

# Session 4



## Visualizations in practice



NLAB: *Data at Scale*

Dr. Evgeniya Lukinova



Today, Tableau  
demystified.





# Key Concepts of Tableau



[Official guide online](#)  
[Tableau Desktop PDF](#)  
[Quick reference](#)

## Six main things to know!

- 1) **Data sources**
- 2) **Sheets & Dashboards**
- 3) **Shelves and cards**
- 4) **Continuous vs. Discrete**
- 5) **Measures vs Dimensions**
- 6) **Show me popup**

Data sources contain the raw data and can be **tables / query results from a database**, excel files etc.



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Sheets are where you create **single graphs**.

**Dashboards** collect and display **previously created sheets**.



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Shelves and cards are **where you drag attributes.**

Attributes = measures or dimensions



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Shelves and cards are **where you drag attributes**.

Attributes = measures or dimensions

By placing fields on shelves or cards, you can **create** the rows and columns of a **data view**, **exclude data** from the view, create pages, and **control mark properties**



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Shelves and cards are **where you drag attributes**.

Attributes = measures or dimensions

The **different placement and combinations** of measures and dimensions, and whether the values are continuous or discrete, **dictate which graph Tableau shows**.

By placing fields on shelves or cards, you can **create** the rows and columns of a **data view**, **exclude data** from the view, create pages, and **control mark properties**



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Each data source (table) contains a set of attributes (columns).

Each attribute can be either **continuous** or a **discrete**.

**Continuous** attributes those with values along a number line (decimal numbers).

**Discrete** attributes are those with values that are "individually separate and distinct."



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**Discrete** attributes are those with values that are "individually separate and distinct."

When placed on the **columns** or **rows** shelves:

Continuous fields produce axes.

Discrete fields create headers.



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Each data source (table) contains a set of attributes (columns).

Each attribute is either a **measure** or a **dimension**.

**Measures** are numbers, they quantify the extent of something.

**Dimensions** are usually names, categorizing the "measure" in different kinds.

What is a measure and what is a dimension depends on the problem.

Am I measuring someone's weight, or do I care about a disease and am grouping people by weight (low/med/high) for my study?



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Attributes can be **converted between** being **measures** and **dimensions**.

Initially Tableau guesses.



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**Measures** are numbers, they quantify the extent of something.

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The **different placement and combinations** of measures and dimensions, and whether the values are continuous or discrete, **dictates which graph Tableau shows**.



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The show me popup helps you **see what graphs Tableau can make.**

Shows you what you need (dimensions, measures, etc) in order for Tableau to show the graph.





Main focus of today...



+ a b l e a u®

S O F T W A R E



## The main interface

The screenshot shows the Tableau main interface with several components highlighted by yellow boxes and annotated with text:

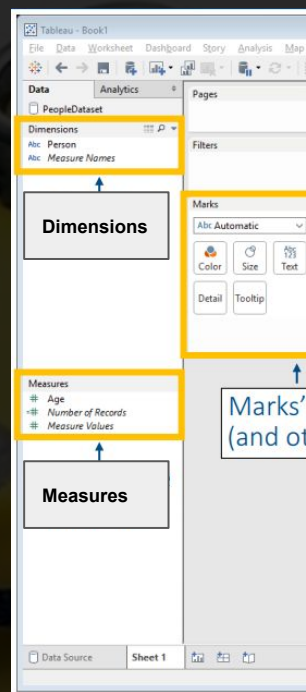
- Dimensions:** A box on the left containing the 'Dimensions' shelf, which currently holds 'Person' and 'Measure Names'. An arrow points from this box to the 'Dimensions' label.
- Measures:** A box on the left containing the 'Measures' shelf, which currently holds 'Age', 'Number of Records', and 'Measure Values'. An arrow points from this box to the 'Measures' label.
- Marks' Visual Variables (and other useful stuff):** A box in the center containing the 'Marks' shelf, which currently holds 'Automatic'. Below it are buttons for 'Color', 'Size', 'Text', 'Detail', and 'Tooltip'. An arrow points from this box to the 'Marks' shelf.
- Visualizations will appear here:** A box in the center containing the 'Columns' and 'Rows' shelves. An arrow points from this box to the 'Columns' shelf.
- Attributes we want to visualize are dropped here:** A box in the center containing the 'Columns' and 'Rows' shelves. An arrow points from this box to the 'Columns' shelf.

The interface also includes a top menu bar (File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help), a toolbar, and a 'Show Me' panel on the right side.



Recall **Dimensions** and **Measures**.

**Example:** People Dataset



**Know your data!**

What was a measurement (**measure**)?

