

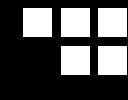
INFORMATION VISUALIZATION

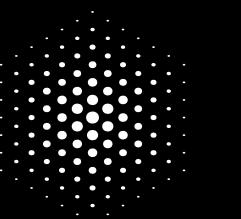
— WHAT, WHEN & HOW?

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1 2 9 0



 CISUC
COGNITIVE AND MEDIA
SYSTEMS

 COMPUTATIONAL
DESIGN &
VISUALIZATION
LAB.

WHAT?

**WHAT?
WHEN?**

**WHAT?
WHEN?
HOW?**

**WHAT?
WHEN?
HOW?**

- It depends.

WHAT?

WHAT?

- "Computer-based visualization systems provide visual representations of datasets intended to help people carry out some task more effectively."

WHAT?

- "Computer-based visualization systems provide visual representations of datasets intended to help people carry out some task more effectively."

WHY?

WHY?

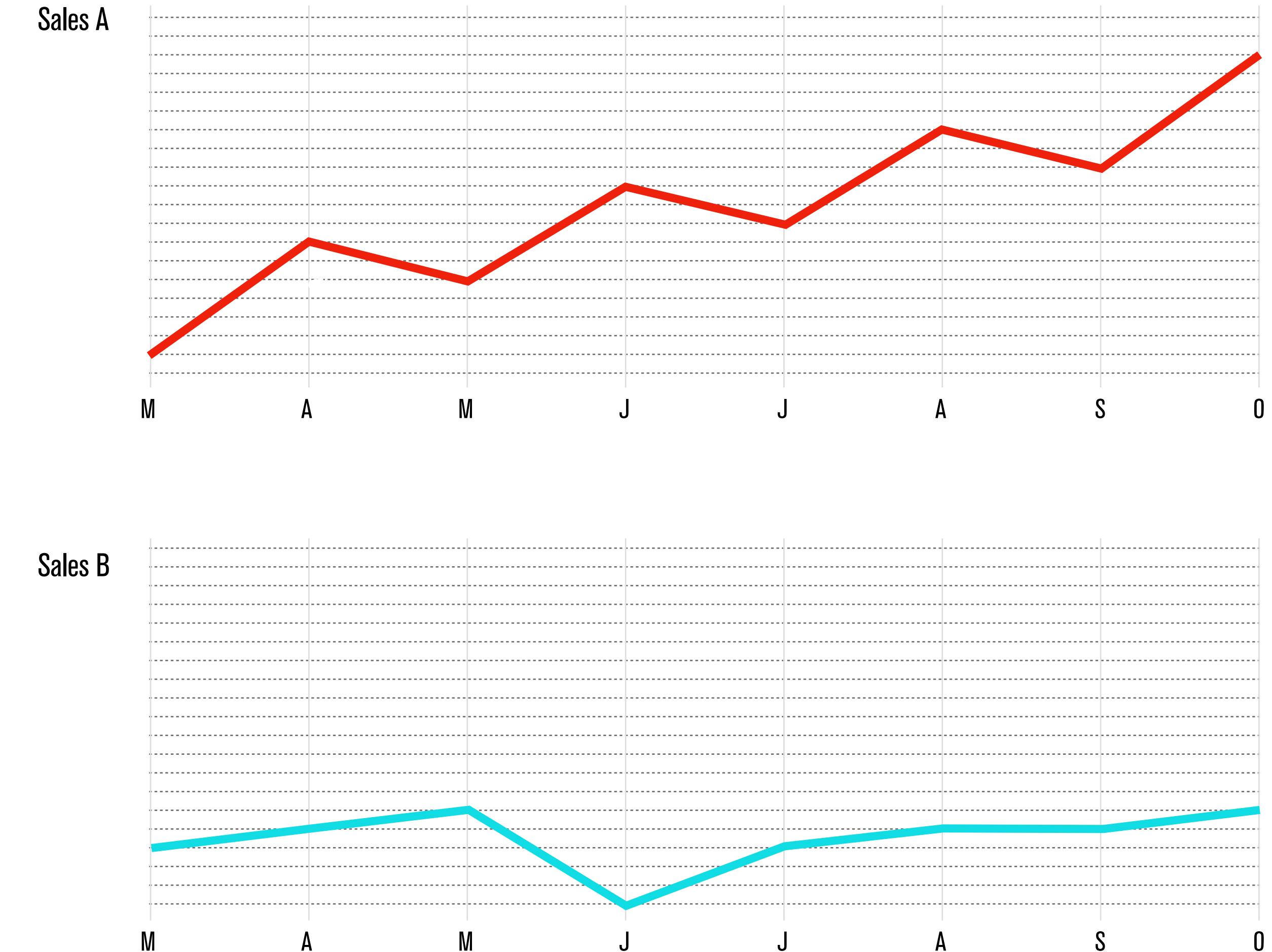
	M	A	M	J	J	A	S	O
Sales A	13	19	17	22	20	25	23	29
Sales B	15	16	17	12	15	16	16	17

Memorability

WHY?

	M	A	M	J	J	A	S	O
Sales A	13	19	17	22	20	25	23	29
Sales B	15	16	17	12	15	16	16	17

Memorability



WHY?

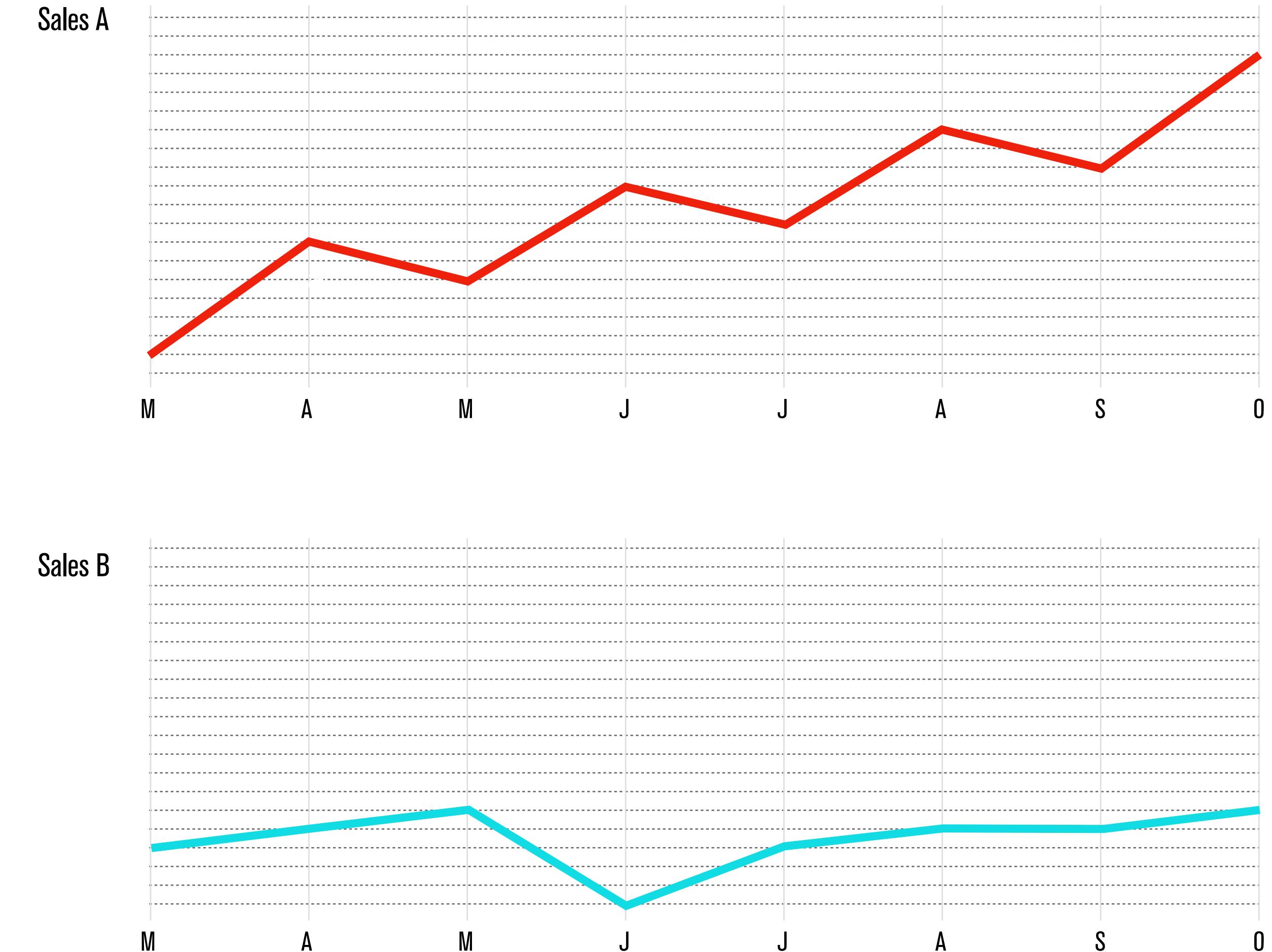
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Memorability

WHY?

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Memorability



WHY?

Identical statistics

x mean	9.0
x variance	10.0
y mean	7.50
y variance	3.75
x/y correlation	0.816

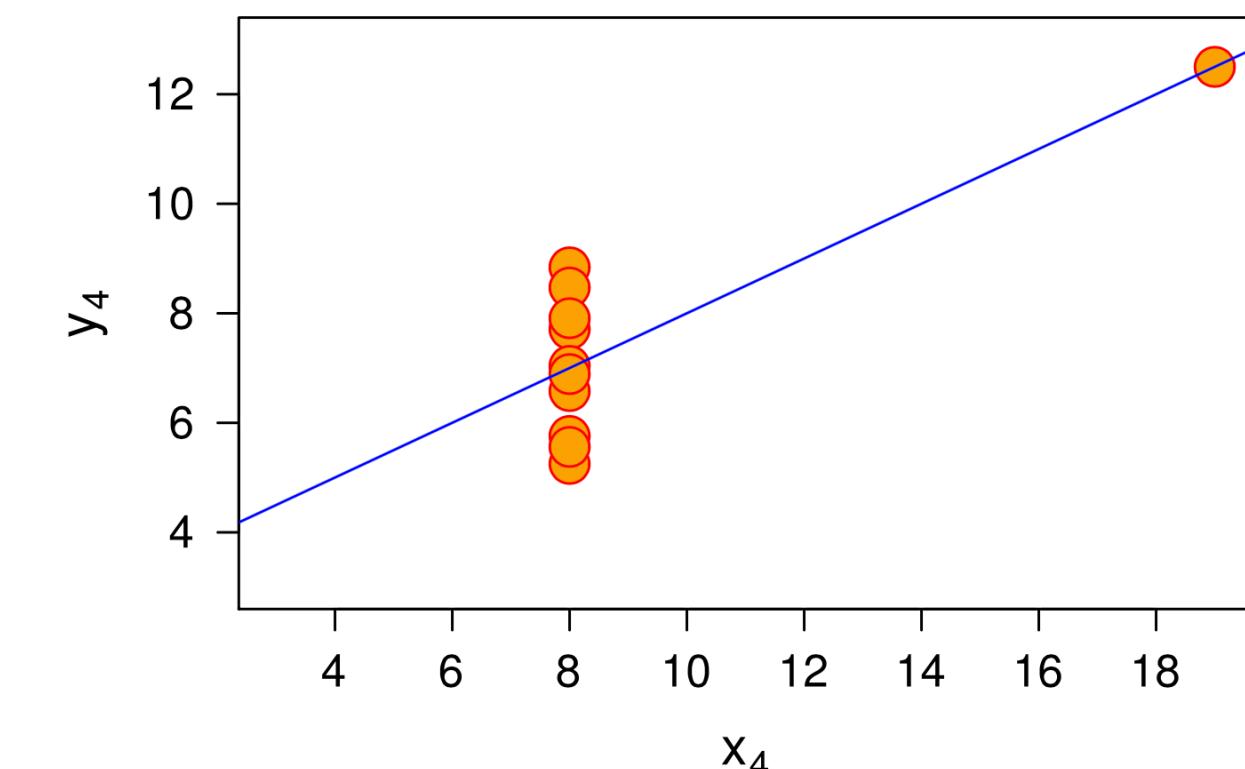
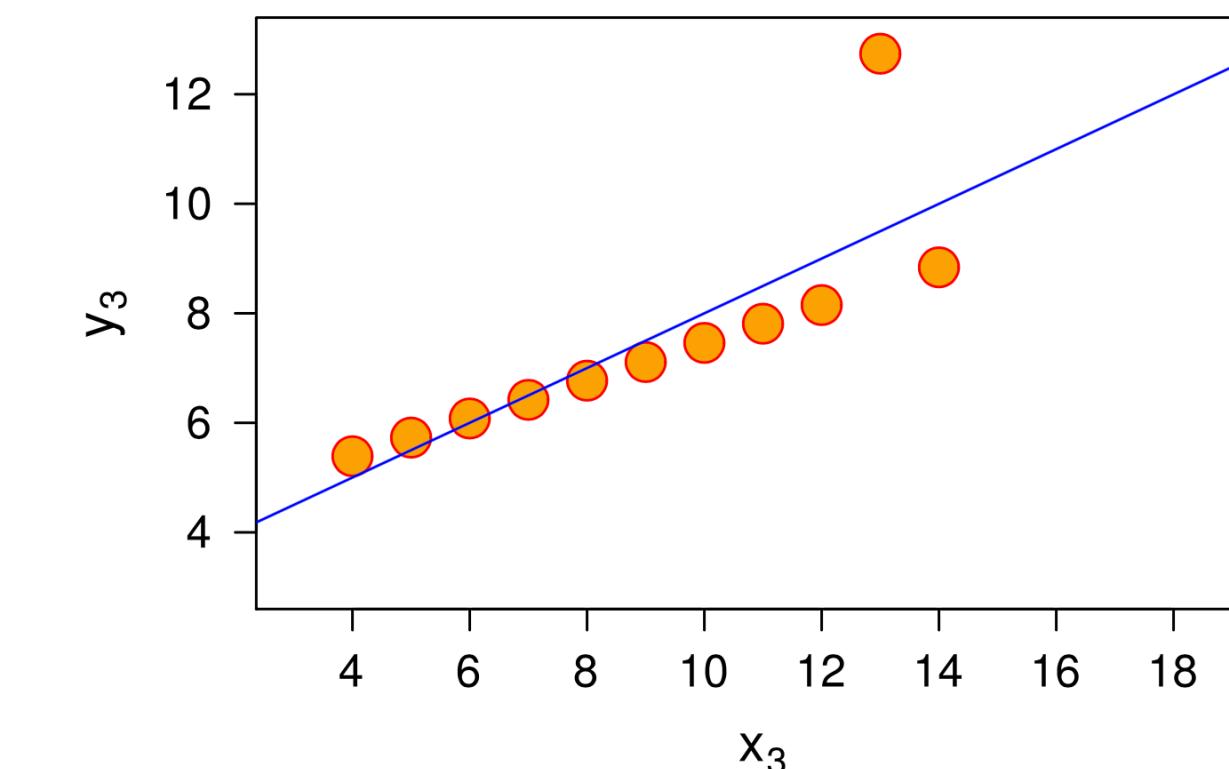
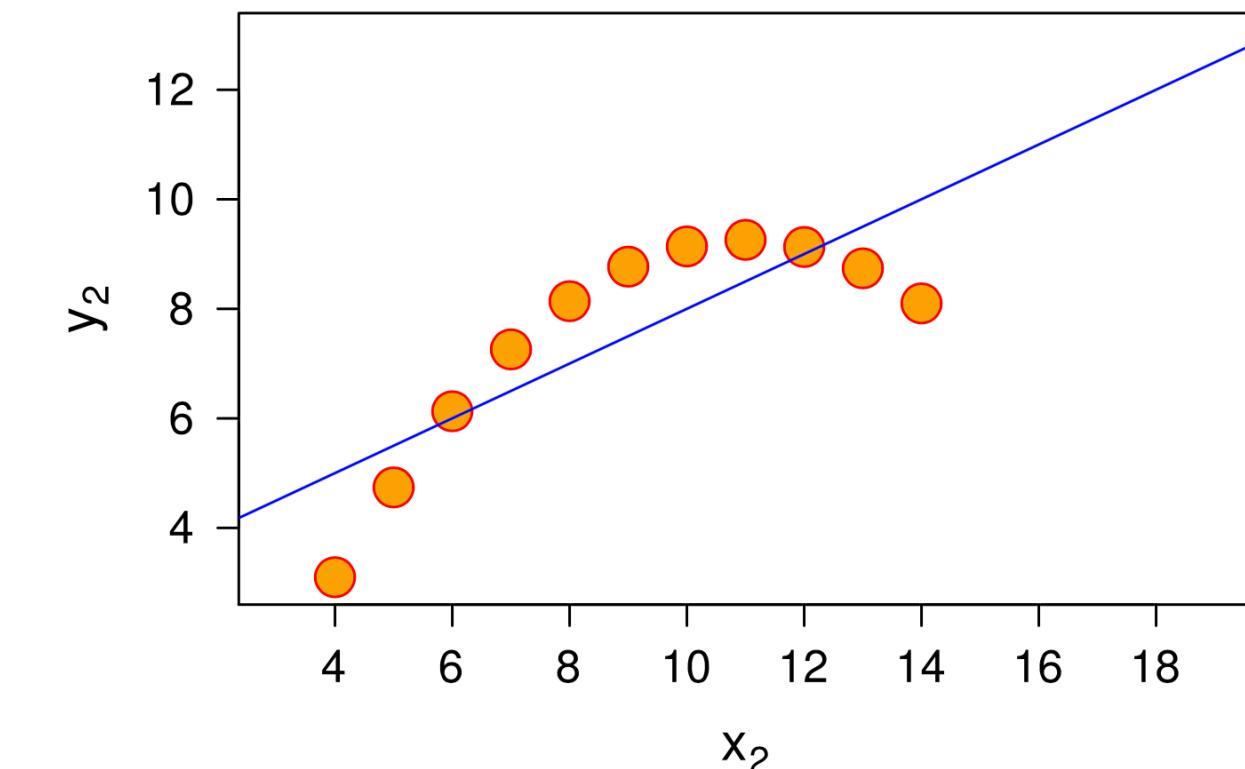
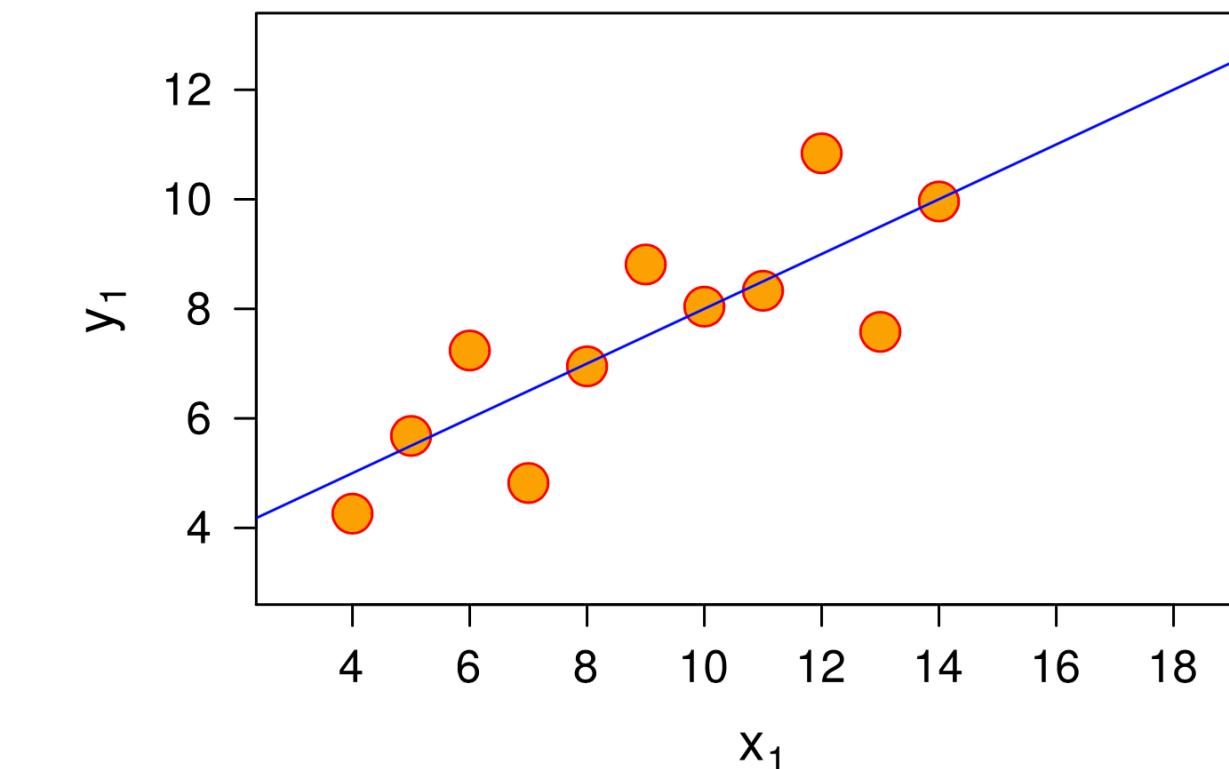
Anscombe's quartet

WHY?

Identical statistics

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Anscombe's quartet

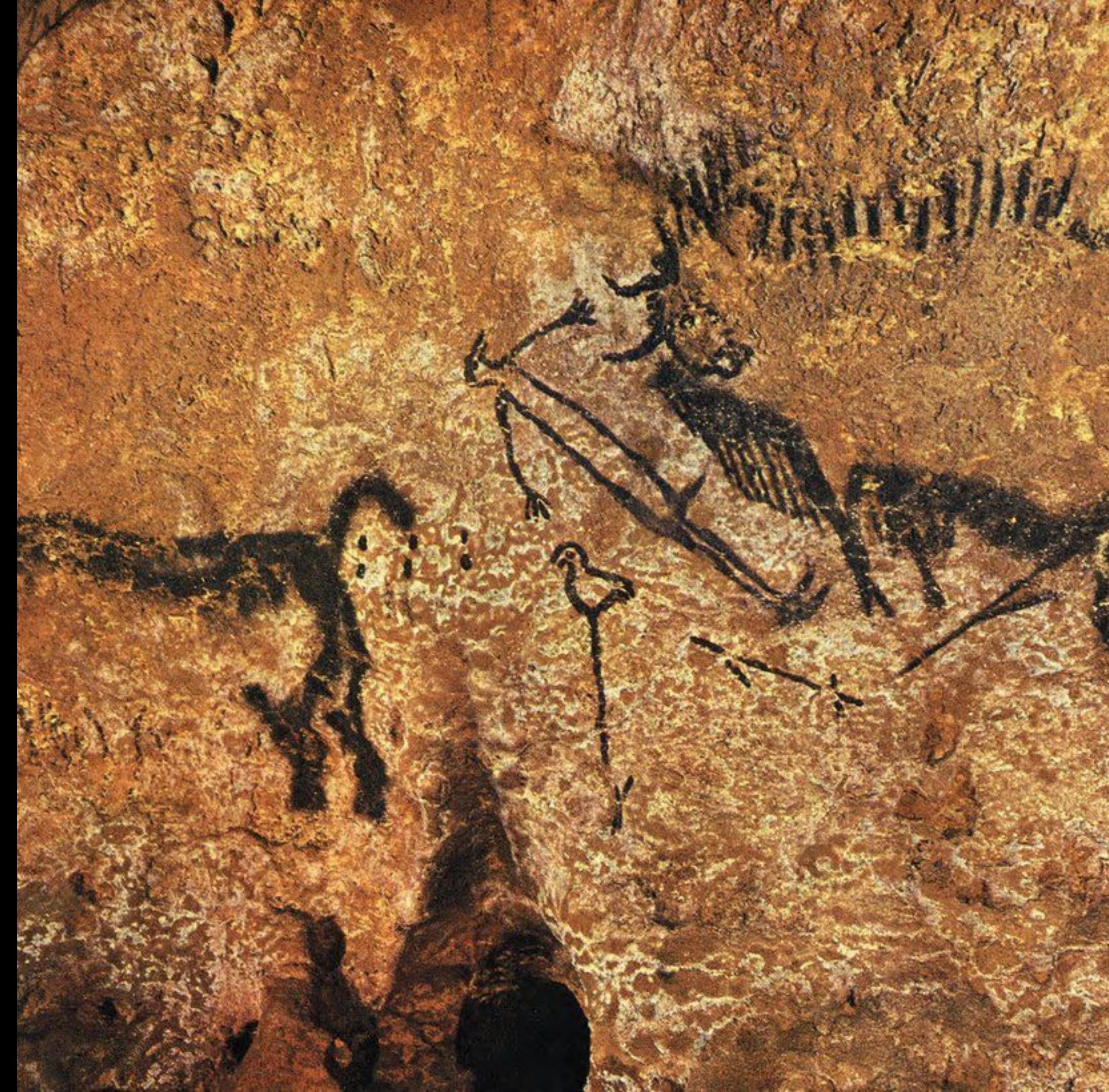


WHEN?

WHEN?

- Represent the world

Lascaux cave painting, 17 000 years old



WHEN?

- Represent the world
- Communicate ideas

Hieroglyphs on the Temple of Kom Ombo, Egypt



WHEN?

- Represent the world
- Communicate ideas
- Oracy → Literacy

Gutenberg Bible, 1454

*Incepit prologus Iohani Ieronimi pref
biteri. In liberum Iosue:*

Sandem finito p̄tathēto
mosyi reludi grādi fōnore
liberati ad ihesum filium
naue manū mittim⁹ quē
hebrei iosue bēnum id ē iosue filiū nun
vocat: ⁊ ad iudicū librū quē sop̄thim
appellat: ad ruth q̄: ⁊ hellet q̄s ihsū
nominib⁹ effecunt. Nonemusq; le
dorem ut siluā hebraicorū nonūmū
et distinctiones p̄t mēbra diuīlas di
ligenis scriptura cōseruet: ne et noster
labor et illius studiū pereat. Et ut in
p̄mis qđ sepe testat⁹ sum sciāt me nō
in reprehensionē veterū noua cūdere
sicut amici mei cūminātur: sed p̄ vili
portione offere līque mee hominib⁹
q̄s tamē uēa delectat: ut p̄ grecos rea
ploys q̄ ⁊ sumptu ⁊ labore maxio in
diget. editionē nēam habeat. Et sicubi
i antiquorū voluminūm legione du
bicarint: hec illis cōfertes inueniant
qđ req̄unt. Maximē cū apud latīnos
tot sint exemplaria quod codices: et u
niusquisq; p̄ arbitrio suo vel addidicit
vel subtraxerit q̄ cū uisū est: et utiq; nō
possit verū esse qđ dissonat. Unde cesser
arcuato vulnere cōtra nos insurgere
scorpīus. et sandū op̄ uenerata carpe
re līqua desistat: vel suscipiēs si placet
vel detinēs si displicer: manineritq;
illorū versuū. Os tuū abundauit ma
licia. ⁊ līqua tua dīnabat dolos. Be
dēs adūsus frattu tuū loq̄baris: et
adūsus filiū māris tue ponetas scān
dālū: sūcū: et cūq; sūcū: et cūq;

irridendi cristi anos sit oblata occa
sio: et ecclēsie hominēs id despicerē
ymmo lacerare unde aduersarij torq
antur. Quod si vetus eis tantū inter
pretatio placet. q̄ ⁊ nichil nō displicer
⁊ nichil extra recipiendū putat: cur ea q̄
sub asteriscis ⁊ obelis uel addita sunt
uel ap̄putata legūt ⁊ neglīnt. Quare
danielē iuxta theodozios trālationē
ecclēsie suscepérunt. Cur originē mirat̄
et eusebīū p̄aphili: cūdas editiones si
militer dissenserent. Aut q̄ fuit stulticia:
postq; vera dixerit p̄ferre q̄ falsa sunt.
Unde aut̄ in novo testamēto p̄bare
poterūt assumpta testimonia: q̄ i libris
veterib⁹ nō habentur. Hec dicim⁹: ne
omnino calūmiantib⁹ tacete videant̄.
Ceterū post sande paule dominionē
cū vīta virtutis exemplū est. et hos
libros quos eustochio virginī cristi
negare nō potui. dictuū dū sp̄irū
hos regit artus p̄phetaq; explanatio
ni incubere. et omnissimū iam dū opus
quodam post linūmō rep̄tere: preser
tim cū ⁊ ammirabilis sandusq; vir
pammachius hoc i dē litteris flagit̄:
et nos ad pātriā sesquātes. mortiferos
hyrenas cat⁹ surda debeat⁹ aure tūsire.
Explicit prol. Incepit liber Iosue. c. 3.



t factum ē post mor
tem mosyi serui dñi.
ut loqueret dñs ad
iosue filiū nun mi
nistrum mosyi: ⁊ di
ceret ei. Moyses sa
uis meus mortuus est. Surge ⁊ trāst
i: dālū: sūcū: et cūq; sūcū: et cūq;

WHEN?

- Represent the world
- Communicate ideas
- Oracy → Literacy
- Understand the world

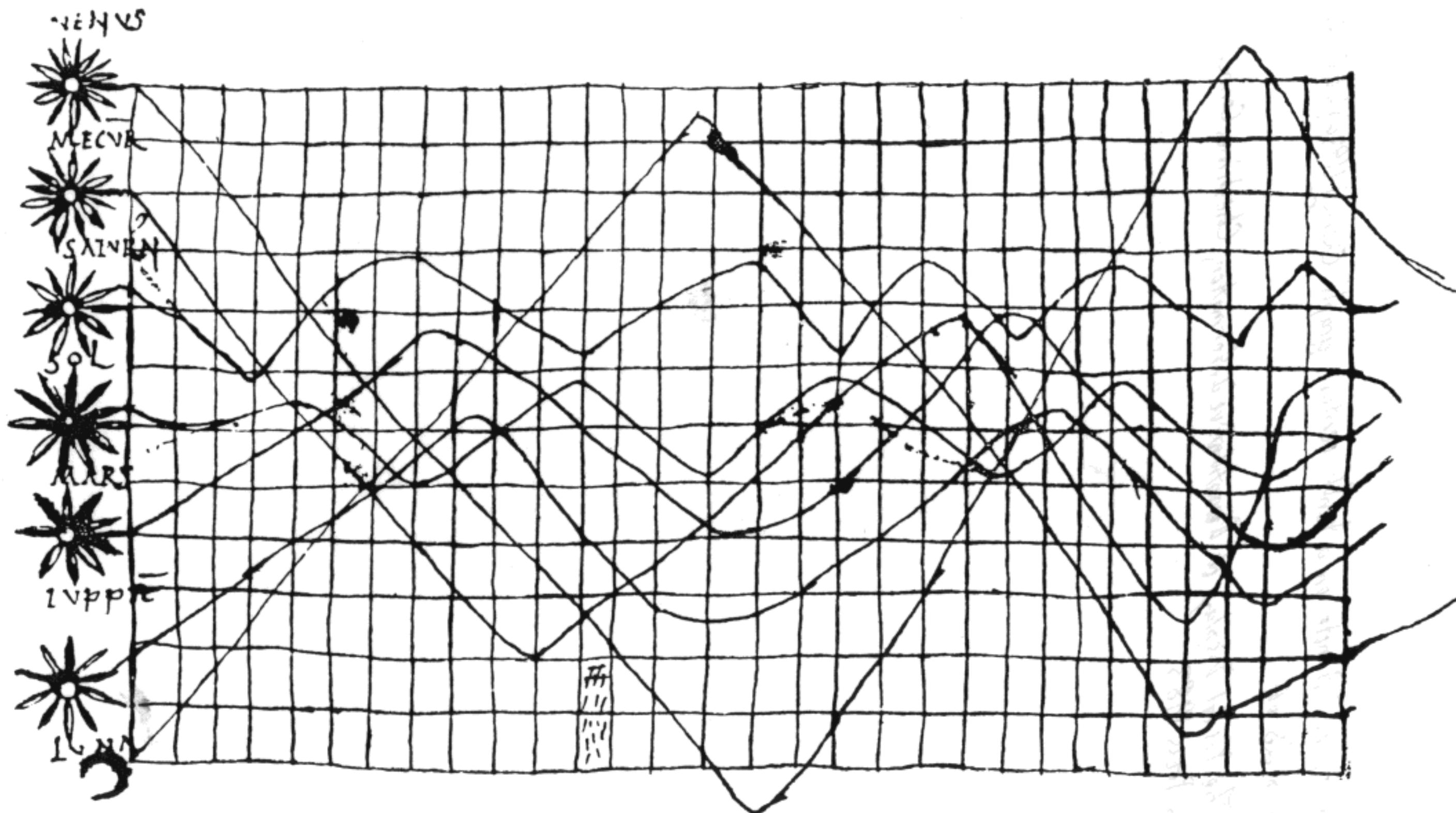
Claudius Ptolemy's world map, 1482

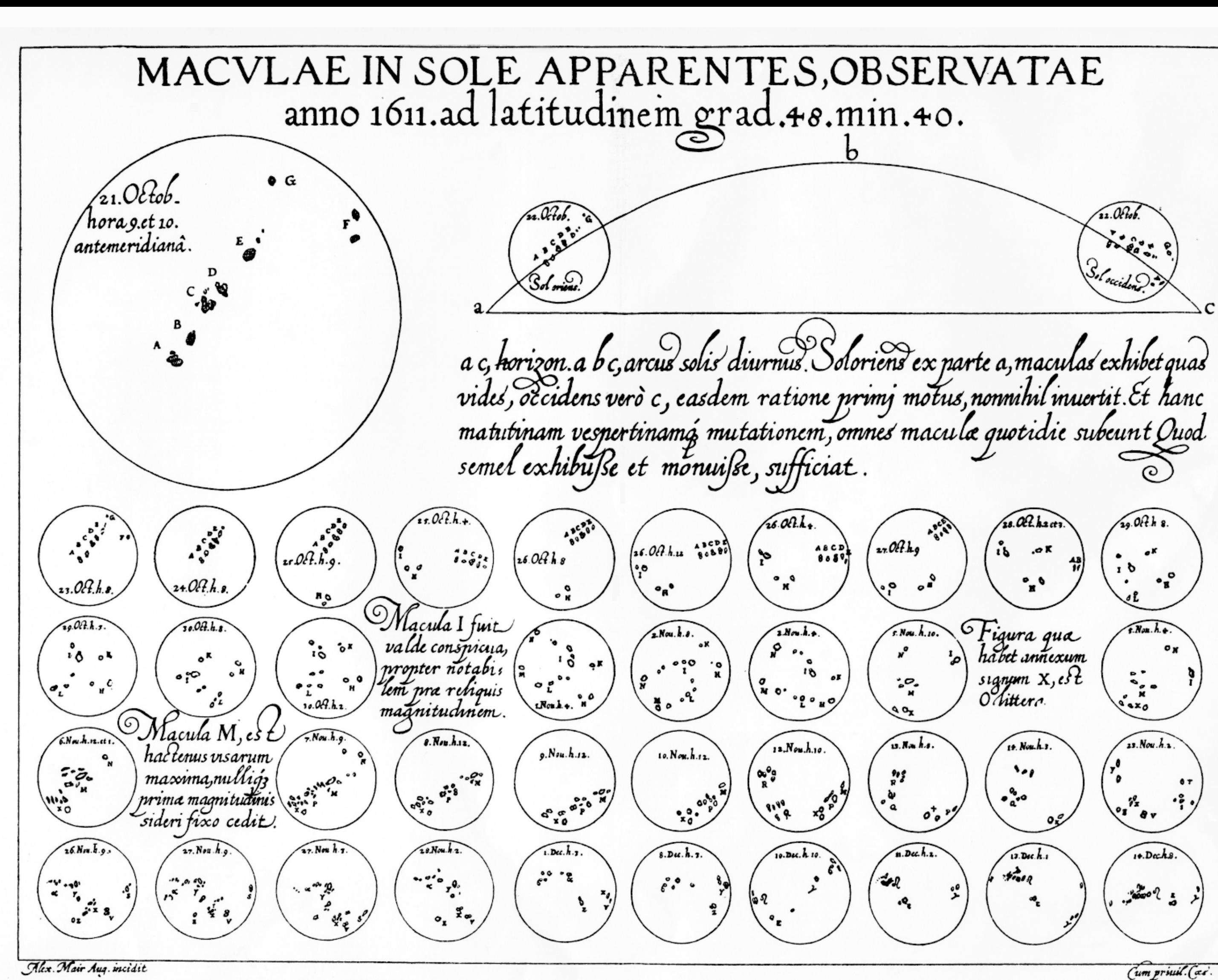


WHEN?

