

# CIS 4930/6930-002

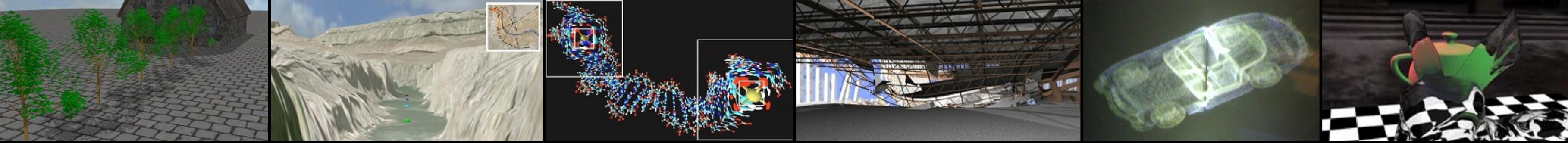
## DATA VISUALIZATION



### VISUALIZING SETS

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University of South Florida

slides credits Miriah Meyer (U of Utah)



## Tables

Items

Attributes

## Networks & Trees

Items (nodes)

Links

Attributes

## Fields

Grids

Positions

Attributes

## Geometry

Items

Positions

## Clusters, Sets, Lists

Items



# THOUGHT EXPERIMENT...

item: lego

attributes:

???



# THOUGHT EXPERIMENT...

item: lego  
attributes:  
color  
height  
width  
length  
shape



# DATASET

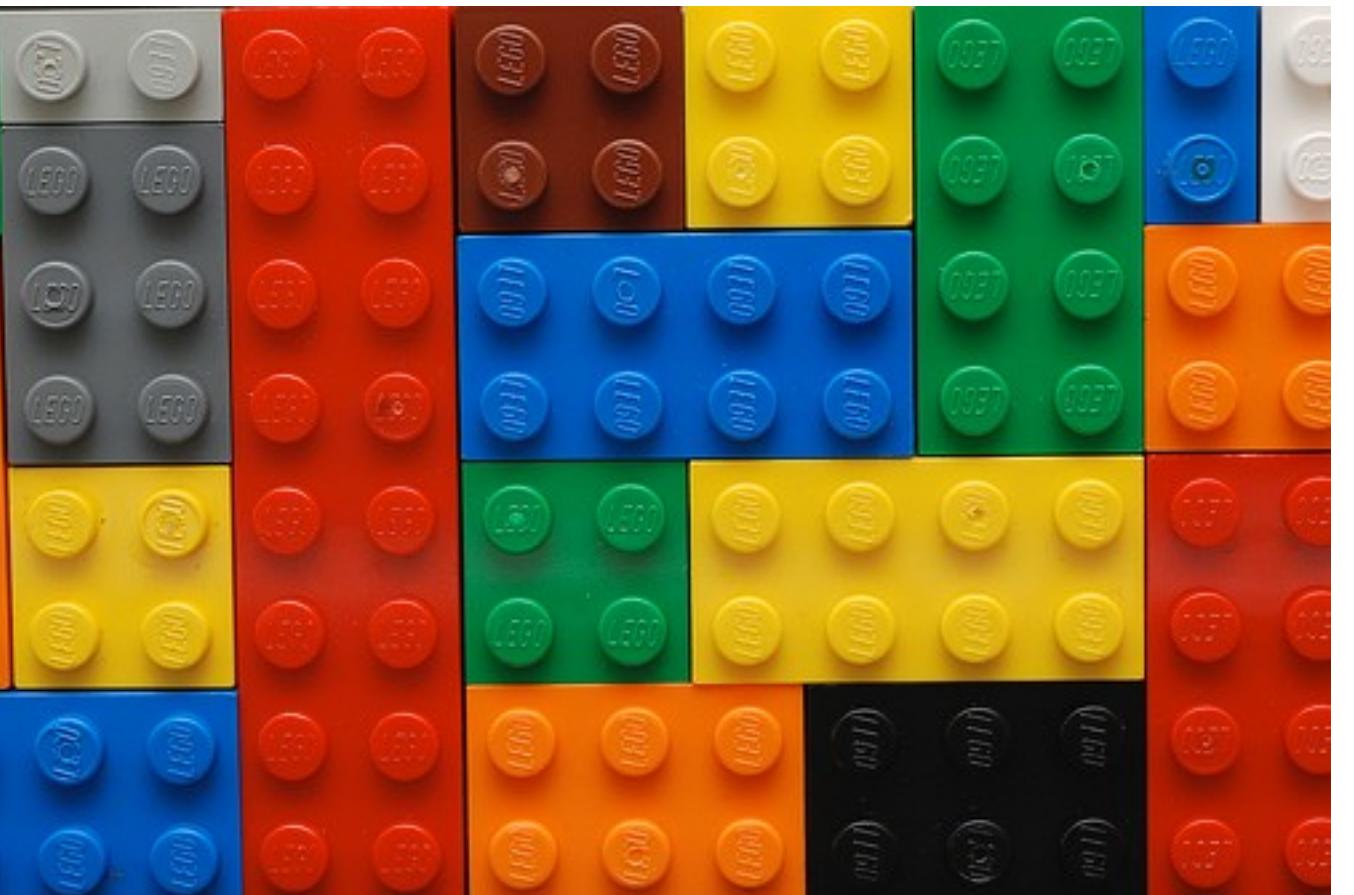


## DATASET: MORE REALISTIC



# DATASET

where do we start?  
we need to organize!  
but, how?



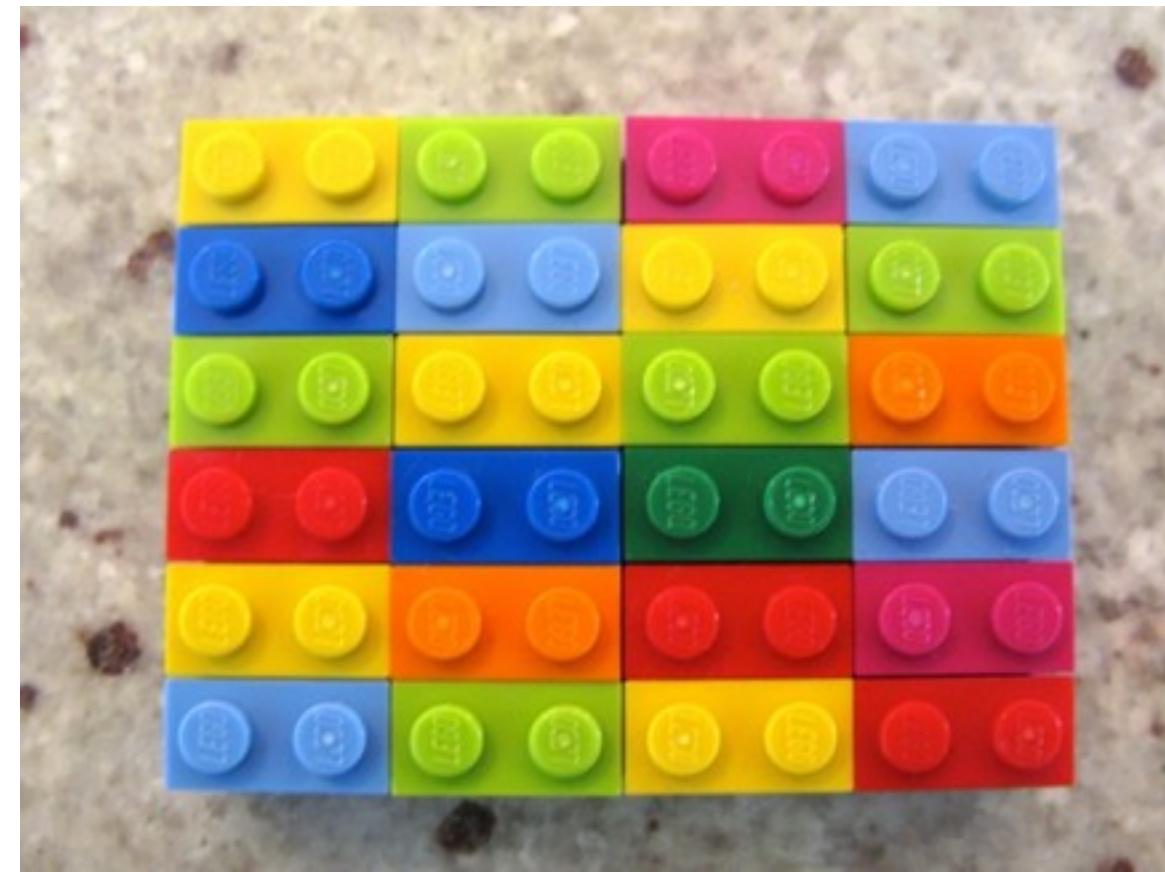
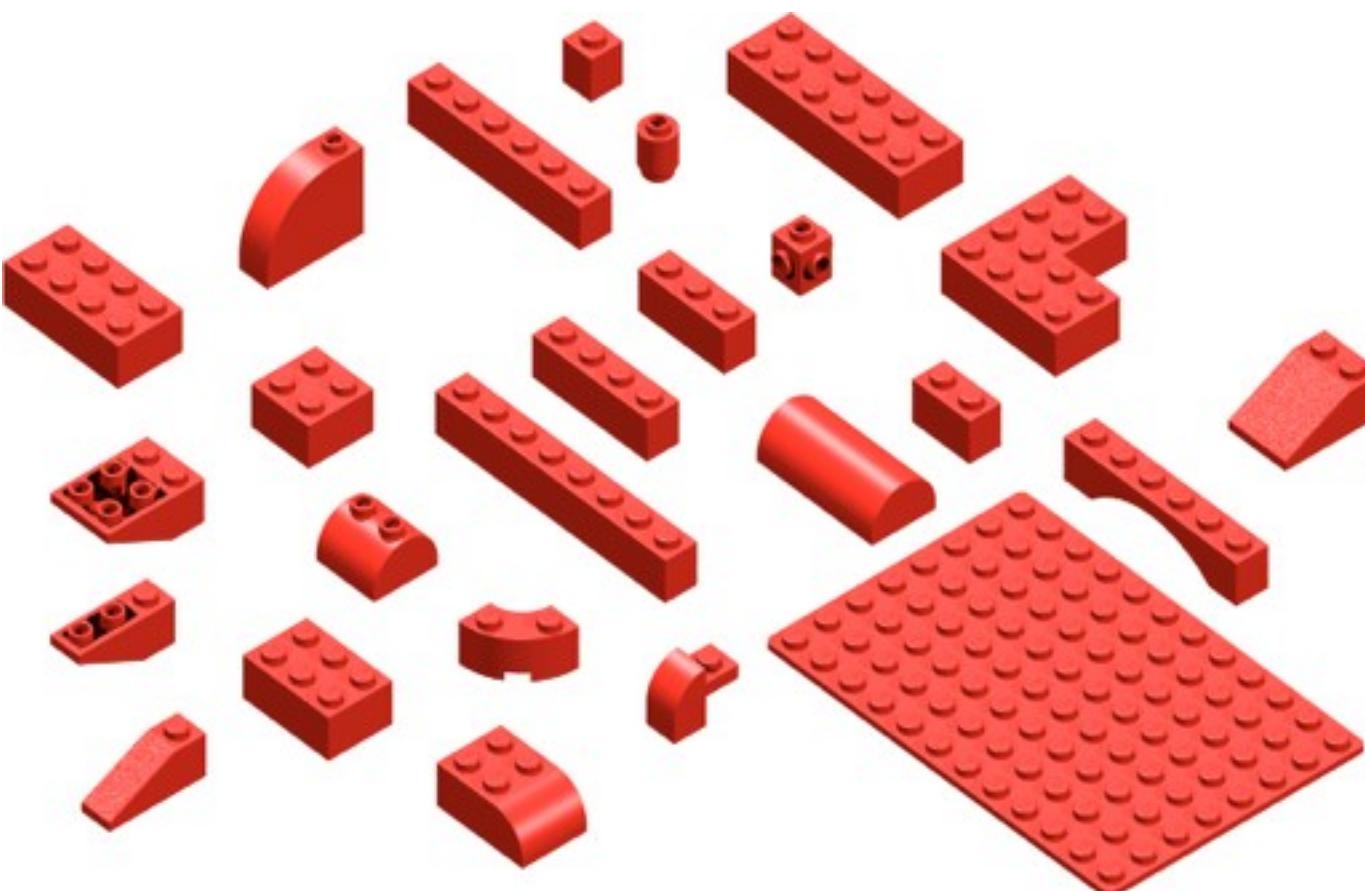
# DATASET

## sort by color



# DATASET

## sort by size, shape



# DATASET

task: organization  
drawbacks?



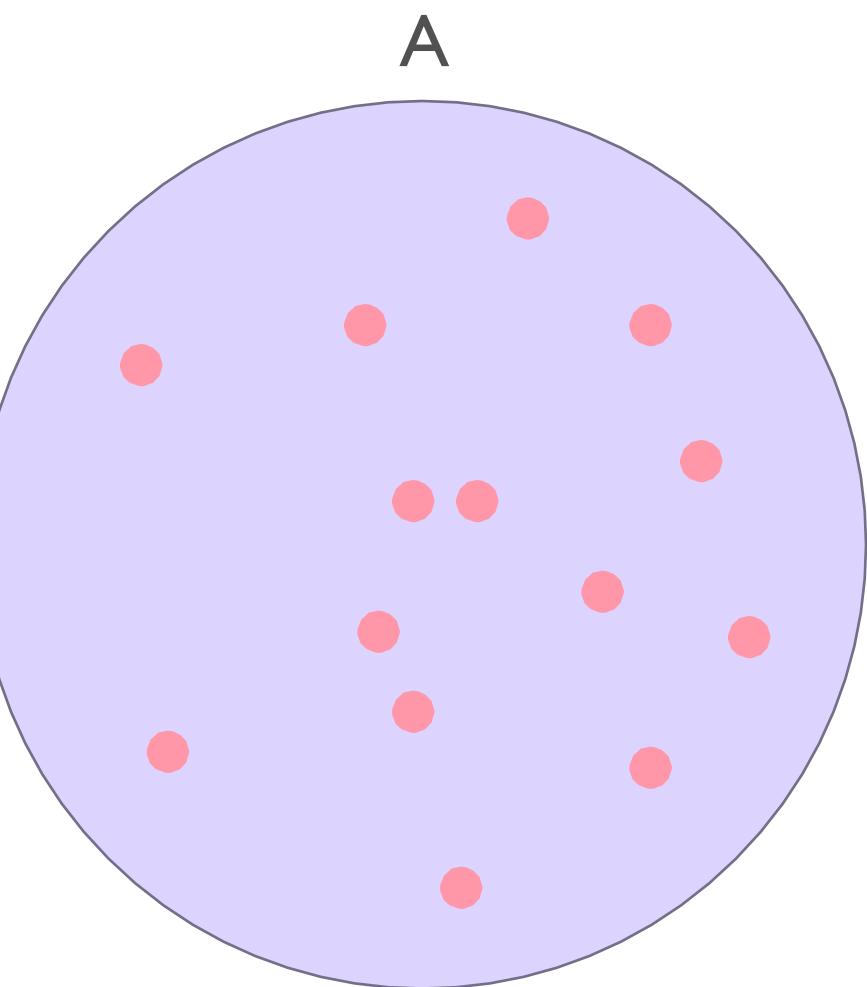
# DATASET

organization leads us to a set problem  
so what are sets?



