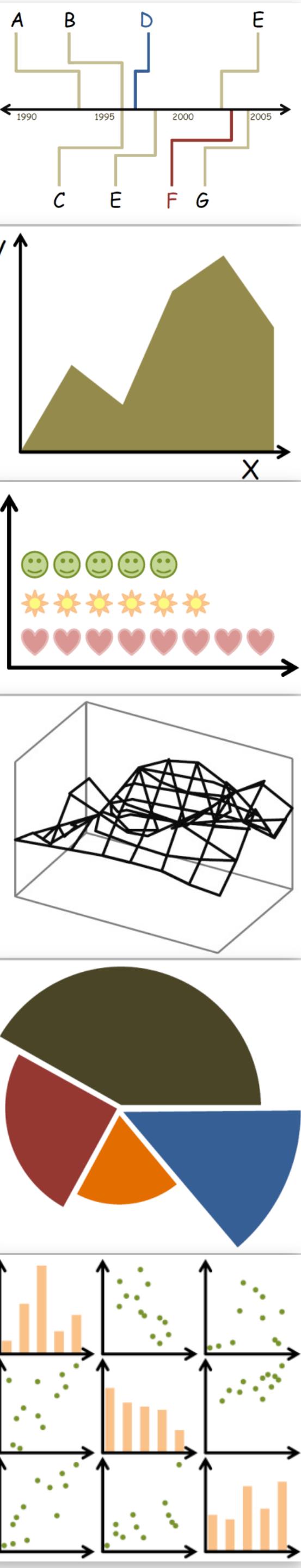


Lecture 9: Visual Encodings

DS 4200
SPRING 2023

Prof. Ab Mosca (*they/them*)
NORTHEASTERN UNIVERSITY



Slides and inspiration from Cody Dunne, Michelle Borkin, Dylan Cashman, Krzysztof Gajos, Hanspeter Pfister, Miriah Meyer, Jonathan Schwabish, and David Sprague

Last Class

We:

- Worked on D3

Any Questions?

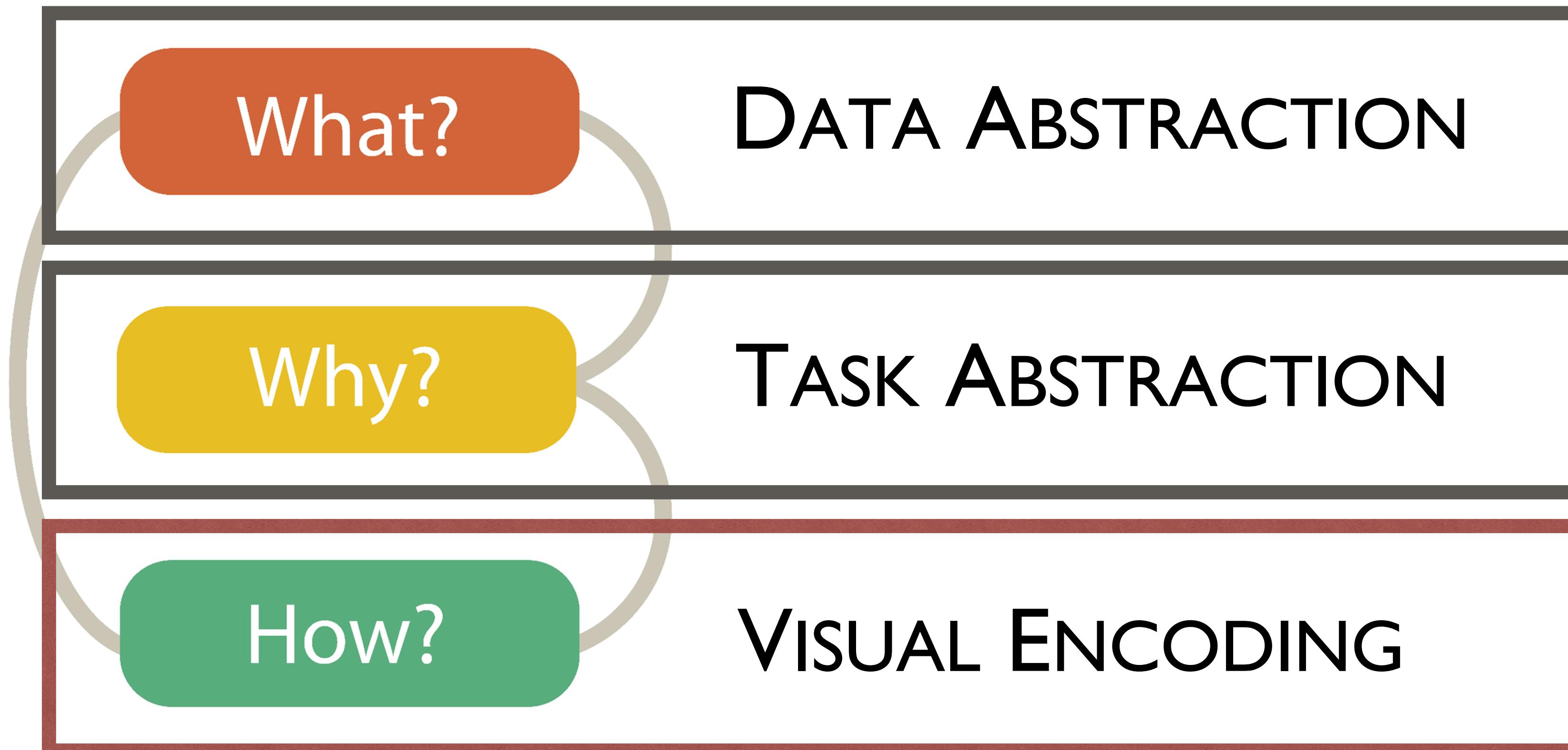
Today

- Visual Encodings (for tables)
- Sketching new visualizations \ iterative design

VISUAL ENCODINGS

From Munzner's book

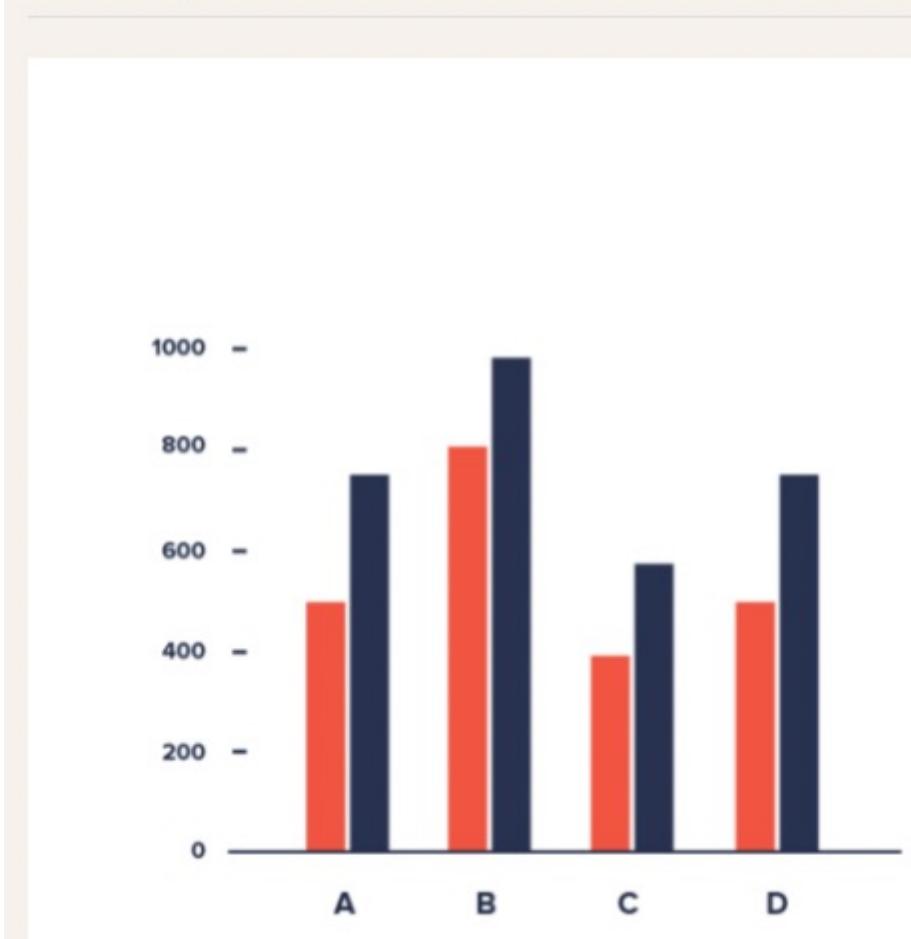
Visualization Building Blocks



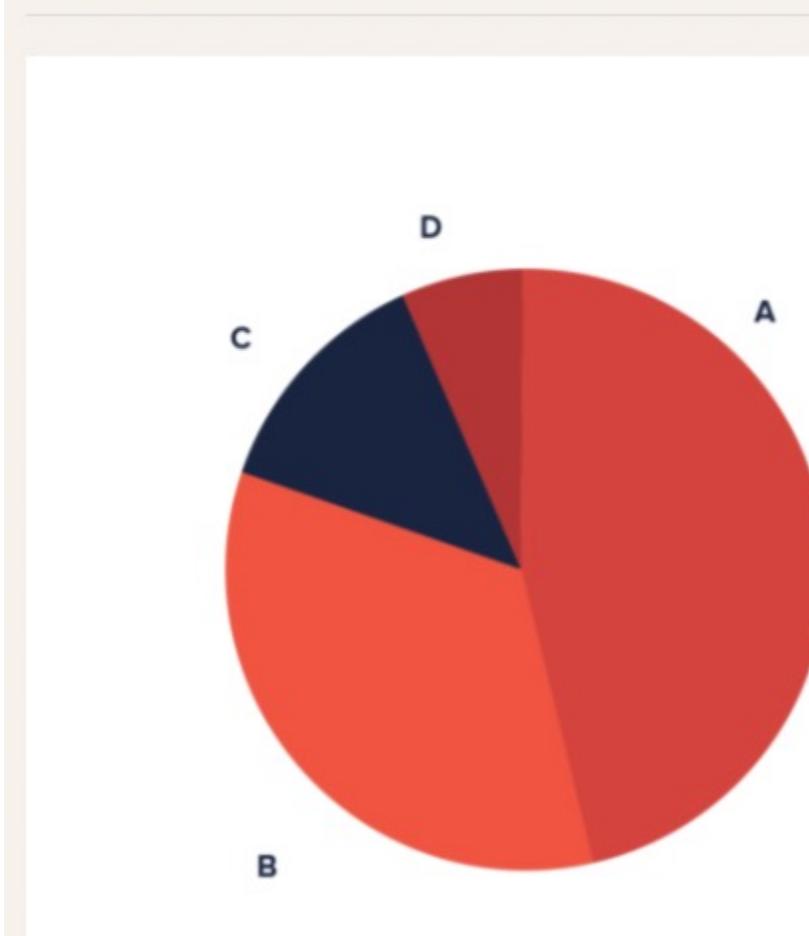
Visual Encoding

What is it? The literal representation of data in a visualization.