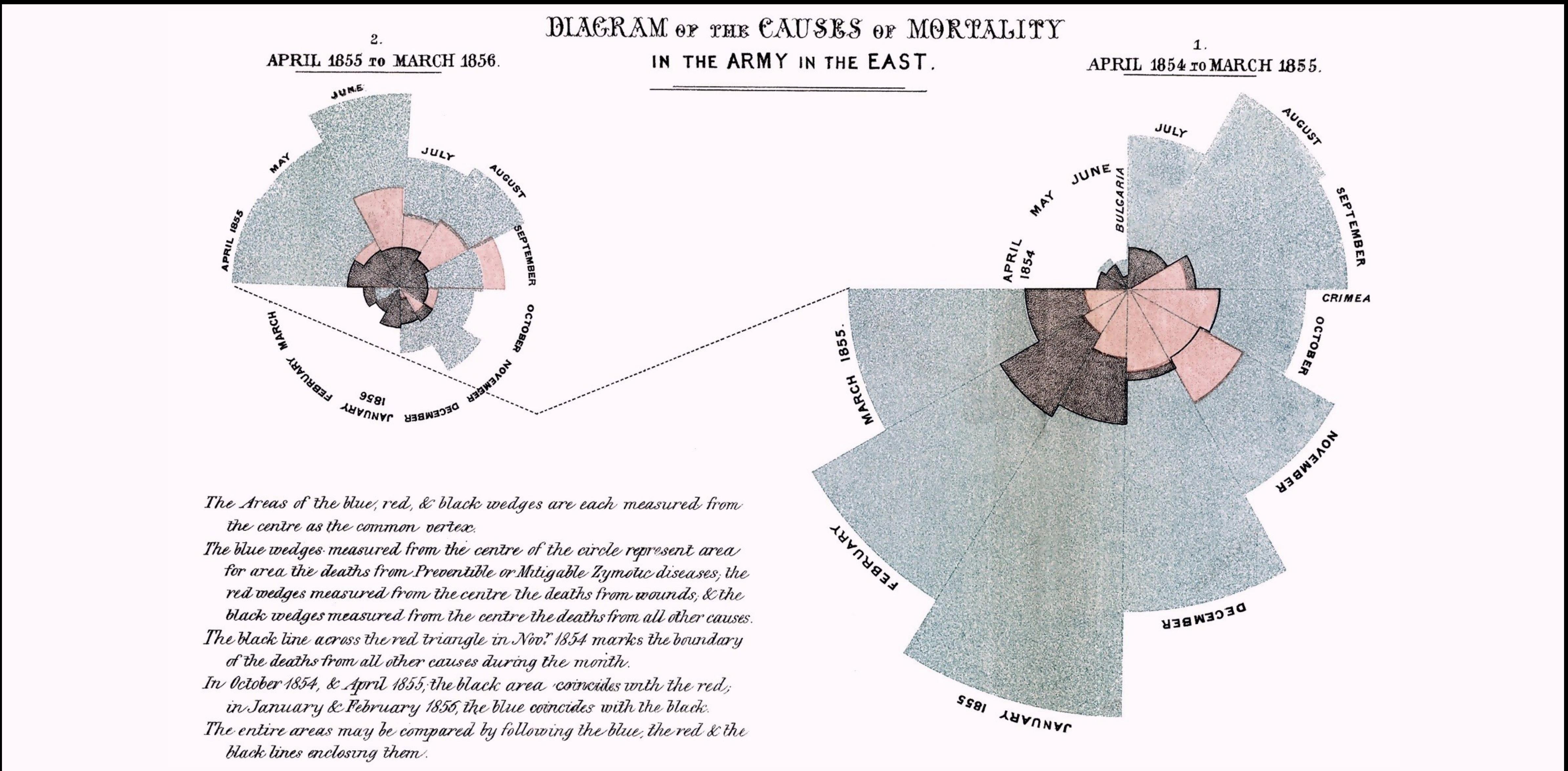
- Represent the world
- Communicate ideas
- Oracy → Literacy
- Understand the world
- Detect patterns.

n.d., Heavenly bodies, 16th century

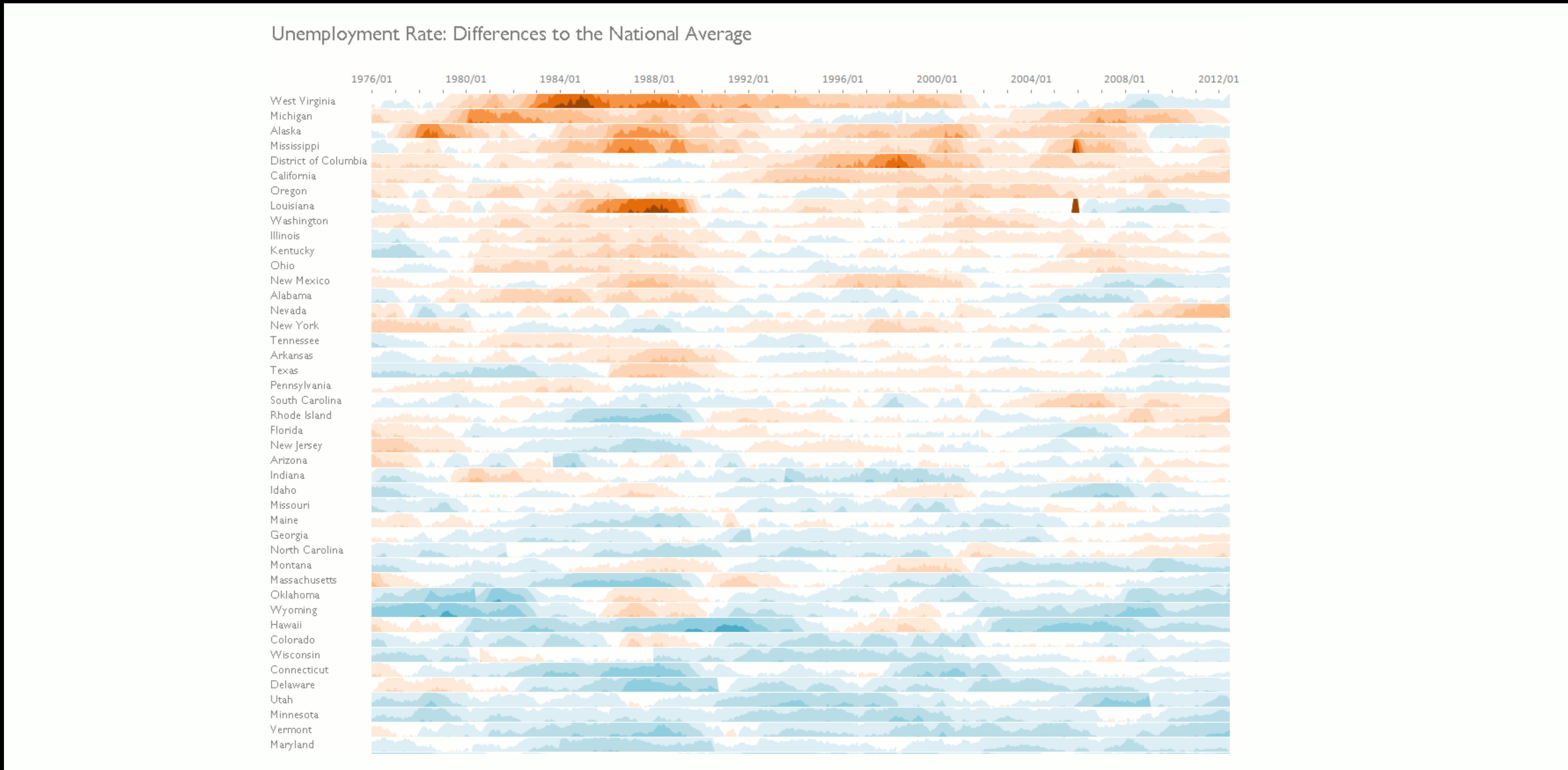




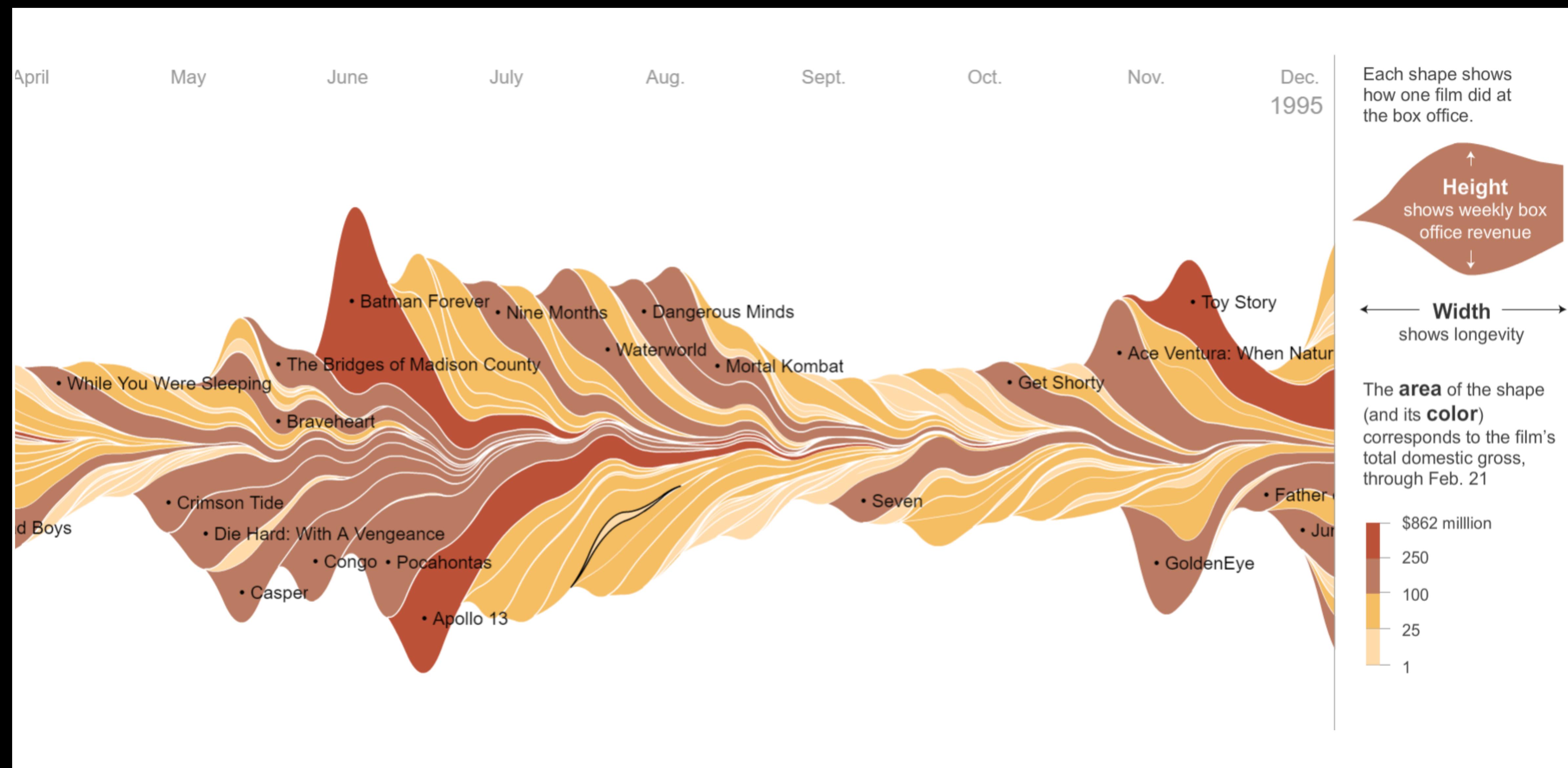
Florence Nightingale's original rose diagram, 1855



Horizon Graph, Unemployment Rate by Jorge Camoes, 2012



Stream Graph, Box Office Receipts by Mathew Bloch, Lee Byron, Shan Carter and Amanda Cox, 2008



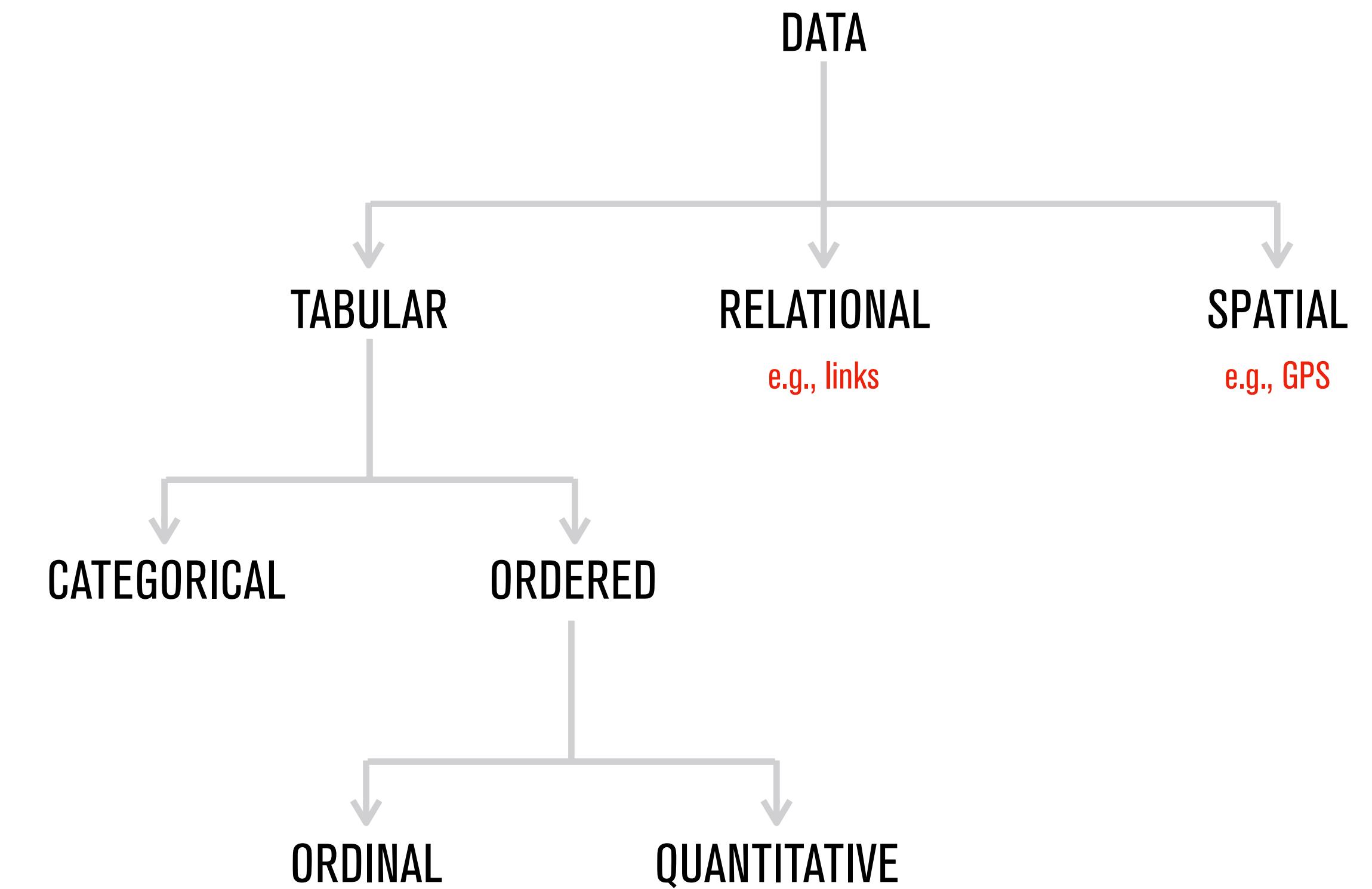
HOW?

HOW?

- Understand your data types

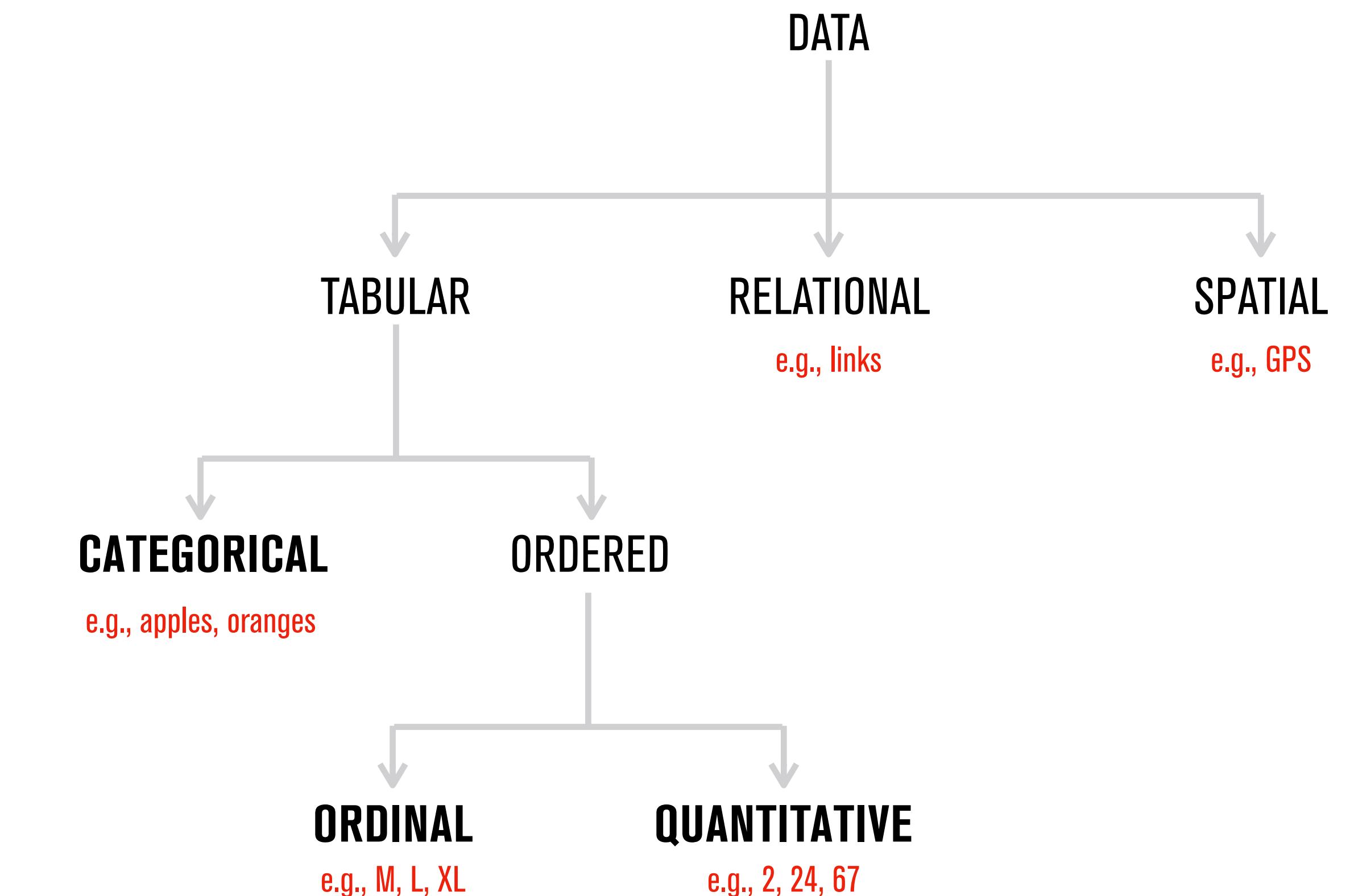
HOW?

- Understand your data types



HOW?

- Understand your data types



HOW?

- Understand your data types
- Represent your data

HOW?

- Understand your data types
- Represent your data:
 - Marks



POINT



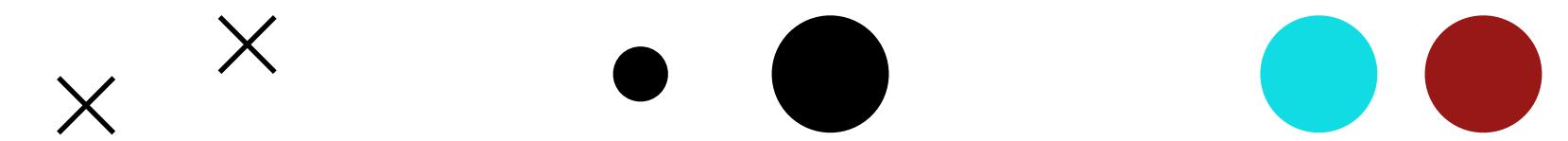
LINE



AREA

HOW?

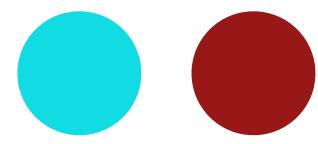
- Understand your data types
- Represent your data:
 - Marks
 - Visual Channels.



POSITION



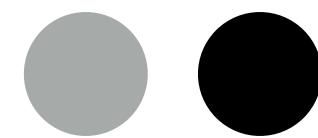
AREA



HUE



TEXTURE



SATURATION



ORIENTATION



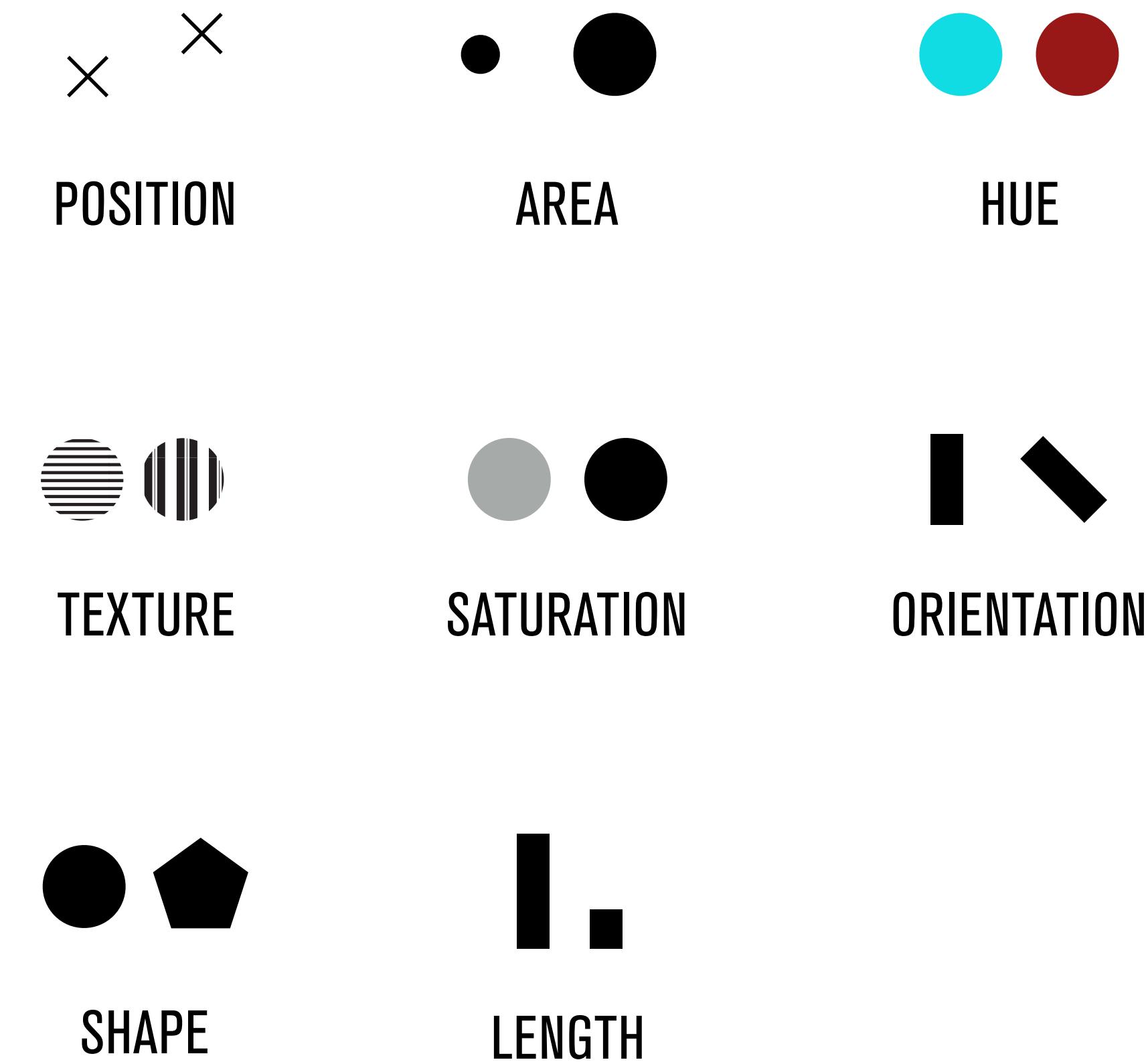
SHAPE



LENGTH

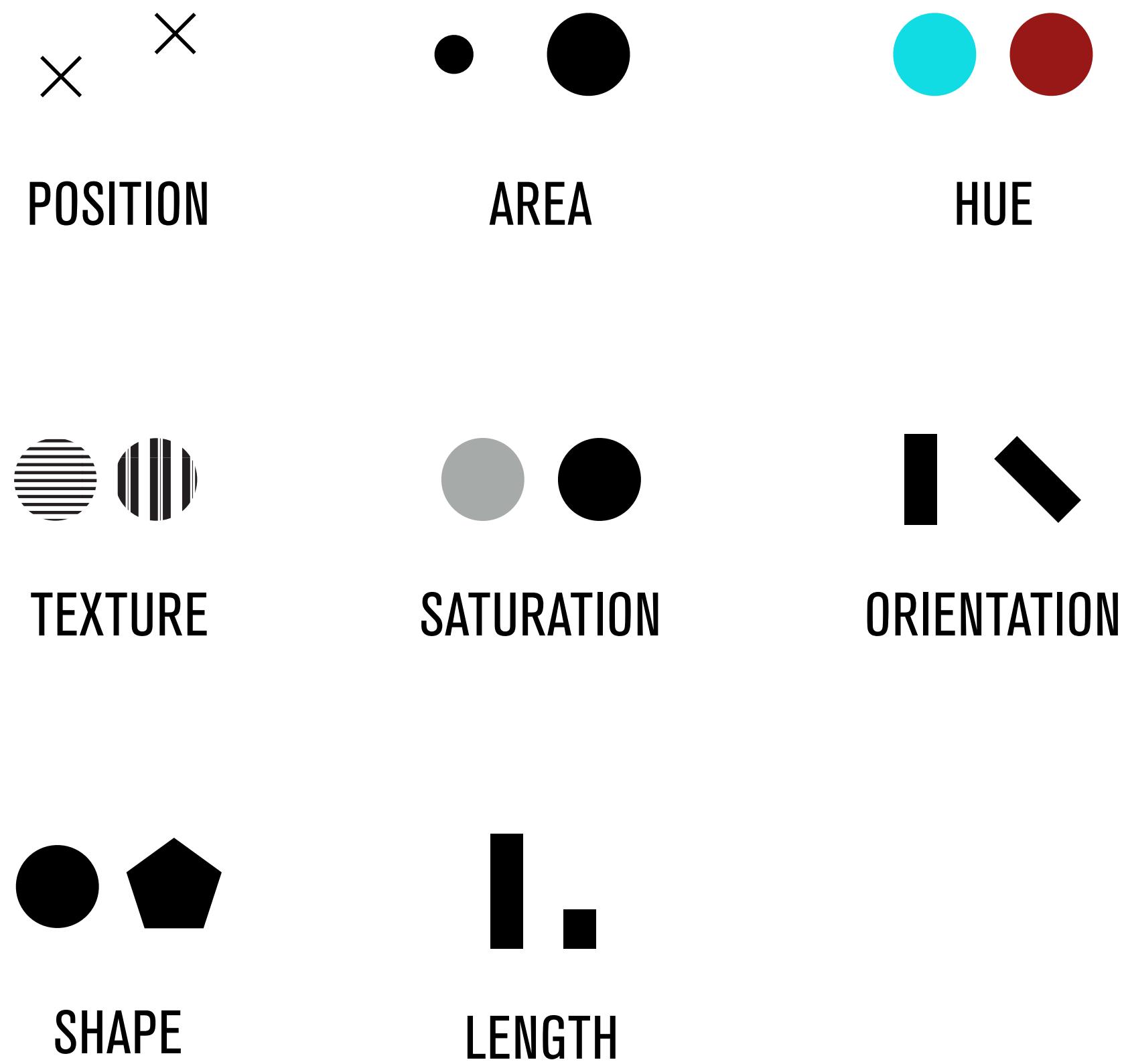
VISUAL WHAT?

- Define the visual appearance of a mark



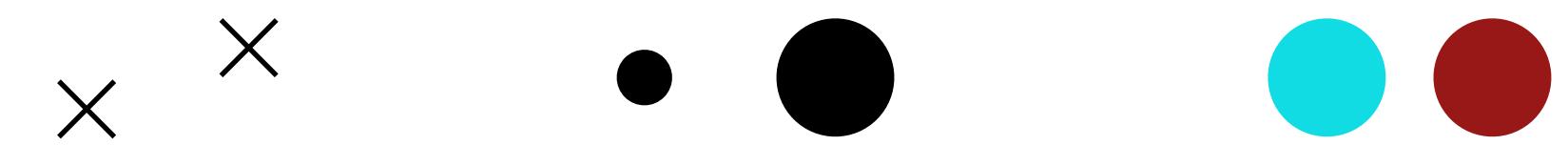
VISUAL WHAT?

- Define the visual appearance of a mark
- Depend on data type



VISUAL WHAT?

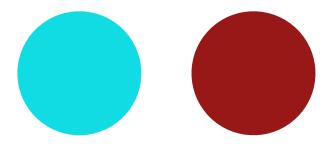
- Define the visual appearance of a mark
- Depend on data type
- Can be used together.



POSITION



AREA



HUE



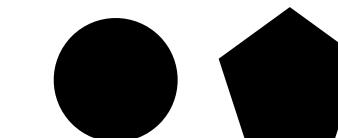
TEXTURE



SATURATION



ORIENTATION



SHAPE



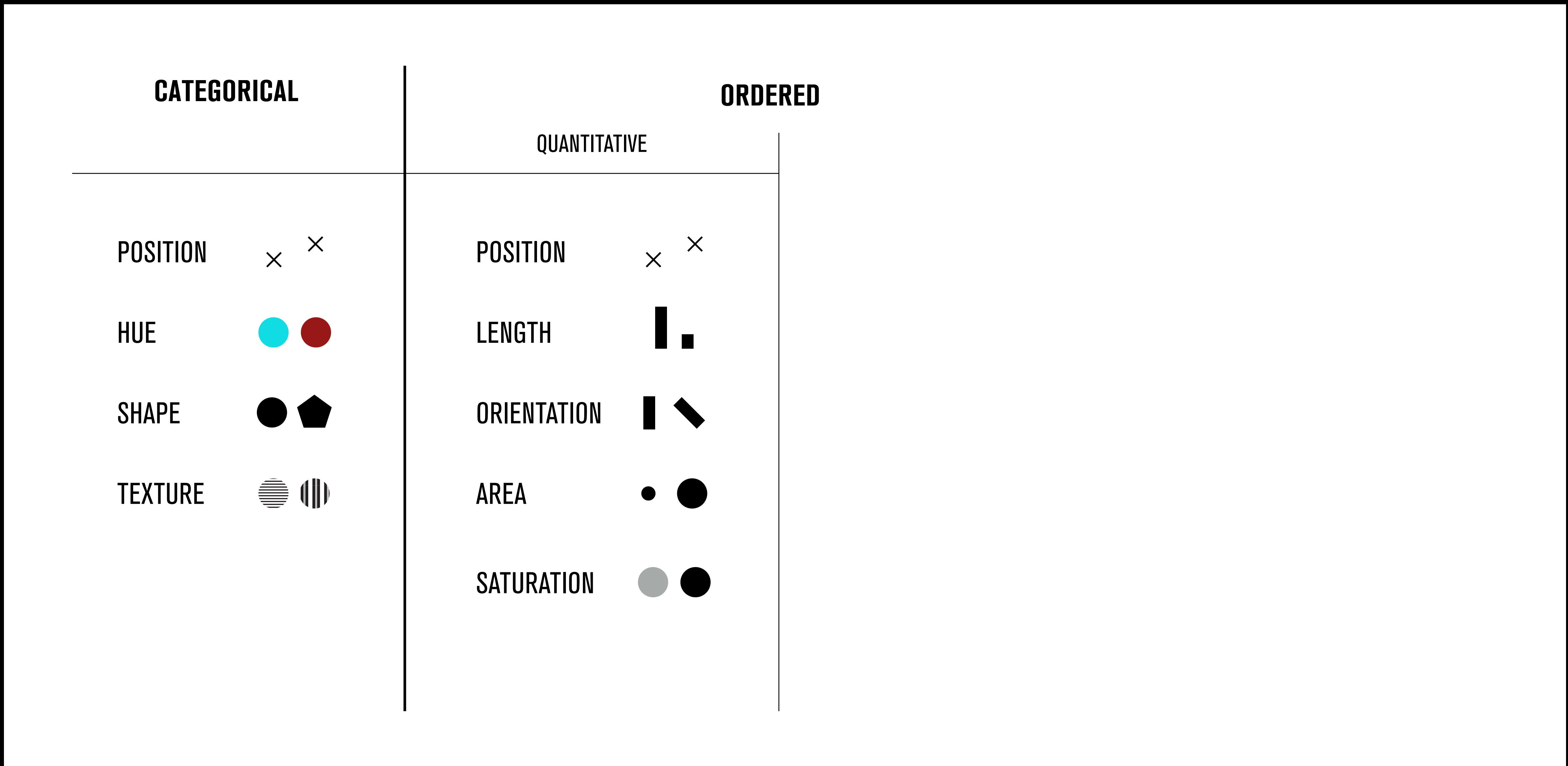
LENGTH

VISUAL
HOW?

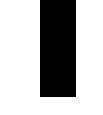
Visual Variables – How? (Bertin, 1983; Mackinlay 1986; Carpendale, 2003; T. Munzner., 2014)



Visual Variables – How? (Bertin, 1983; Mackinlay 1986; Carpendale, 2003; T. Munzner., 2014)



Visual Variables – How? (Bertin, 1983; Mackinlay 1986; Carpendale, 2003; T. Munzner., 2014)

CATEGORICAL		ORDERED	
		QUANTITATIVE	ORDINAL
POSITION	×	×	
HUE	 	 	 
SHAPE	 	 	 
TEXTURE	 	 	 
		SATURATION	
		 	

Visual Variables – How? (Bertin, 1983; Mackinlay 1986; Carpendale, 2003; T. Munzner., 2014)

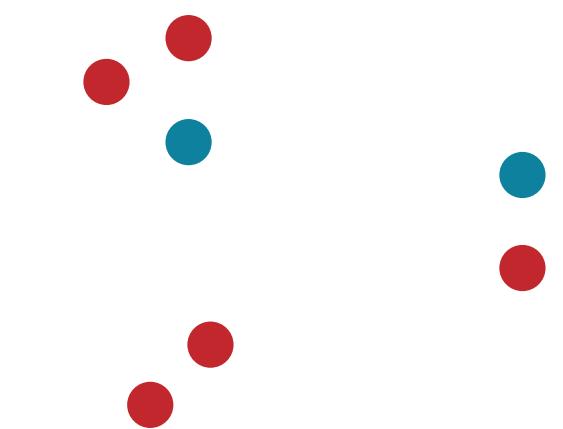
CATEGORICAL		ORDERED		RELATIONAL	
		QUANTITATIVE	ORDINAL		
POSITION	×	×	POSITION	×	×
HUE	●	●	LENGTH	■	■
SHAPE	●	●	ORIENTATION	■	■
TEXTURE	●	●	AREA	●	●
			SATURATION	●	●

VISUAL WARNING!

- Separability

VISUAL WARNING!

- Separability

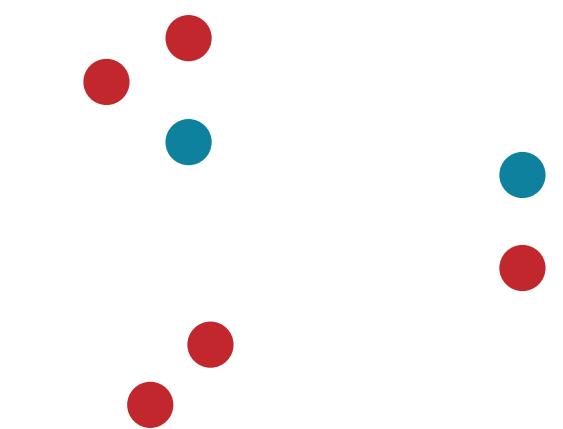


POSITION + COLOUR

Fully Separable

VISUAL WARNING!

- Separability



POSITION + COLOUR

Fully Separable

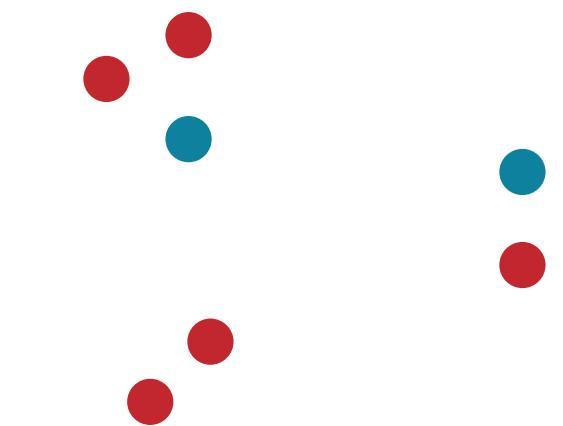


SIZE + COLOUR

Some Interference

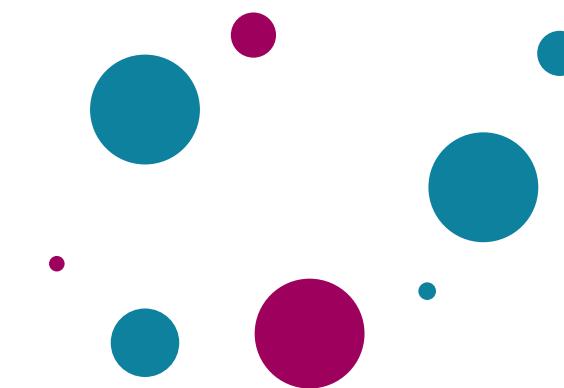
VISUAL WARNING!

- Separability



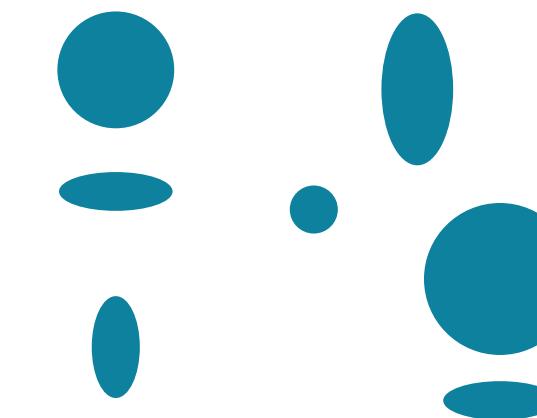
POSITION + COLOUR

Fully Separable



SIZE + COLOUR

Some Interference

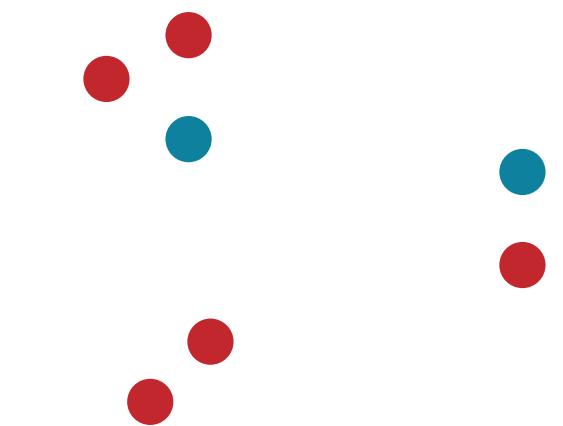


WIDTH + HEIGHT

Significant Interference

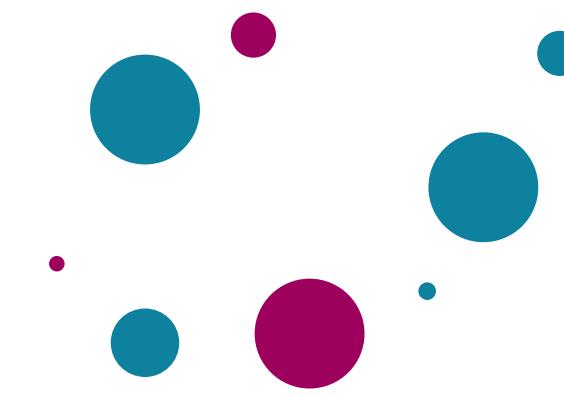
VISUAL WARNING!

- Separability



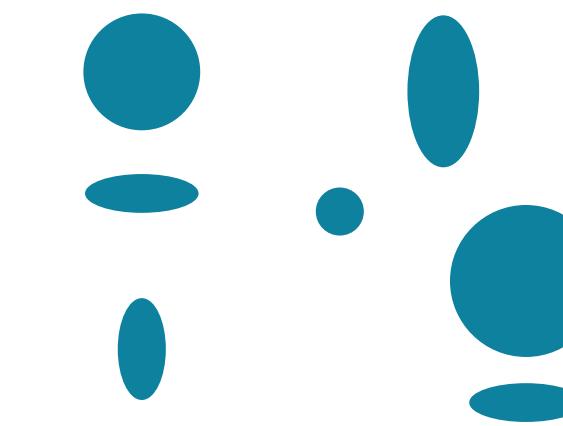
POSITION + COLOUR

Fully Separable



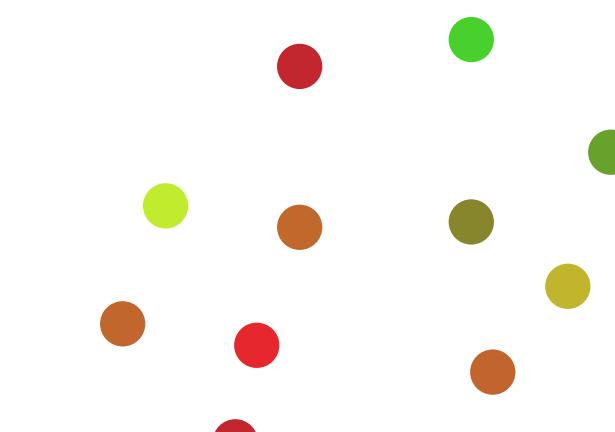
SIZE + COLOUR

Some Interference



WIDTH + HEIGHT

Significant Interference



HUE + HUE

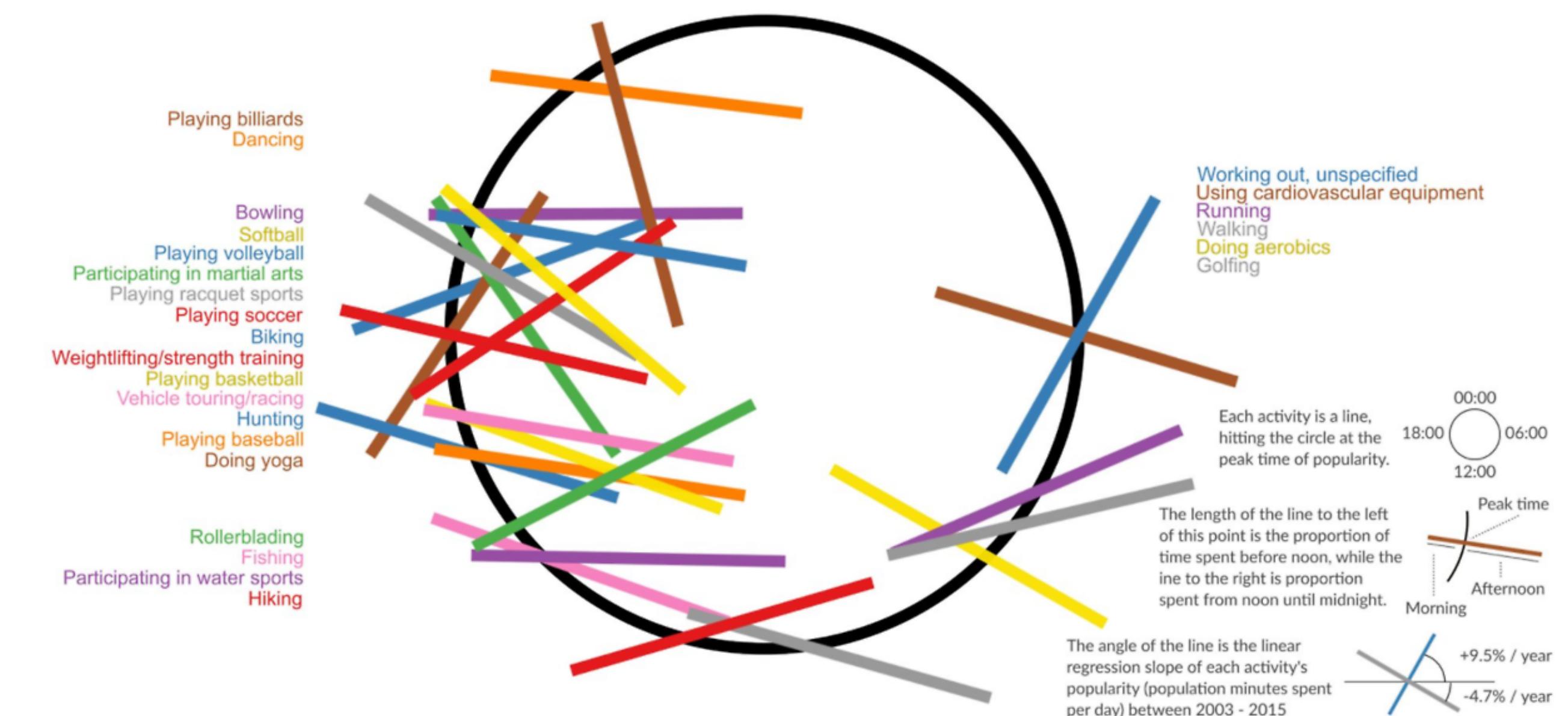
Major Interference

VISUAL WARNING!

- Separability
- Simplify.

Peak time for sports and leisure

@hnrikIndbrg | Source: American Time Use Survey



TIME

TIME WHAT?