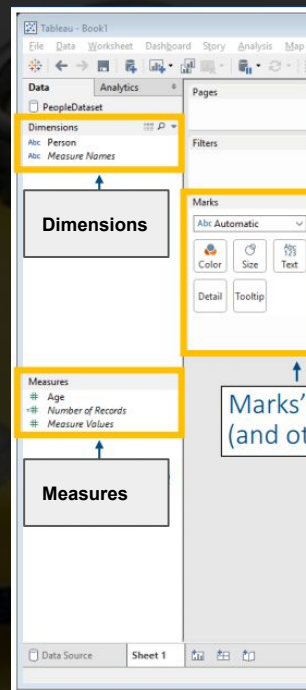
What was a label describing what was measured (**dimension**)?

**Don't know?** Why are you visualizing something you don't understand....



Recall **Dimensions** and **Measures**.

**Example:** People Dataset



**Know your data!**

What was a measurement (**measure**)?

What was a label describing what was measured (**dimension**)?

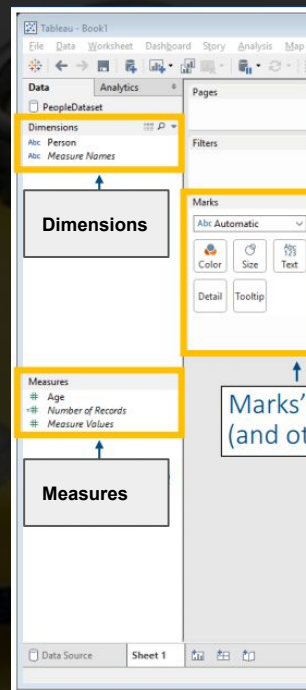
**Don't know?** Why are you visualizing something you don't understand....

Why care? Tableau will enable options based on its understanding of the data.



Recall **Dimensions** and **Measures**.

**Example:** People Dataset



**Know your data!**

What was a measurement (**measure**)?

What was a label describing what was measured (**dimension**)?

**Don't know?** Why are you visualizing something you don't understand....

Why care? Tableau will enable options based on its understanding of the data.

Want to predict the future of a label regarding a measurement? **Huh?!?**

Predict a measured value? **Sure!**



## Creating visualizations

The screenshot shows the Tableau Desktop interface with the following components and annotations:

- Dimensions:** A box labeled "Dimensions" points to the Dimensions shelf, which contains "Person" and "Measure Names".
- Measures:** A box labeled "Measures" points to the Measures shelf, which contains "Age", "Number of Records", and "Measure Values".
- Marks:** A box labeled "Marks' Visual Variables (and other useful stuff)" points to the Marks card, which is set to "Automatic" and displays options for Color, Size, Text, Detail, and Tooltip.
- Columns:** A box labeled "Move 'Pills'" points to the "Person" pill on the Columns shelf.
- Rows:** A box labeled "Visualizations will appear here" points to the "Age" pill on the Rows shelf.



## A note on "Pills"

Pill colour denote if an attribute is **discrete** or **continuous**.

Person

**Blue pill:** Discrete attributes.

**Green pill:** Continuous attributes.

Age



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# Creating visualizations

Abc	#
PeopleDataset.c...	PeopleDataset.c...
Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65

Columns	Person
Rows	
Sheet 1	
Charles	Claire
Person	Emily
John	Samantha

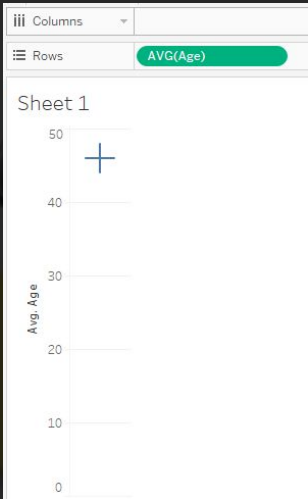
Columns	
Rows	Person
Sheet 1	
Person	
Charles	+
Claire	+
Emily	+
John	+
Samantha	+

Placing discrete attributes creates "headers".  
Value existence is then plotted.



# Creating visualizations

Abc	#
PeopleDataset.c...	PeopleDataset.c...
Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65



Placing continuous attributes creates "plotted **aggregate** values" **on an axis**.

