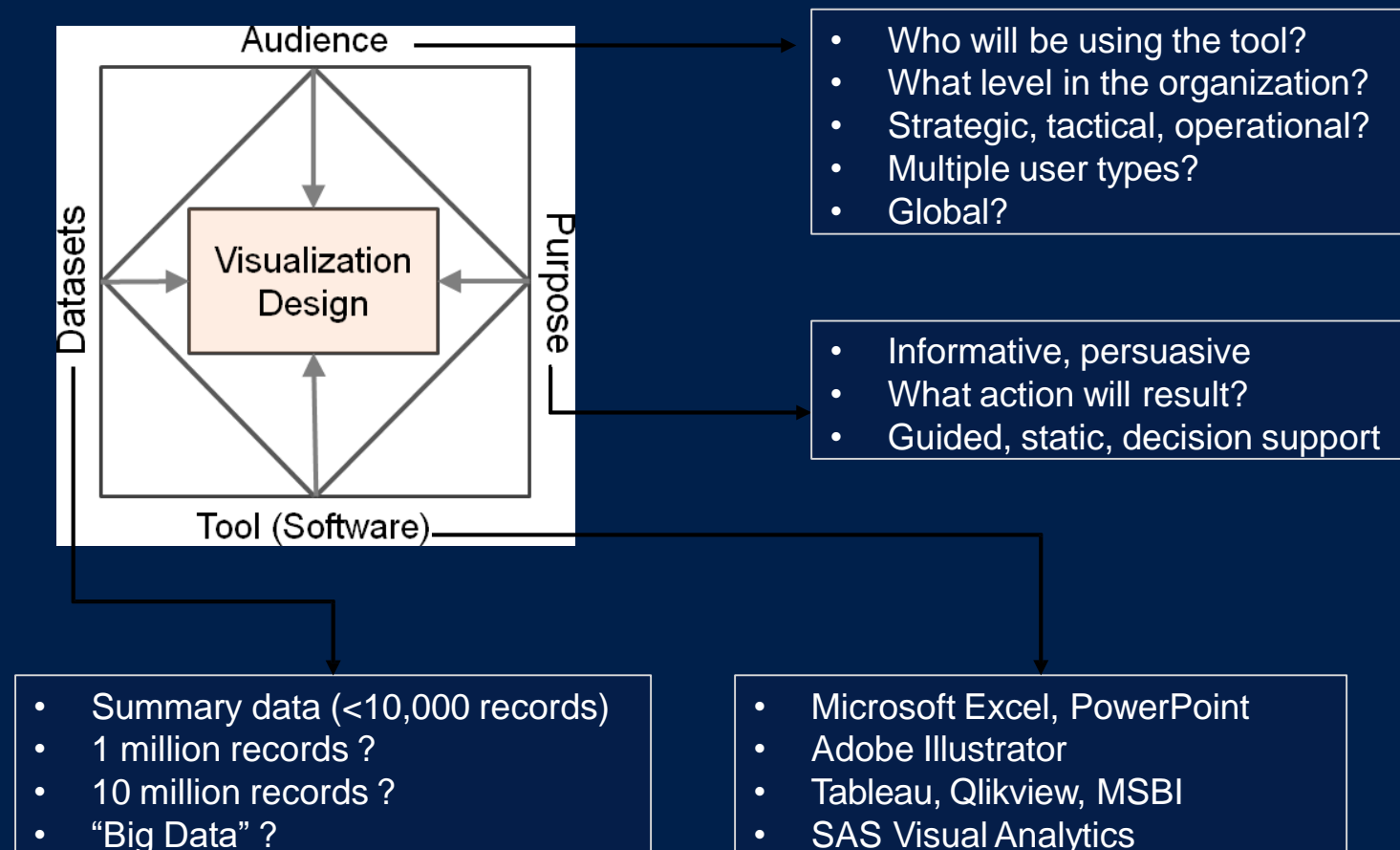
- Visualization of his team's findings
- Use of symbols and colors to highlight best routes
- Findings were counter-intuitive (heading west to go faster east)

Results

- Roundtrip from Virginia to Rio 75 days instead of 112 days
- Found the Gulf Stream's full shape
- Cut time from Cape Horn to California by a third
- Reduced ship lost due to storms

What is Data Visualization?

A Basic Framework – Rhetoric for Data Visualization

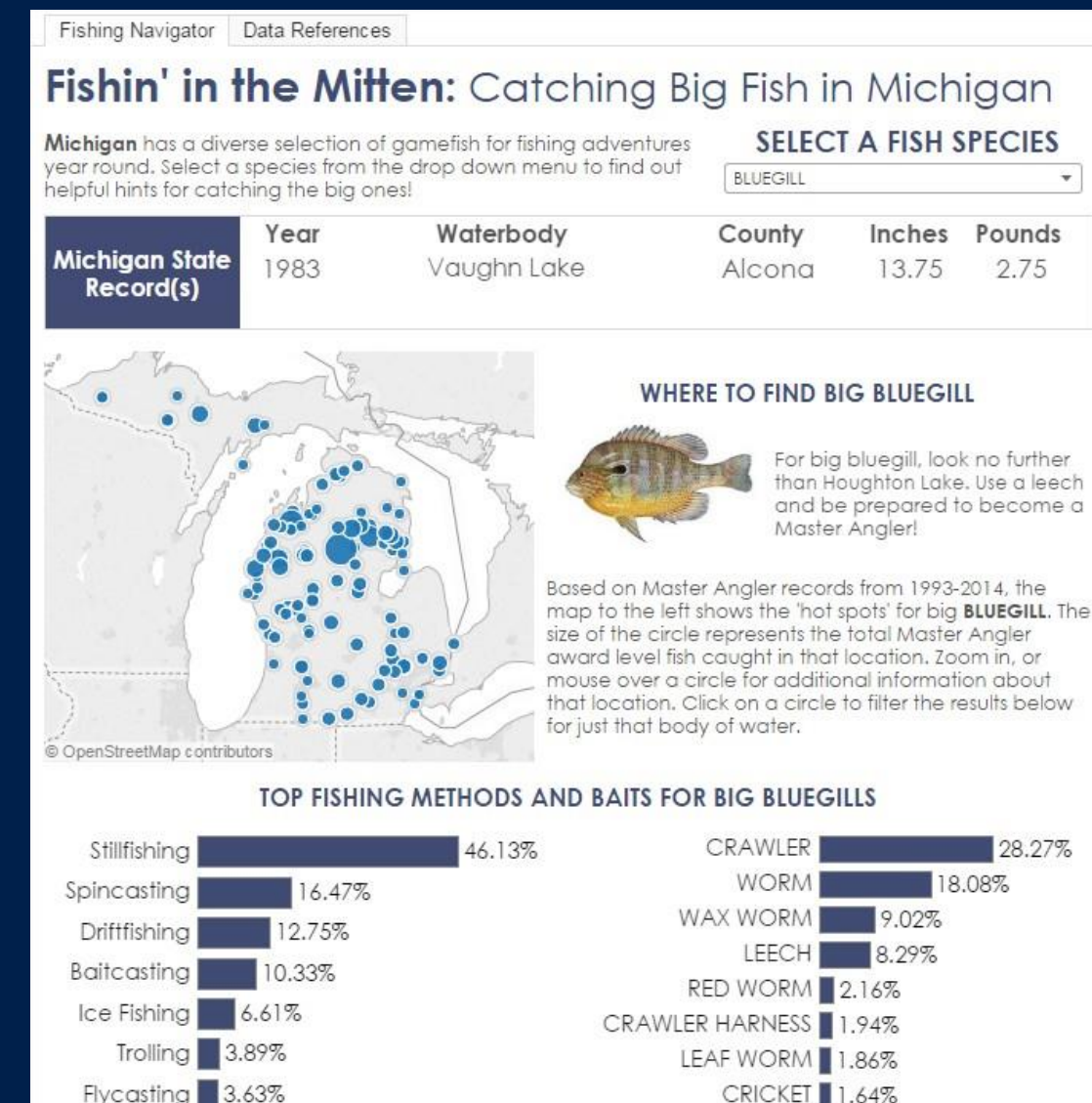
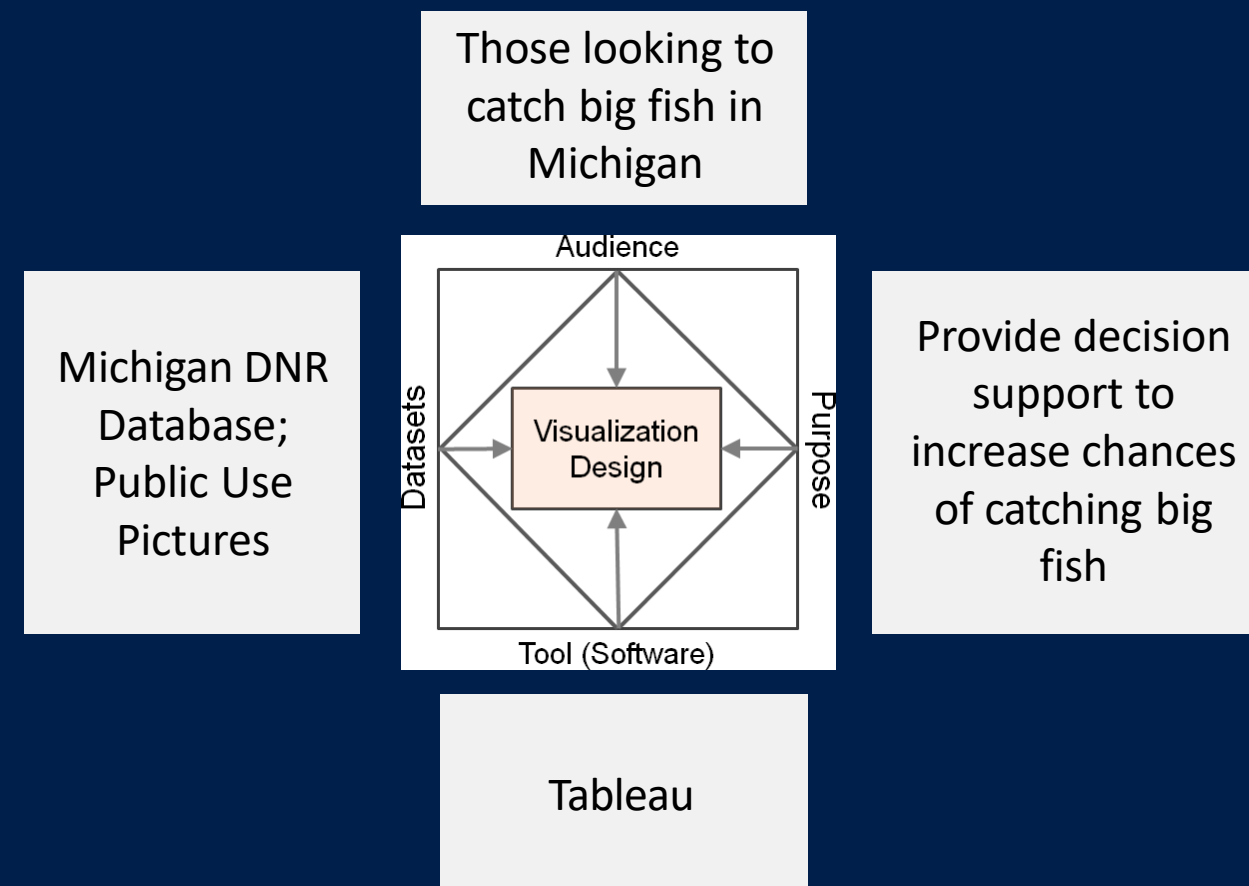


Methodology

1. Identify Purpose (Intended Use)
2. Consider Audience
3. Research
 - i. Identify Available Datasets
 - ii. Identify Data Elements
 - iii. Benchmark Designs
4. Design
 - i. Sketch
 - ii. Iterate
 - iii. Collect Feedback
5. Execute Design
 - i. Collect Feedback
6. Document – Deploy
7. Sustain

What is Data Visualization?