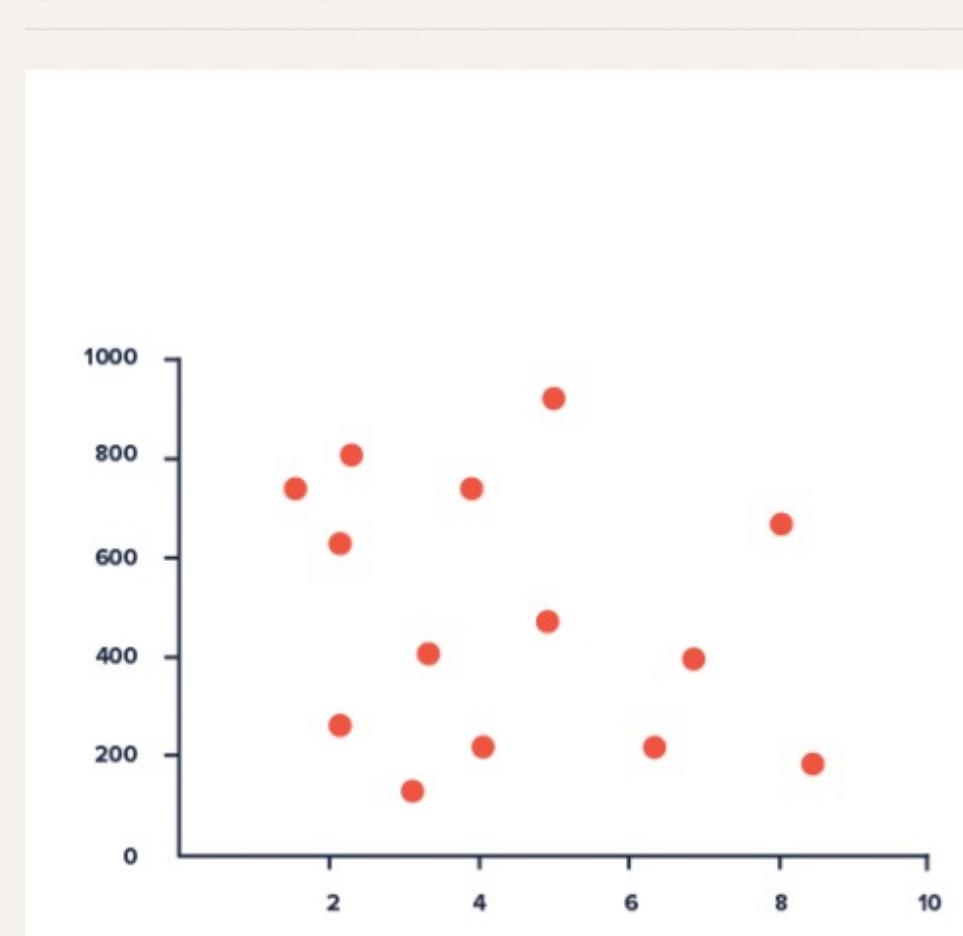
Grouped Bar Chart



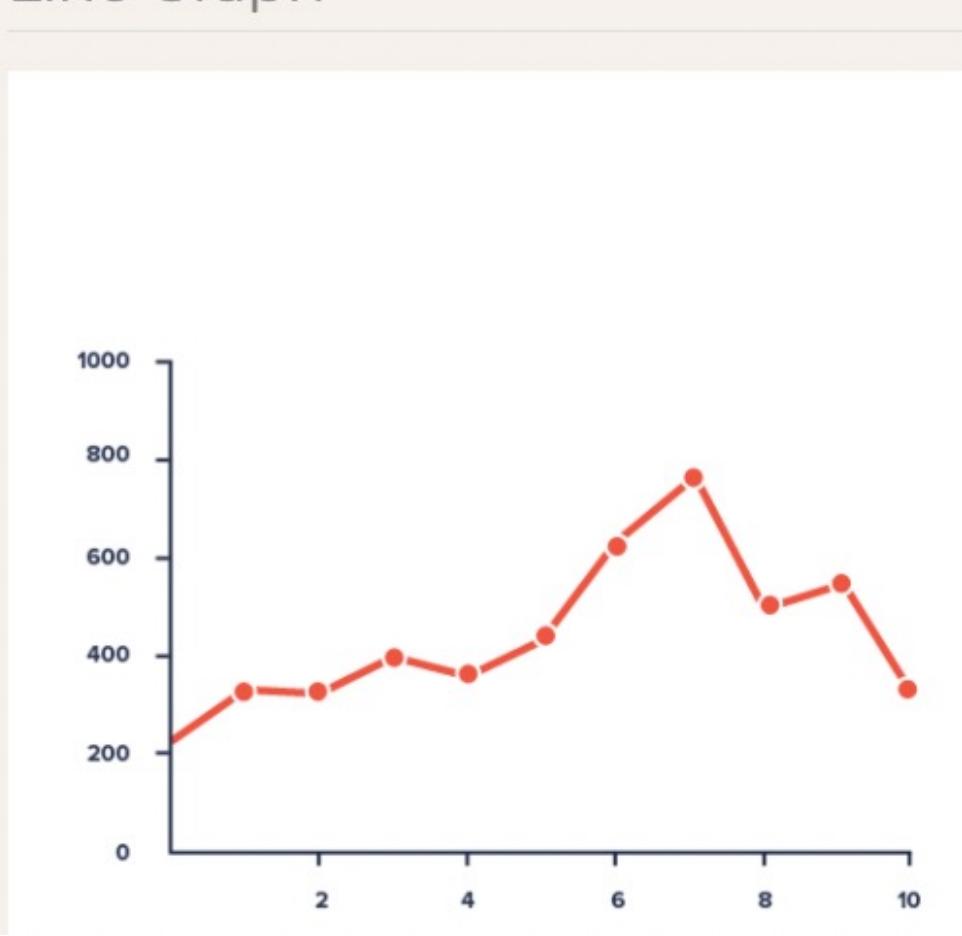
Pie Chart



Scatter Plot

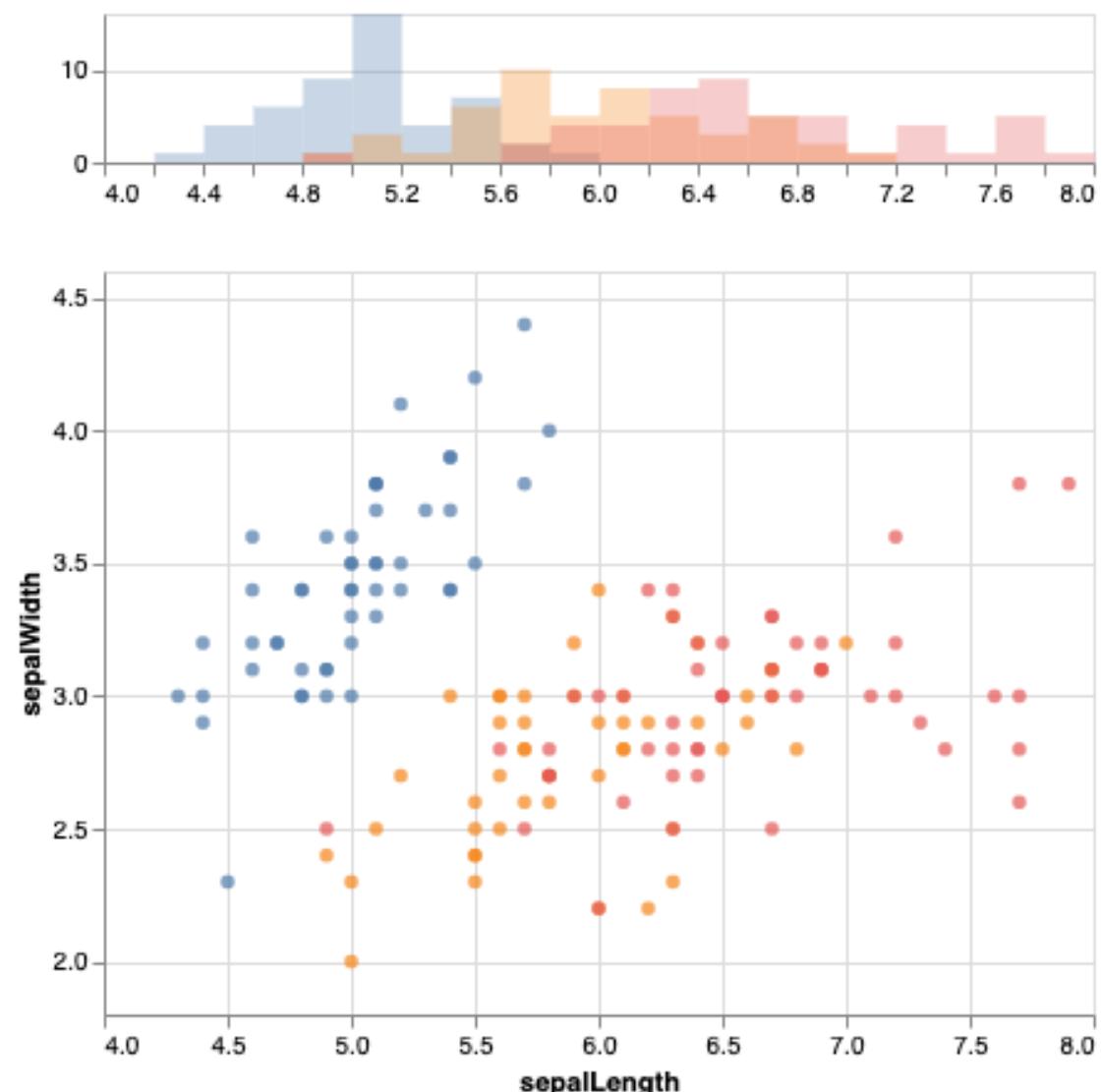


Line Graph

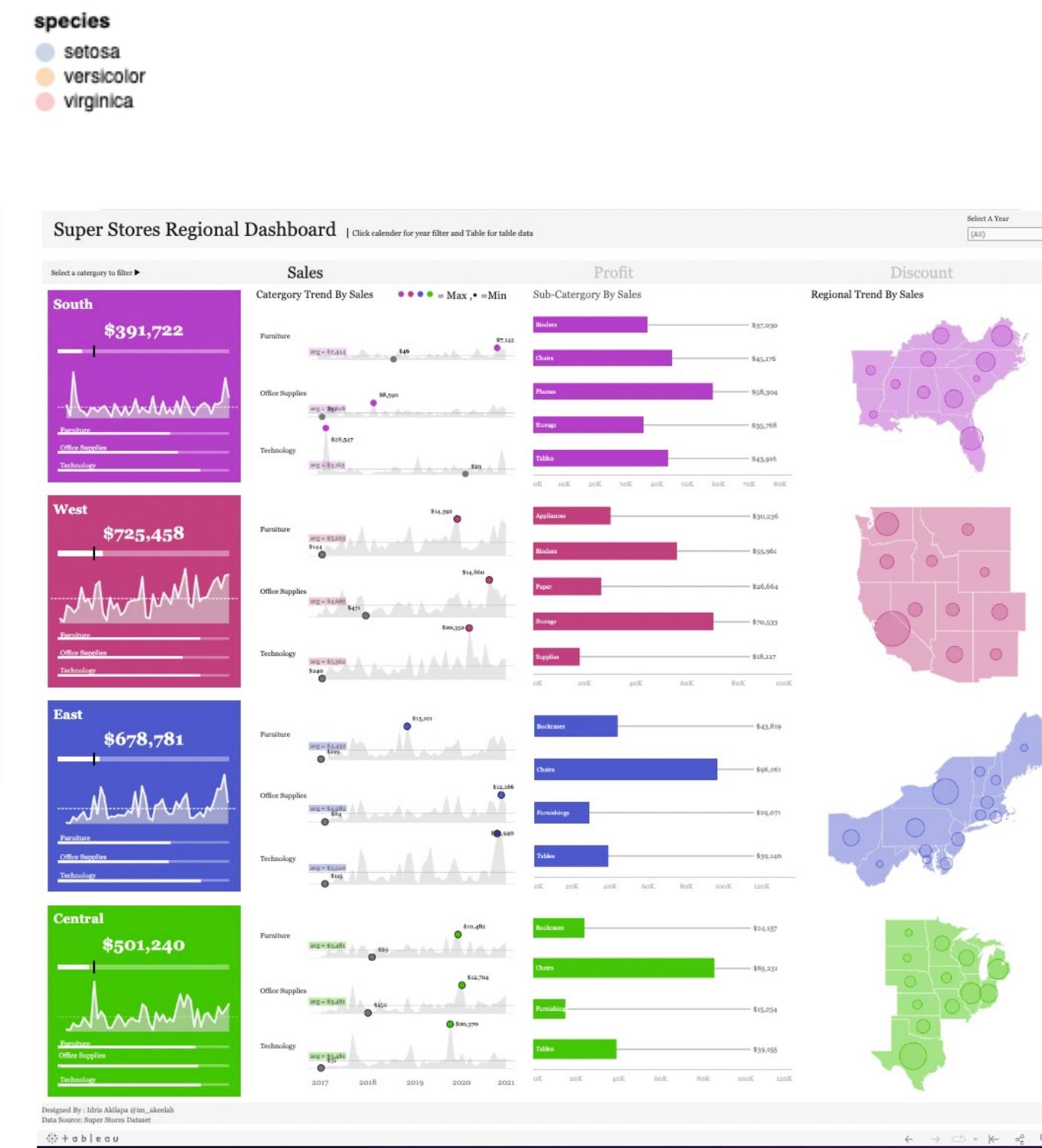


Visual Encoding

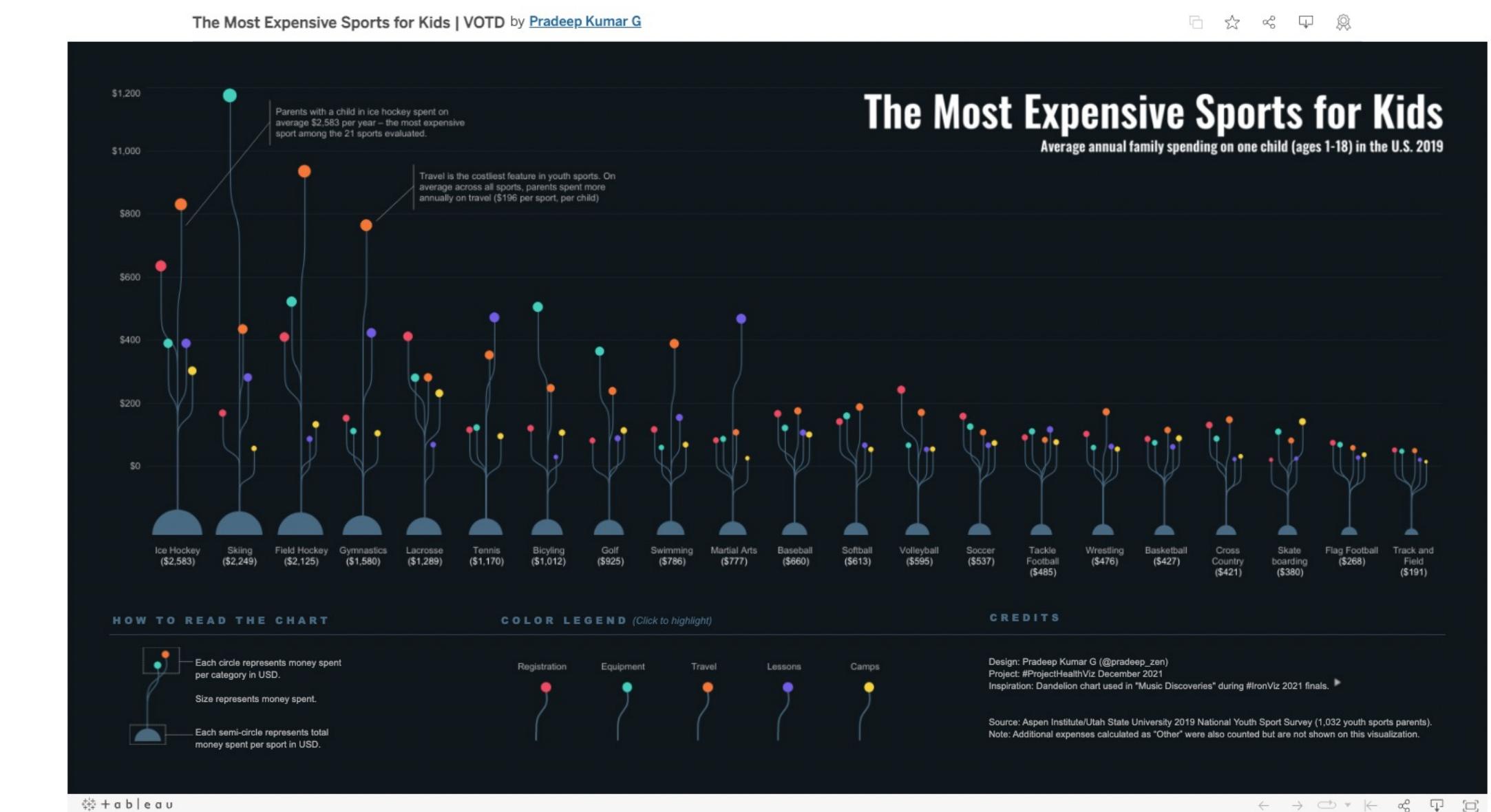
What is it? The literal representation of data in a visualization.



<https://altair-viz.github.io/gallery/index.html>



<https://public.tableau.com/app/profile/akilapa.idris5302/viz/SuperStoresRegionalDashboard/SuperStoreRegionalDashboard>



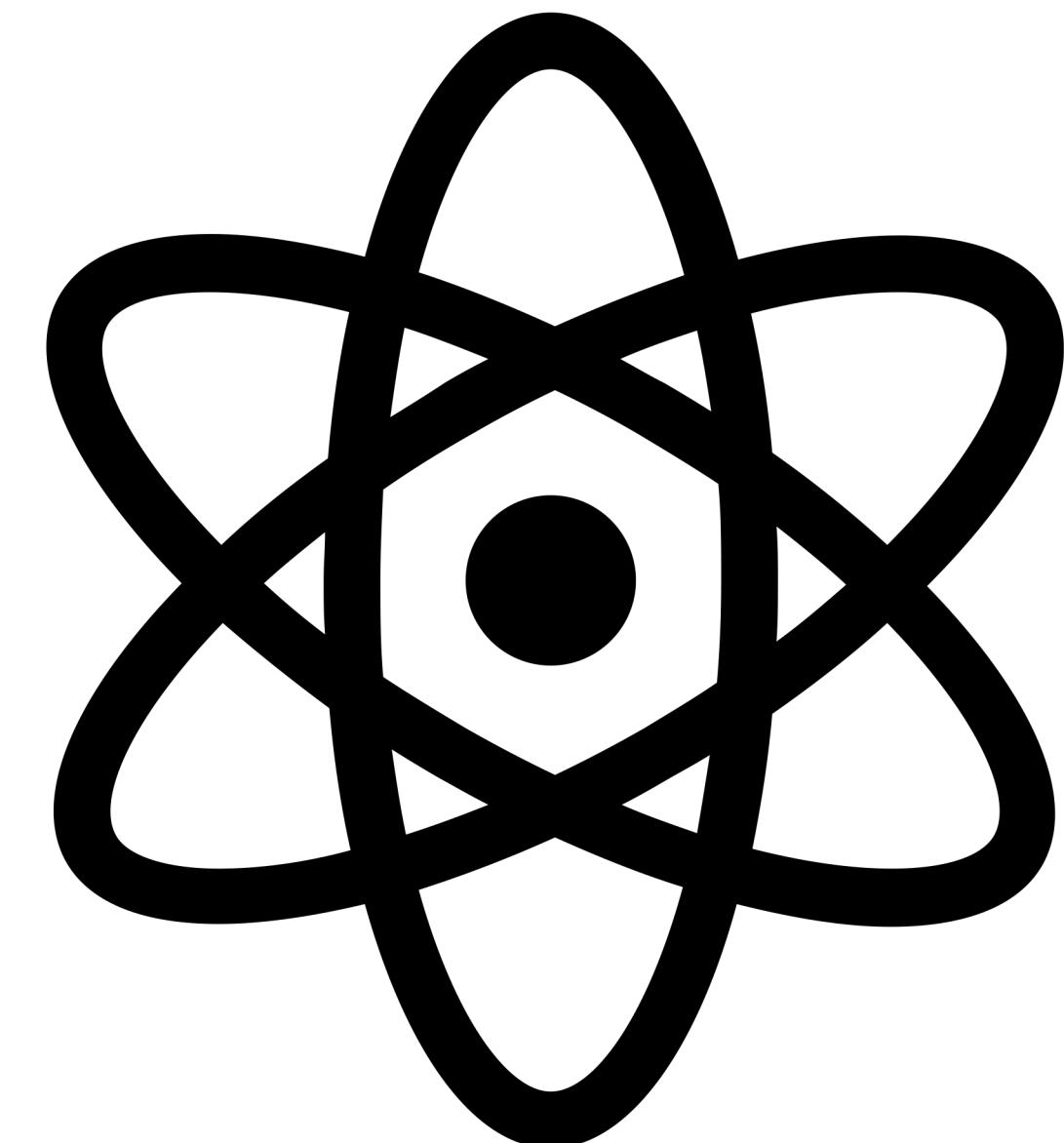
<https://public.tableau.com/app/profile/pradeepkumar.g/viz/TheMostExpensiveSportsforKids/ProjectHealthViz>

Marks and Channels

MARKS AND CHANNELS = basic visual primitives that make up visualizations

MARK = basic graphical element in an image

CHANNELS = ways to control the appearance of marks

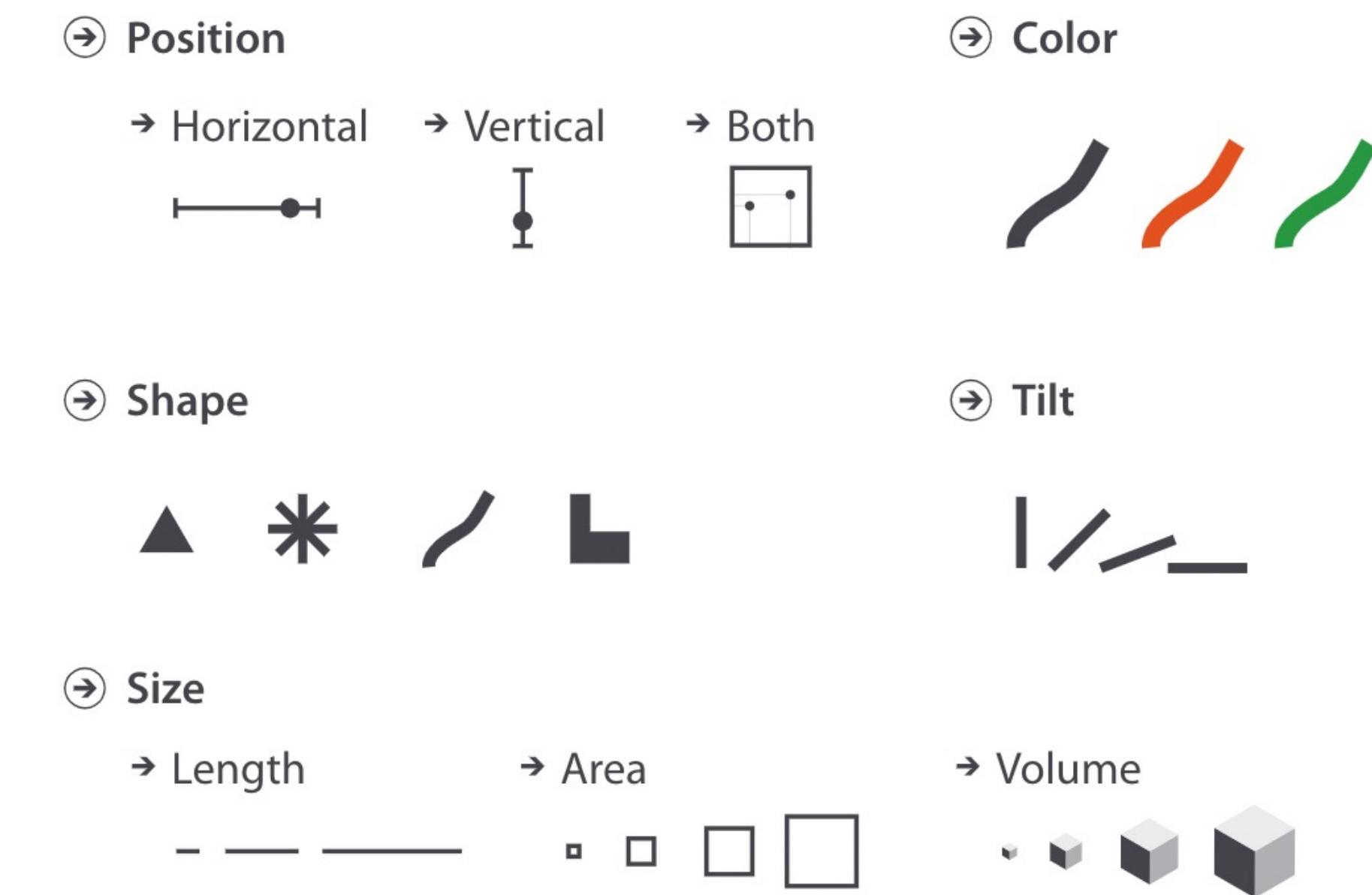


Visual Encoding

MARKS



CHANNELS

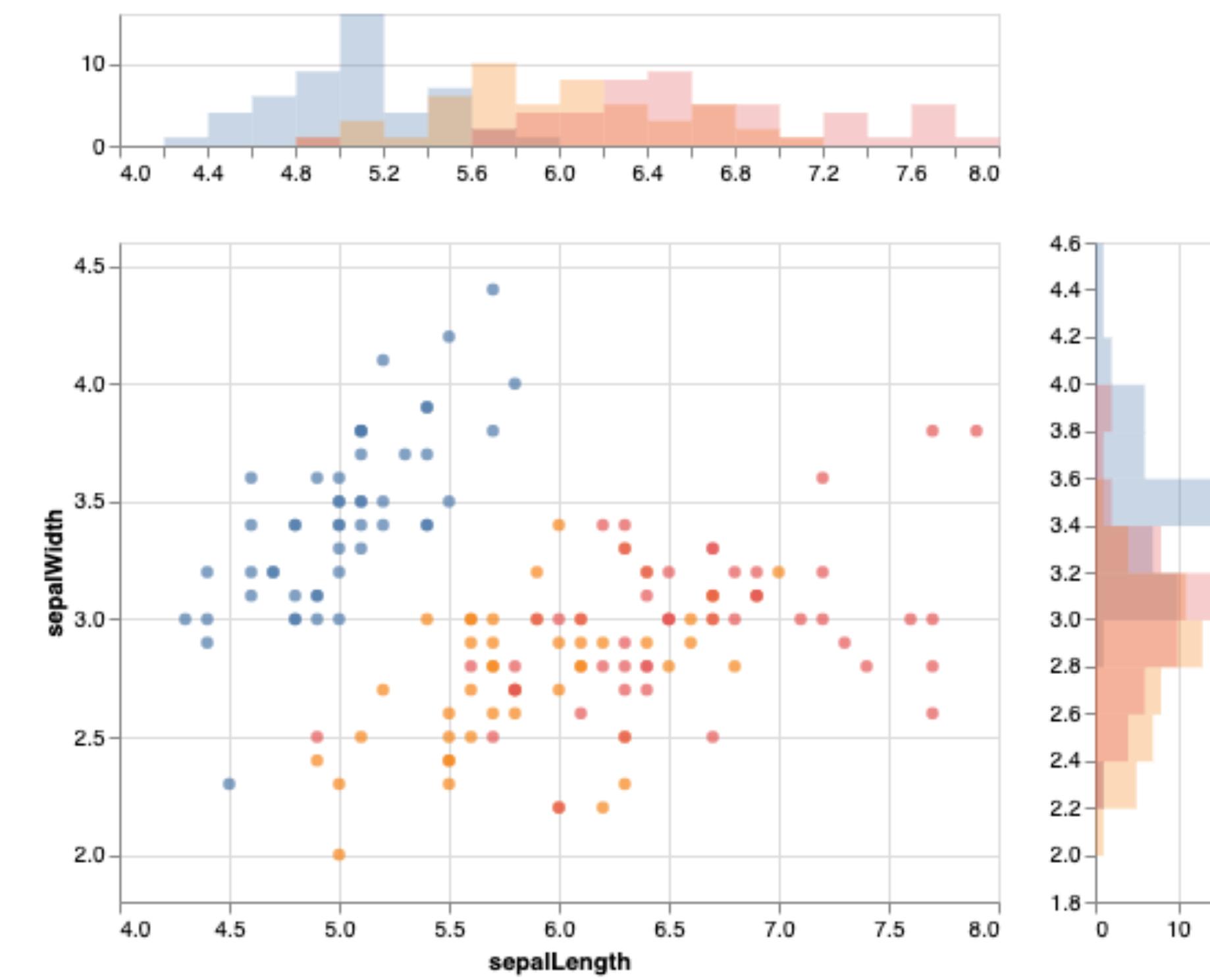


Visual Encoding

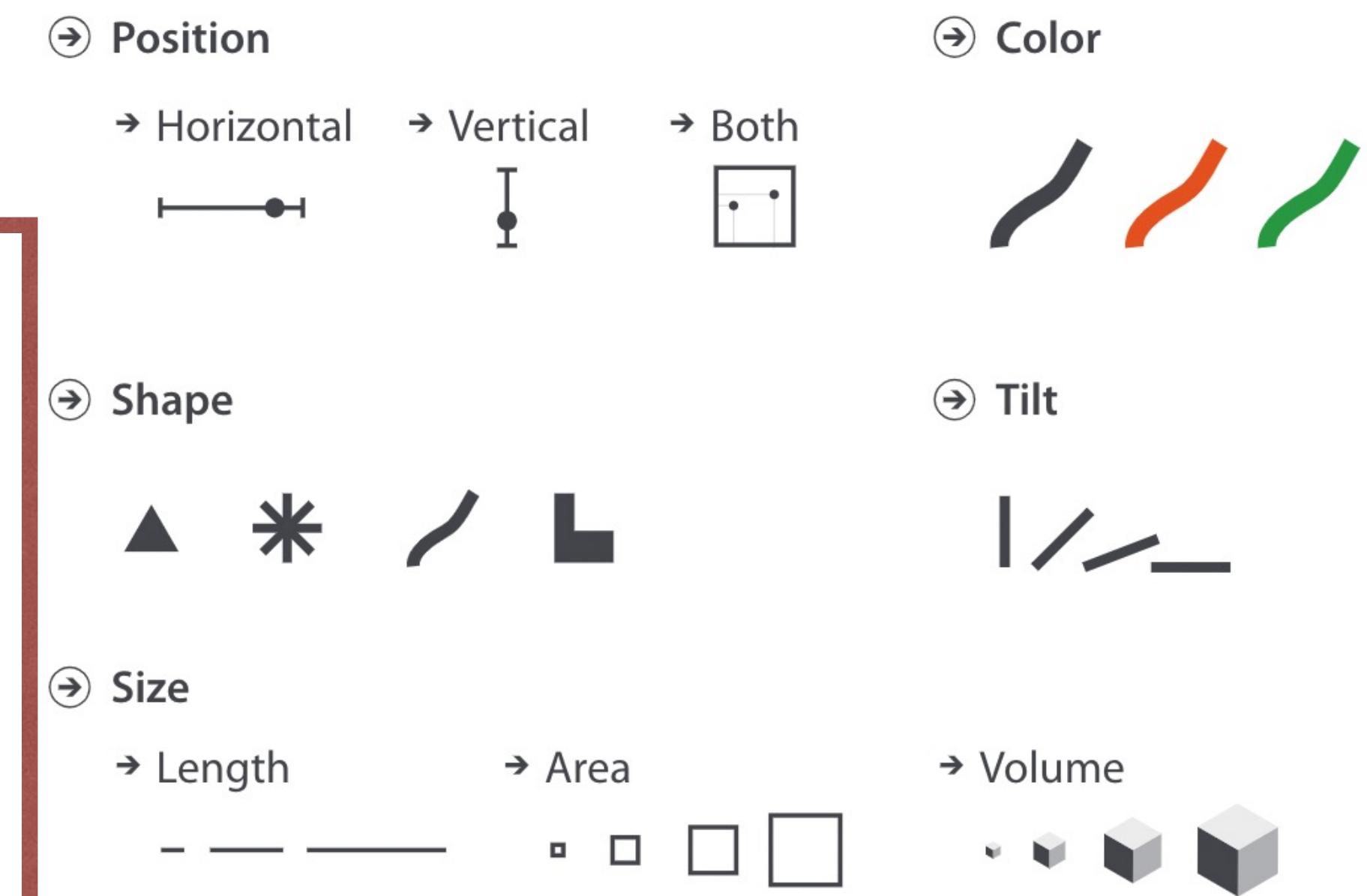
MARKS



What are the marks and channels in this vis?



CHANNELS



Visual Encoding

DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

What are the items, attributes, and attribute types in this dataset?

Visual Encoding

Items:

- row (flight)

Attributes:

- columns

DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

ordinal

categorical

categorical

ordinal

ordinal

categorical

categorical

quantitative

Visual Encoding

Items:

- row (flight)

Attributes:

- columns

DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

ordinal categorical categorical categorical ordinal ordinal categorical categorical quantitative

Sketch a visual encoding that allows the user to check for a relationship between DAY_OF_WEEK and DISTANCE for these flights. Secondarily, your visual encoding should show the DEST and DIVERTED status of each flight.