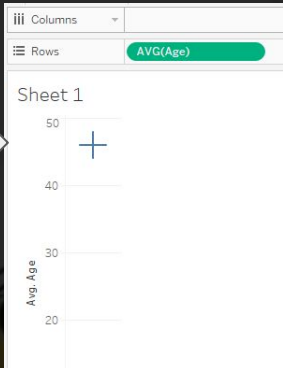
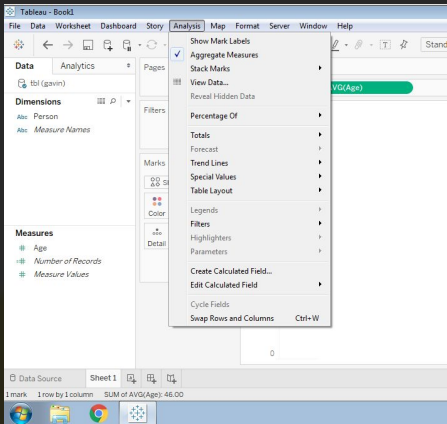


Dragging and dropping continuous attributes by default creates **single point aggregate** measures.



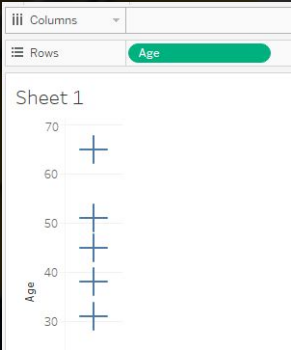
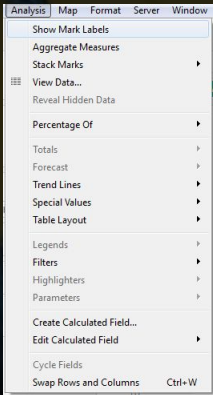
**However:** Measures can be returned to a set of values as per the original data.

Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65



Placing continuous attributes creates "plotted **aggregate** values" **on an axis**.

Or one can select to not aggregate...





Adding Person to columns  
gave us headers.

Abc	#
PeopleDataset.c...	PeopleDataset.c...
Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65

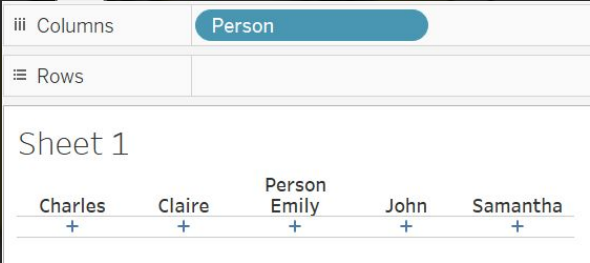
Columns	Person
Rows	
Sheet 1	
Charles	Claire
+	+
Person	Emily
+	+
John	Samantha
+	+

By placing attributes in  
**rows** and **columns** we  
can build basic graphs.



Adding Person to columns gave us headers.

Abc	#
PeopleDataset.c...	PeopleDataset.c...
Person	Age
Emily	45
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By placing attributes in **rows** and **columns** we can build basic graphs.

By combining 1 dimension and 1 measure we can build basic graphs.





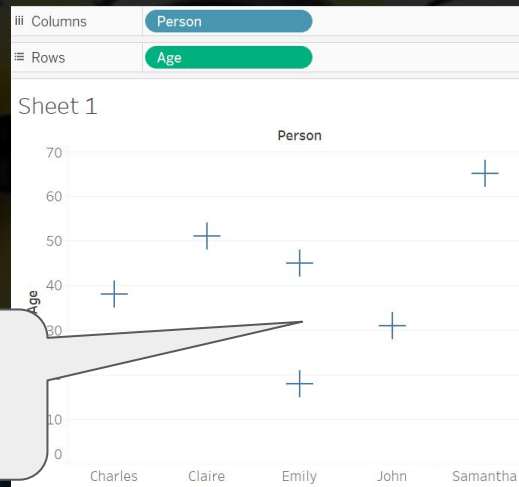
Let's update our data!

Abc PeopleDataset_f.c...	# PeopleDataset_f.c...
Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65
Emily	18
Emily	18

By combining 1 dimension and 1 measure we can build basic graphs.