Example – Decision Support



What is Data Visualization?

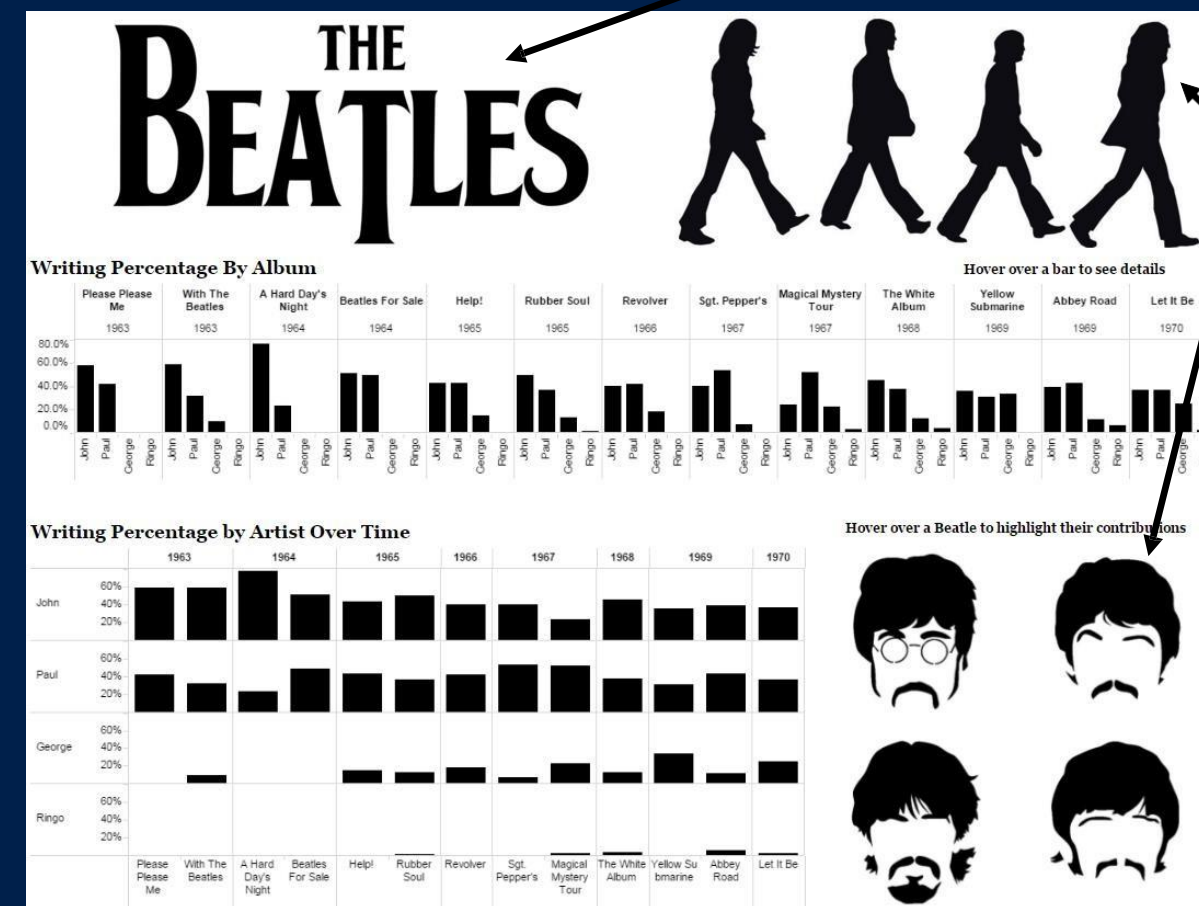
Elements of Design - Unity

Unity is the application of methods that ensure that elements in the design appear to 'go together' - (color, font, & shape consistency)

Consistent
Font

Consistent Color (lack)

Simplified
Images



<https://public.tableau.com/s/gallery/beatles-albums>

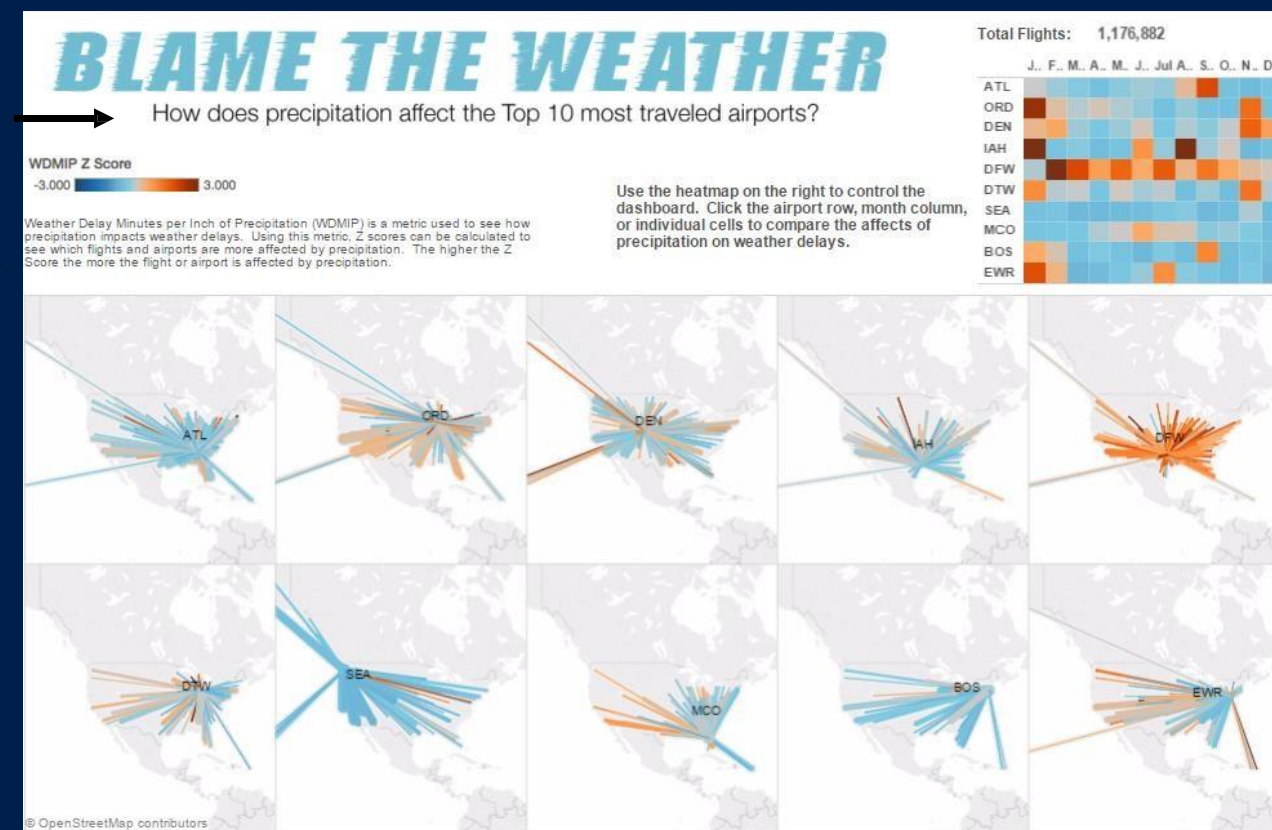
Author: [Mike Moore](#)

What is Data Visualization?

Elements of Design - Hierarchy

Hierarchy is the application of design methods to indicate importance and 'flow' within the visual (size, placement)

- Level 1
- Level 2
- Level 3
- Level 4



<https://public.tableau.com/s/gallery/blame-weather-us-flight-delayed-precipitation> Author: Matt Chambers

Elements of Design - Color

Use of color provides contrast for data points in opposition and brings attention to relevant elements within the visual.



