Class Activity

5 students with their opinion on six topics. What can you tell?

```
P1 [0, -0, 0,  0, 0,    3],
P2 [1, -1, 1,  2, 1,    6],
P3 [2, -2, 4,  4, 0.5,  2],
P4 [3, -3, 9,  6, 0.33, 4],
P5 [4, -4, 16, 8, 0.25, 9]
```

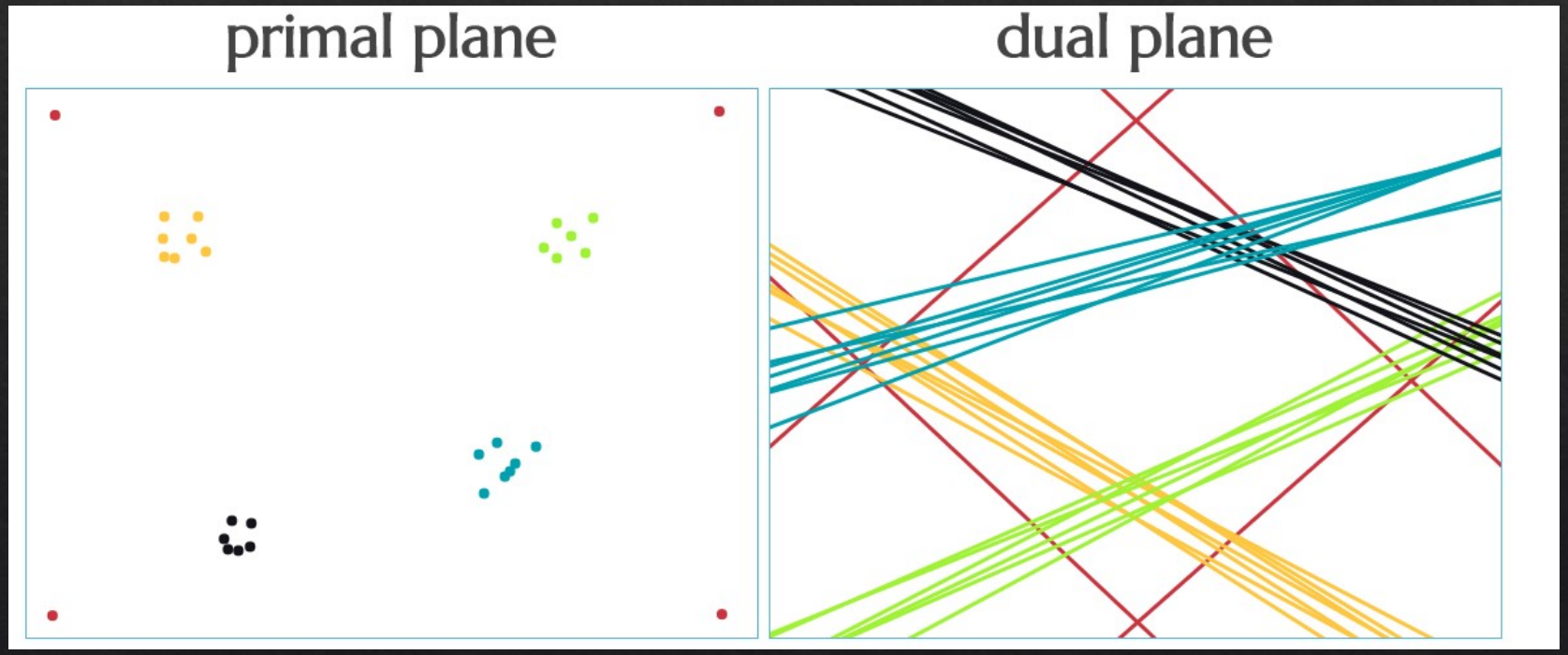
Dealing with Multidimensional Data using Parallel Coordinates

Debajyoti Mondal

University of Saskatchewan

Background Concept: Point-Line Duality

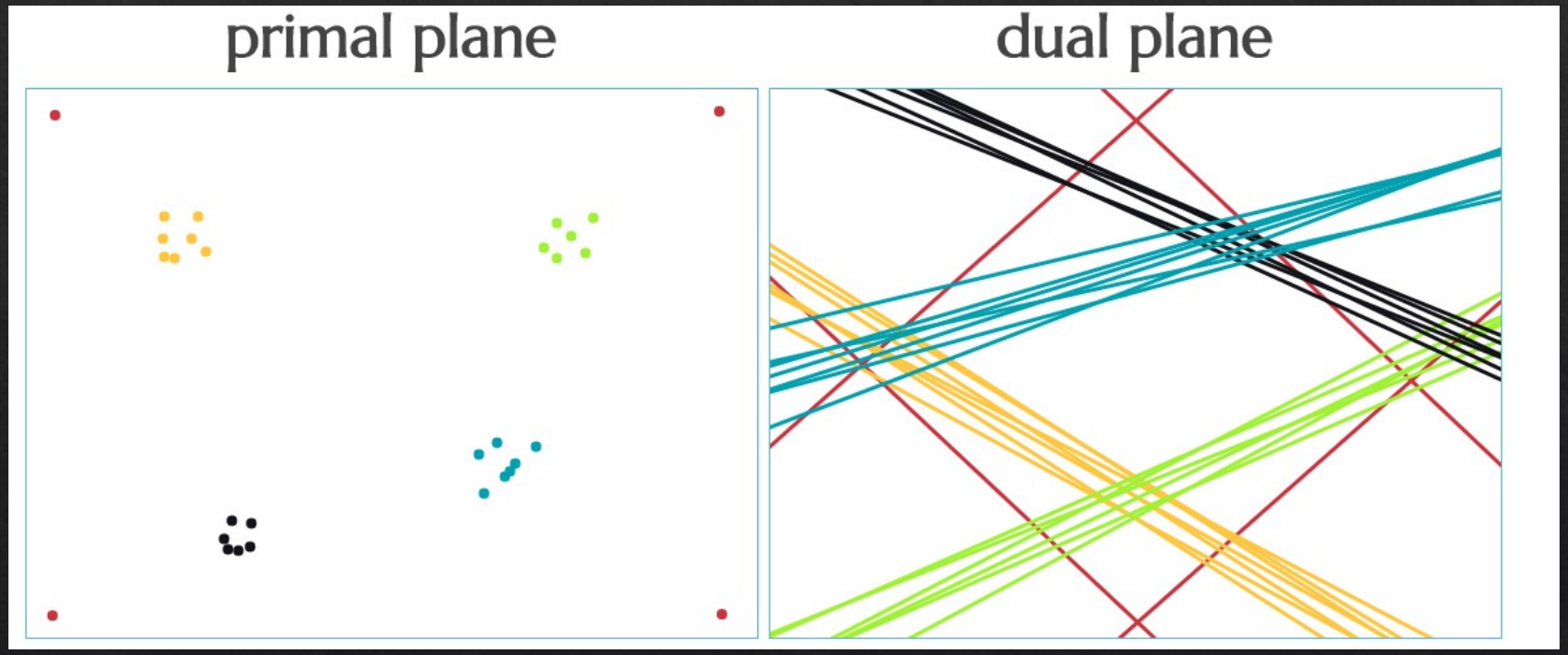
The point-line duality is the most fundamental concept for parallel coordinates (Inselberg, 1985)



http://students.cec.wustl.edu/~tdeck/duality/

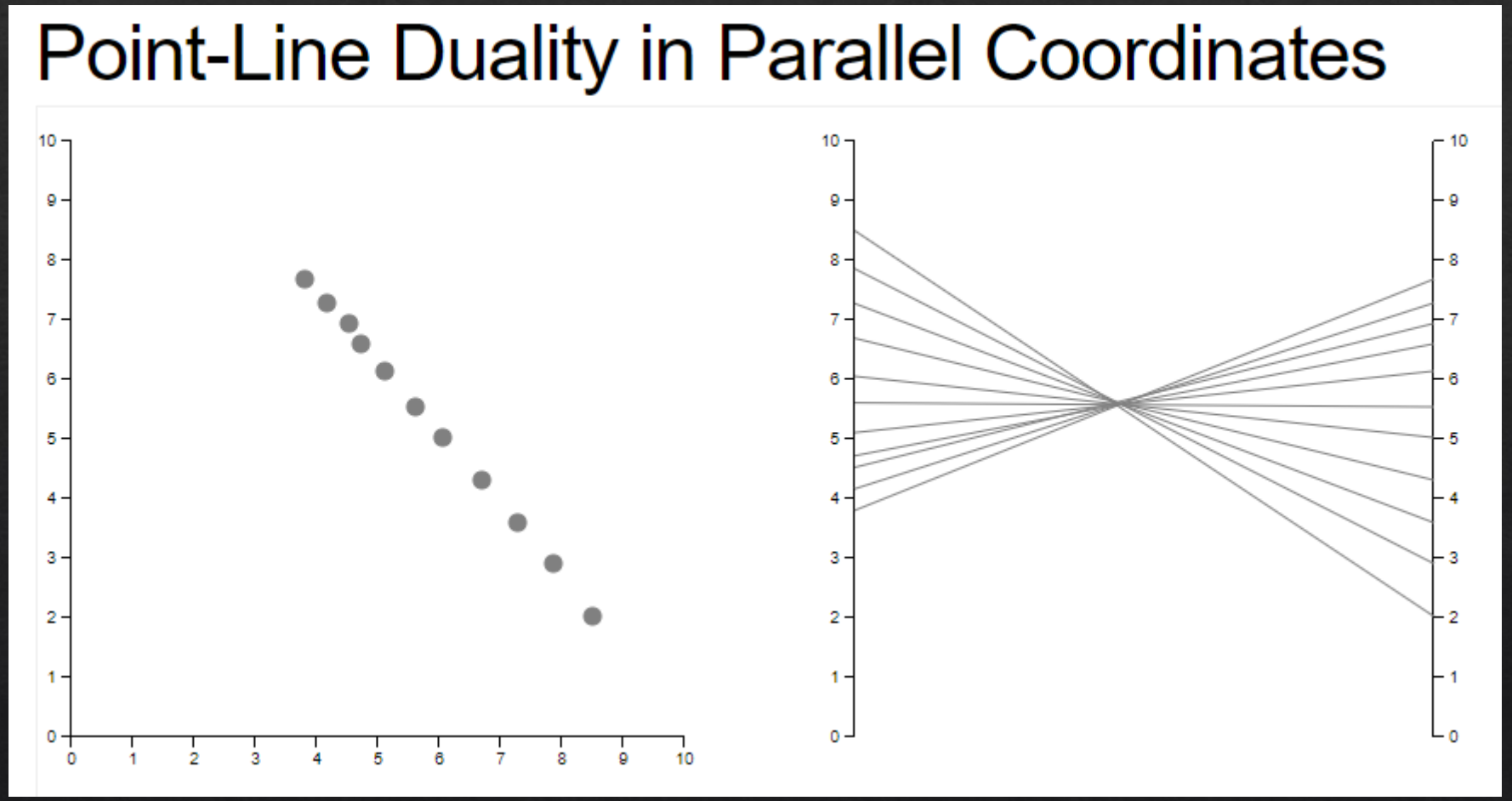
Background Concept: Point-Line Duality

The point-line duality is the most fundamental concept for parallel coordinates (Inselberg, 1985)