# SET THEORY

set  
a collection of objects  
some set: $A$



# SET THEORY

set

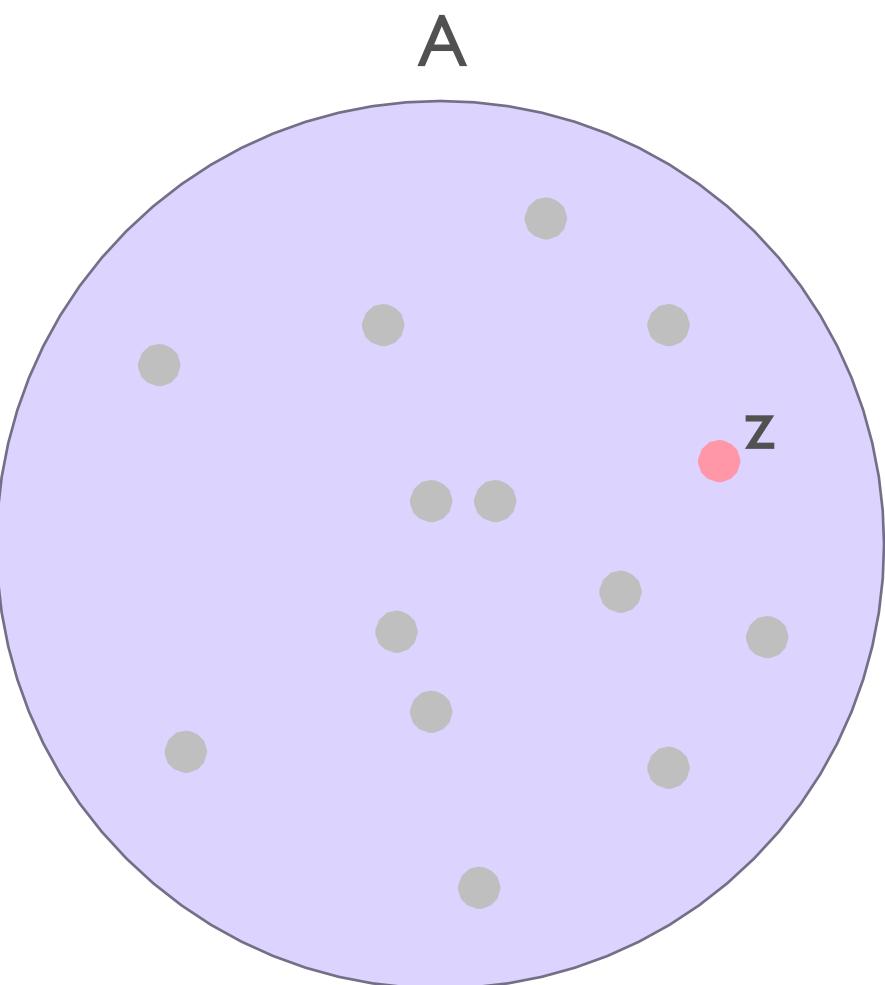
a collection of objects

some set: A

object

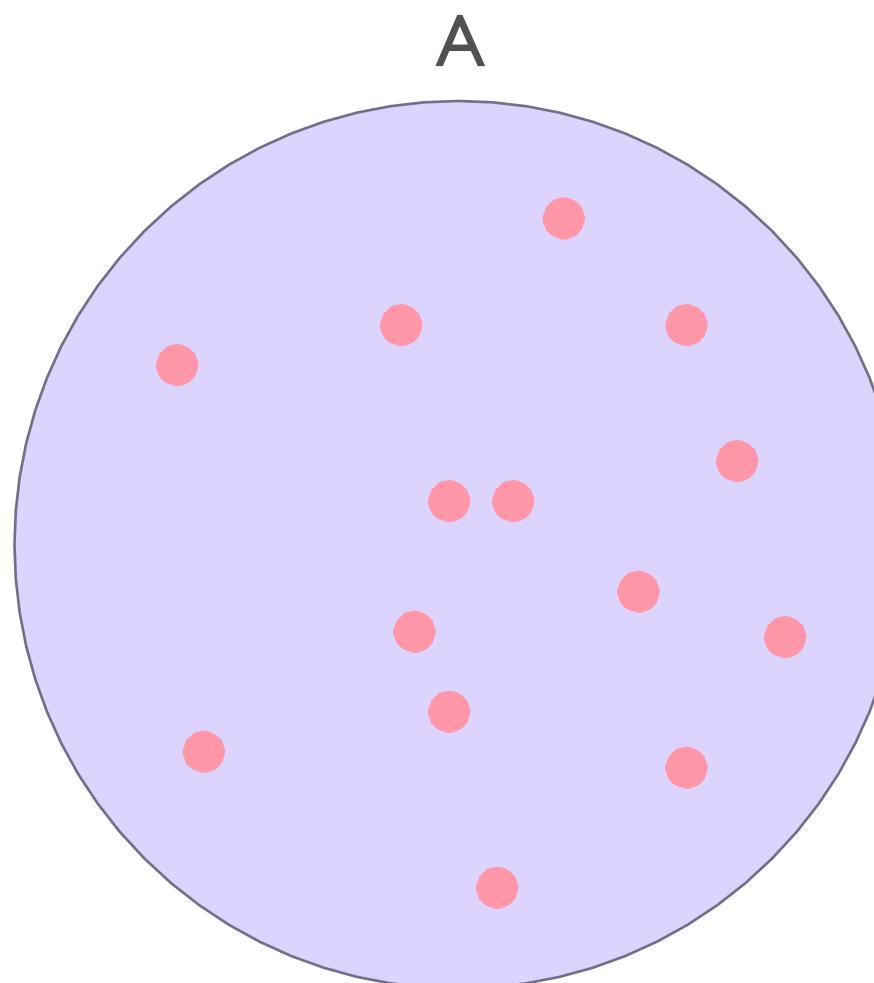
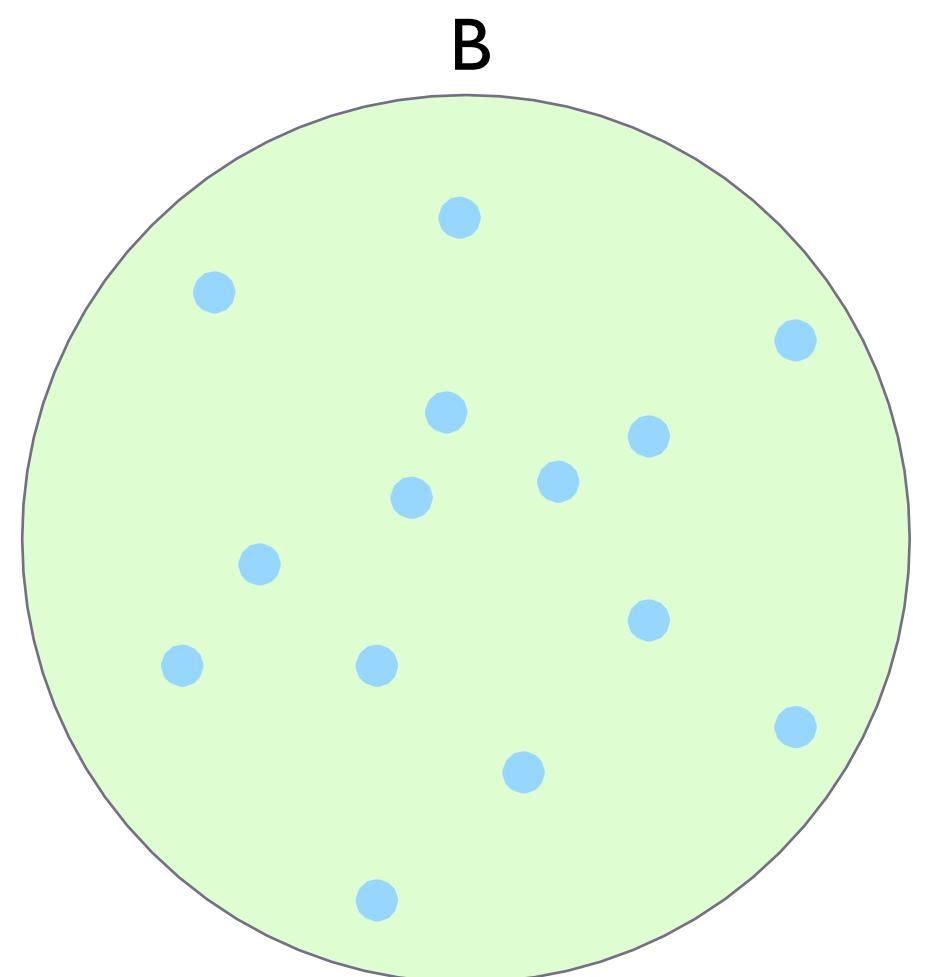
some object: z