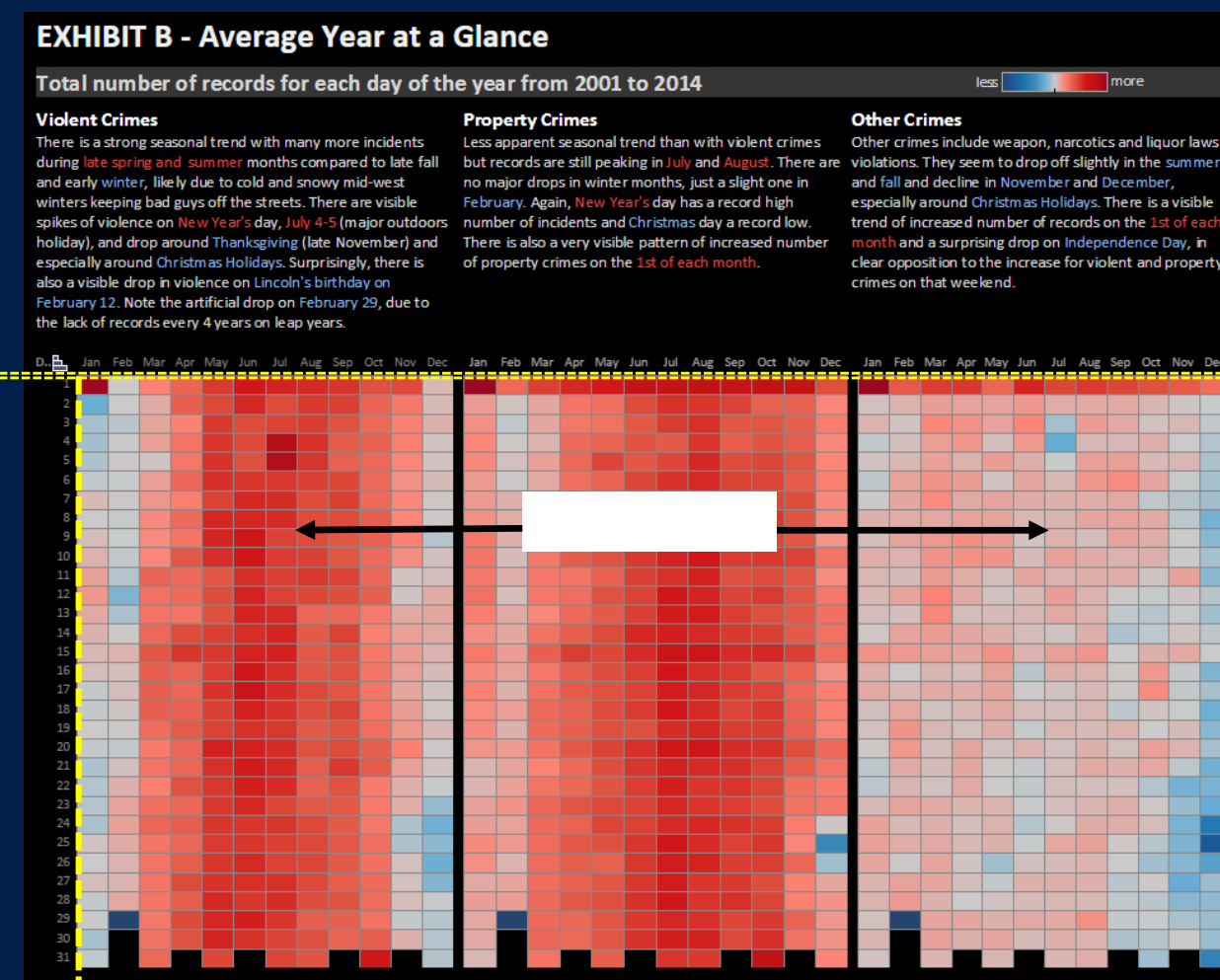
<https://public.tableau.com/s/gallery/road-accidents-germany>
Author: [Oliver Linder](#)

What is Data Visualization?

Elements of Design – Balance & Alignment

Balance and alignment are used to create harmonious visuals that do not distract from the message being communicated.

Alignment



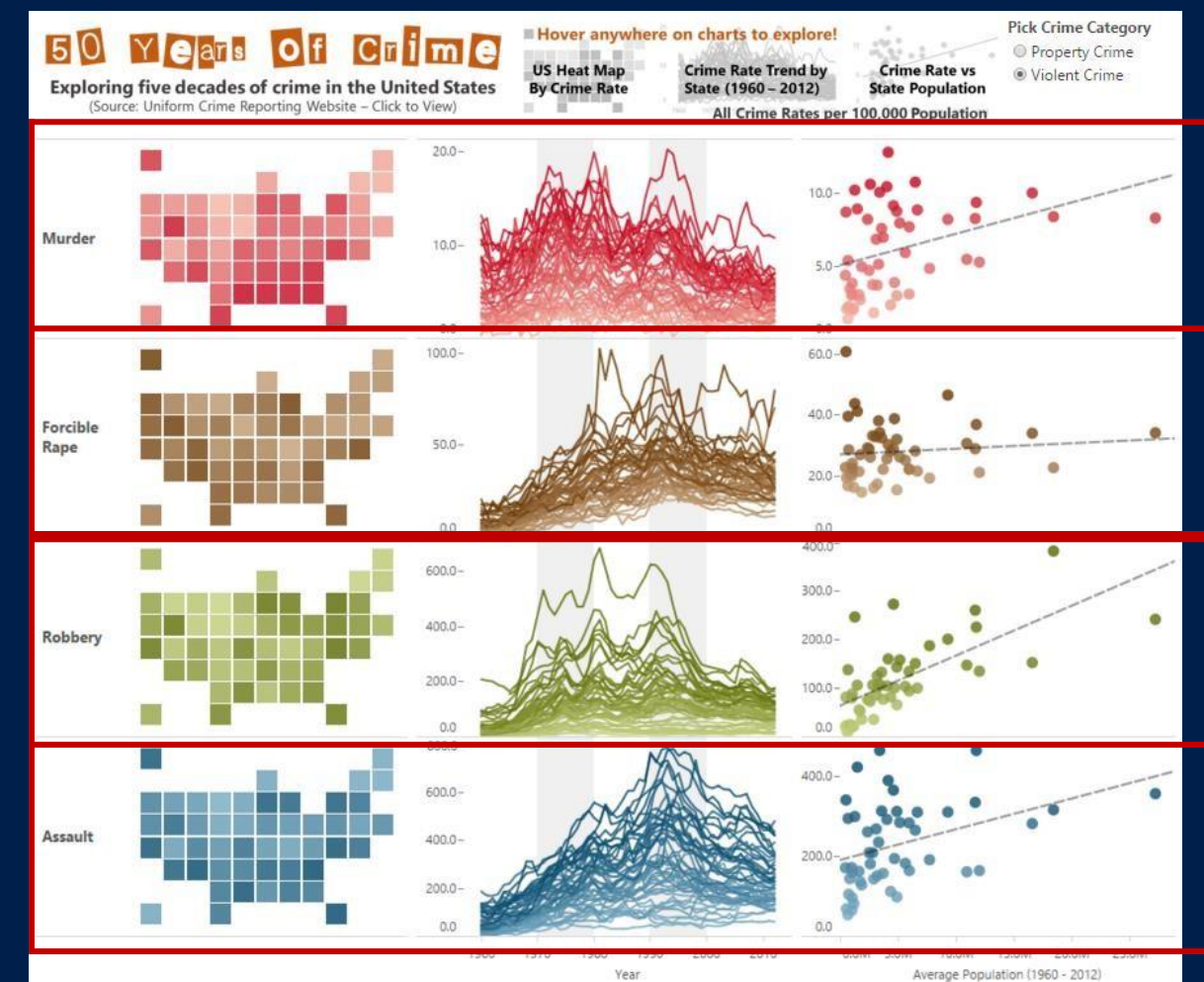
<https://public.tableau.com/s/gallery/chicago-crime-scene>

Author: [George Gorczynski](#)

What is Data Visualization?

Elements of Design – Grouping / Spacing

Grouping and spacing can be used to associate similar elements and provide a narrative or visual flow within the visualization.



<https://public.tableau.com/s/gallery/50-years-crime-us> Author: [Shine Pulikathara](#)