- Inherent semantic structure

TIME WHAT?

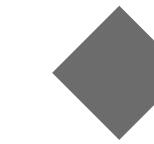
- Inherent semantic structure
 - Different calendars

TIME WHAT?

- Inherent semantic structure
 - Different calendars
 - Different levels of granularity.

TIME WHAT?

- Time primitives



INSTANT



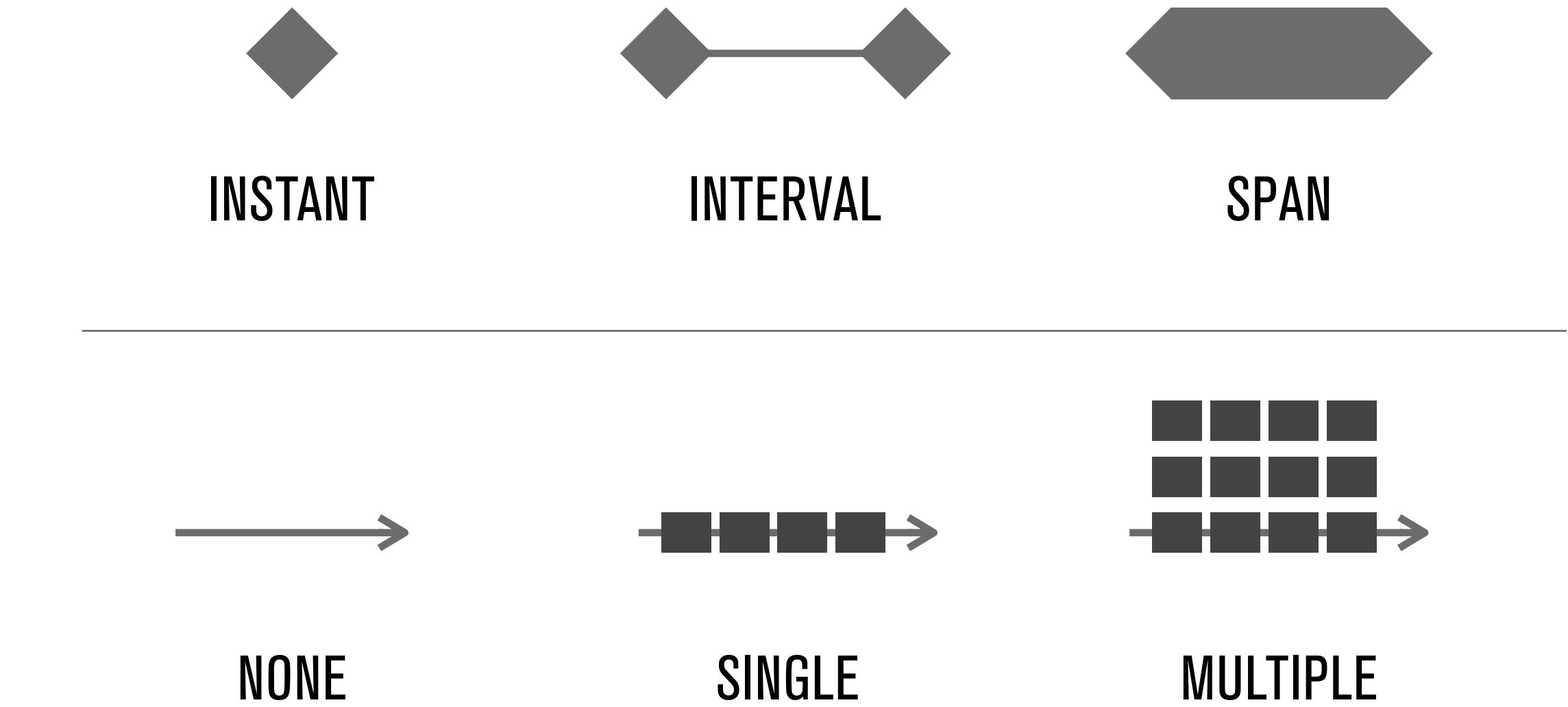
INTERVAL



SPAN

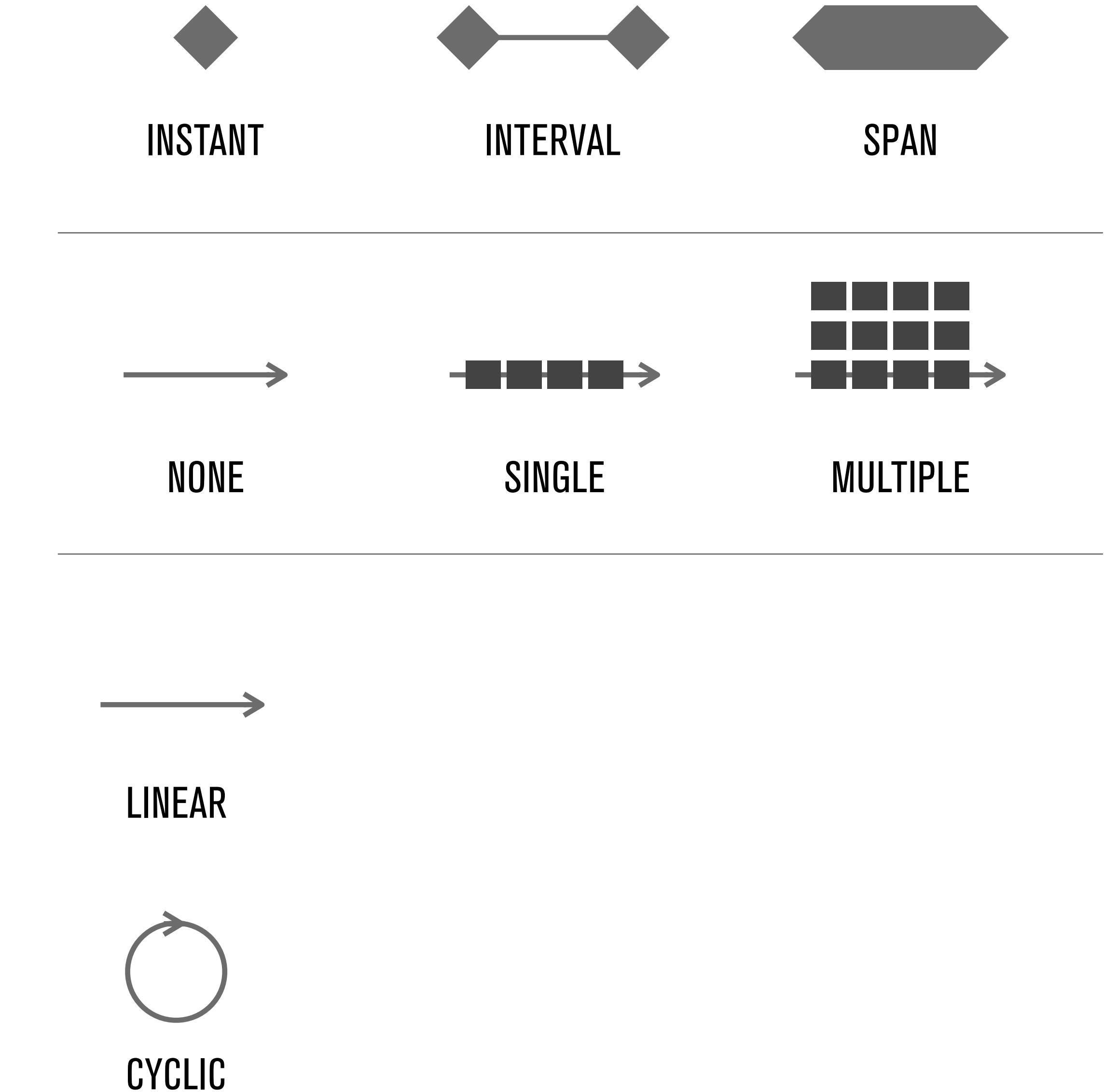
TIME WHAT?

- Time primitives
- Granularity



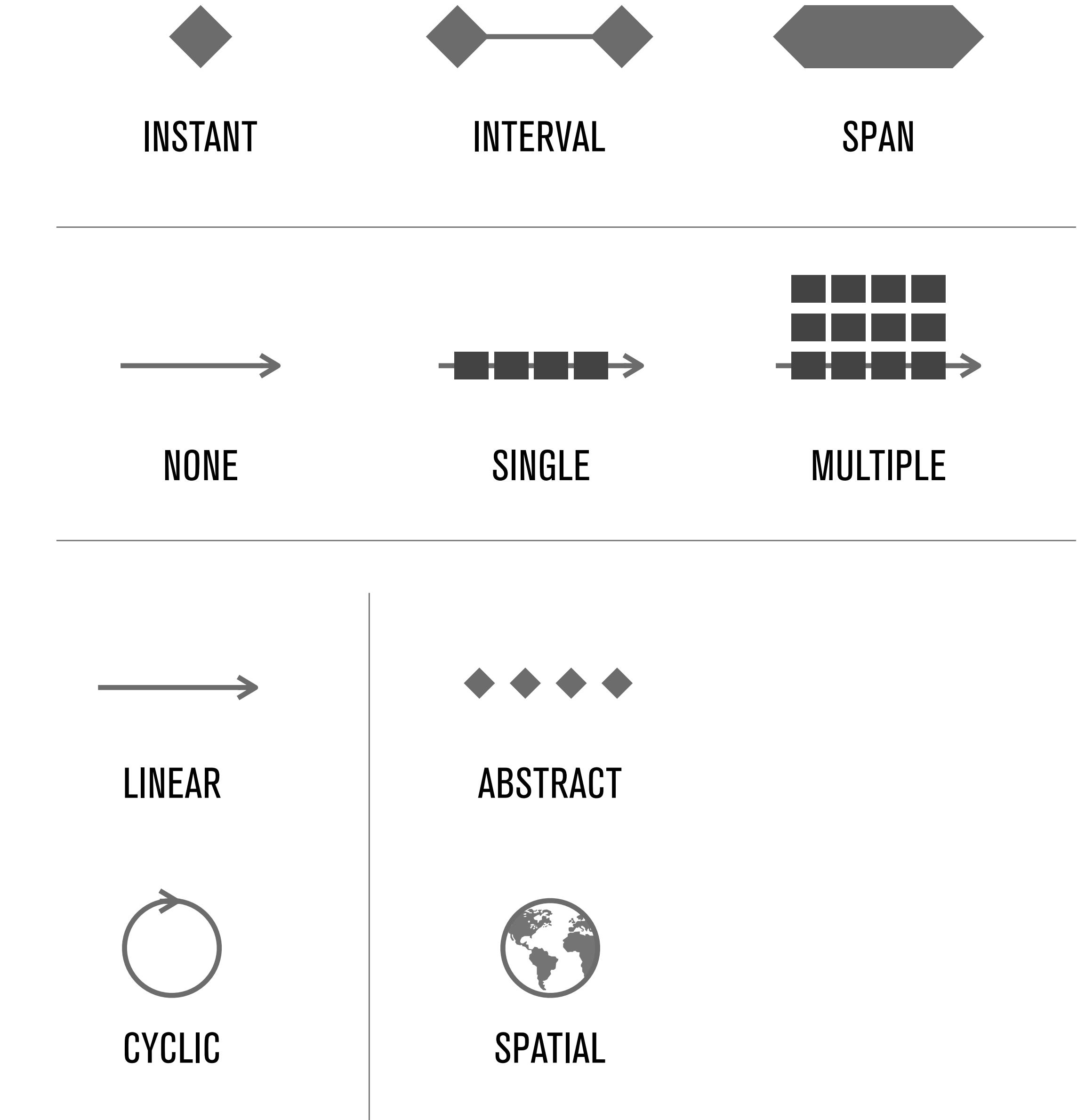
TIME WHAT?

- Time primitives
- Granularity
- Arrangement



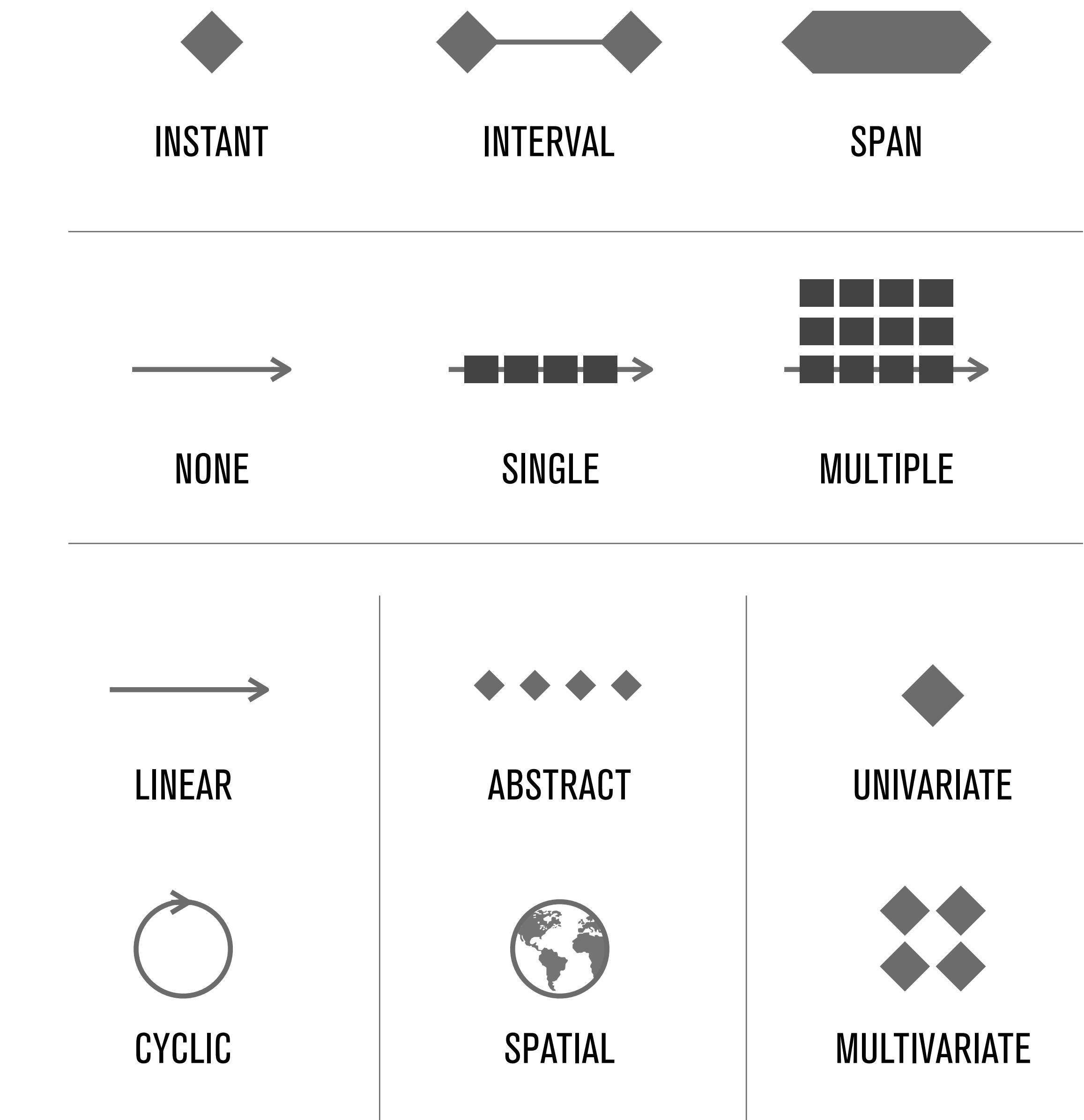
TIME WHAT?

- Time primitives
- Granularity
- Arrangement
- Frame of reference



TIME WHAT?

- Time primitives
- Granularity
- Arrangement
- Frame of reference
- Number of variables.



TIME HOW?

- No single correct model or taxonomy

CONSUMPTION

CONSUMPTION DATASET

The image shows two adjacent Microsoft Excel spreadsheets side-by-side. Both spreadsheets have the same header and structure, displaying a large dataset of consumption data.

Header:

TIME_KEY	LOCATION_CD	LOCATION_DSC	SKU	TRANSACTION_HOUR_KEY	POST_CD	CUSTOMER_ACCOUNT_KEY	NET_SLS_AMT_EUR	QTY	PROD_
----------	-------------	--------------	-----	----------------------	---------	----------------------	-----------------	-----	-------

Top Spreadsheet (ipn_201304_sku.csv):

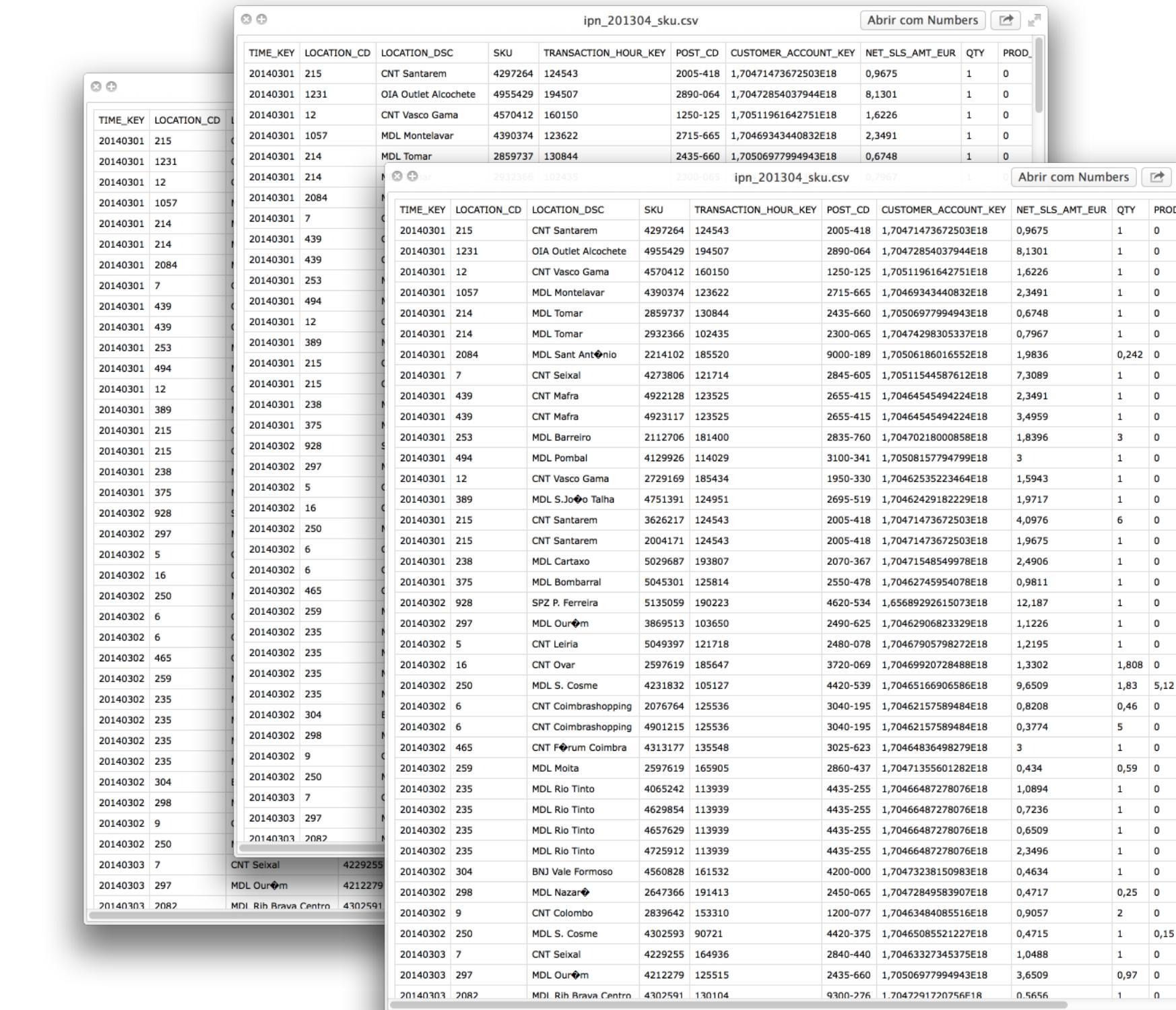
This spreadsheet contains 35 rows of data corresponding to different time periods and locations. The data includes transaction details such as SKU, transaction hour key, post code, customer account key, net sales amount in EUR, quantity, and product ID. The locations listed include CNT Santarem, OIA Outlet Alcochete, CNT Vasco Gama, MDL Montelavar, and MDL Tomar.

Bottom Spreadsheet (ipn_201304_sku.csv):

This spreadsheet also contains 35 rows of data, identical in structure to the top one. It lists the same time periods, locations, and transaction details. The locations listed are CNT Santarem, OIA Outlet Alcochete, CNT Vasco Gama, MDL Montelavar, and MDL Tomar.

CONSUMPTION DATASET

- 278 GB



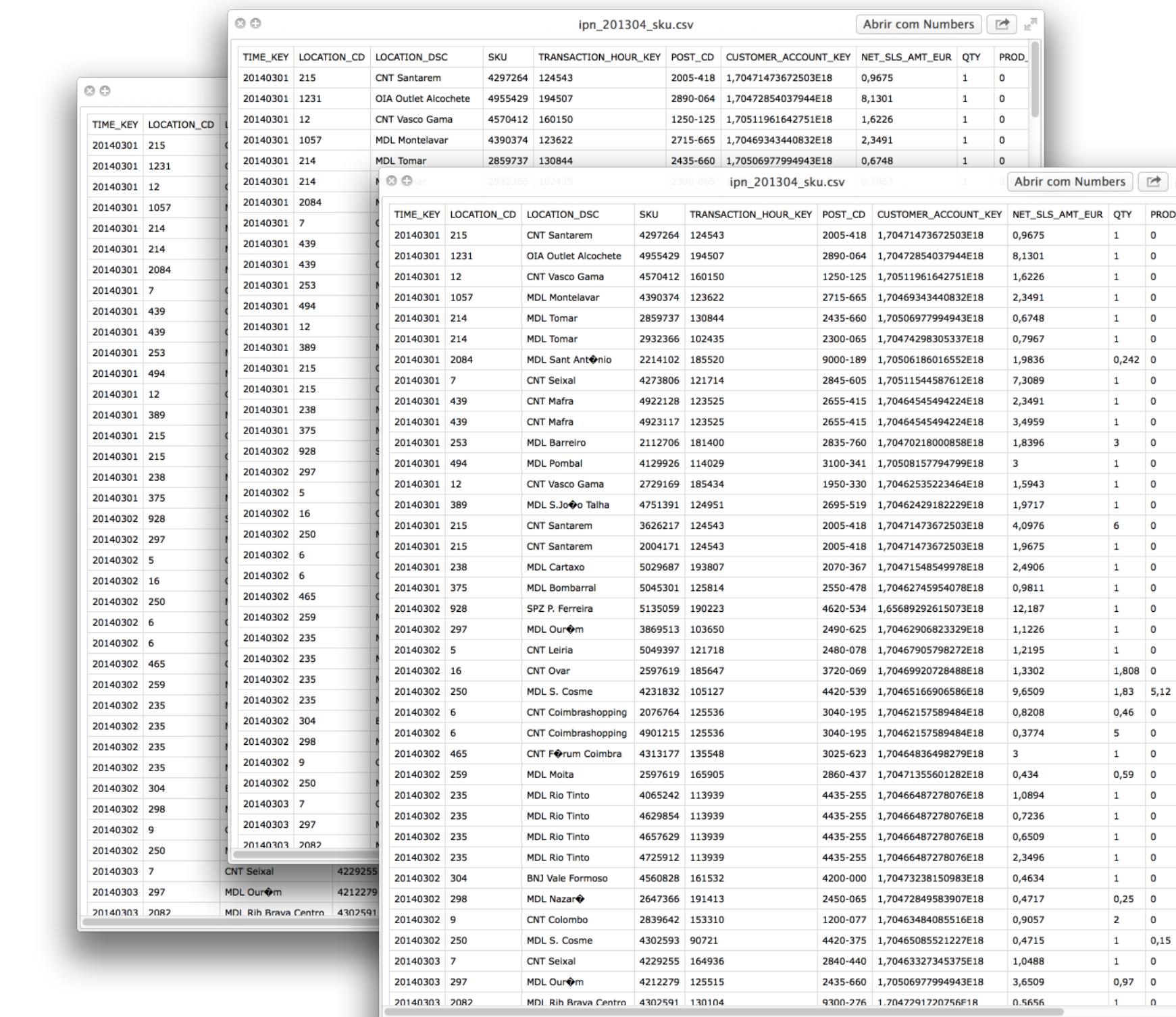
The image shows two adjacent Microsoft Excel windows displaying large datasets. Both windows have a title bar labeled 'Abrir com Numbers' and a status bar at the bottom.

Top Window: The title is 'ipn_201304_sku.csv'. It contains a table with columns: TIME_KEY, LOCATION_CD, LOCATION_DSC, SKU, TRANSACTION_HOUR_KEY, POST_CD, CUSTOMER_ACCOUNT_KEY, NET_SLS_AMT_EUR, QTY, and PROD_. The data includes rows for various locations like CNT Santarem, OIA Outlet Alcochete, CNT Vasco Gama, MDL Montelavar, and MDL Tomar, with transaction details and sales amounts.

Bottom Window: The title is 'ipn_201304_sku.csv'. This window also displays a similar table structure with the same columns. It includes rows for locations such as CNT Santarem, OIA Outlet Alcochete, CNT Vasco Gama, MDL Montelavar, and MDL Tomar, showing detailed transaction and sales information.

CONSUMPTION DATASET

- 278 GB
- 2.86 billions of transactions



The image shows two overlapping CSV files from a spreadsheet application. The top file is titled 'ipn_201304_sku.csv' and the bottom file is 'ipn_201304_sku.csv'. Both files have identical columns: TIME_KEY, LOCATION_CD, LOCATION_DSC, SKU, TRANSACTION_HOUR_KEY, POST_CD, CUSTOMER_ACCOUNT_KEY, NET_SLS_AMT_EUR, QTY, and PROD_. The data consists of approximately 300 rows of transaction records. The columns are separated by commas.

TIME_KEY	LOCATION_CD	LOCATION_DSC	SKU	TRANSACTION_HOUR_KEY	POST_CD	CUSTOMER_ACCOUNT_KEY	NET_SLS_AMT_EUR	QTY	PROD_
20140301	215	CNT Santarem	4297264	124543	2005-418	1,70471473672503E18	0,9675	1	0
20140301	1231	OIA Outlet Alcochete	4955429	194507	2890-064	1,70472854037944E18	8,1301	1	0
20140301	12	CNT Vasco Gama	4570412	160150	1250-125	1,70511961642751E18	1,6226	1	0
20140301	1231	MDL Montelavar	4390374	123622	2715-665	1,70469343440832E18	2,3491	1	0
20140301	12	MDL Tomar	2859737	130844	2435-660	1,70506977994943E18	0,6748	1	0
20140301	214								
20140301	2084								
20140301	1057								
20140301	214								
20140301	439								
20140301	214								
20140301	2084								
20140301	7								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	214								
20140301	2084								
20140301	7								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
20140301	439								
20140301	253								
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20140301	1057								
20140301	12								
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20140301	439								
20140301	253								
20140301	494								
20140301	1057								
20140301	12								
20140301	214								
20140301	1231								
2014									

CONSUMPTION DATASET

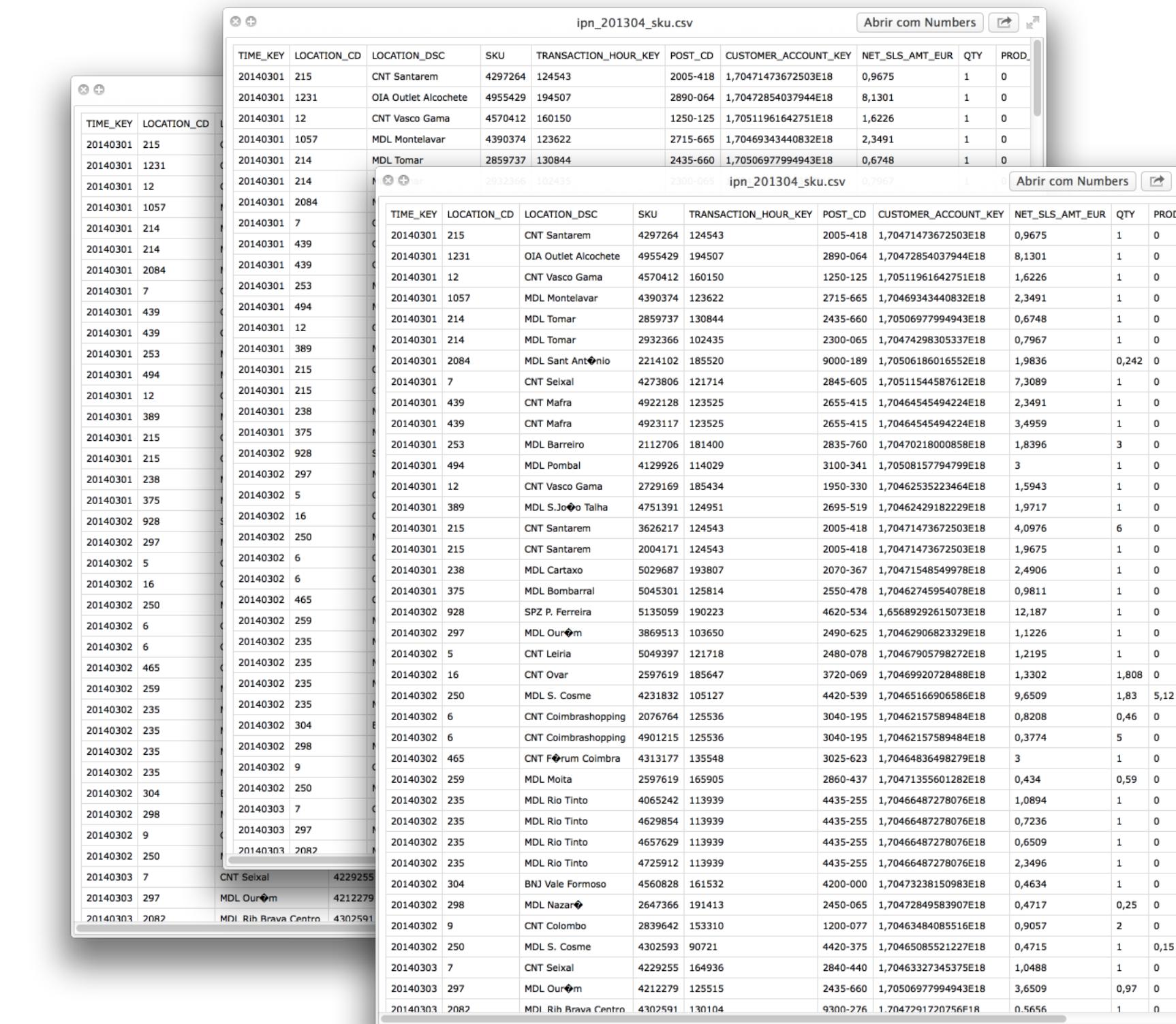
- 278 GB

- 2.86 billions of transactions

- 729 hypermarkets
and supermarkets

CONSUMPTION DATASET

- 278 GB
- 2.86 billions of transactions
- 729 hypermarkets and supermarkets
- 2 years (May 2012 to April 2014).



The image shows two side-by-side screenshots of Microsoft Excel spreadsheets. Both spreadsheets have a title bar at the top with the file name 'ipn_201304_sku.csv' and a button 'Abrir com Numbers'. The left spreadsheet has a single visible column header 'TIME_KEY'. The right spreadsheet has multiple visible column headers: TIME_KEY, LOCATION_CD, LOCATION_DSC, SKU, TRANSACTION_HOUR_KEY, POST_CD, CUSTOMER_ACCOUNT_KEY, NET_SLS_AMT_EUR, QTY, and PROD_. Both spreadsheets contain numerous rows of data, with the right one showing significantly more columns of data per row.

TIME_KEY	LOCATION_CD	LOCATION_DSC	SKU	TRANSACTION_HOUR_KEY	POST_CD	CUSTOMER_ACCOUNT_KEY	NET_SLS_AMT_EUR	QTY	PROD_
20140301	215	CNT Santarem	4297264	124543	2005-418	1,70471473672503E18	0,9675	1	0
20140301	1231	OIA Outlet Alcochete	4955429	194507	2890-064	1,70472854037944E18	8,1301	1	0
20140301	12	CNT Vasco Gama	4570412	160150	1250-125	1,70511961642751E18	1,6226	1	0
20140301	1231	MDL Montelavar	4390374	123622	2715-665	1,70469343440832E18	2,3491	1	0
20140301	12	MDL Tomar	2859737	130844	2435-660	1,70506977994943E18	0,6748	1	0
20140301	214								
20140301	1057								
20140301	214								
20140301	439								
20140301	2084								
20140301	7								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
20140301	214								
20140301	1231								
20140301	12								
20140301	2084								
20140301	1250-125								
20140301	1057								
20140301	MDL Montelavar								
20140301	214								
20140301	MDL Tomar								
20140301	2084								
20140301	1231								
20140301	12								
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20140301	12								
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20140301	214								
20140301	MDL Tomar								
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20140301	214								
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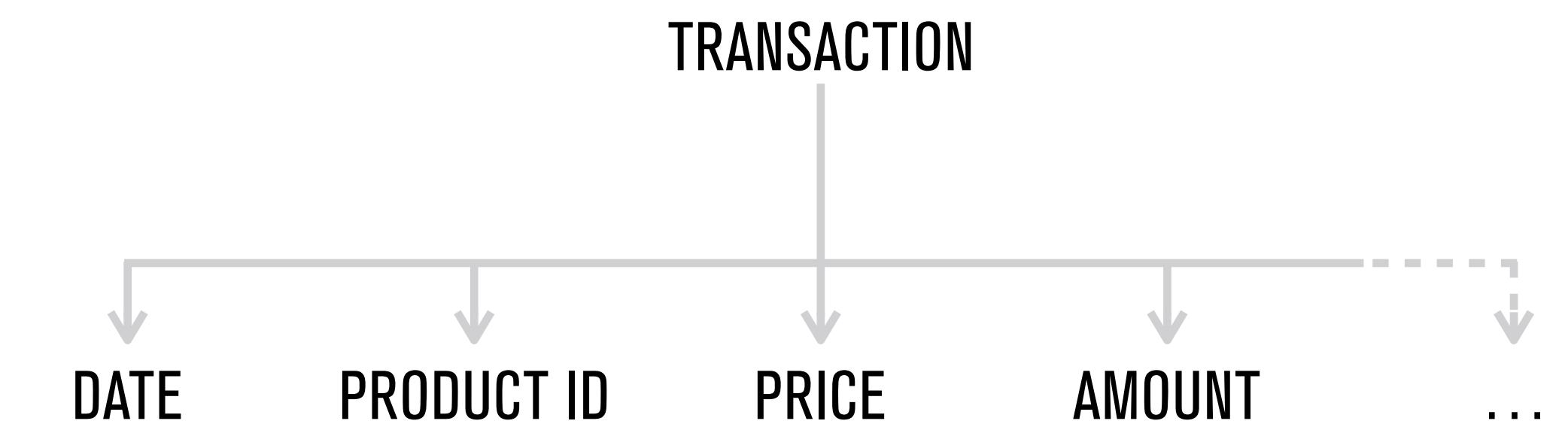
CONSUMPTION DATASET

TRANSACTION

- Transaction → Product bought

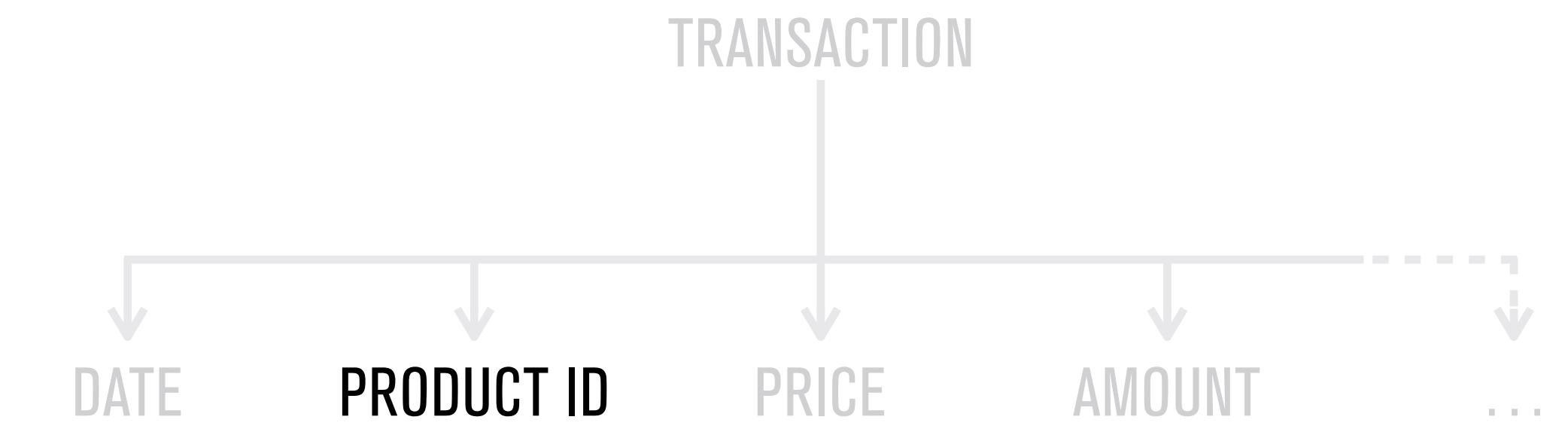
CONSUMPTION DATASET

- Transaction → Product bought



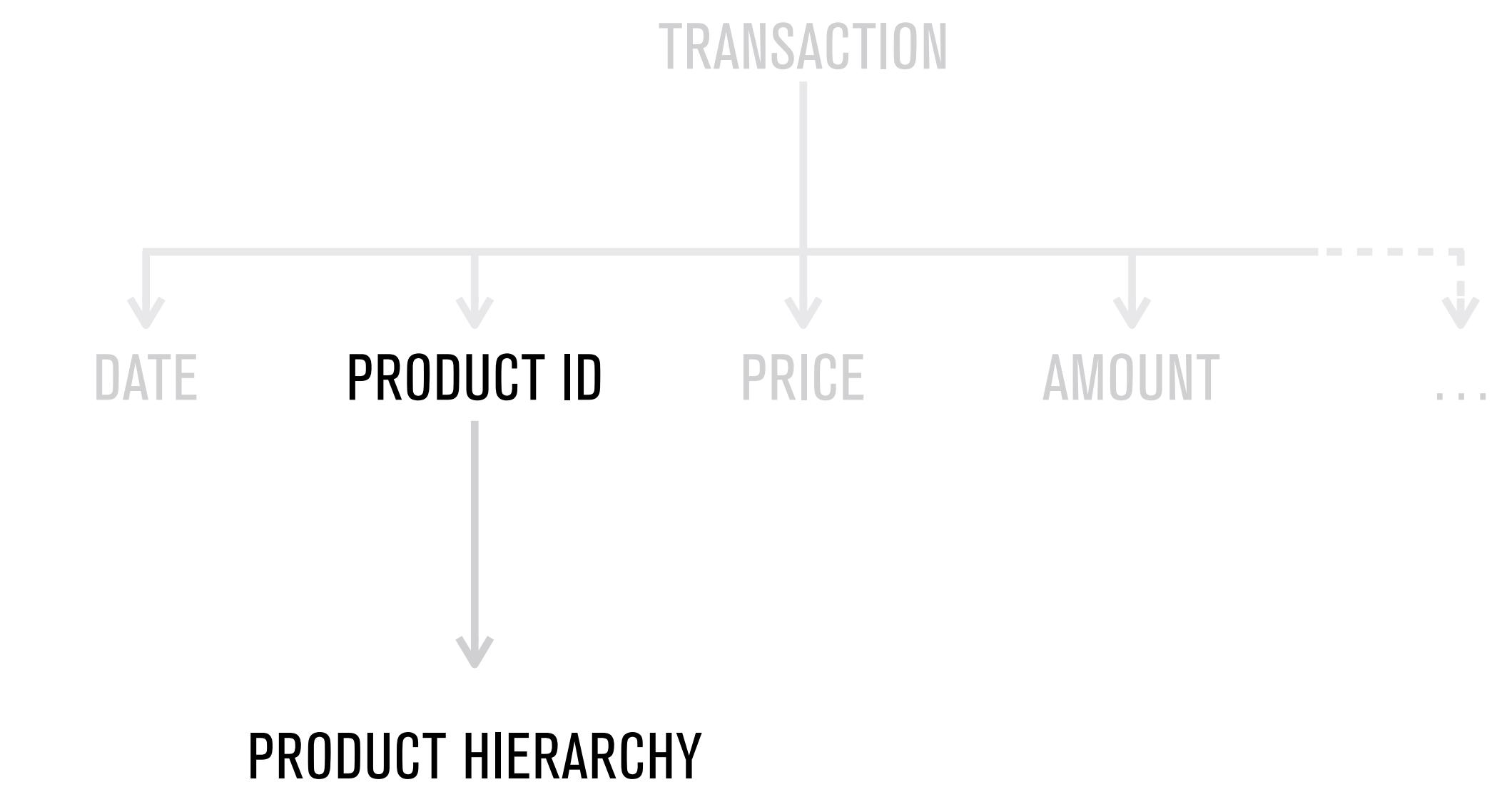
CONSUMPTION DATASET

- Transaction → Product bought
- Hierarchy of products



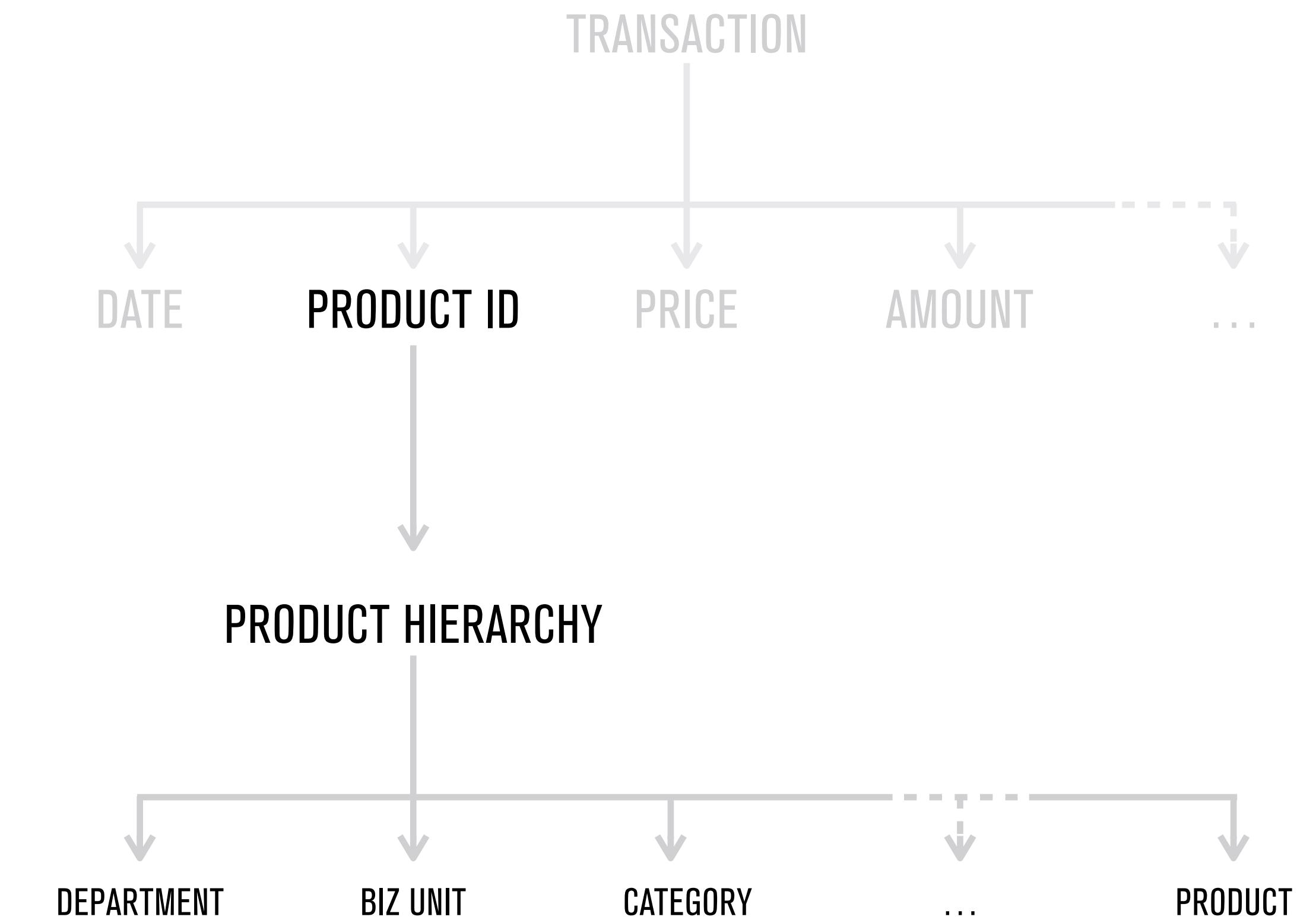
CONSUMPTION DATASET

- Transaction → Product bought
- Hierarchy of products



CONSUMPTION DATASET

- Transaction → Product bought
- Hierarchy of products



CONSUMPTION GOAL

- Represent the evolution of consumption over time

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical
- Overview and comparison.