Visual Encoding

DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

MARKS:

- points (item)

CHANNELS:

- DAY_OF_WEEK → horizontal position
- DISTANCE → vertical position
- DEST → shape
- DIVERTED → color

Visual Encoding

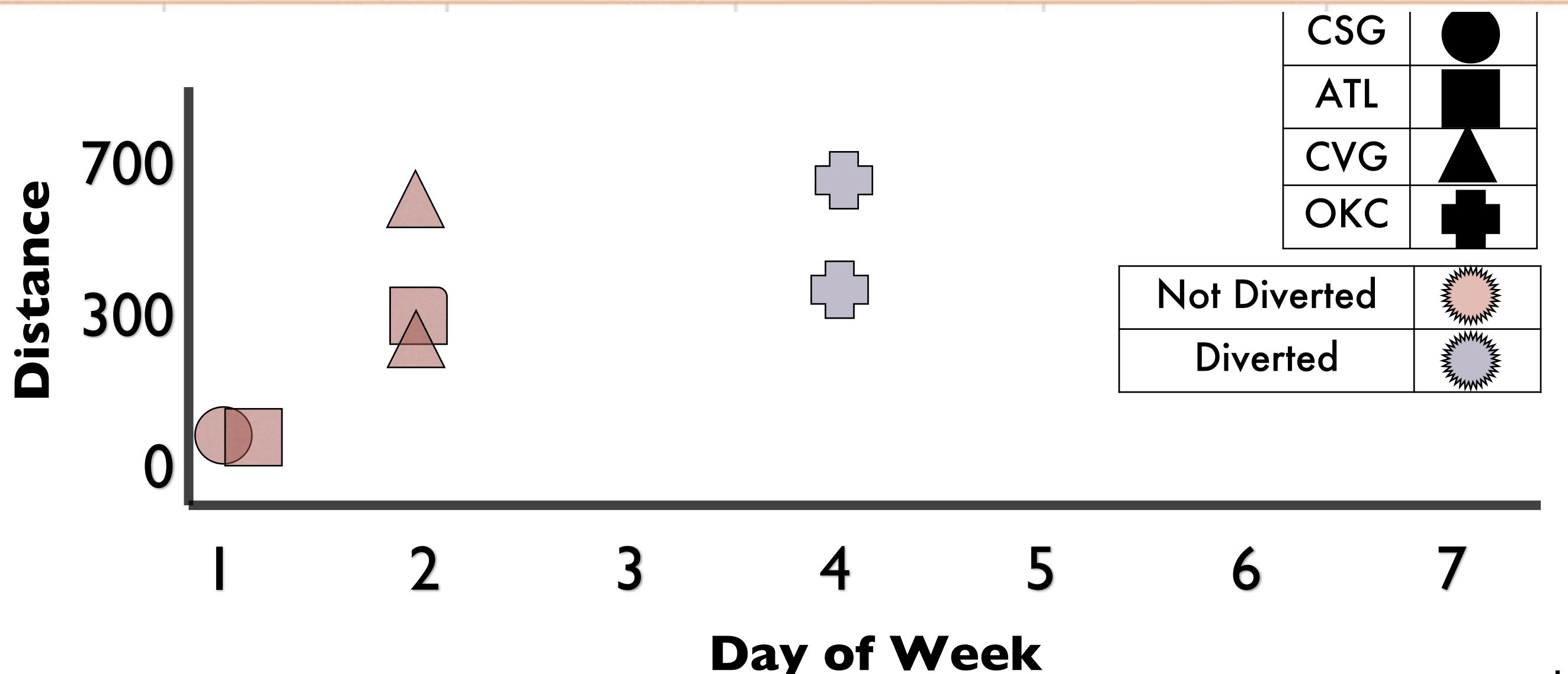
DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

MARKS:

- points (item)

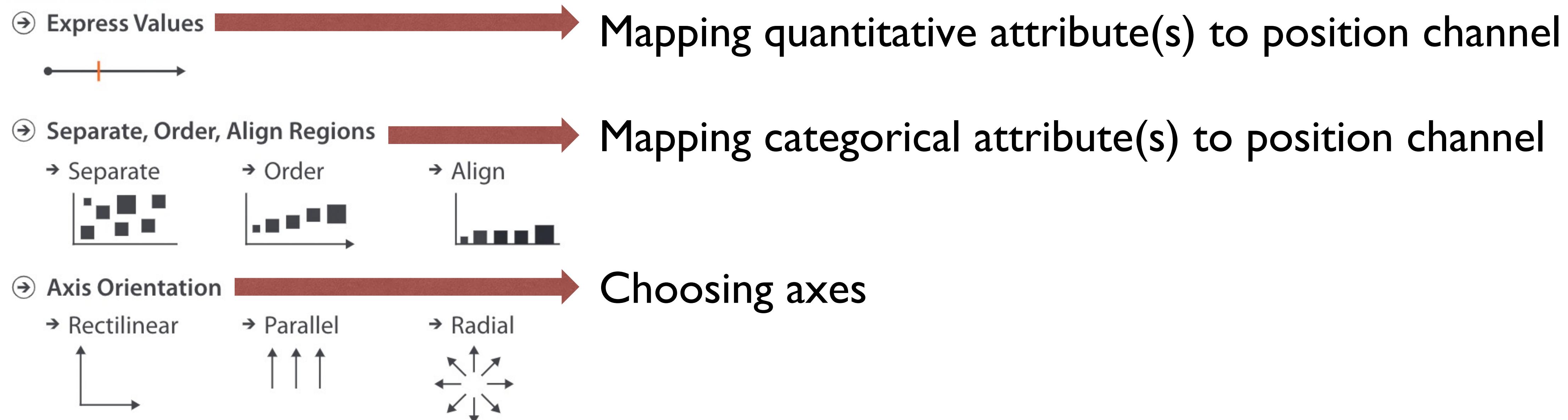
CHANNELS:

- DAY_OF_WEEK → horizontal position
- DISTANCE → vertical position
- DEST → shape
- DIVERTED → color



Arrange (tables)

ARRANGE (HOW WILL WE USE OUR MOST EFFECTIVE CHANNELS?)



Arrange (tables)

ARRANGE

Express Values



Separate, Order, Align Regions

→ Separate



→ Order

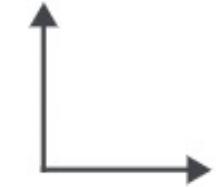


→ Align



Axis Orientation

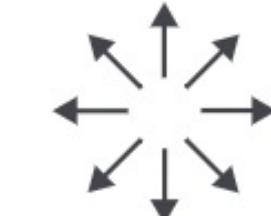
→ Rectilinear



→ Parallel



→ Radial

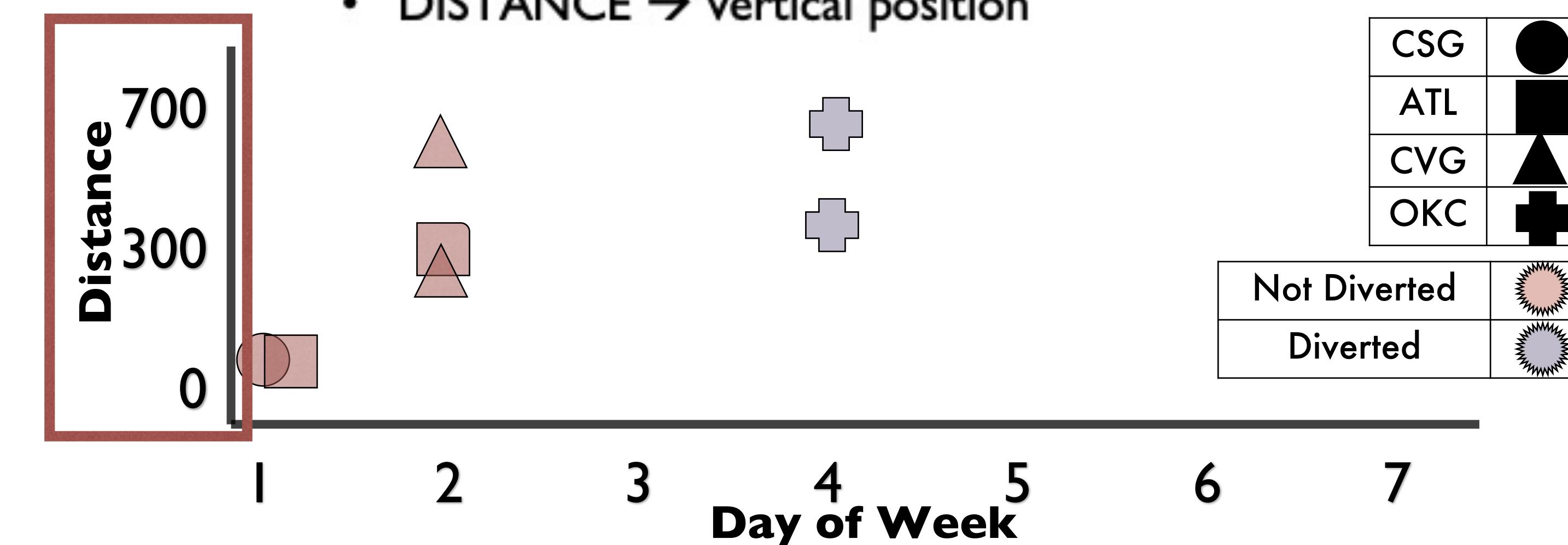


MARKS:

- points (item)

CHANNELS:

- DAY_OF_WEEK → horizontal position
- DEST → shape
- DIVERTED → color
- DISTANCE → vertical position



Arrange (tables)

ARRANGE

→ Express Values



→ Separate, Order, Align Regions

→ Separate



→ Order

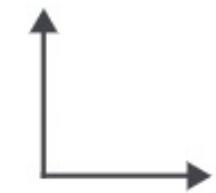


→ Align



→ Axis Orientation

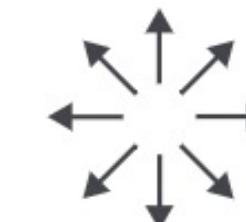
→ Rectilinear



→ Parallel



→ Radial



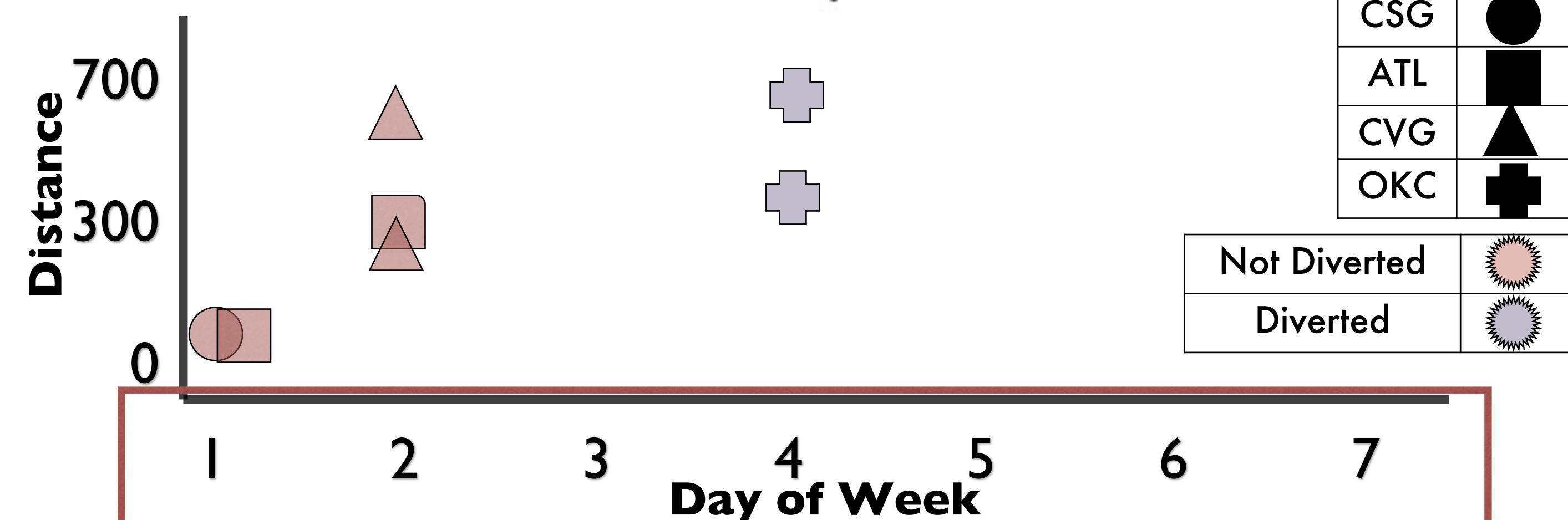
DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

MARKS:

- points (item)

CHANNELS:

- DAY_OF_WEEK → horizontal position
- DEST → shape
- DIVERTED → color
- DISTANCE → vertical position



Arrange (tables)

ARRANGE

Express Values



Separate, Order, Align Regions

→ Separate



→ Order

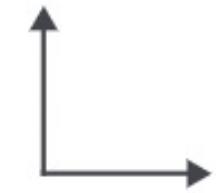


→ Align



Axis Orientation

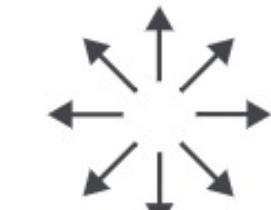
→ Rectilinear



→ Parallel



→ Radial



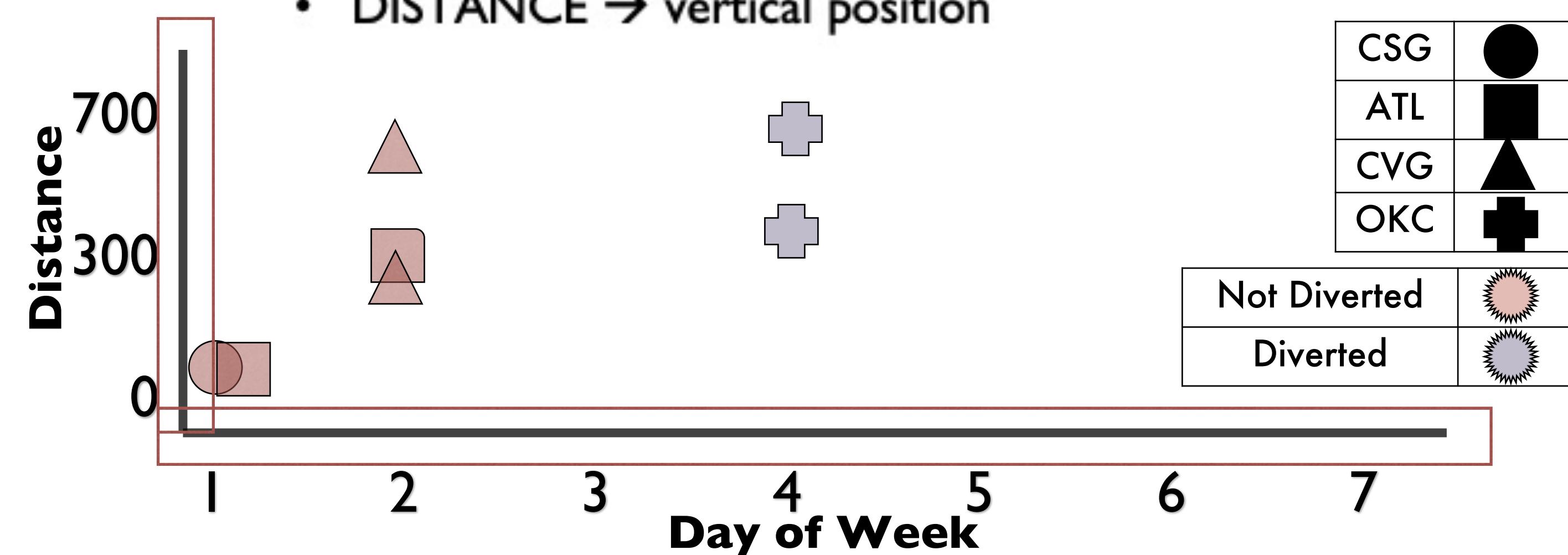
DAY_OF_WEEK	TAIL_NUM	ORIGIN	DEST	DEP_TIME	ARR_TIME	CANCELLED	DIVERTED	DISTANCE
1	N8970D	ATL	CSG	1640	1712	0	0	83
1	N8970D	CSG	ATL	1743	1831	0	0	83
2	N8688C	GNV	ATL	601	722	0	0	300
2	N348PQ	MSP	CVG	1359	1633	0	0	596
2	N8896A	DTW	CVG	1215	1329	0	0	229
4	N202SY	DEN	OKC	2012	1135	0	1	495
4	N134SY	ORD	OKC	1928	1026	0	1	693

MARKS:

- points (item)

CHANNELS:

- DAY_OF_WEEK → horizontal position
- DEST → shape
- DIVERTED → color
- DISTANCE → vertical position



Arrange (tables)

ARRANGE

④ Express Values



④ Separate, Order, Align Regions

→ Separate



→ Order

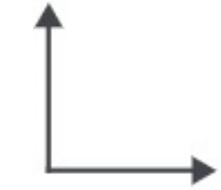


→ Align



④ Axis Orientation

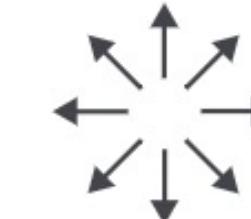
→ Rectilinear



→ Parallel



→ Radial



Considerations for the arrange step:

Arrange (tables)

ARRANGE

④ Express Values



④ Separate, Order, Align Regions

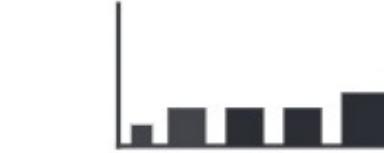
→ Separate



→ Order

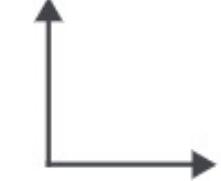


→ Align



④ Axis Orientation

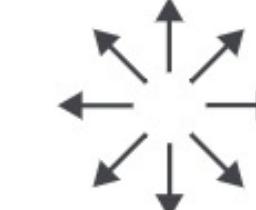
→ Rectilinear



→ Parallel



→ Radial



Considerations for the arrange step:

For tables, we arrange items by keys and values:

Key = an independent attribute(s) that can be used as a ***unique index*** to look up table items
→ Categorical or ordinal

Value = a dependent attribute, value in a specific cell

Arrange (tables)

ARRANGE

④ Express Values

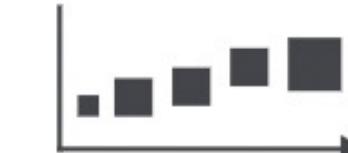


④ Separate, Order, Align Regions

→ Separate



→ Order



→ Align



④ Axis Orientation

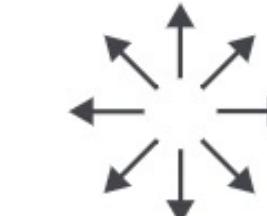
→ Rectilinear



→ Parallel



→ Radial



Considerations for the arrange step:

For tables, we arrange items by keys and values:

Key = an independent attribute(s) that can be used as a ***unique index*** to look up table items
→ Categorical or ordinal

Value = a dependent attribute, value in a specific cell

Arrange (tables)

Sketch a vis that supports the following task:

- Compare start time of each street sweeping zone

MainID	St_name	Dist	DistName	StartTime	EndTime	Side	from	to	miles	oneway	week1
1	Ackley Pl	2	Jamaica Plain	08:00	12:00	Even	Washington St	Dead End	0.0455	FALSE	FALSE
2	Arcadia Park	3	North Dorchester	08:00	12:00	Even	Draper St	Ditson St	0.0835	FALSE	FALSE
3	Ashcroft St	2	Jamaica Plain	08:00	12:00	Odd	Perkins St	Moraine St	0.1015	FALSE	TRUE
4	Boylston St	1B	Back Bay	00:01	07:00		Tremont St	Charles St	0.1519	FALSE	TRUE
5	Chestnut St	1H	Beacon Hill	08:00	12:00	Even	Walnut St	Charles St	0.2008	FALSE	FALSE
6	Blackwood St	1B	Back Bay	08:00	12:00	Even	St Botolph St	Dead End	0.0517	FALSE	FALSE
7	Bucknam St	10M	Mission Hill	12:00	16:00	Odd	Lawn St	Fisher Ave	0.0803	FALSE	TRUE
8	Acadia St	5	South Boston	09:00	13:00	Even	East First St	East Second St	0.0568	FALSE	TRUE
9	Acadia St	5	South Boston	09:00	13:00	Odd	East First St	East Second St	0.0568	FALSE	FALSE
10	Allston St	7	South Dorchester	12:00	16:00	Odd	Centre St	Melville Ave	0.1955	FALSE	TRUE

Arrange (tables)

Sketch a vis that supports the following task:

- Compare **start time** of each **street sweeping zone**

Value

Key

Key

Value

MainID	St_name	Dist	DistName	StartTime	EndTime	Side	from	to	miles	oneway	week1
1	Ackley Pl	2	Jamaica Plain	08:00	12:00	Even	Washington St	Dead End	0.0455	FALSE	FALSE
2	Arcadia Park	3	North Dorchester	08:00	12:00	Even	Draper St	Ditson St	0.0835	FALSE	FALSE
3	Ashcroft St	2	Jamaica Plain	08:00	12:00	Odd	Perkins St	Moraine St	0.1015	FALSE	TRUE
4	Boylston St	1B	Back Bay	00:01	07:00		Tremont St	Charles St	0.1519	FALSE	TRUE
5	Chestnut St	1H	Beacon Hill	08:00	12:00	Even	Walnut St	Charles St	0.2008	FALSE	FALSE
6	Blackwood St	1B	Back Bay	08:00	12:00	Even	St Botolph St	Dead End	0.0517	FALSE	FALSE
7	Bucknam St	10M	Mission Hill	12:00	16:00	Odd	Lawn St	Fisher Ave	0.0803	FALSE	TRUE
8	Acadia St	5	South Boston	09:00	13:00	Even	East First St	East Second St	0.0568	FALSE	TRUE
9	Acadia St	5	South Boston	09:00	13:00	Odd	East First St	East Second St	0.0568	FALSE	FALSE
10	Allston St	7	South Dorchester	12:00	16:00	Odd	Centre St	Melville Ave	0.1955	FALSE	TRUE

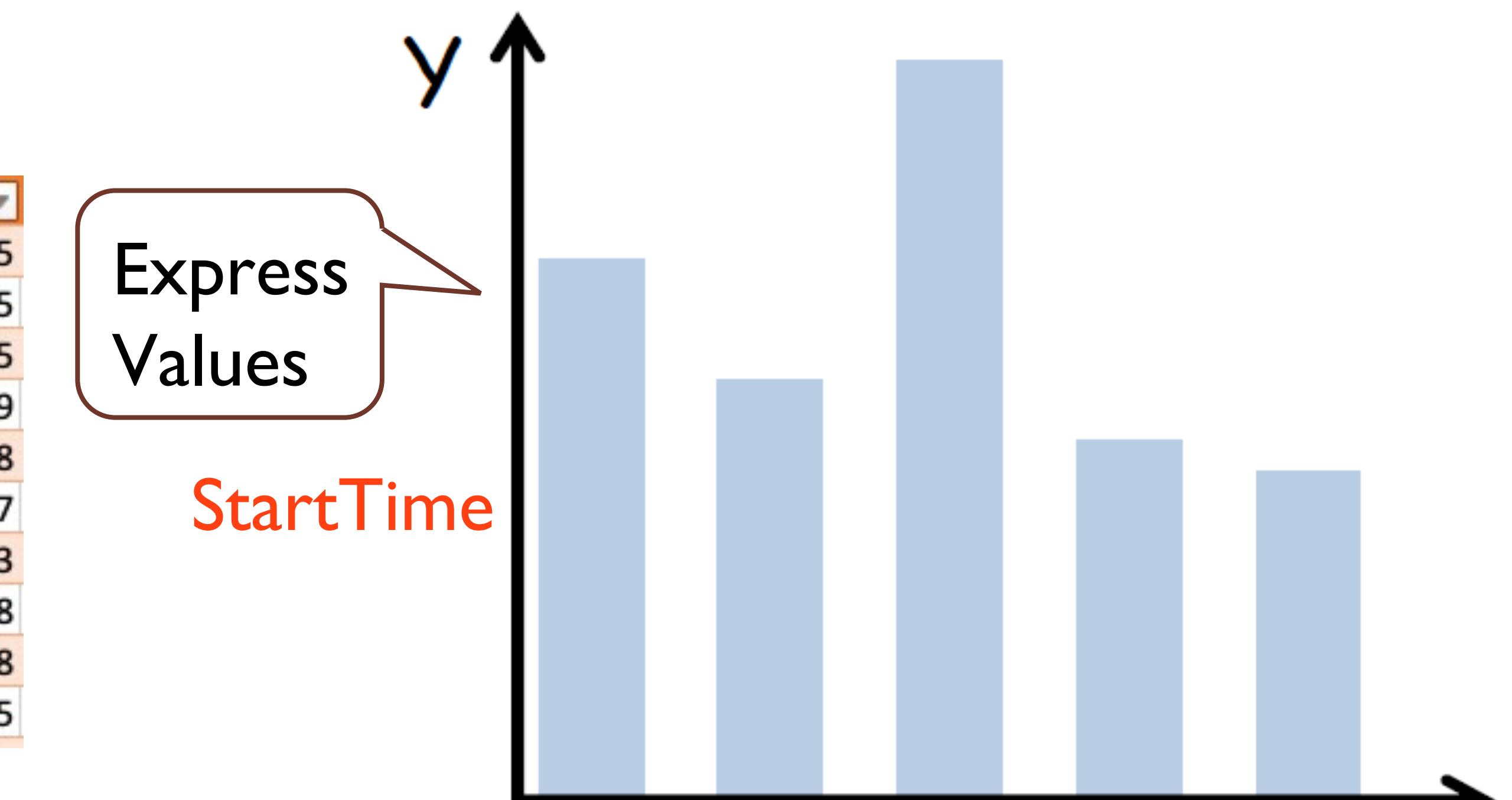
Arrange (tables)

One key (list alignment)