What is Data Visualization



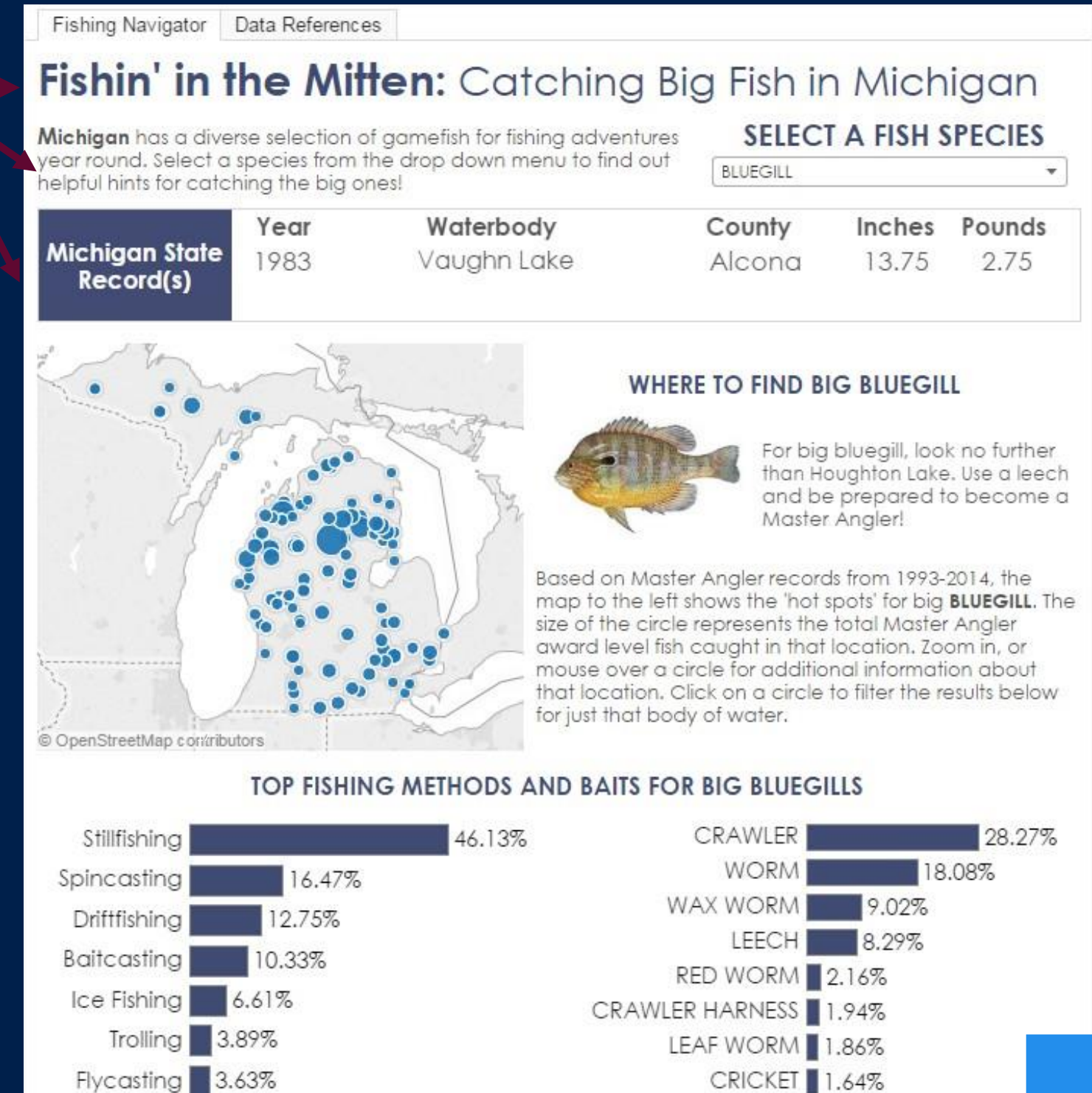
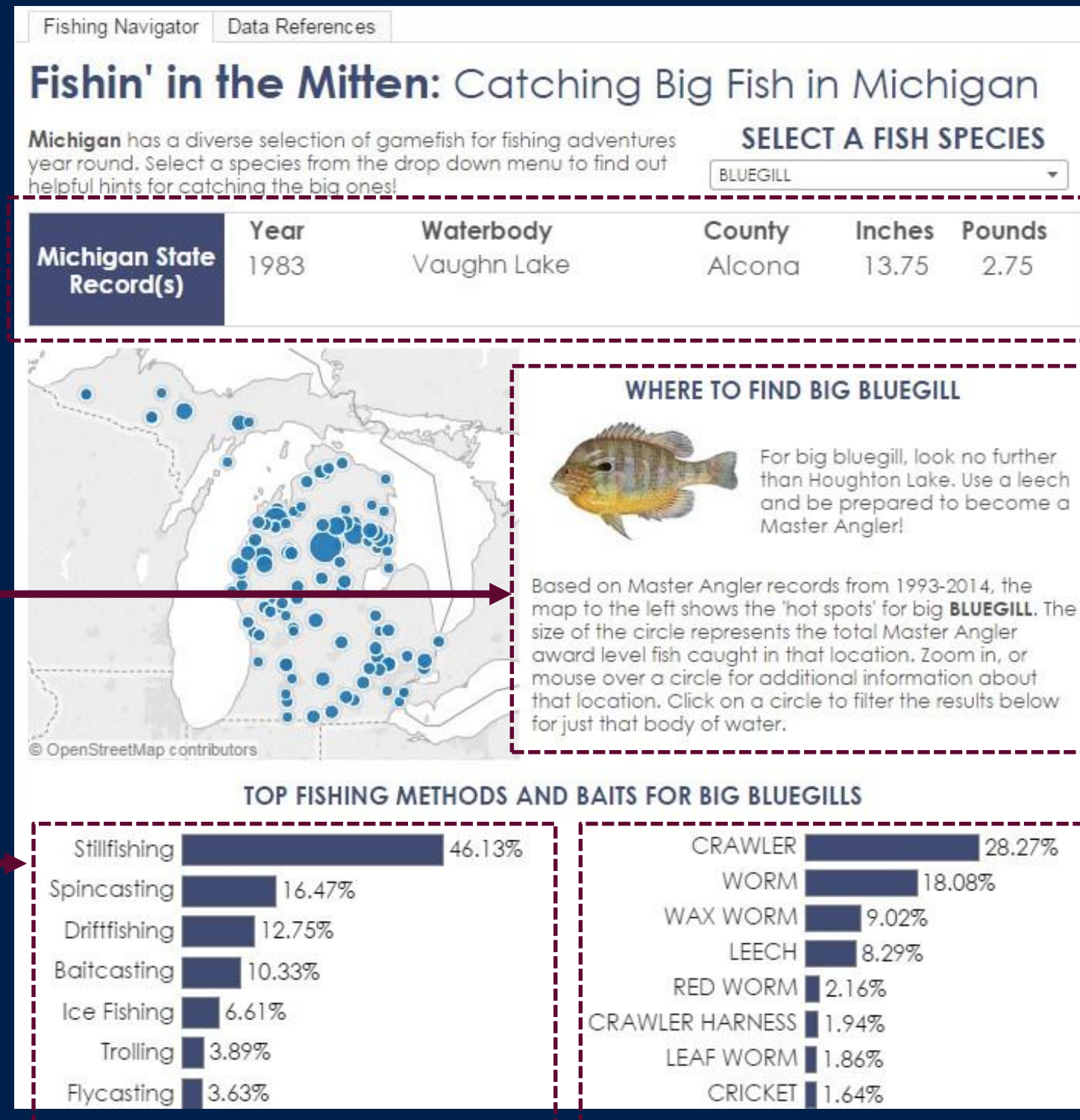
Detailed Example - Design

Hierarchy

Grouping

Grouping

Balance





General Overview

Tableau – General Overview

- All worksheets & dashboards start with data
- Tableau connects to almost every type of data file imaginable
- You can join across different type of data sources!

Files
(Excel, CSV, JSON, SAS...)

Servers
(Databases)

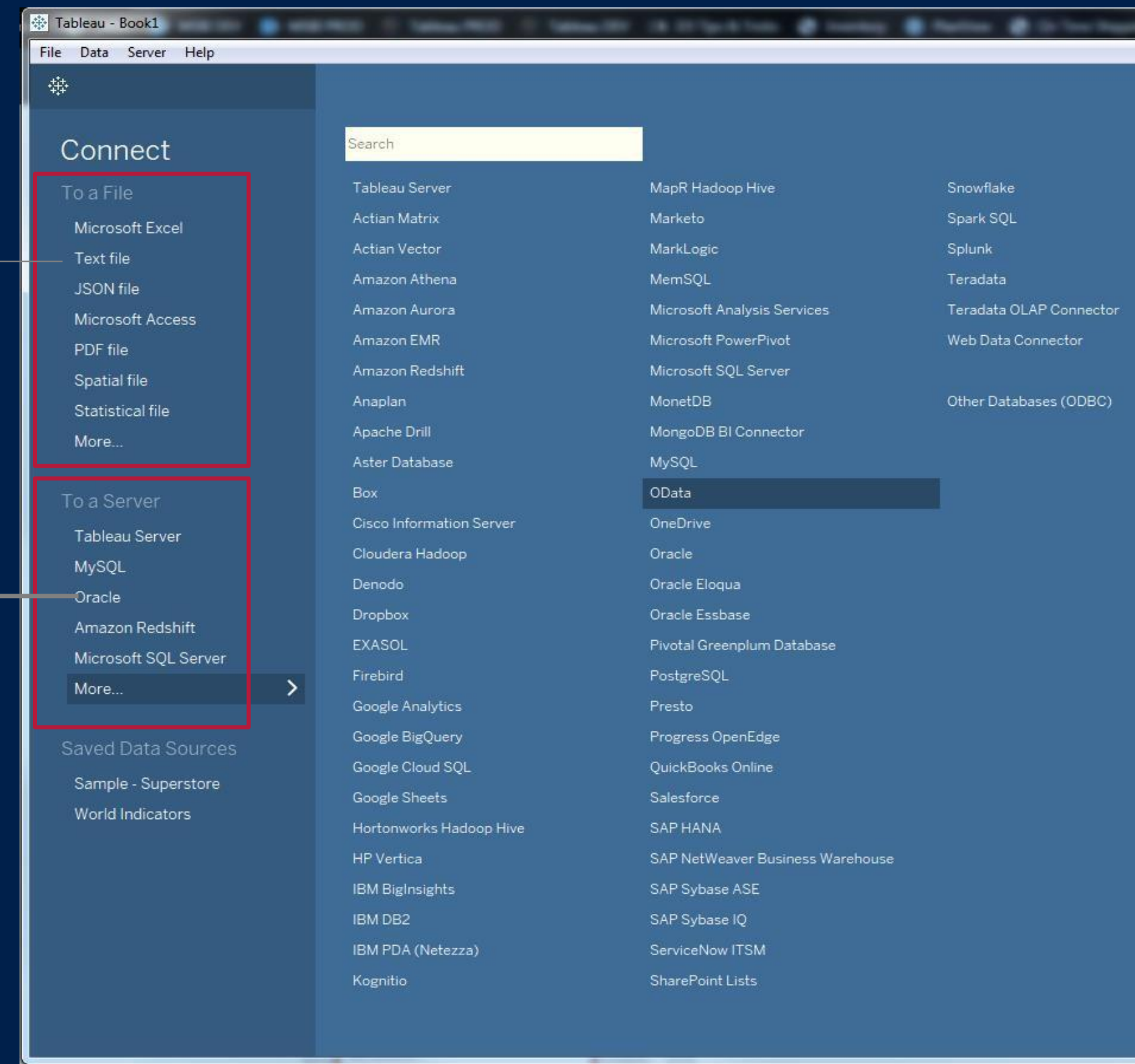


Tableau – General Overview – simple example

- A simple table with 15 rows of data in an Excel spreadsheet
- Build an interactive dashboard in under three minutes

	A	B	C	D	E
1	Product Type	State	Zip Code	Sales	Profit
2	Chairs	Michigan	49012	\$ 78,847	\$ 13,462
3	Chairs	Michigan	49008	\$ 42,998	\$ 2,578
4	Chairs	Michigan	49014	\$ 39,554	\$ 3,998
5	Chairs	Michigan	49007	\$ 10,973	\$ 2,112
6	Chairs	Ohio	45891	\$ 9,558	\$ 940
7	Chairs	Ohio	45888	\$ 51,831	\$ 6,443
8	Chairs	Ohio	45871	\$ 34,972	\$ 5,504
9	Desks	Michigan	49012	\$ 30,838	\$ 1,134
10	Desks	Michigan	49008	\$ 71,298	\$ 5,720
11	Desks	Michigan	49014	\$ 11,558	\$ 1,756
12	Desks	Michigan	49007	\$ 74,435	\$ 31
13	Desks	Ohio	45891	\$ 52,503	\$ 10,610
14	Desks	Ohio	45888	\$ 45,530	\$ 397
15	Desks	Ohio	45871	\$ 84,076	\$ 6,996