$z \in A$



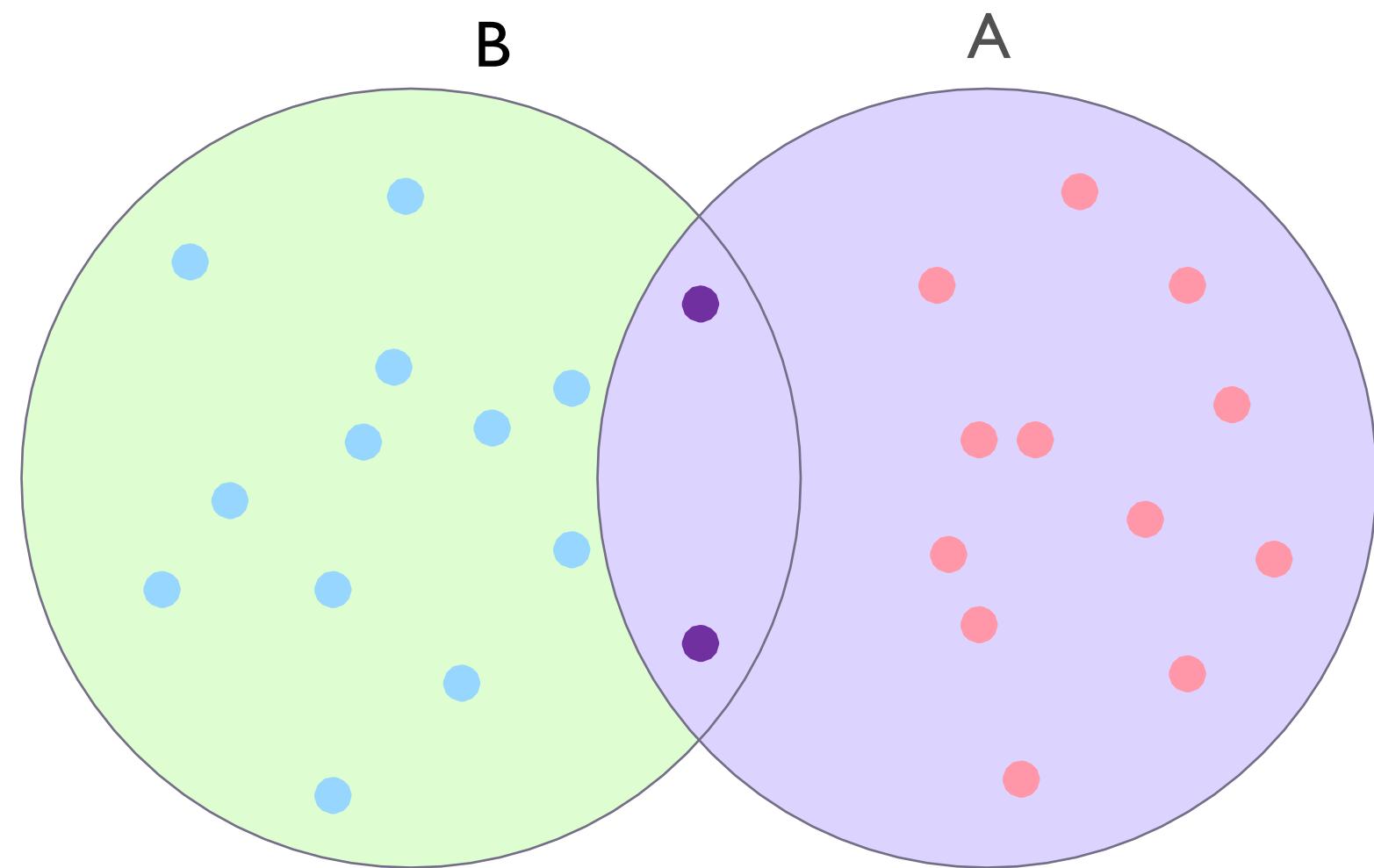
# SET THEORY

multiple sets: A & B



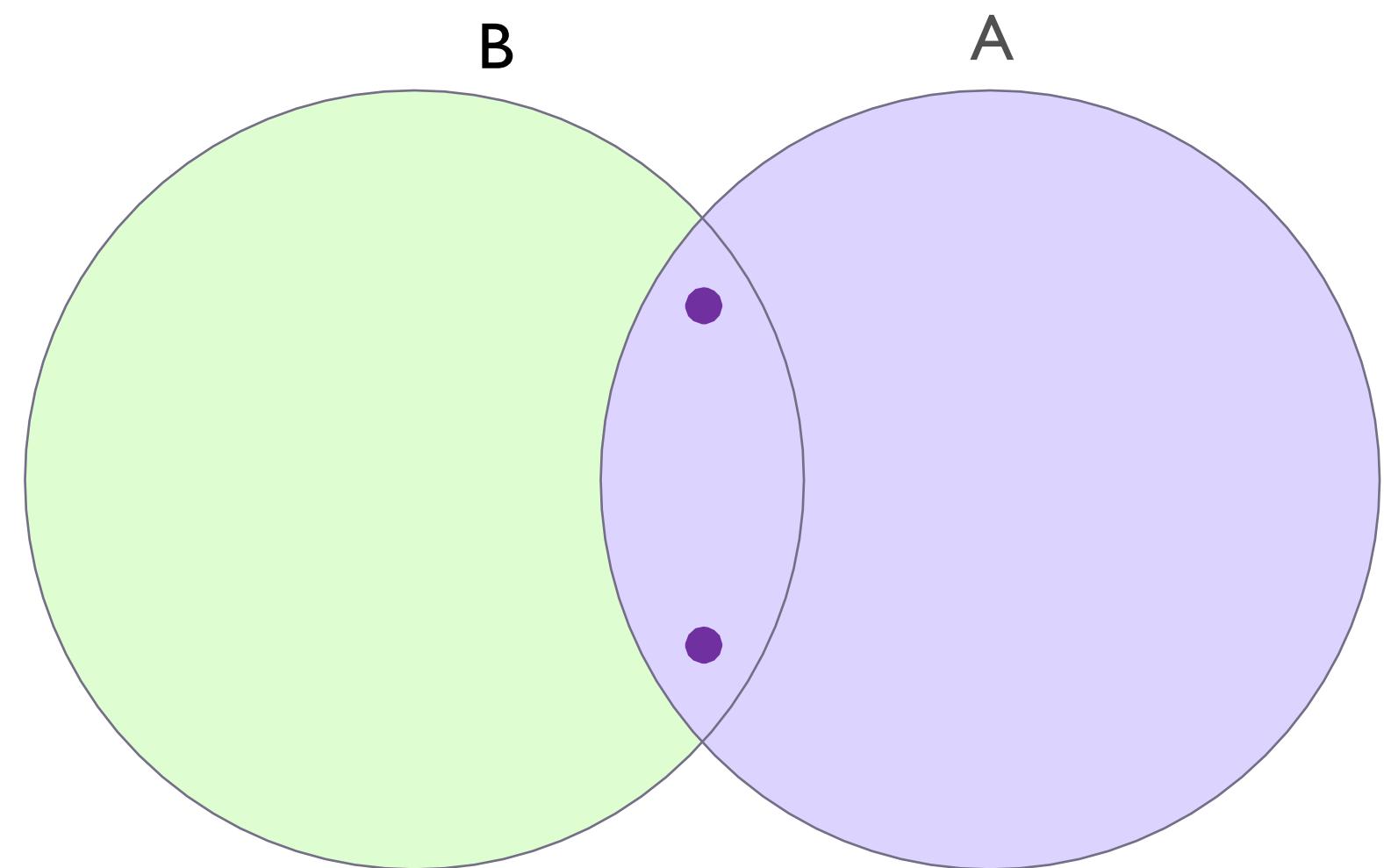
# SET THEORY

union: $A \cup B$



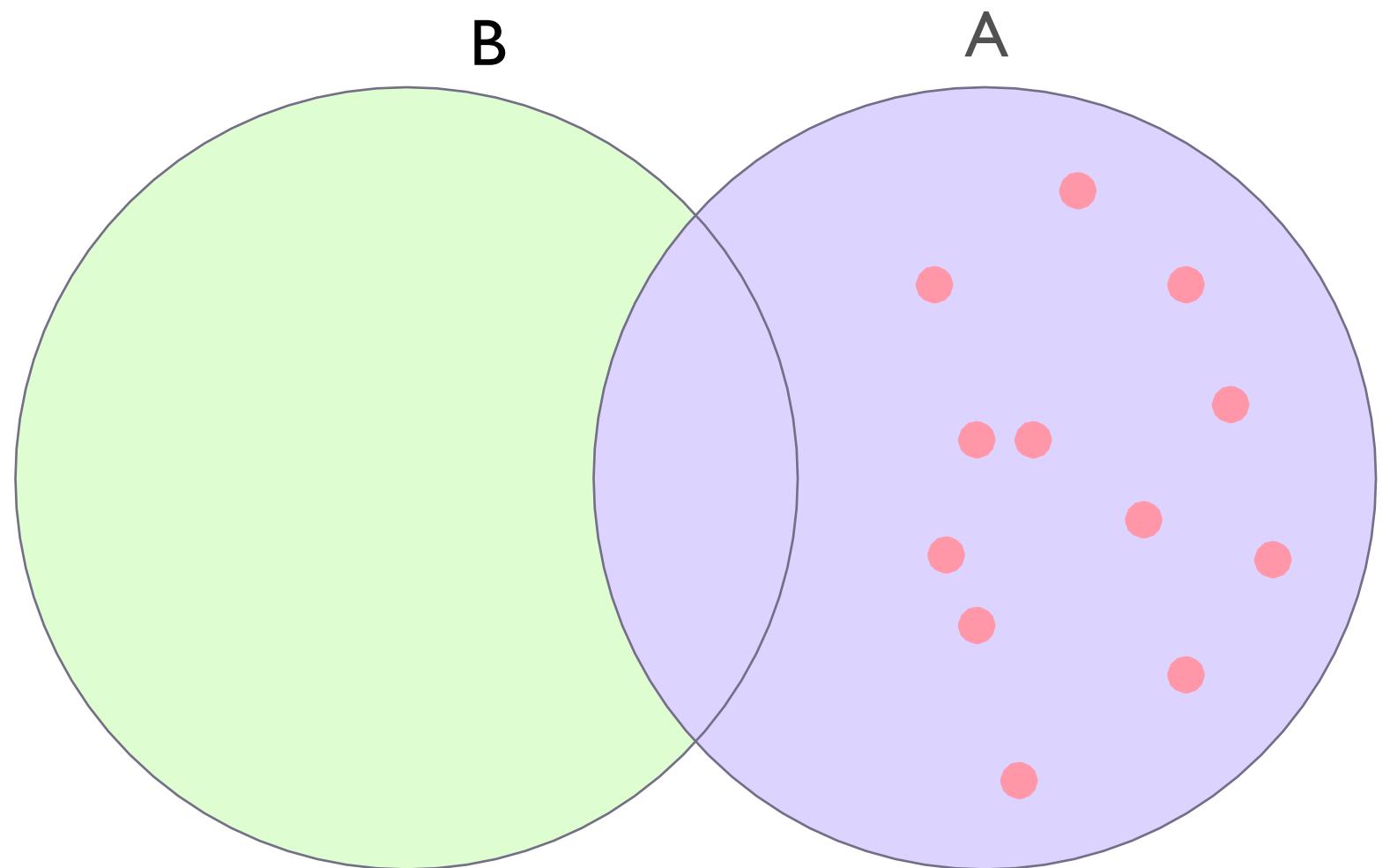
# SET THEORY

intersection: $A \cap B$



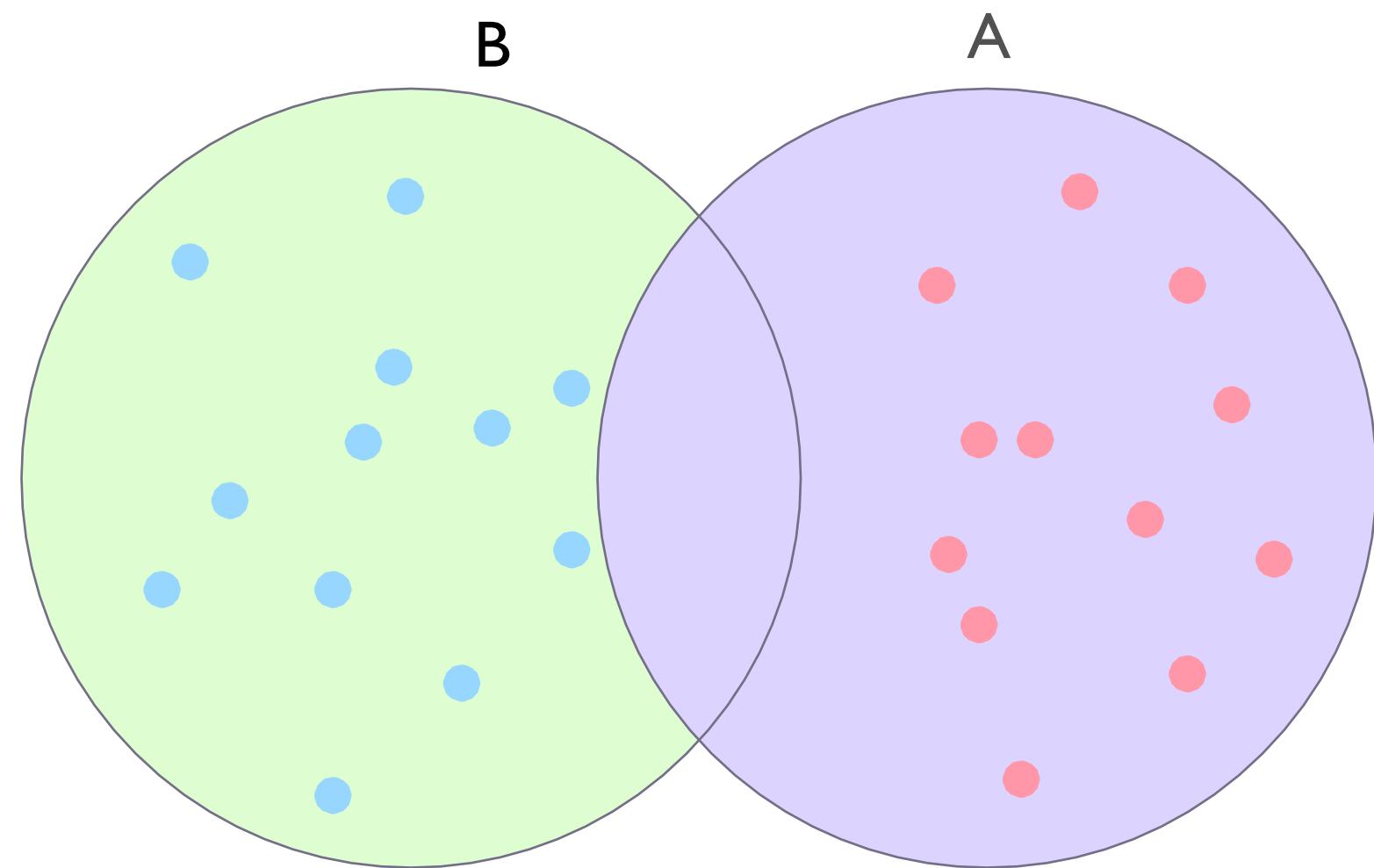
# SET THEORY

set difference:  $A \setminus B$



## SET THEORY

symmetric difference: $A \ominus B$

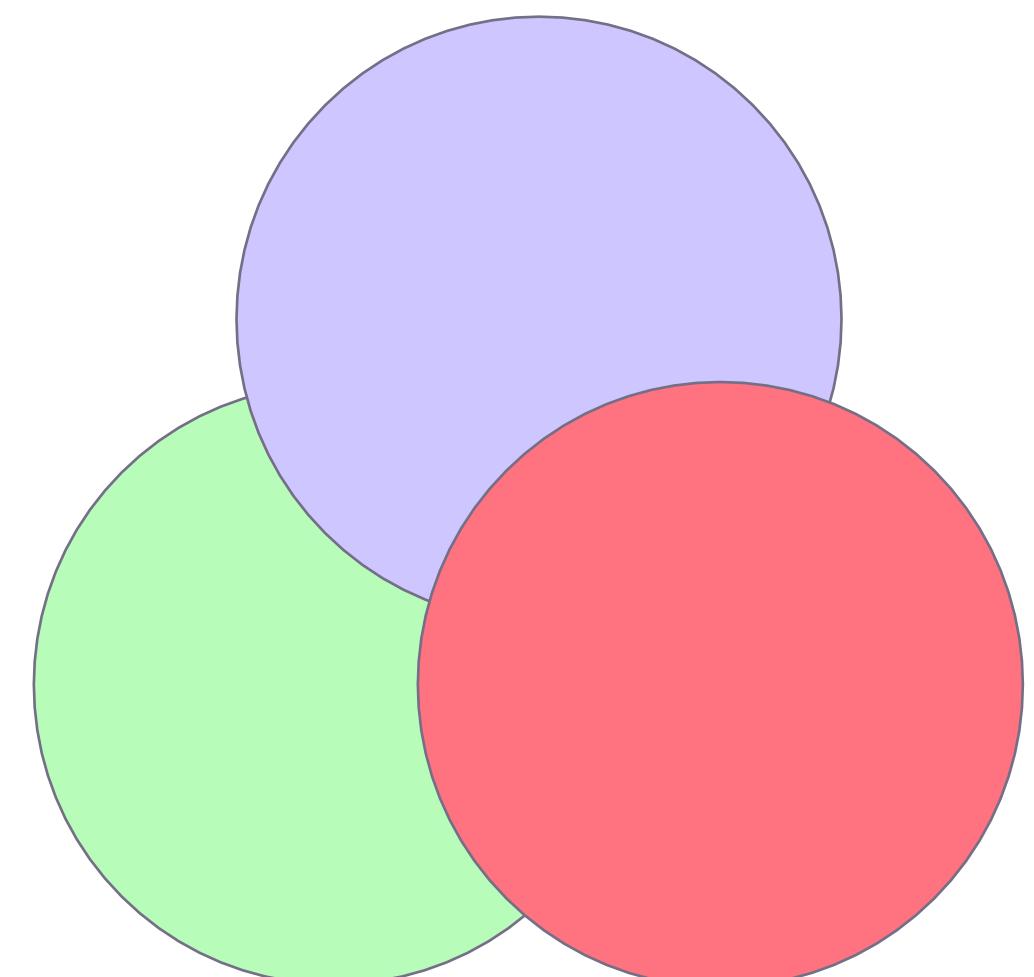
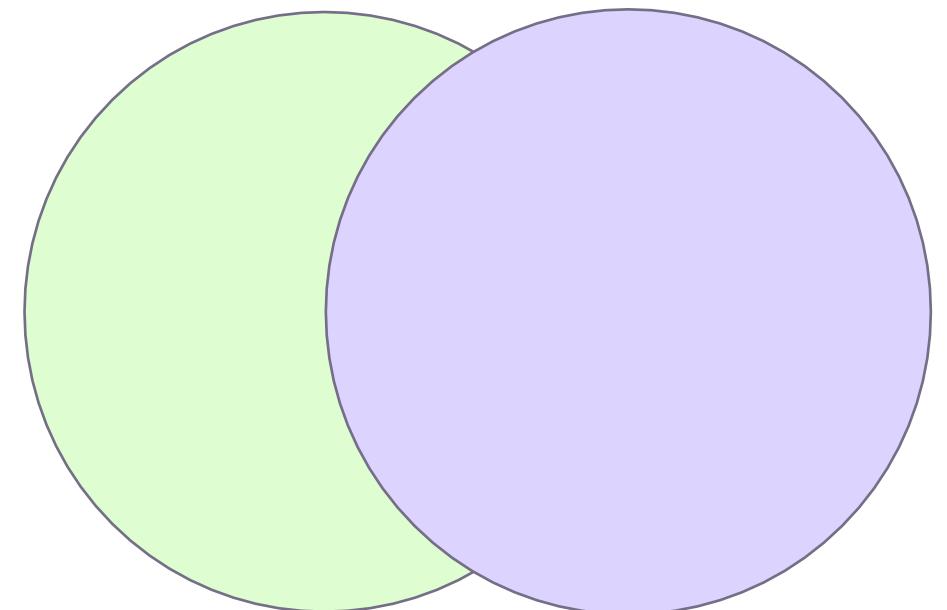


[HTTP://STUDENTS.BROWN.EDU/SEEING-  
THEORY/INDEX.HTML](http://students.brown.edu/seeing-theory/index.html)

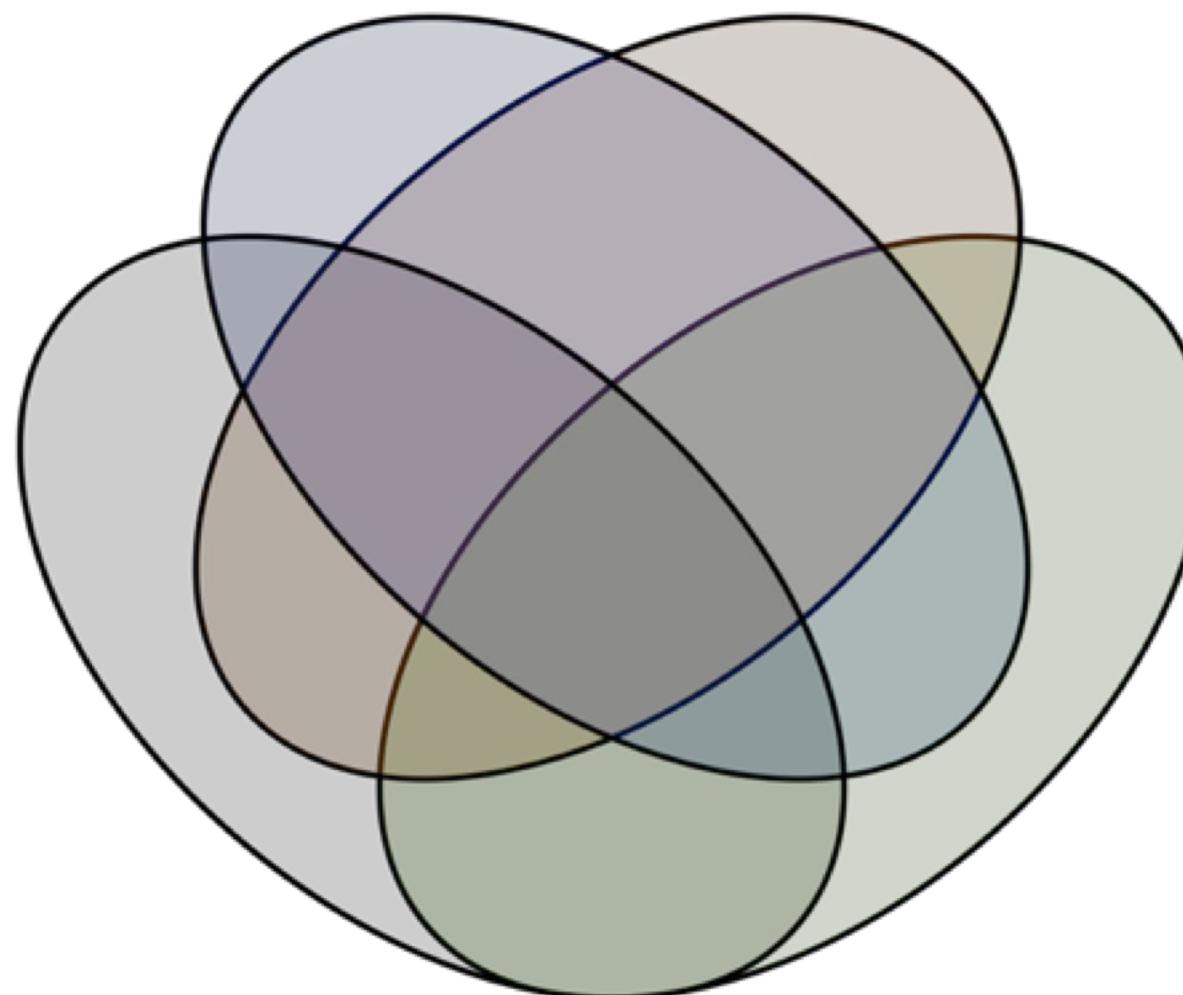


# VISUALIZING SETS



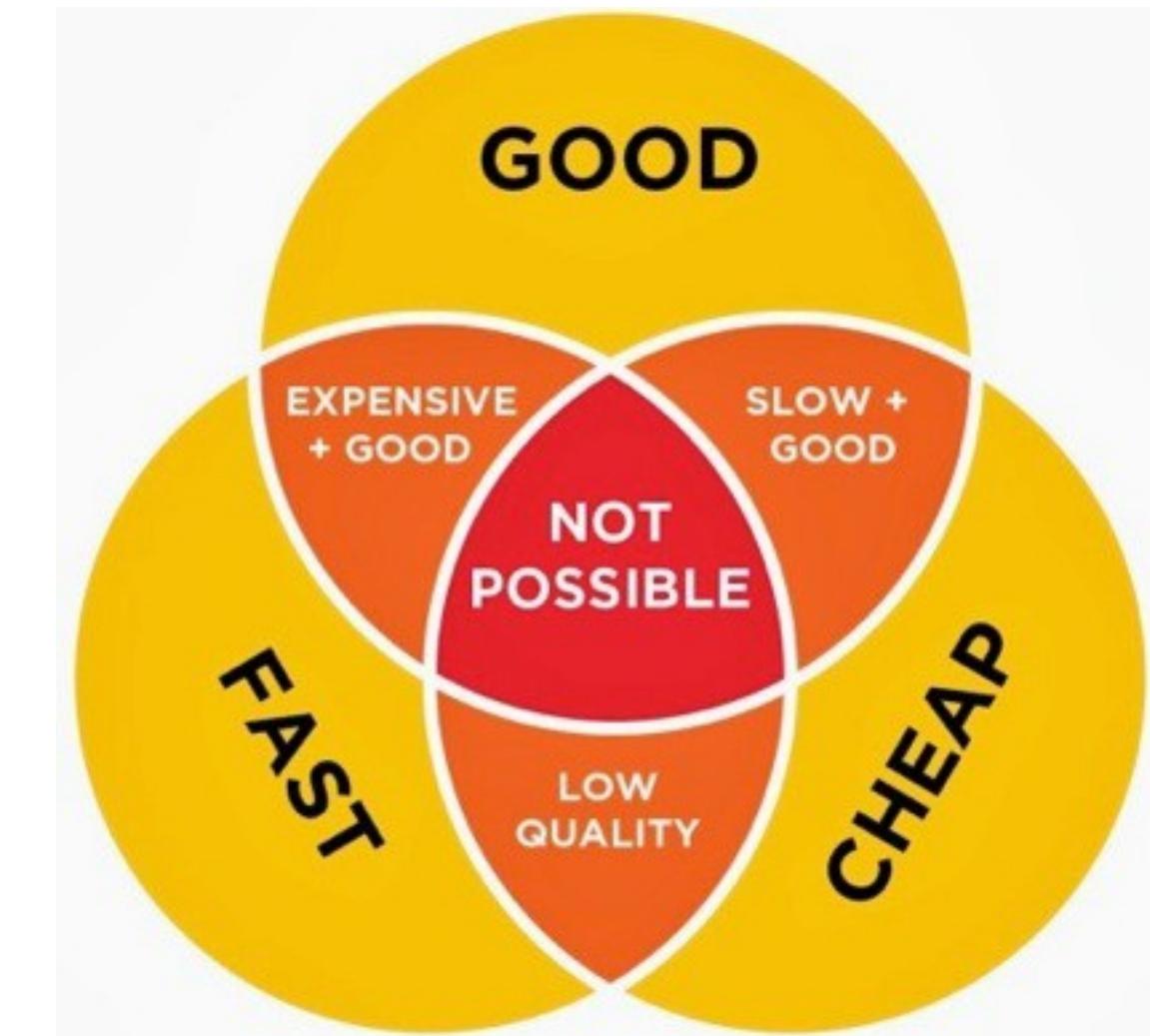
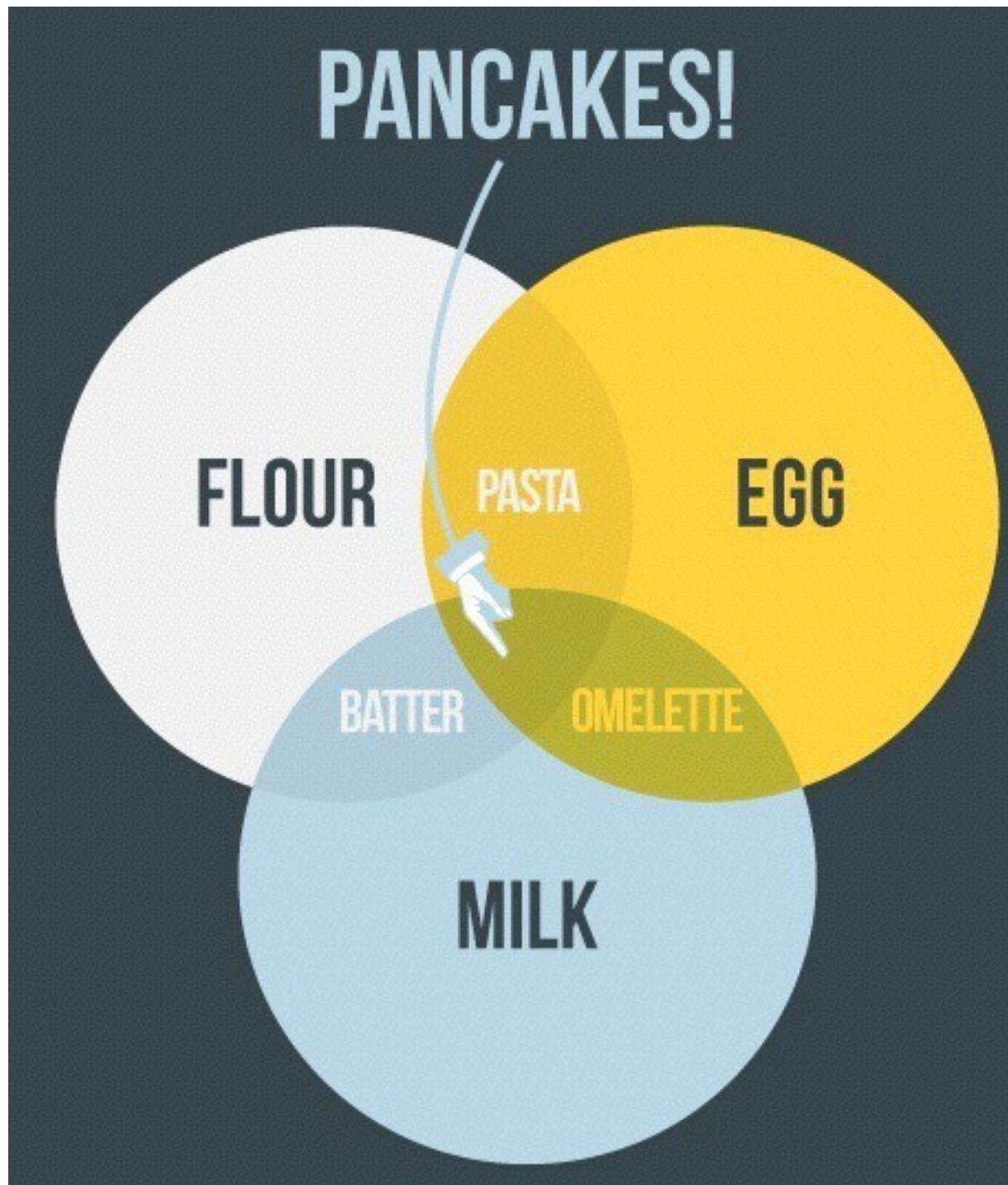