Key

MainID	St_name	Dist	DistName	StartTime	miles
1	Ackley Pl	2	Jamaica Plain	08:00	0.0455
2	Arcadia Park	3	North Dorchester	08:00	0.0835
3	Ashcroft St	2	Jamaica Plain	08:00	0.1015
4	Boylston St	1B	Back Bay	00:01	0.1519
5	Chestnut St	1H	Beacon Hill	08:00	0.2008
6	Blackwood St	1B	Back Bay	08:00	0.0517
7	Bucknam St	10M	Mission Hill	12:00	0.0803
8	Acadia St	5	South Boston	09:00	0.0568
9	Acadia St	5	South Boston	09:00	0.0568
10	Allston St	7	South Dorchester	12:00	0.1955

Value



Express
Values

StartTime

MainID

Separate, order,
align (by key)

BAR CHART

Arrange (tables)

Sketch a vis that supports the following task:

- Compare number of students for each major and college

College ▾	Major ▾	Num Students ▾
Khoury	Computer Science	300
	Data Science	475
	Math	699
COS	Math	80
	Data Science	402
D'Amore-McKim	Computer Science	337
	Data Science	920

Arrange (tables)

Sketch a vis that supports the following task:

- Compare **number of students** for each **major and college**

Value

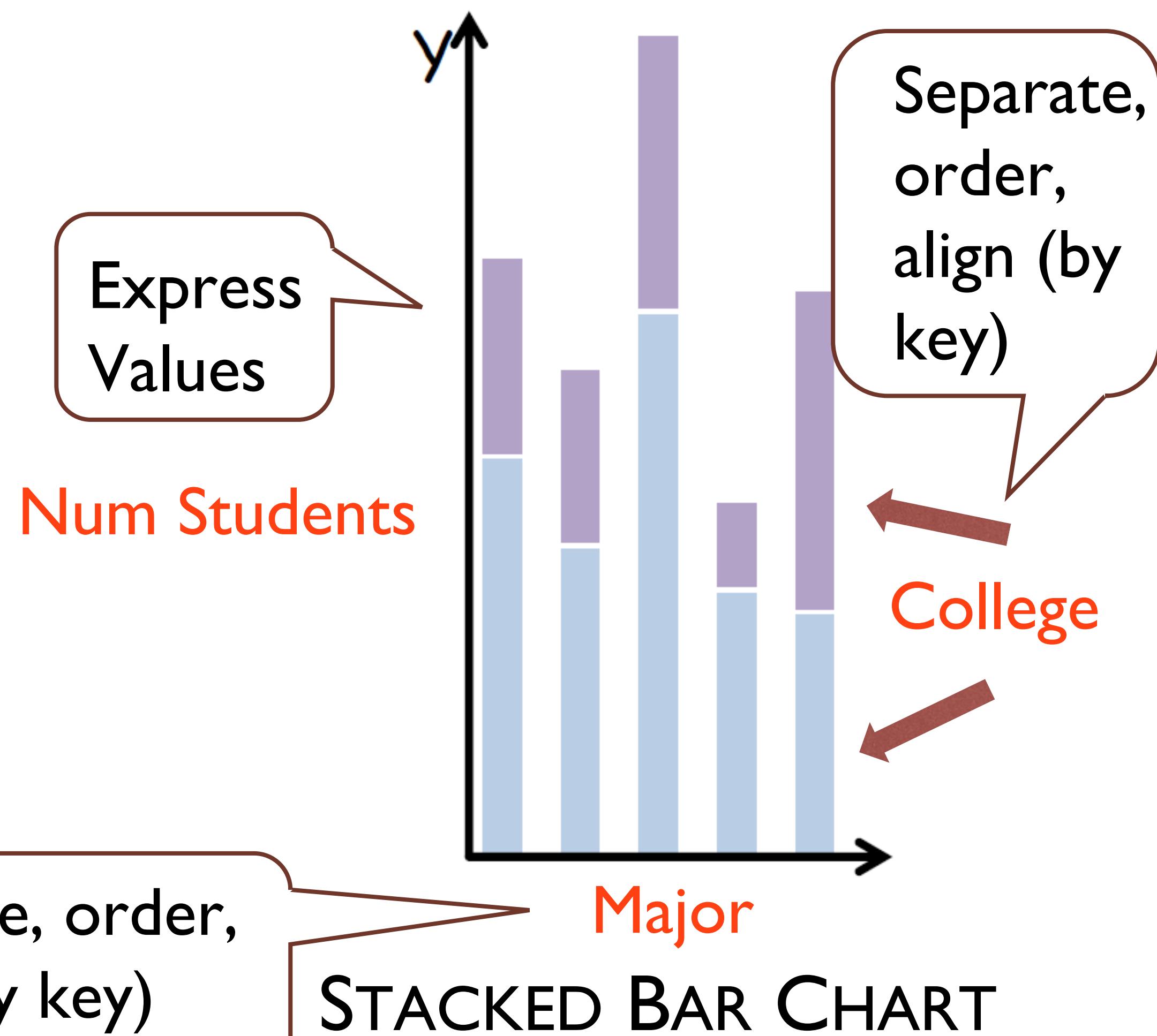
2 Keys

Key	Key	Value
College	Major	Num Students
Khoury	Computer Science	300
Khoury	Data Science	475
Khoury	Math	699
COS	Math	80
COS	Data Science	402
D'Amore-McKim	Computer Science	337
D'Amore-McKim	Data Science	920

Arrange (tables)

Two keys (multi-dimensional table)

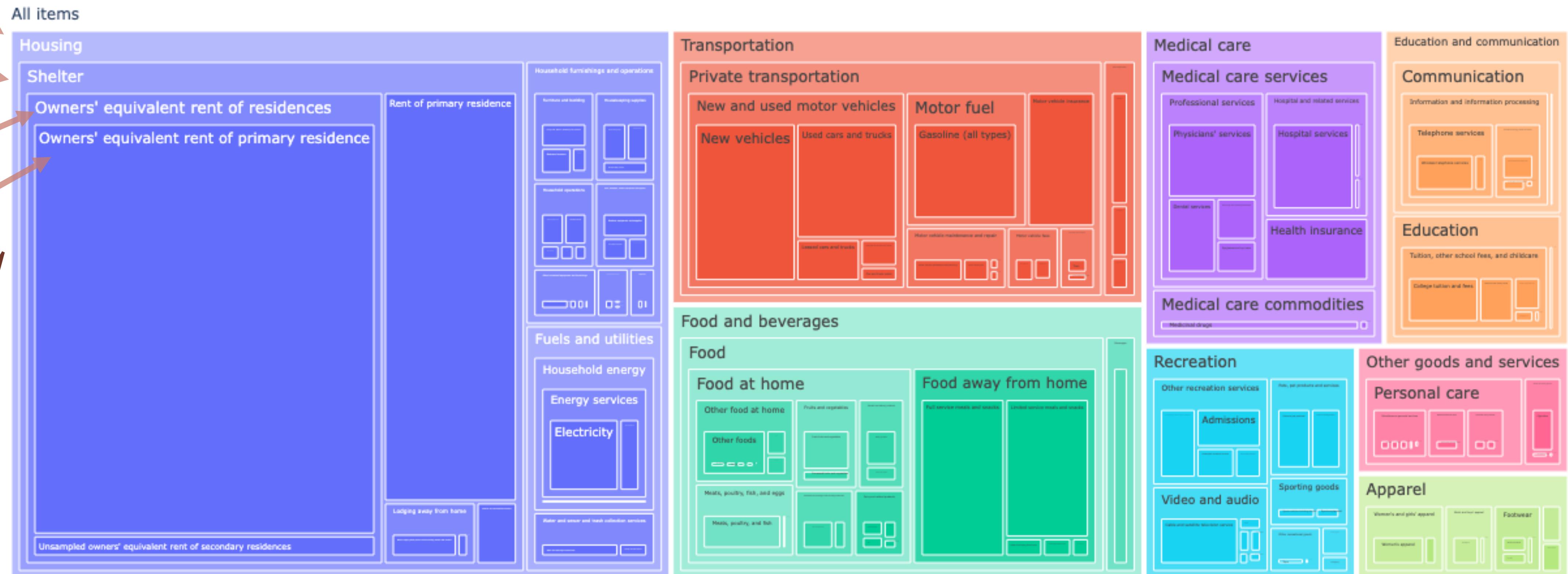
Key	Key	Value
College	Major	Num Students
Khoury	Computer Science	300
Khoury	Data Science	475
Khoury	Math	699
COS	Math	80
COS	Data Science	402



Arrange (tables)

Note: we can also have more than two keys

Key
Key
Key
Key



Arrange (tables)

Sketch a vis that supports the following task:

- Look for a relationship between air date and question value

Show Number	Air Date	Round	Category	Value	Question	Answer
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$2,000	9-letter word for the phenomenon that produced the mass of stellar debris called Cassiopeia A	a supernova
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$800	A.C. Crommelin proved that 3 of these, seen in 1818, 1873 & 1928, were really 1 of these visiting 3 times	comets
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$1,600	The radiant is the point from which these, such as the Lyrids, originate	meteor showers
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$200	An improper fraction is rude enough to have a numerator greater than or equal to this	the denominator
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$400	In its lowest terms, a .400 batting average in baseball is this fraction	5-Feb
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$1,000	It's how you express the fraction 7/4 as a mixed number	1 3/4
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$600	It's the decimal form of the fraction 3/1000	0.003
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$800	To divide a number by 3/4, multiply the number by this fraction	3-Apr
5333	11/14/07	Jeopardy!	FRENCH MENU	\$1,000	Ah! A luscious gateau Montmorency, a cake topped with this fruit	cherries
3342	3/2/99	Jeopardy!	FRENCH MENU	\$300	Bifteck	Steak
3342	3/2/99	Jeopardy!	FRENCH MENU	\$200	Eau minerale	Mineral water
3342	3/2/99	Jeopardy!	FRENCH MENU	\$100	Escargots	Snails

Arrange (tables)

Sketch a vis that supports the following task:

- Look for a relationship between **air date** and question **value**

Value

Value

Value

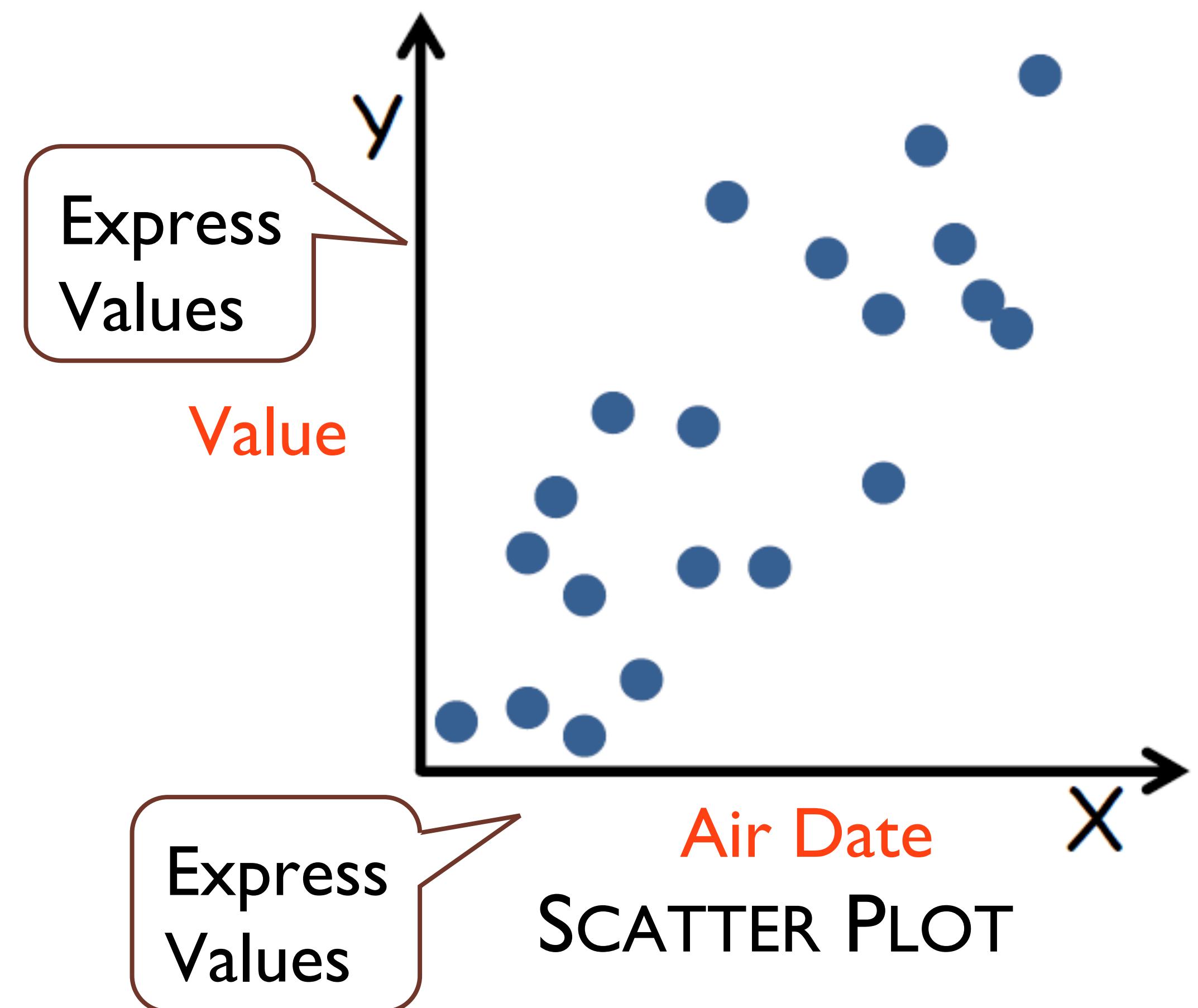
Value

Show Number	Air Date	Round	Category	Value	Question	Answer
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$2,000	9-letter word for the phenomenon that produced the mass of stellar debris called Cassiopeia A	a supernova
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$800	A.C. Crommelin proved that 3 of these, seen in 1818, 1873 & 1928, were really 1 of these visiting 3 times	comets
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE	\$1,600	The radiant is the point from which these, such as the Lyrids, originate	meteor showers
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$200	An improper fraction is rude enough to have a numerator greater than or equal to this	the denominator
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$400	In its lowest terms, a .400 batting average in baseball is this fraction	5-Feb
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$1,000	It's how you express the fraction 7/4 as a mixed number	1 3/4
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$600	It's the decimal form of the fraction 3/1000	0.003
3699	10/5/00	Double Jeopardy!	FRACTIONS	\$800	To divide a number by 3/4, multiply the number by this fraction	3-Apr
5333	11/14/07	Jeopardy!	FRENCH MENU	\$1,000	Ah! A luscious gateau Montmorency, a cake topped with this fruit	cherries
3342	3/2/99	Jeopardy!	FRENCH MENU	\$300	Bifteck	Steak
3342	3/2/99	Jeopardy!	FRENCH MENU	\$200	Eau minerale	Mineral water
3342	3/2/99	Jeopardy!	FRENCH MENU	\$100	Escargots	Snails

Arrange (tables)

No key

Value			
Show Number	Air Date	Round	Category
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE
4742	3/29/05	Double Jeopardy!	FOUND IN SPACE
3699	10/5/00	Double Jeopardy!	FRACTIONS
3699	10/5/00	Double Jeopardy!	FRACTIONS
3699	10/5/00	Double Jeopardy!	FRACTIONS
3699	10/5/00	Double Jeopardy!	FRACTIONS
3699	10/5/00	Double Jeopardy!	FRACTIONS
5333	11/14/07	Jeopardy!	FRENCH MENU
3342	3/2/99	Jeopardy!	FRENCH MENU
3342	3/2/99	Jeopardy!	FRENCH MENU
3342	3/2/99	Jeopardy!	FRENCH MENU



Arrange (tables)

ARRANGE

④ Express Values → Mapping quantitative attribute(s) to position channel



④ Separate, Order, Align Regions → Mapping categorical attribute(s) to position channel

→ Separate



→ Order

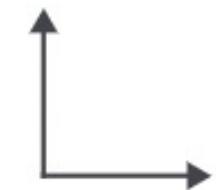


→ Align



④ Axis Orientation

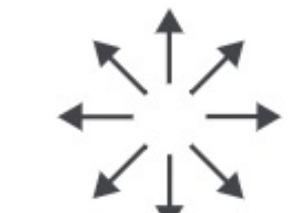
→ Rectilinear



→ Parallel



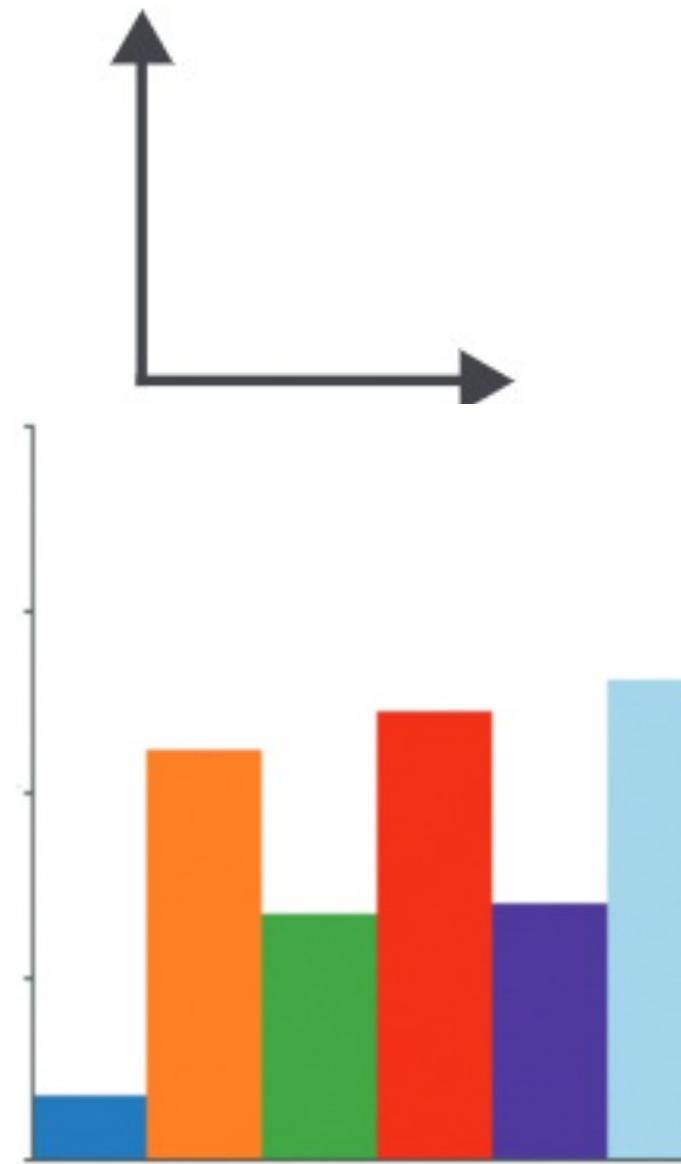
→ Radial



Arrange (tables)