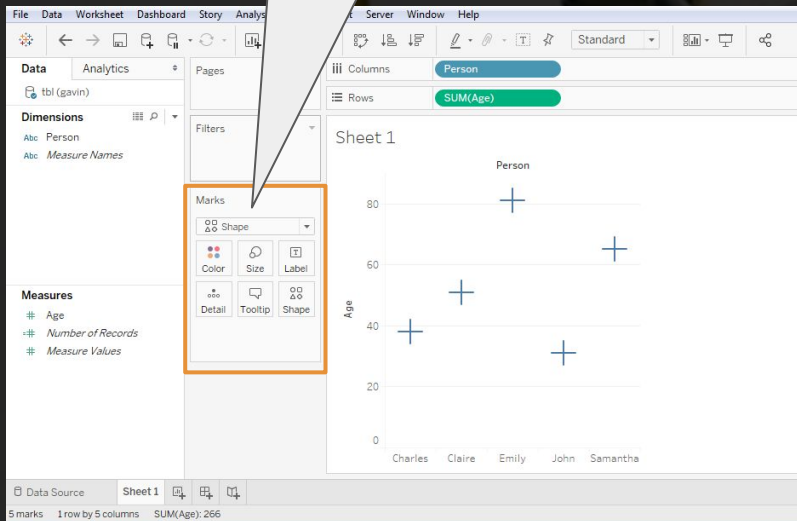


**Note:** No aggregation

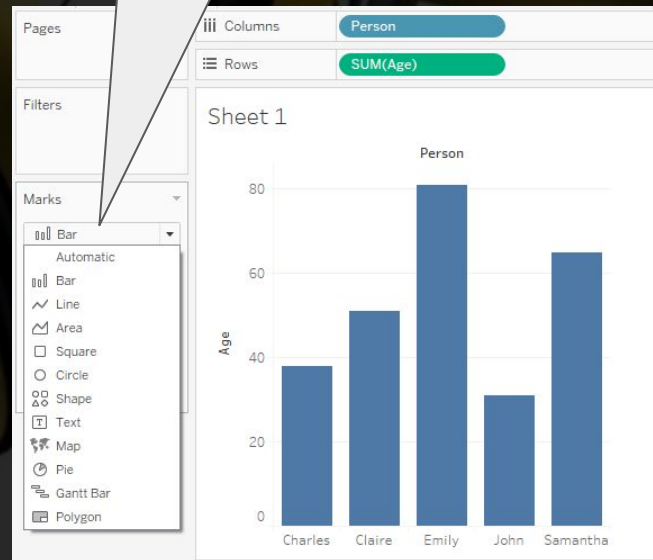




The "mark" drawn for the graph can be selected



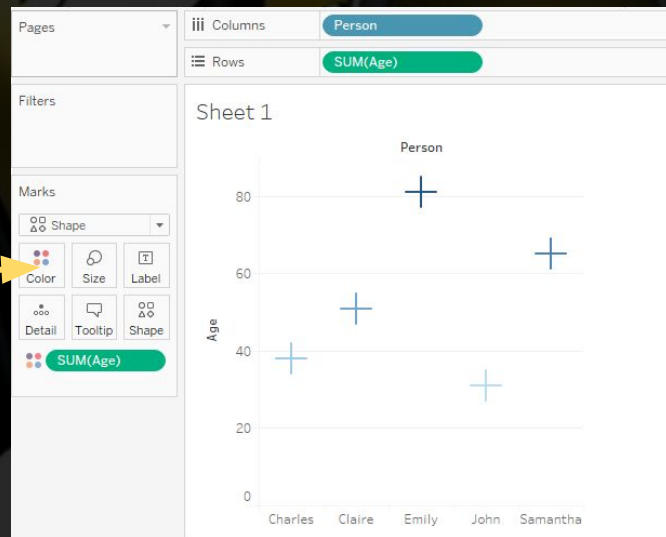
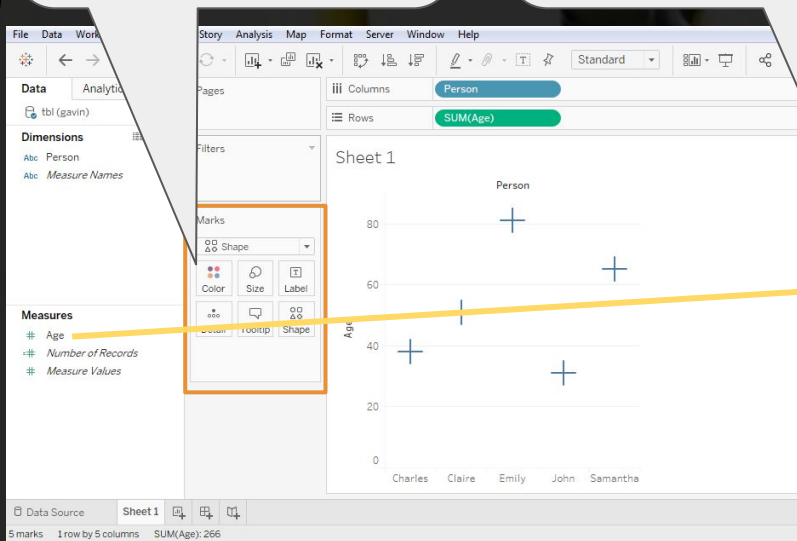
Here "bar" has now been selected.