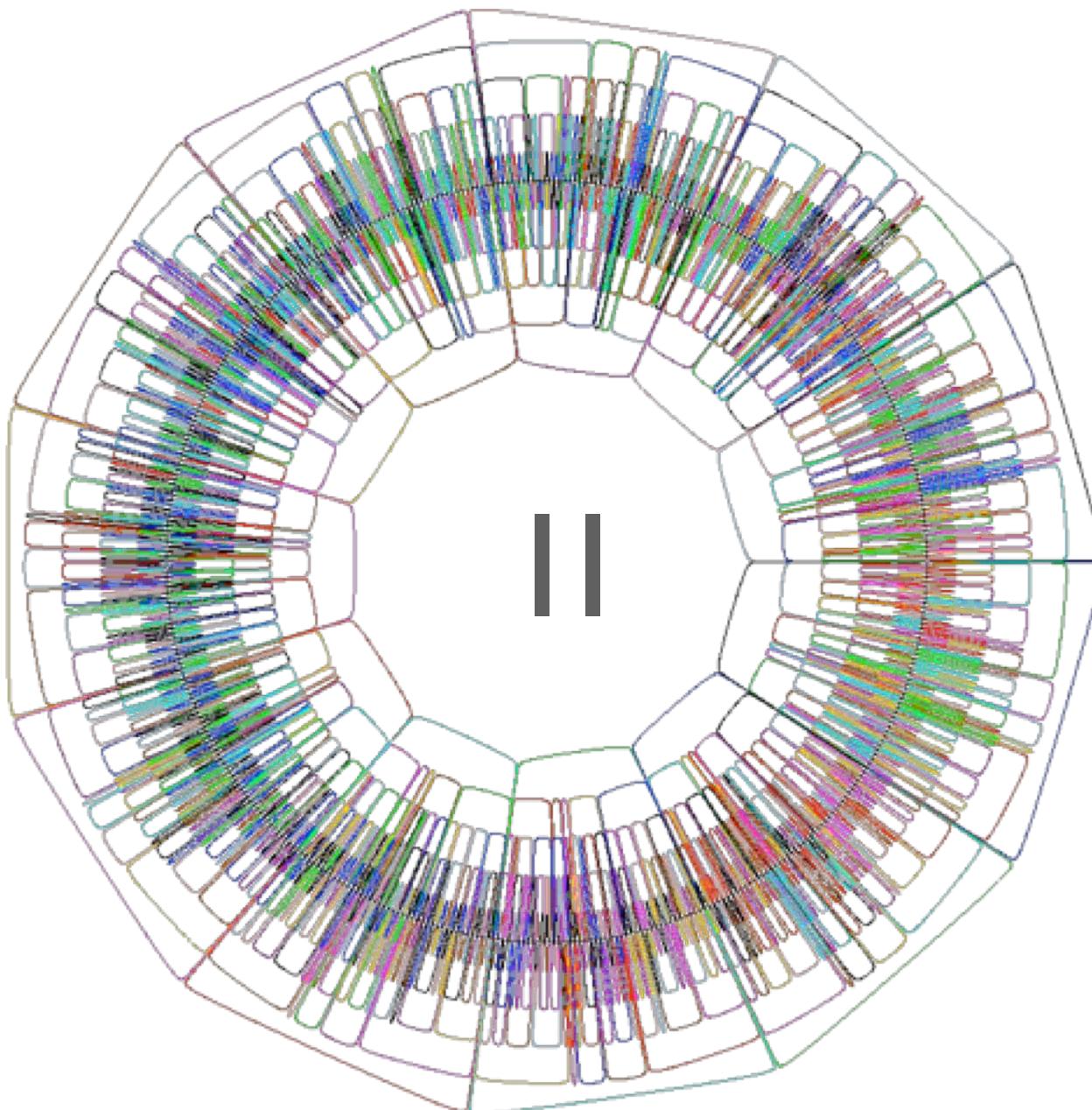
**VENN DIAGRAMS**  
show all possible relationships



# VENN DIAGRAMS

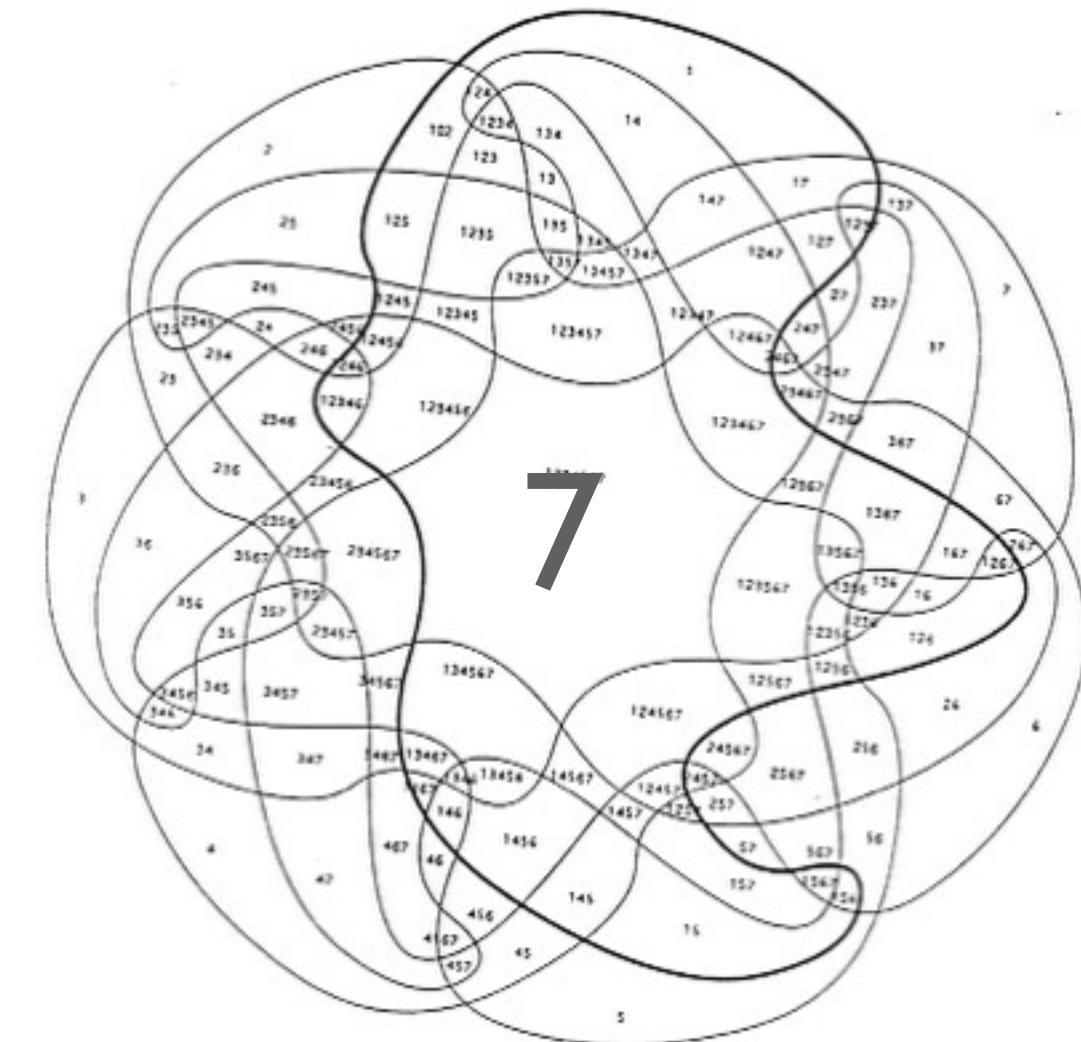
“casual infovis”





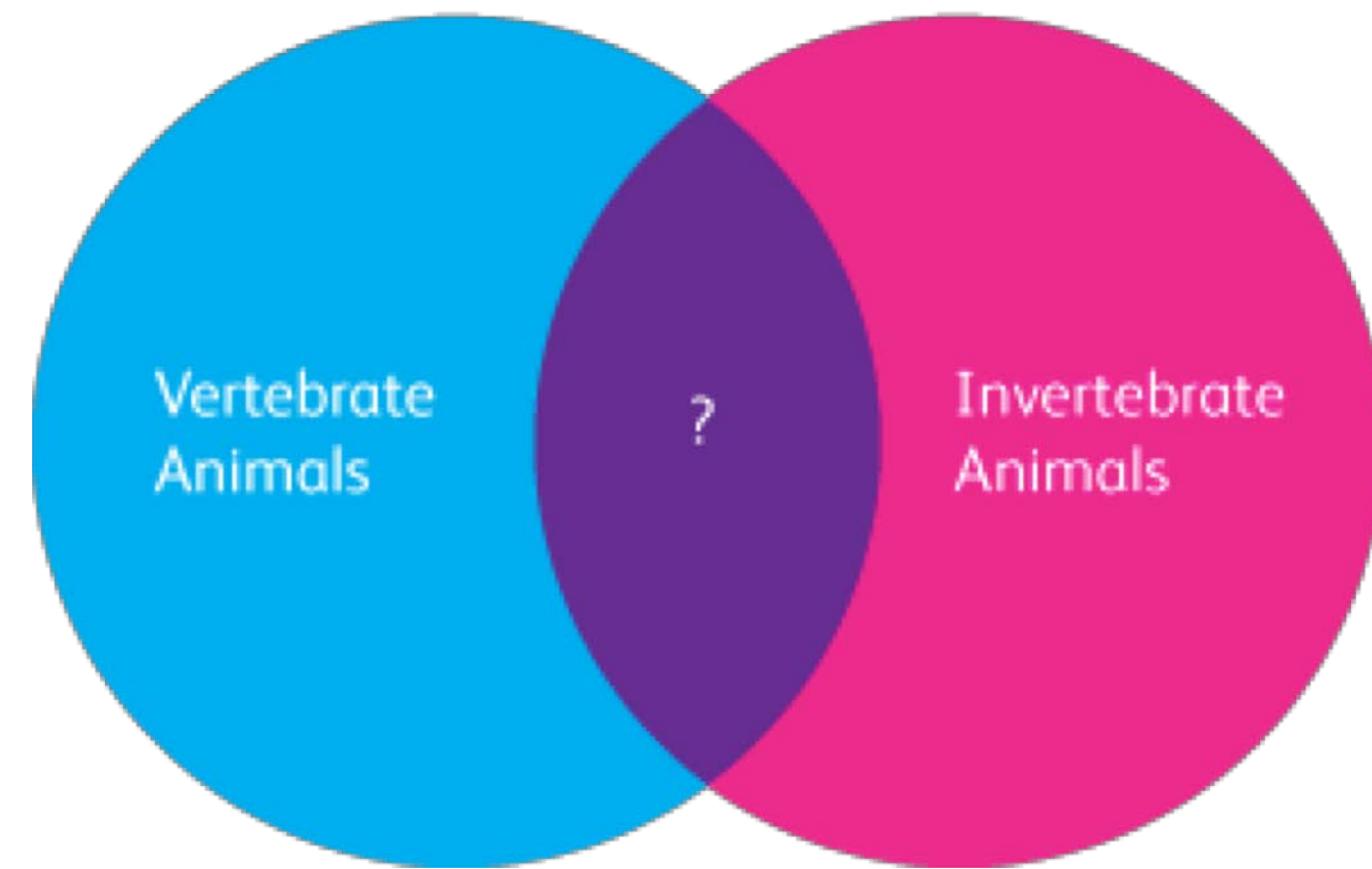
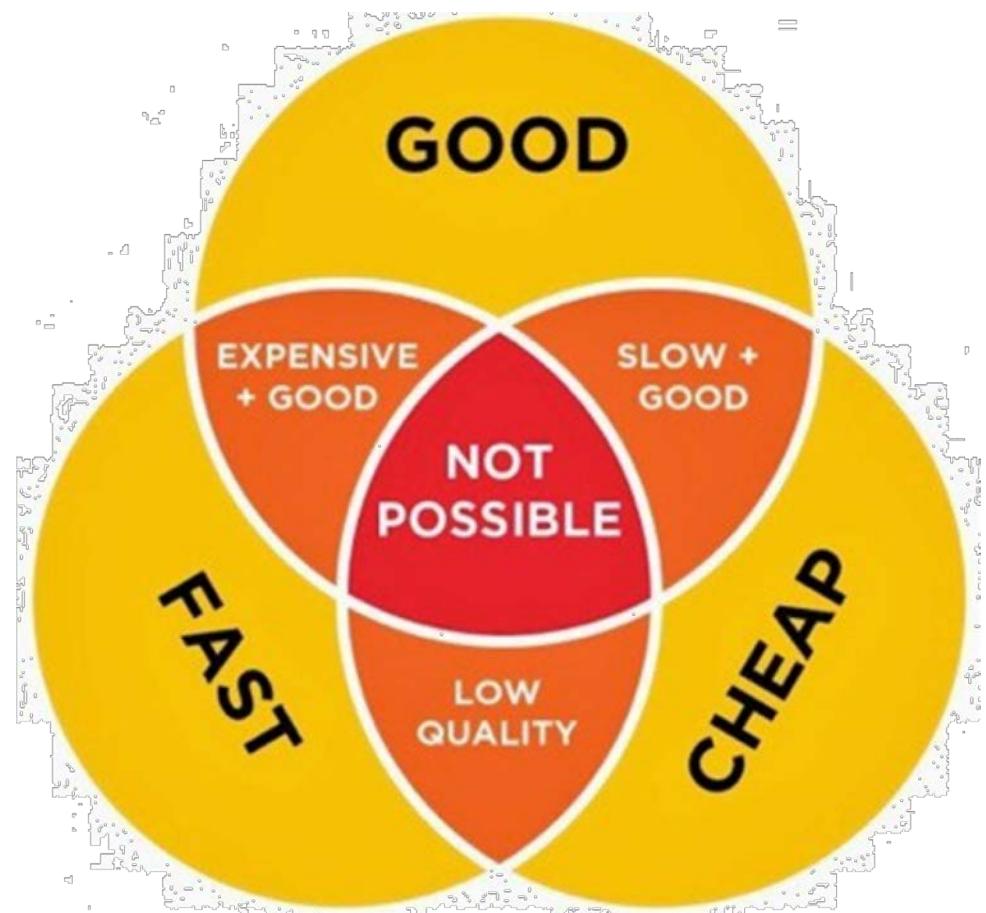
# VENN DIAGRAMS