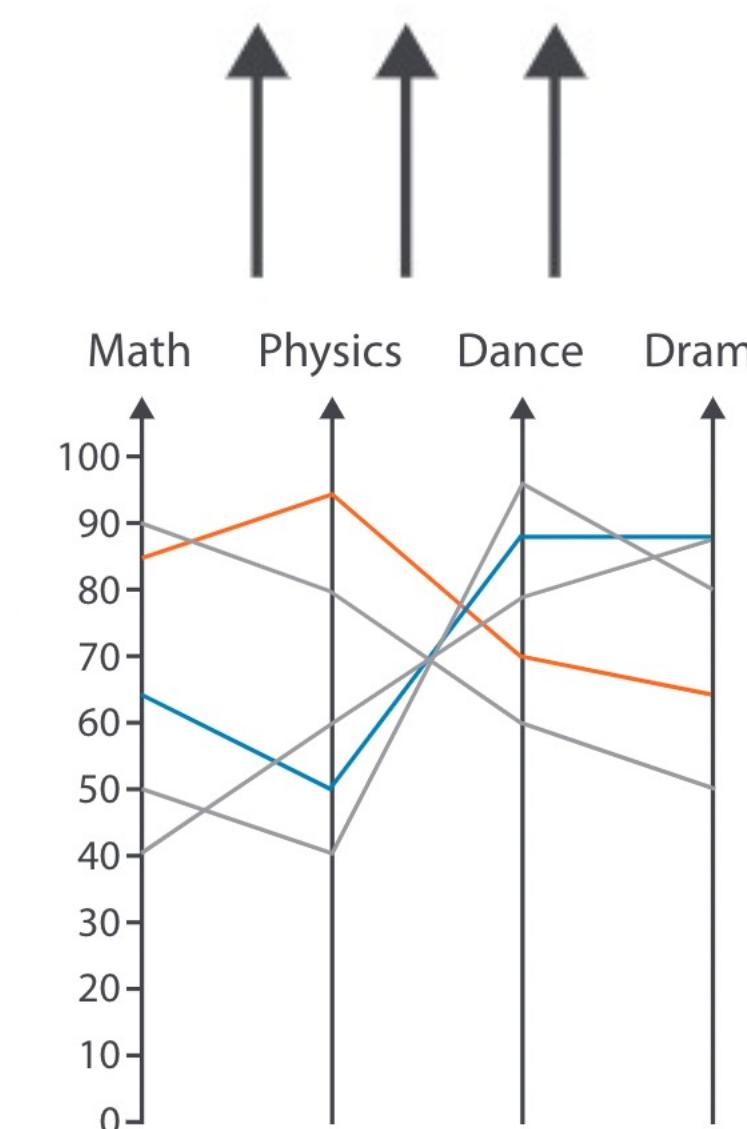
Axis Orientation

→ Rectilinear



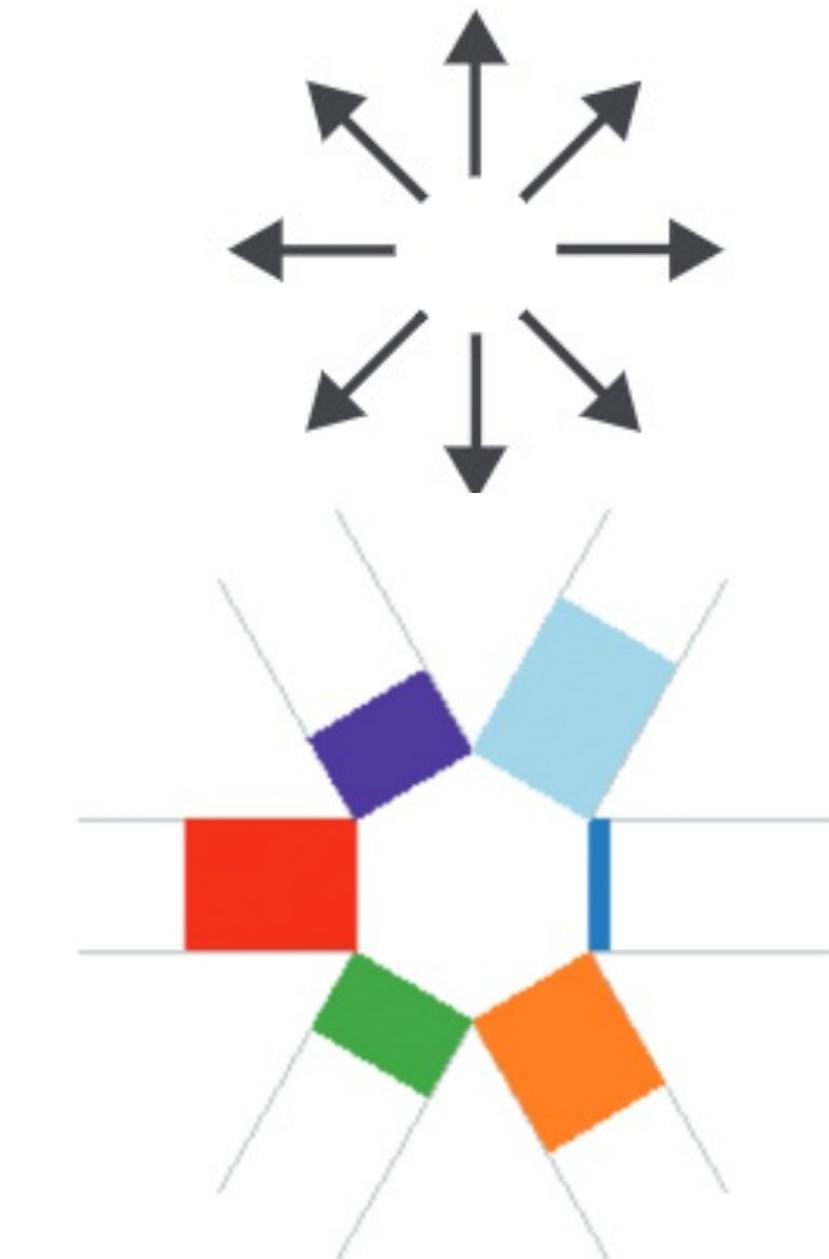
BAR CHART

→ Parallel



PARALLEL COORDINATES
PLOT

→ Radial

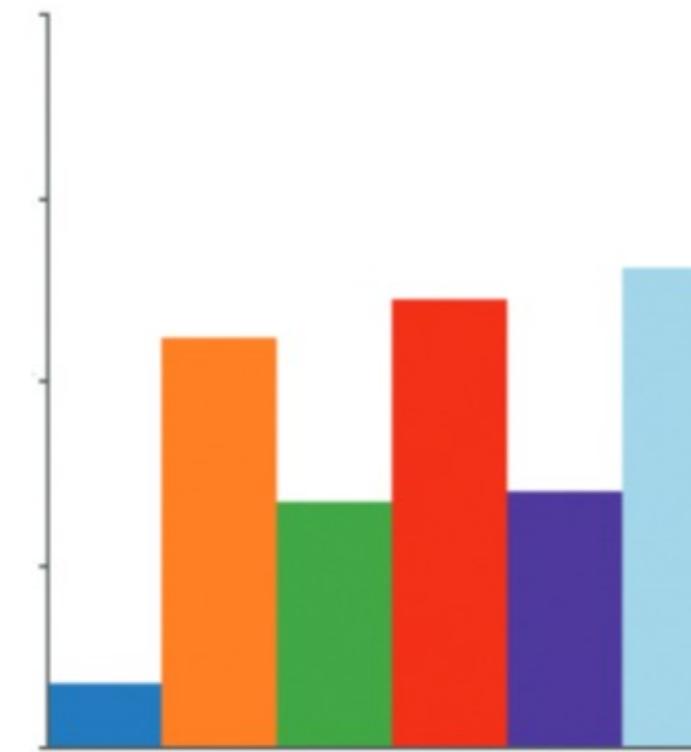


RADIAL BAR CHART

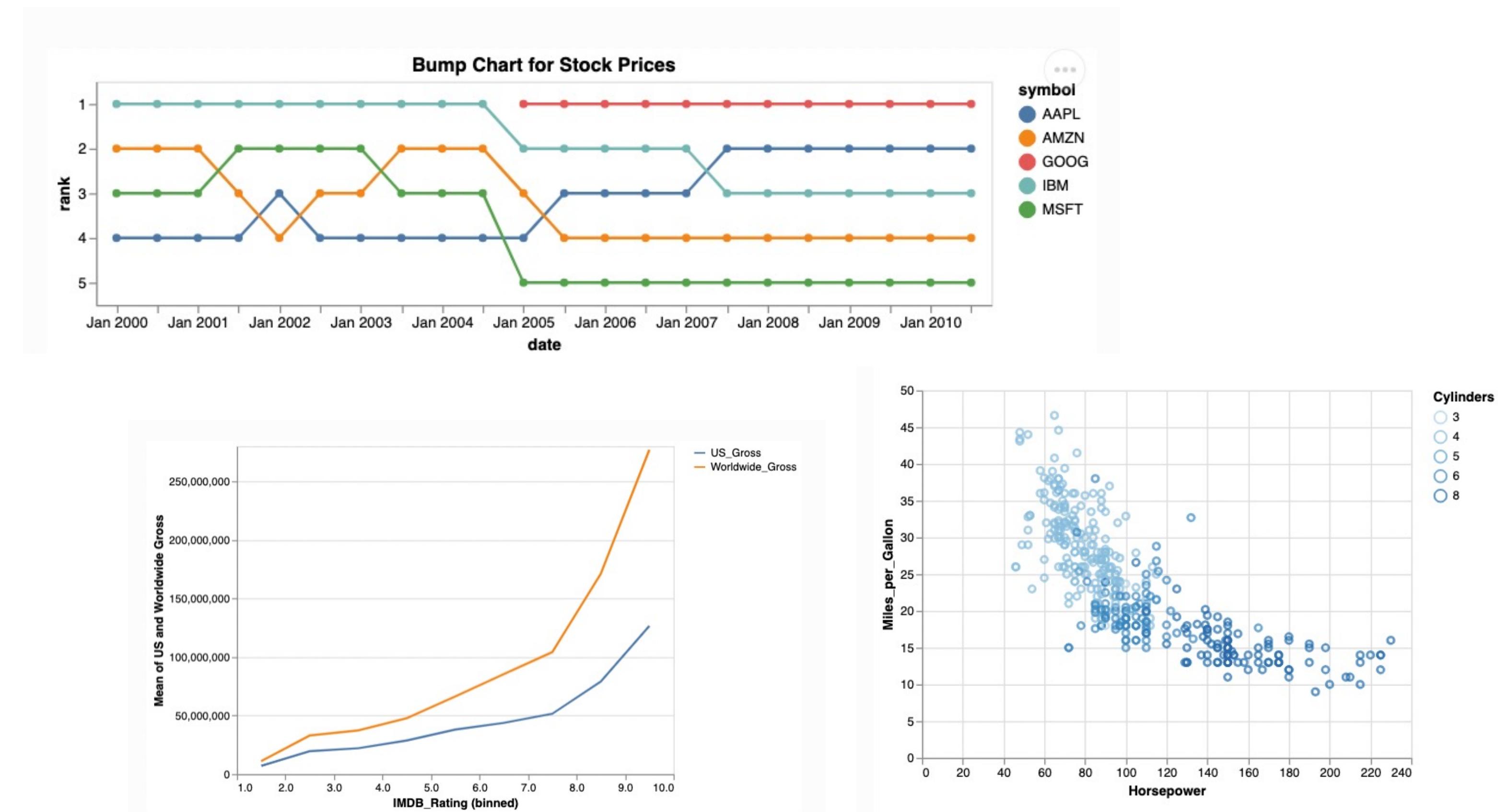
Arrange (tables)

Axis Orientation

→ Rectilinear



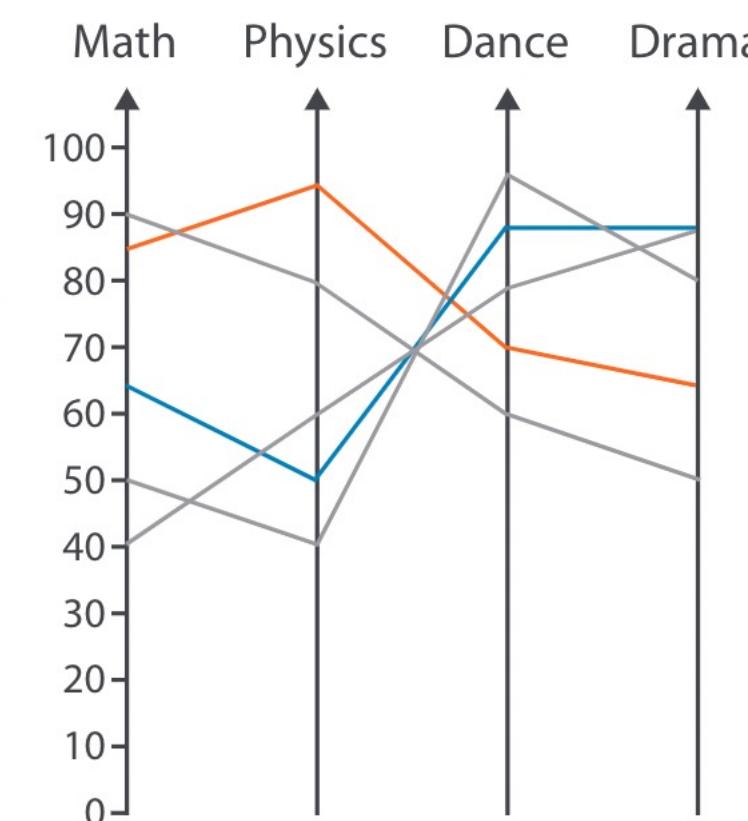
BAR CHART



Arrange (tables)

Axis Orientation

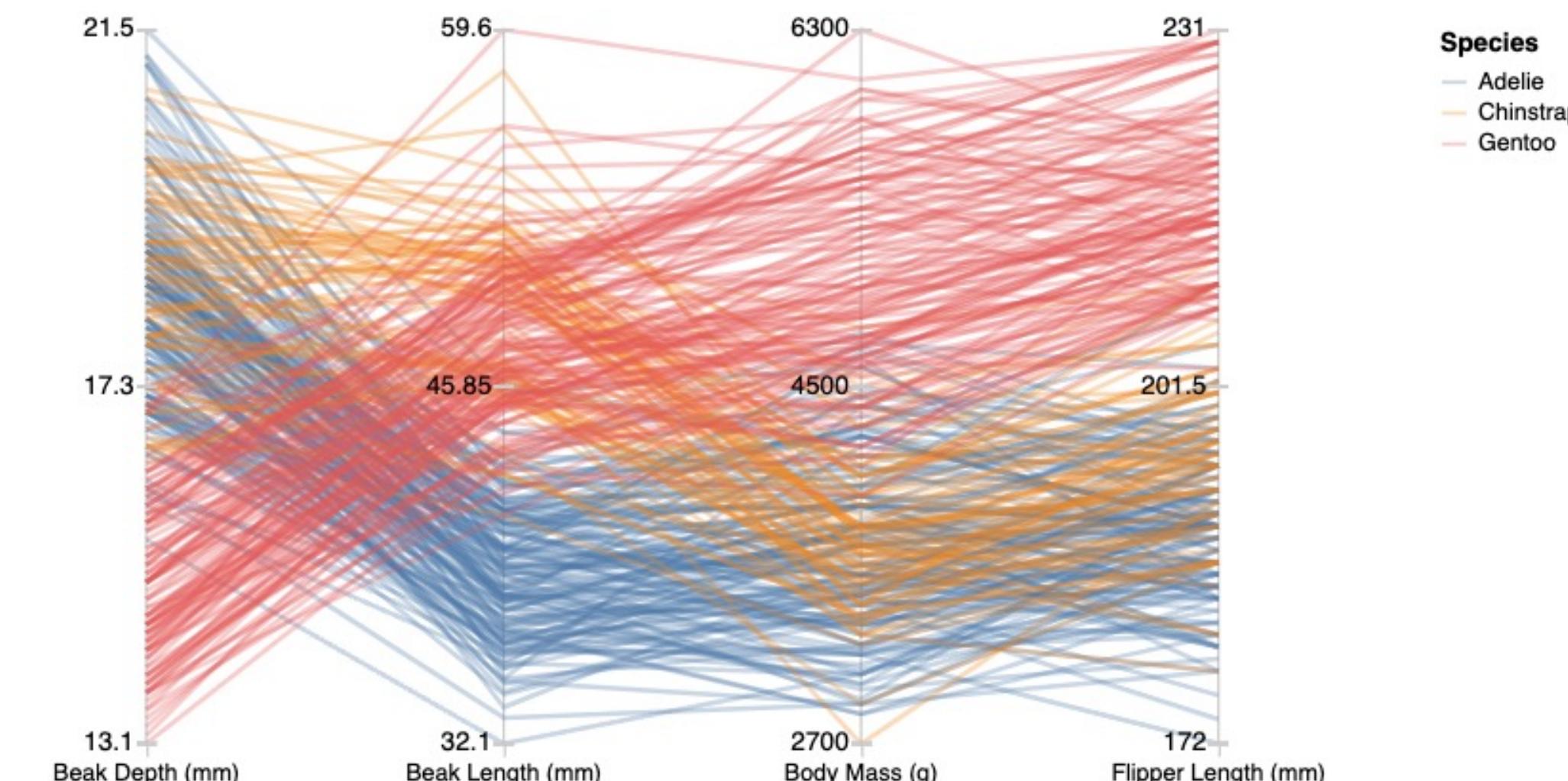
→ Parallel



PARALLEL COORDINATES PLOT

	r = 0.1 *	r = 0.3	r = 0.5	r = 0.7	r = 0.9 *	overall
pcp-negative	pcp-negative	scatterplot-positive	scatterplot-negative	scatterplot-negative	scatterplot-positive	scatterplot-positive
scatterplot-positive	scatterplot-positive	pcp-negative	scatterplot-positive	scatterplot-positive	pcp-negative	pcp-negative
scatterplot-negative	scatterplot-negative	scatterplot-negative	pcp-negative	pcp-negative	scatterplot-negative	scatterplot-negative
stackedbar-negative	stackedbar-negative	stackedbar-negative	stackedbar-negative	ordered line-positive	stackedbar-negative	stackedbar-negative
ordered line-positive	ordered line-positive	ordered line-positive	ordered line-positive	donut-negative	ordered line-positive	ordered line-positive
donut-negative	donut-negative	donut-negative	donut-negative	ordered line-negative	donut-negative	donut-negative
stackarea-negative	stackarea-negative	stackarea-negative	ordered line-negative	stackedbar-negative	stackarea-negative	stackarea-negative
ordered line-negative	ordered line-negative	ordered line-negative	stackarea-negative	stackedline-negative	ordered line-negative	ordered line-negative
stackedline-negative	stackedline-negative	stackedline-negative	stackedline-negative	stackarea-negative	stackedline-negative	stackedline-negative
pcp-positive	pcp-positive	pcp-positive	pcp-positive	radar-positive	pcp-positive	pcp-positive
radar-positive	radar-positive	radar-positive	radar-positive	pcp-positive	radar-positive	radar-positive
line-positive						

<https://visualthinking.psych.northwestern.edu/publications/Harrison-weberlaw-infovis2014.pdf>

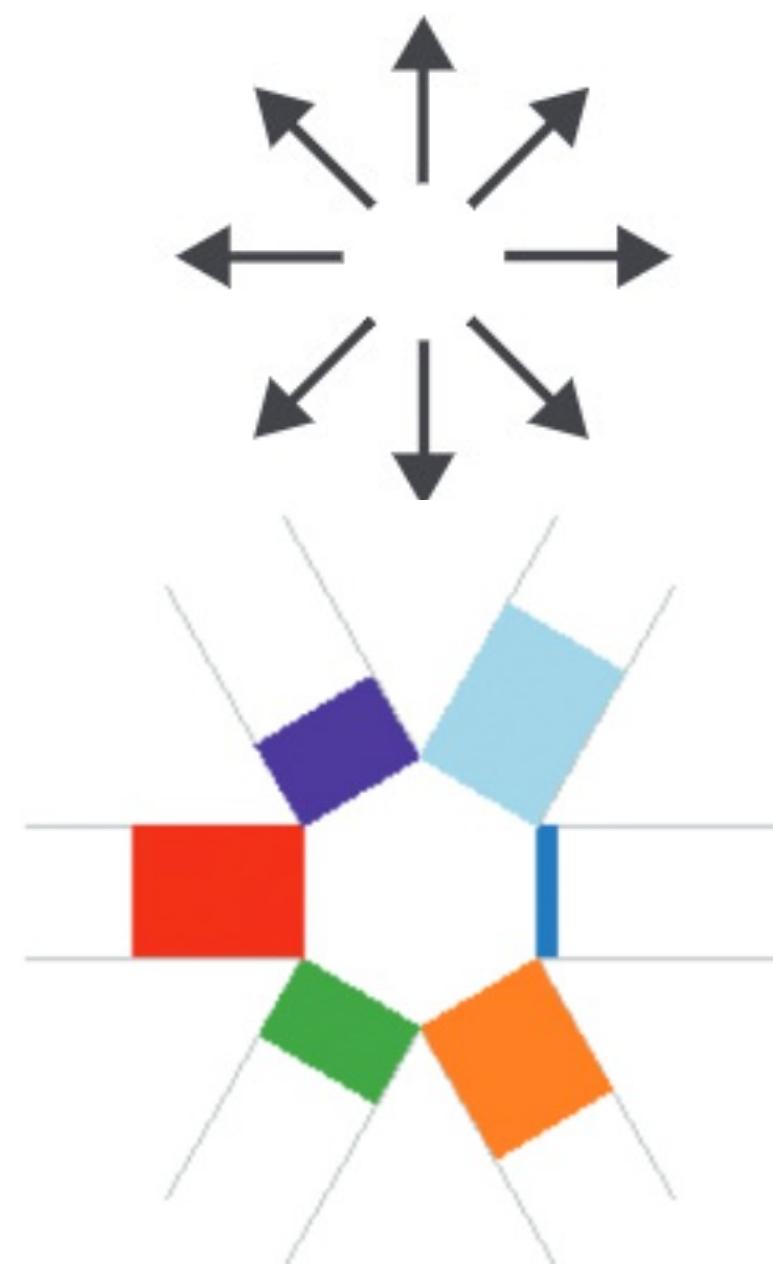


https://vega.github.io/vega-lite/examples/parallel_coordinate.html

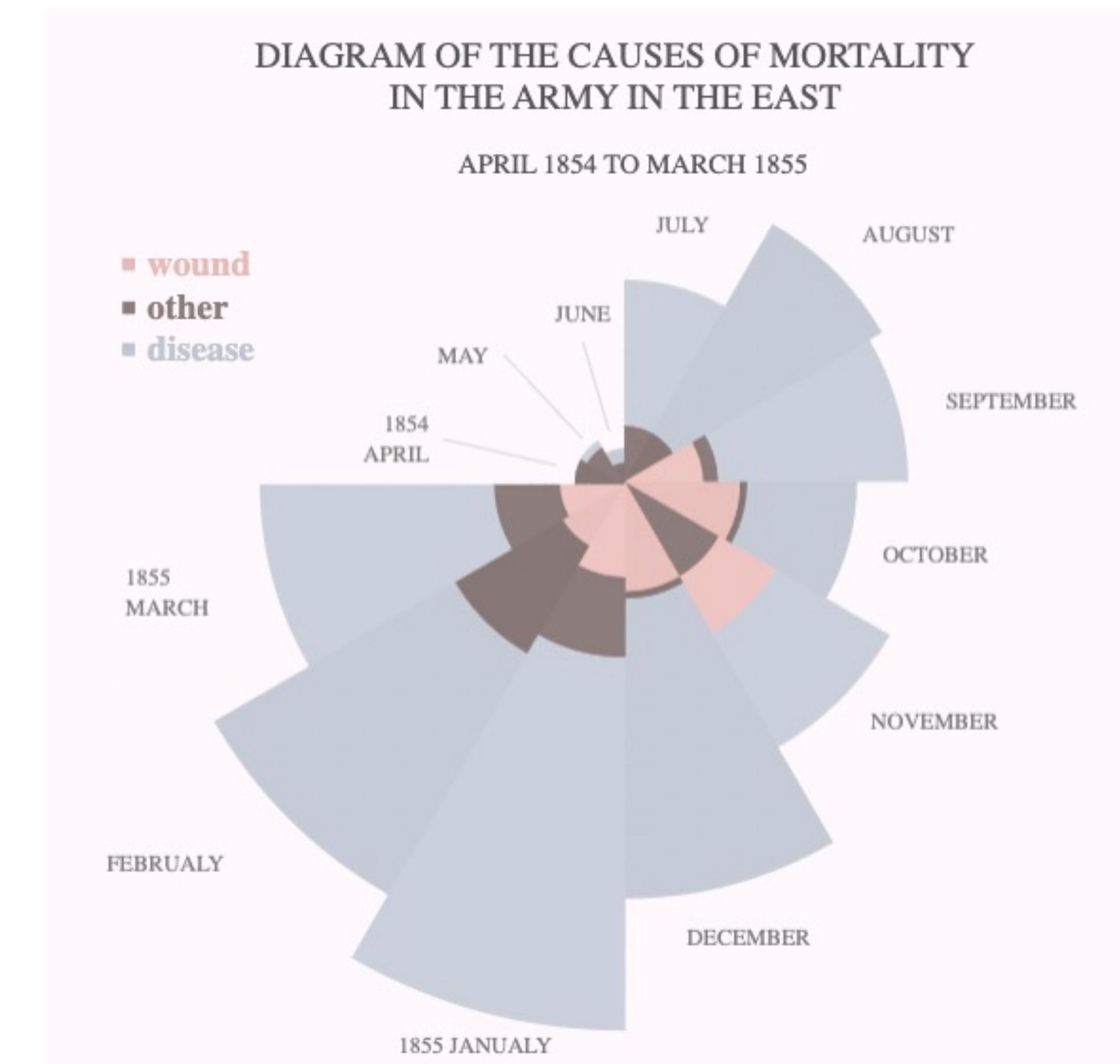
Arrange (tables)