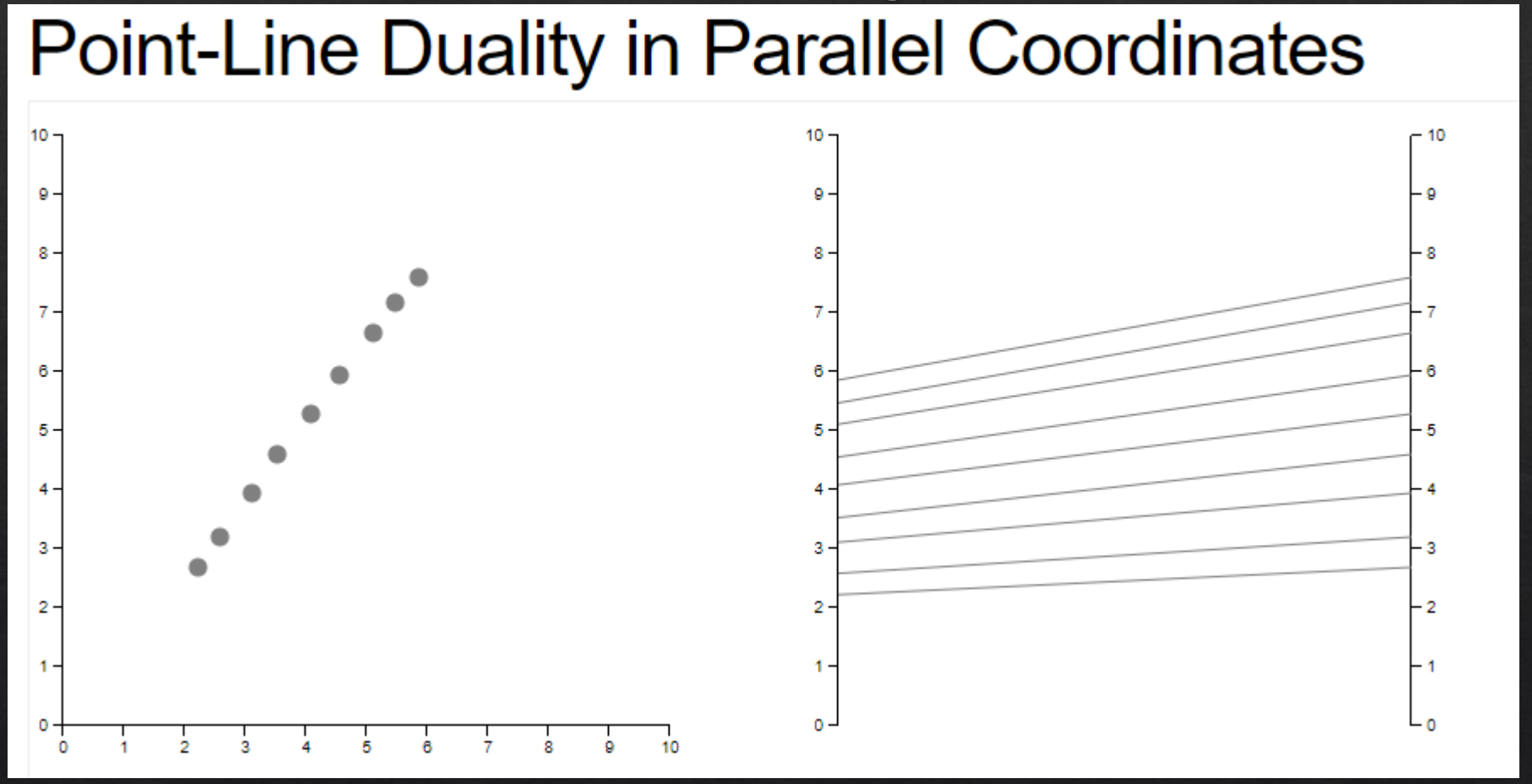


http://students.cec.wustl.edu/~tdeck/duality/

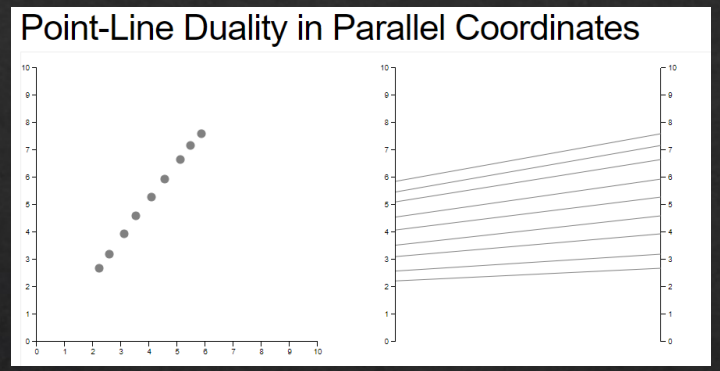
Background Concept: Point-Line Duality

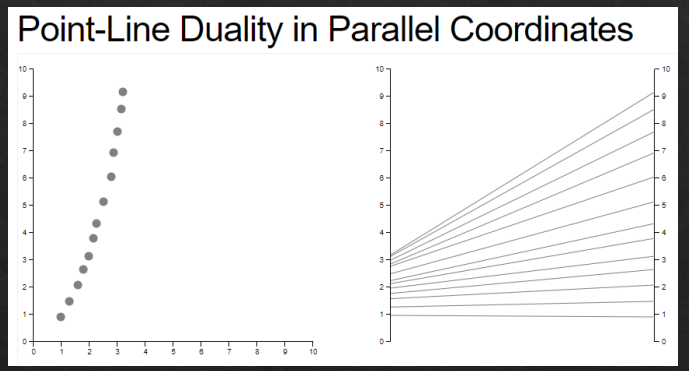


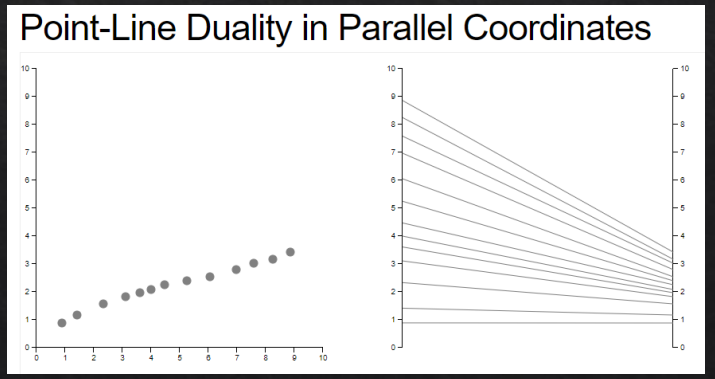
Background Concept: Point-Line Duality



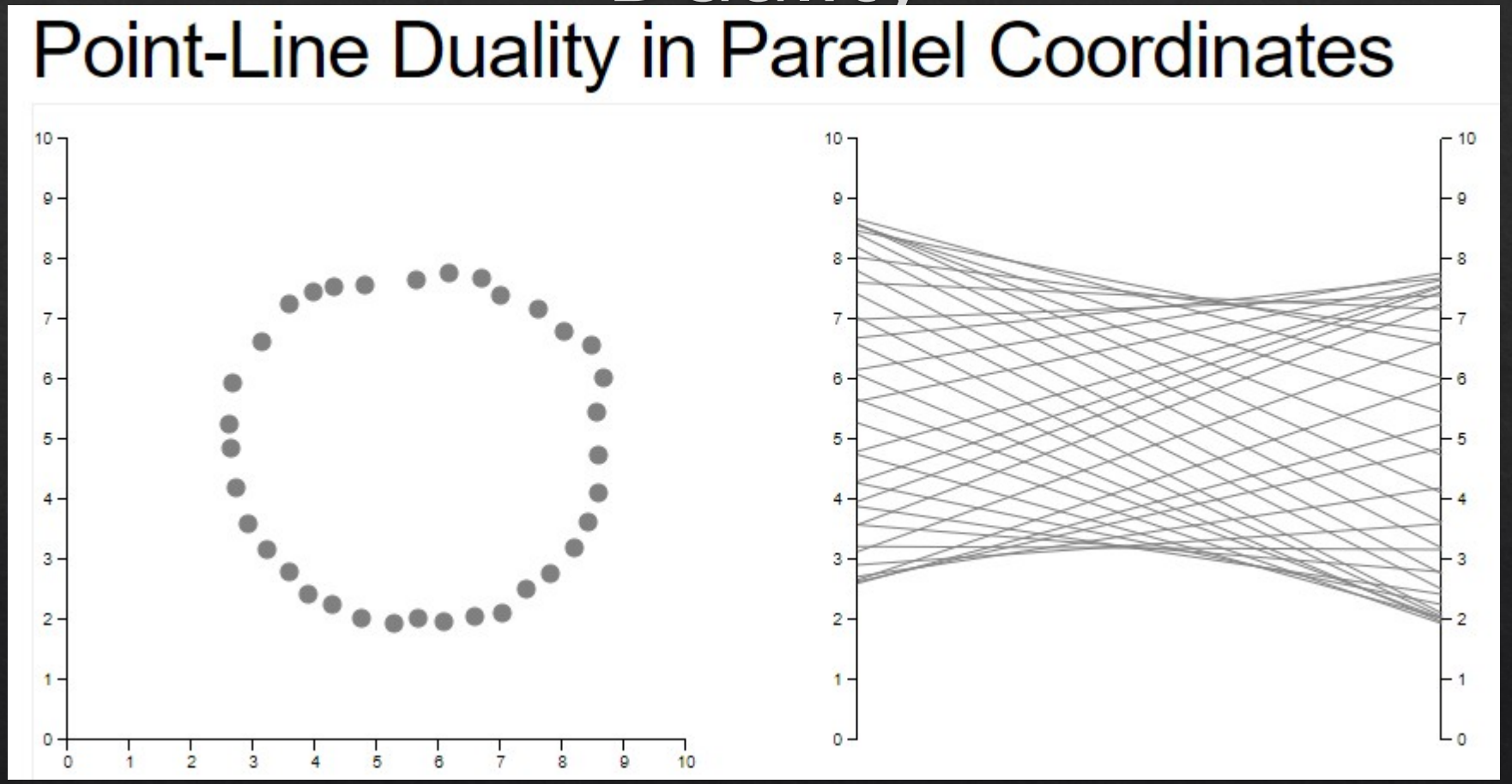
Background Concept: Point-Line Duality



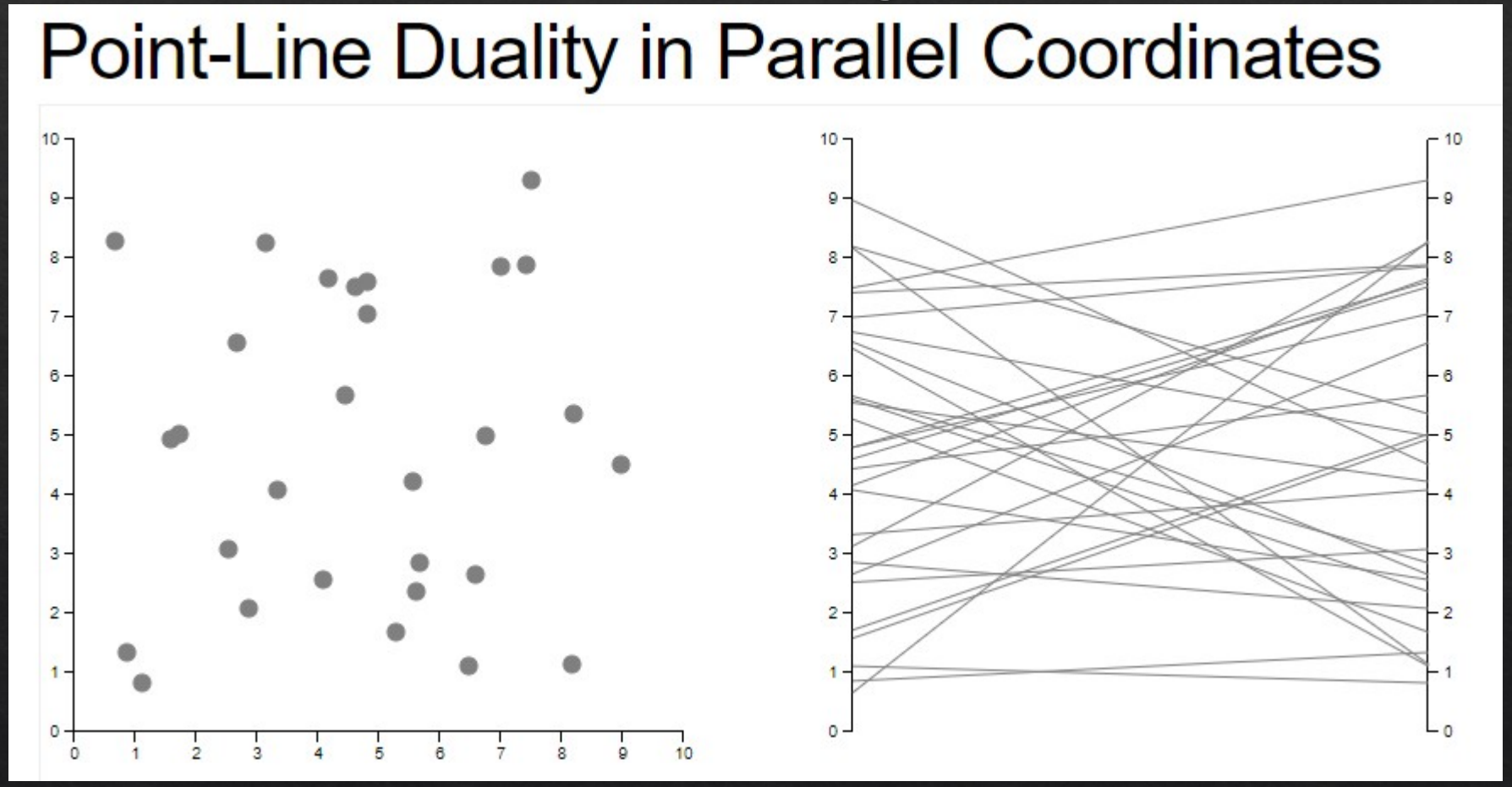