Or colour, size, label, detail, tooltip or shape changed **based on the value** by a **pill value** (drag & drop)

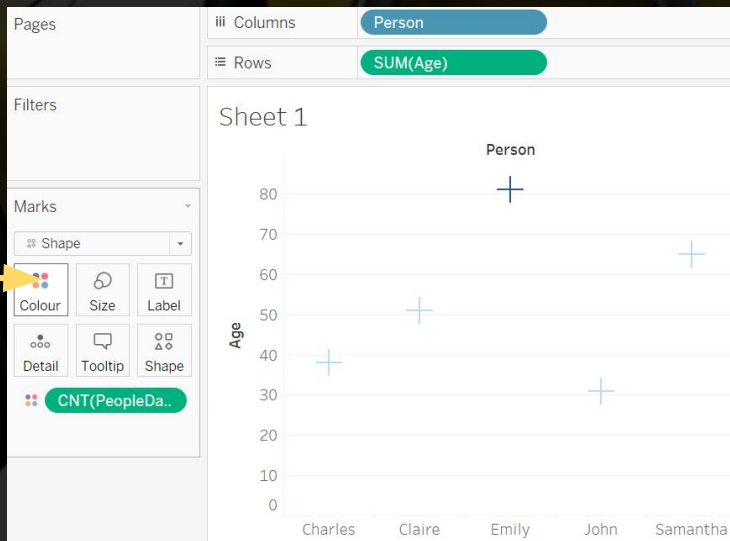
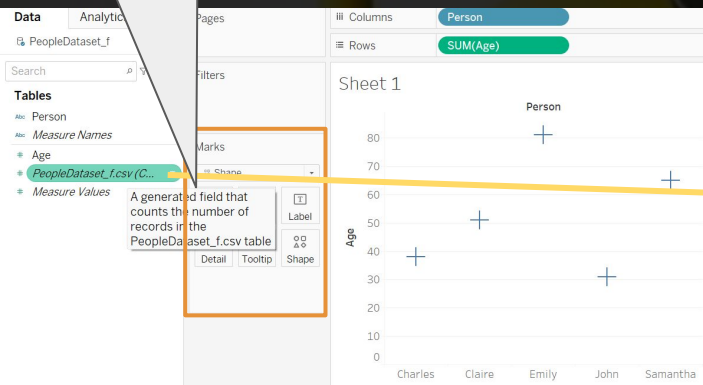
E.g. Dragging "Age" to "Colour"





Or colour, size, label, detail, tooltip or shape changed **based on the value** by a **pill value** (drag & drop)

E.g. Dragging number of records (or "Count") to "Colour"  
(remember Emily appears x3)



Person	Age
Emily	45
John	31
Charles	38
Claire	51
Samantha	65
Emily	18
Emily	18



Adding more **attributes** to the **Rows** and **Columns** shelves adds more rows, columns, and panes to the table.



Dimensions (labels of the measurements) combine ("nest") to show the measure values for all possible label combinations.



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Dimensions (labels of the measurements) combine ("nest") to show the measure values for all possible label combinations.

Measures have created axis and plotted values.



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Dimensions (labels of the measurements) combine ("nest") to show the measure values for all possible label combinations.

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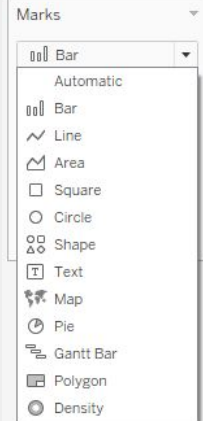
Measures GO AFTER dimensions on a shelf.



Adding more **attributes** to the *Rows* and *Columns* shelves adds more rows, columns, and panes to the table.



Inner attributes determine an automatic **mark type**. Here: Bar.



Automatic is not always what you want.

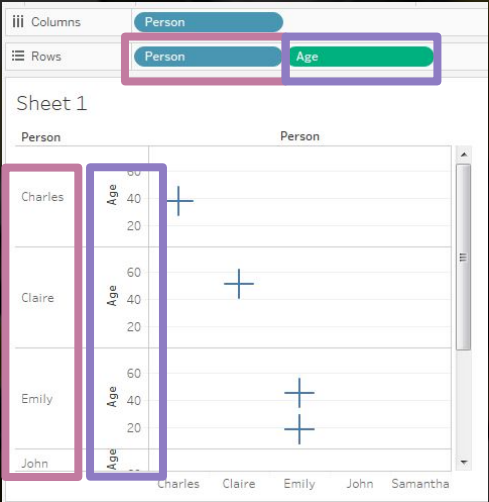
Change it as you see fit in the Marks card!