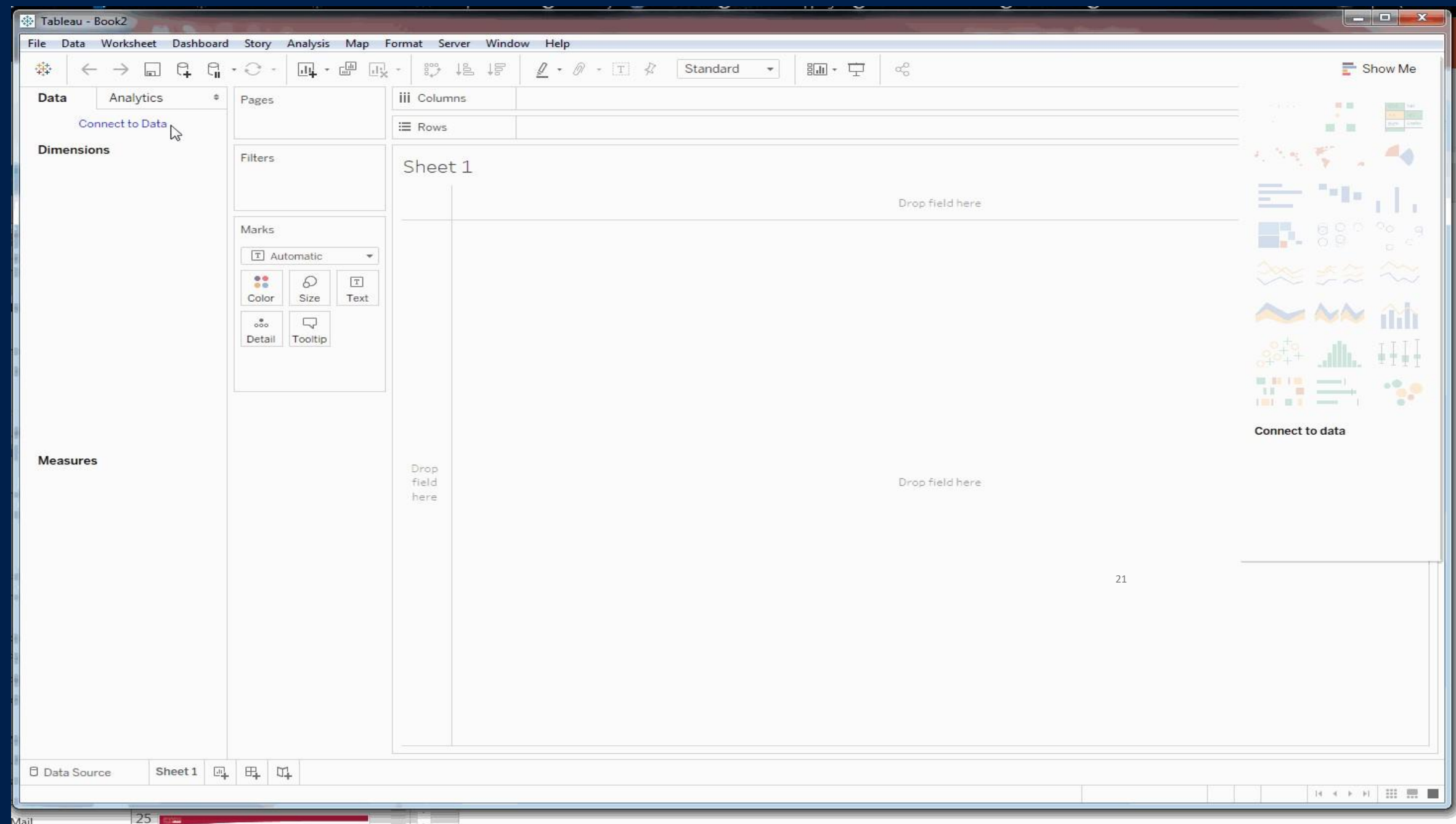


Tableau – General Overview

Calculated Fields

The screenshot shows the Tableau calculated field editor. The main text area contains the following code:

```
if CONTAINS([Product Type], "CHAIR")  
then "SEATING"  
else "NOT SEATING" END
```

Below the code, a status bar indicates "The calculation is valid." and there are "Apply" and "OK" buttons.

On the right side, a dropdown menu is open, showing a list of functions. The "CONTAINS" function is selected and highlighted. The list includes:

- ASCII
- ASIN
- ATAN
- ATAN2
- ATTR
- AVG
- CASE
- CEILING
- CHAR
- COLLECT
- CONTAINS**
- CORR
- COS
- COT
- COUNT
- COUNTD
- COVAR
- COVARP
- DATE
- DATEADD
- DATEDIFF
- DATENAME

To the right of the dropdown, the description for the CONTAINS function is displayed:

CONTAINS(string, substring)
Returns true if the string contains the substring.
Example:
CONTAINS("Calculation", "alcu") is true

Tableau – General Overview Basic Analytics

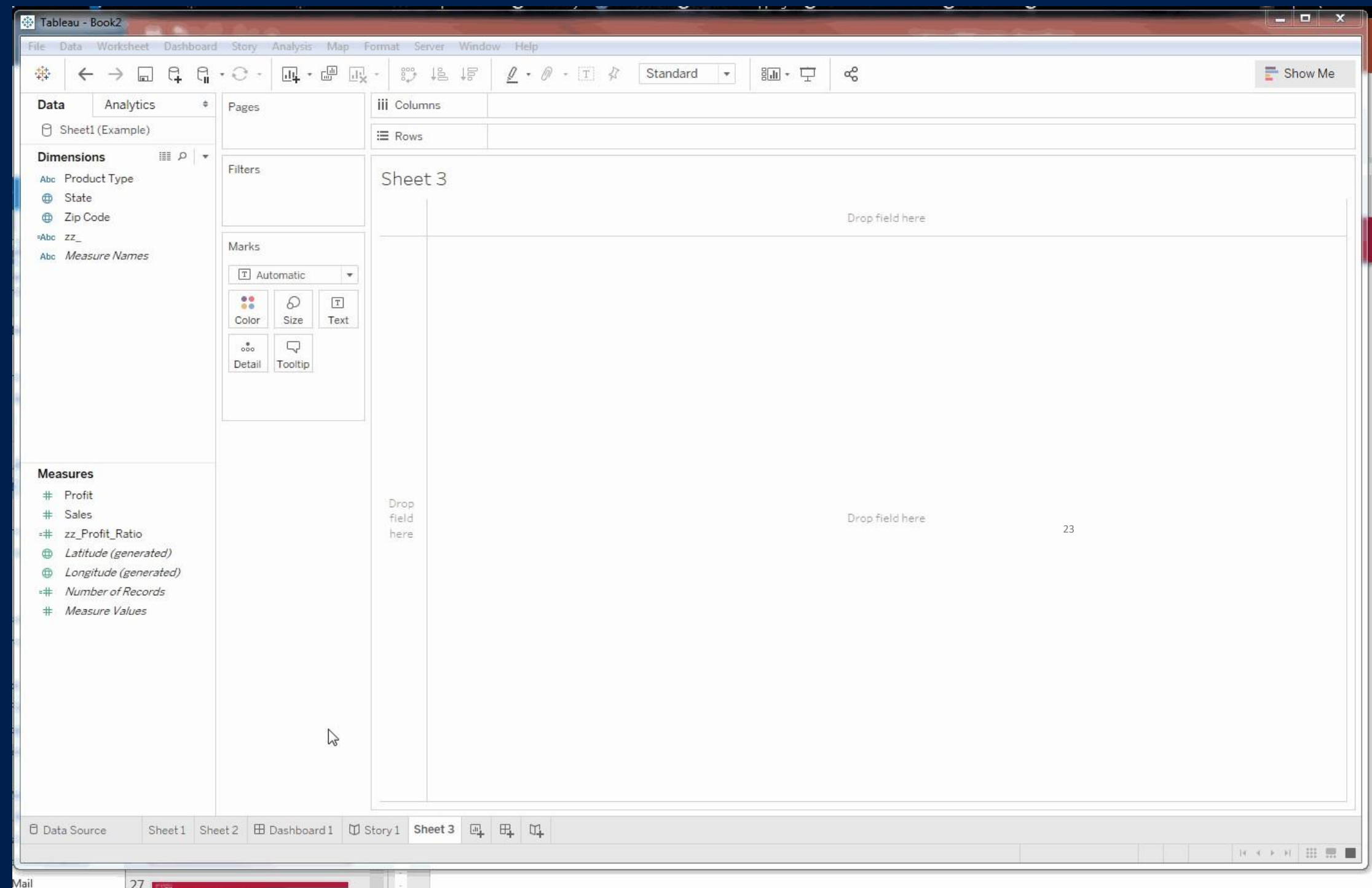


Tableau - General Overview: Bringing it all together

- Many different worksheets, text boxes, parameters, and filters come together to create a dashboard
- Multiple dashboards can be 'chained' together so that users are guided through multiple analytical paths

Text Box

Text Box

Worksheet #3

Worksheet #2

Text Box

Worksheet #1

Fishing Navigator
Data References

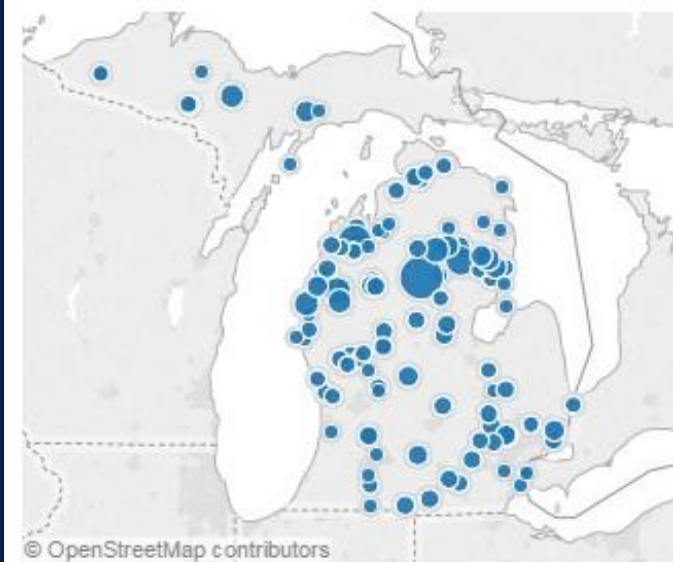
Fishin' in the Mitten: Catching Big Fish in Michigan

Michigan has a diverse selection of gamefish for fishing adventures year round. Select a species from the drop down menu to find out helpful hints for catching the big ones!

SELECT A FISH SPECIES


BLUEGILL

Michigan State Record(s)	Year	Waterbody	County	Inches	Pounds
	1983	Vaughn Lake	Alcona	13.75	2.75



© OpenStreetMap contributors

WHERE TO FIND BIG BLUEGILL



For big bluegill, look no further than Houghton Lake. Use a leech and be prepared to become a Master Angler!

Based on Master Angler records from 1993-2014, the map to the left shows the 'hot spots' for big **BLUEGILL**. The size of the circle represents the total Master Angler award level fish caught in that location. Zoom in, or mouse over a circle for additional information about that location. Click on a circle to filter the results below for just that body of water.