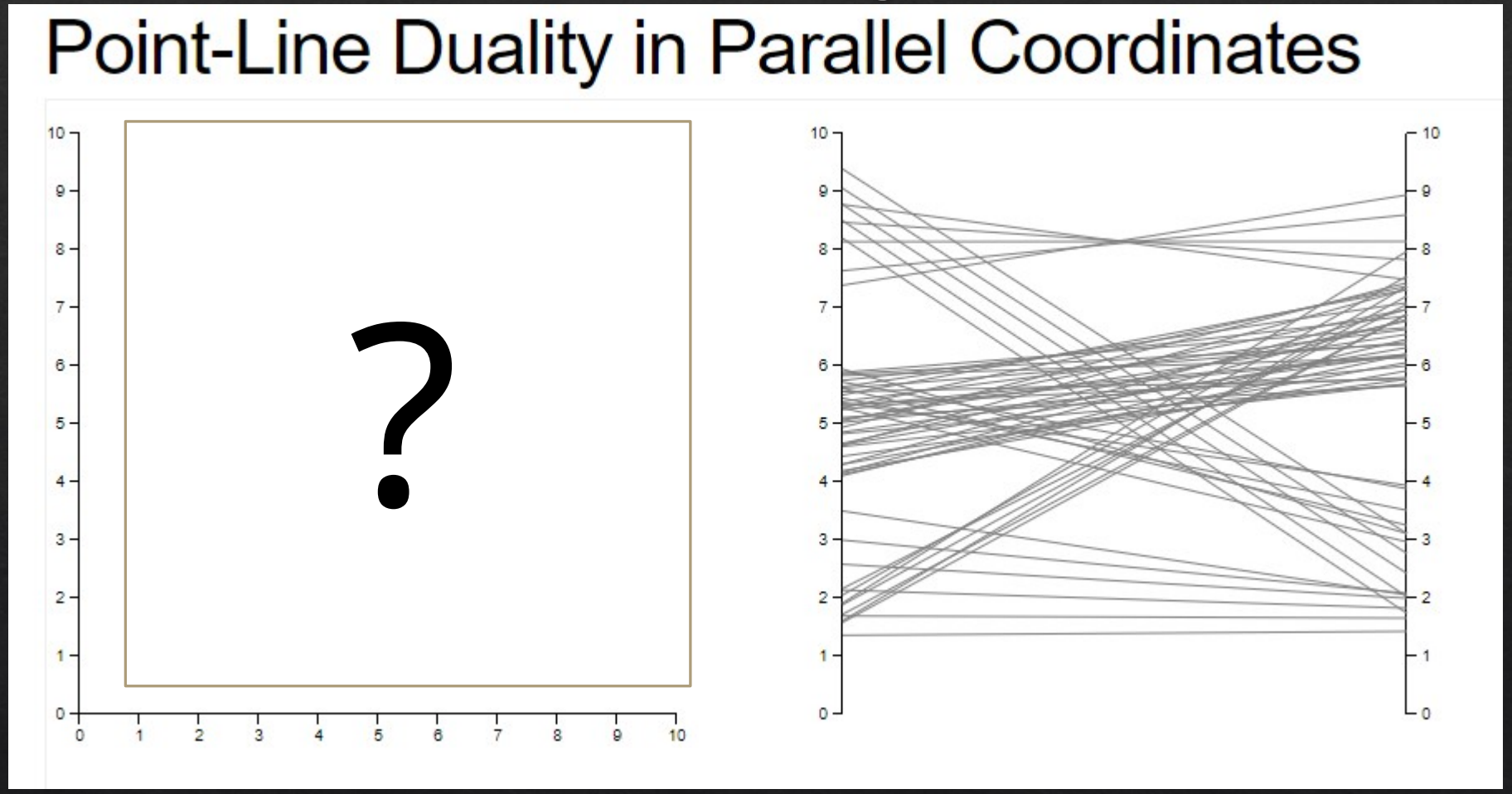
Background Concept: Point-Line Duality



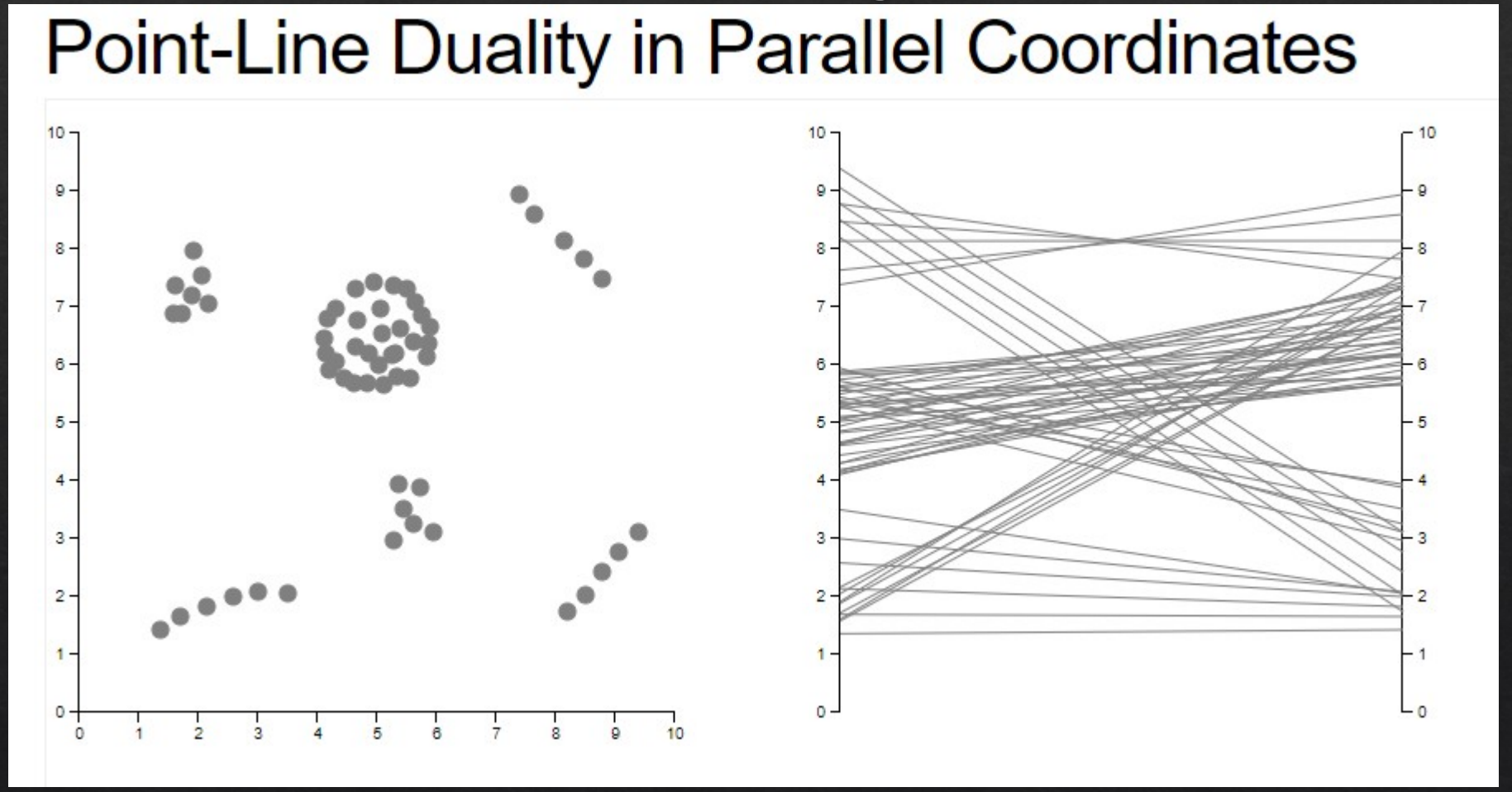
Background Concept: Point-Line Duality



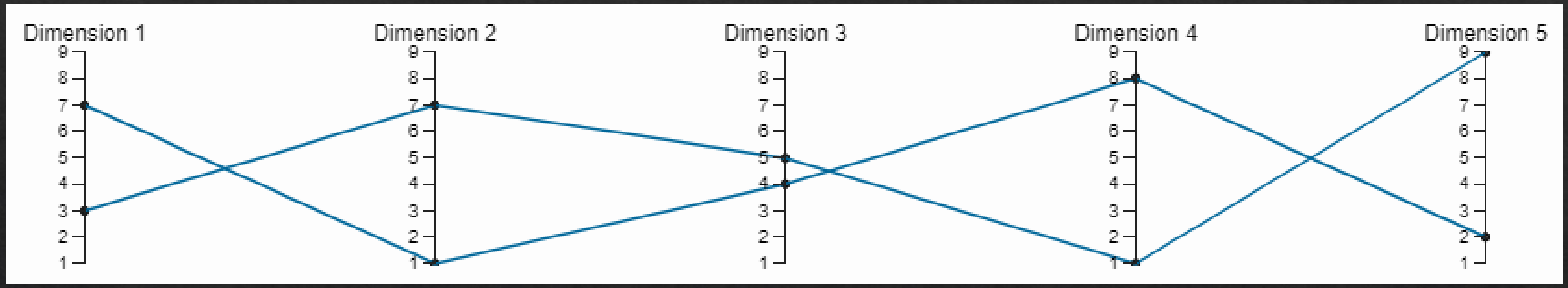
Background Concept: Point-Line Duality



Background Concept: Point-Line Duality



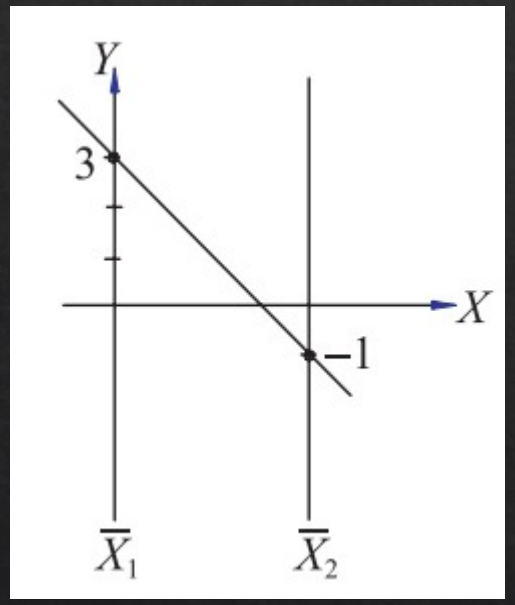
Parallel Coordinates



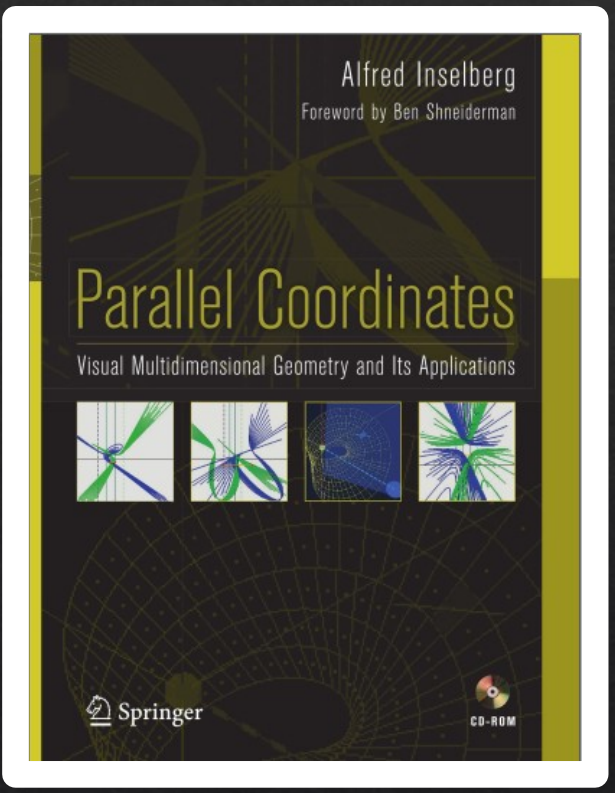
Fundamental ideas of parallel coordinates:

1. axes are drawn in parallel.
2. points are represented by lines.

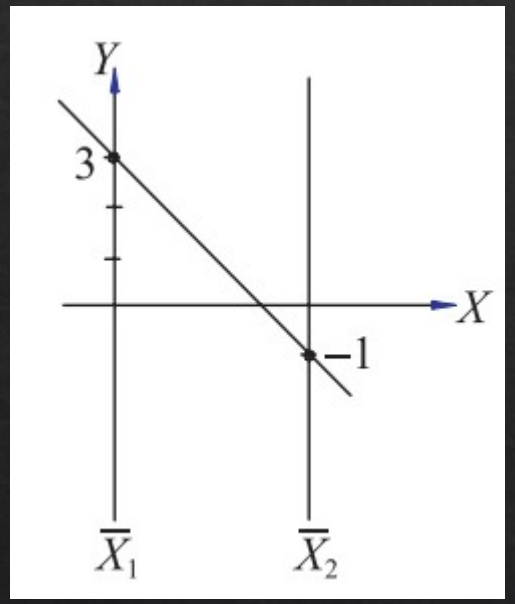
Brief Overview of Another Deep Theory



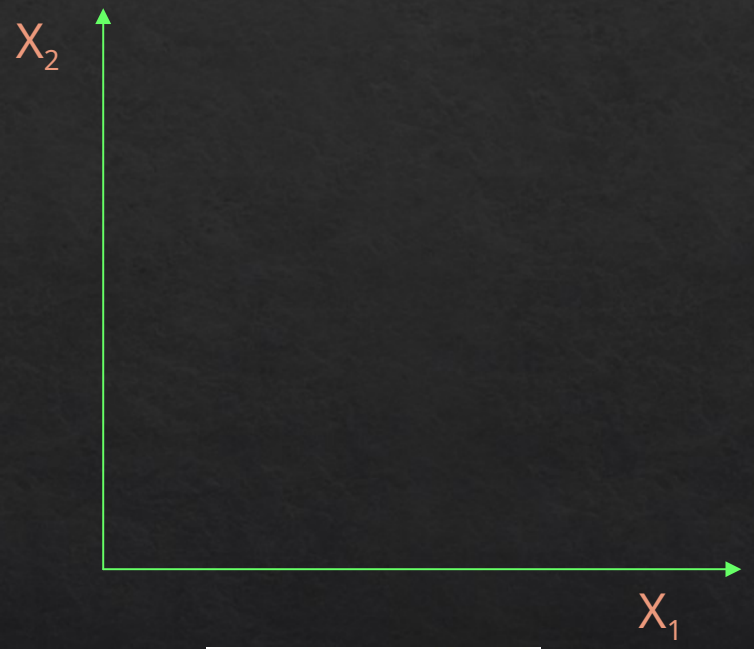
y = m x + b



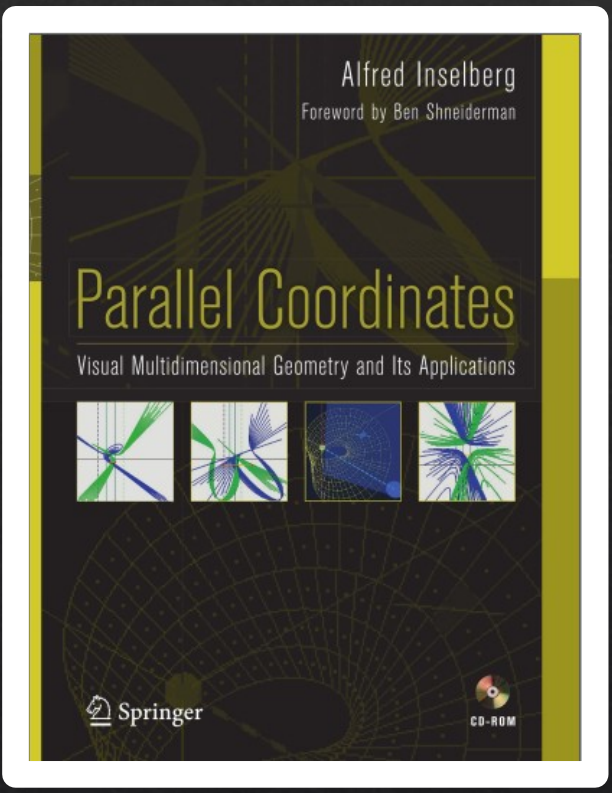
Brief Overview of Another Deep Theory



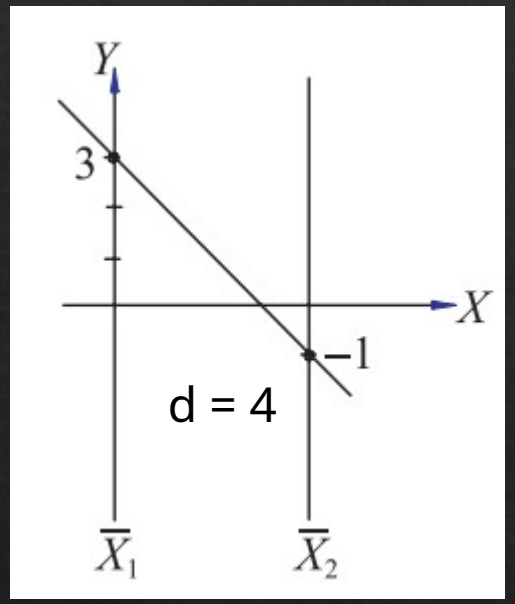
y = -x + 3
m = -1
b = 3



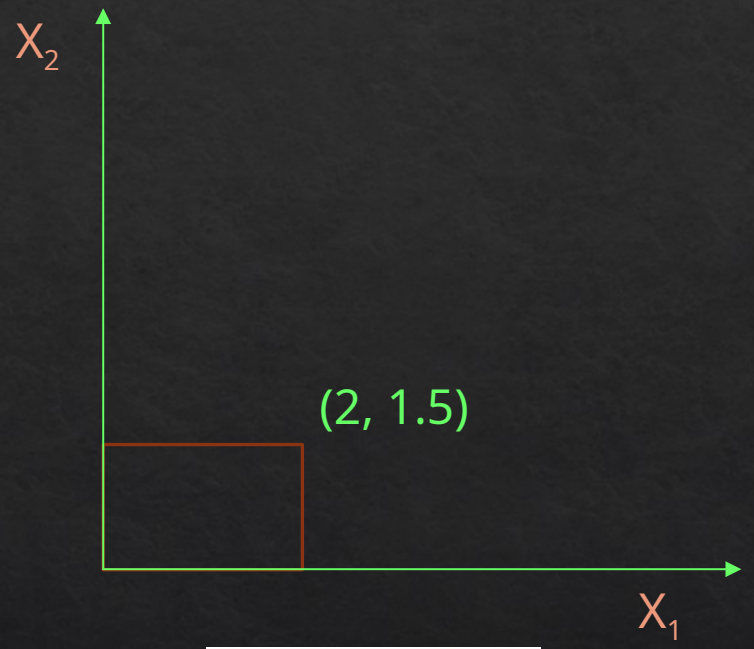
$$\left(\frac{d}{1-m}, \frac{b}{1-m}\right)$$