## get messy fast



# VENN DIAGRAMS

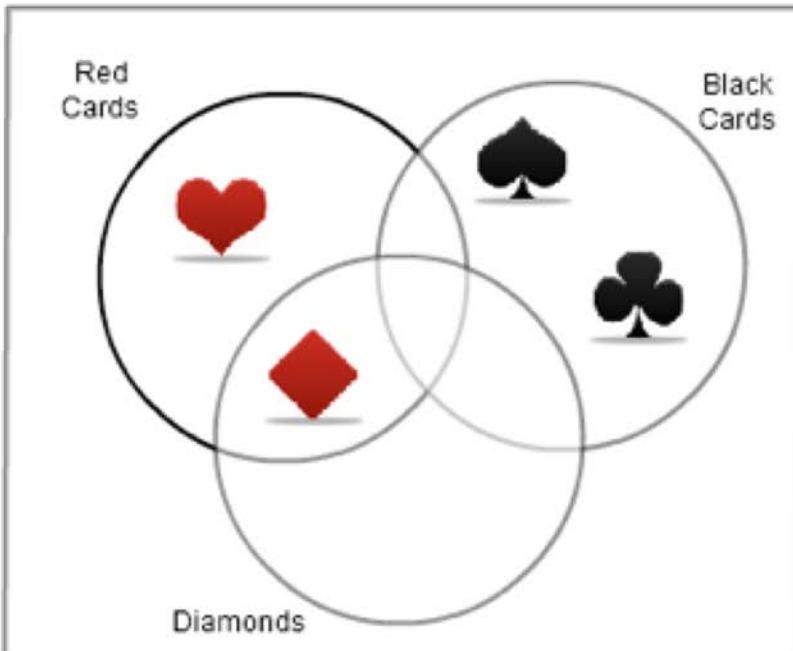
## non-sensical



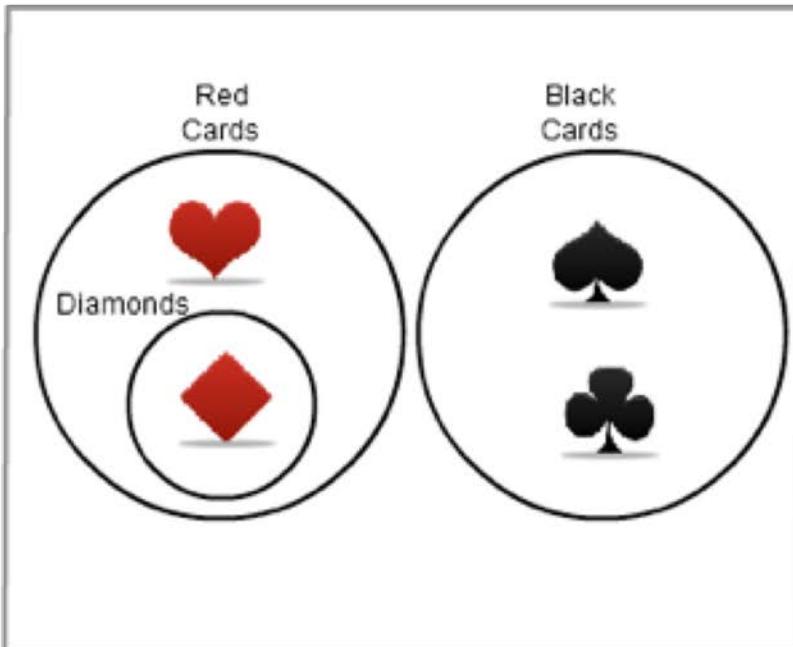
## EULER DIAGRAMS

show only existing relationships

V  
E  
N  
N

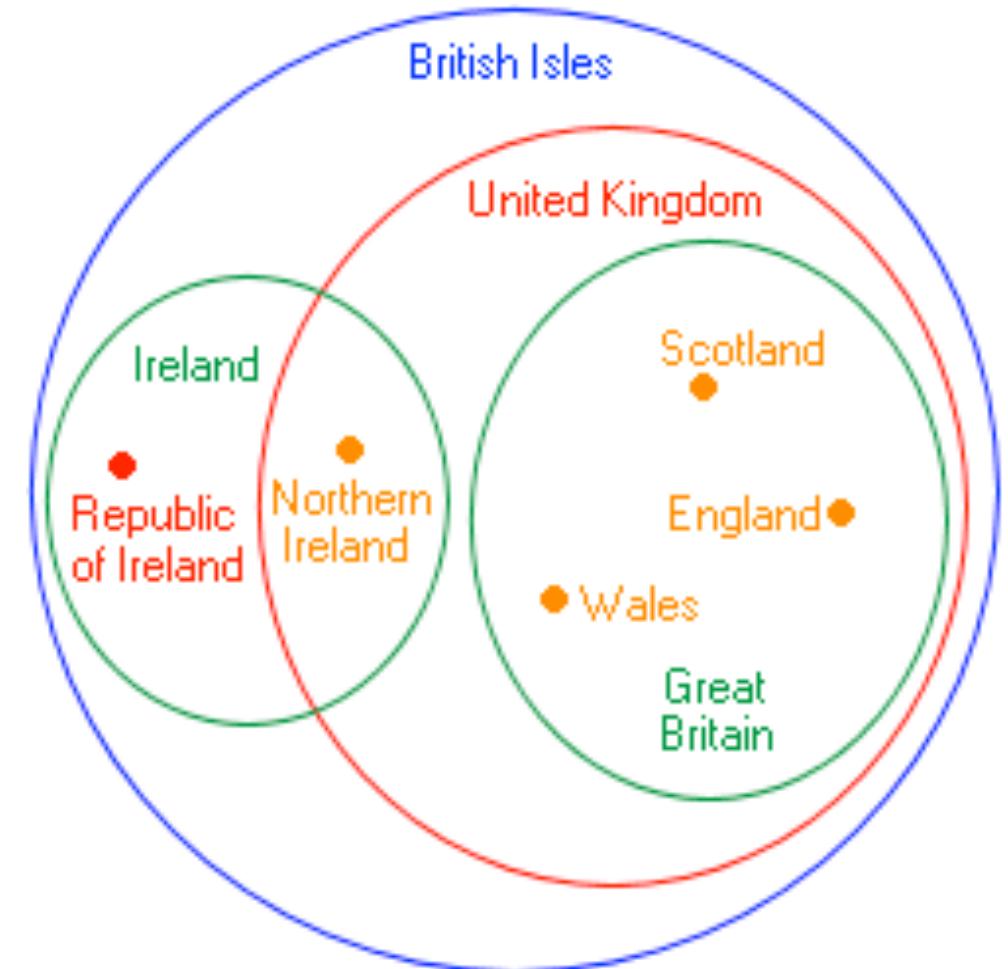


E  
U  
L  
E  
R

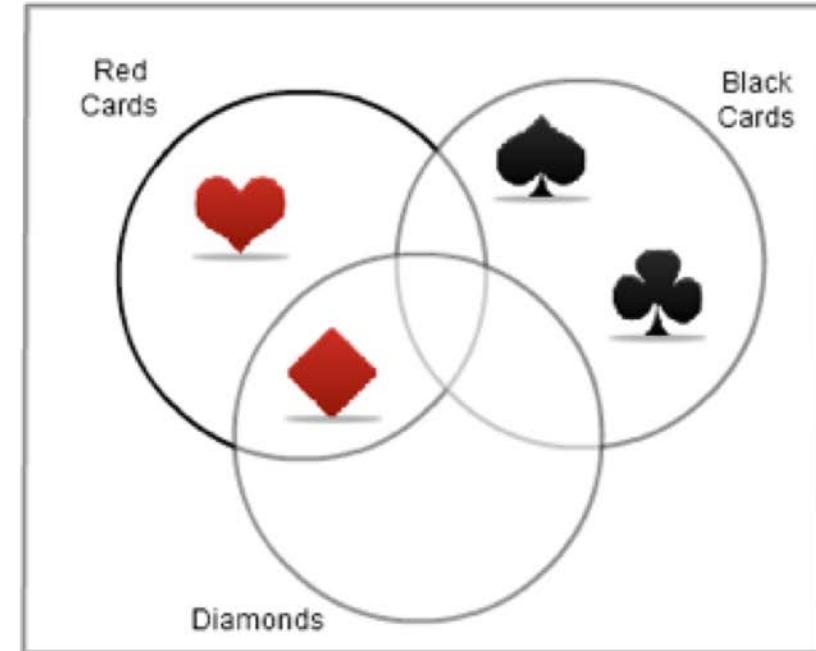


# EULER DIAGRAMS

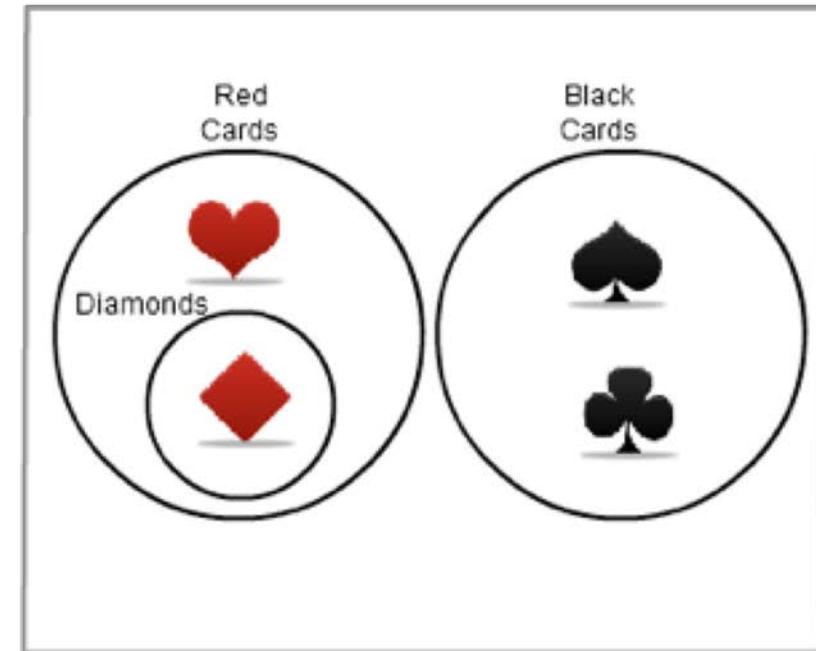
## show only existing relationships



V  
E  
N  
N



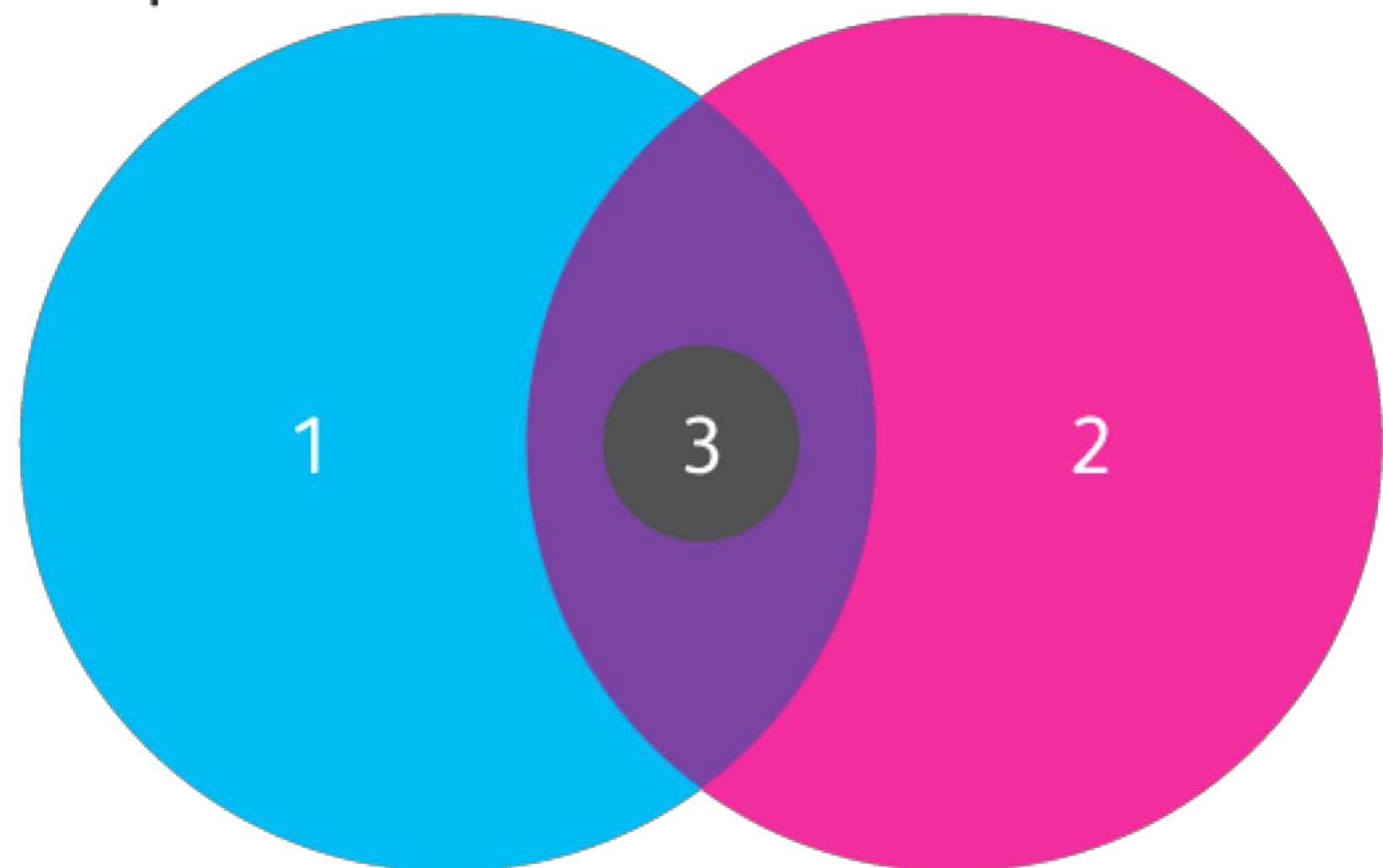
E  
U  
L  
E  
R



## EULER DIAGRAMS

Misunderstood

- 1: People who know what a Venn Diagram is.
- 2: People who know what an Euler Diagram is.
- 3: People who know the difference.



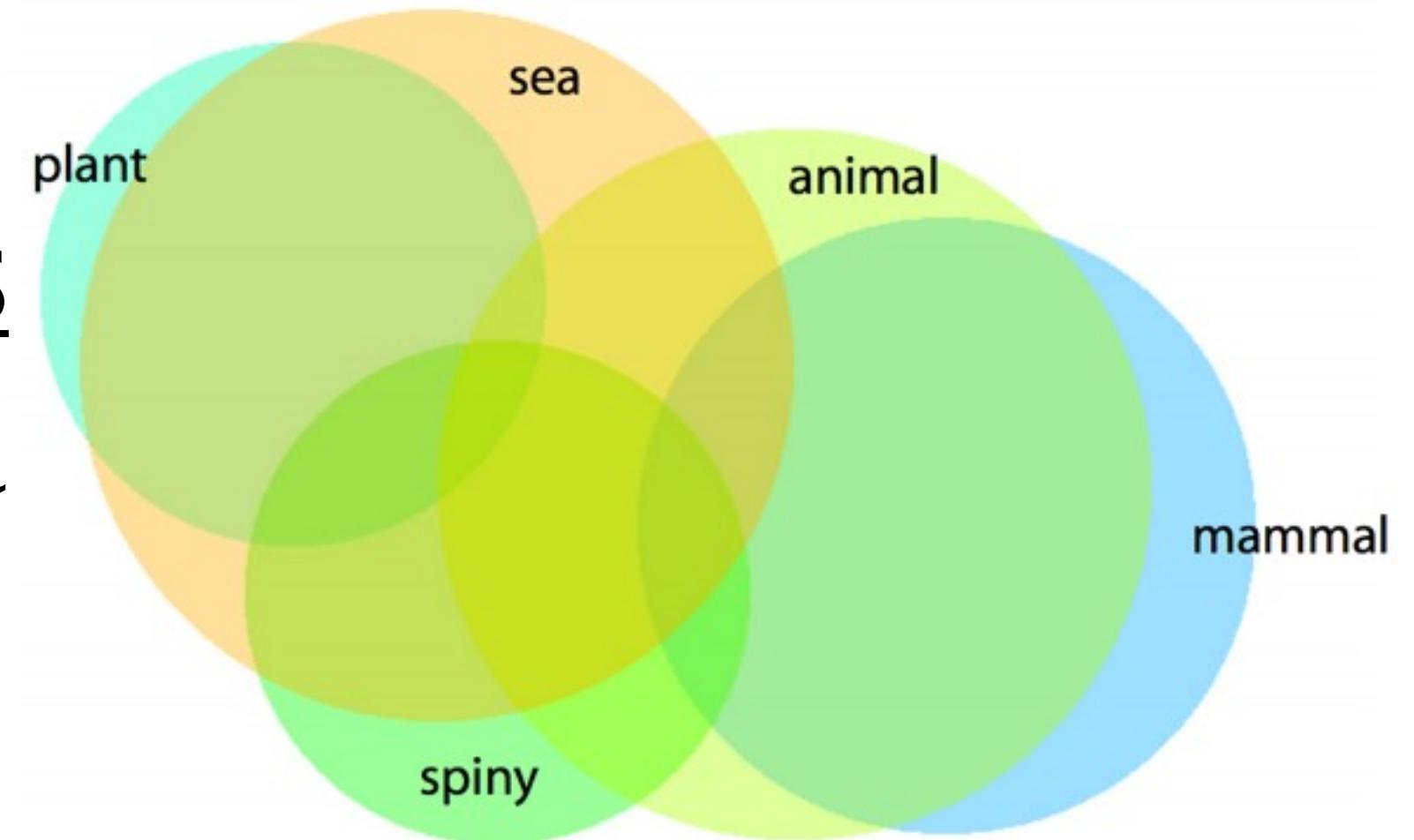
## VENN & EULER DIAGRAMS

adjust for area  
starts getting tricky!

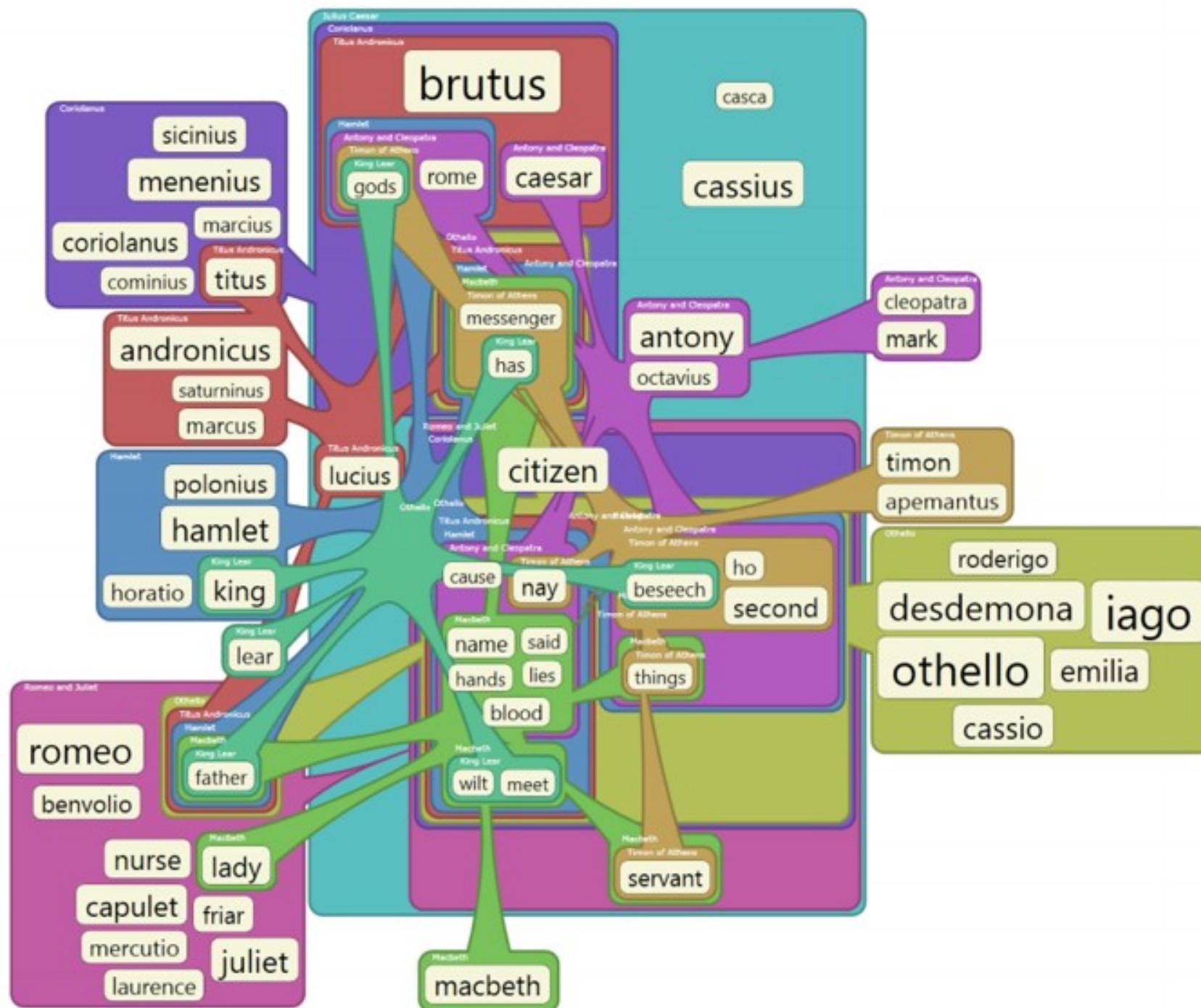


## VENN & EULER DIAGRAMS

adjust for area  
starts getting tricky!