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical
- Overview and comparison.

TYPICAL

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical
- Overview and comparison.

Detect periodic behaviours



TYPICAL

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical
- Overview and comparison.

TYPICAL
ATYPICAL

CONSUMPTION GOAL

- Represent the evolution of consumption over time
- Detect typical and periodic behaviours
- Emphasise the atypical
- Overview and comparison.

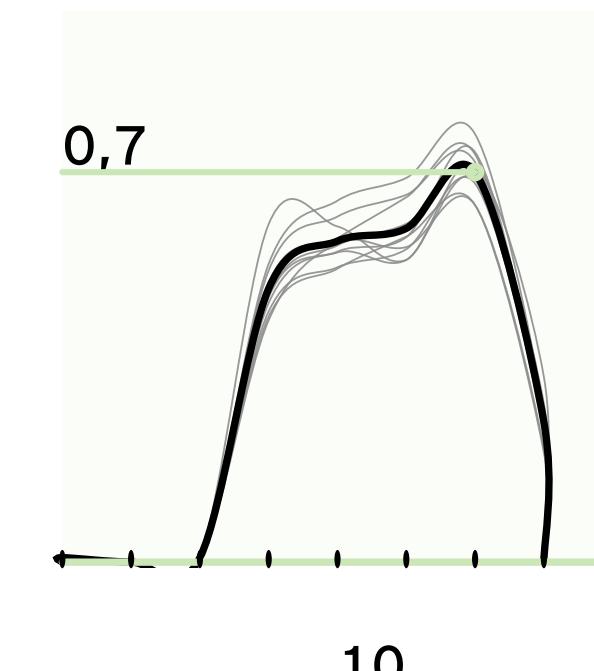
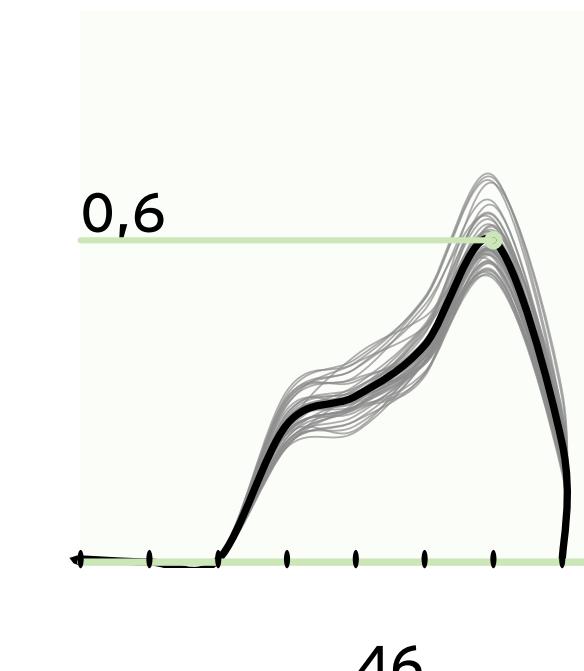
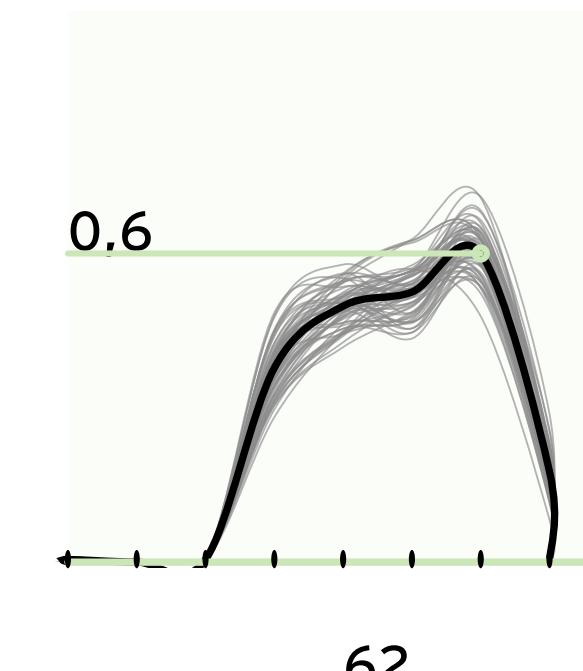
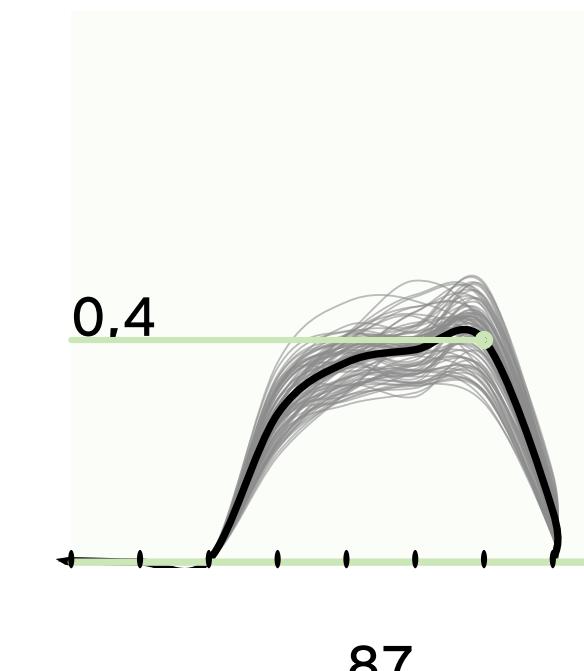
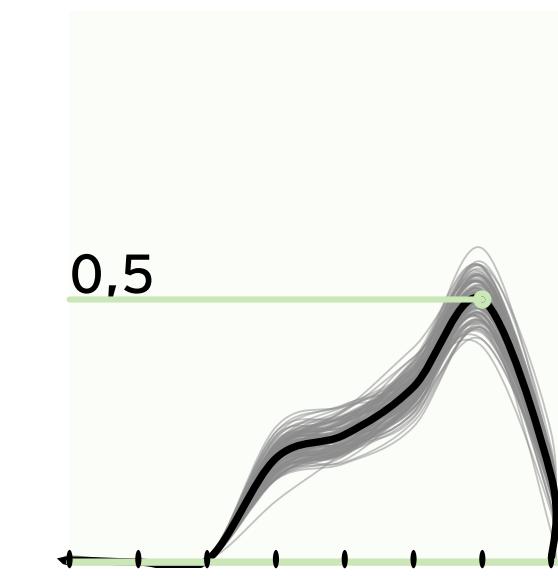
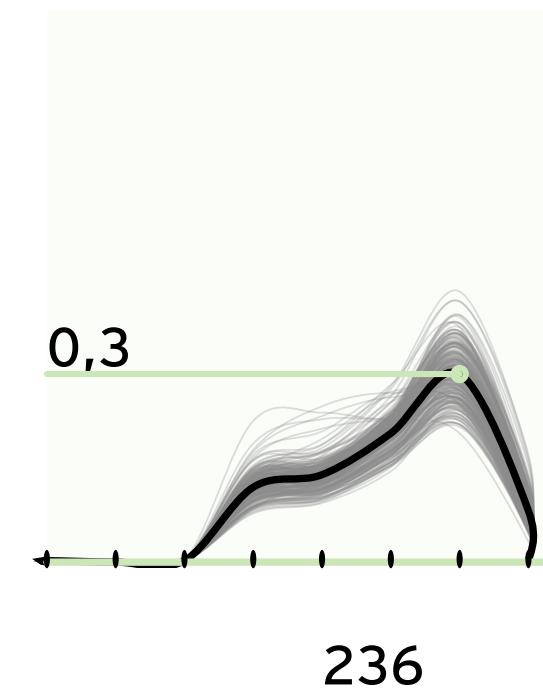
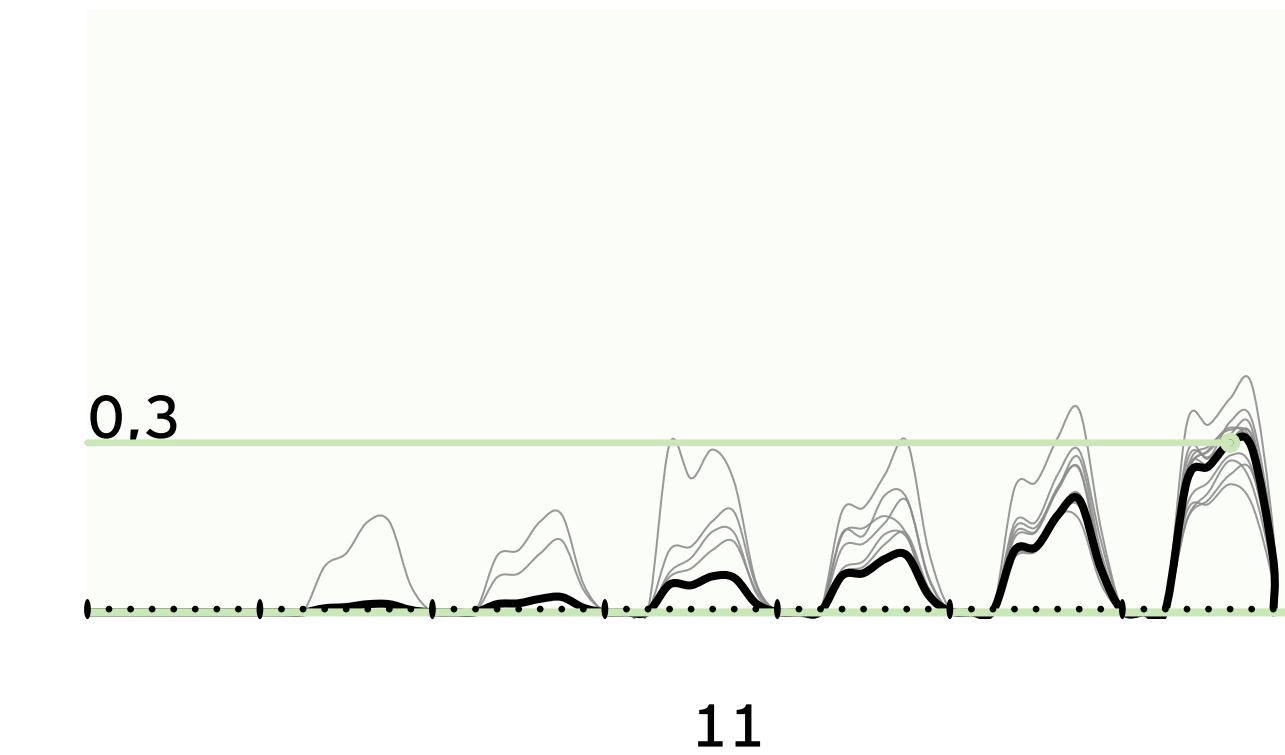
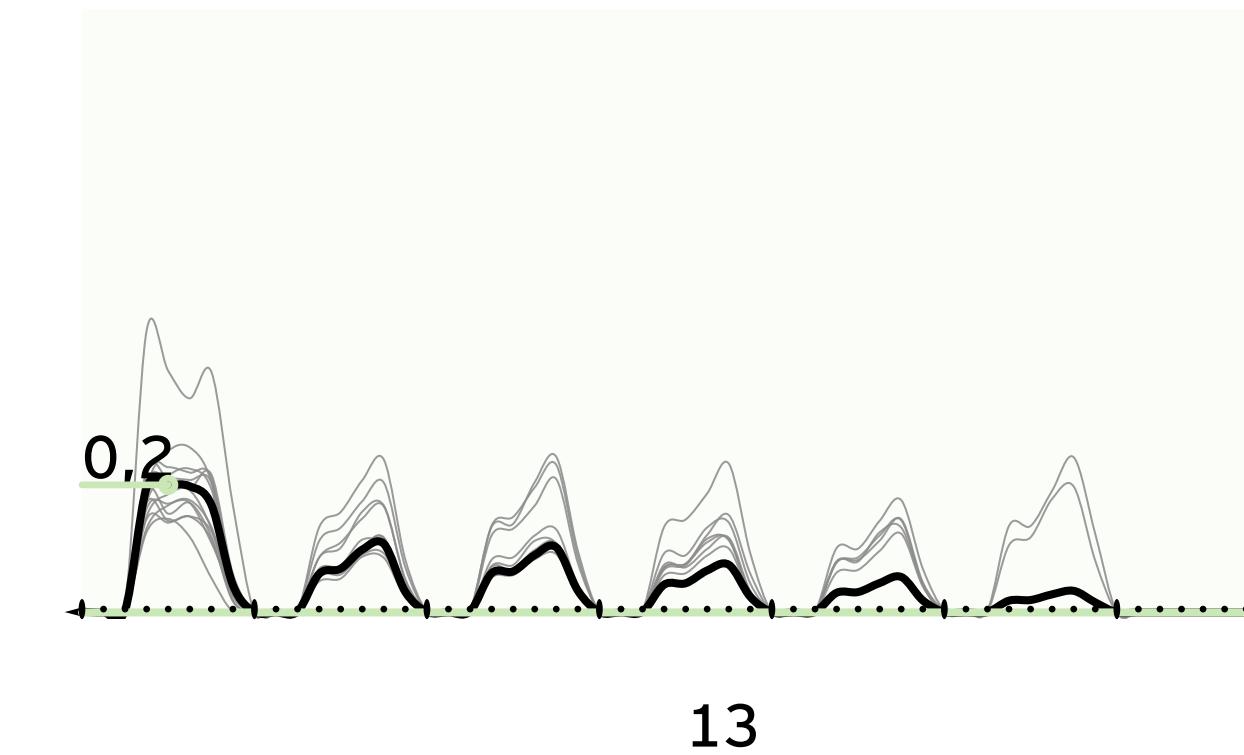
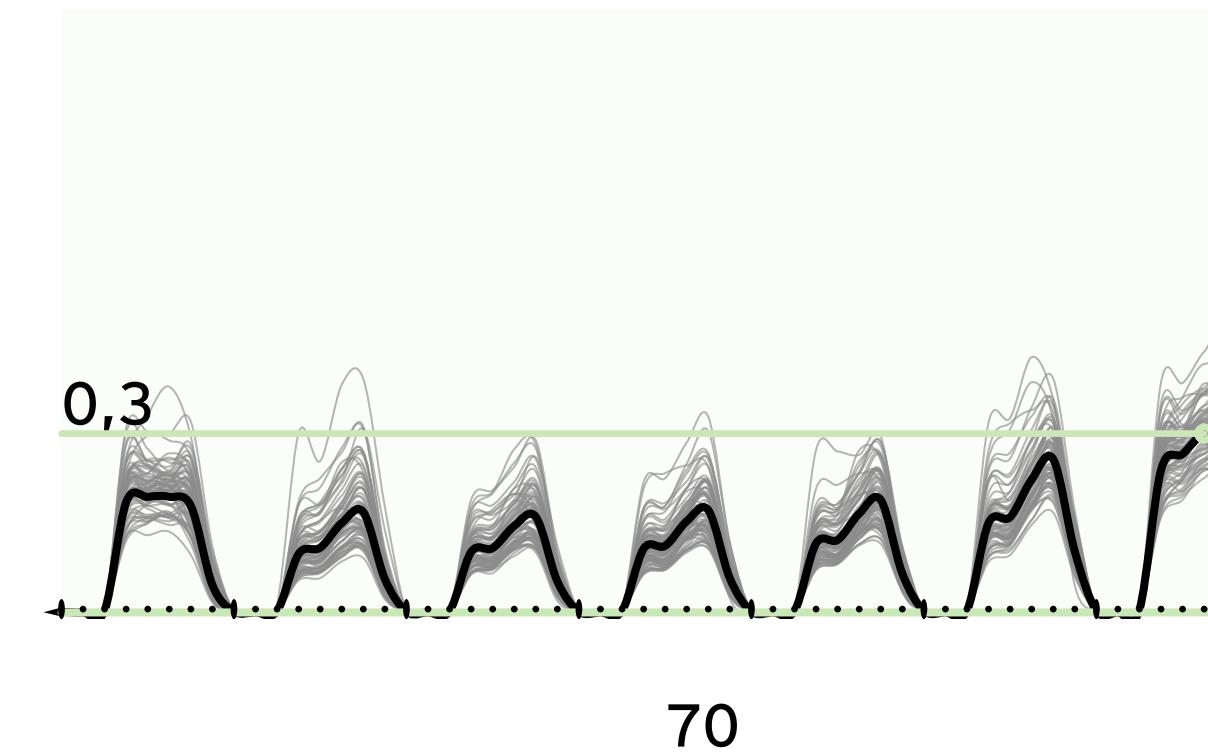
TYPICAL

ATYPICAL

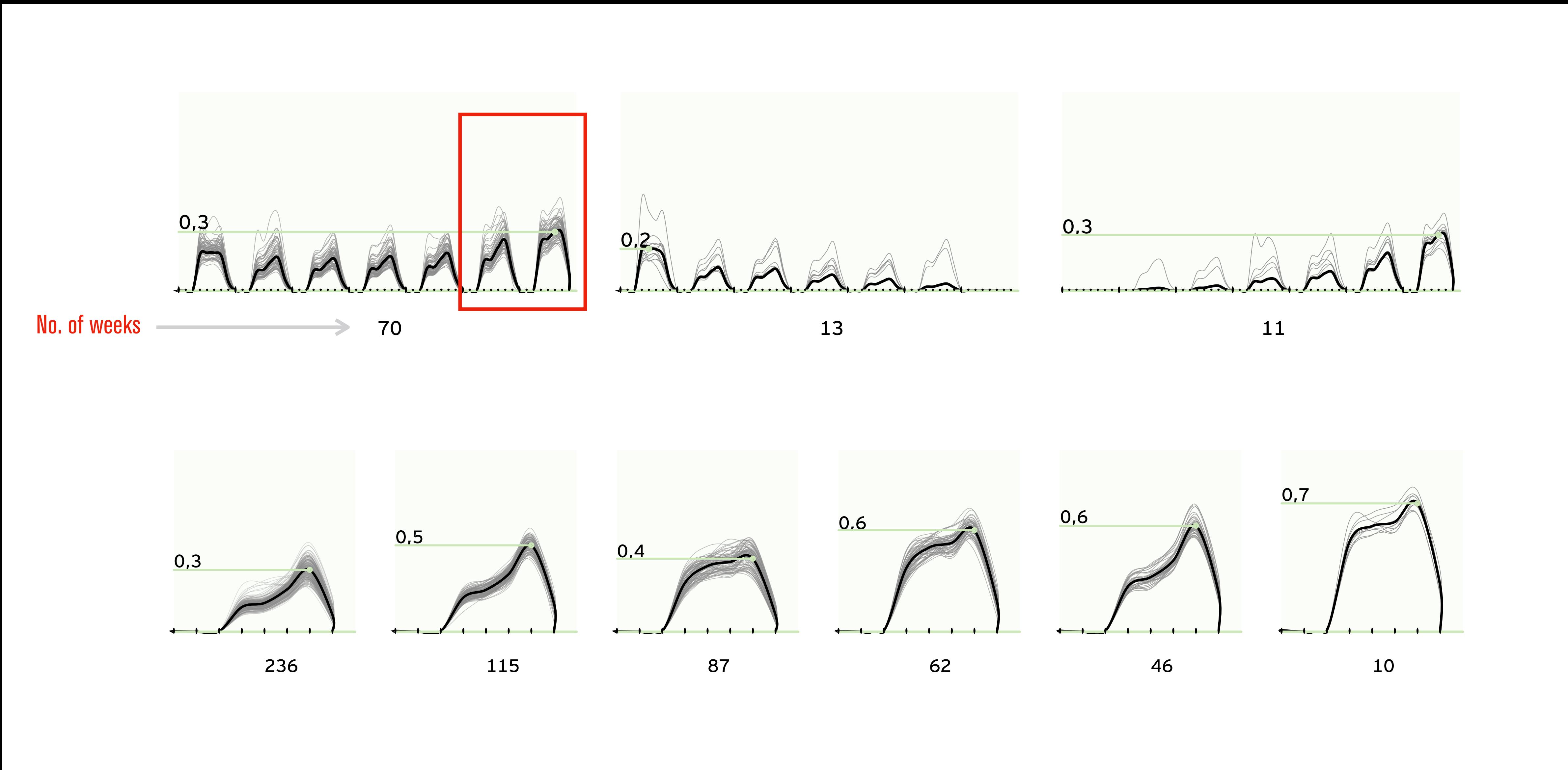


Emphasise the deviations

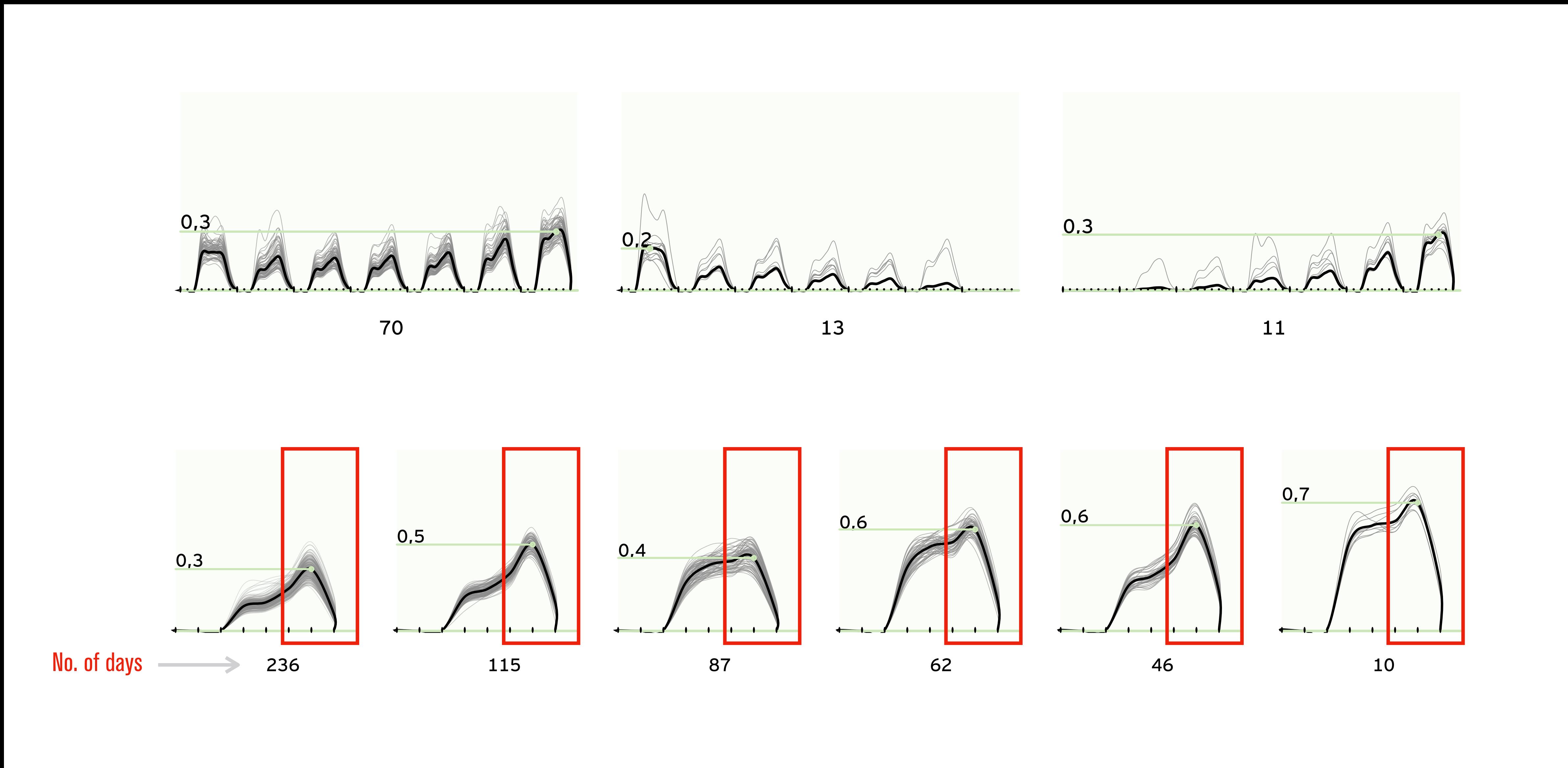
Detecting the typical behaviours – Clustering daily and weekly behaviours of consumption



Detecting the typical behaviours – Clustering daily and weekly behaviours of consumption



Detecting the typical behaviours – Clustering daily and weekly behaviours of consumption