Axis Orientation

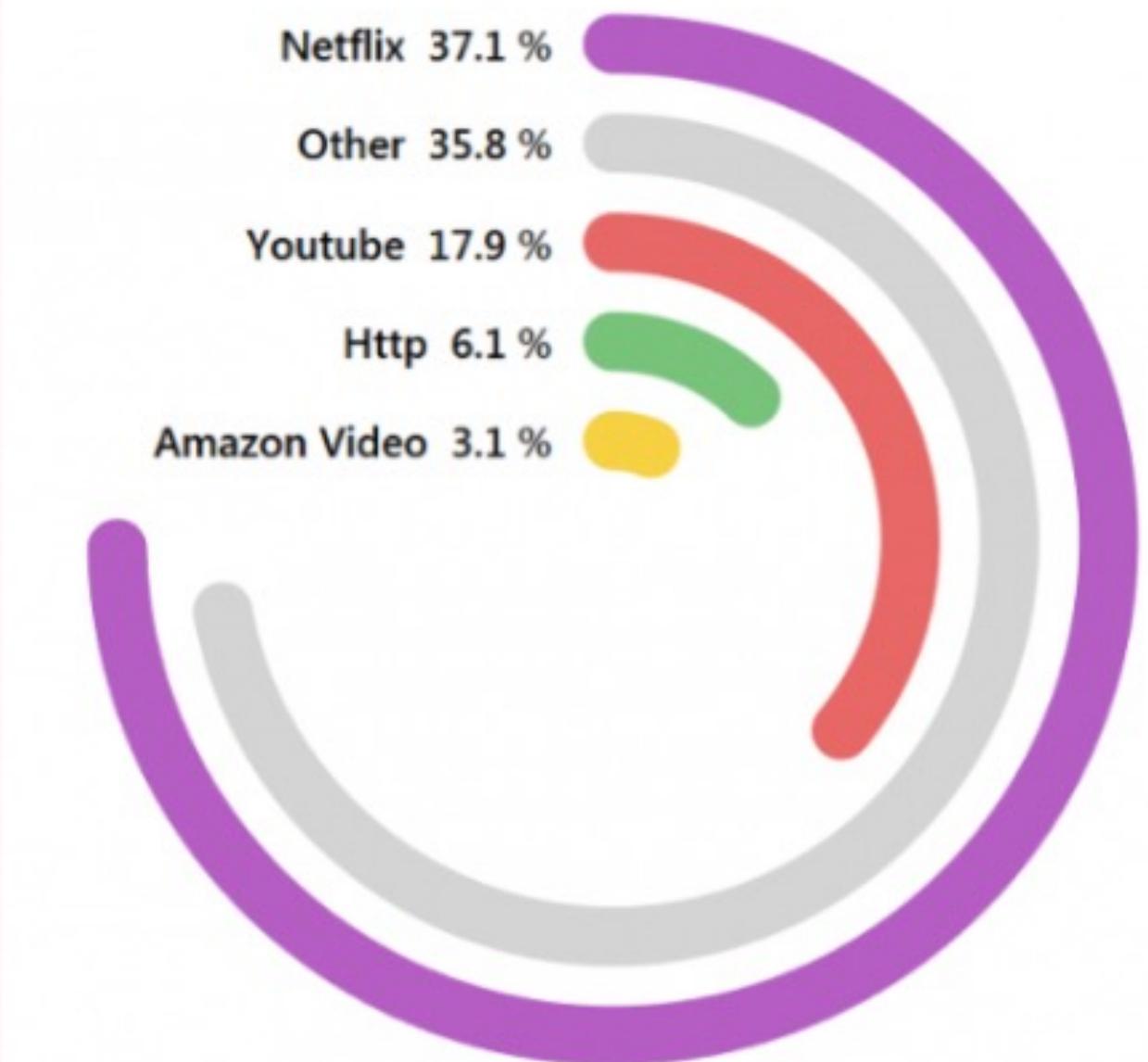
→ Radial



RADIAL BAR CHART



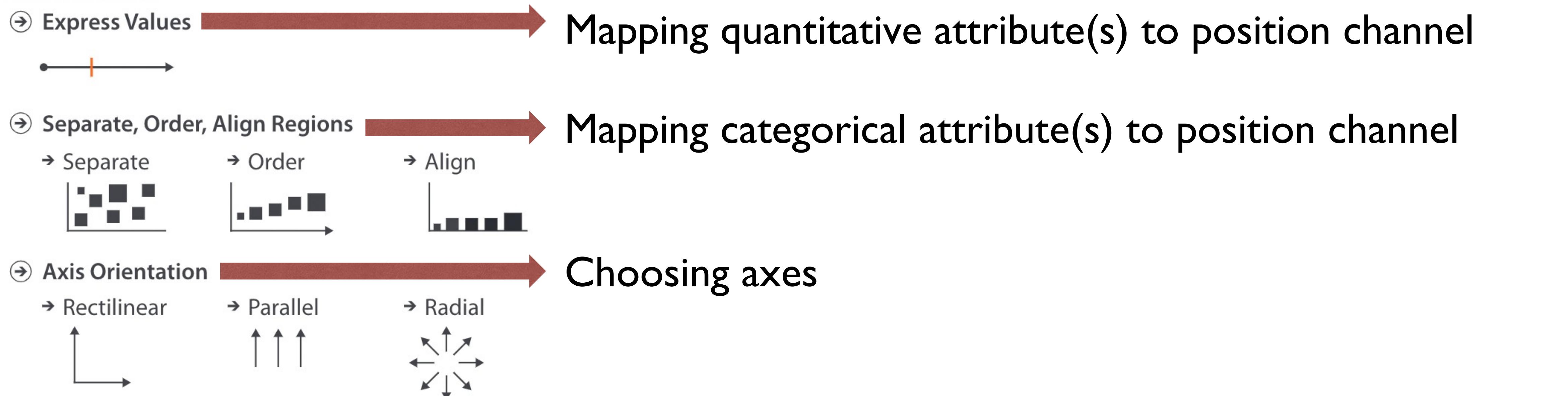
<https://public.tableau.com/app/profile/satoshi.ganeko/viz/NaichingaleDiagram/Diagram>



<https://tableau.toanhoang.com/radial-bar-chart-tutorial/>

Arrange (tables)

ARRANGE

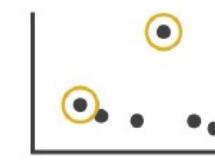


Visual Encodings and Tasks

Low-level tasks:

⌚ Query

→ Identify → Compare



→ Summarize



AN ANALYTIC TASK TAXONOMY

- Retrieve Value
- Filter
- Compute Derived Value
- Find Extremum
- Sort
- Determine Range
- Characterize Distribution
- Find Anomalies
- Cluster
- Correlate

More granular visualization tasks:

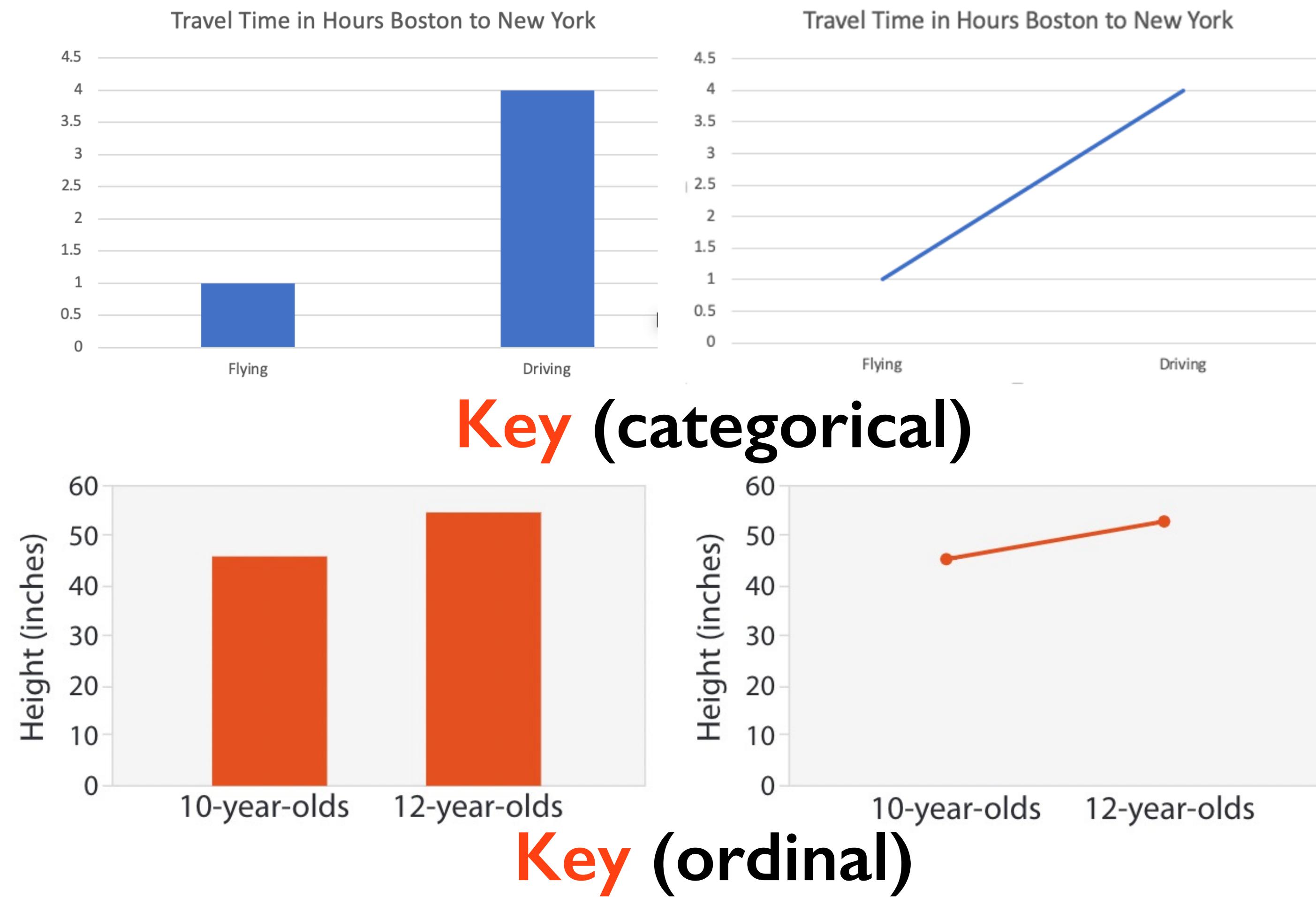
Comparison Concept visualisation Correlation

Distribution Geographical data Part to whole Trend over time

Amar et al. Low-level components of analytic activity in information visualization

Visual Encodings and Tasks

→ Be aware of the attribute type of your key and what your visualization communicates



Visual Encodings and Tasks

Choose two tasks. Sketch a visual encoding for each that works for one task but not the other.

More granular visualization tasks:

Comparison Concept visualisation Correlation

Distribution Geographical data Part to whole Trend over time

AN ANALYTIC TASK TAXONOMY

- Retrieve Value
- Filter
- Compute Derived Value
- Find Extremum
- Sort
- Determine Range
- Characterize Distribution
- Find Anomalies
- Cluster
- Correlate

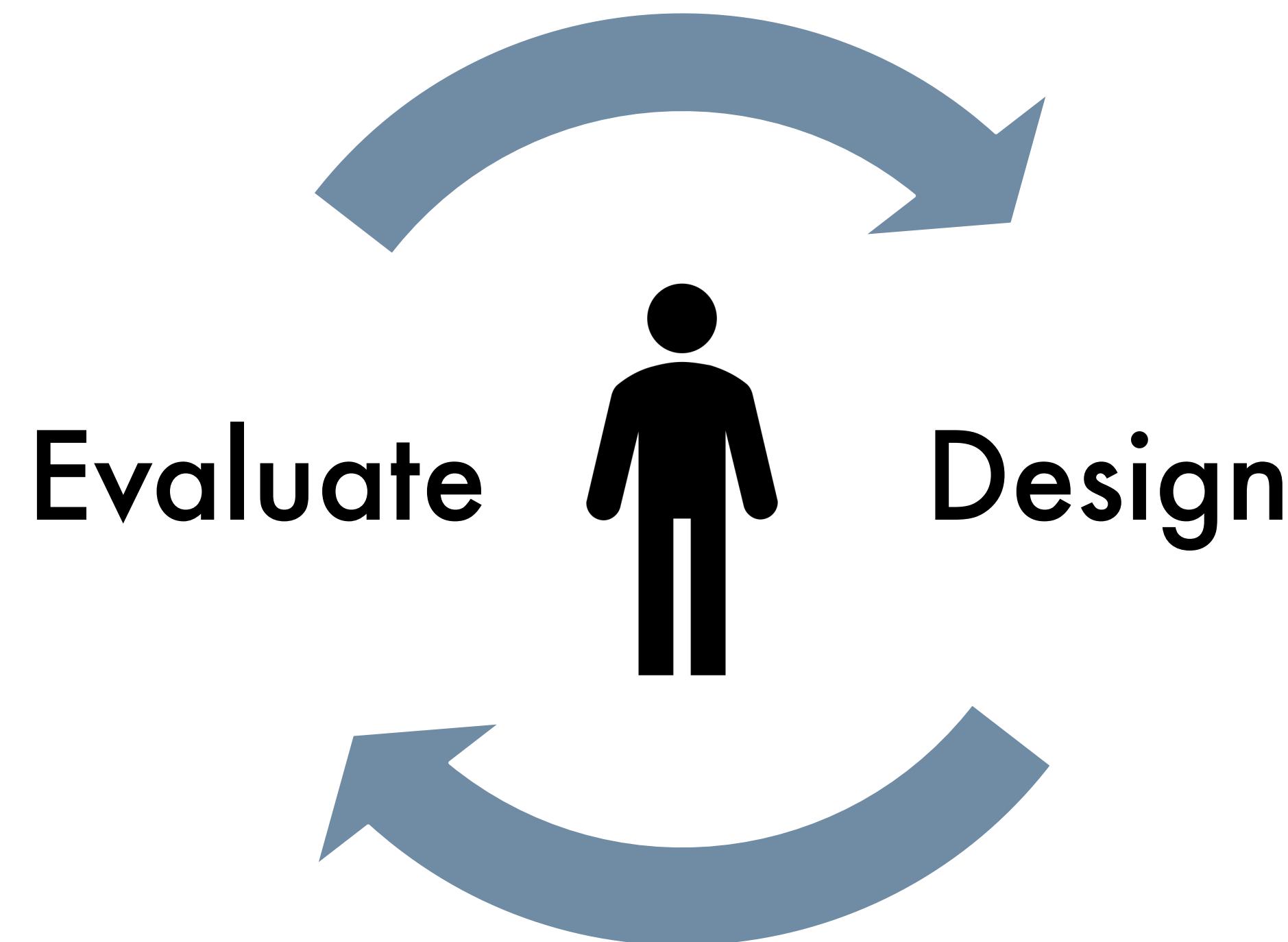
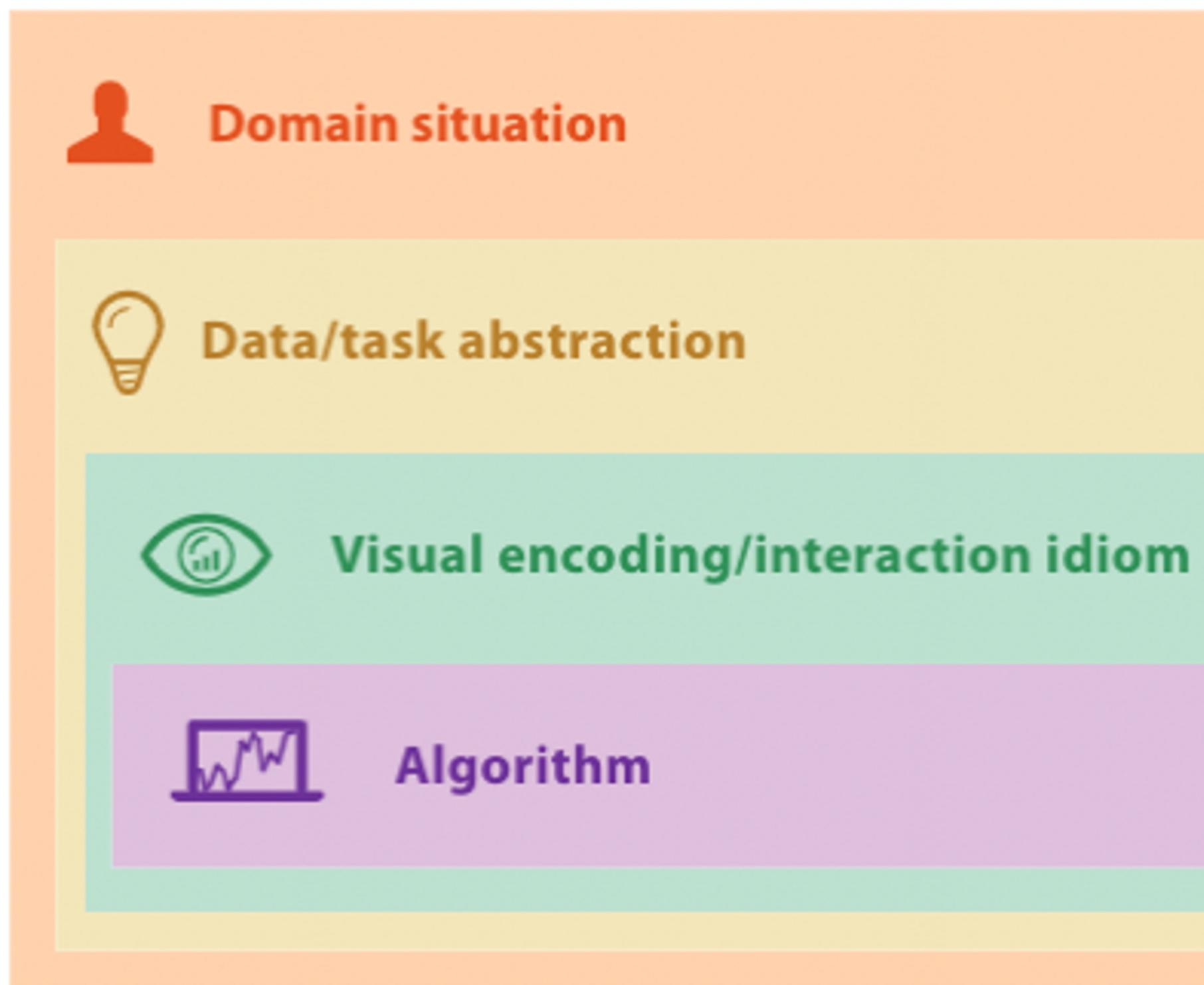
Amar et al. Low-level components of analytic activity in information visualization

Let's take a break! Stretch, go
for a walk, be social ☺
Be back here in 10 mins.

SKETCHING NEW VISUALIZATIONS

Human-Centered, Iterative Design

Human-Centered, Iterative Design



Human-Centered, Iterative Design

- Ground our designs in human needs
- Gather an understanding of the domain situation from our end users
- Check our work by iterating, i.e. continually verifying and evaluating our proposed visualization tool

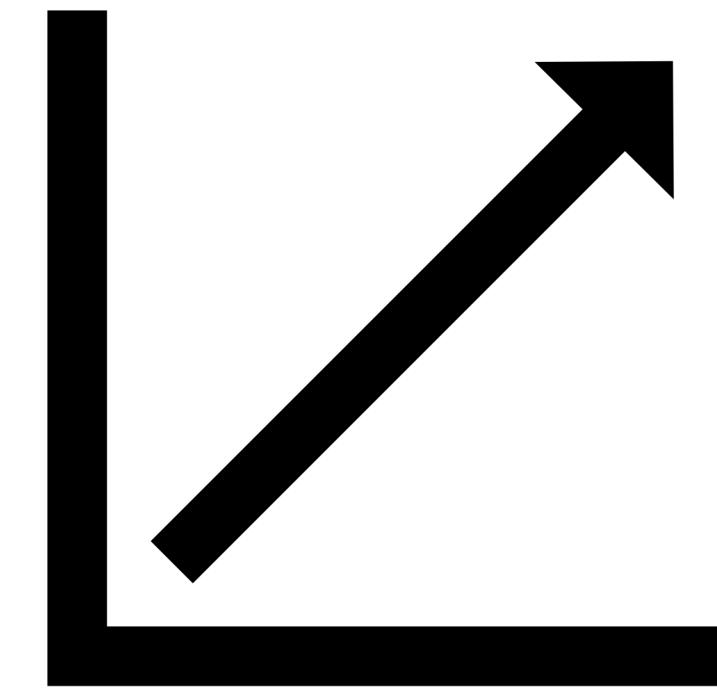
Task/Data Abstraction → Visual Encoding

1. Look at the tasks you need to support
2. Identify Visual Encodings that support those tasks and work with your attribute types
→ Ex. Bar chart vs. line chart, bar chart vs scatter plot