TOP FISHING METHODS AND BAITS FOR BIG BLUEGILLS

Stillfishing 46.13%	CRAWLER 28.27%
Spincasting 16.47%	WORM 18.08%
Driftfishing 12.75%	WAX WORM 9.02%
Baitcasting 10.33%	LEECH 8.29%
Ice Fishing 6.61%	RED WORM 2.16%
Trolling 3.89%	CRAWLER HARNESS 1.94%
Flycasting 3.63%	LEAF WORM 1.86%
	CRICKET 1.64%

Parameter

Text Box

Worksheet #6

Worksheet #5

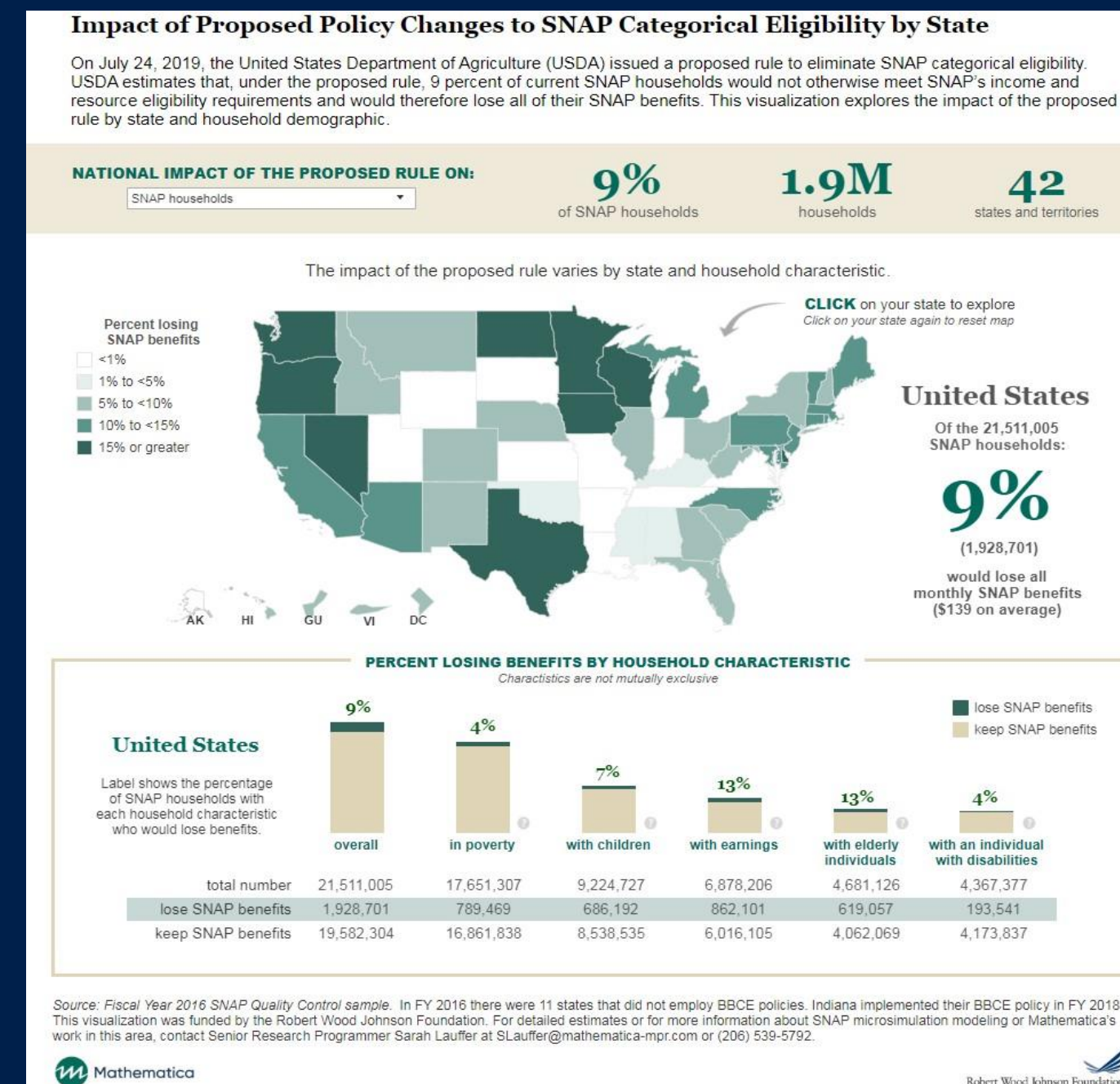
Worksheet #4



Use for Reporting - Examples

Tableau – Reporting Example

- The results of detailed statistical analysis can be made available freely on Tableau Public where individuals can interact with data visualizations to view results – to supplement published research or publicly available reports
- Expands the audience for consuming research and provides a visual and interactive experience.

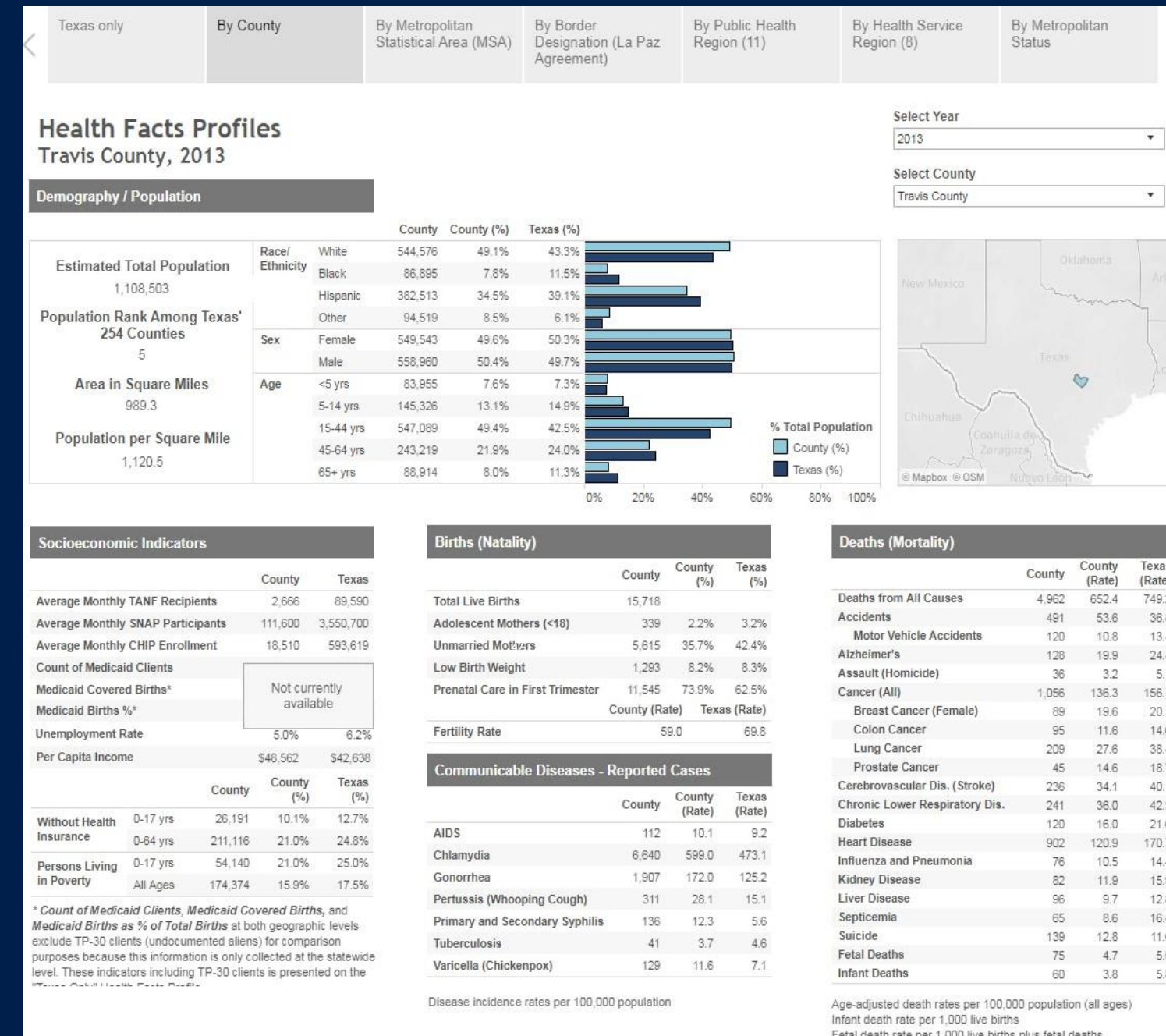


<https://public.tableau.com/en-us/gallery/impact-proposed-policy-changes-snap?tab=featured&type=featured>

https://public.tableau.com/profile/texaschs#!/vizhome/HFP_1/Story1

Tableau – Reporting Example

- Story Points – (a Tableau feature) provides a user experience similar to PowerPoint but with interactive data visualizations
- This allows for guided analytics where you create a general narrative and allow users to interact with visualizations to ‘deep dive’ into key points.