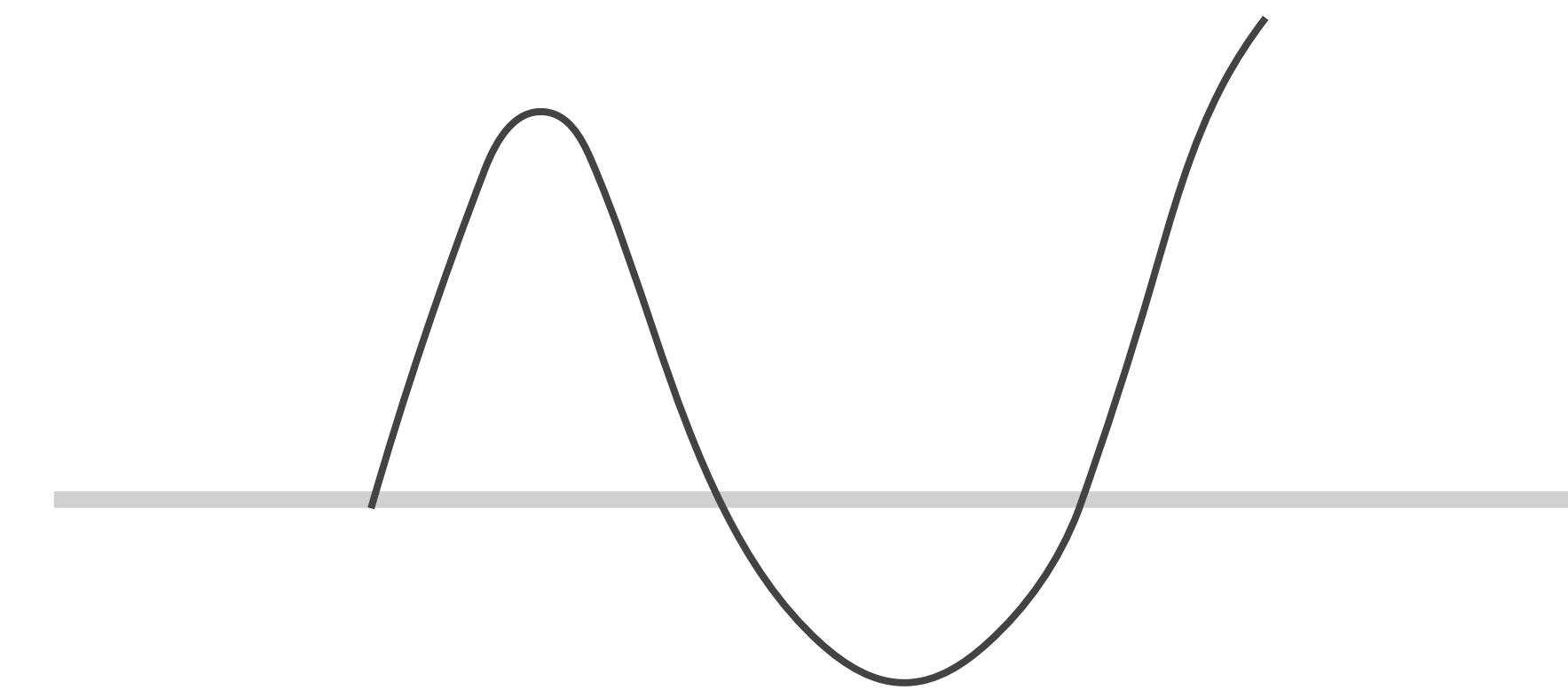
CONSUMPTION VISUALIZATION

- Baseline as a straight line



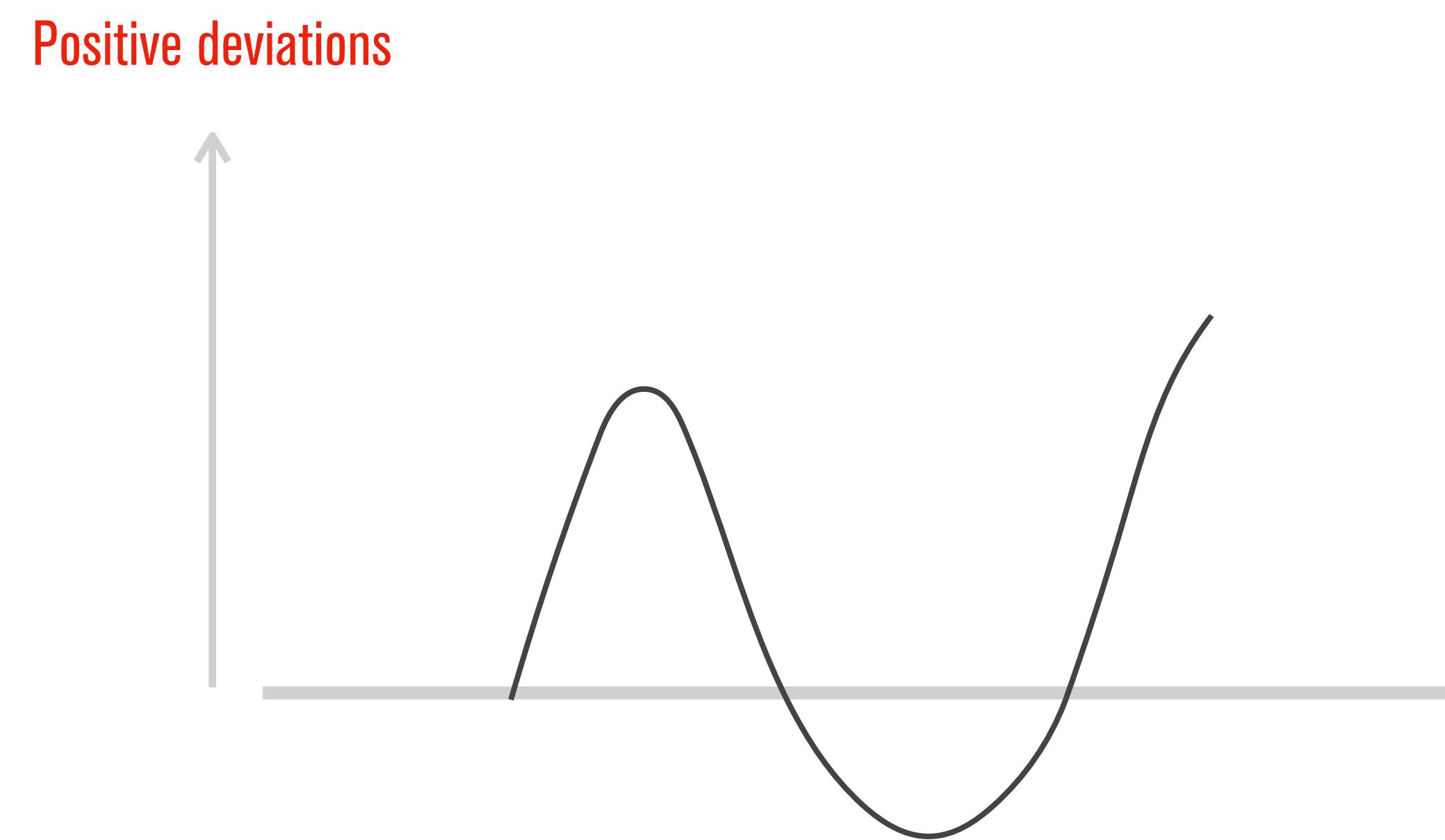
CONSUMPTION VISUALIZATION

- Baseline as a straight line
- Deviations along the baseline



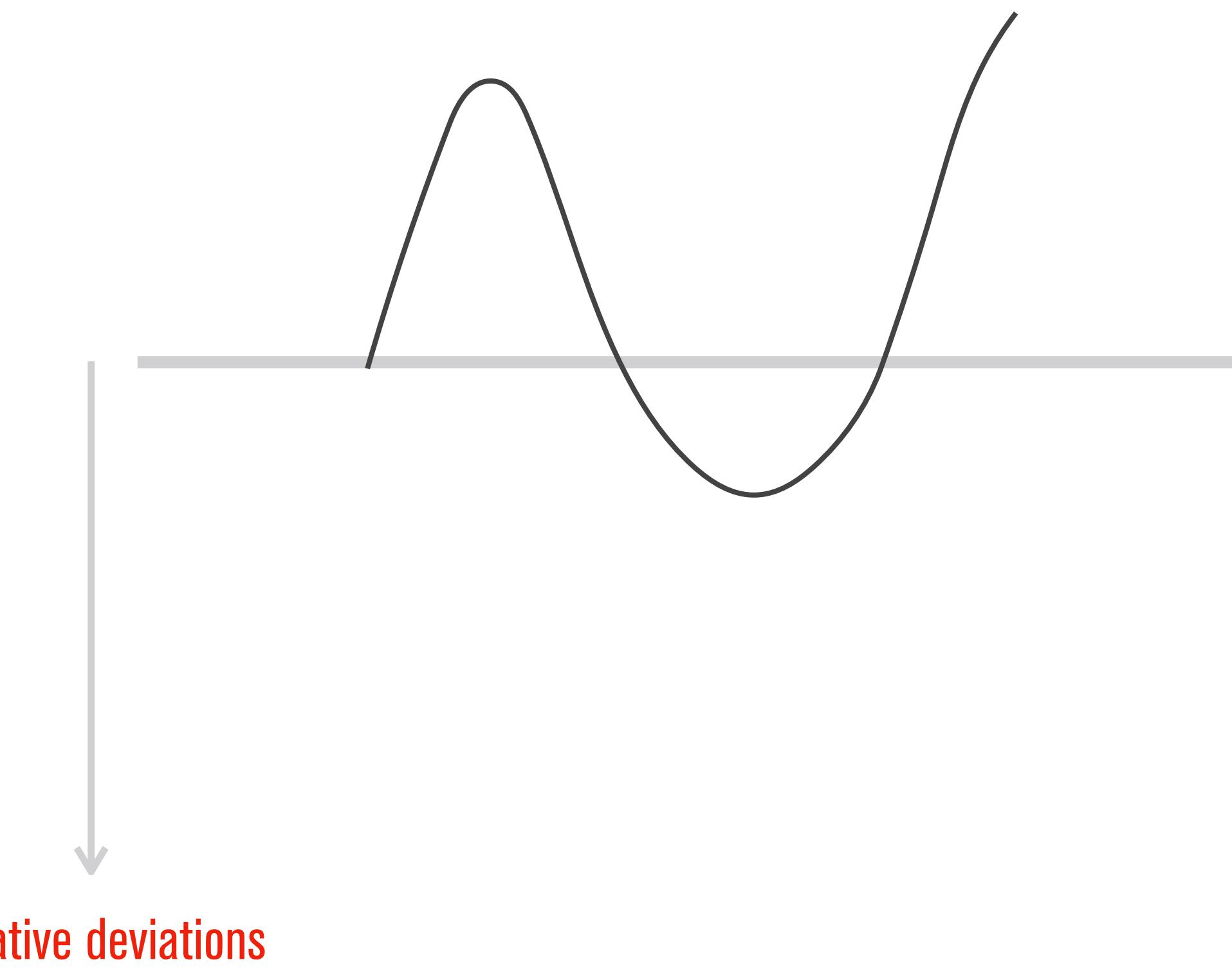
CONSUMPTION VISUALIZATION

- Baseline as a straight line
- Deviations along the baseline



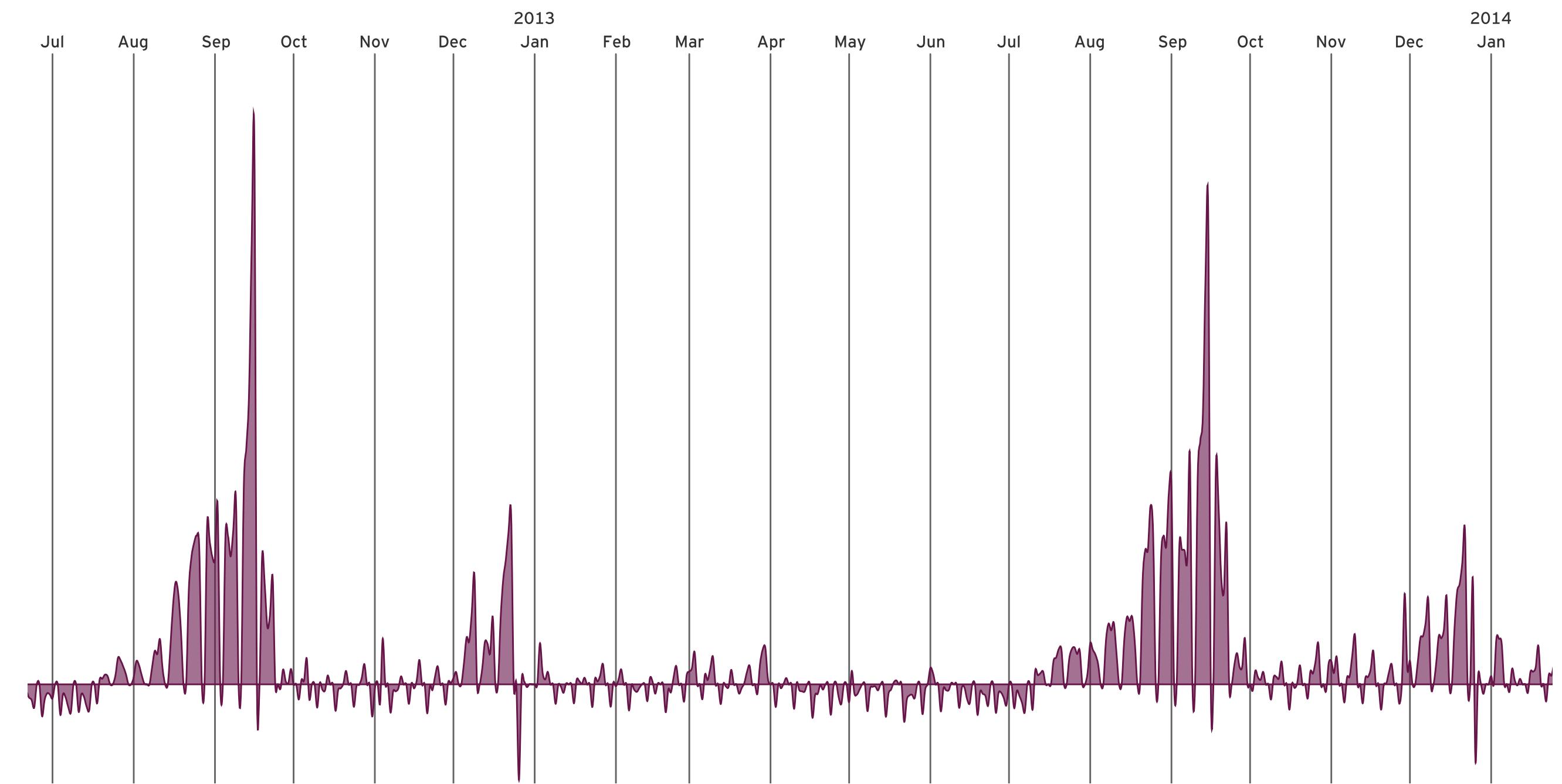
CONSUMPTION VISUALIZATION

- Baseline as a straight line
- Deviations along the baseline



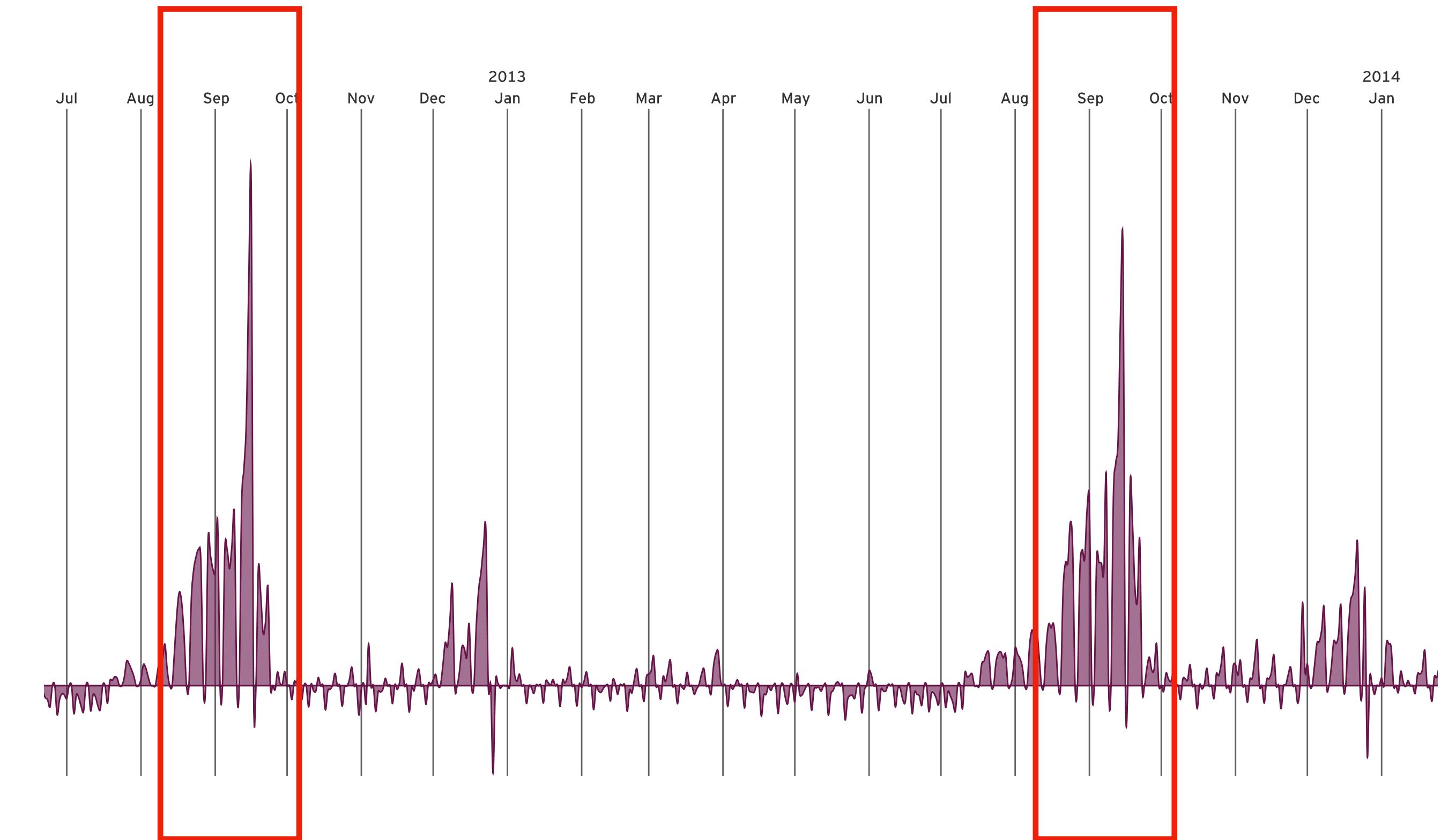
CONSUMPTION VISUALIZATION

- Representing the deviations



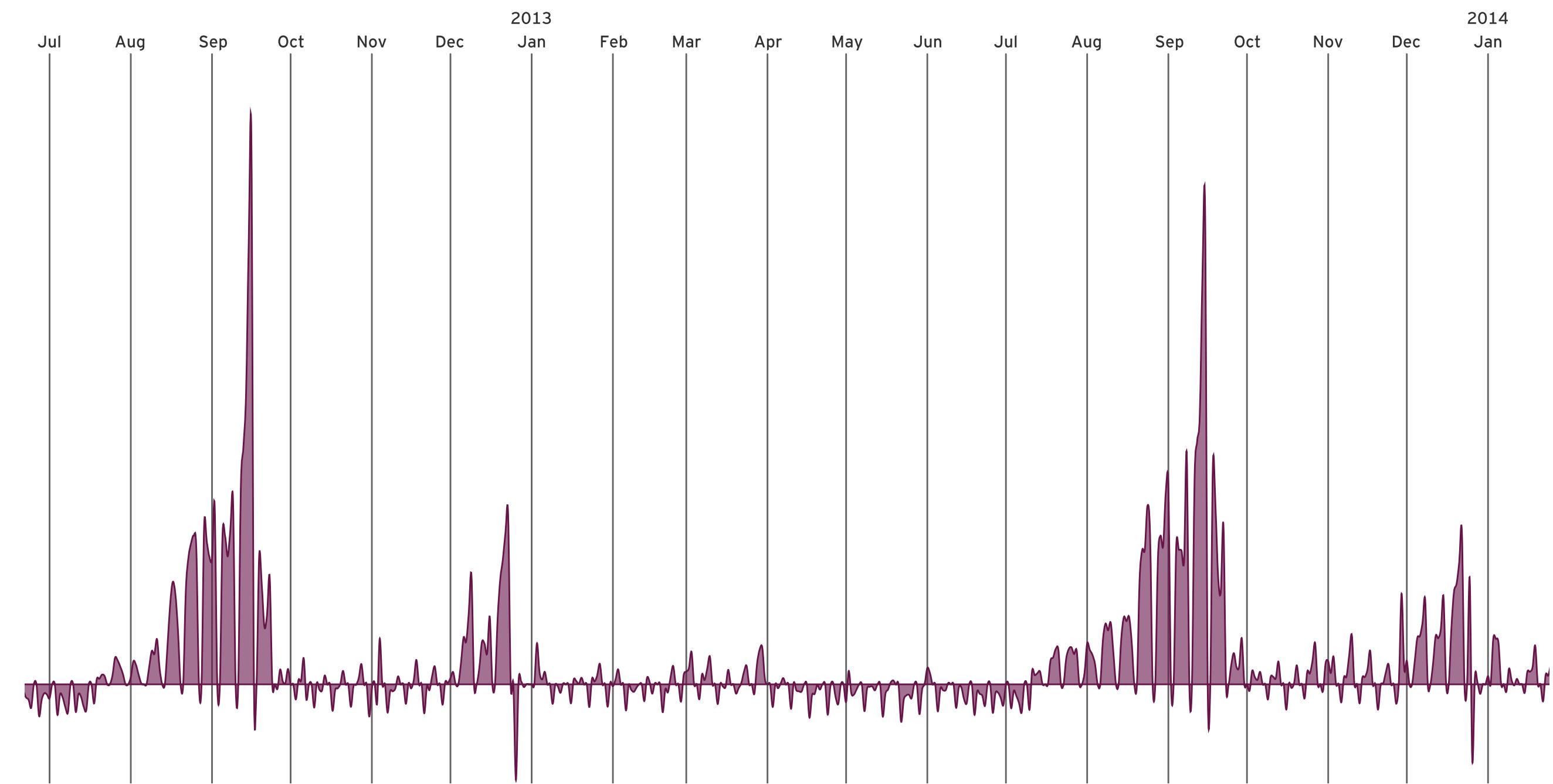
CONSUMPTION VISUALIZATION

- Representing the deviations



CONSUMPTION VISUALIZATION

- Representing the deviations
- Difficult to compare different days



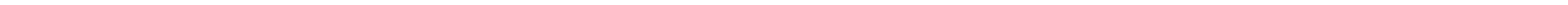
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations

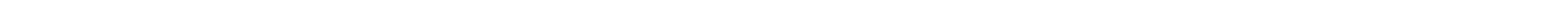
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally

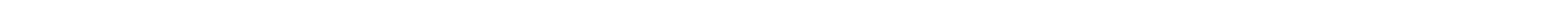
Monday



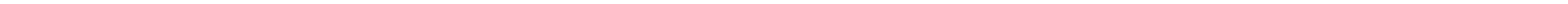
Tuesday



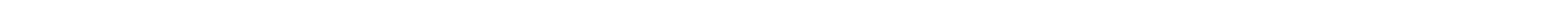
Wednesday



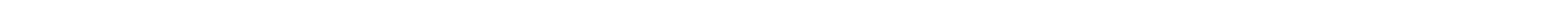
Thursday



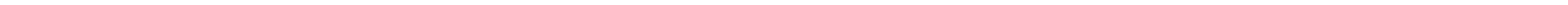
Friday



Saturday



Sunday



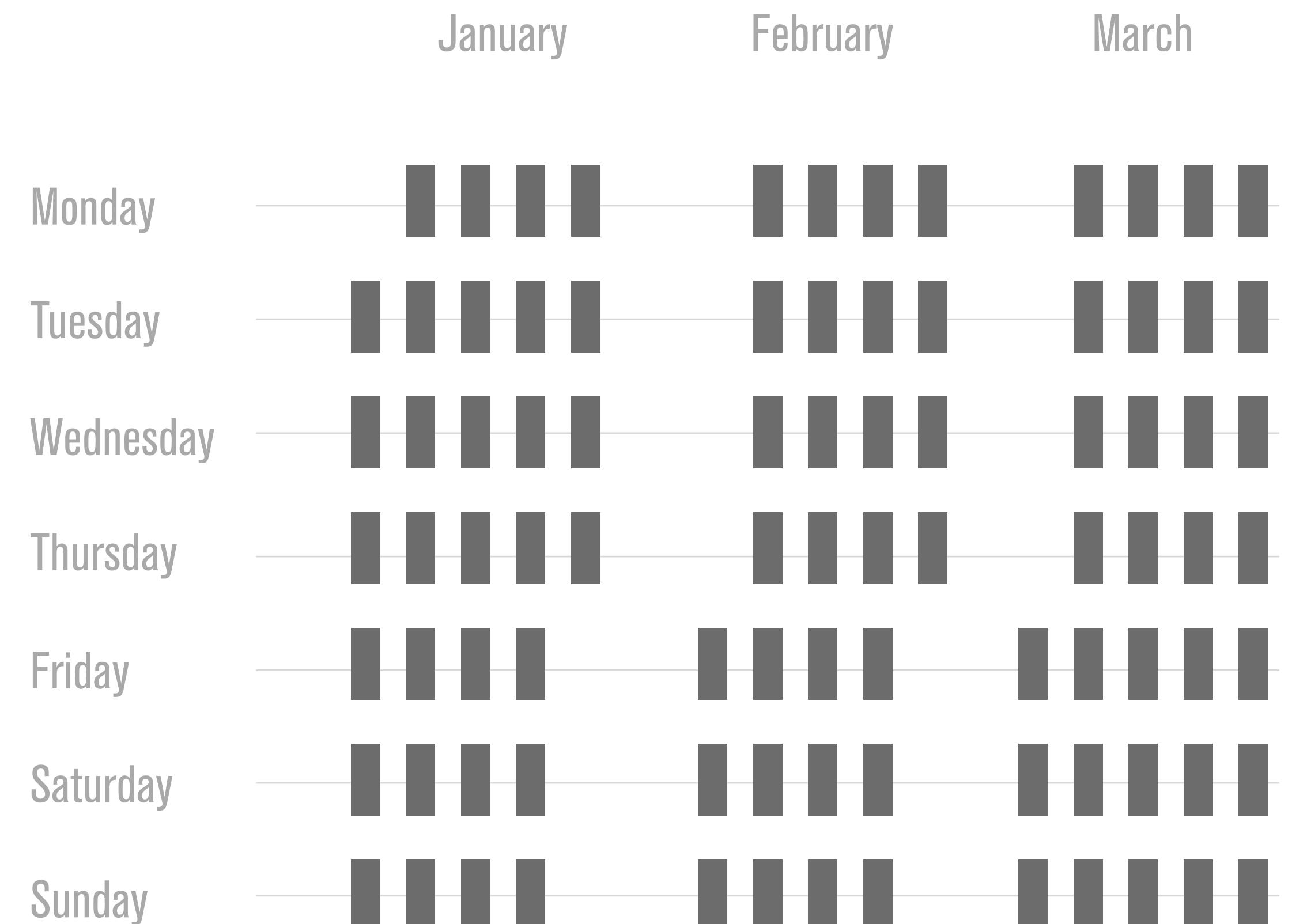
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally
 - Months ordered from left to right

	January	February	March
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

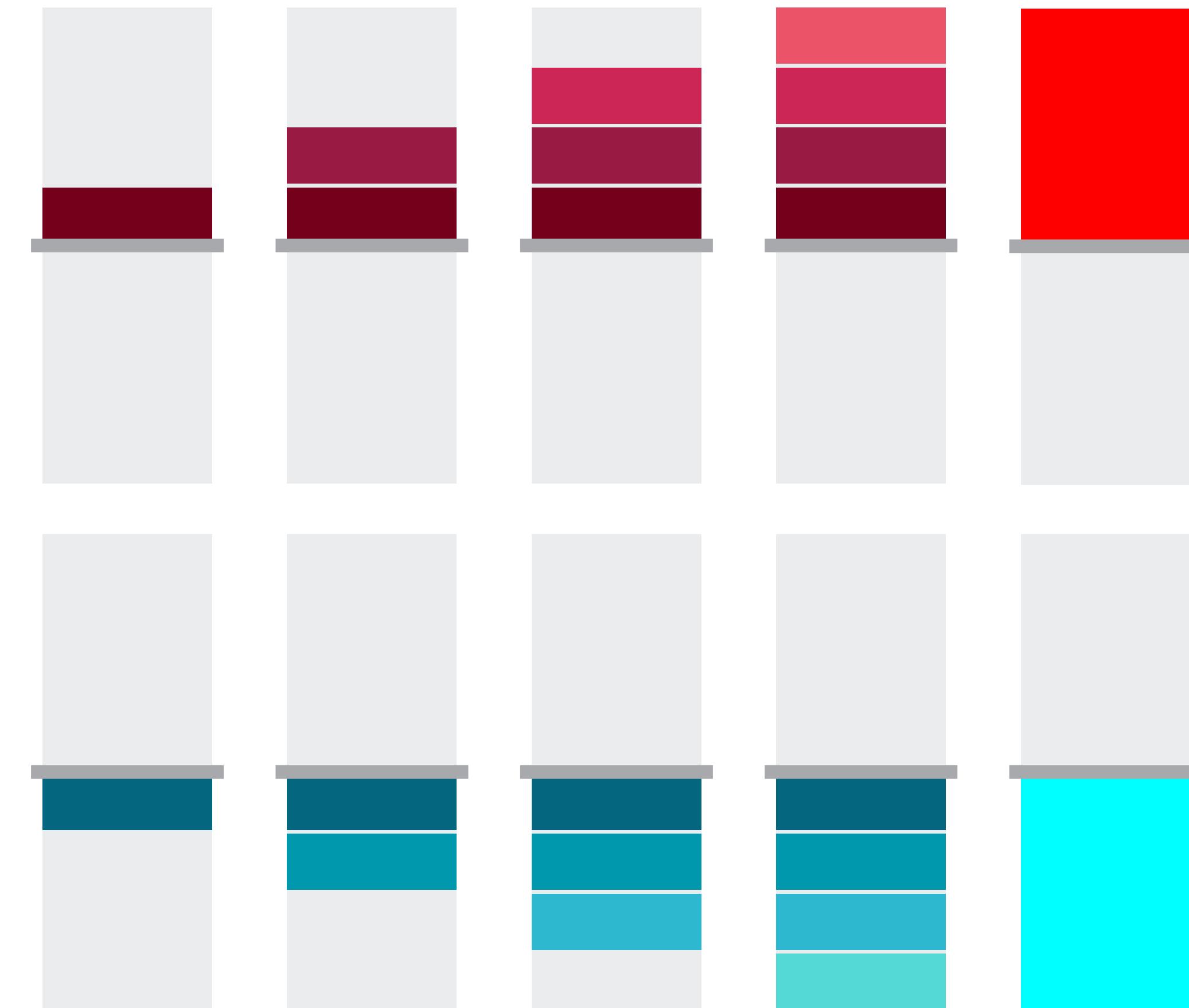
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally
 - Months ordered from left to right
 - Rectangles as days



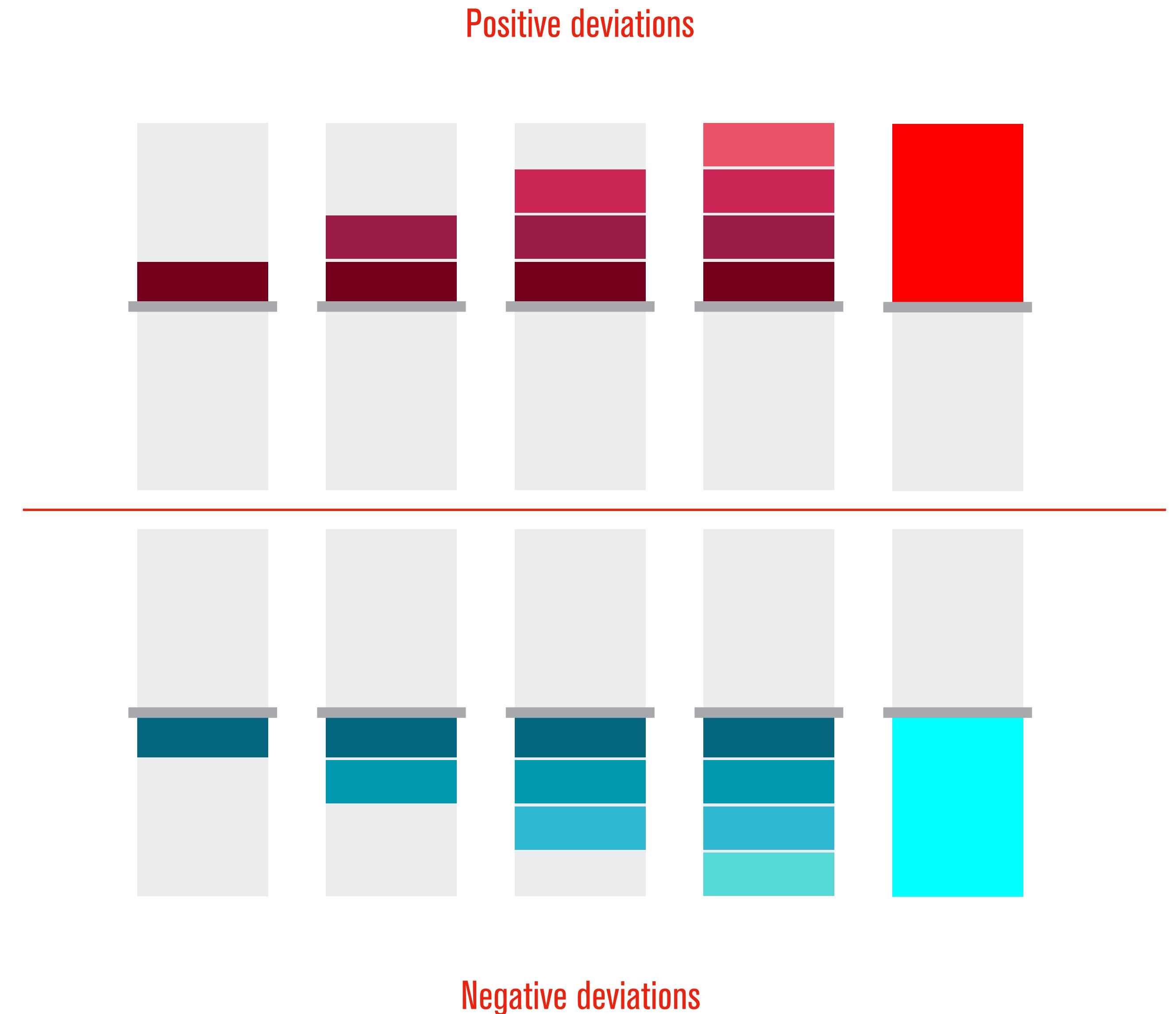
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally
 - Months ordered from left to right
 - Rectangles as days
- Deviation values as ranges



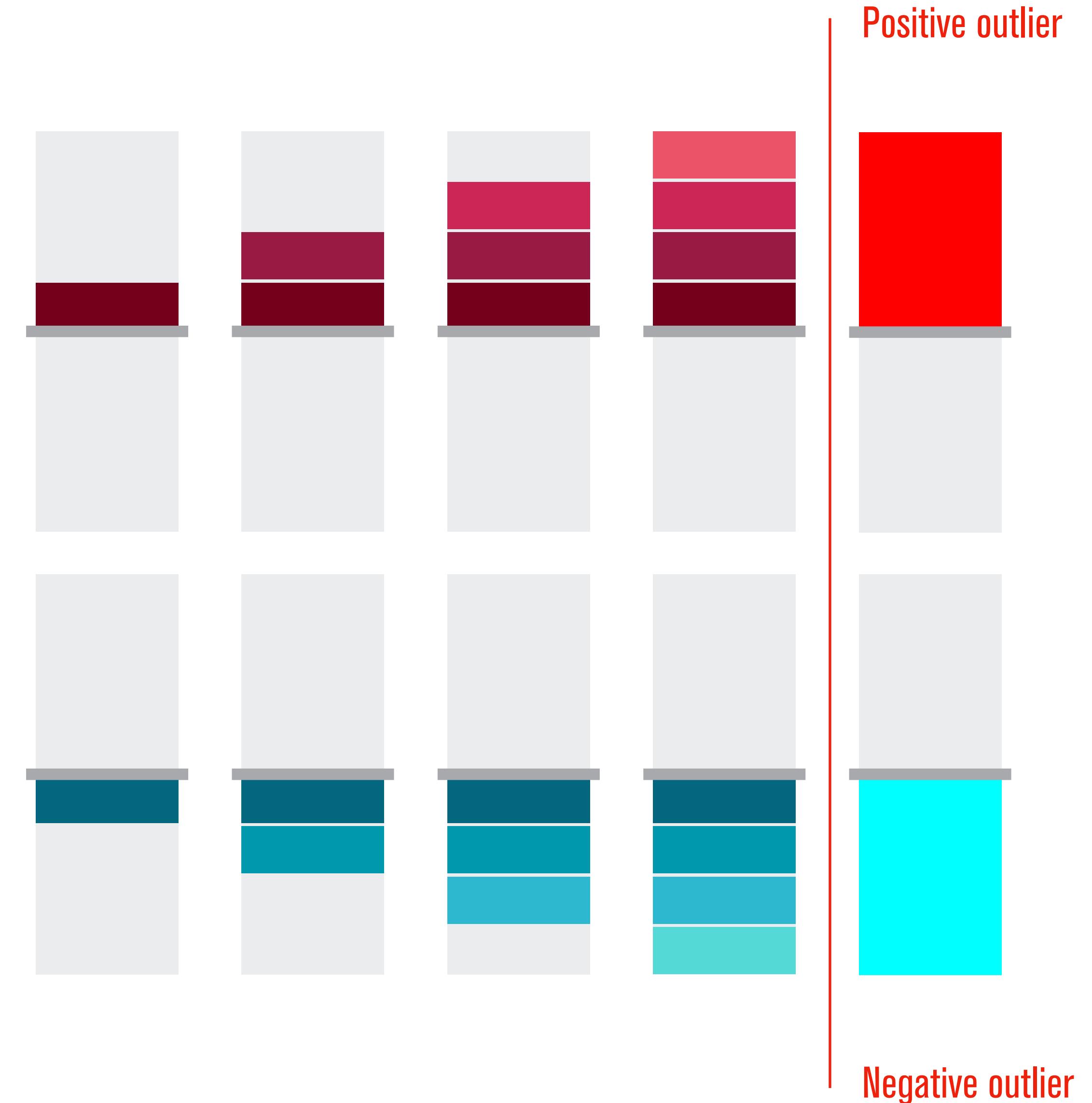
CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally
 - Months ordered from left to right
 - Rectangles as days
- Deviation values as ranges



CONSUMPTION VISUALIZATION

- Calendar representation of the deviations
 - Week days aligned horizontally
 - Months ordered from left to right
 - Rectangles as days
- Deviation values as ranges





Calendários de Consumos

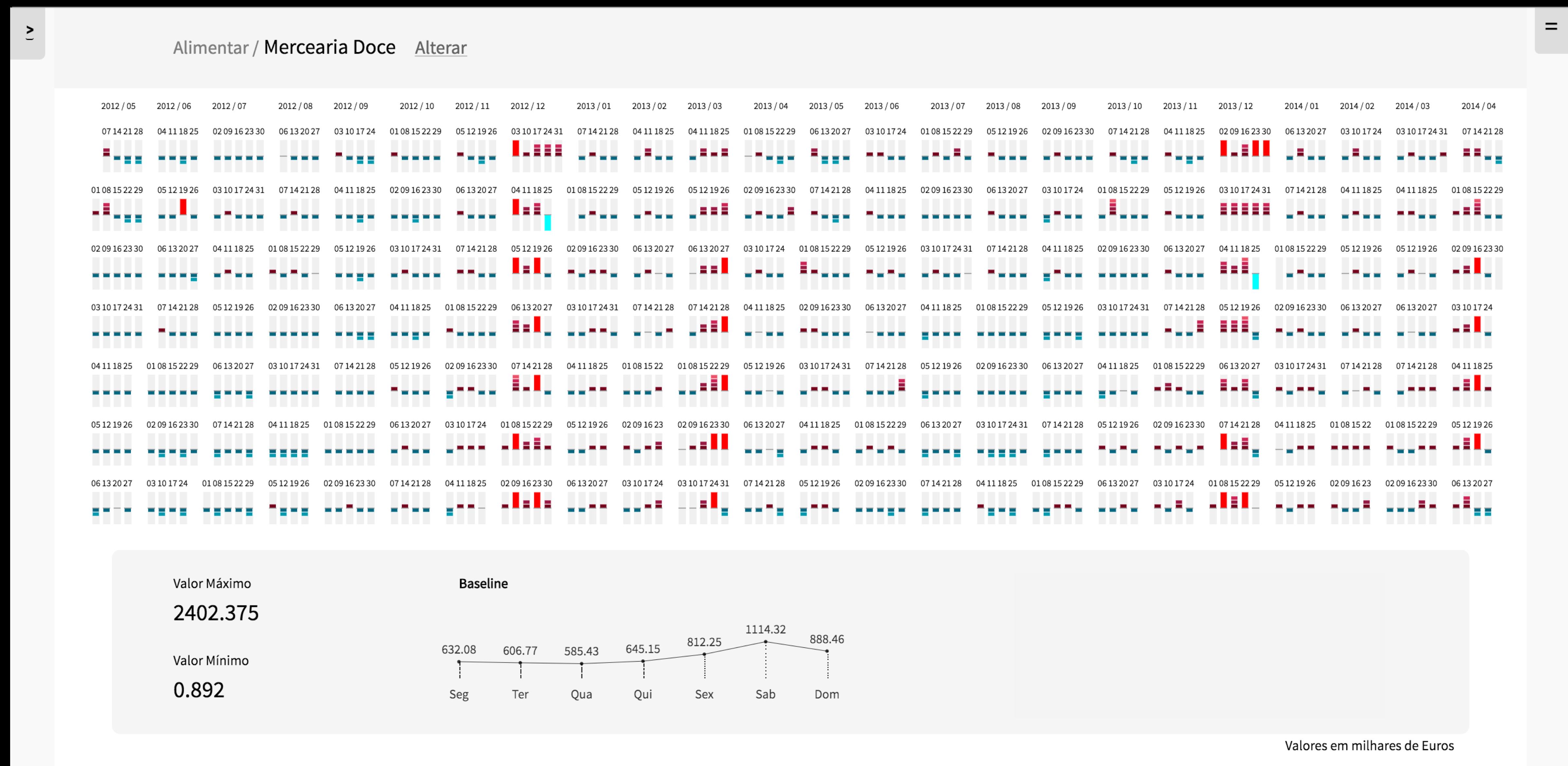
Departamento	Biz Unit	Categoria	Sub-Categoria	Unit Base
<u>Alimentar</u>				
<u>Frescos</u>				
<u>Food & Bakery</u>				
<u>Casa</u>				
<u>Bazar</u>				
<u>Têxtil</u>				
<u>Wells</u>				

Application – Selection of an element of the hierarchy

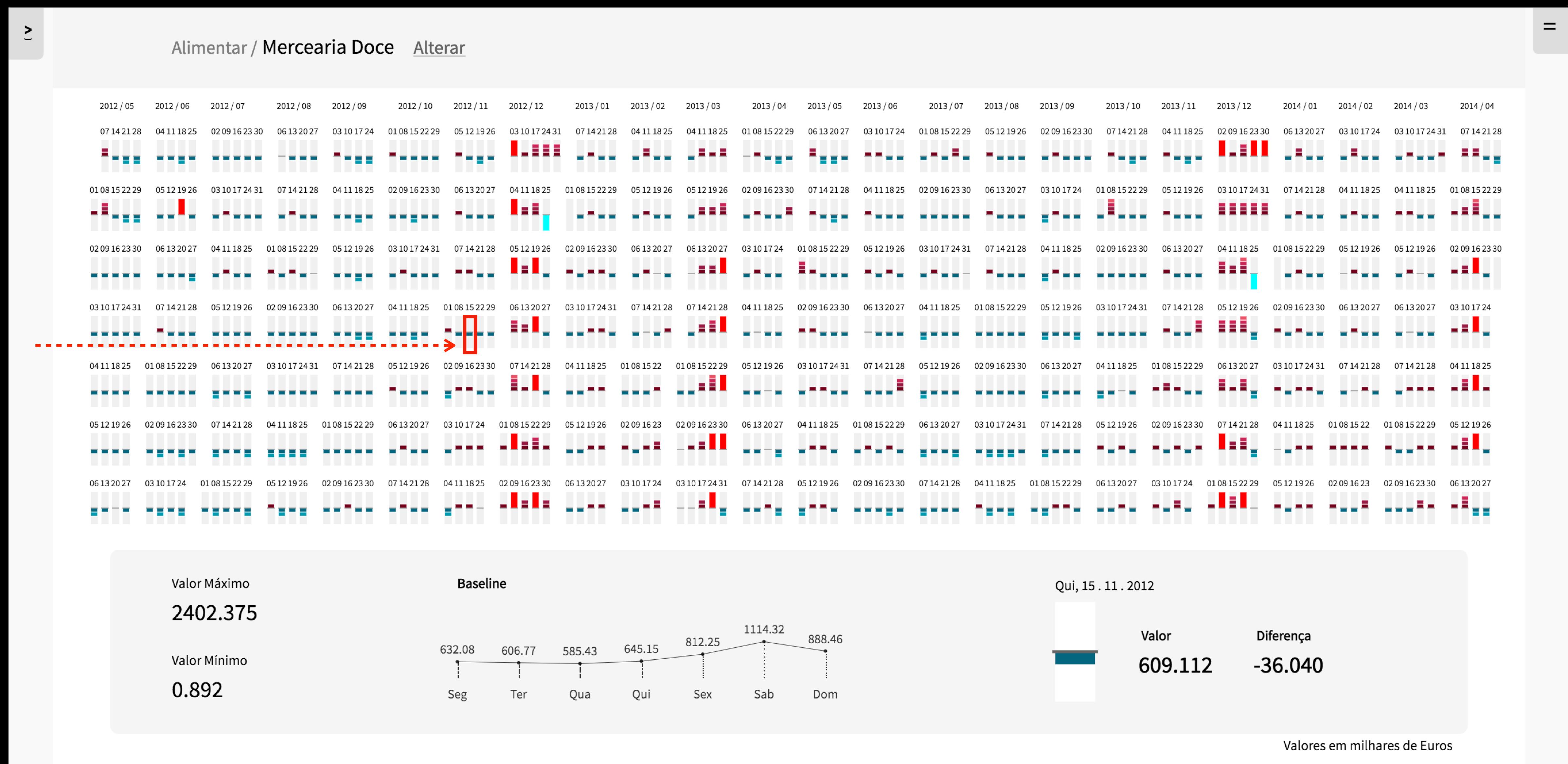
Departamento	Biz Unit	Categoria	Sub-Categoria	Unit Base
<u>Alimentar</u>	<u>Mercearia Salgada</u>	<u>Cereais</u>		
Frescos	Mercearia Doce	<u>Doçaria</u>		
Food & Bakery	Bebidas	<u>Bolachas</u>		
Casa	Taras	<u>Sobremesas</u>		
Bazar	Higiene e Beleza	<u>Alimentação Infantil</u>		
Têxtil	Limpeza do Lar	<u>Bebidas Quentes</u>		
Wells	Congelados	<u>Mel e Compotas</u>		
	Lacticínios			

[Alimentar / Mercearia Doce](#) [Ver](#)

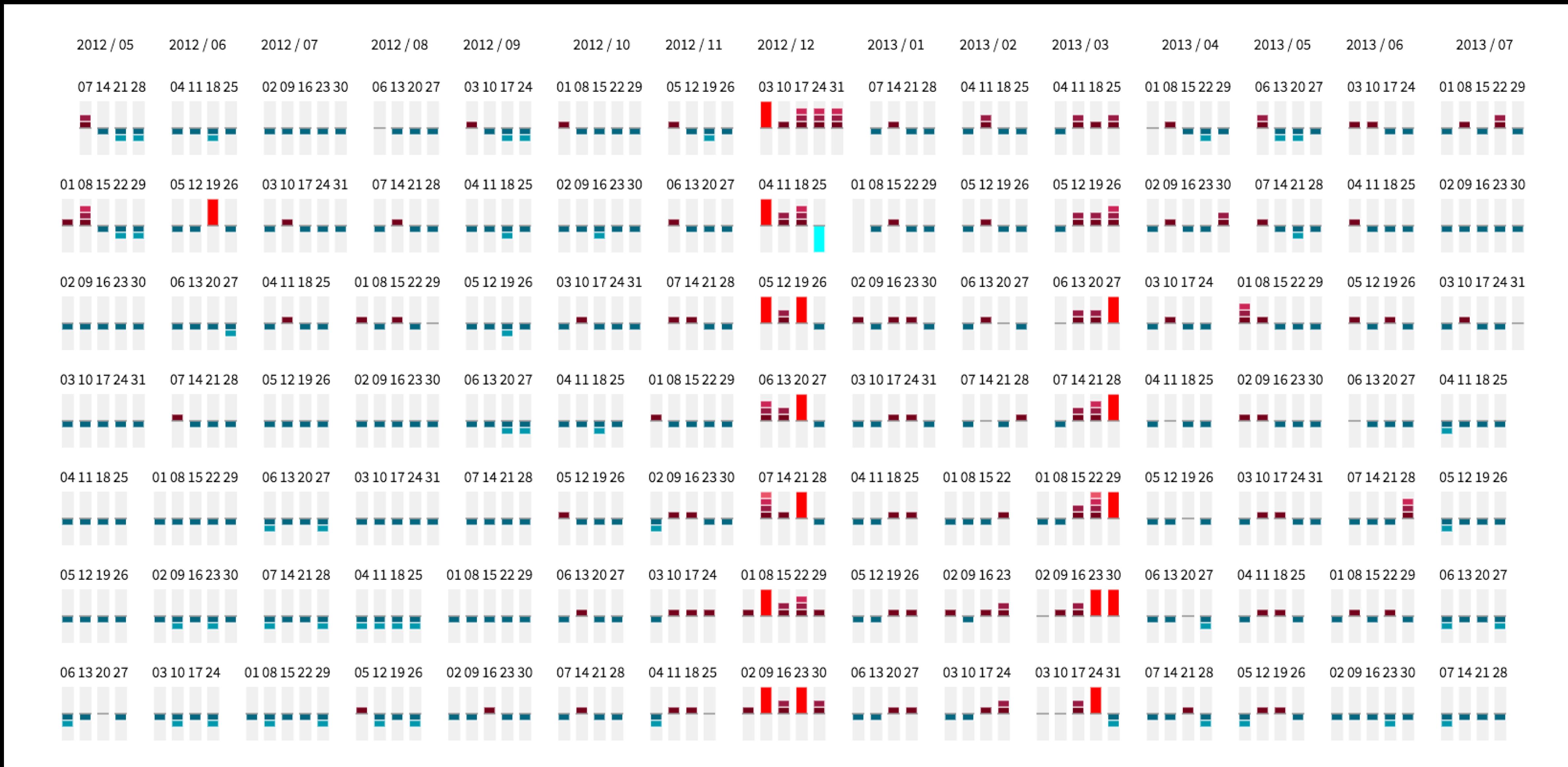
Application – Calendar Visualization



Application – Calendar Visualization



Application – Calendar Visualization (zoom)



Application – Calendar Visualization (zoom)



CONSUMPTION RESULTS

- Two levels of information

CONSUMPTION RESULTS

- Two levels of information
- Highlight the deviations

CONSUMPTION RESULTS

- Two levels of information
- Highlight the deviations
- Eliminate periodic repetition.

CONSUMPTION.2

CONSUMPTION.2

CONCEPT

- Radial models are able to provide valuable insights from the data, using space efficiently and easing the comprehension and interaction of the user.

CONSUMPTION.2

GOAL

CONSUMPTION.2

GOAL

- Test a radial Calendar model

CONSUMPTION.2

GOAL

- Test a radial Calendar model:
 - Compare weekly consumption
in a month and between months

CONSUMPTION.2

GOAL

- Test a radial Calendar model:
 - Compare weekly consumption in a month and between months
 - Identify deviations

CONSUMPTION.2

GOAL

- Test a radial Calendar model:
 - Compare weekly consumption in a month and between months
 - Identify deviations
 - Overview and details.