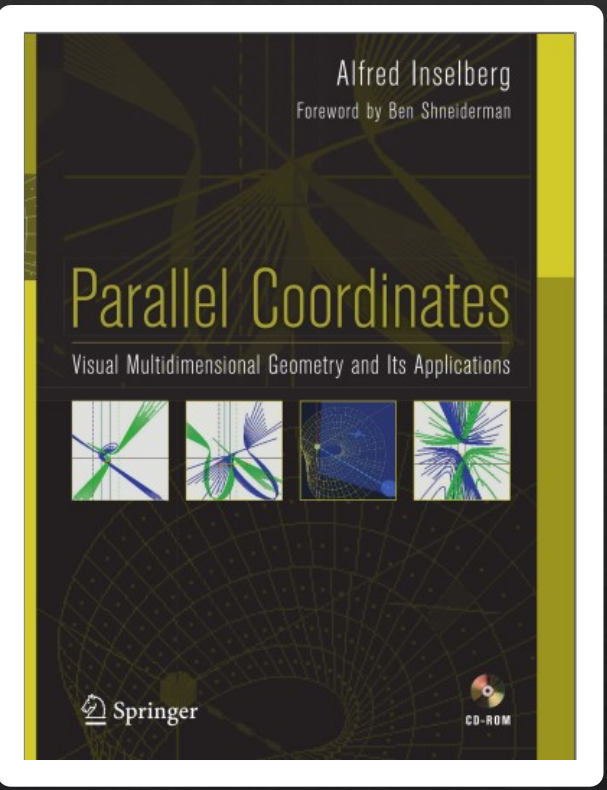
Brief Overview of Another Deep Theory



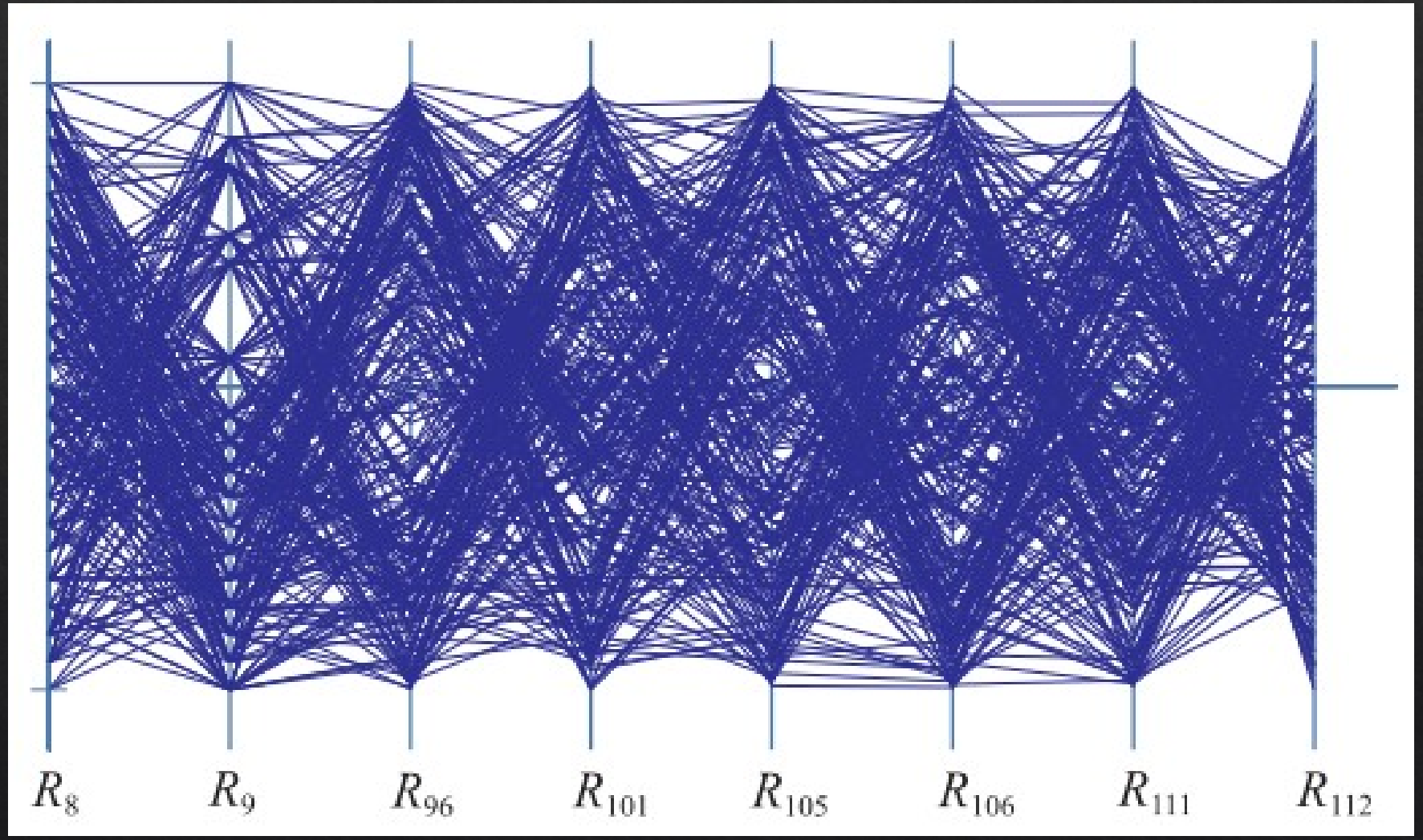
y = -x + 3
m = -1
b = 3



$$\left(\frac{d}{1-m}, \frac{b}{1-m}\right)$$



Parallel Coordinates: Industry Example



Top Hat Q3.3:

Can **Parallel Coordinate** Handle BigData?

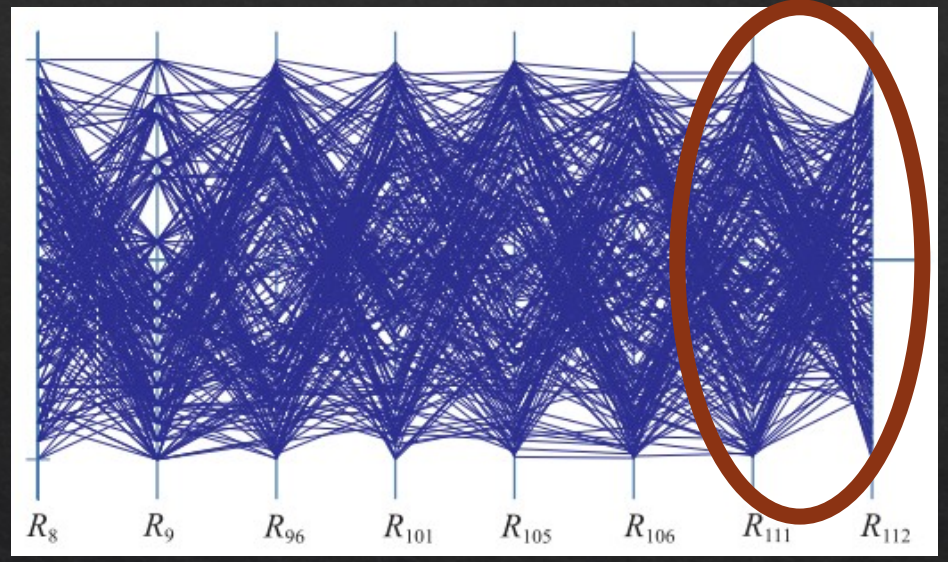
A. Lots of data lots of lines nothing visible

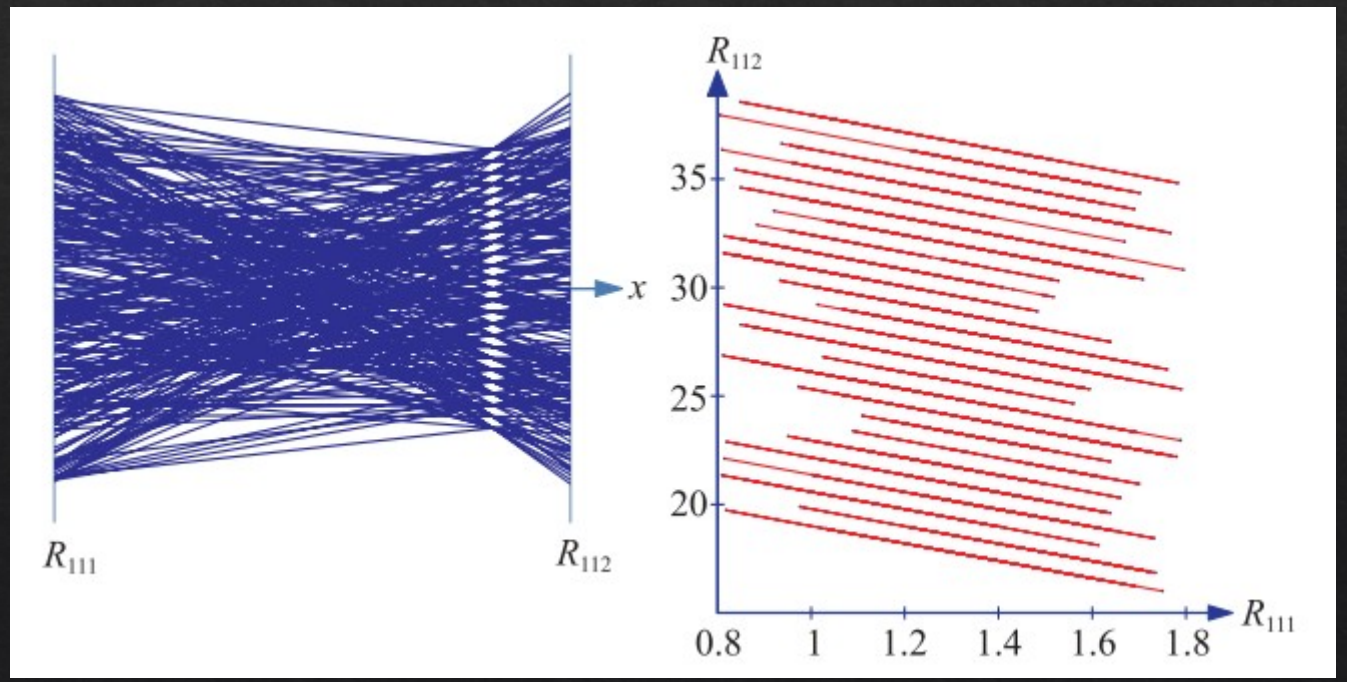
B. Dimensions are parallel never run out of space!