# Meaningless graphs to show pill combinations

outer

inner



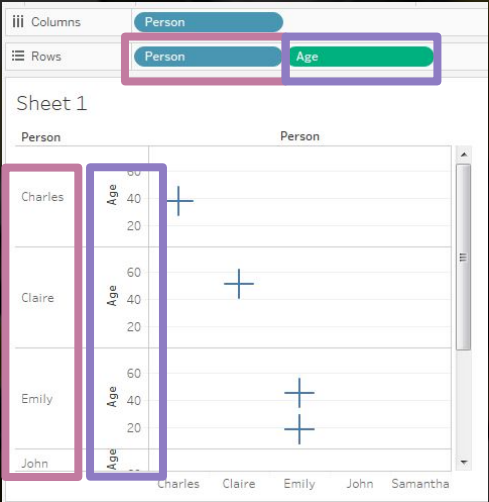
Person	Age
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Emily	18



Meaningless  
graphs to show  
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outer

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## A small problem for context.

**Data:** Every week, the Minions are busy across their different activities...

..., i.e. managing banana supplies, plotting evil plans, working in the lab, causing mischief, training, and cleaning up the mess afterward.

Now being a data guy, what does Gru do?





## A small problem for context.

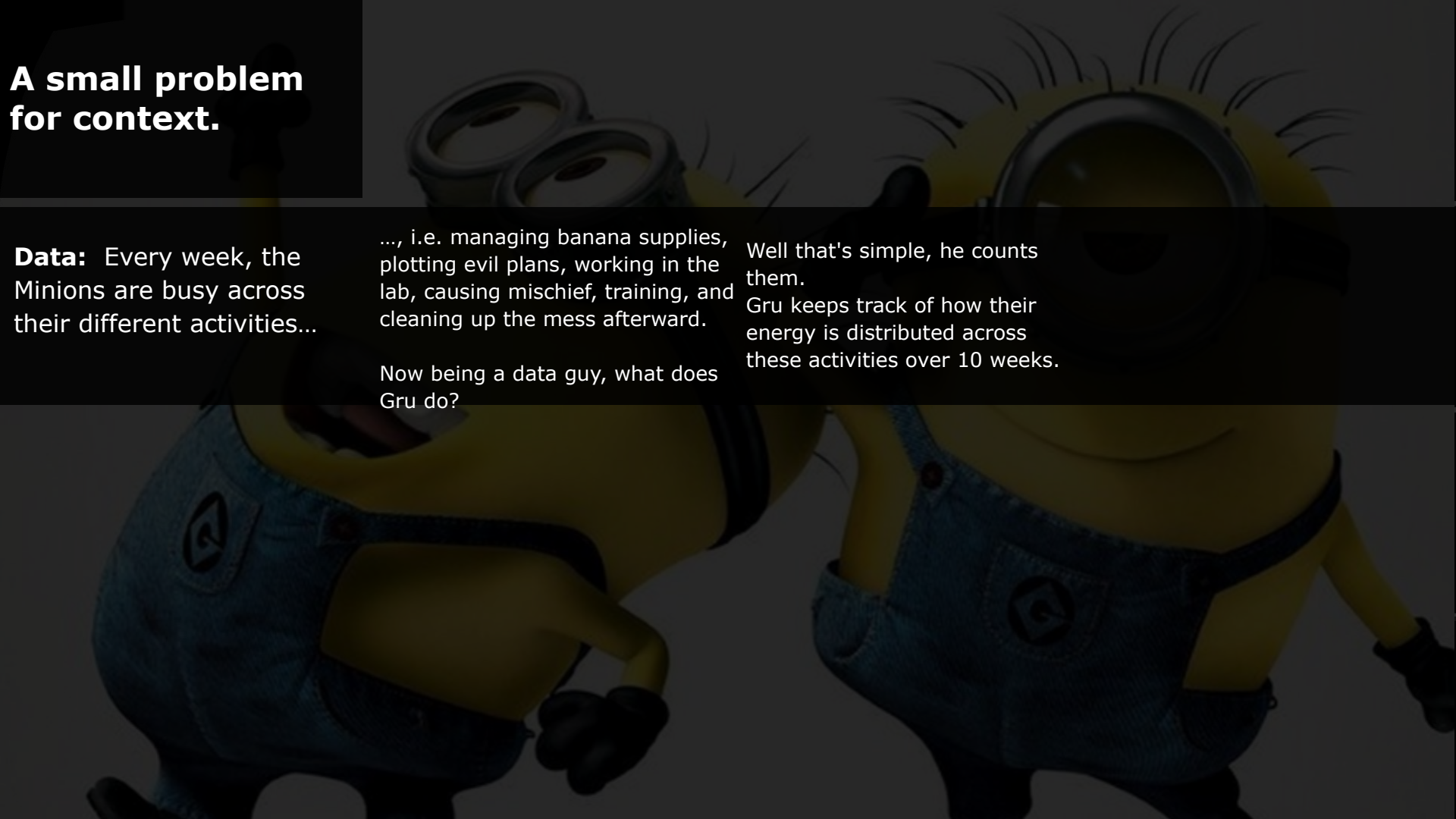
**Data:** Every week, the Minions are busy across their different activities...