CONSUMPTION.2

DATASET

- Consumptions aggregated by:

CONSUMPTION.2

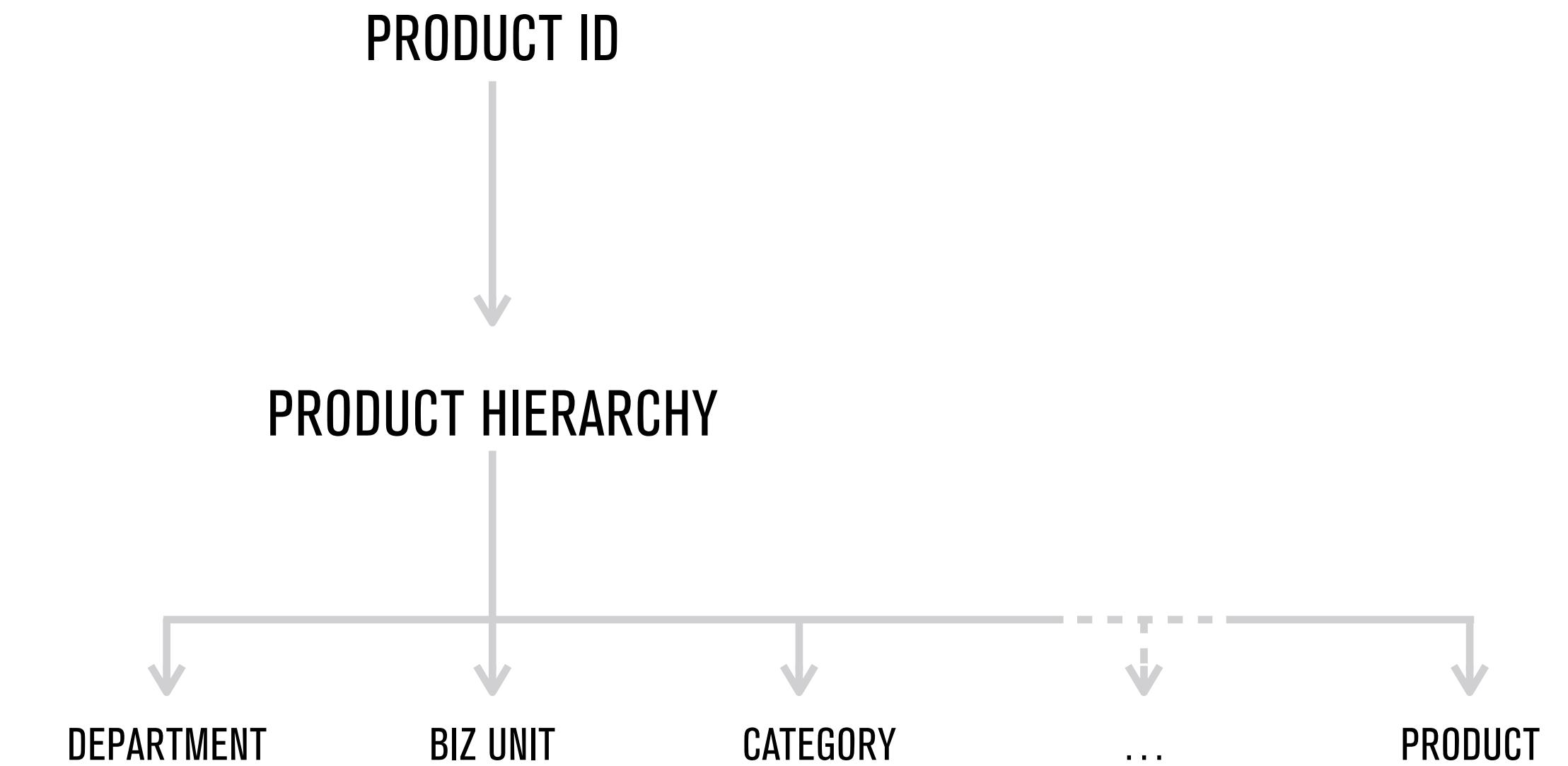
DATASET

- Consumptions aggregated by:
 - Day

CONSUMPTION.2

DATASET

- Consumptions aggregated by:
 - Day
 - Product hierarchy level.



CONSUMPTION.2

VISUALIZATION

CONSUMPTION.2

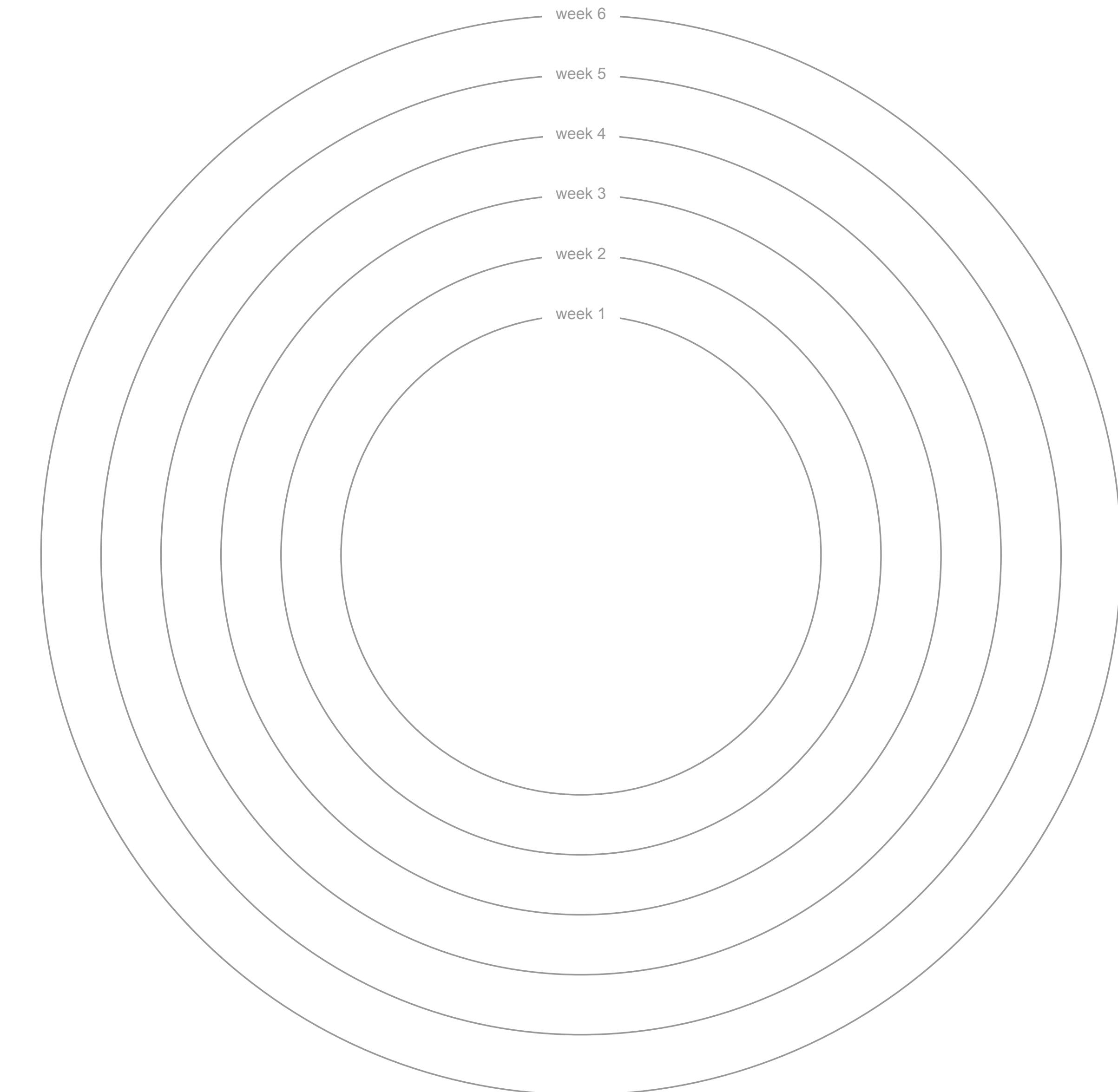
VISUALIZATION

- Radial model

CONSUMPTION.2

VISUALIZATION

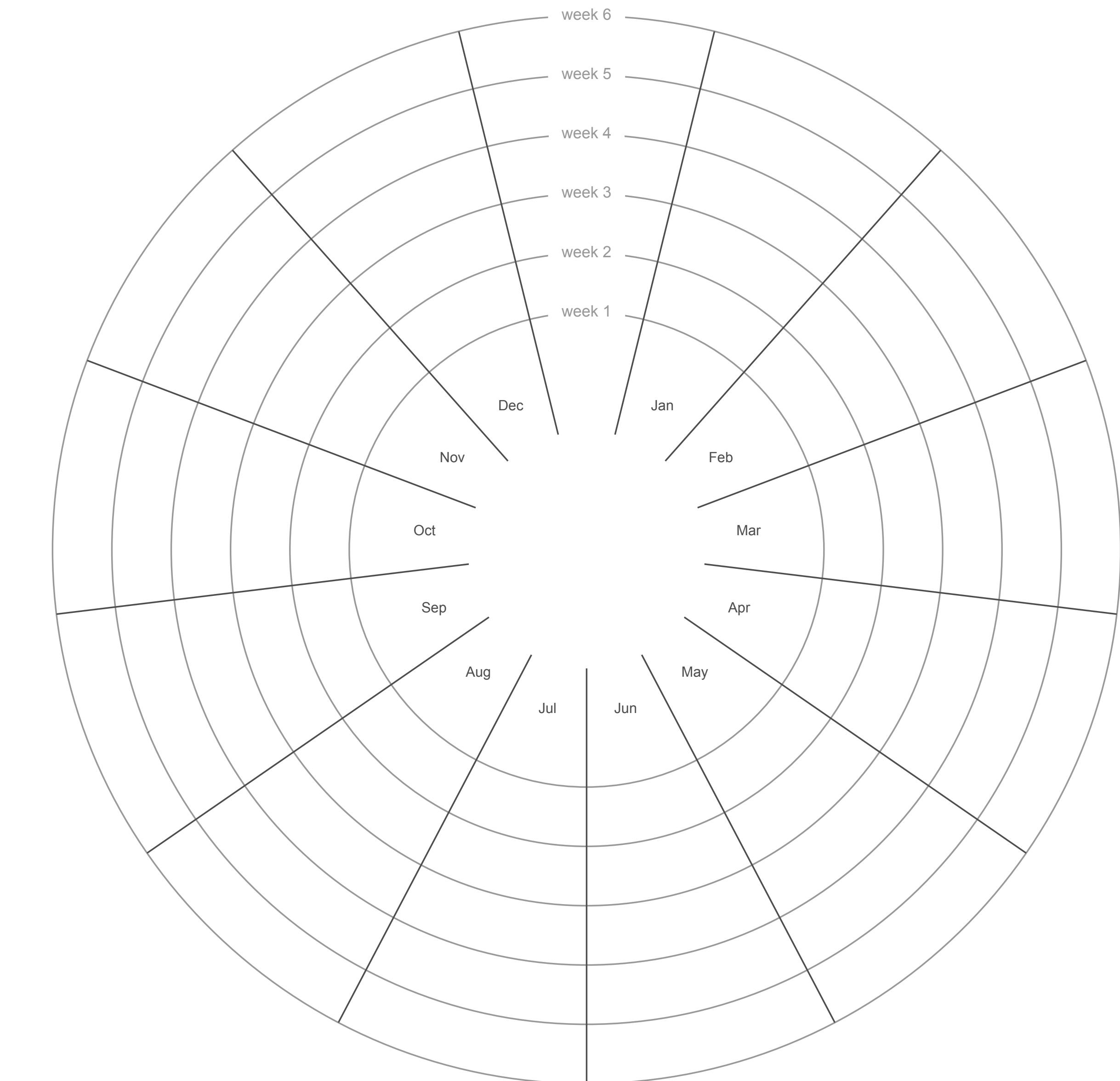
- Radial model
 - Weeks of the month aligned



CONSUMPTION.2

VISUALIZATION

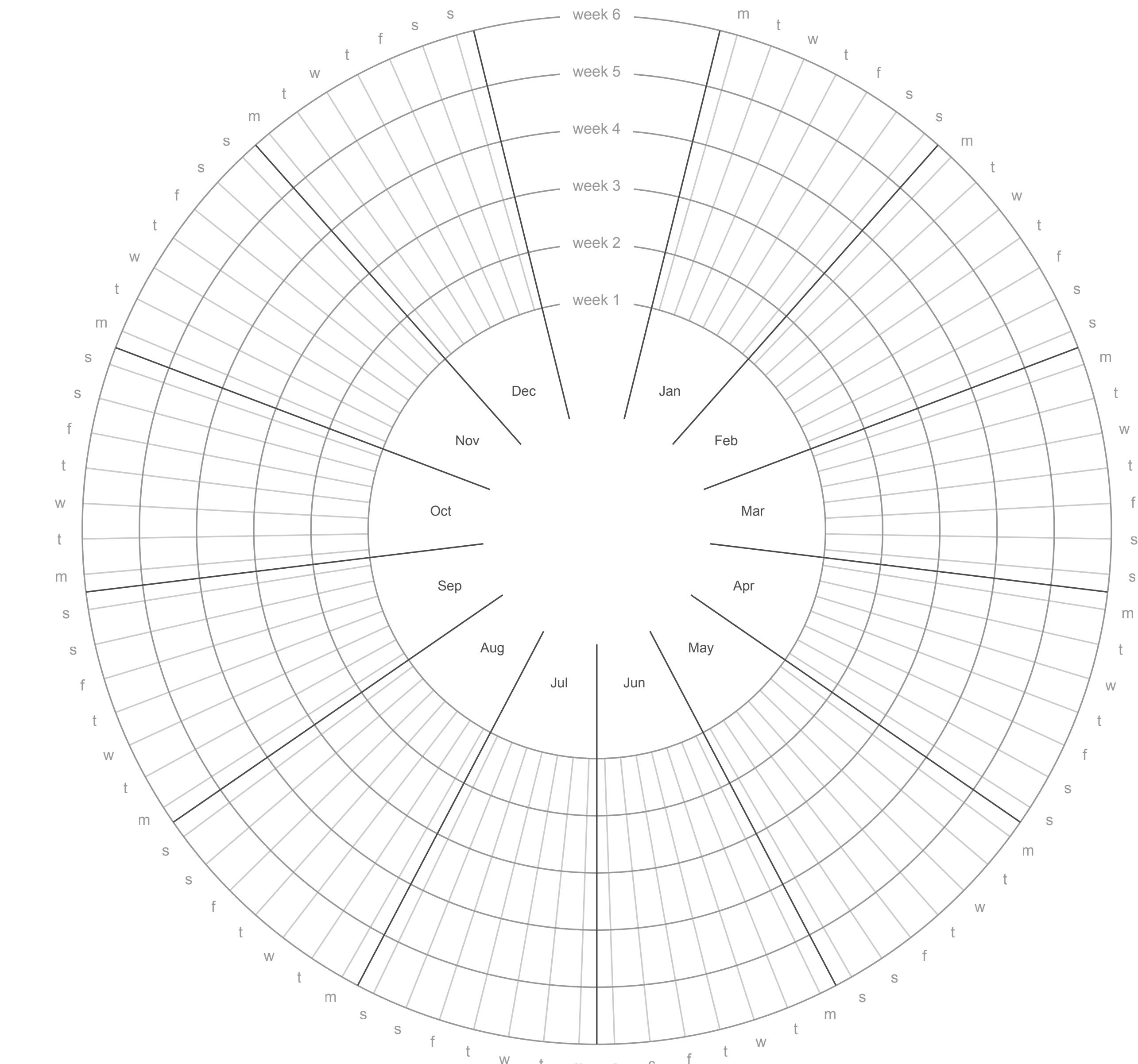
- Radial model
- Weeks of the month aligned
- Months in 12 equal wedges



CONSUMPTION.2

VISUALIZATION

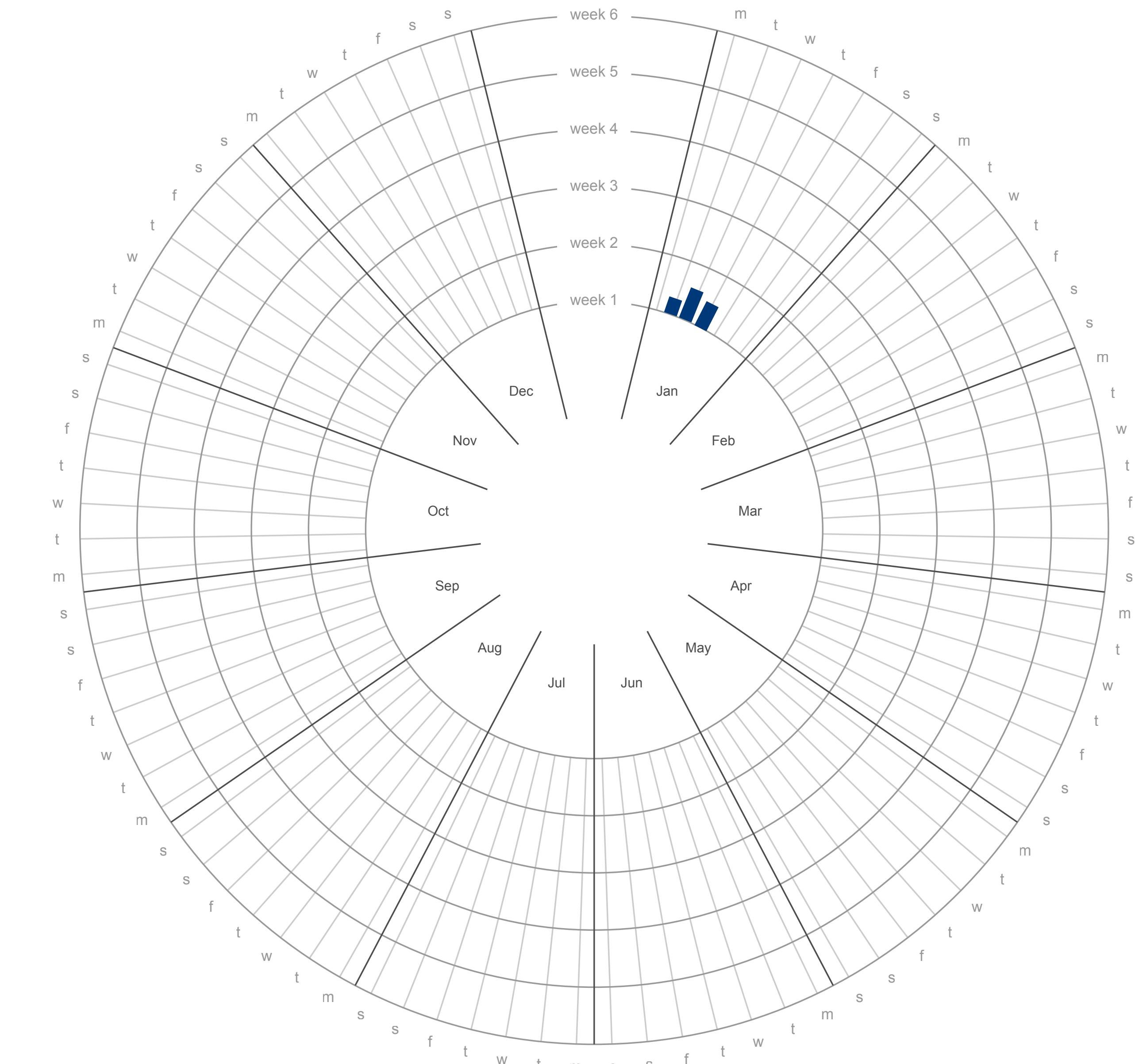
- Radial model
- Weeks of the month aligned
- Months in 12 equal wedges
- Weeks along the wedge



CONSUMPTION.2

VISUALIZATION

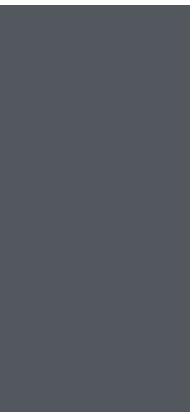
- Radial model
 - Weeks of the month aligned
 - Months in 12 equal wedges
 - Weeks along the wedge



CONSUMPTION.2

VISUALIZATION

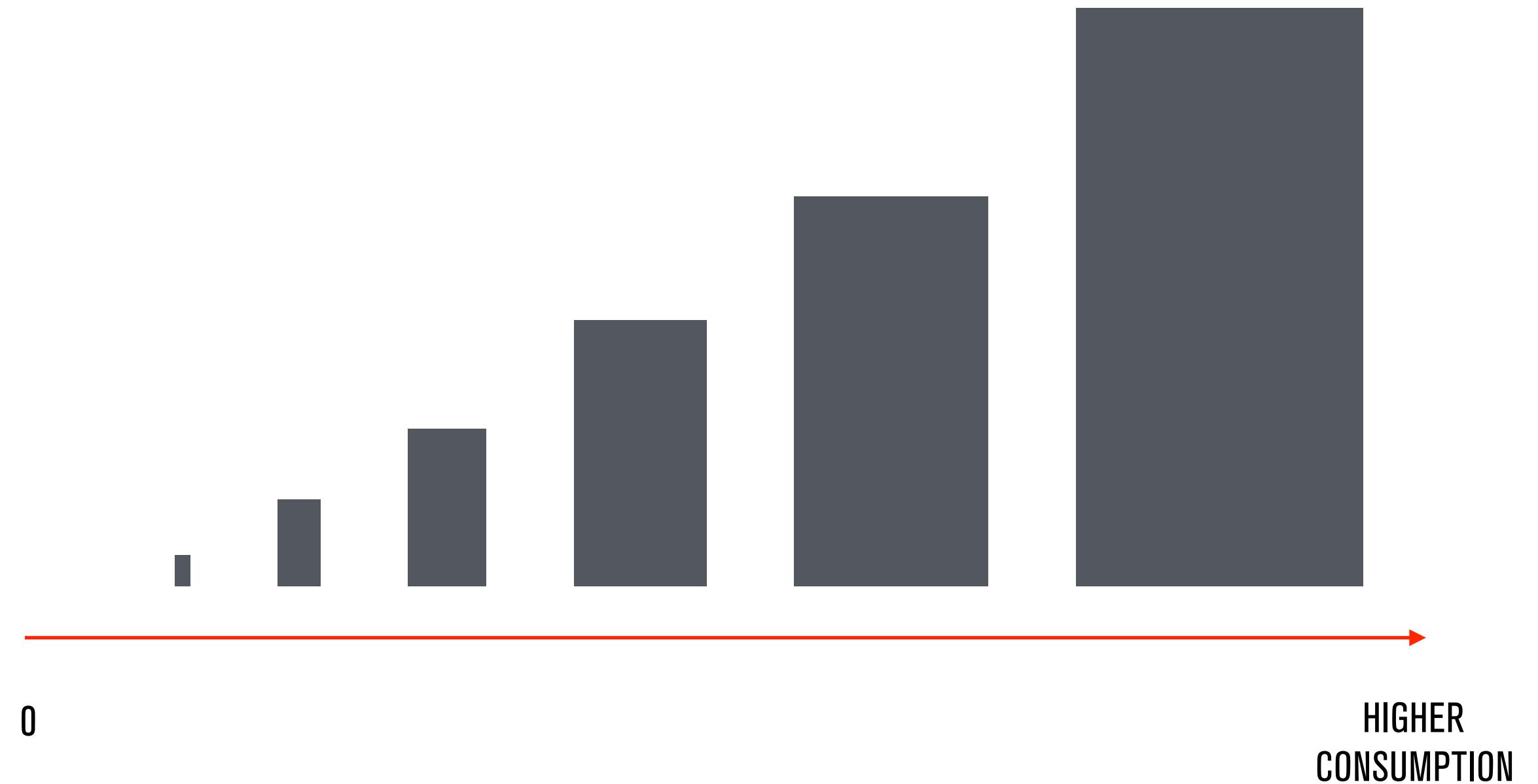
- Day of consumption → rectangle



CONSUMPTION.2

VISUALIZATION

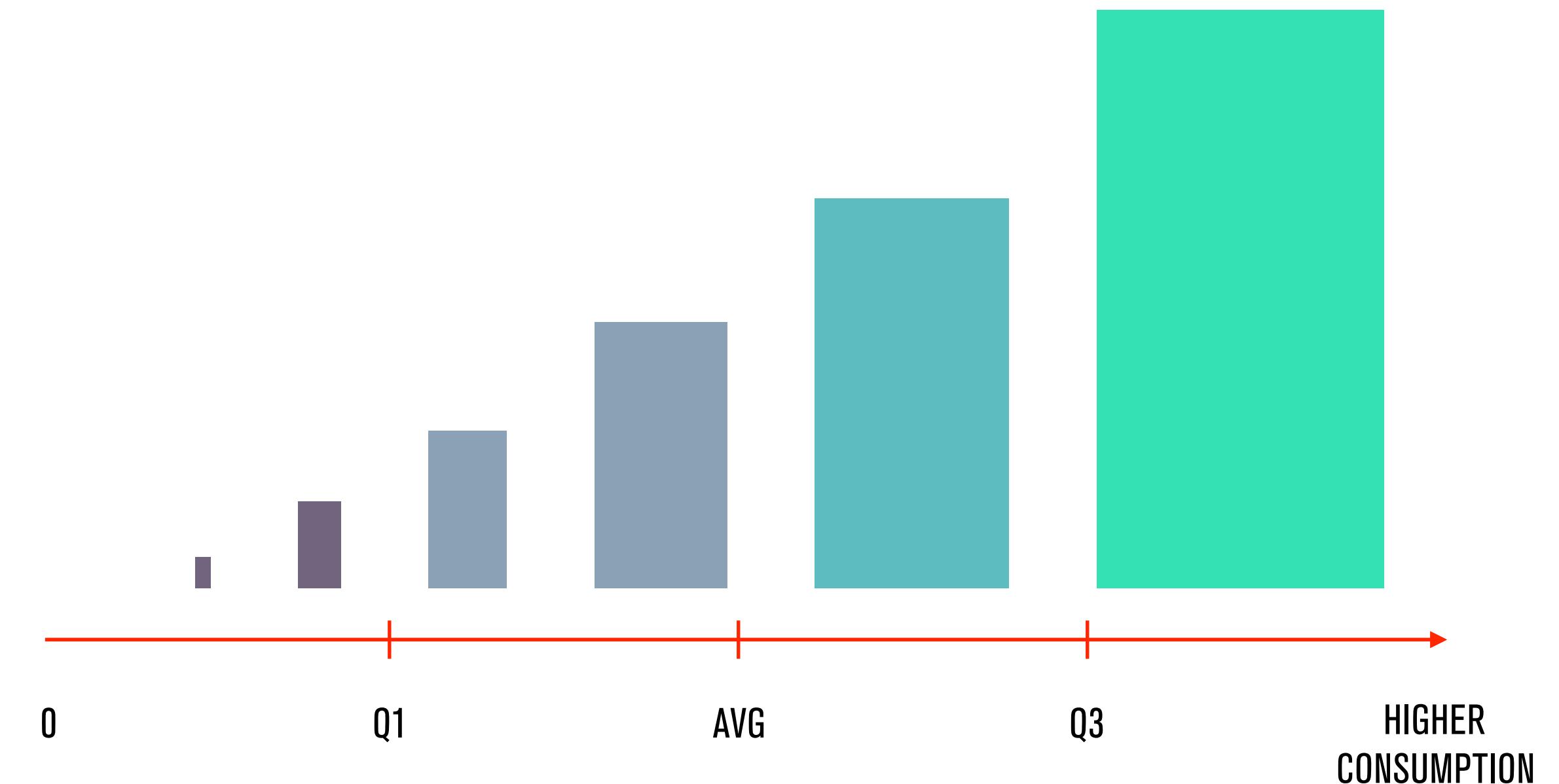
- Day of consumption → rectangle
- Consumption value → size and colour



CONSUMPTION.2

VISUALIZATION

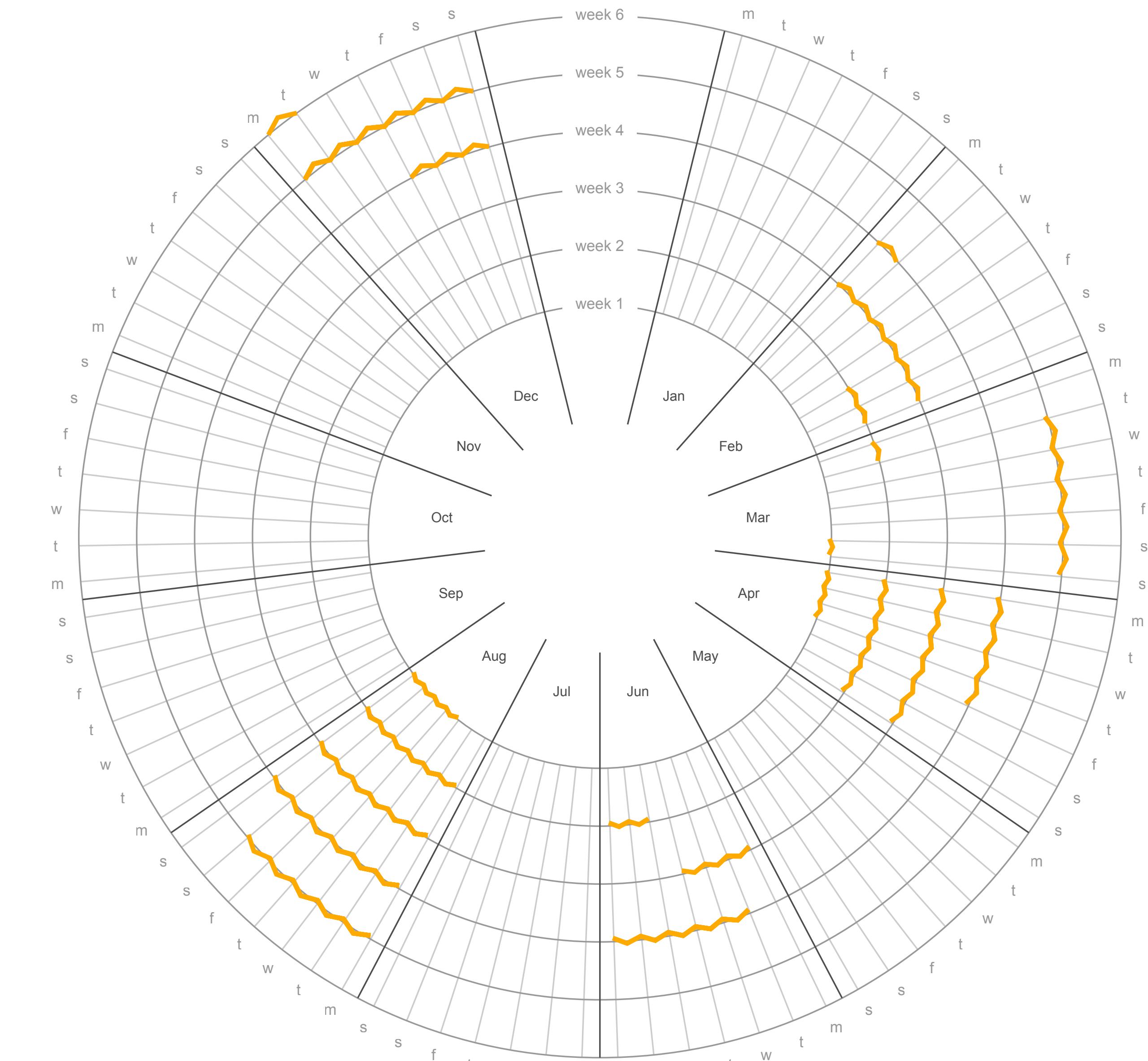
- Day of consumption → rectangle
- Consumption value → size and colour



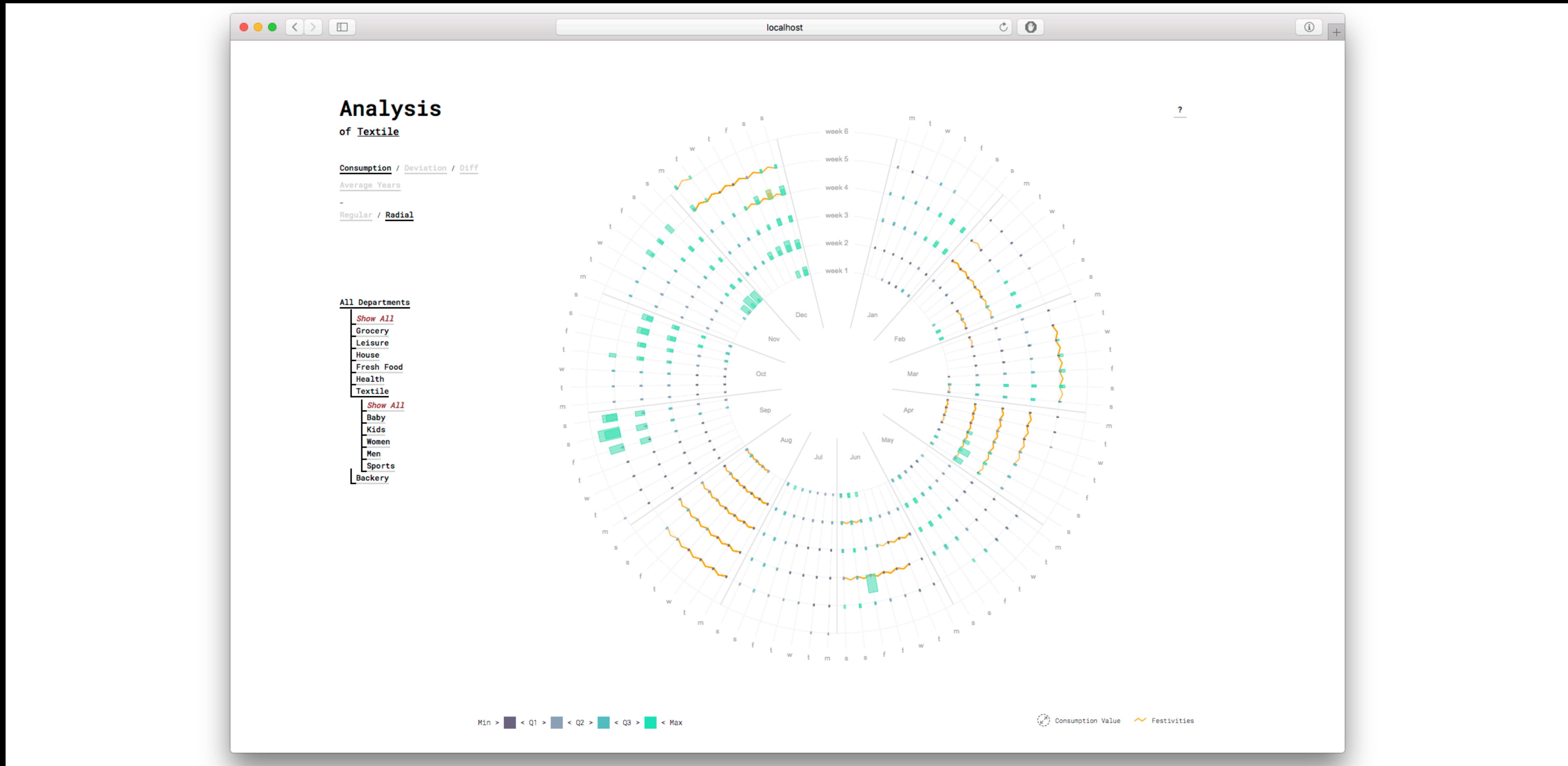
CONSUMPTION.2

VISUALIZATION

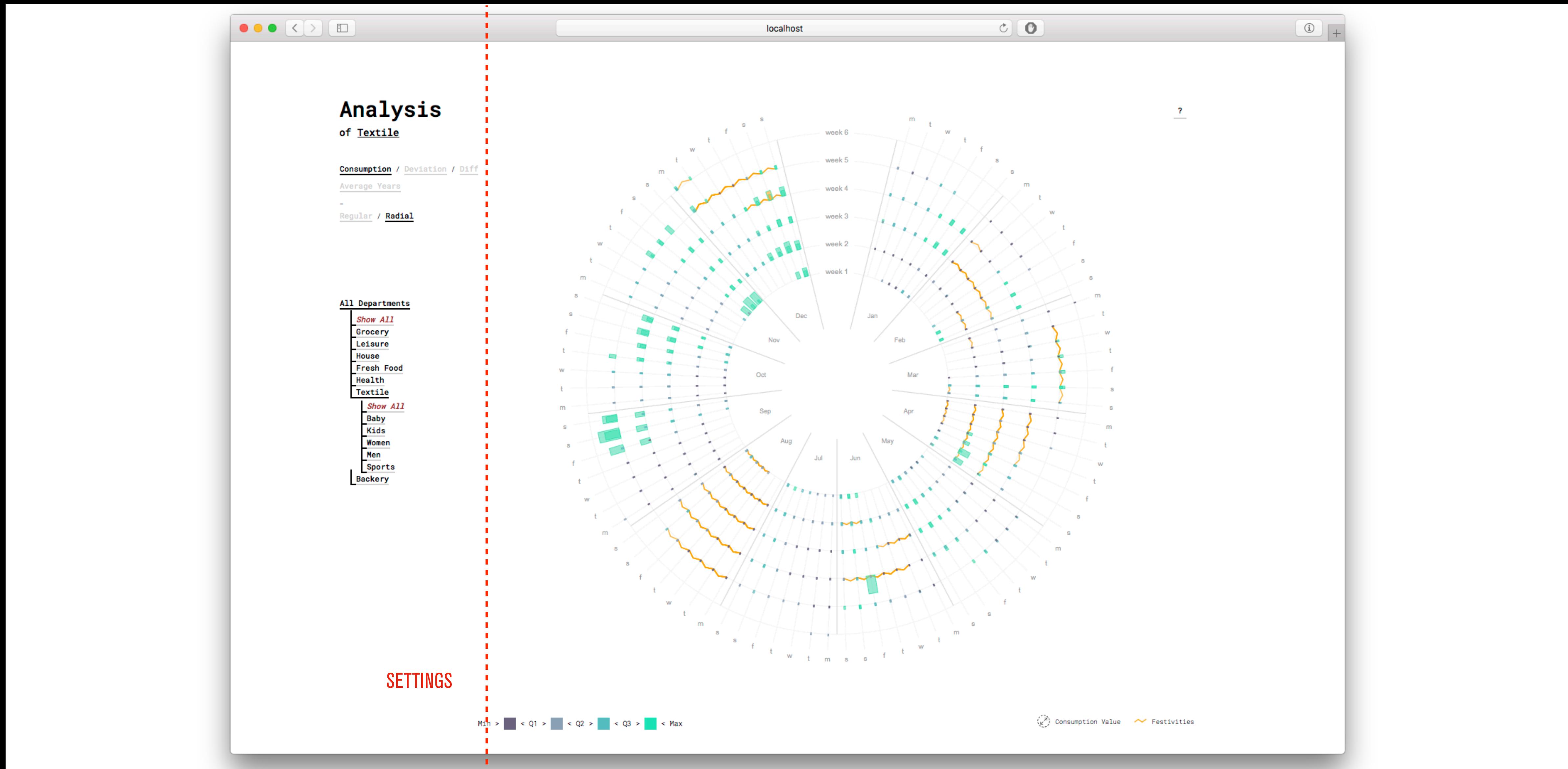
- Day of consumption → rectangle
- Consumption value → size and colour
- Visual clues to cultural events.