C. Pattern – if visible – is only between the adjacent dimensions

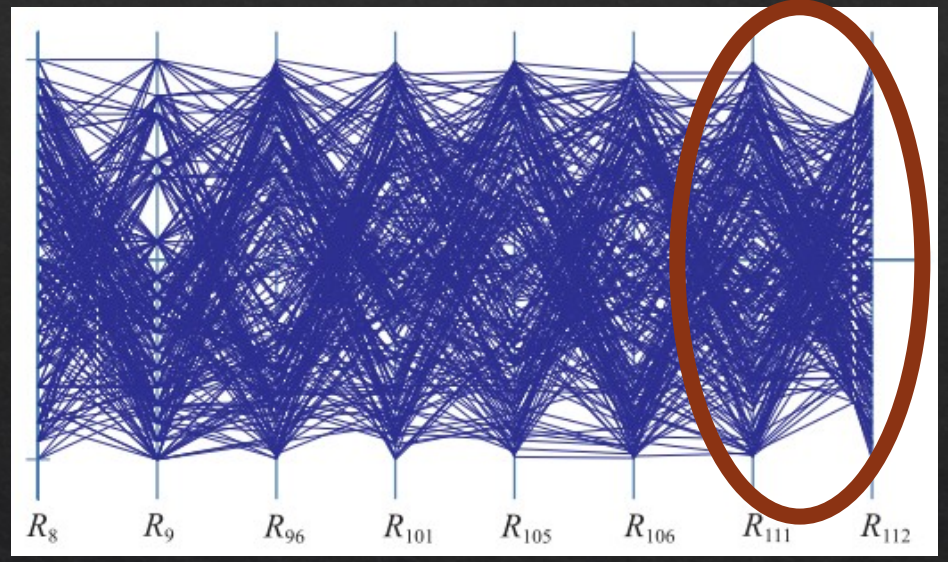
D. All the above are true

Parallel Coordinates: Industry Example

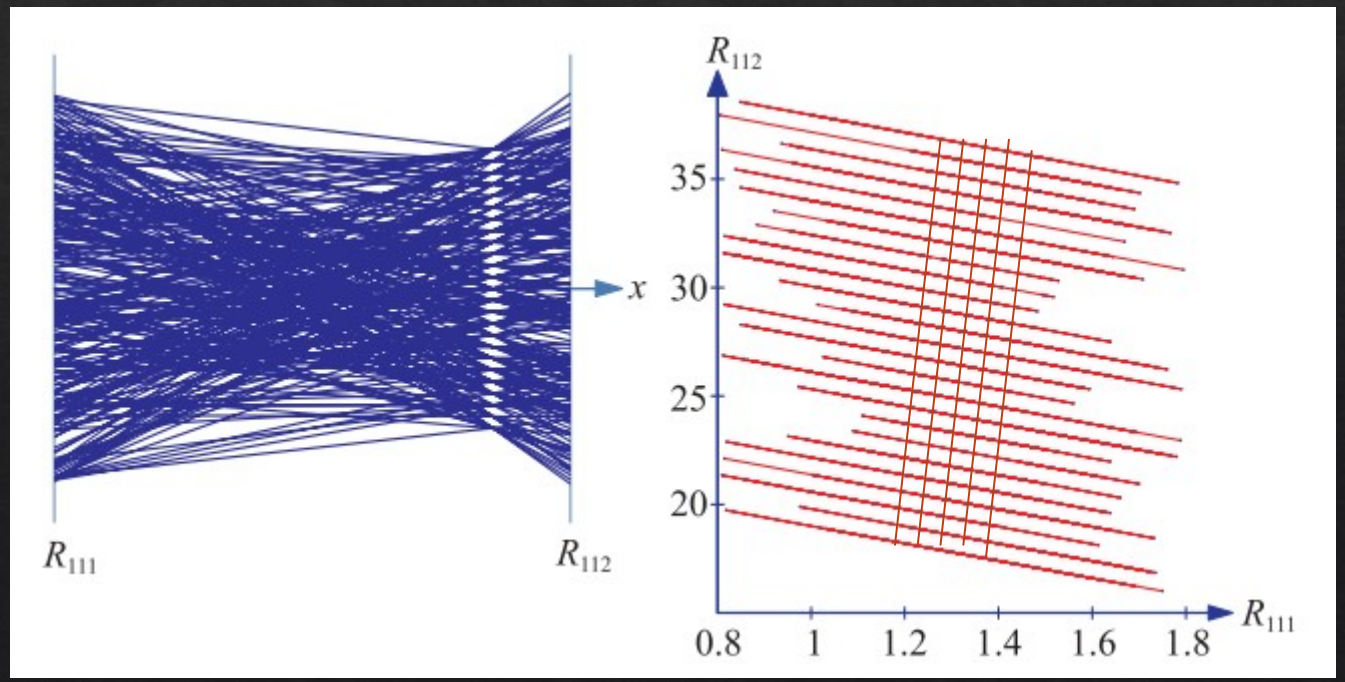




Parallel Coordinates: Industry Example



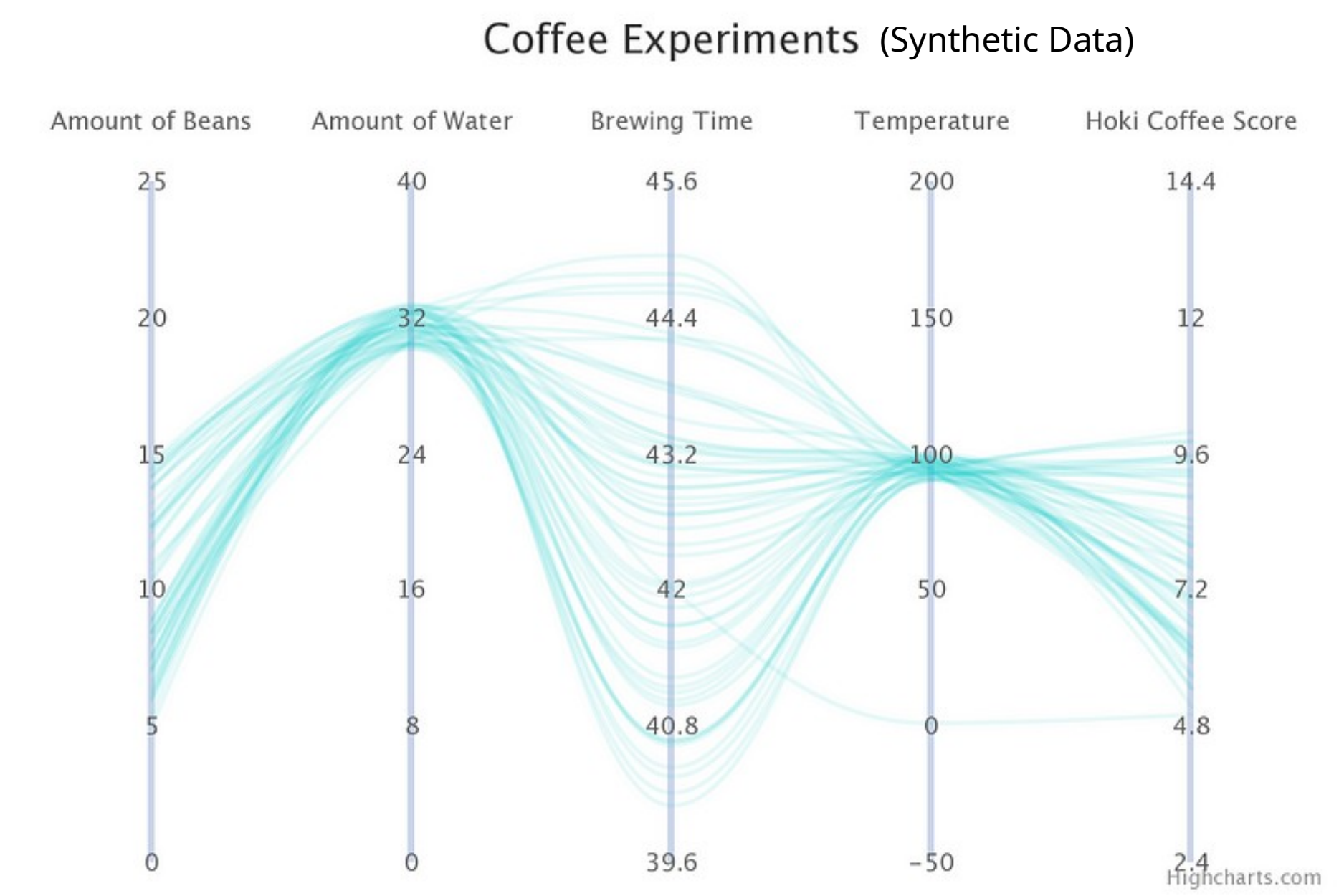
Is there a missing parameter?



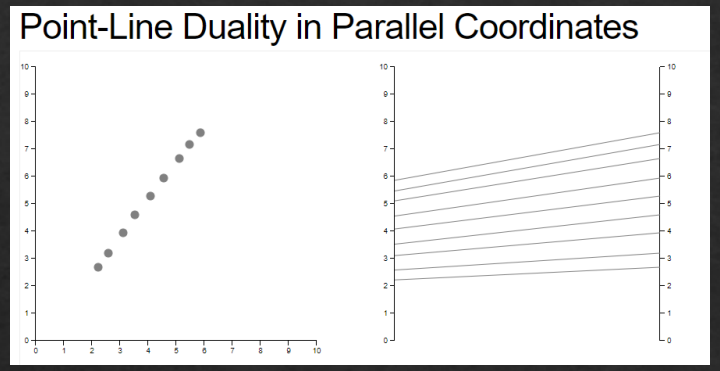
Class Activity:

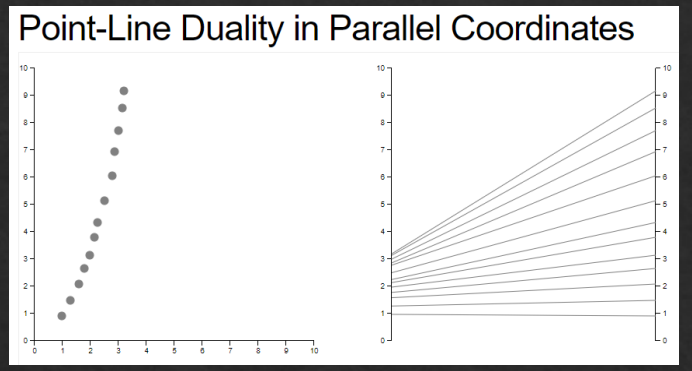
Can you find any useful information from this plot?

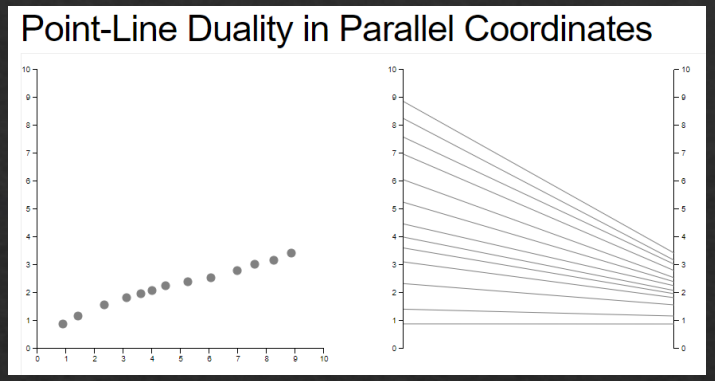
- If so, please write it down.
- If not, how could you improve the plot?