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Now being a data guy, what does Gru do?

Well that's simple, he counts them.

Gru keeps track of how their energy is distributed across these activities over 10 weeks.





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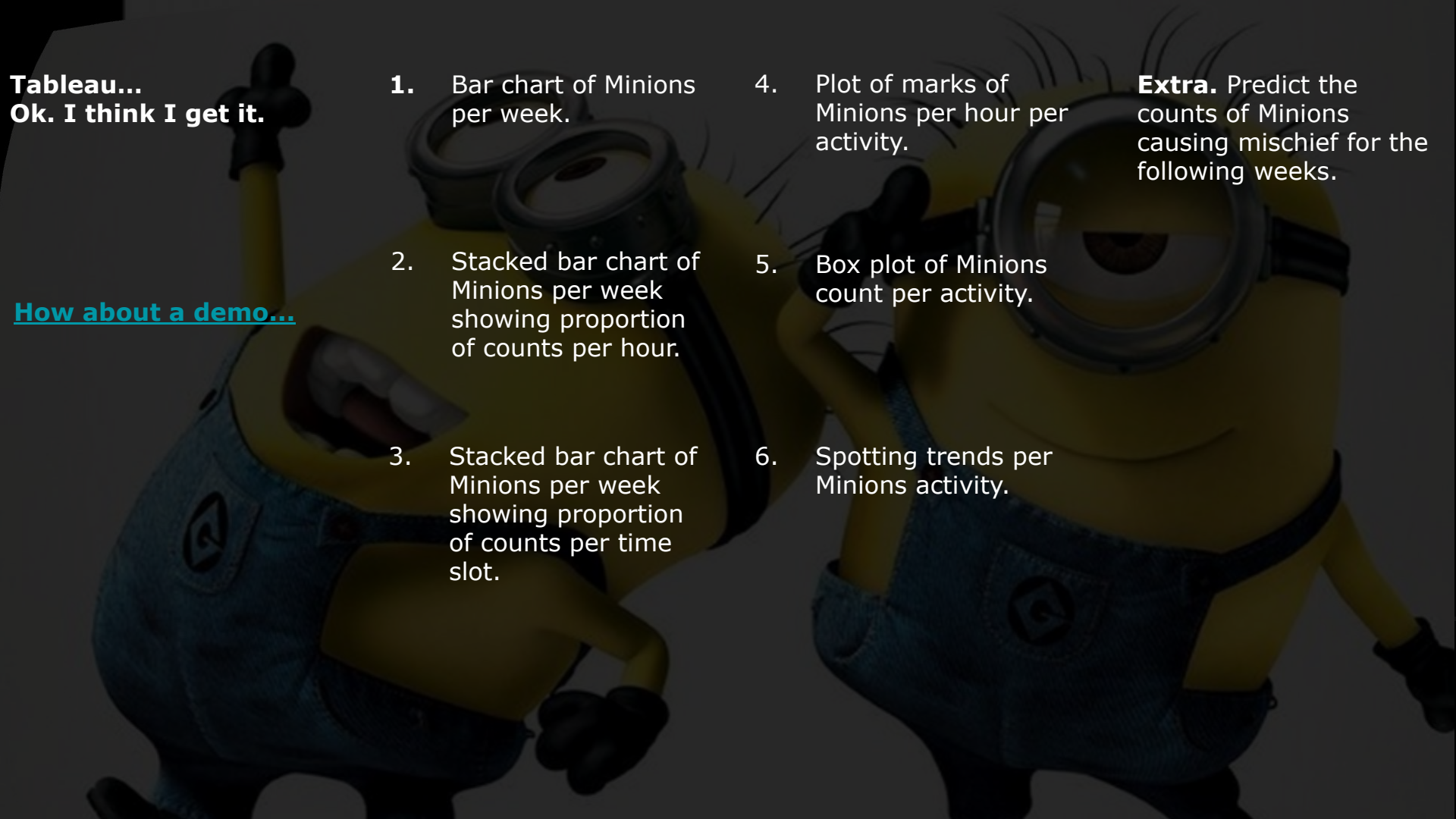
Well that's simple, he counts them.

Gru keeps track of how their energy is distributed across these activities over 10 weeks.