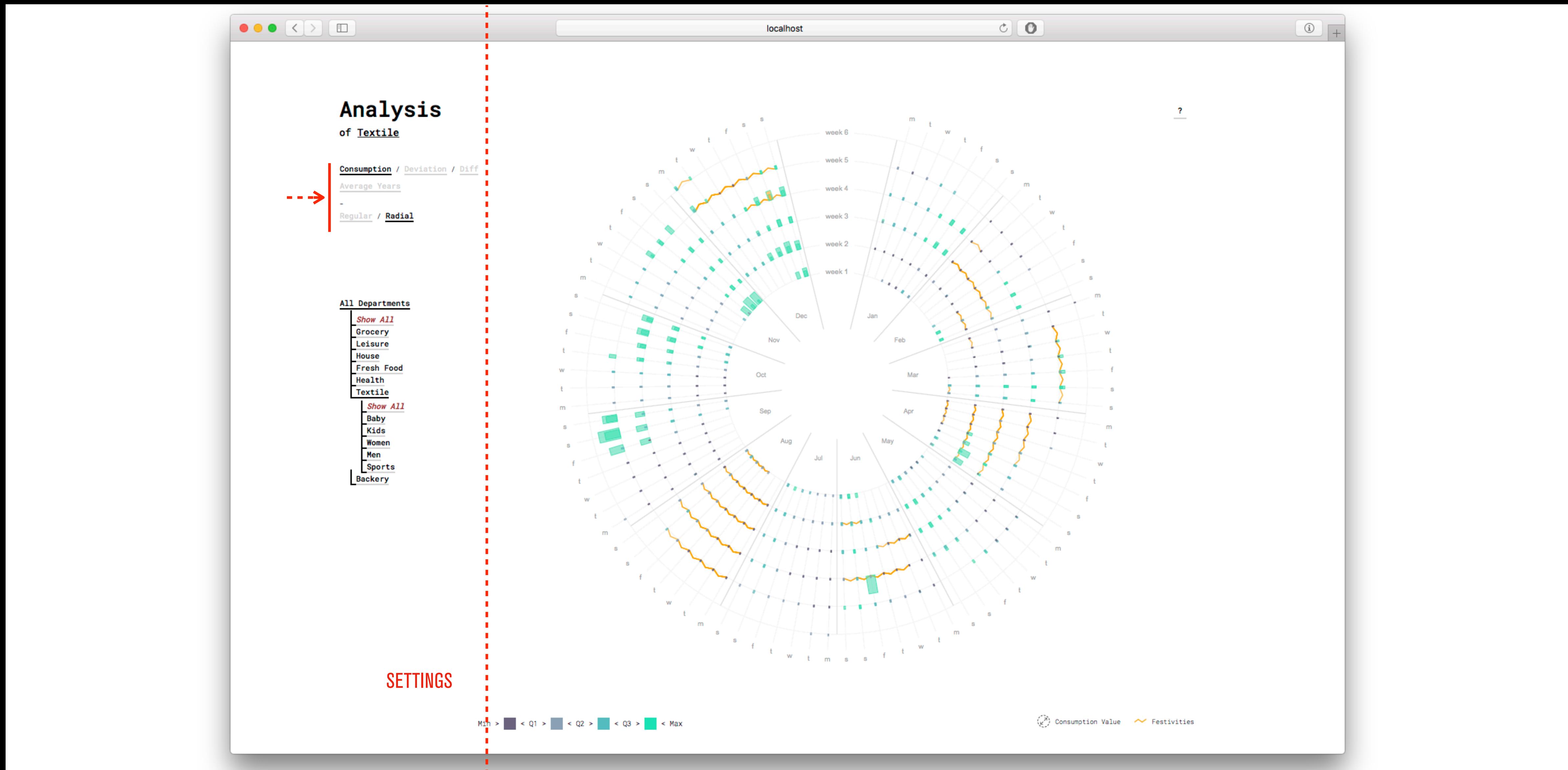
Radial Calendar Application



Radial Calendar Application



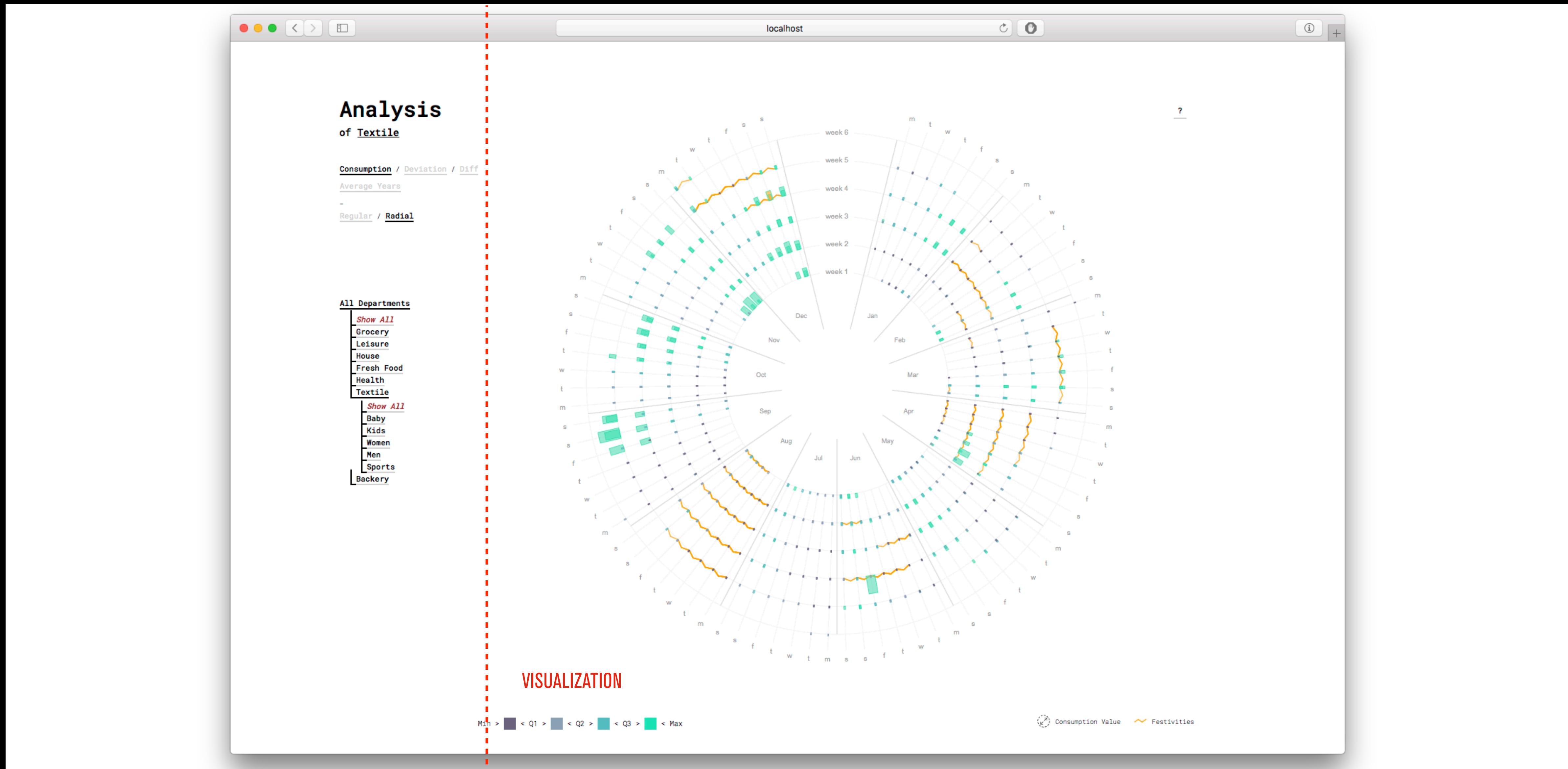
Radial Calendar Application



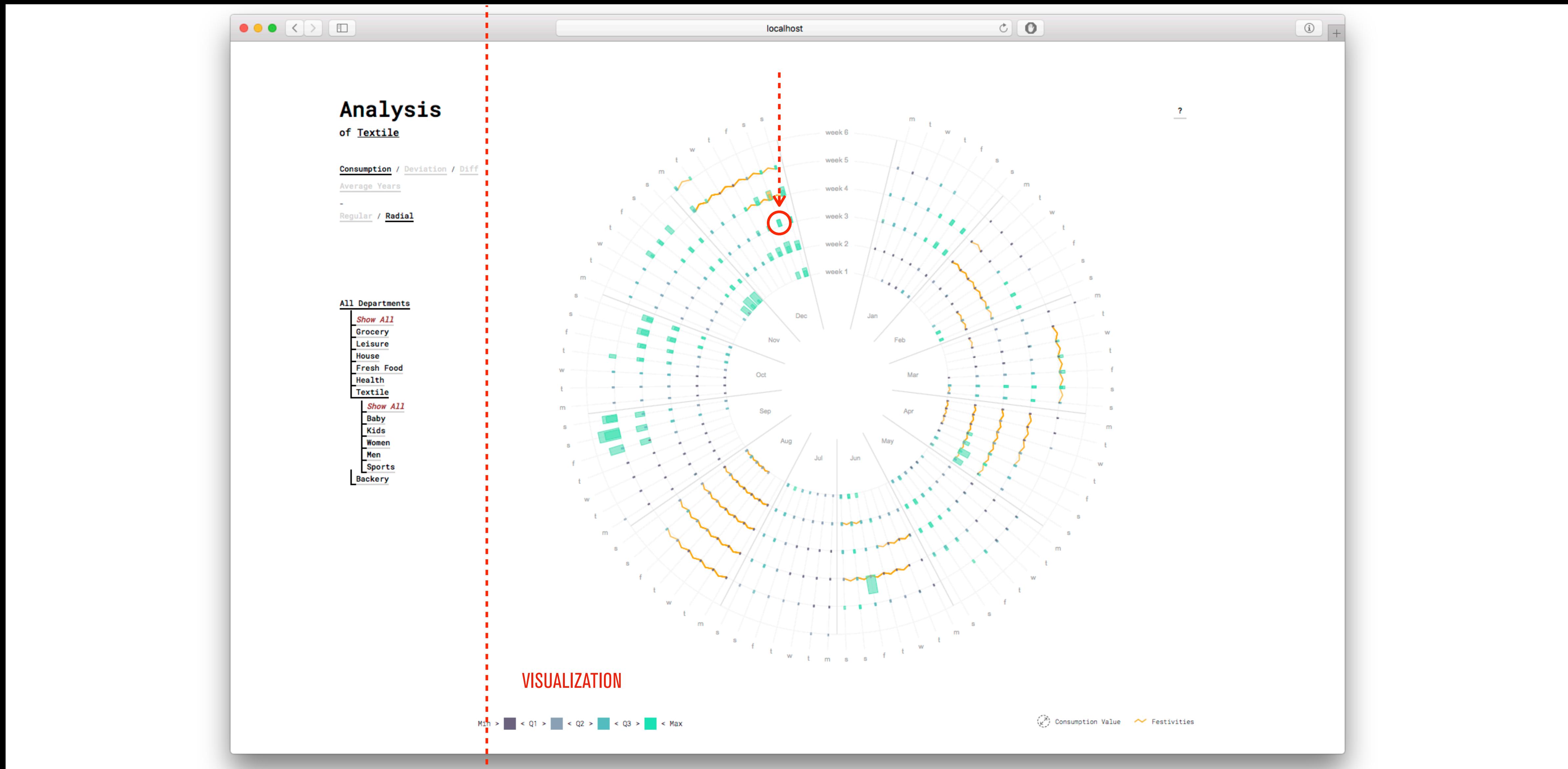
Radial Calendar Application



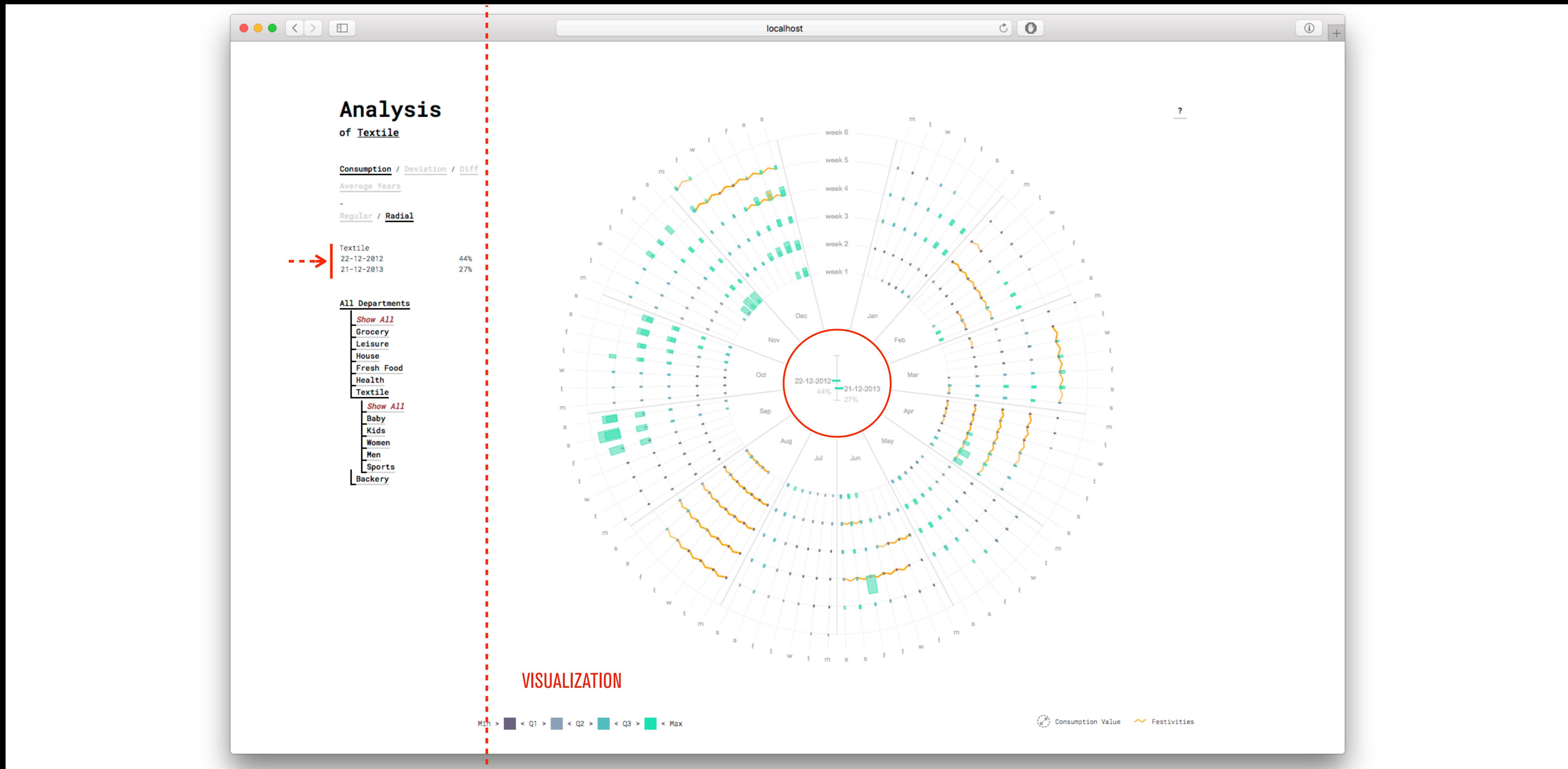
Radial Calendar Application



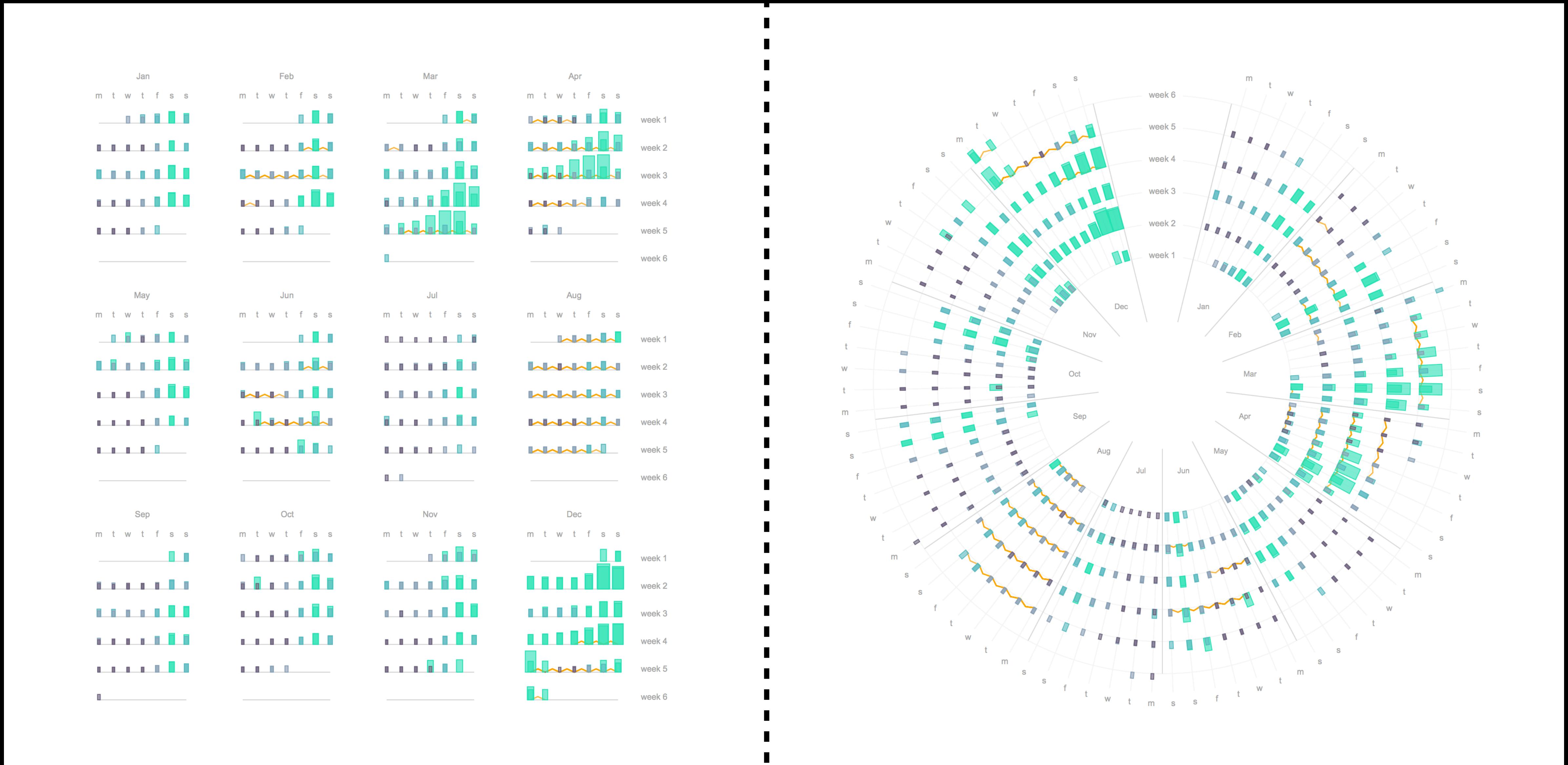
Radial Calendar Application



Radial Calendar Application

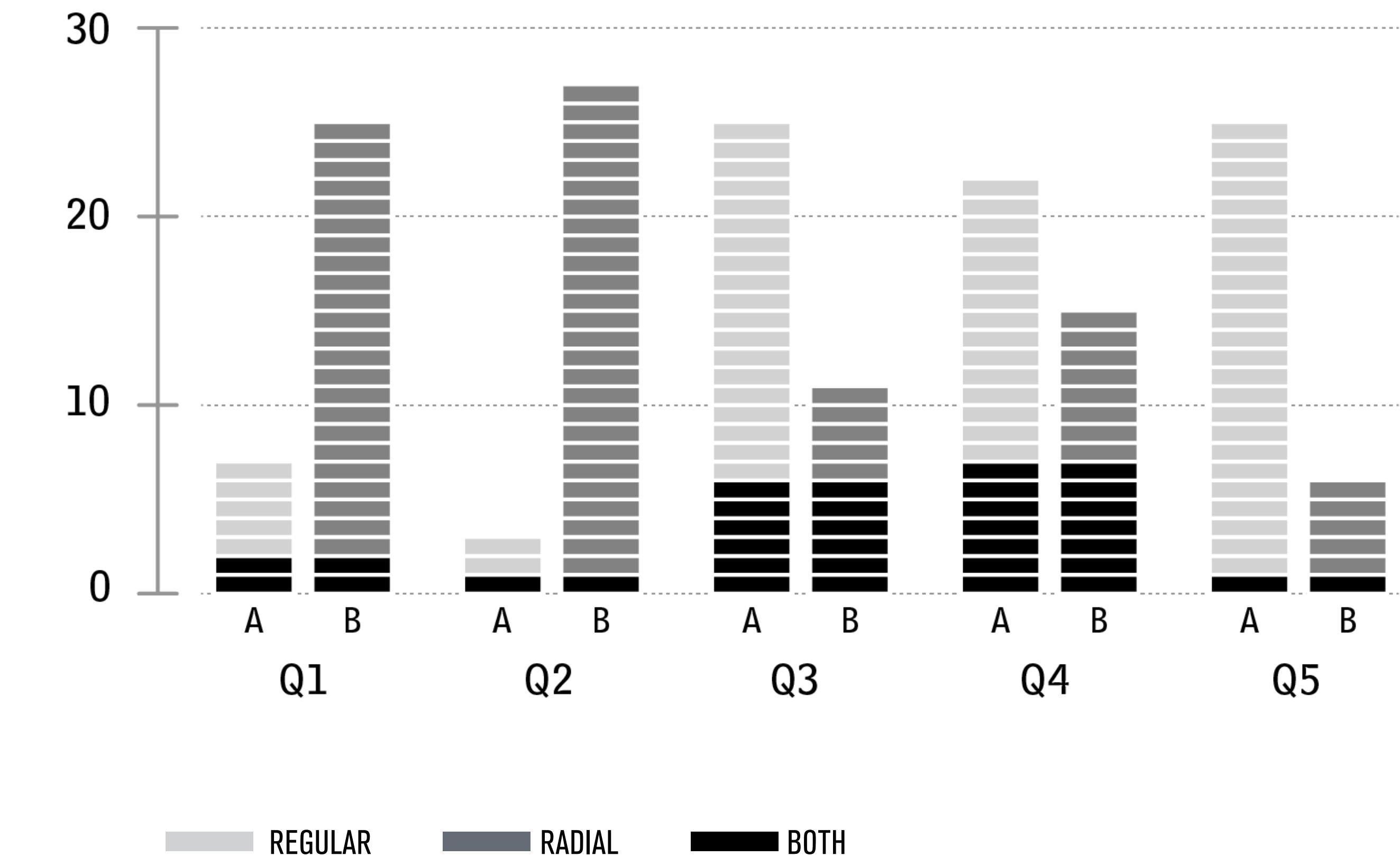


User Testing between a Regular Calendar and the Radial Calendar



CONSUMPTION.2

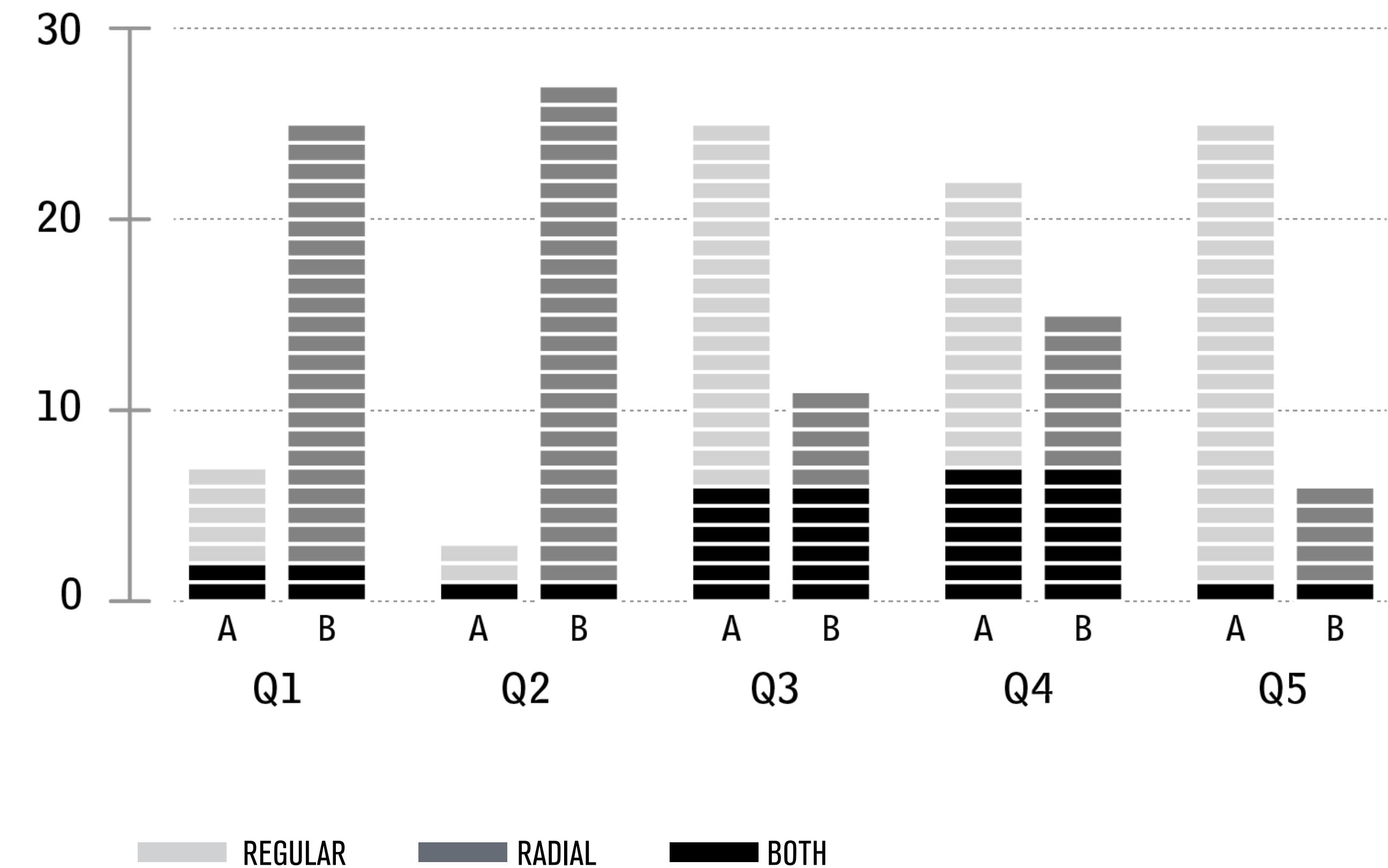
RESULTS



CONSUMPTION.2

RESULTS

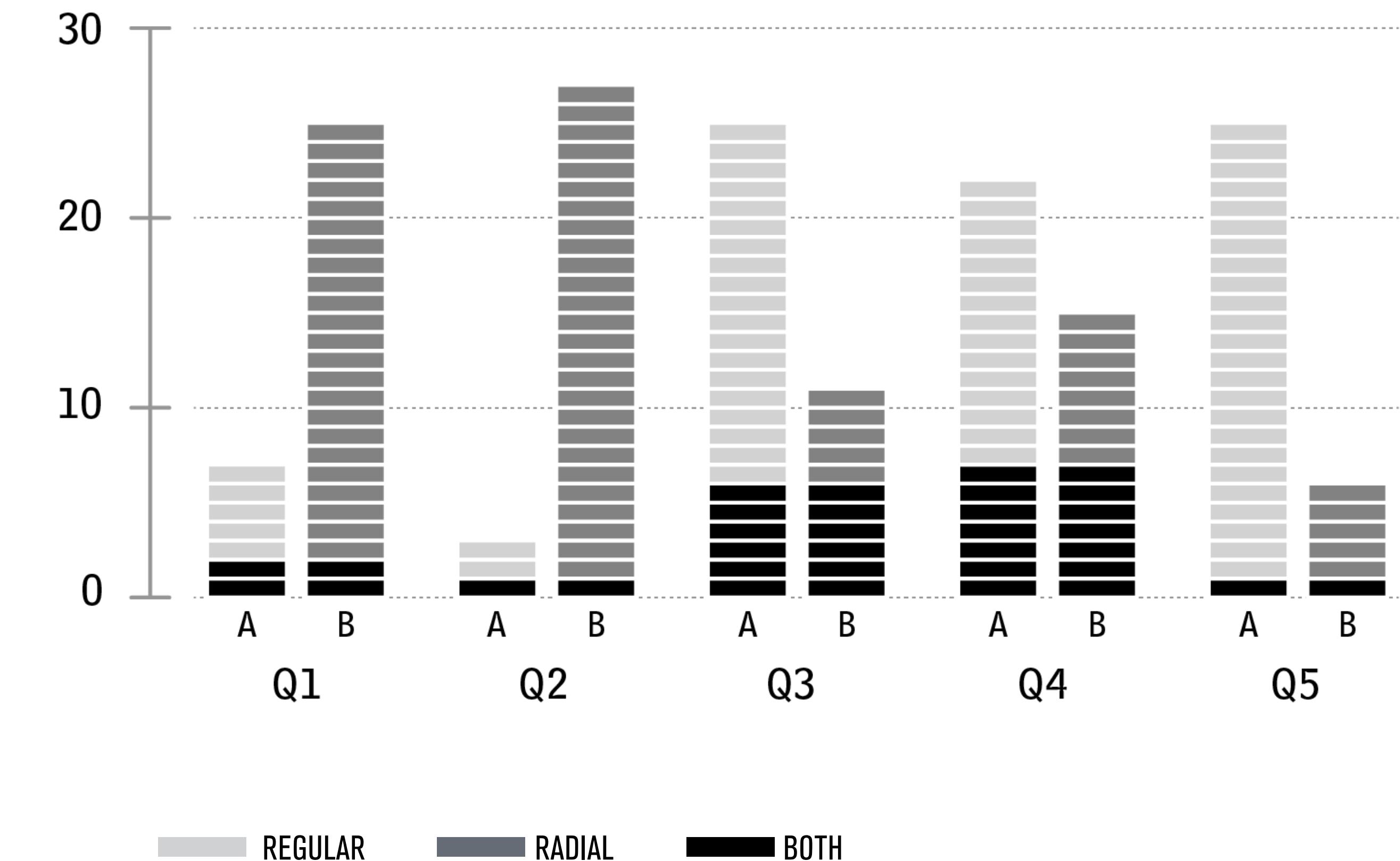
- Radial more aesthetically pleasing [Q1], leading to higher curiosity to explore the data [Q2]



CONSUMPTION.2

RESULTS

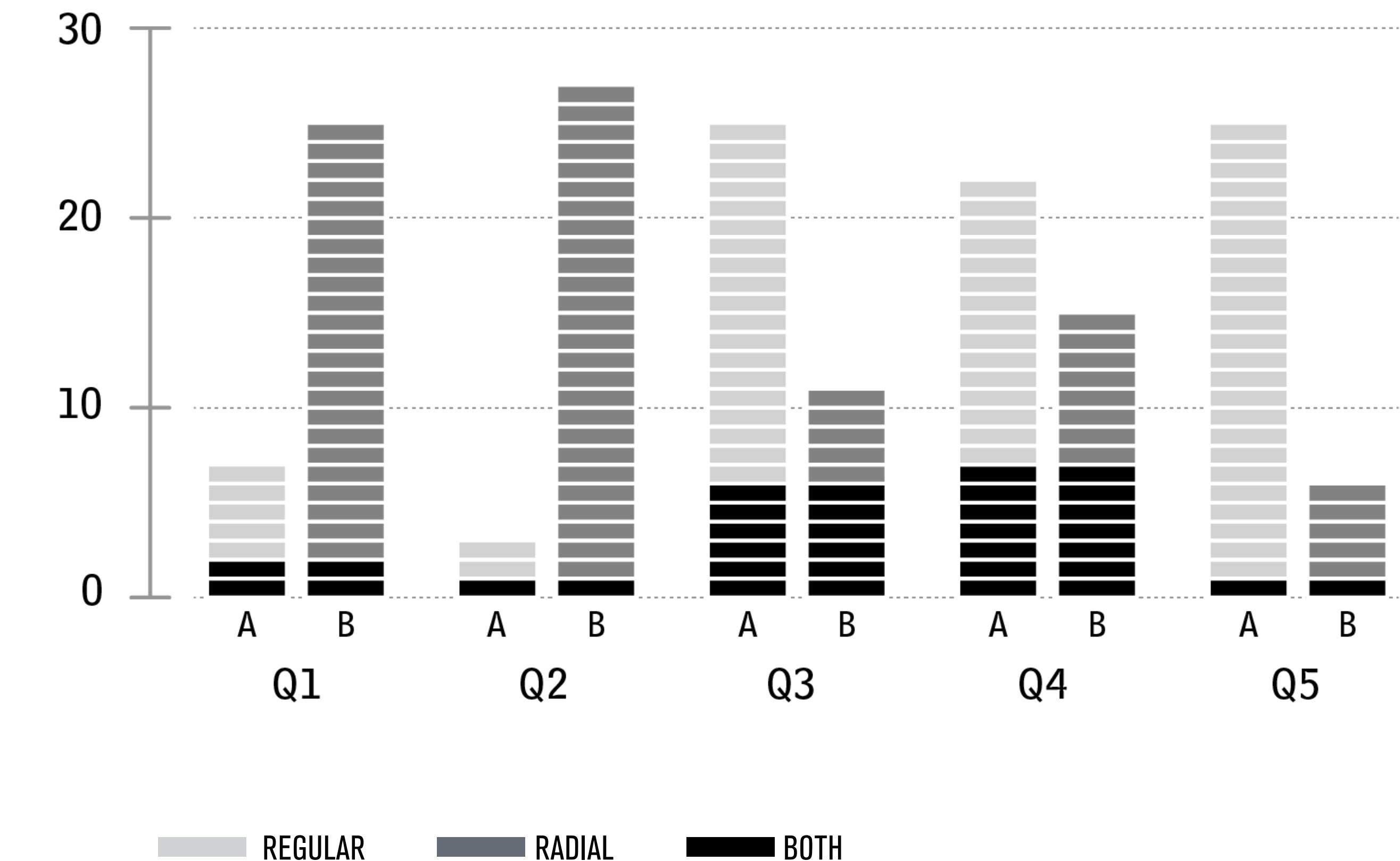
- Radial more aesthetically pleasing [Q1], leading to higher curiosity to explore the data [Q2]
- Regular calendar is seen has more intuitive [Q5], as it is more familiar



CONSUMPTION.2

RESULTS

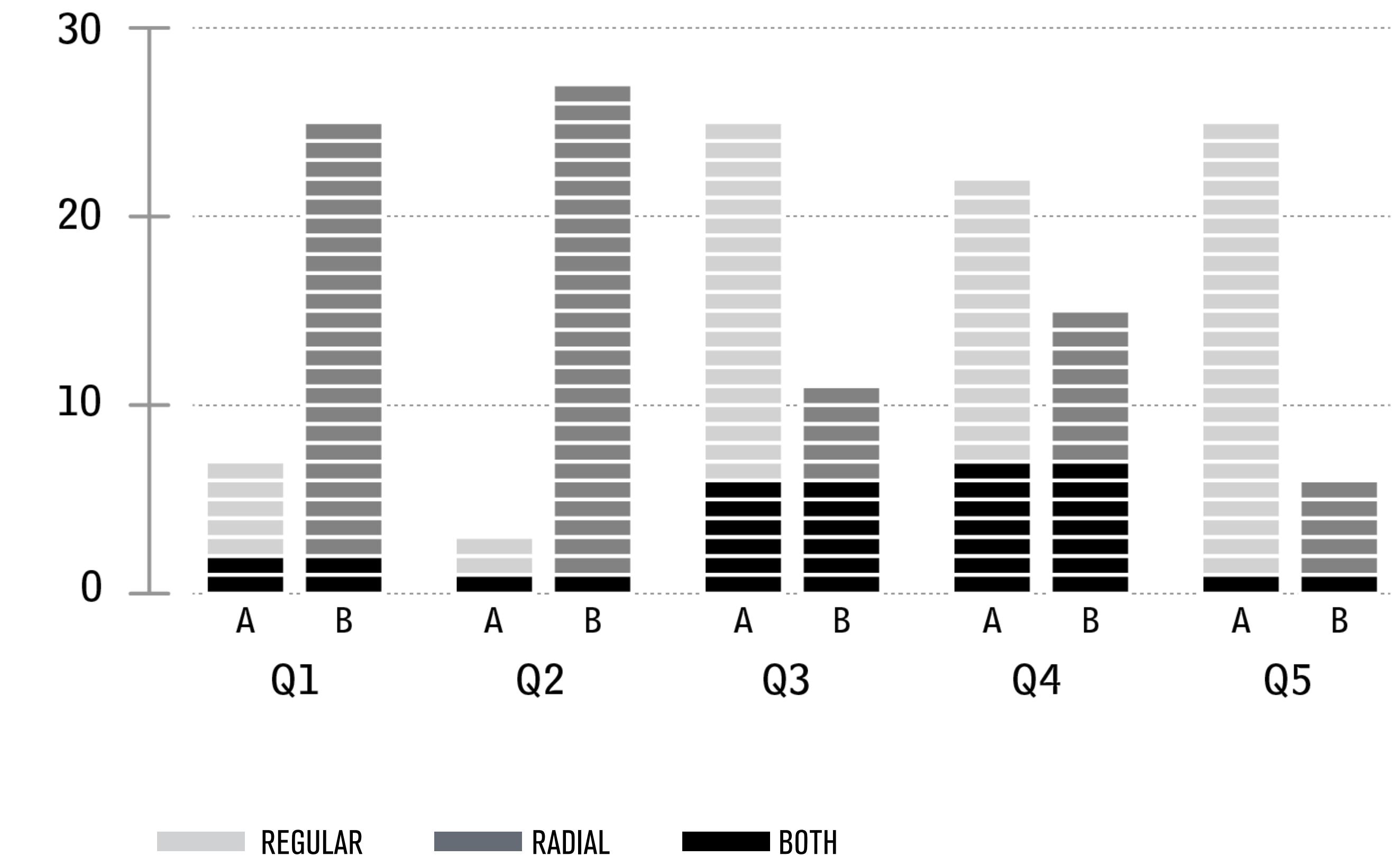
- Radial more aesthetically pleasing [Q1], leading to higher curiosity to explore the data [Q2]
- Regular calendar is seen has more intuitive [Q5], as it is more familiar
 - Easier to learn [Q3]
 - More useful [Q4]



CONSUMPTION.2

RESULTS

- Radial more aesthetically pleasing [Q1], leading to higher curiosity to explore the data [Q2]
- Regular calendar is seen has more intuitive [Q5], as it is more familiar
 - Easier to learn [Q3]
 - More useful [Q4]
- “the radial visualization could condense better the information, revealing more insights”



TIMELINE

TIMELINE

GOAL

- Analysis and detection of fraudulent behaviours

TIMELINE

GOAL

- Analysis and detection of fraudulent behaviours
- Provide an overview of the data

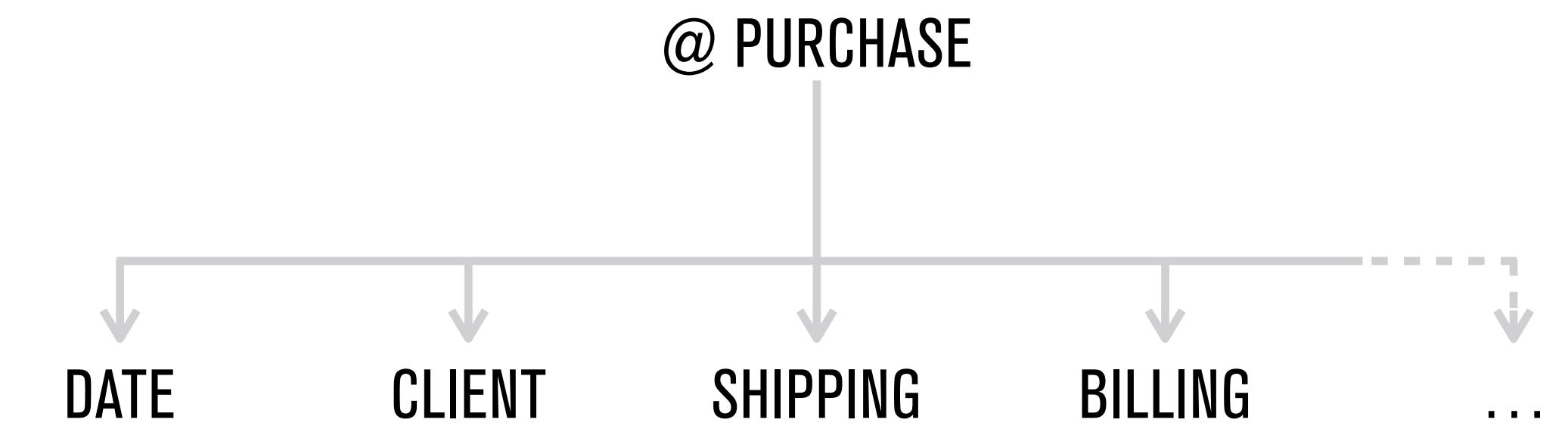
TIMELINE

GOAL

- Analysis and detection of fraudulent behaviours
- Provide an overview of the data
- Reduce interaction.