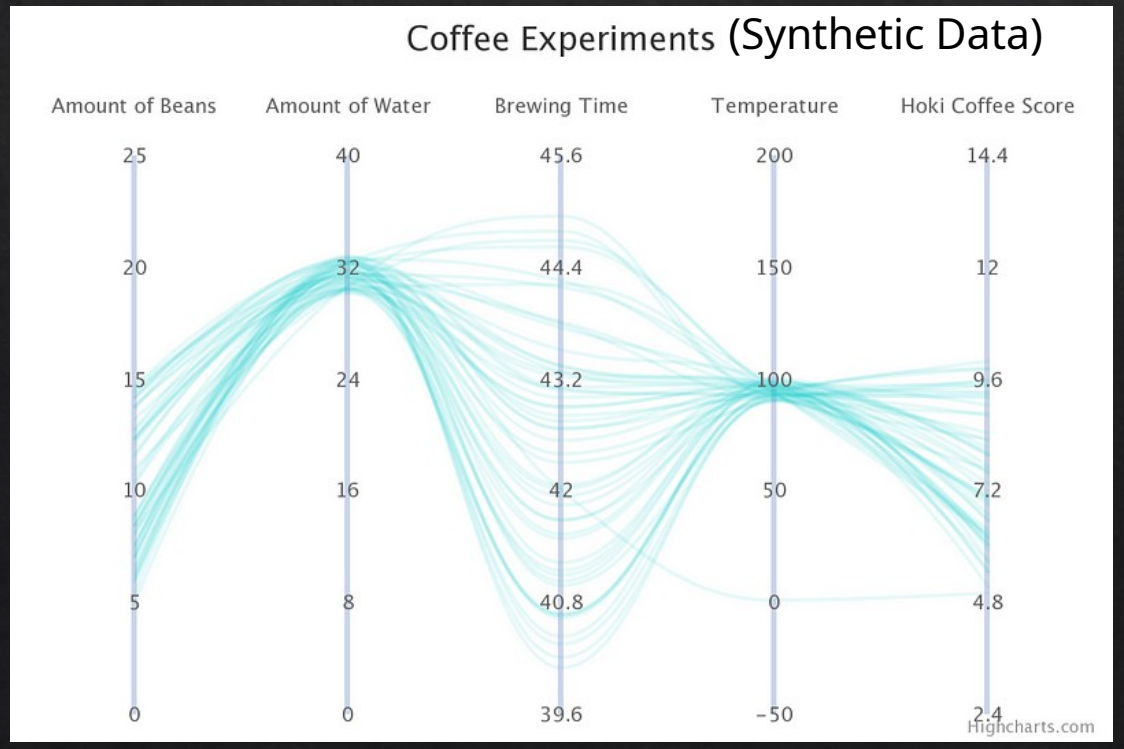


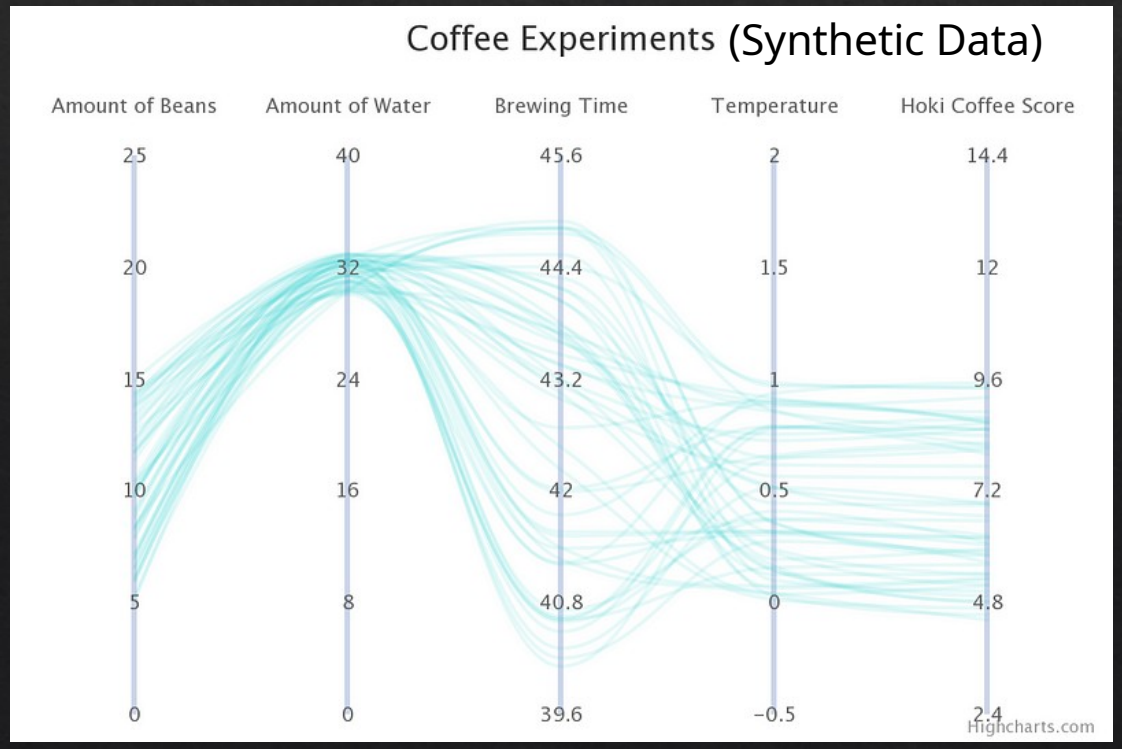
Scale Matters





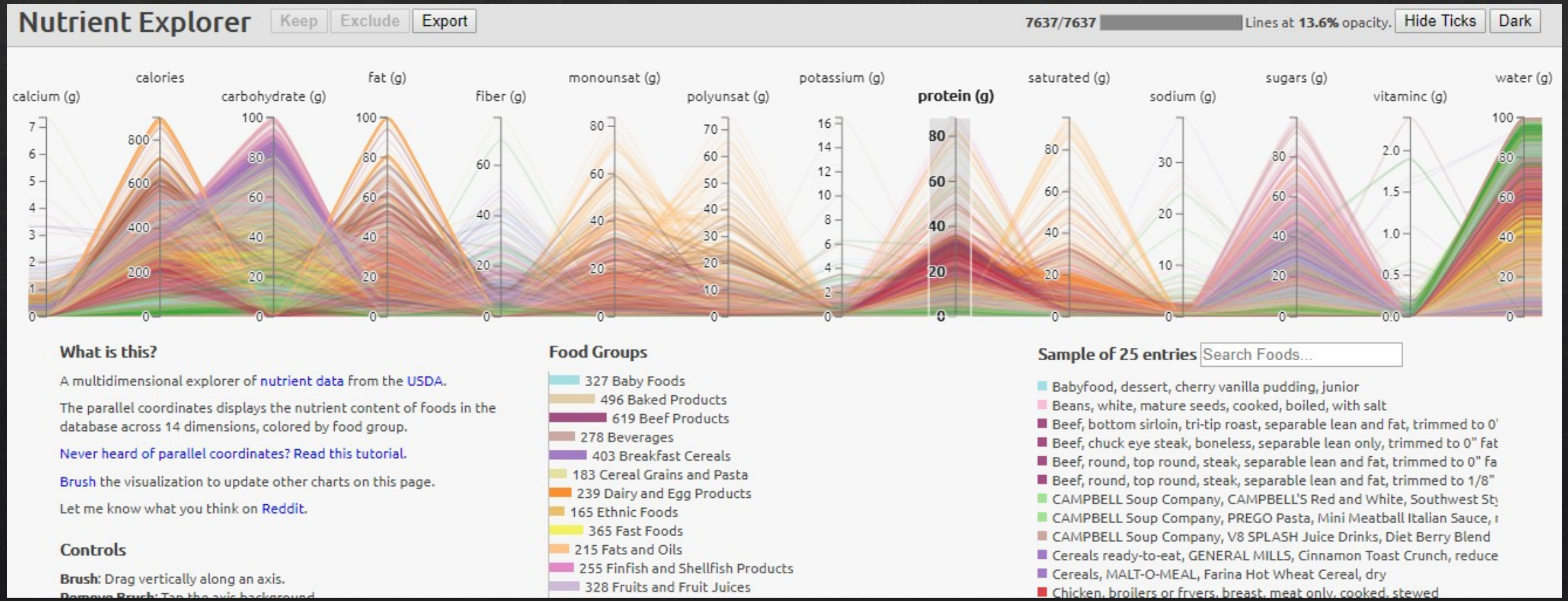




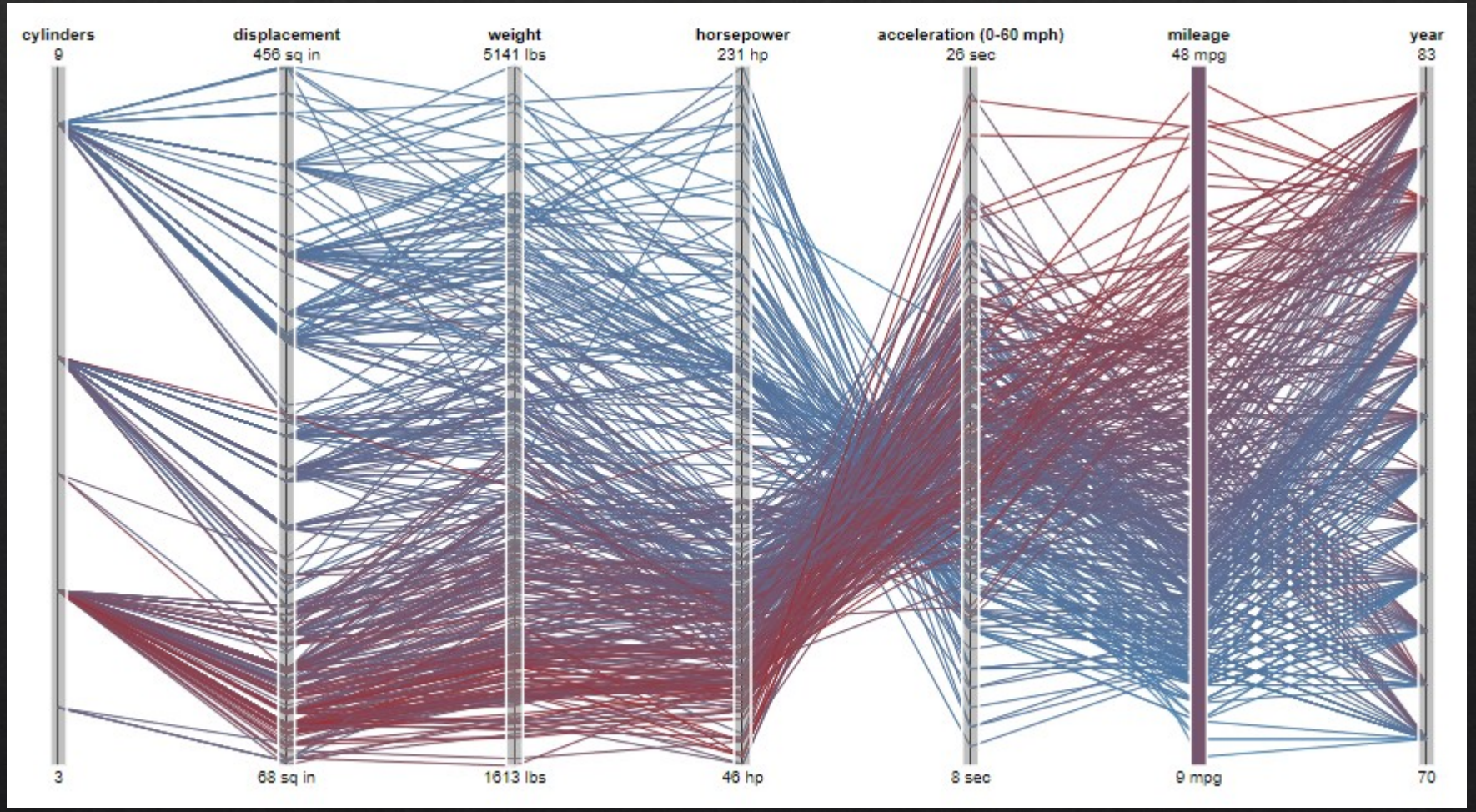


Interaction: Brushing & Sliding

https://gist.github.com/syntagmatic/c9fb69e425a3c07cfbd09169941fbf46



Interaction: Brushing & Sliding



http://mbostock.github.io/protovis/ex/cars.html

Limitations

Lots of over-plotting can make it impossible to read

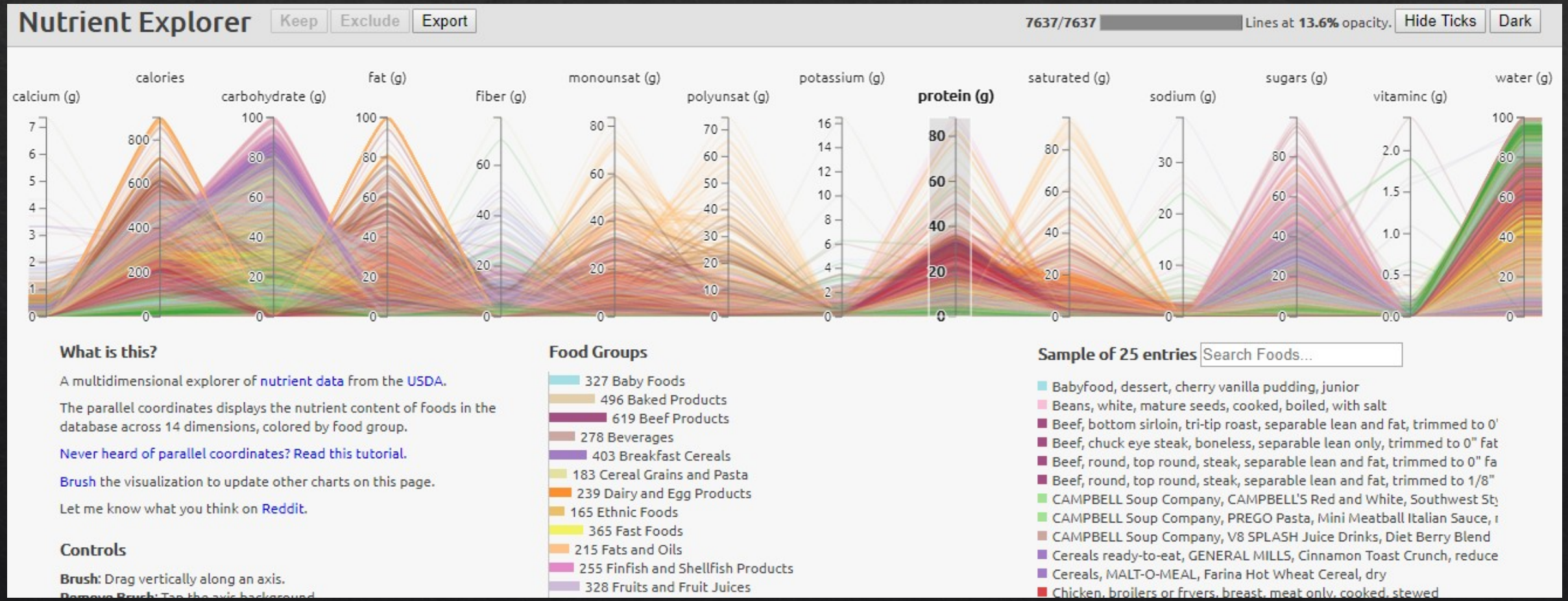