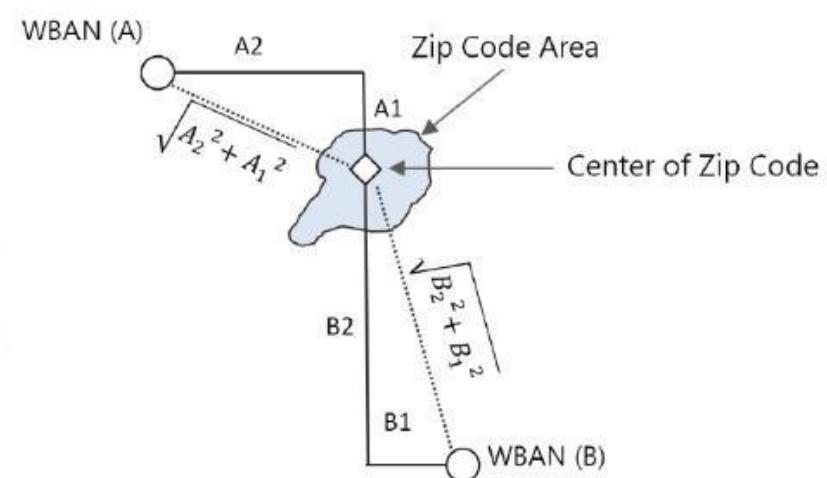
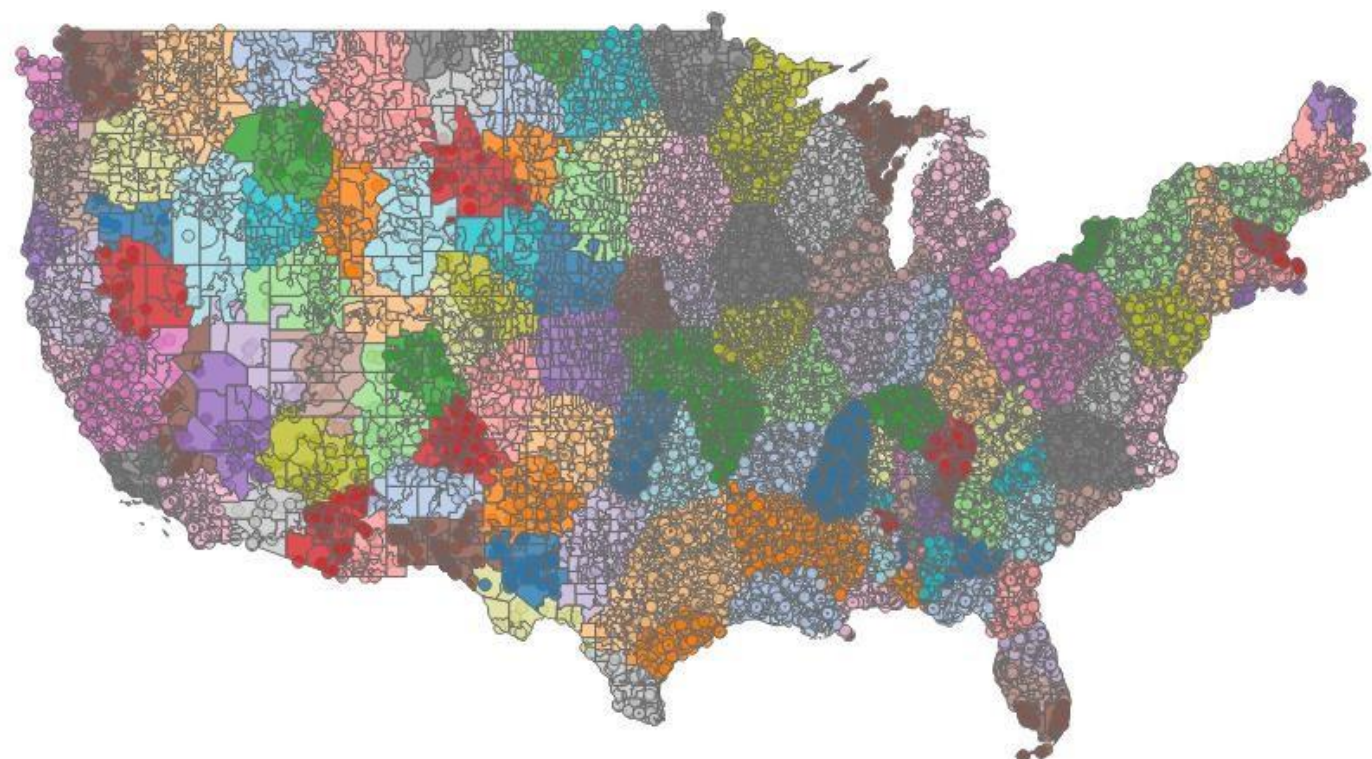


Use for Storytelling - Examples

Tableau – Storytelling Example (Story Points)

Visualizing Weather Data in Tableau Software

< Introduction to the Methodology	Collecting the Data	Mapping WBAN to ZIP Codes	Visualizing Temperatures	Visualizing Precipitation	Polar Vortex >
-----------------------------------	---------------------	---------------------------	--------------------------	---------------------------	----------------



To map each ZIP code to the nearest WBAN, a simple pairwise comparison was used. For each ZIP code, a distance was calculated from the center of the ZIP code to the location of each WBAN utilizing the Latitude and Longitude data from the dataset. Each ZIP code was assigned to one WBAN sensor based on the minimum calculated distance in the pairwise matrix. The map above shows the ZIP codes assigned to each sensor.

Visualizing Weather Data in Tableau Software

< Introduction to the Methodology	Collecting the Data	Mapping WBAN to ZIP Codes	Visualizing Temperatures	Visualizing Precipitation	Polar Vortex >
-----------------------------------	---------------------	---------------------------	--------------------------	---------------------------	----------------

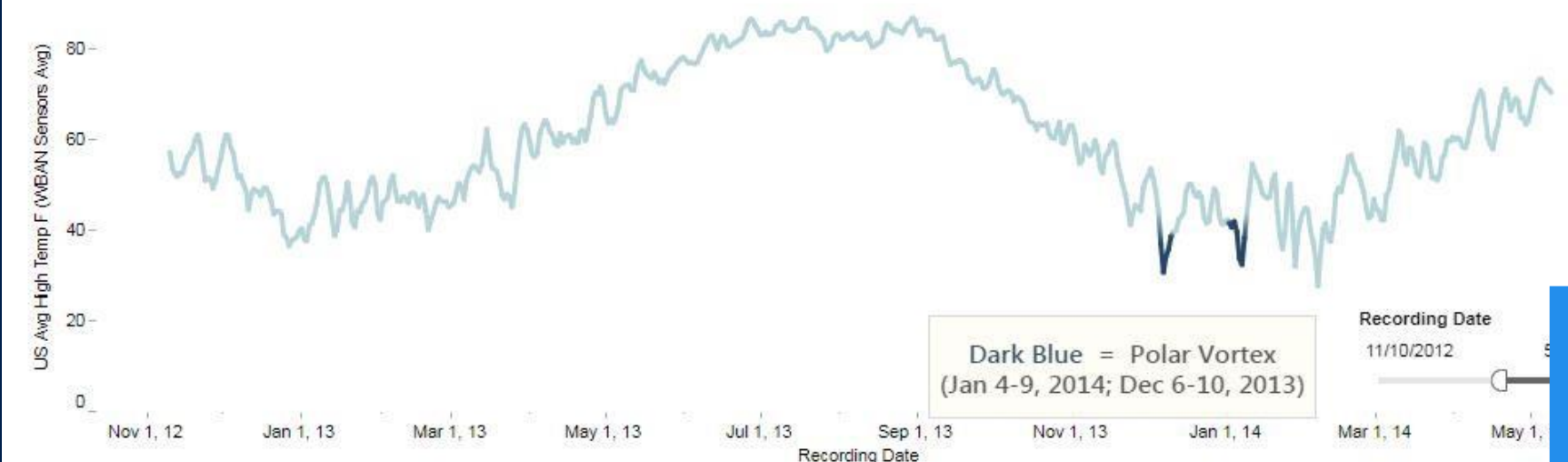
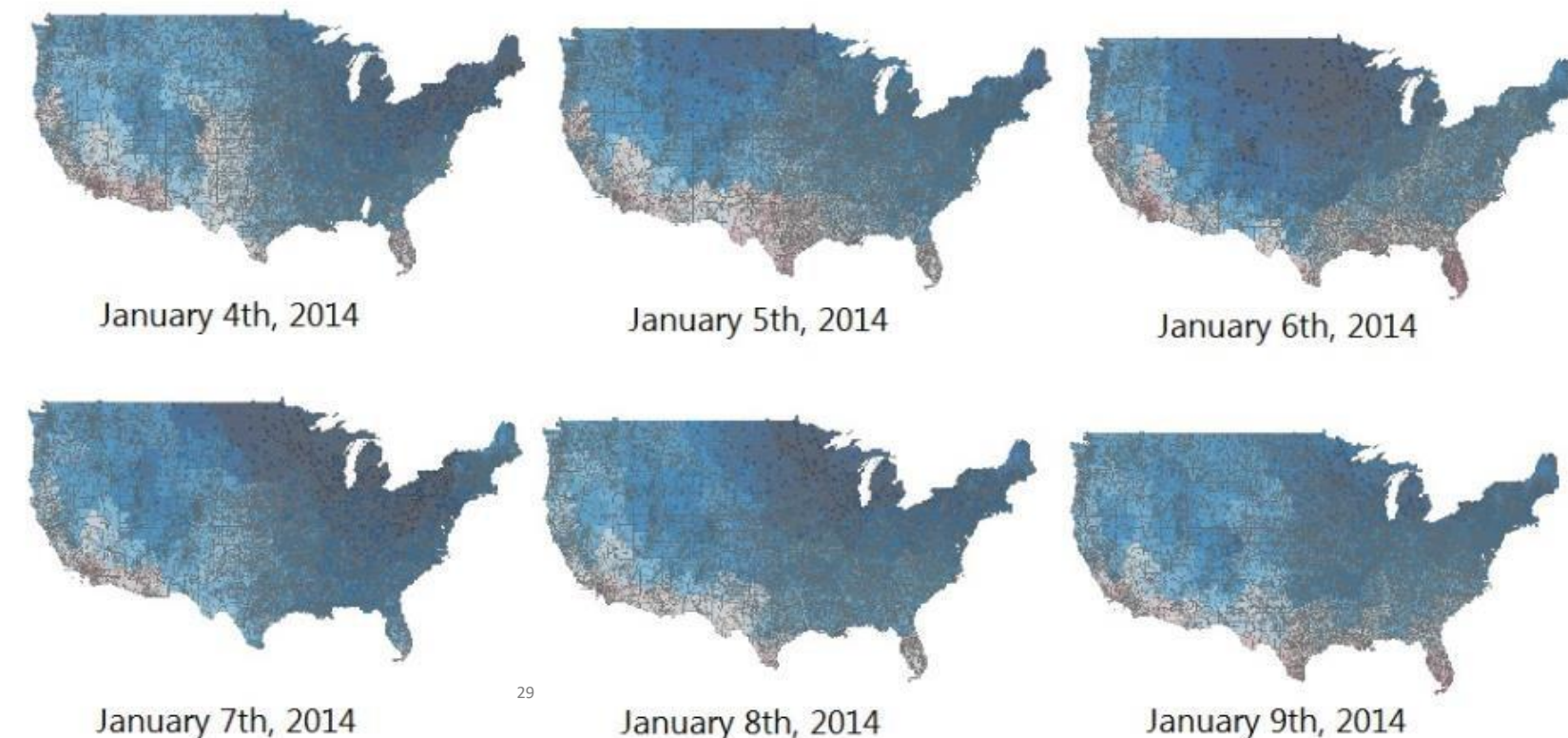
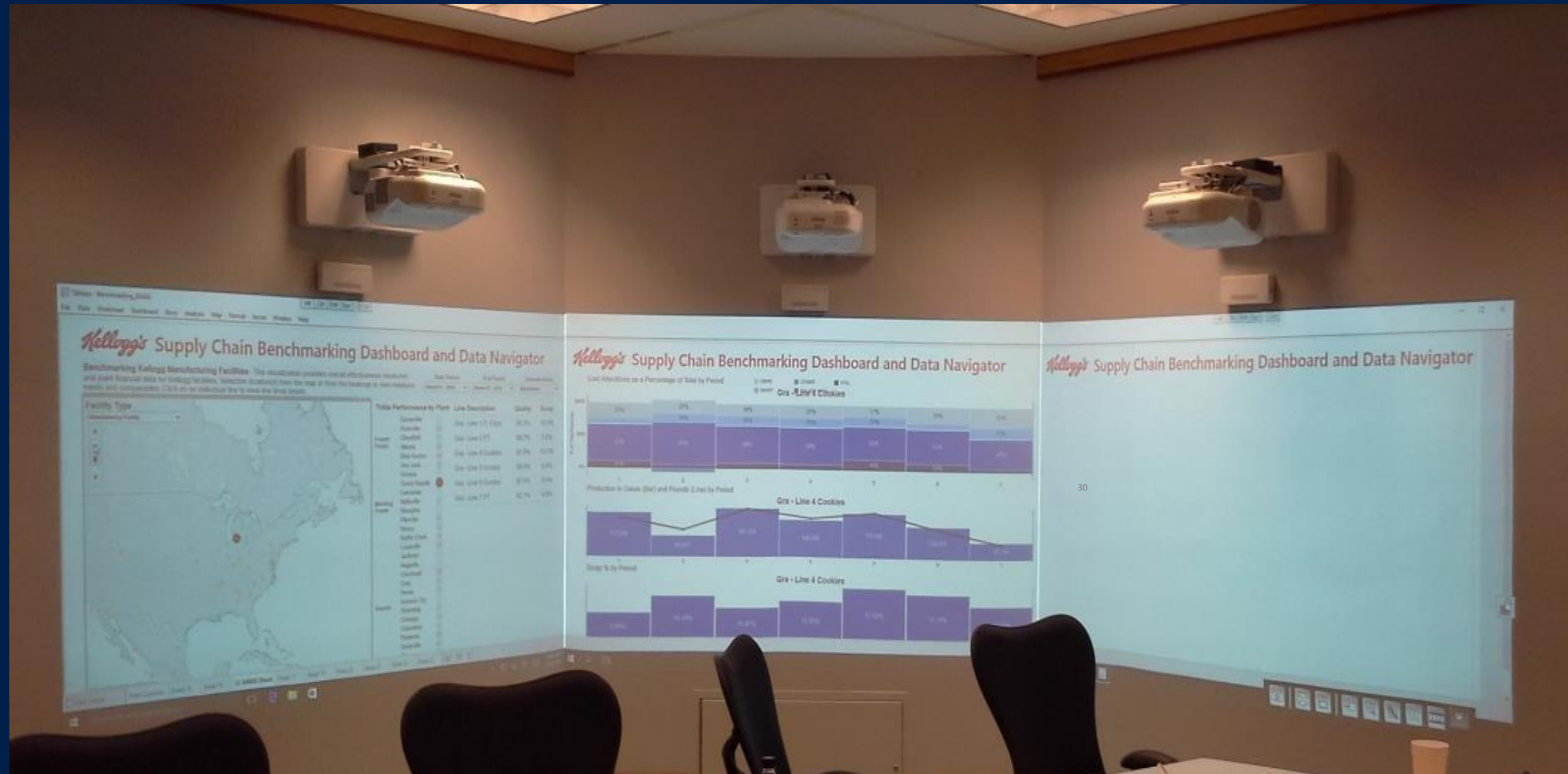