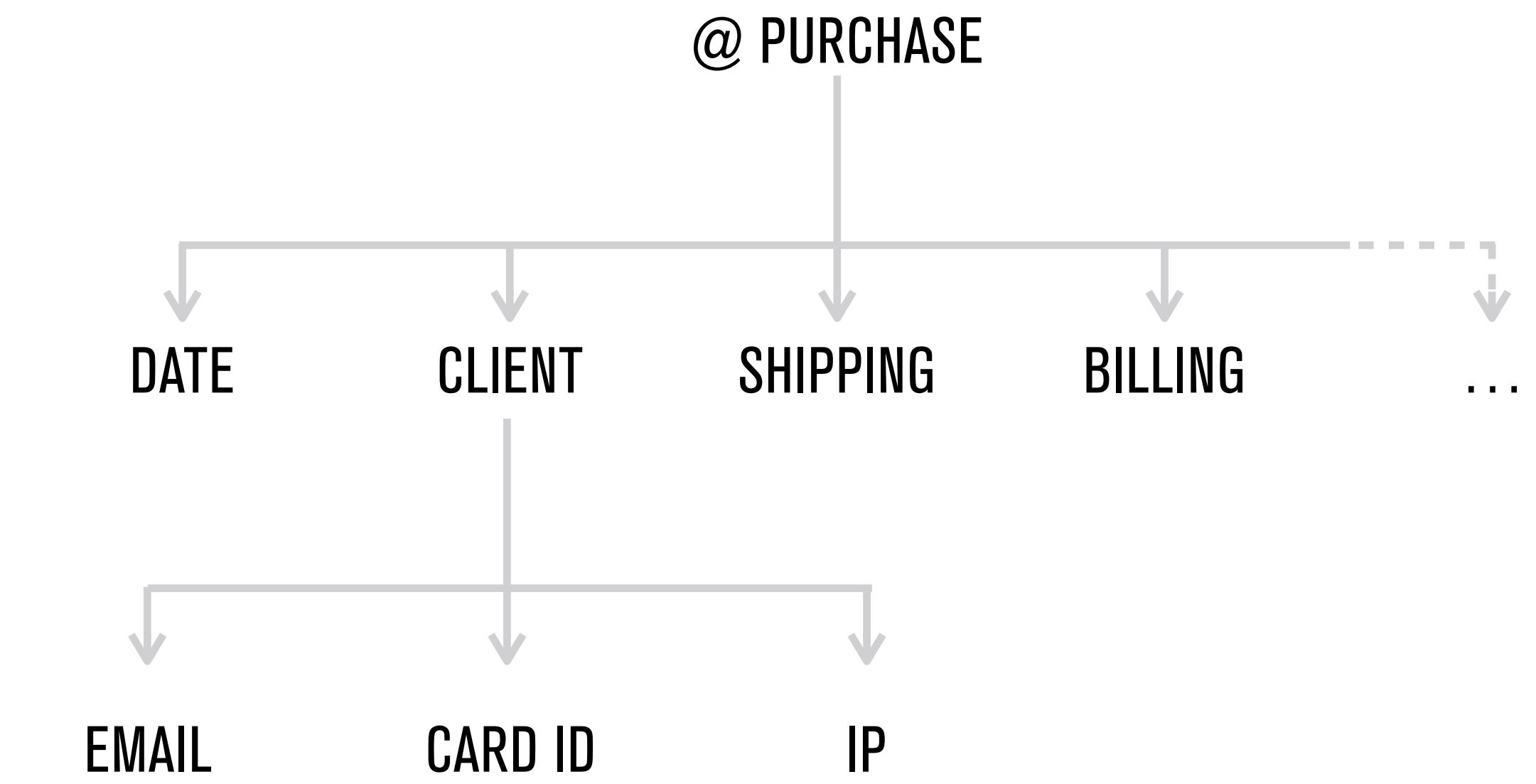
TIMELINE DATASET

- Online shopping



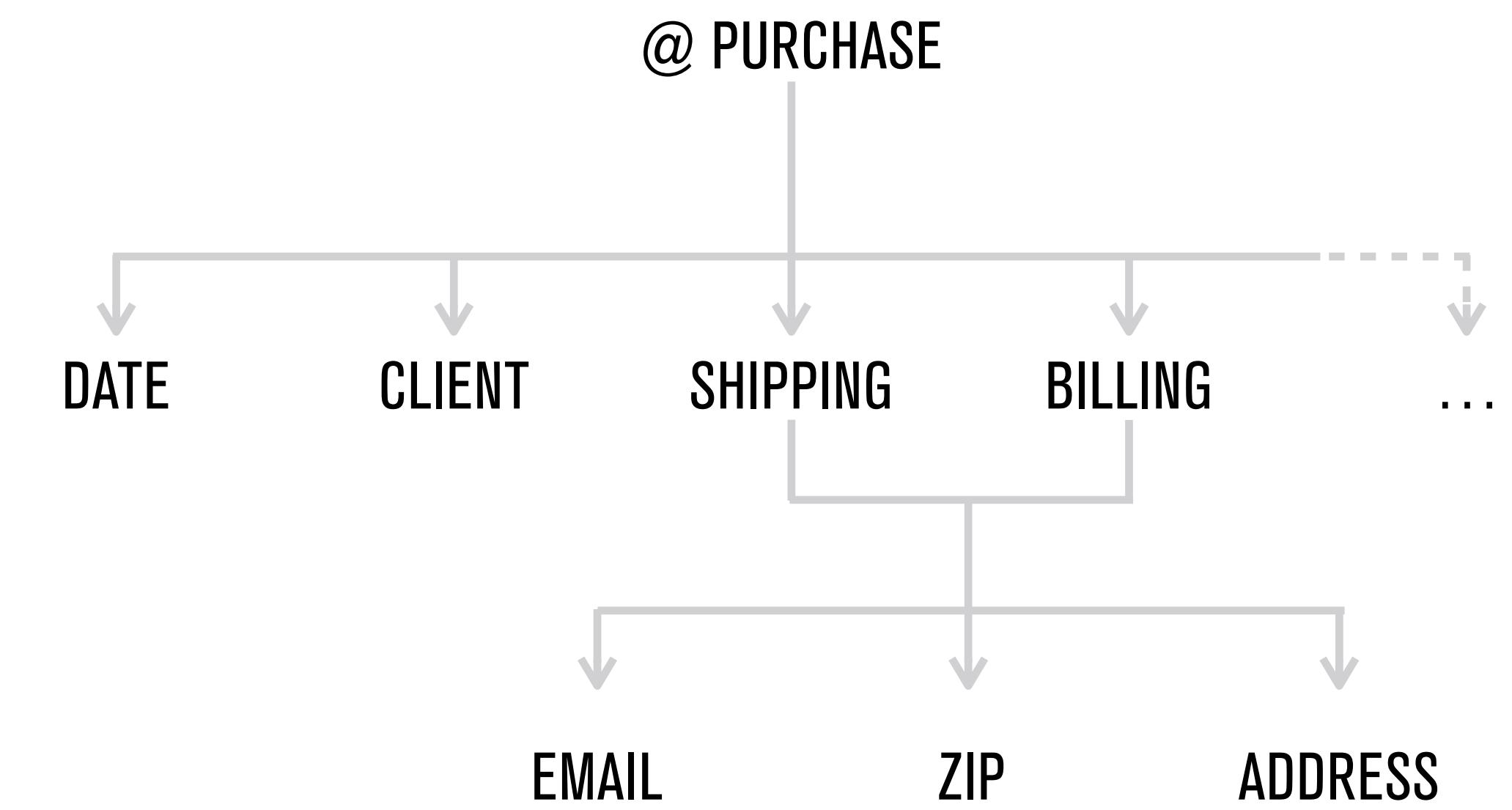
TIMELINE DATASET

- Online shopping



TIMELINE DATASET

- Online shopping



TIMELINE CONCEPT

- Represent the purchase distribution over time

TIMELINE CONCEPT

- Represent the purchase distribution over time
- Highlight suspicious behaviours

TIMELINE CONCEPT

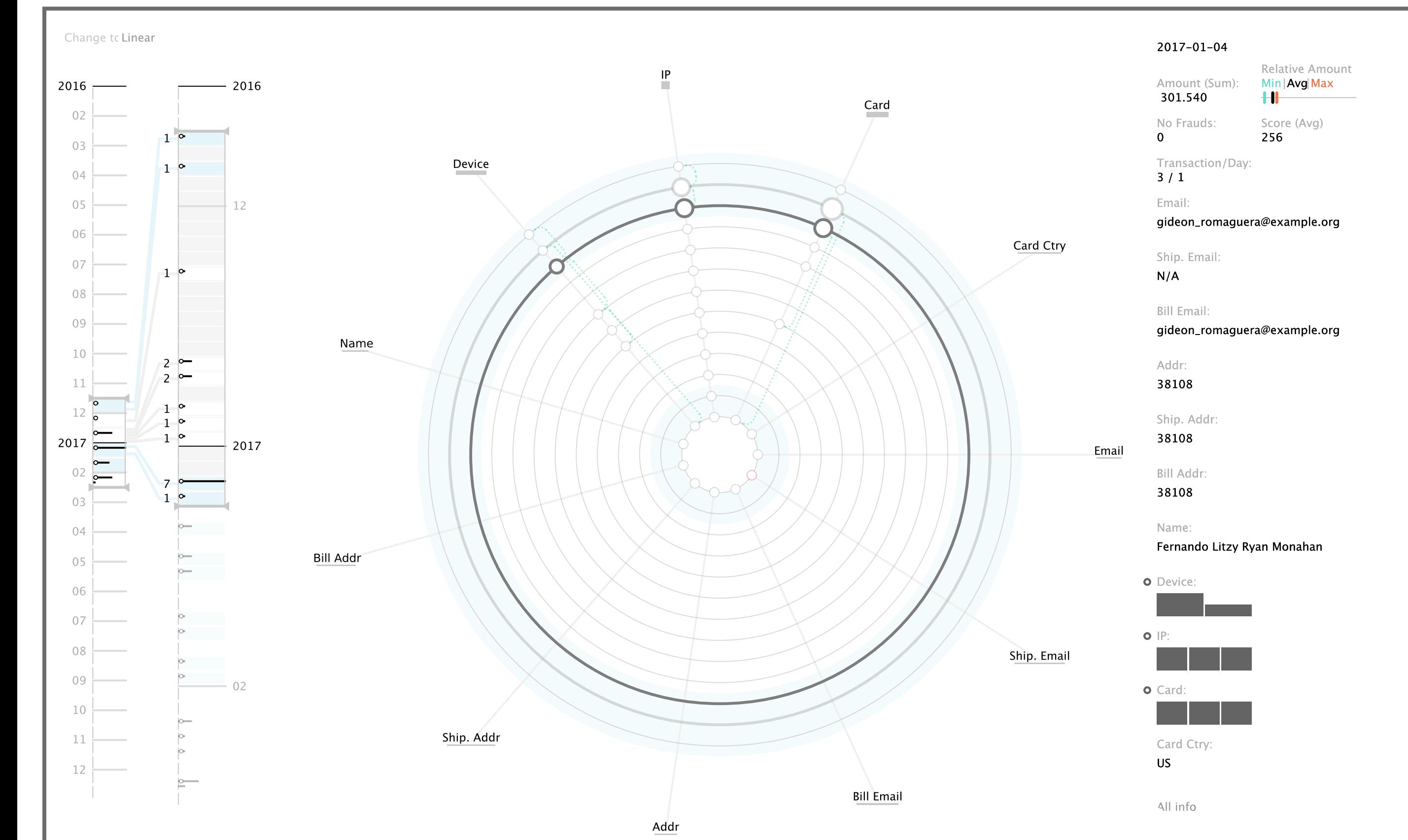
- Represent the purchase distribution over time
- Highlight suspicious behaviours
- Multiscale timeline (Overview and details)

TIMELINE CONCEPT

- Represent the purchase distribution over time
- Highlight suspicious behaviours
- Multiscale timeline (Overview and details)
 - Visualization and tool.

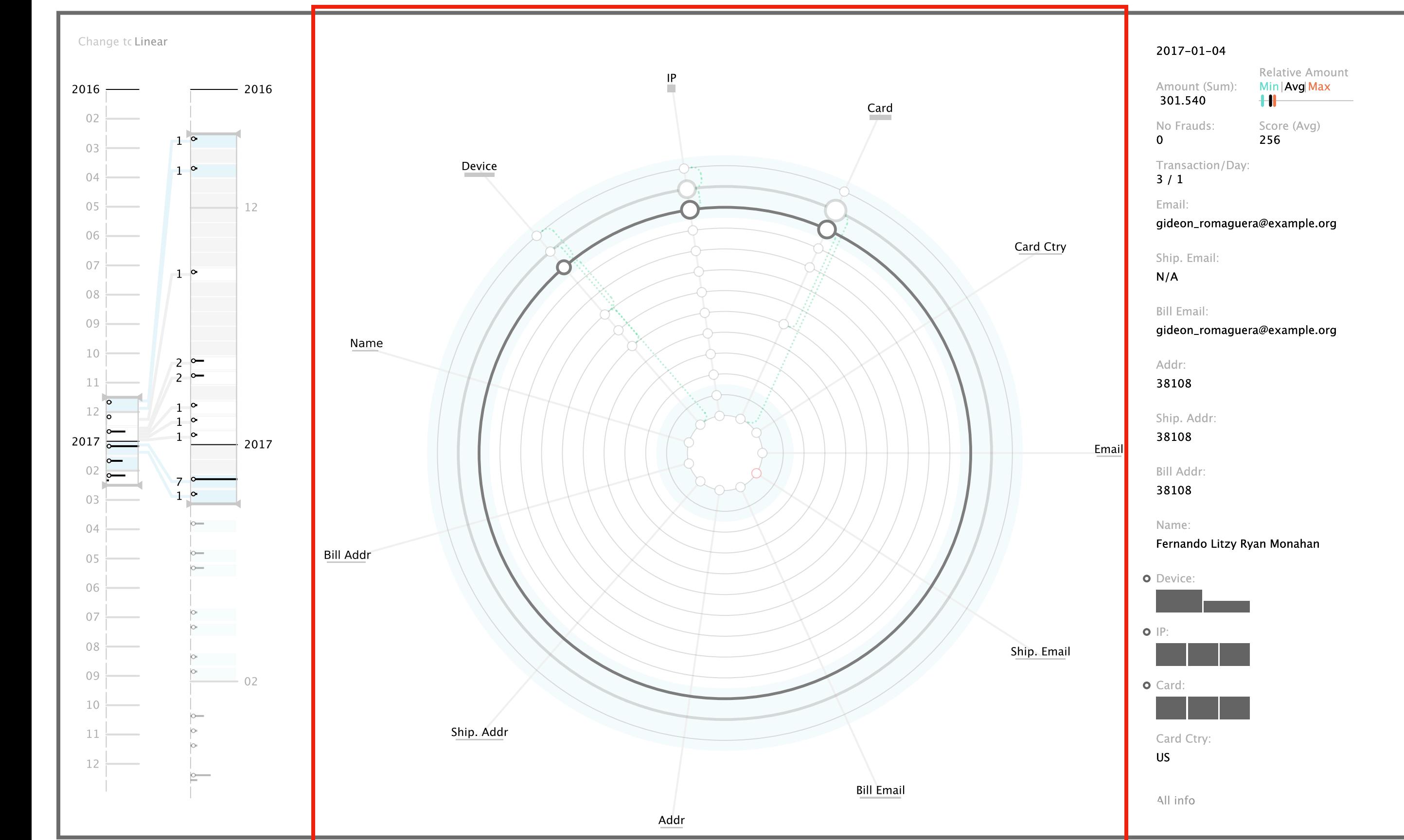
TIMELINE VISUALIZATION

- Three areas



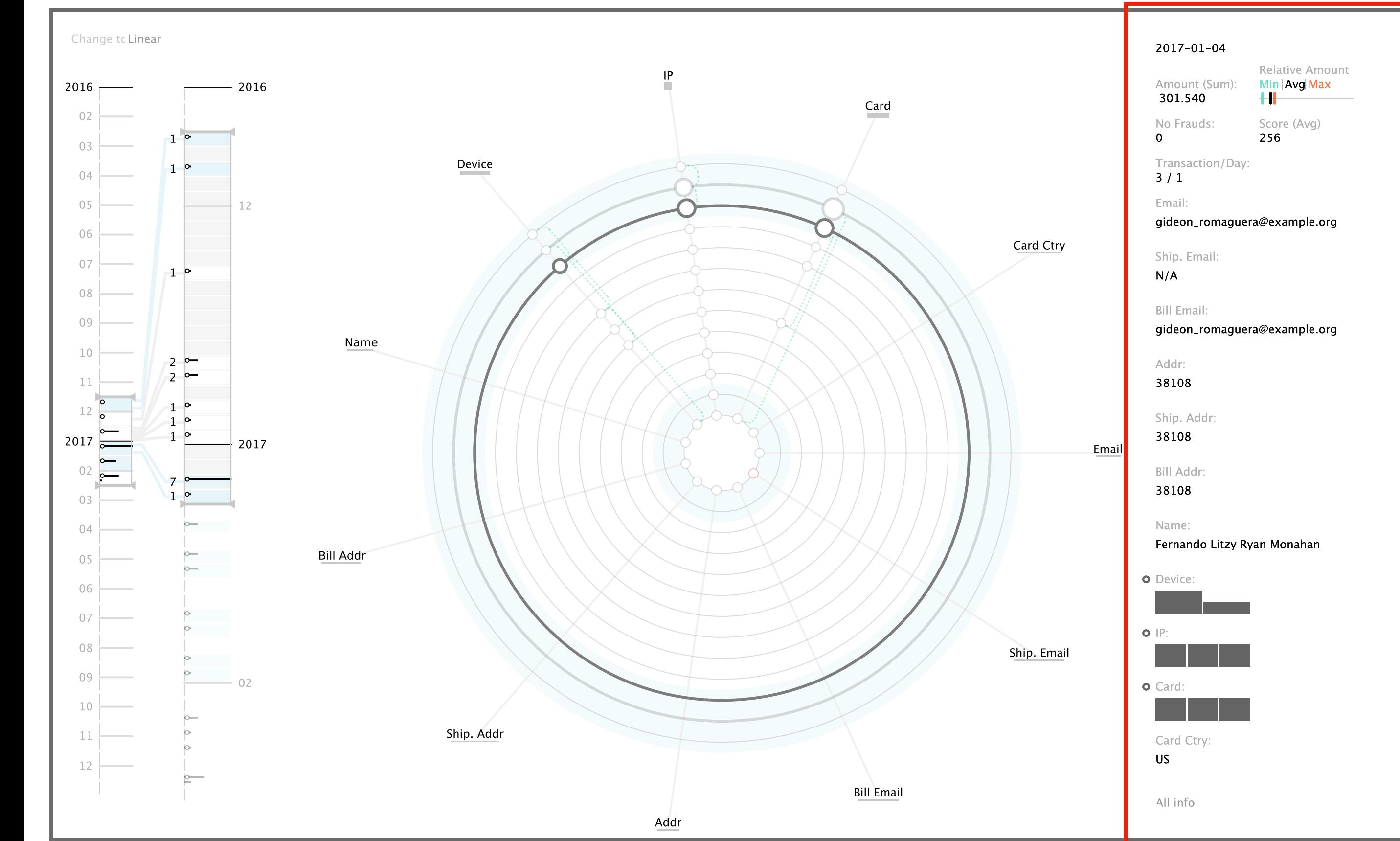
TIMELINE VISUALIZATION

- Three areas
 - Main visualization



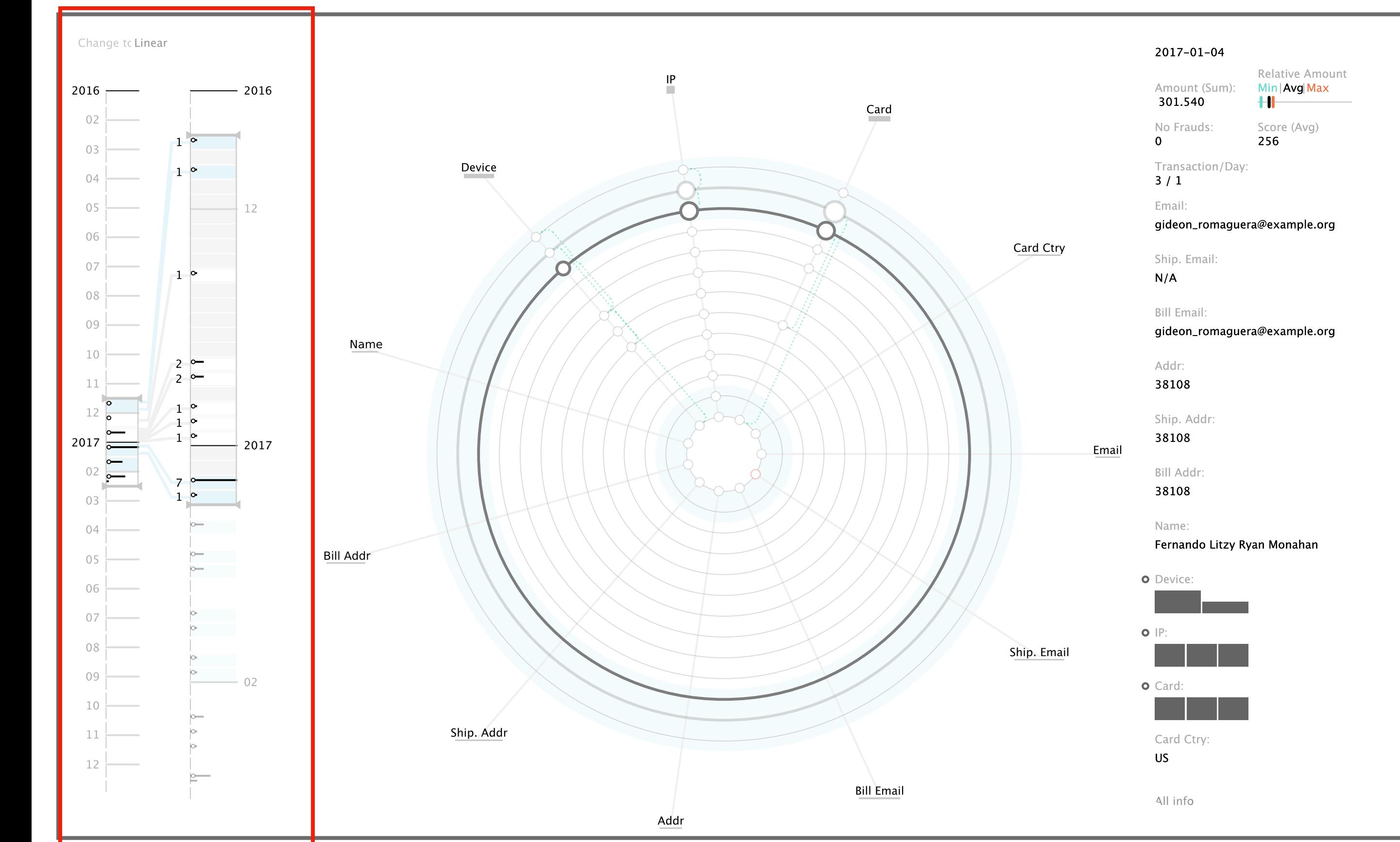
TIMELINE VISUALIZATION

- Three areas
 - Main visualization
 - Details



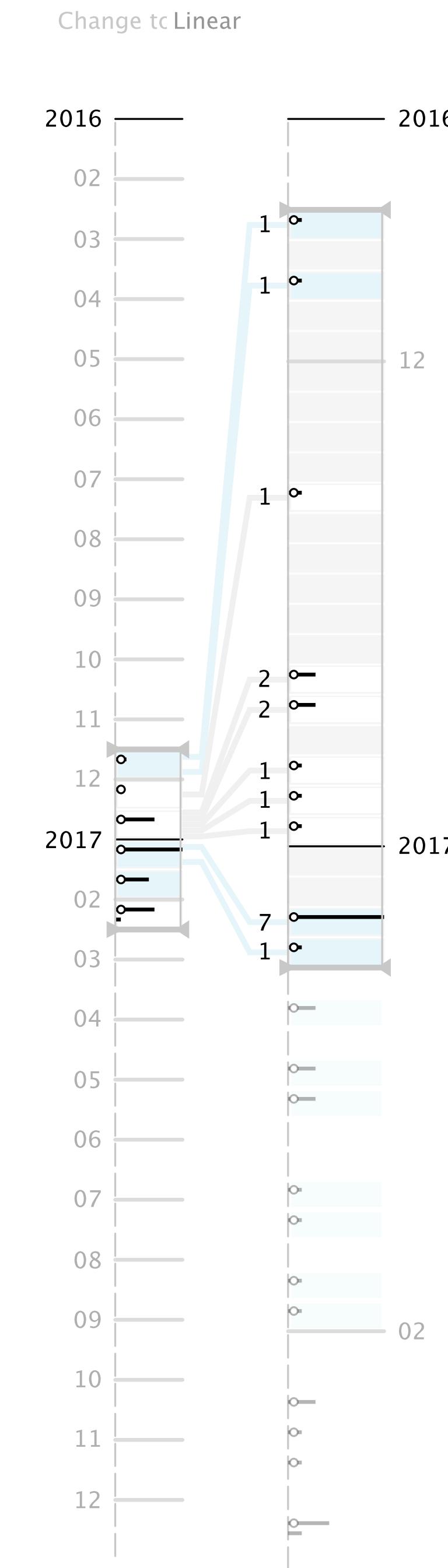
TIMELINE VISUALIZATION

- Three areas
 - Main visualization
 - Details
 - Timeline



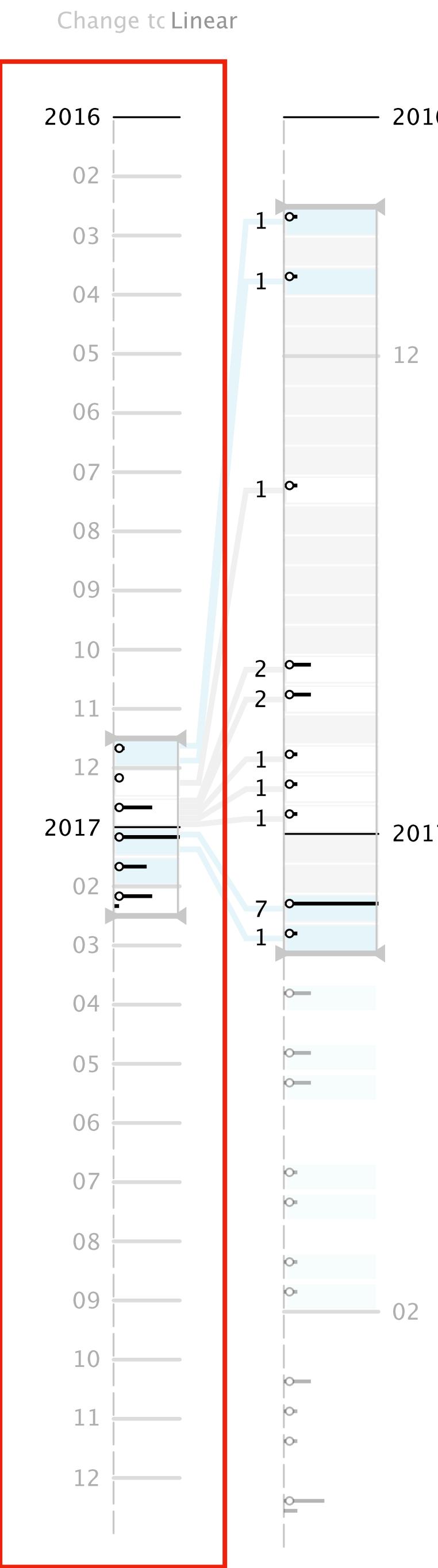
TIMELINE VISUALIZATION

- Two vertical timelines with different time scales



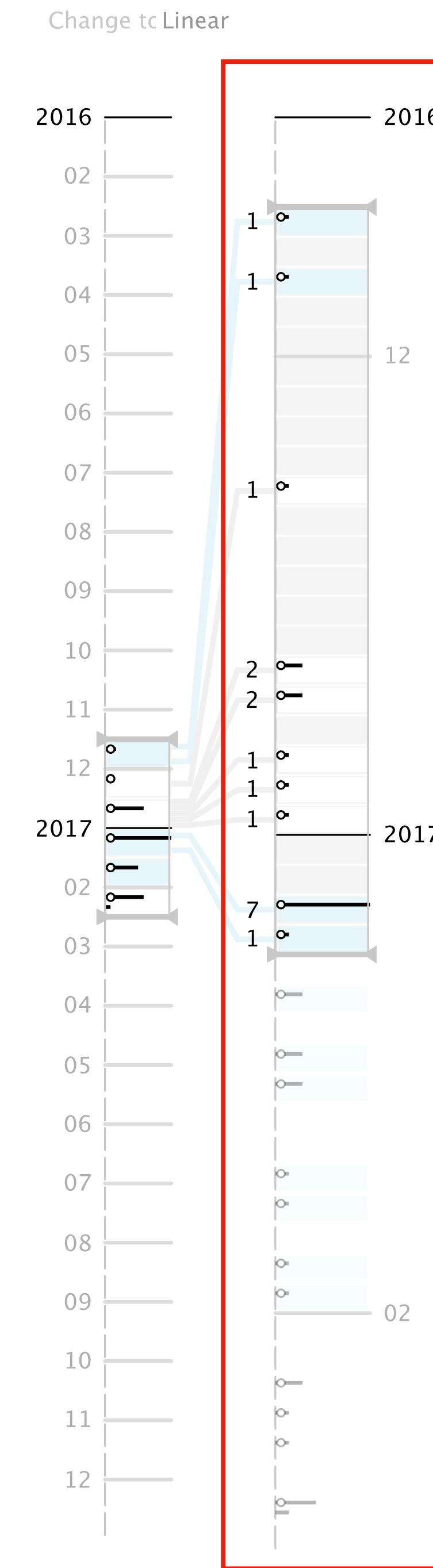
TIMELINE VISUALIZATION

- Two vertical timelines with different time scales



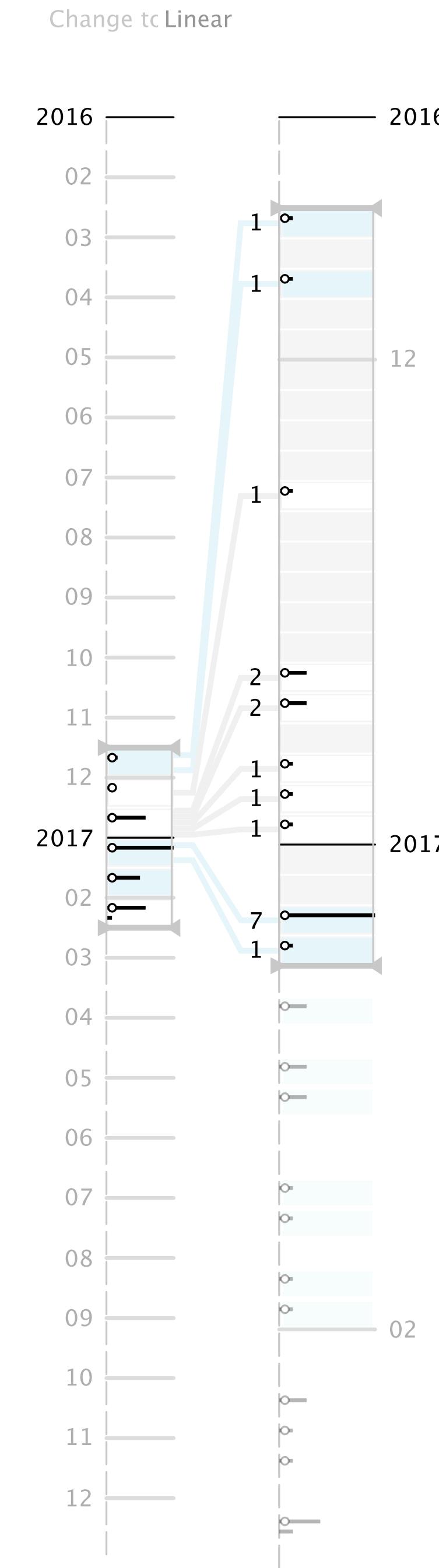
TIMELINE VISUALIZATION

- Two vertical timelines with different time scales



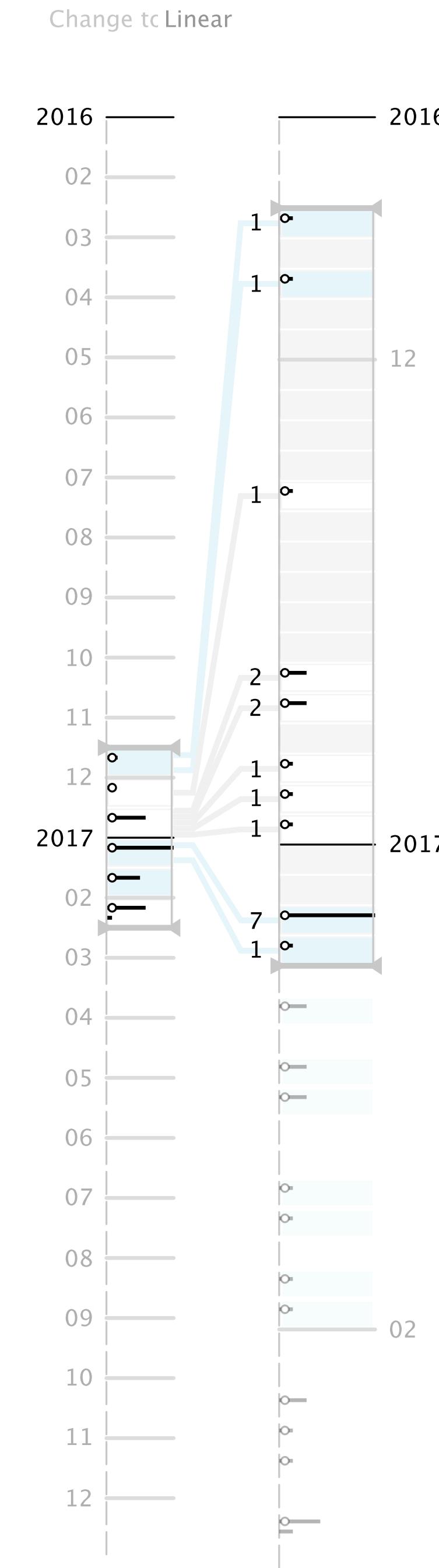
TIMELINE VISUALIZATION

- Two vertical timelines with different time scales
- Adaptive algorithm



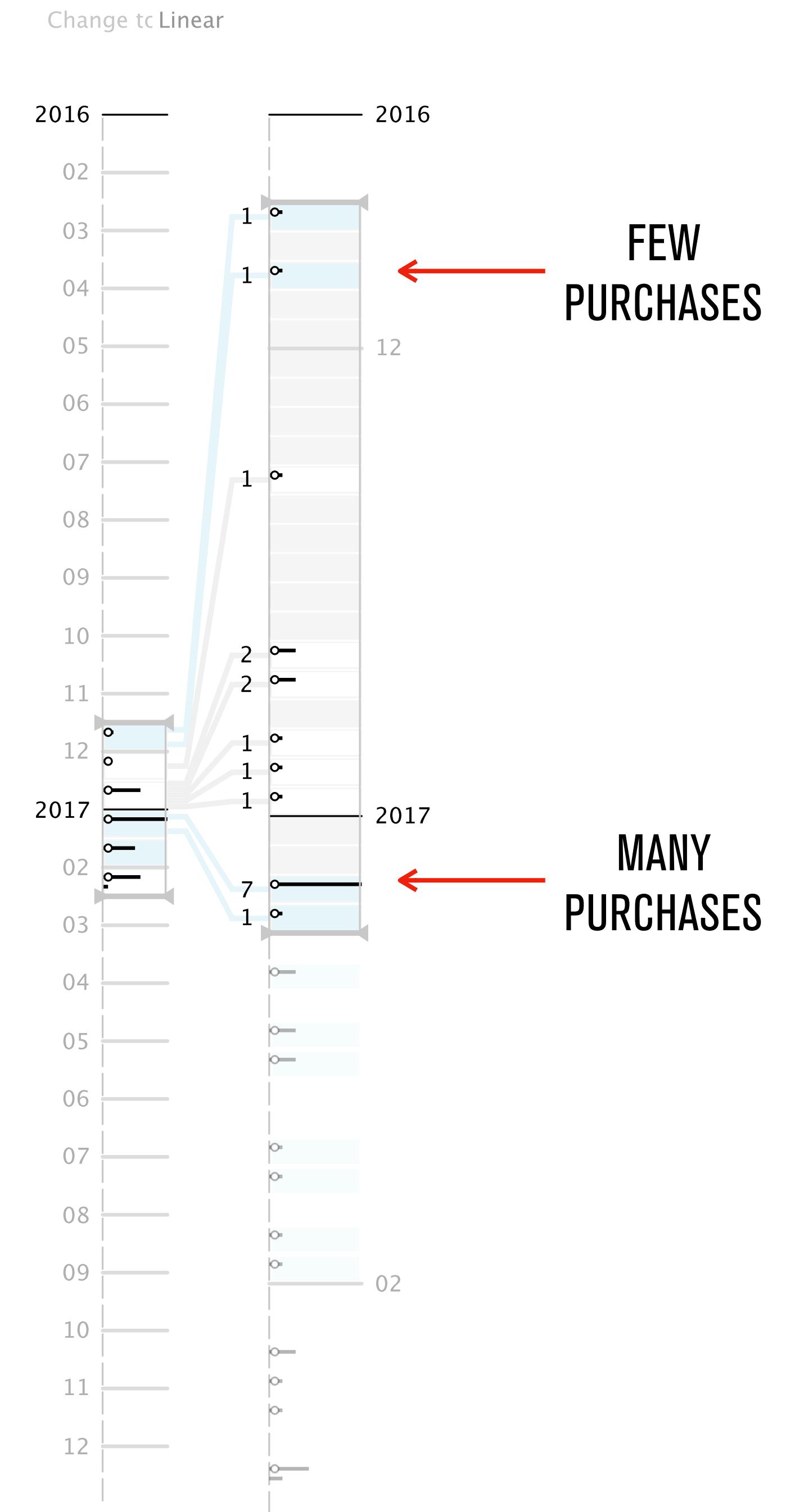
TIMELINE VISUALIZATION

- Two vertical timelines with different time scales
 - Adaptive algorithm
 - Different granularities



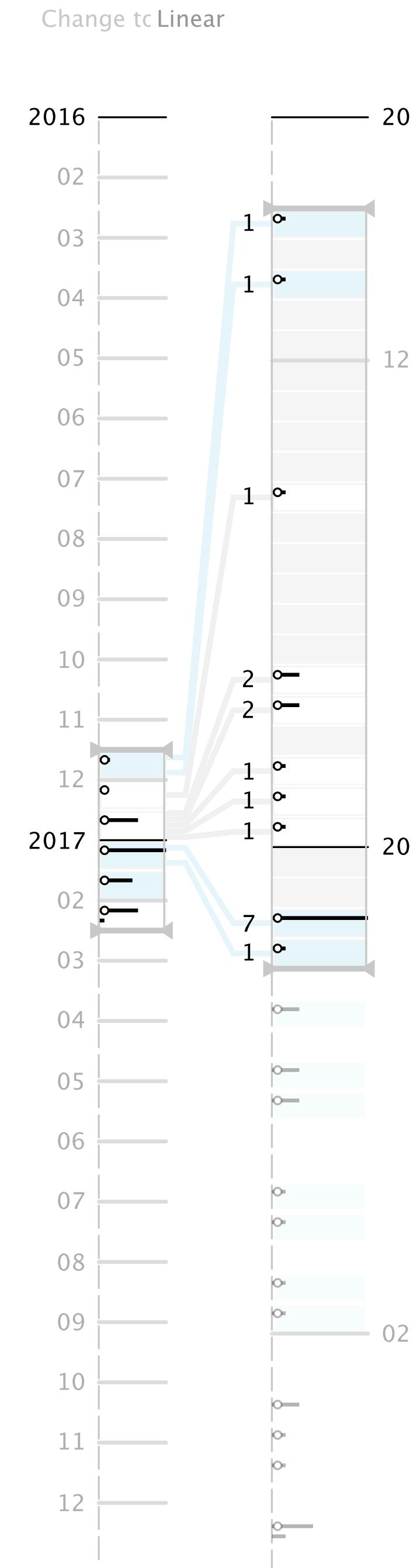
TIMELINE VISUALIZATION

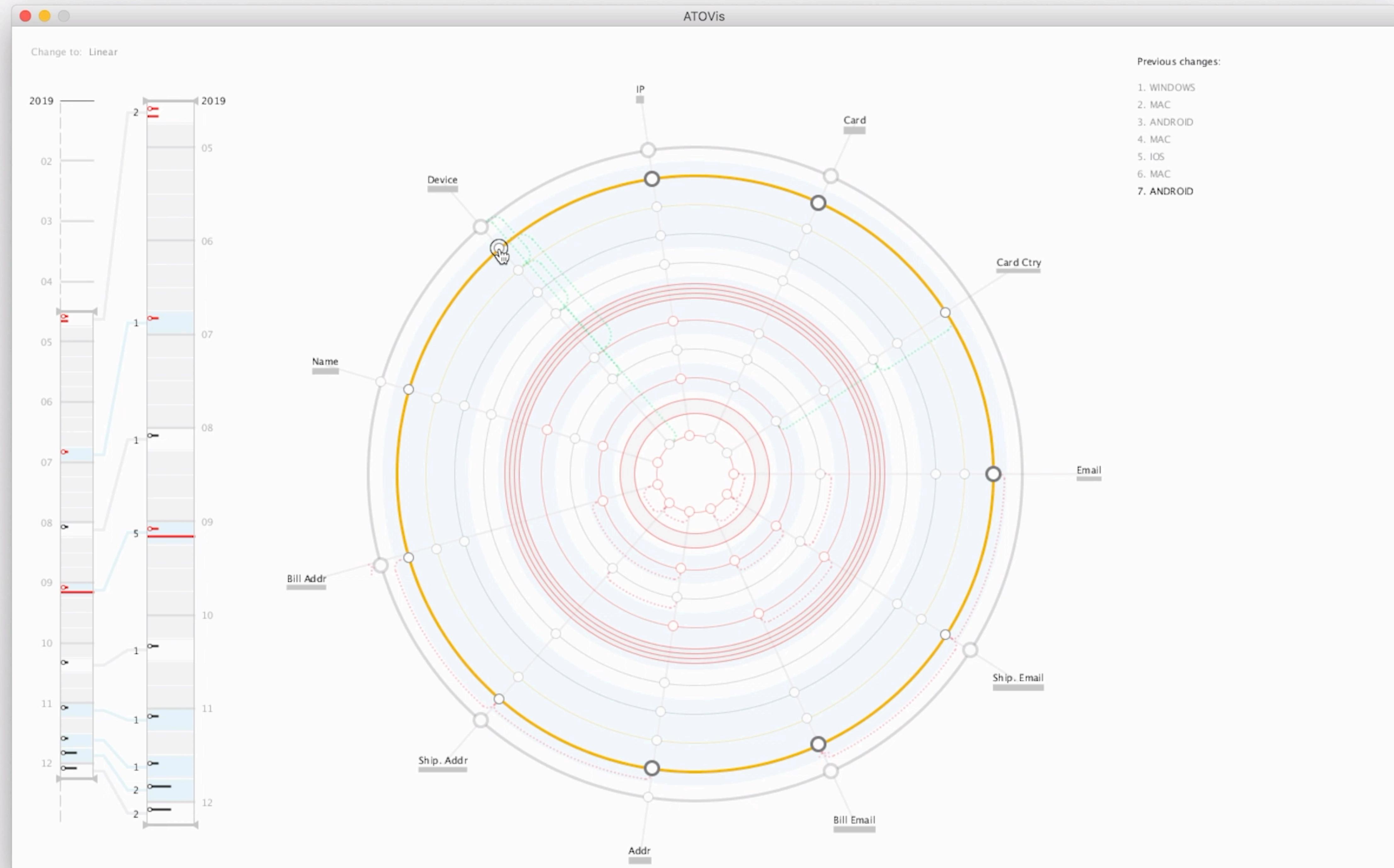
- Two vertical timelines with different time scales
- Adaptive algorithm
- Different granularities
- Bar chart to represent the quantity of purchases



TIMELINE VISUALIZATION

- Two vertical timelines with different time scales
 - Adaptive algorithm
 - Different granularities
- Bar chart to represent the quantity of purchases
- Colour to emphasise fraudulent transactions.





TIMELINE RESULTS

- Easy to interact and interpret

TIMELINE RESULTS

- Easy to interact and interpret
- Effective to overview the data.

INFORMATION VISUALIZATION

— WHAT, WHEN & HOW?

CONSUMPTIONS AND TIMELINE

INFORMATION VISUALIZATION

- WHAT, WHEN & HOW?
- CONSUMPTIONS AND TIMELINE

THANK YOU!

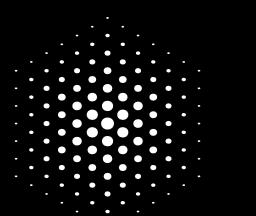
Catarina Maçãs | cmacas@dei.uc.pt

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