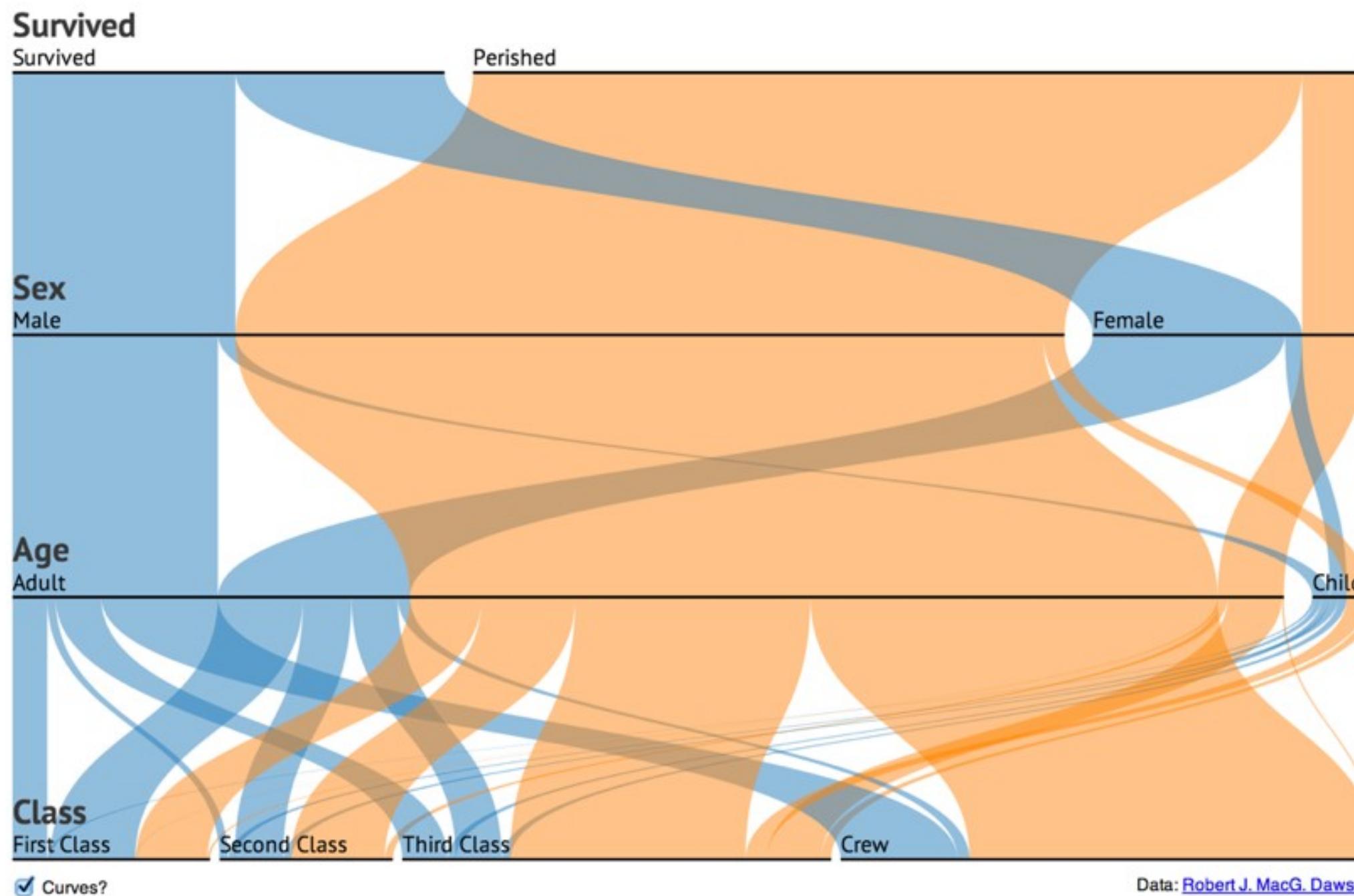


# COMPACT EULER DIAGRAMS



# PARALLEL SETS

Titanic Survivors



## PARALLEL SETS

builds on PC to better handle categorical data

discrete

small number of values

no implied ordering between attributes

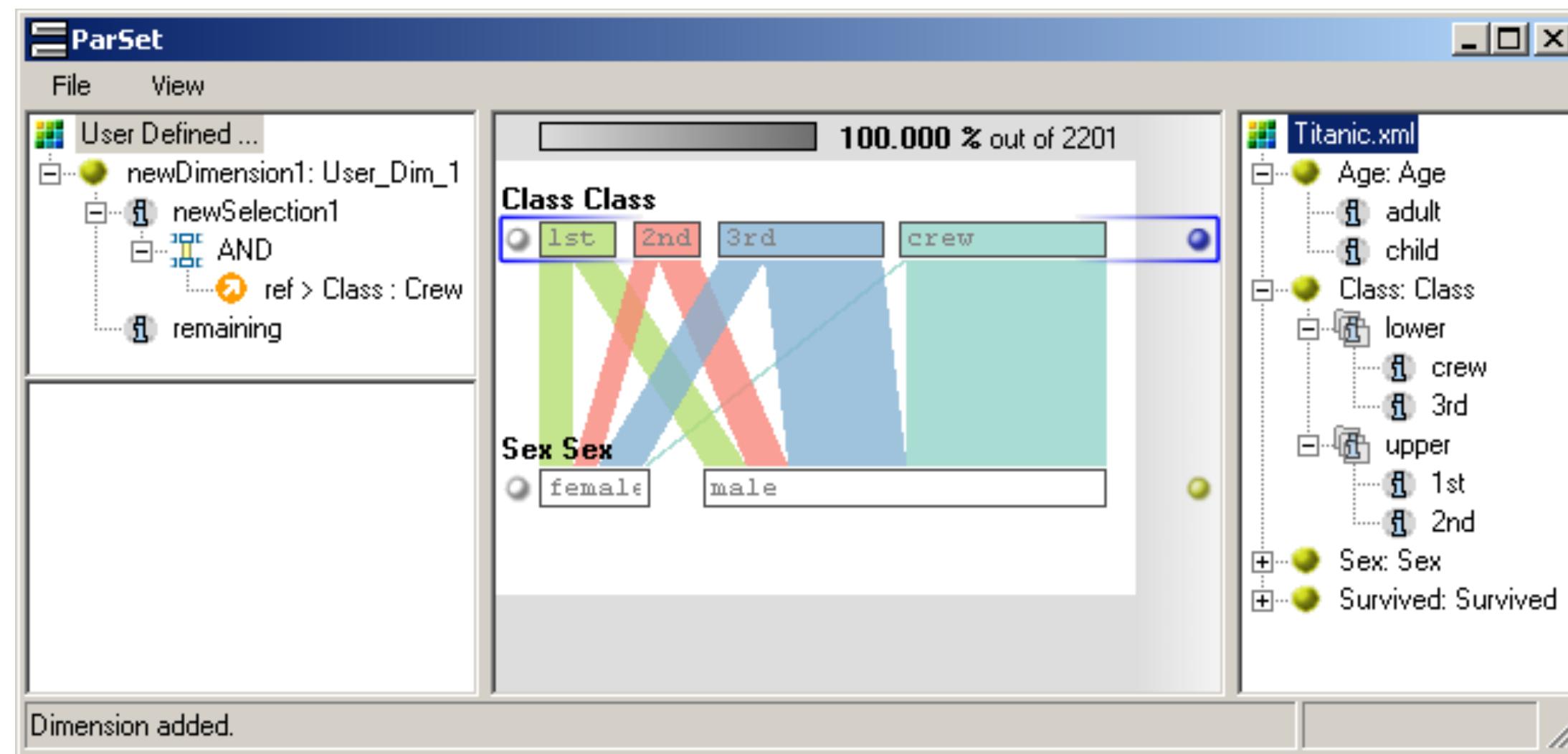
task: find relationship between attributes, not outliers