**The Data is very simple.**

Week	Banana Supply	Evil Plans	Lab Work	Mischief	Training	Cleanup
Week 1	101	67	56	18	49	35
Week 2	90	60	56	29	38	23
Week 3	86	40	39	37	31	21
Week 4	75	51	57	40	42	32
Week 5	69	65	57	51	39	18
Week 6	65	61	45	57	44	39
Week 7	50	68	44	62	22	28
Week 8	46	51	59	76	24	32
Week 9	39	64	59	82	38	23
Week 10	29	56	44	86	26	35





**Tableau...**  
**Ok. I think I get it.**

1. Bar chart of Minions per week.

4. Plot of marks of Minions per hour per activity.

**Extra.** Predict the counts of Minions causing mischief for the following weeks.

2. Stacked bar chart of Minions per week showing proportion of counts per hour.

5. Box plot of Minions count per activity.

3. Stacked bar chart of Minions per week showing proportion of counts per time slot.

6. Spotting trends per Minions activity.

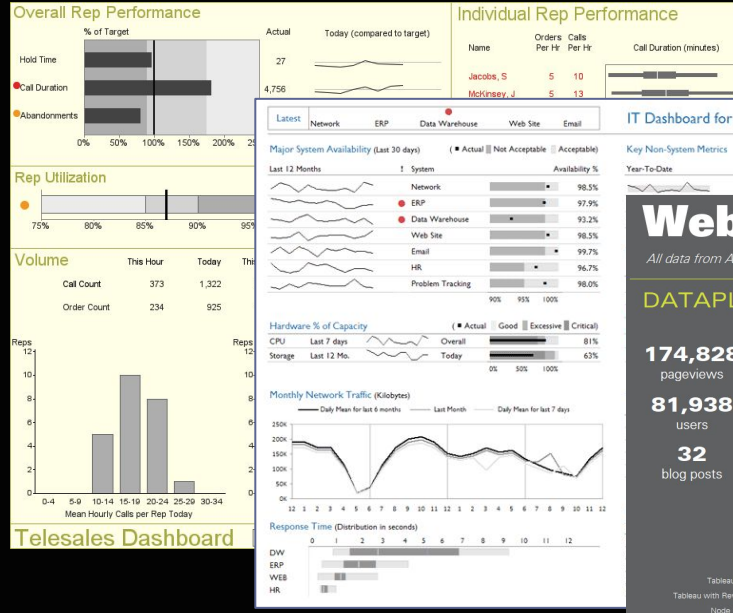
[How about a demo...](#)



# Dashboards *\*are\** part of real world data analytics (at least until you can get someone else to do it)

## Presentation:

- clearly stated messages
- concise (data to ink ratio)
- direct
- customized to goals
- consistent layout - data changes over time, not layout



## Website Analytics

All data from August 1, 2015 through July 15, 2016

data + science  
transforming data to insight

DATAPLUSSSCIENCE.COM

174,828  
pageviews

81,938  
users

32  
blog posts

## Complaints Dashboard

Total Complaints: Closed 288 Open 39 Total 327

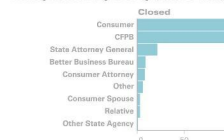
Complaints by Month



Complaints by Reason



Complaints by Party



NLAB:

Data at Scale

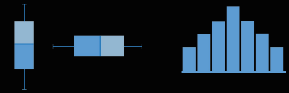




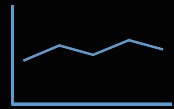
Comparing data across categories



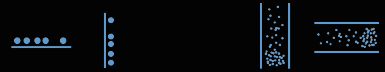
Showing / understanding the distribution of your data



Viewing trends in data over time



Investigating the relationship between different variables



Showing the relationship between two factors.



\$60,000	\$17,907	\$80,000
\$5,000	\$2,000	\$1,000
\$10,000	\$3,000	\$2,000
\$15,000	\$4,000	\$3,000
\$20,000	\$5,000	\$4,000
\$25,000	\$6,000	\$5,000
\$30,000	\$7,000	\$6,000
\$35,000	\$8,000	\$7,000
\$40,000	\$9,000	\$8,000
\$45,000	\$10,000	\$9,000
\$50,000	\$11,000	\$10,000
\$55,000	\$12,000	\$11,000
\$60,000	\$13,000	\$12,000

Showing geocoded (located) data



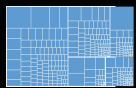
Displaying things in use over time.



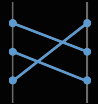
Evaluating performance of a metric against a goal



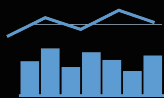
Showing hierarchical data as a proportion of a whole



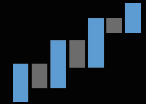
Showing a comparison of rank (typically between two time periods)



Show general trends / overall information, add extra context



Showing the gradual transition (+/-) in the quantitative value.



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