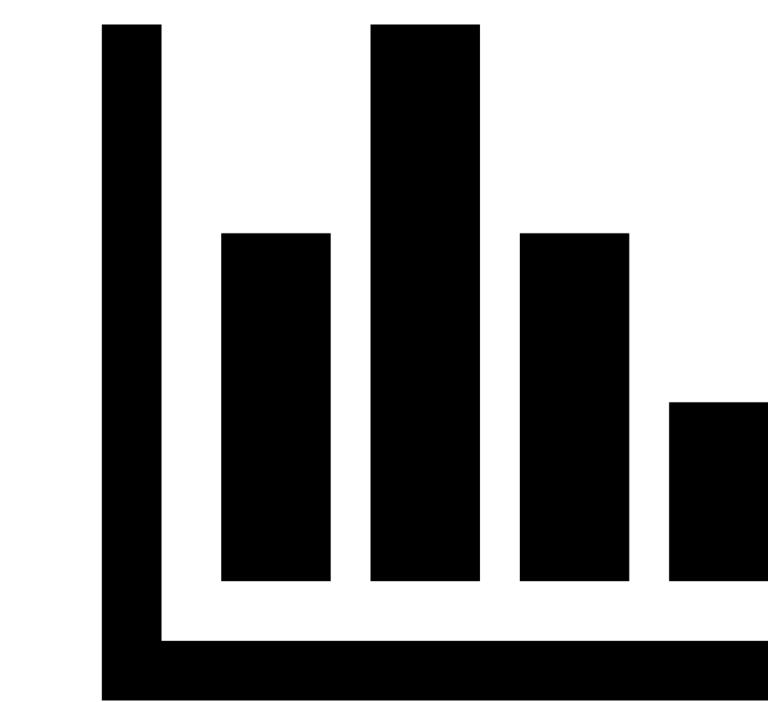


Comparison

vs

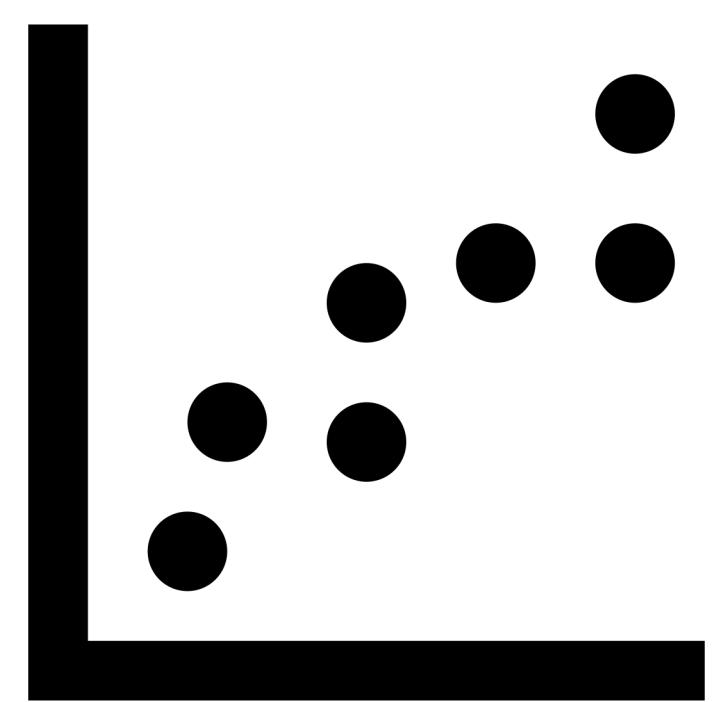


Trend



Quantitative vs.
Categorical

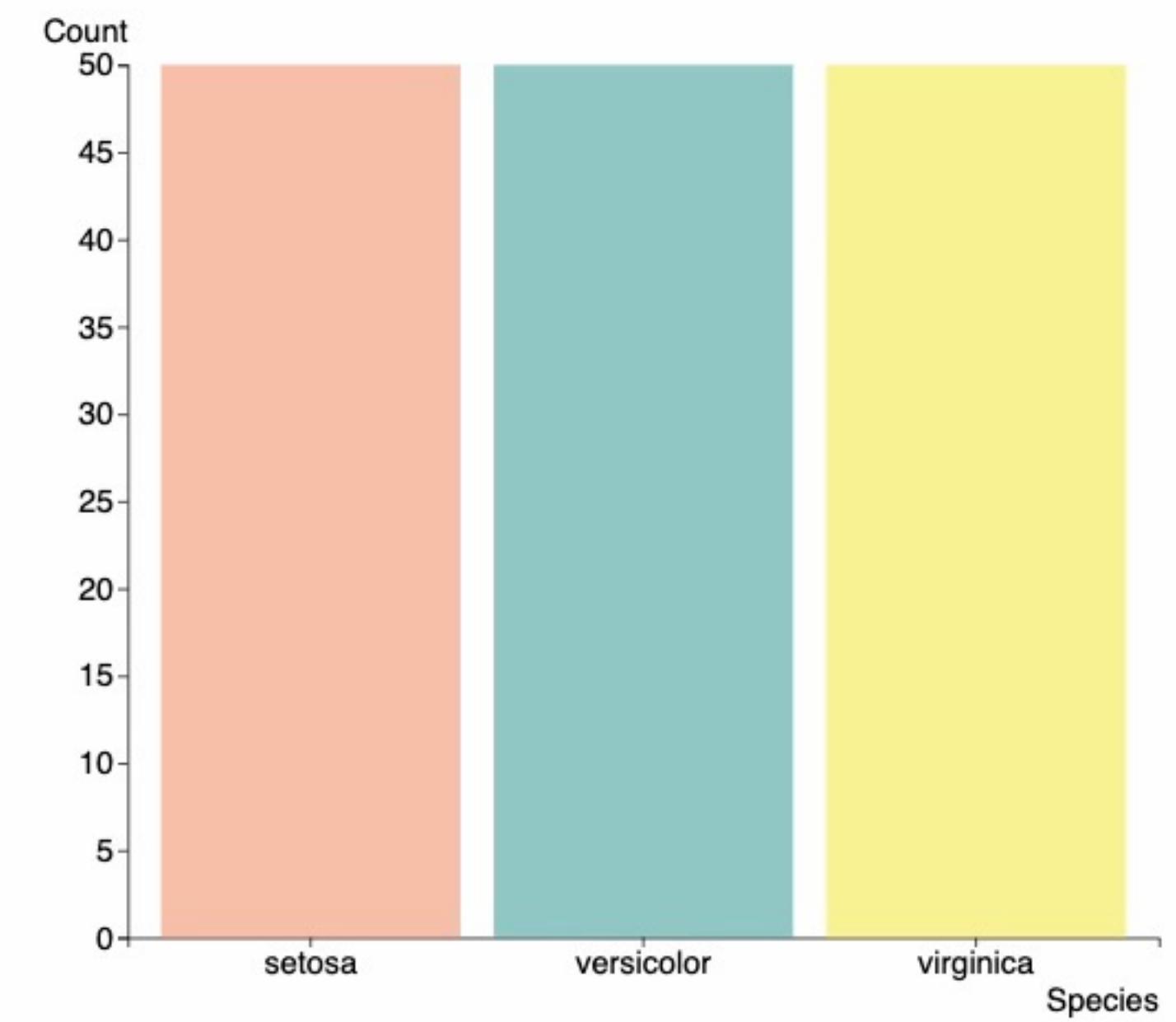
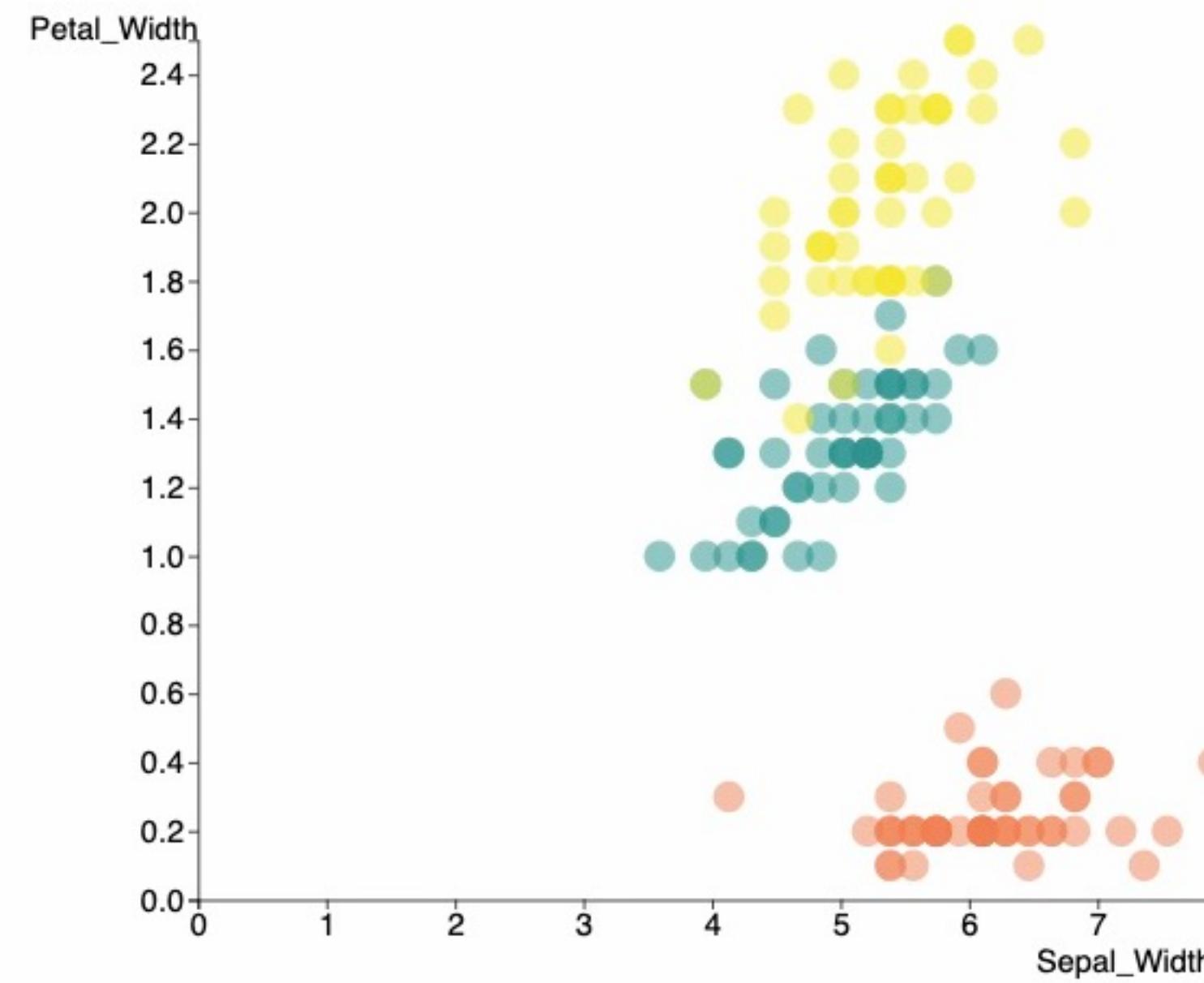
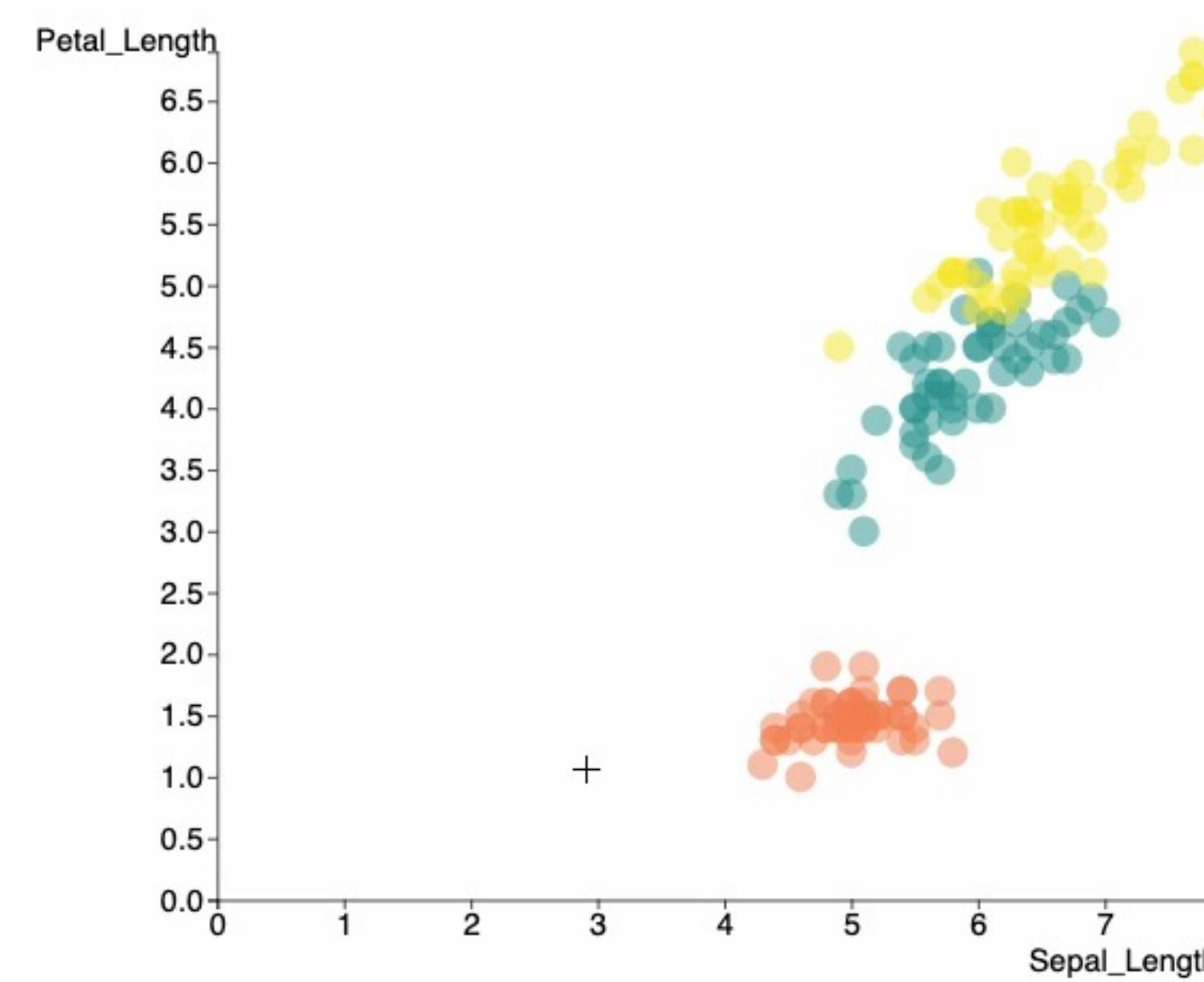
vs



Quantitative vs
Quantitative

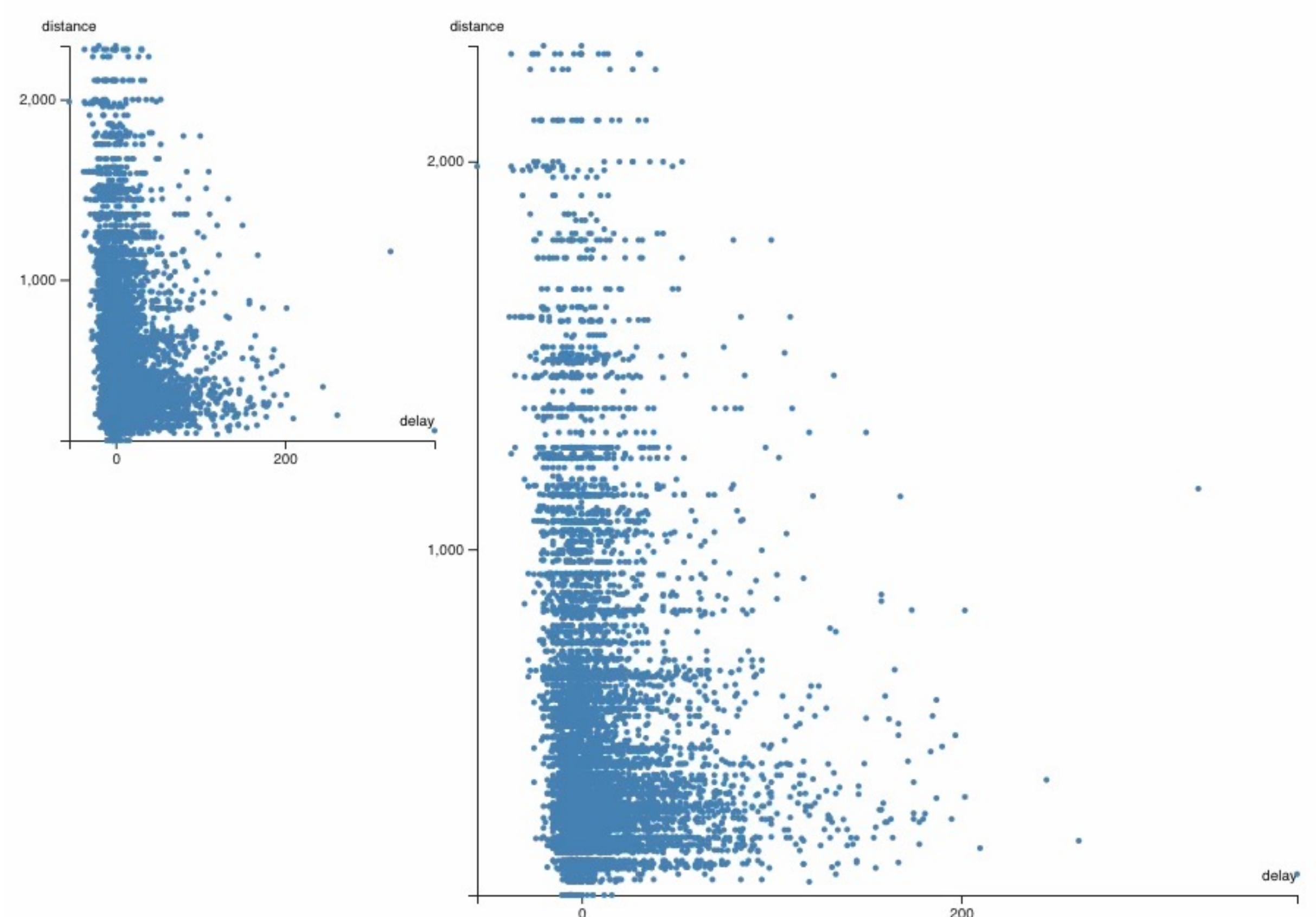
Task/Data Abstraction → Visual Encoding

3. Think about linking tasks together (i.e. coordinating multiple visual encodings)



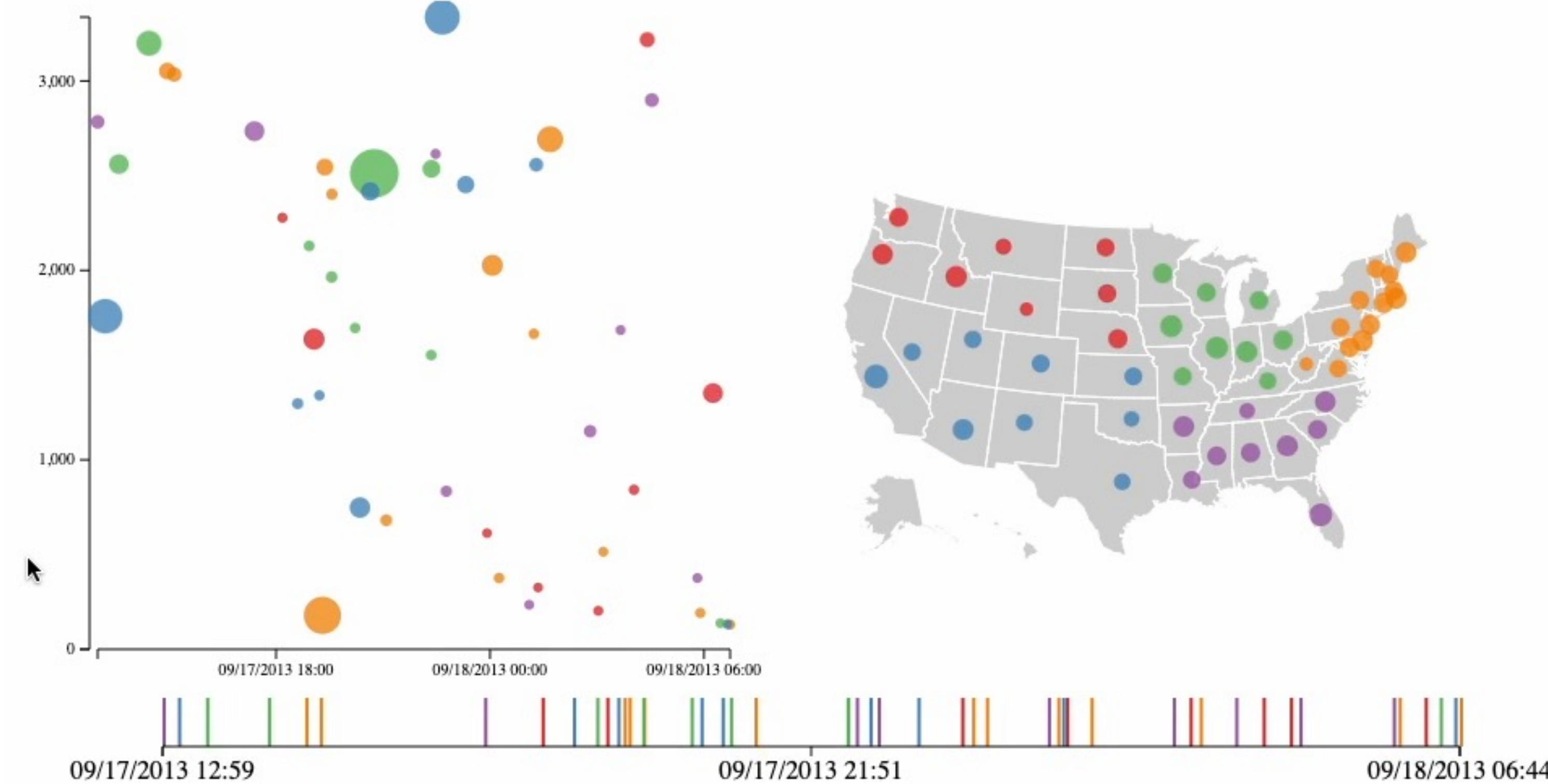
Task/Data Abstraction → Visual Encoding

3. Think about linking tasks together (i.e. coordinating multiple visual encodings)



Task/Data Abstraction → Visual Encoding

3. Think about linking tasks together (i.e. coordinating multiple visual encodings)



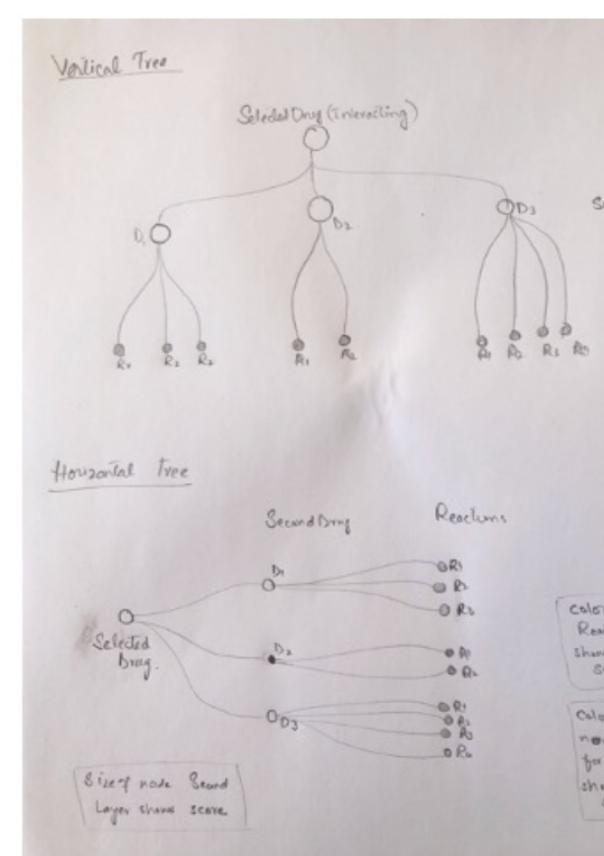
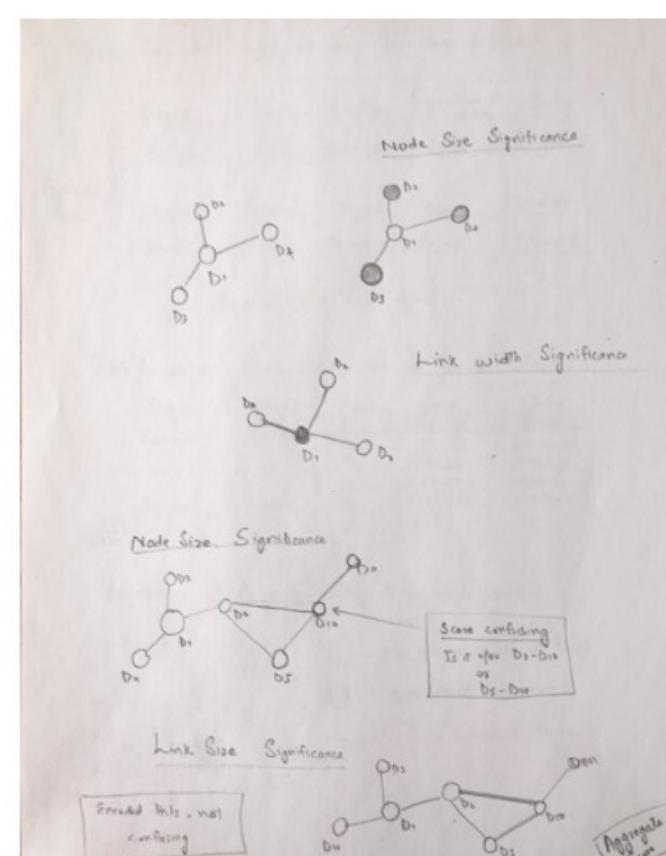
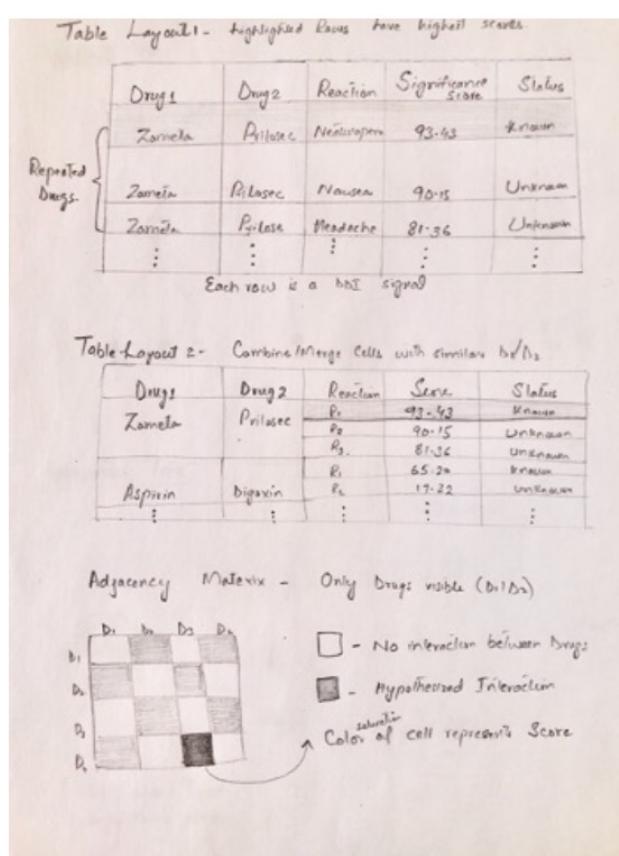
Task/Data Abstraction → Visual Encoding

3. Be creative & sketch, review, sketch

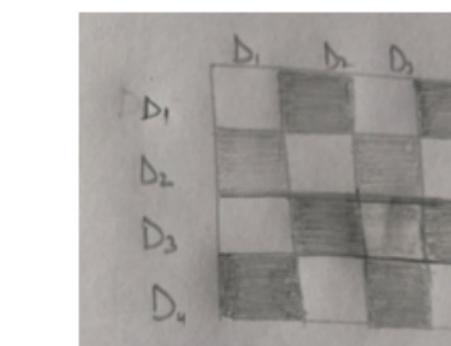
**Ex.
DIVA**

Visual Design and Prototypes to Get User Feedback

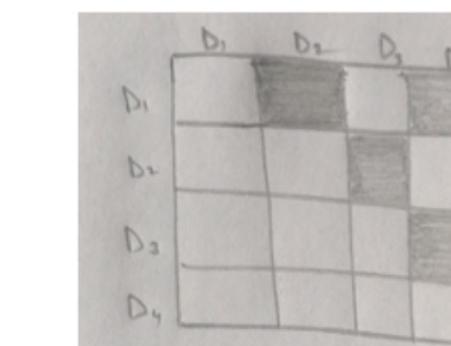
Given the complexity of the DDI signals and user tasks, designing a single visualization is not feasible. Based on literature review and heuristic analysis of different visualization techniques for the underlying data, we considered various visualizations.