Tableau – Storytelling Example (K-MAX)





Advanced Features - Examples

Advanced Features – Connecting Tableau to “R”

- Step #1

- Install “R” or “R” Studio on your computer
- Load the Rserve library package
- Start Rserve

Console ~/ ↵

```
R version 3.6.0 (2019-04-26) -- "Planting of a Tree"  
Copyright (C) 2019 The R Foundation for Statistical Computing  
Platform: x86_64-w64-mingw32/x64 (64-bit)
```

```
R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.
```

```
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.
```

```
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.
```

```
[workspace loaded from ~/.RData]
```

```
> library(Rserve)
```

```
> Rserve()
```

```
Starting Rserve...
```

```
"C:\Users\usknxa19\DOCUME~1\R\R-36~1.0\library\Rserve\libs\x64\Rserve.exe"
```

Advanced Features – Connecting Tableau to “R”

- Step #2
 - Connect Tableau to your Rserve instance

The screenshot shows the Tableau interface with a table of baseball game data. The 'Server' menu is highlighted in the top navigation bar. The table has the following data:

Gameday	Away	Awayruns	Home	Homeruns
6/4/2019	Atlanta	12	Pittsburgh	5
	Baltimore	12	Texas	11
	Boston	8	Kansas City	3
	Chi White S..	5	Washington	9
	Cincinnati	4	St. Louis	1
	Colorado	3	Chi Cubs	6
	Houston	11	Seattle	5
	LA Dodgers	9	Arizona	0
	Miami	16	Milwaukee	0
	Minnesota	2	Cleveland	5
	NY Yankees	3	Toronto	4
	Oakland	4	LA Angels	2
	Philadelphia	9	San Diego	6
	San Francis..	9	NY Mets	3
	Tampa Bay	6	Detroit	9

The interface also shows the 'Data' pane with dimensions like 'Away', 'Awayruns', 'Home', and 'Homeruns'. The 'Measures' pane shows 'F1' and 'zz_R_Script'. The 'Marks' card is set to 'Automatic'.

Advanced Features – Connecting Tableau to “R”

- Step #3
 - Write “R” script within a calculated field in Tableau

Note: This is also generally the same way to connect Tableau to Python in Anaconda – with a few small configuration differences.

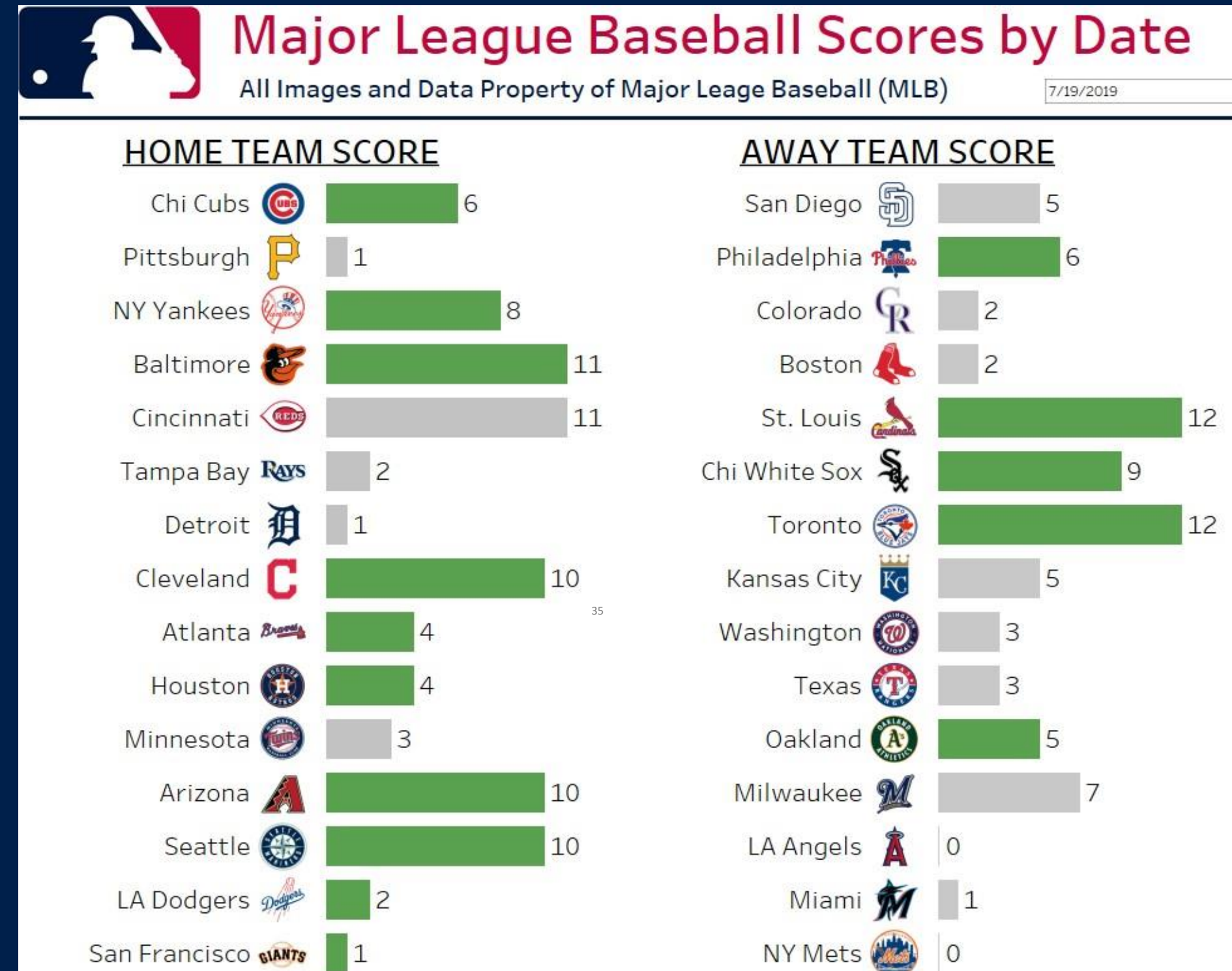
Measures	
=#	Away Score
=Abc	Away Team
=#	Home Score
=Abc	Home Team
=#	zz_Axis_1
=#	zz_date2
=#	zz_Total
=Abc	zz_Winner_Color_AWAY
=Abc	zz_Winner_Color_HOME
=#	Number of Records
#	Measure Values

Parameters	
📅	Date Par

```
INT(SCRIPT_Str("library(xml2);  
dater <- as.Date(Sys.Date()-.arg2);  
year <- paste('year_', format(dater, '%Y'), '/', sep = "");  
month <- paste('month_', format(dater, '%m'), '/', sep = "");  
day <- paste('day_', format(dater, '%d'), '/', sep = "");  
xmlFile <-  
paste('http://gd2.mlb.com/components/game/mlb/', year,  
month, day, 'miniscoreboard.xml', sep = "");  
x <- read_xml(toString(xmlFile));  
games=xml_children(x);  
ns <- xml_ns(x);  
awayruns <-xml_attr(games,'away_team_runs',ns);  
awayrunsdf <- as.data.frame(awayruns);  
awayrunsdf$ID <- seq.int(nrow(awayrunsdf));  
toString(awayrunsdf[,arg1, 1]);  
",MAX([Idvalue]),max([zz_date])))
```

Advanced Features – Example

- Example that queries Major League Baseball's open API for statistics
- "R" script downloads data as an XML file, parses the data and returns the results to Tableau for visualization.





Institut Informatika & Bisnis
DARMAJAYA
Yayasan Alfian Husin



**Kampus
Merdeka**
INDONESIA JAYA

**MERDEKA
BELAJAR**

THANK YOU!!

DATA SCIENCE DARMAJAYA "YOUR BEST FUTURE IN DATA"