interaction driven technique



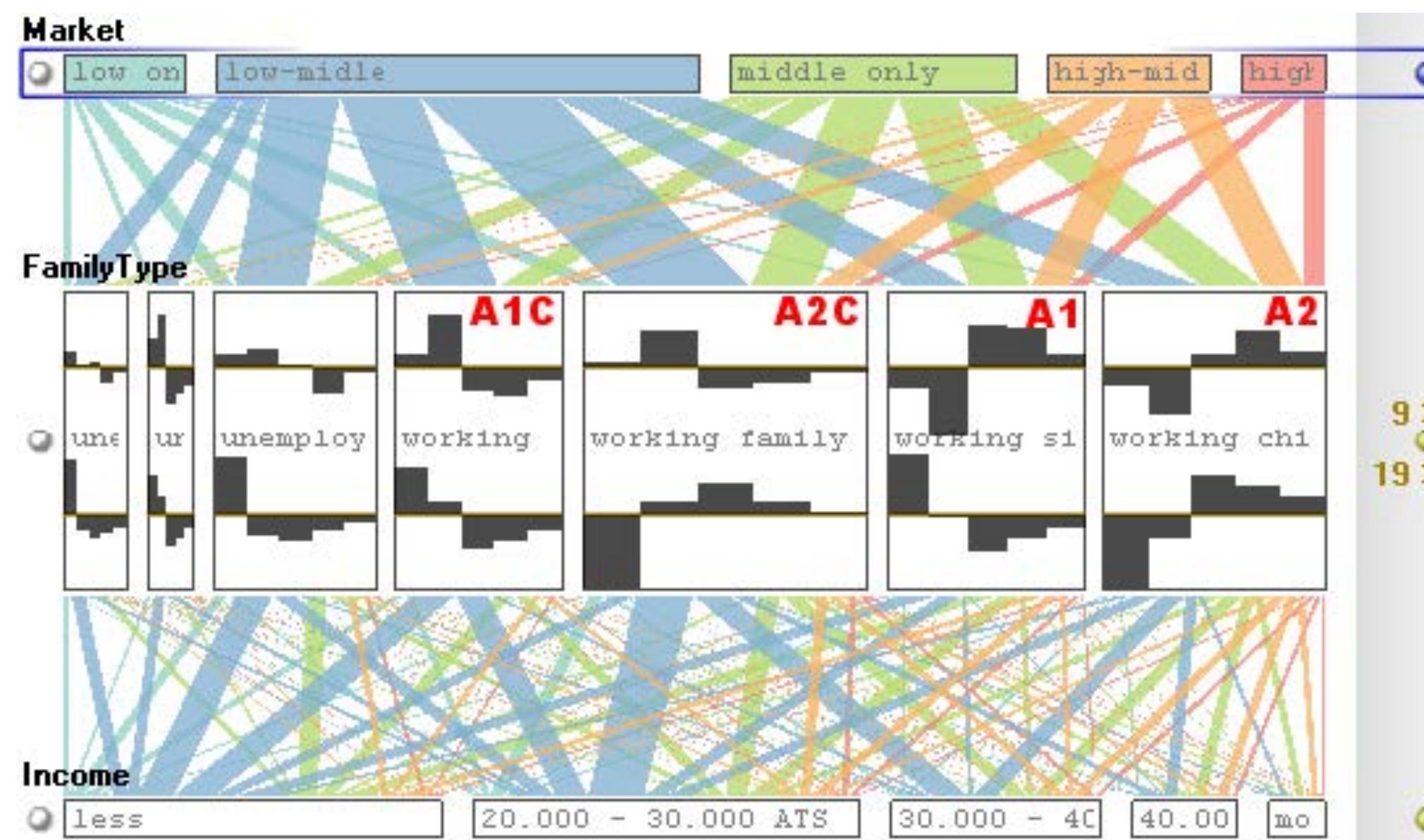
# VISUAL ENCODING

boxes scaled by frequency  
color coded by values for current active dimension

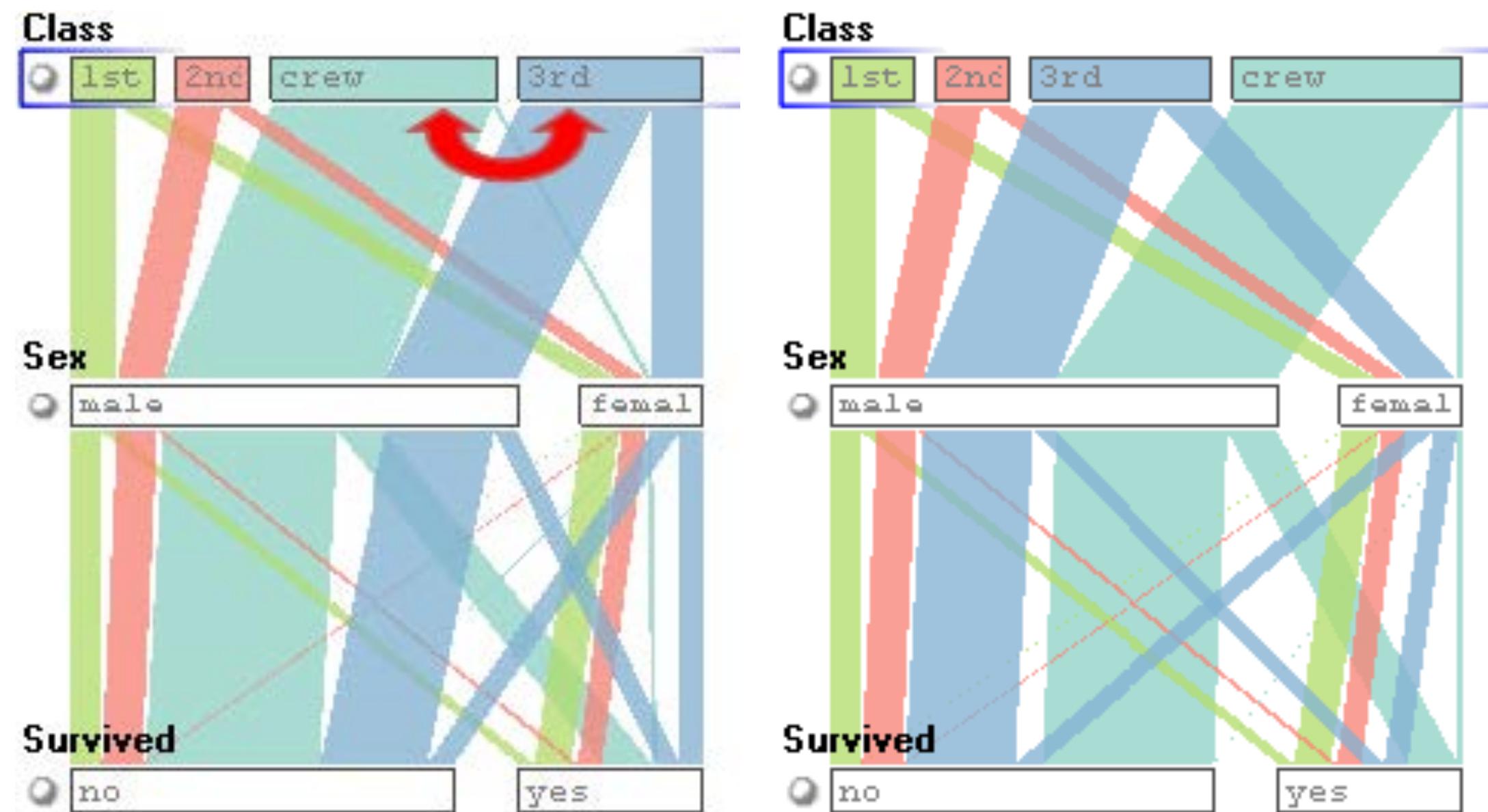


# VISUAL ENCODING

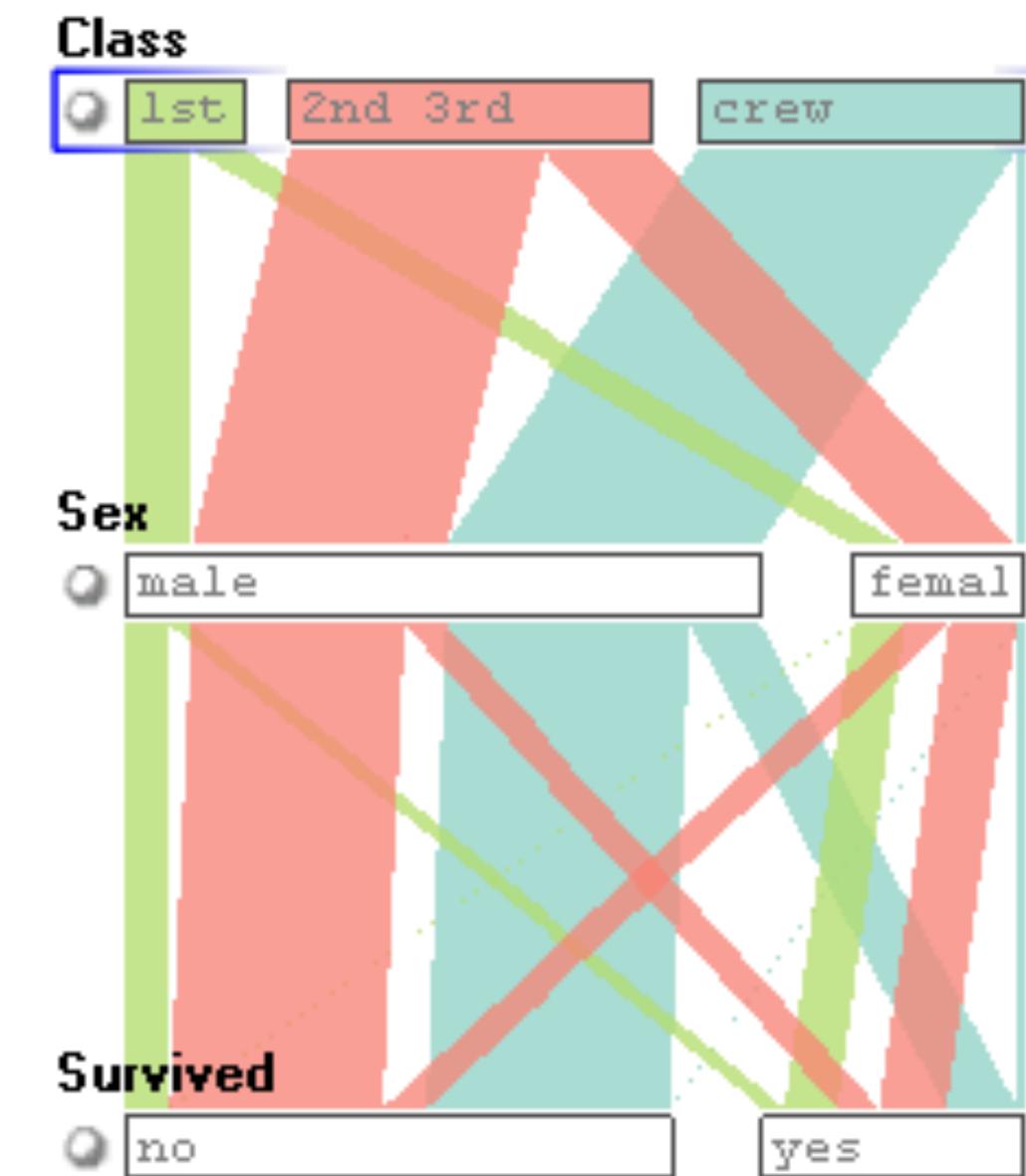
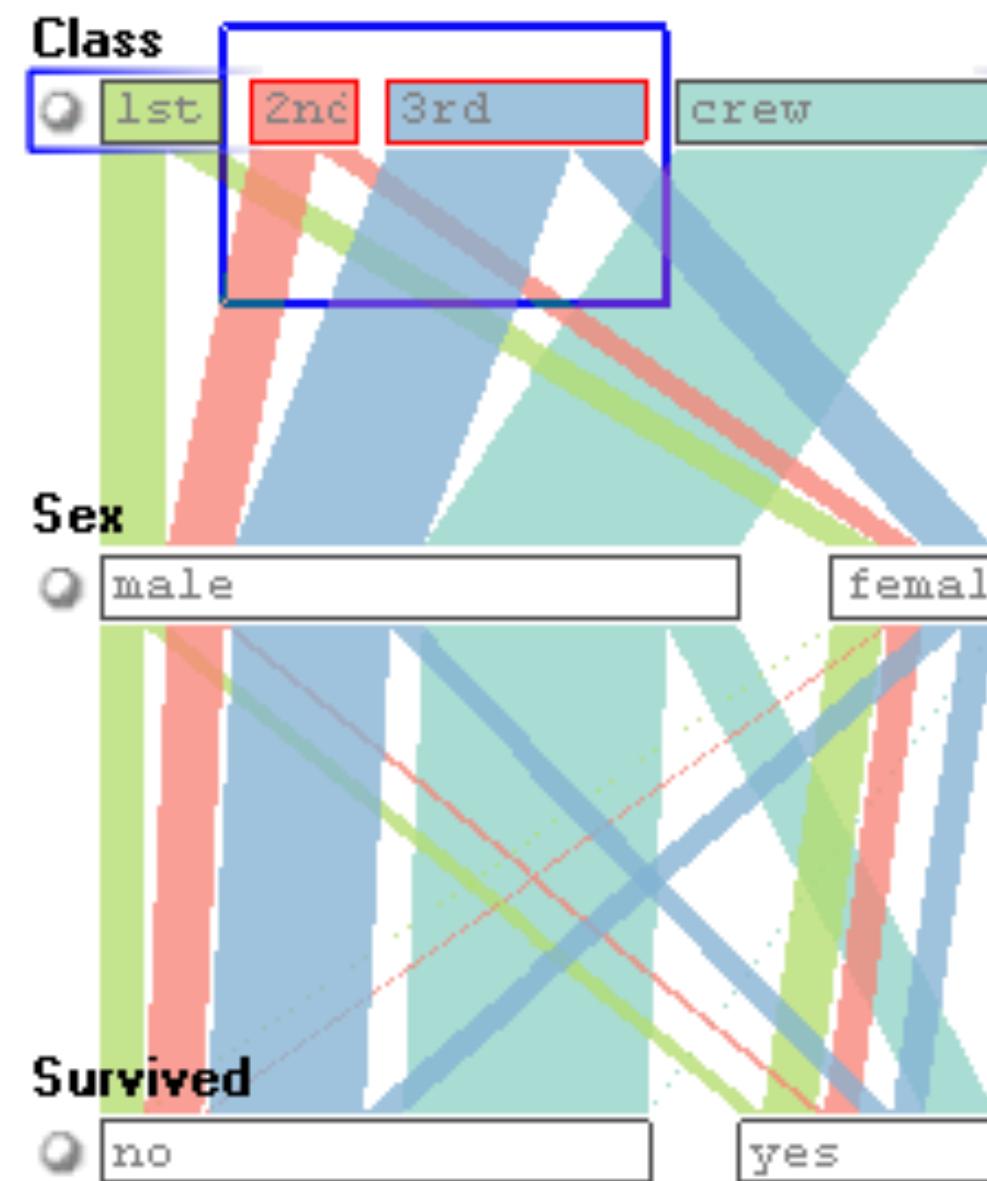
boxes expand to show histogram