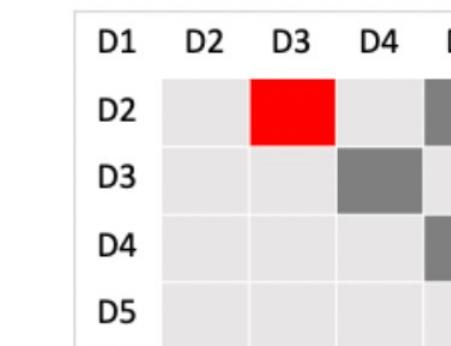
To help users explore the set of all the machine-generated drug-drug interactions (DDIs) the first suitable candidate is an Adjacency Matrix (below figures). Due to sparsity of the matrix for real data, alternatively, a node-link diagram is designed.



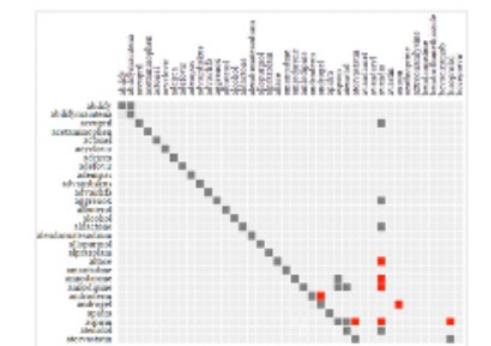
Each axis represents four drugs (D₁, D₂, etc.). Shaded cells represent an interaction between two drugs exist in the machine generated signals.



No order between DDIs. Interaction between D₁-D₂ is same as D₂-D₁. Only used the upper triangular matrix.

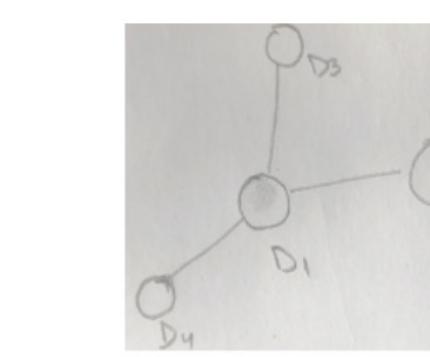


Color of the cell is mapped to the significance score of the DDI interaction used by the machine learning algorithm to rank signals.

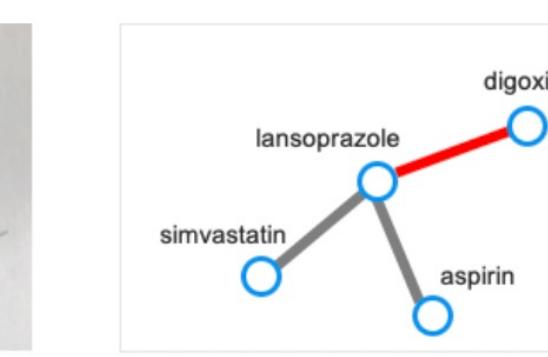


Adjacency matrix using D3.js with real DDI data has high sparsity, due to hundreds of drugs having unequal number of interactions with each other

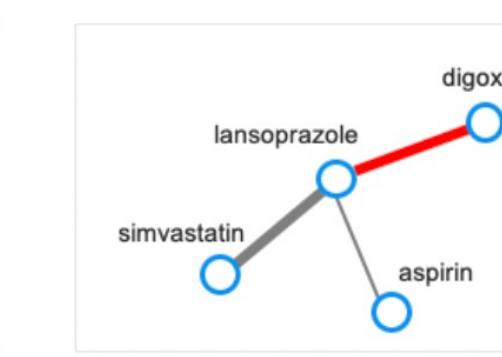
In the node-link diagrams (following figure), the nodes are mapped to the drugs and the links depict the interaction between drugs. The visual encodings, i.e., color and size of the links (Screening view) and nodes (Triage view) are mapped to the significance score of the signals and status of the reactions, respectively.



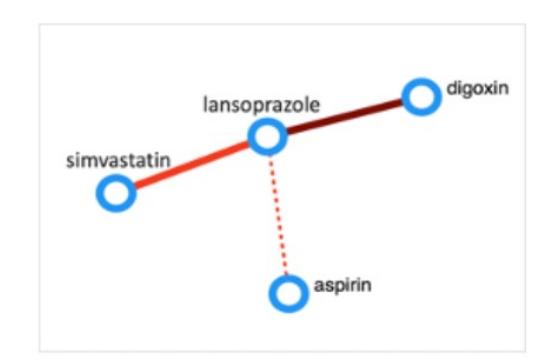
Nodes represent drugs, and links between nodes represent a machine-generated drug-drug interaction.



Links are encoded with score using color hue. Red color shows a high score, grey means a low score.



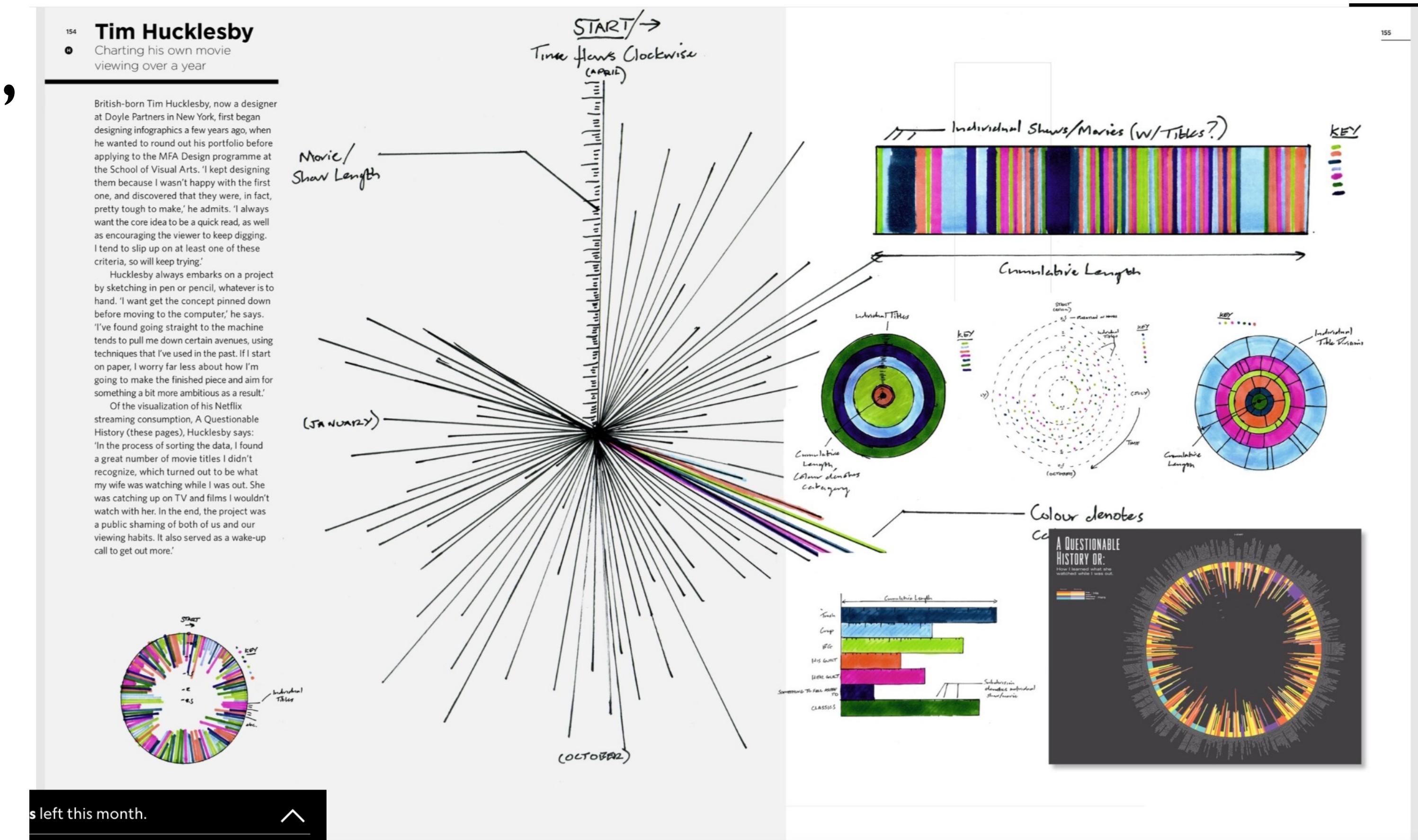
The signal status (known or unknown) is mapped to the link size. Thin = known signal and thick = unknown.



In the final design, color saturation is used to encode score. Both link shape and size are used to encode status.

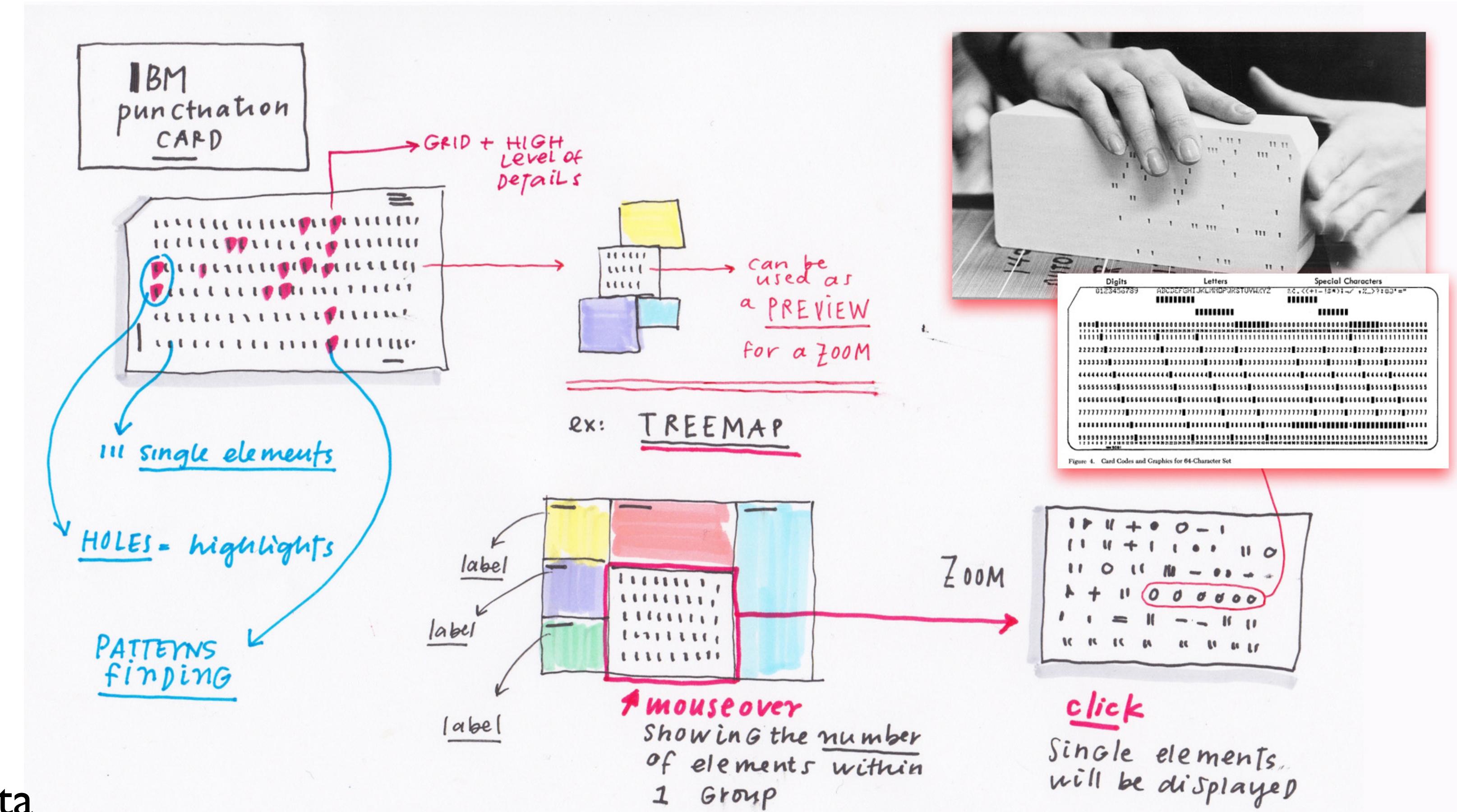
Task/Data Abstraction → Visual Encoding

3. Be creative & sketch, review, sketch



Task/Data Abstraction → Visual Encoding

3. Be creative & sketch, review, sketch



Task/Data Abstraction → Visual Encoding

3. Be creative & sketch, review, sketch

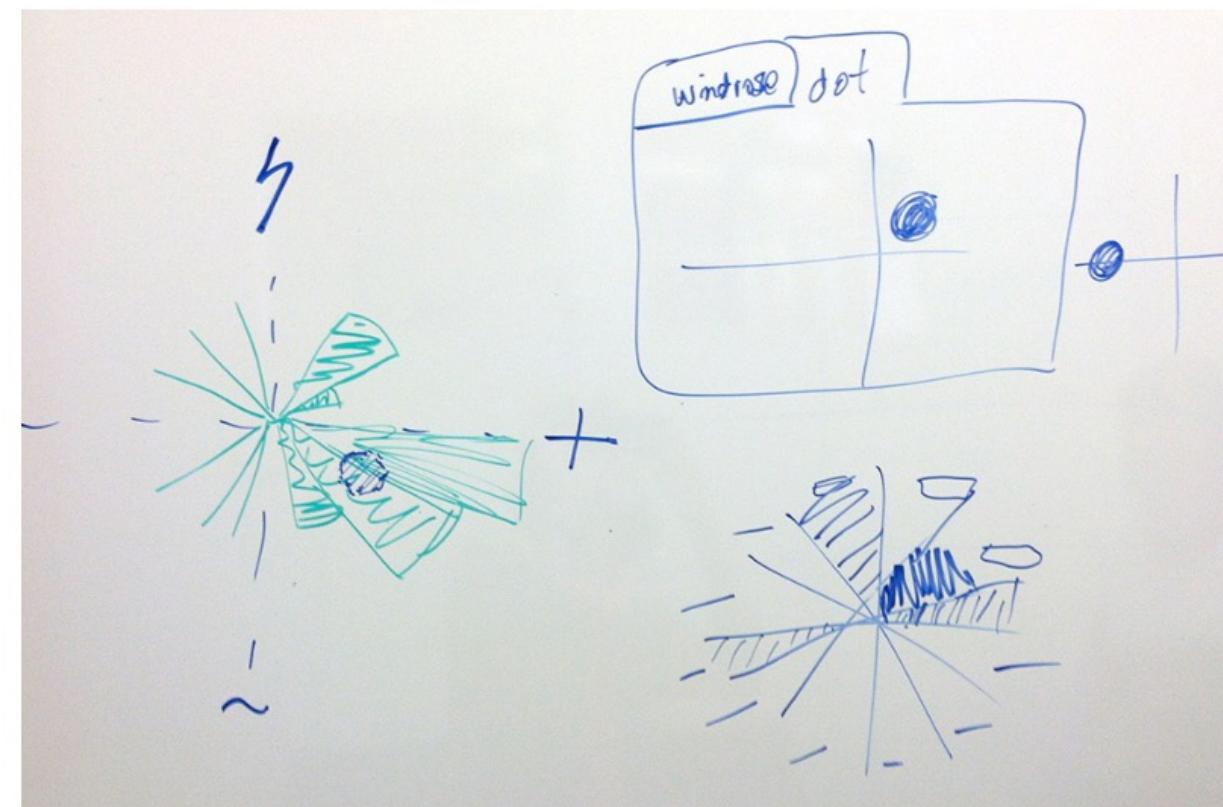


Figure 2. Example of a whiteboard outcome of converging collaboration.

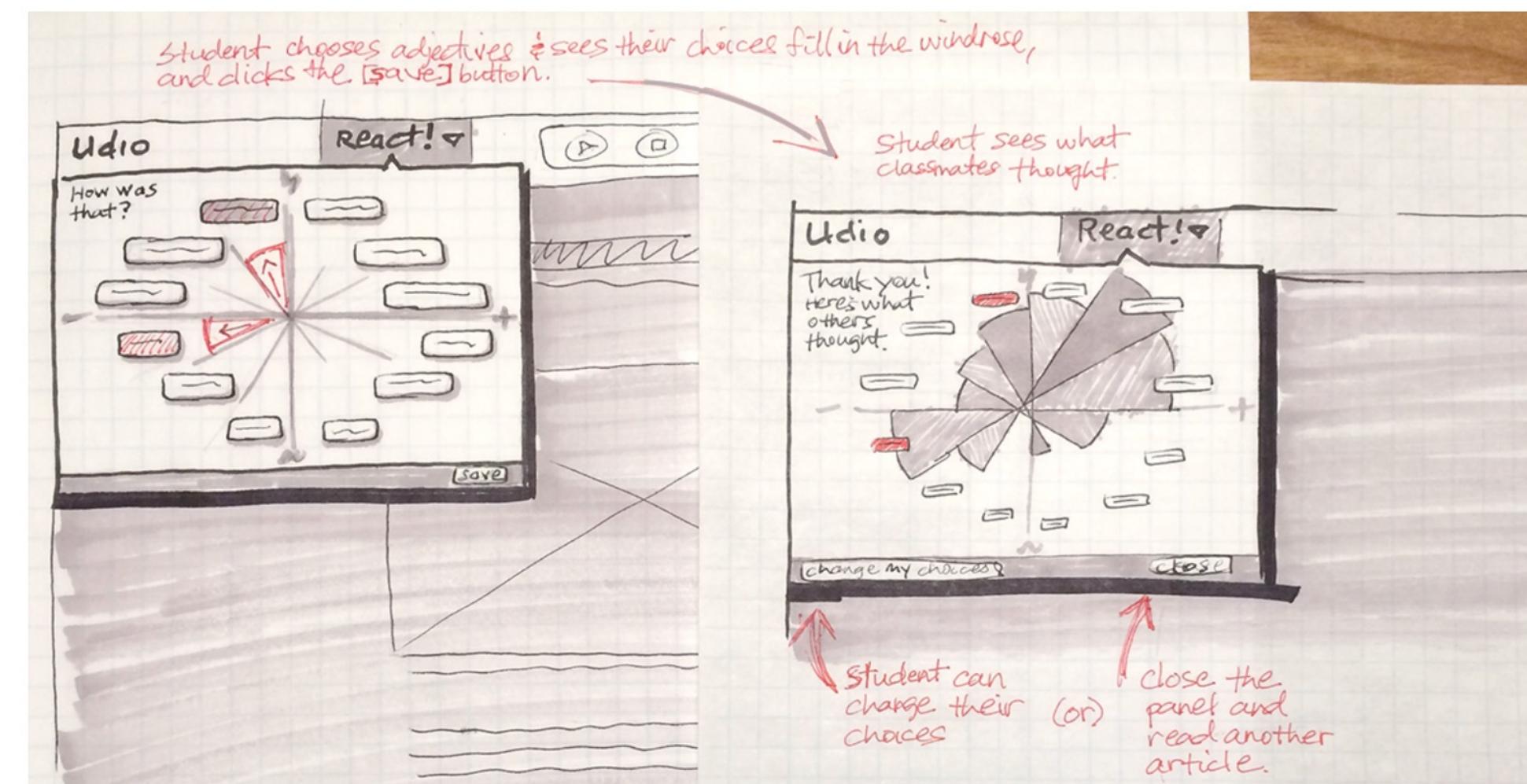
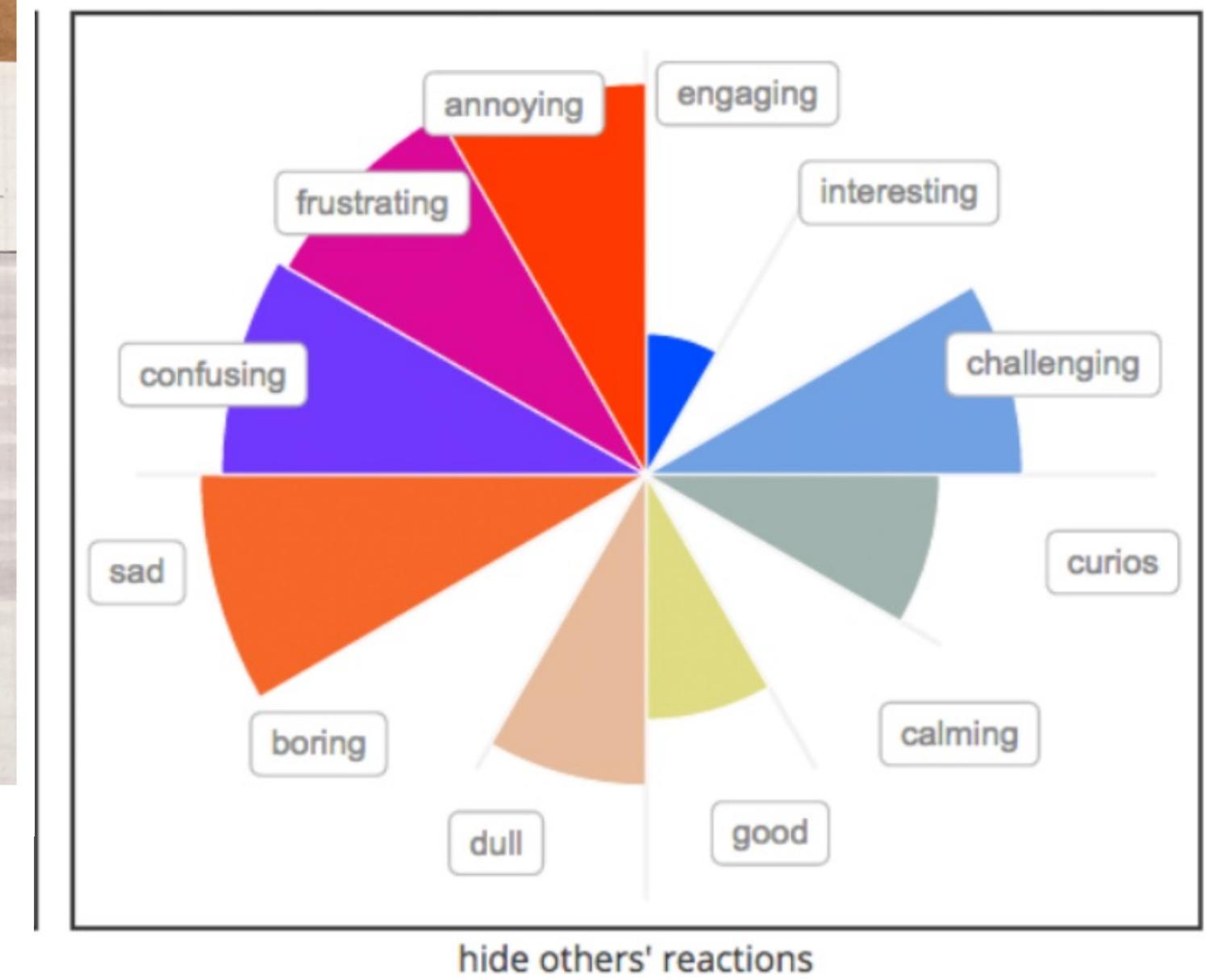


Figure 3. Example of refined sketch of "React" data visualization.



Summary

Today we:

- Reviewed arranging visual encodings for tables
- Reviewed iterative design / sketching new visualizations

ic-09 is DUE today.

hw-06 is OUT today.