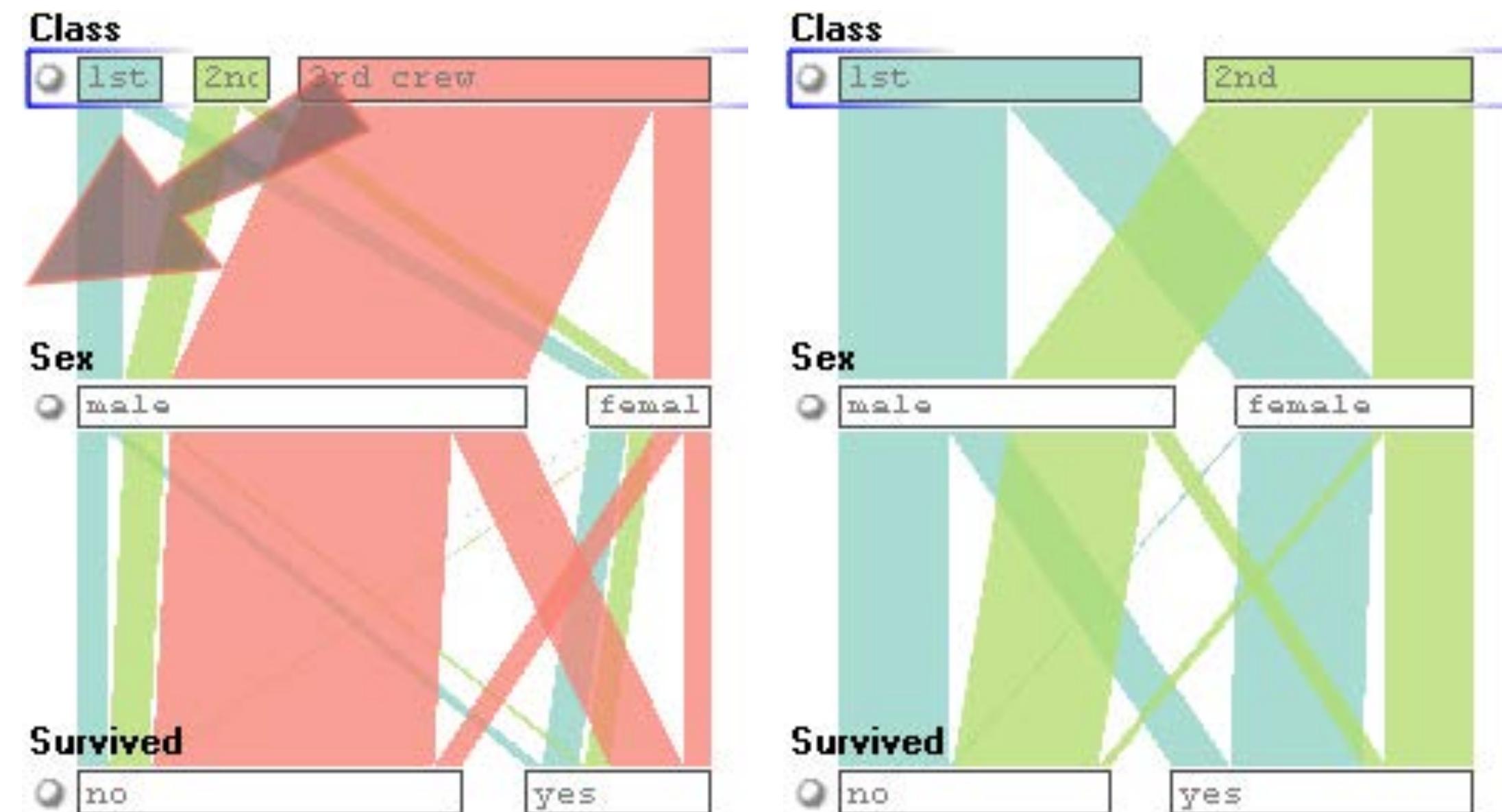
# INTERACTION: REORDER



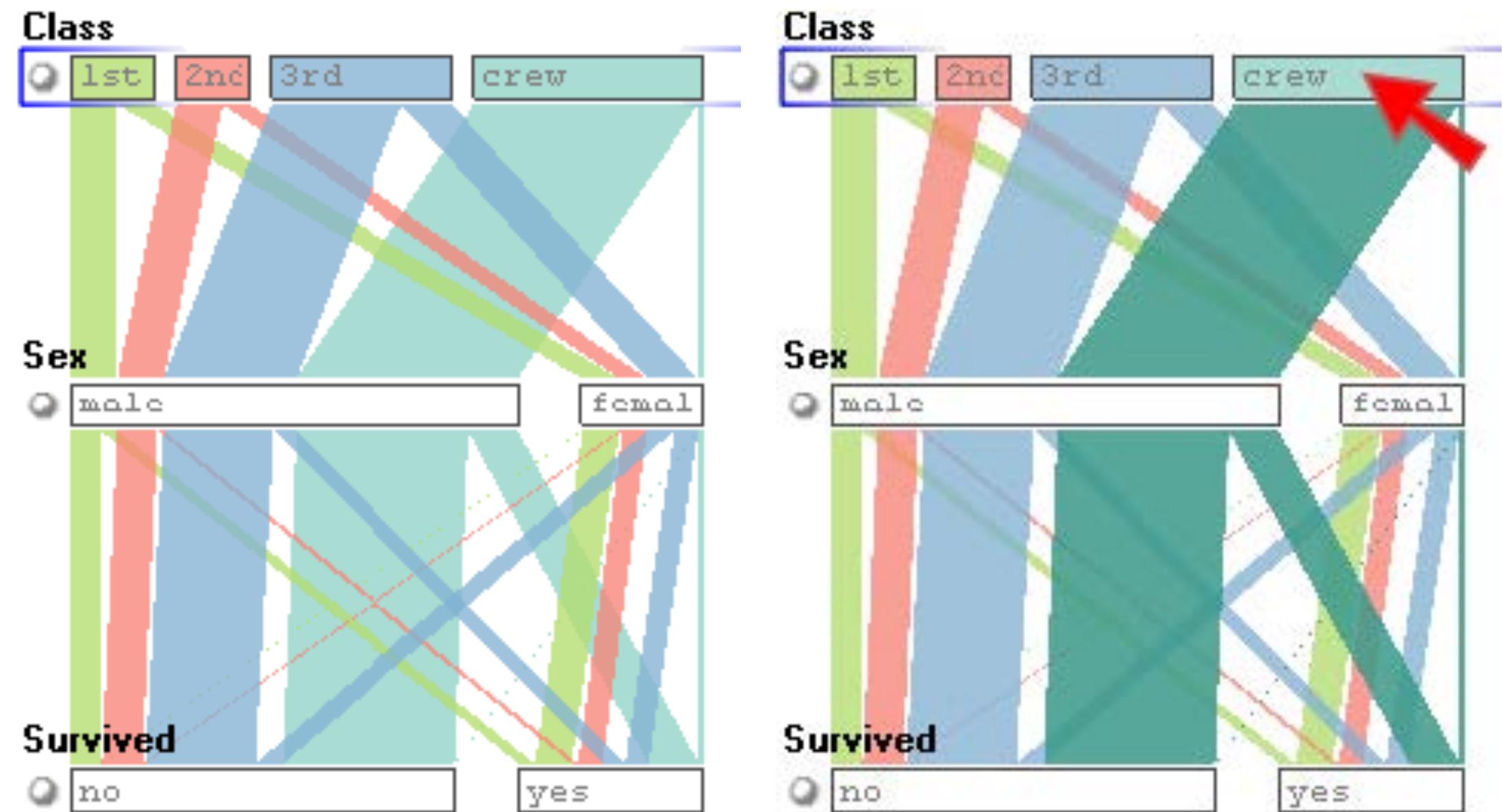
# INTERACTION:AGGREGATE



# INTERACTION: FILTER



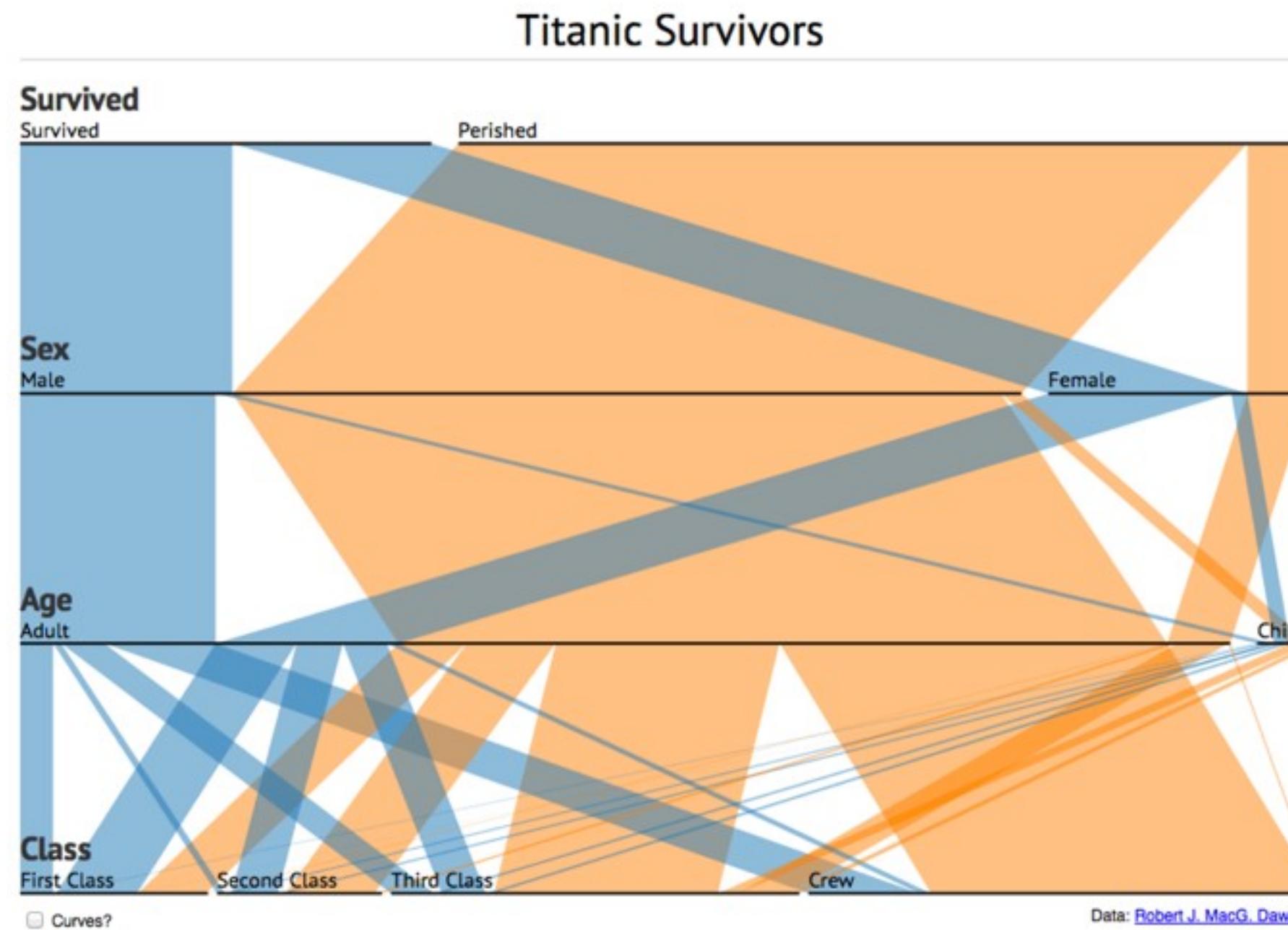
# INTERACTION: HIGHLIGHT



# CRITIQUE:WHAT DO YOU THINK?

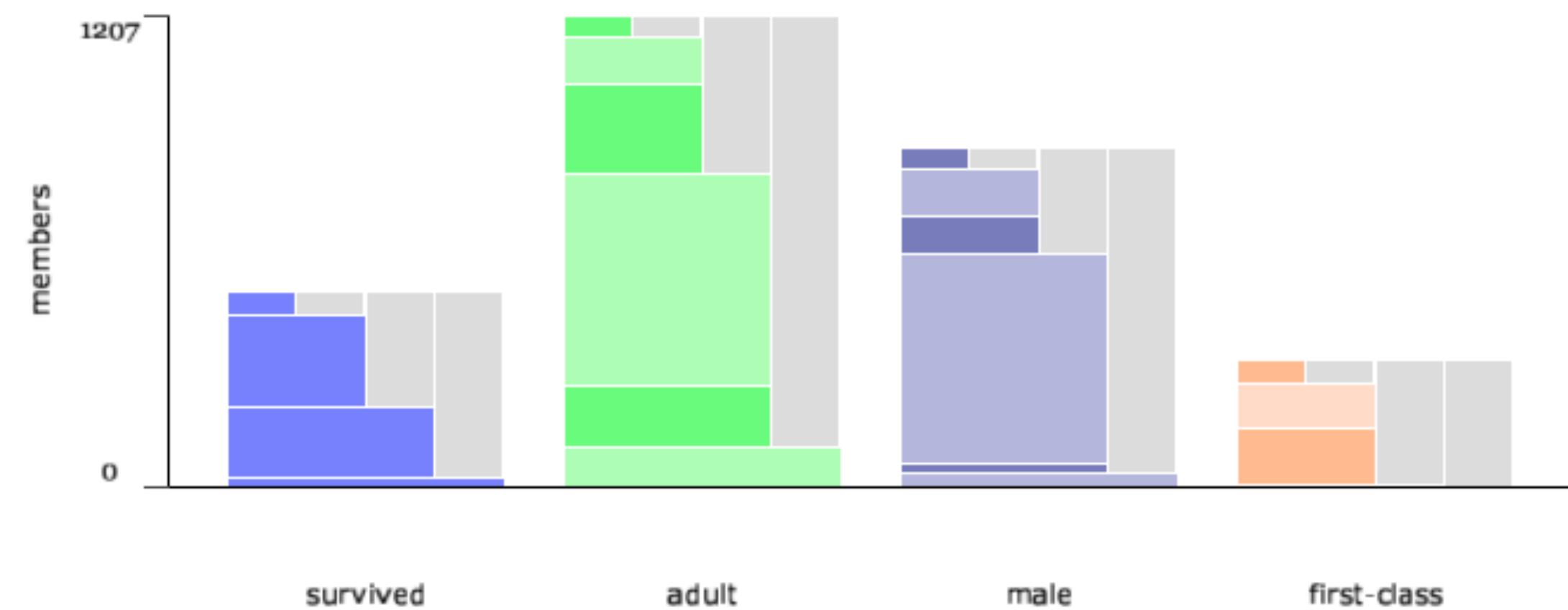
## Parallel Sets

A visualisation technique for multidimensional categorical data.



# SET O'GRAM

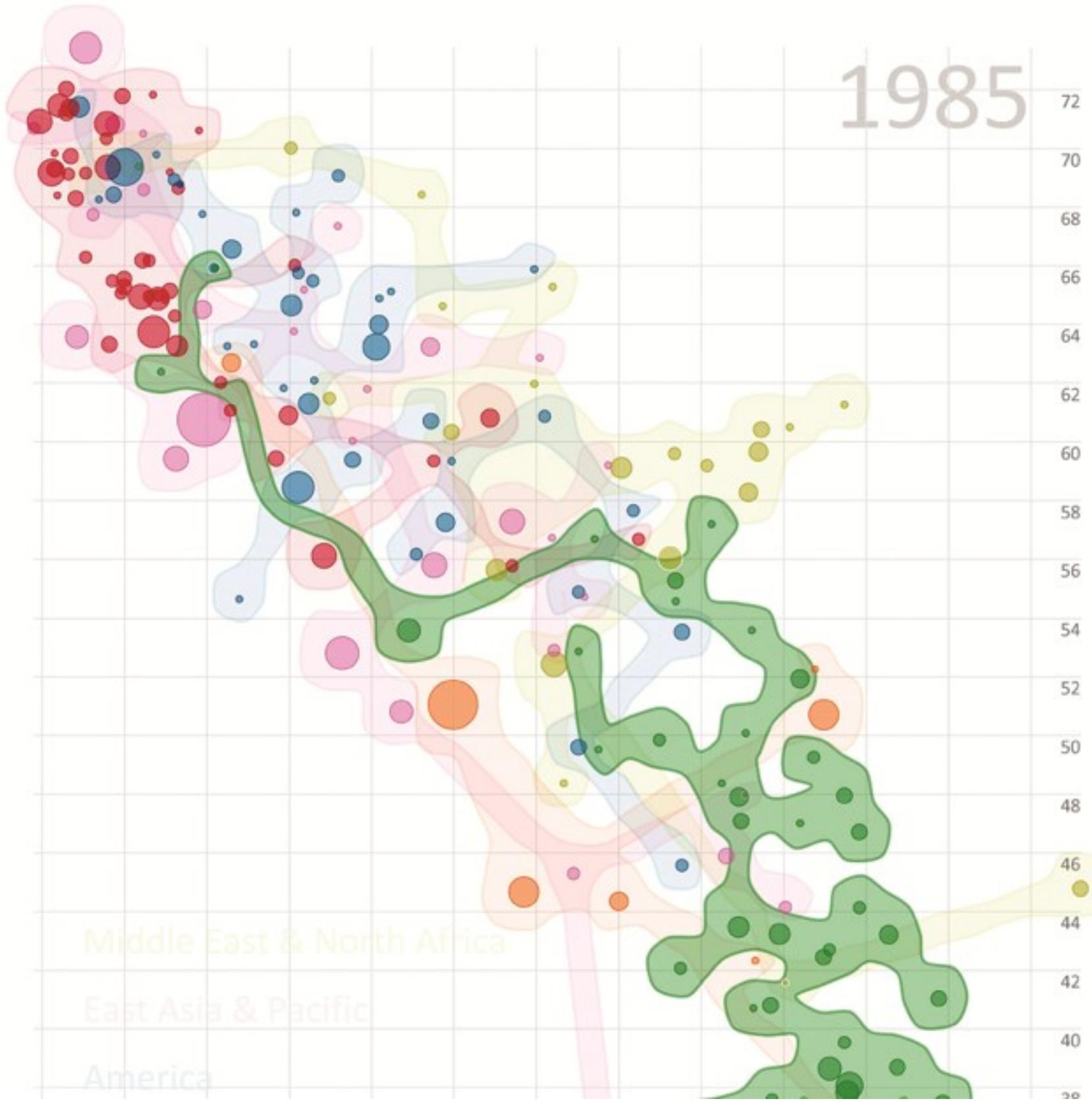
Titanic



# VISUALIZING SETS WITH CONSTRAINTS



## BUBBLE SETS

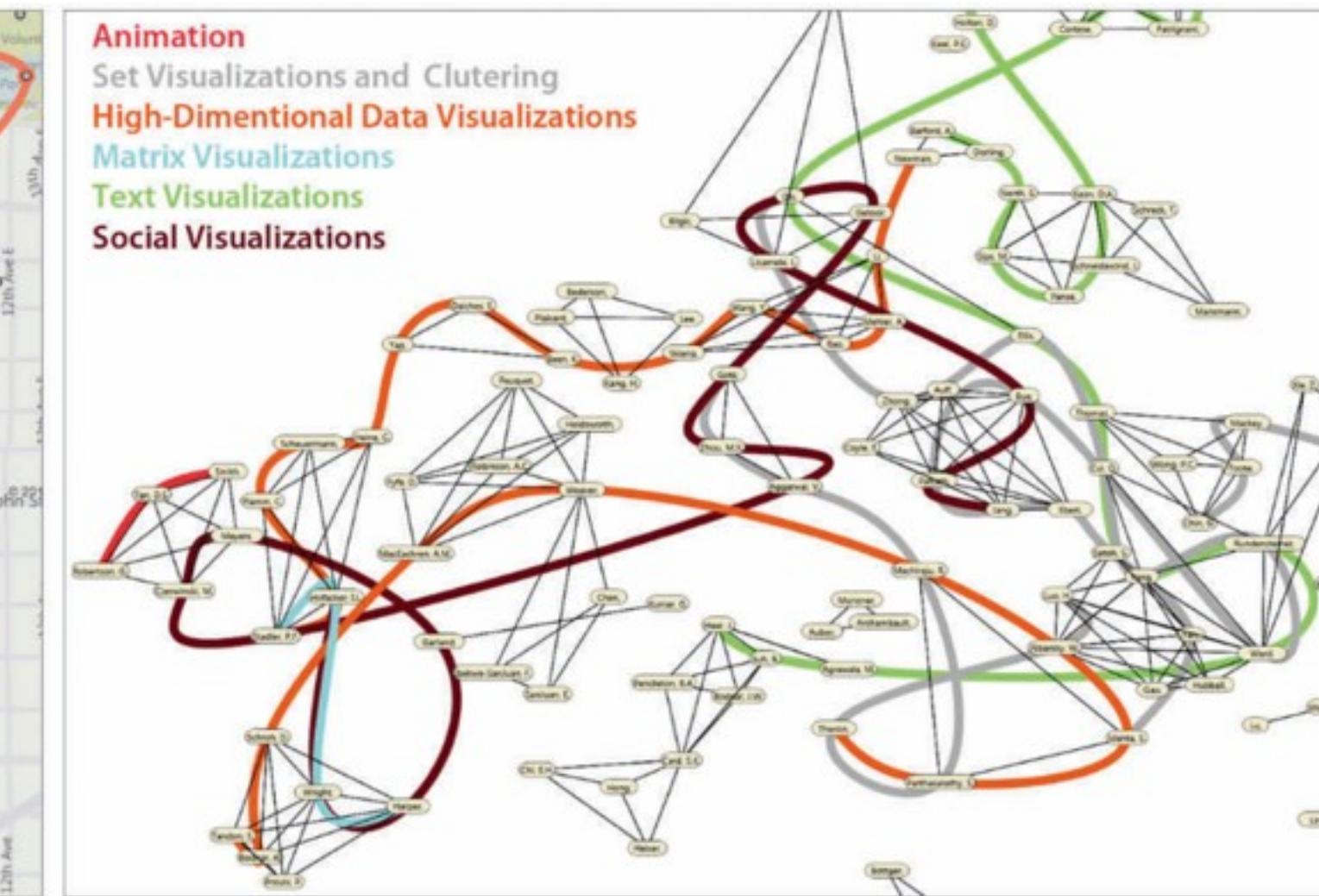


## LINE SETS

# restaurants



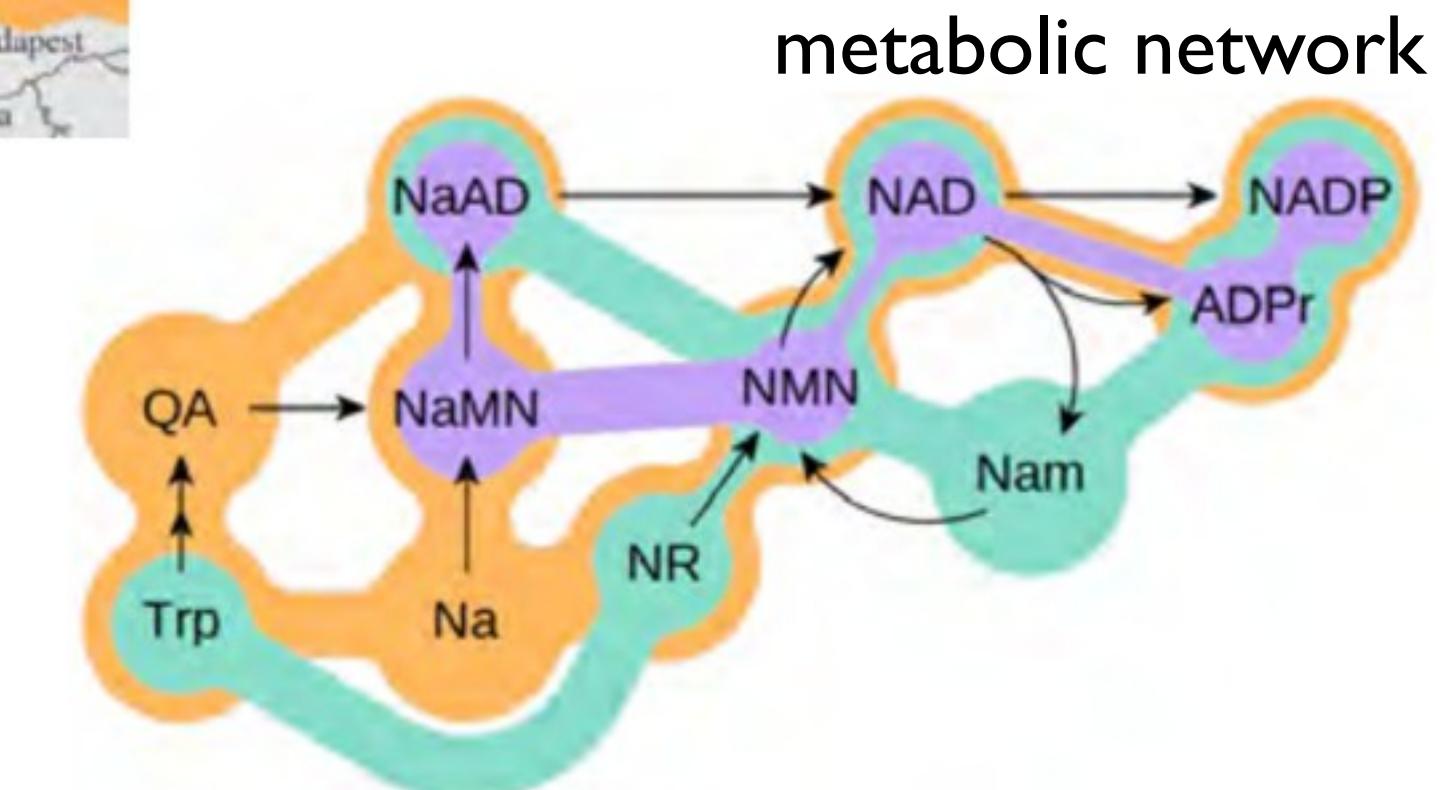
# social communities



# KELP DIAGRAMS

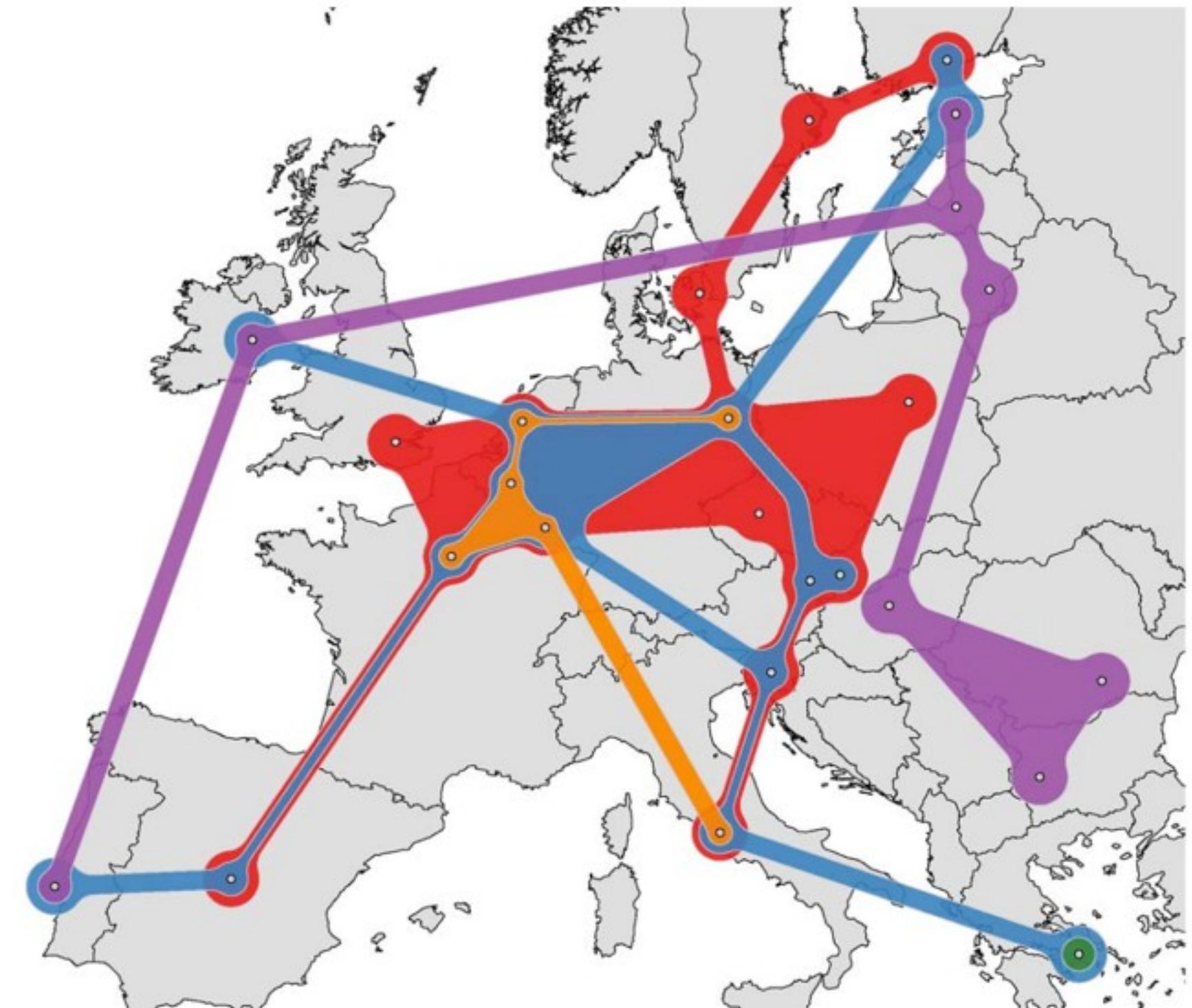


cities on a map



# KELP FUSION

## cities on map lines & areas



## SETS

applies to many datasets

many combinations may be interesting

limited numbers of sets more tractable