Number of dimensions on screen also needs to be below about a dozen

A few thousand records.

The data needs to be numerical.

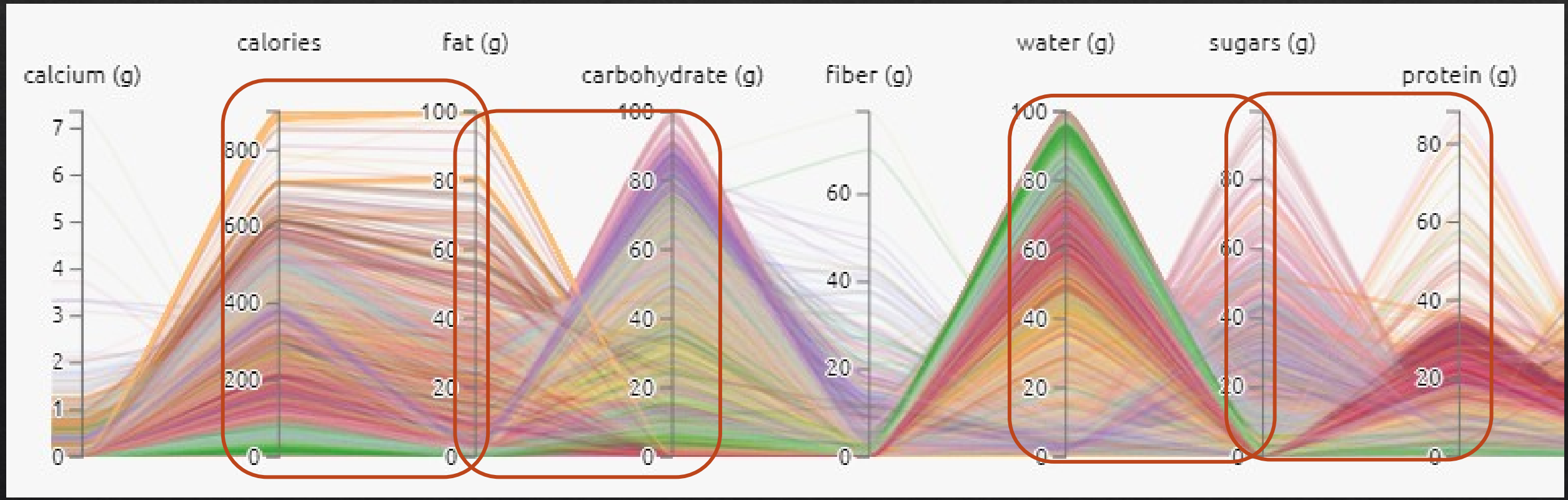
Example: Nutrient Explorer

https://gist.github.com/syntagmatic/c9fb69e425a3c07cfbd09169941fbf46

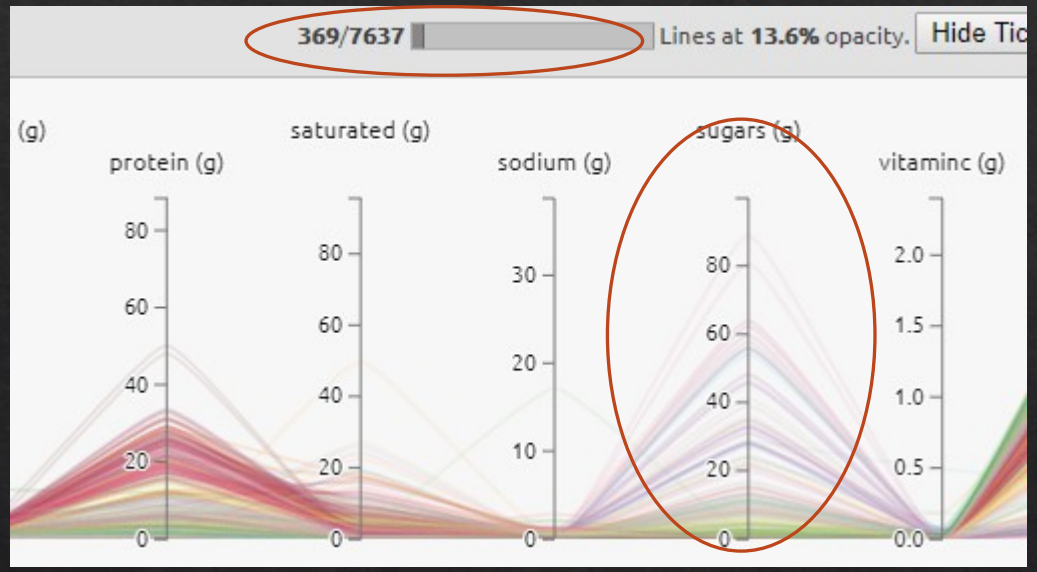


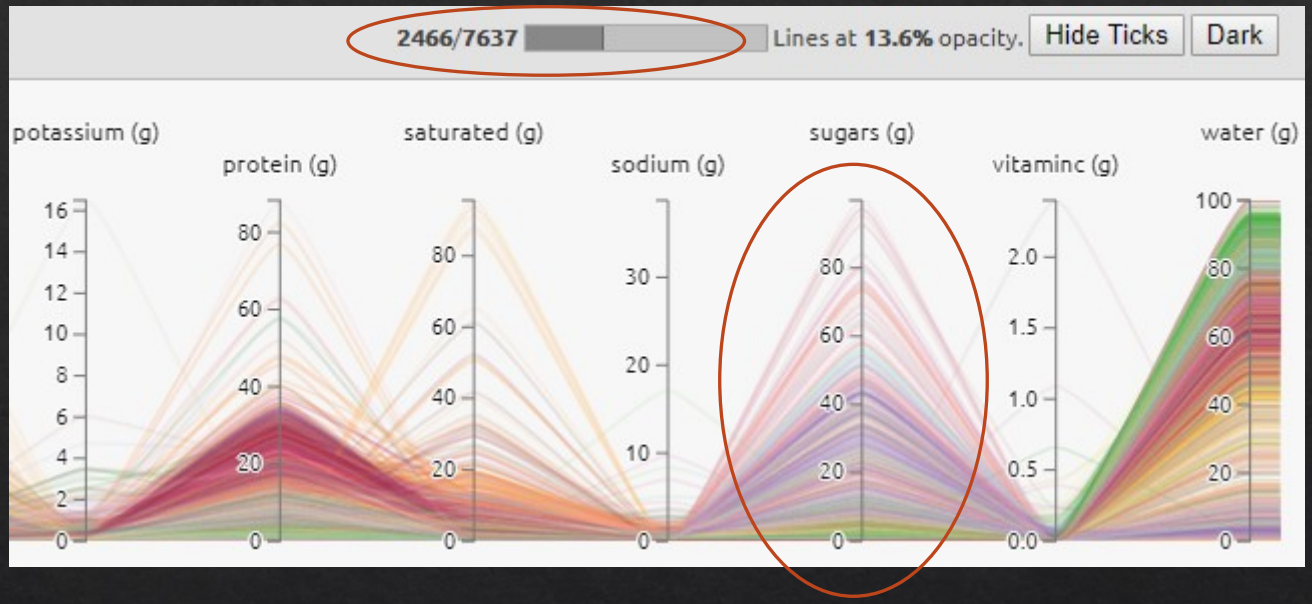
Example: Nutrient Explorer

https://gist.github.com/syntagmatic/c9fb69e425a3c07cfbd09169941fbf46



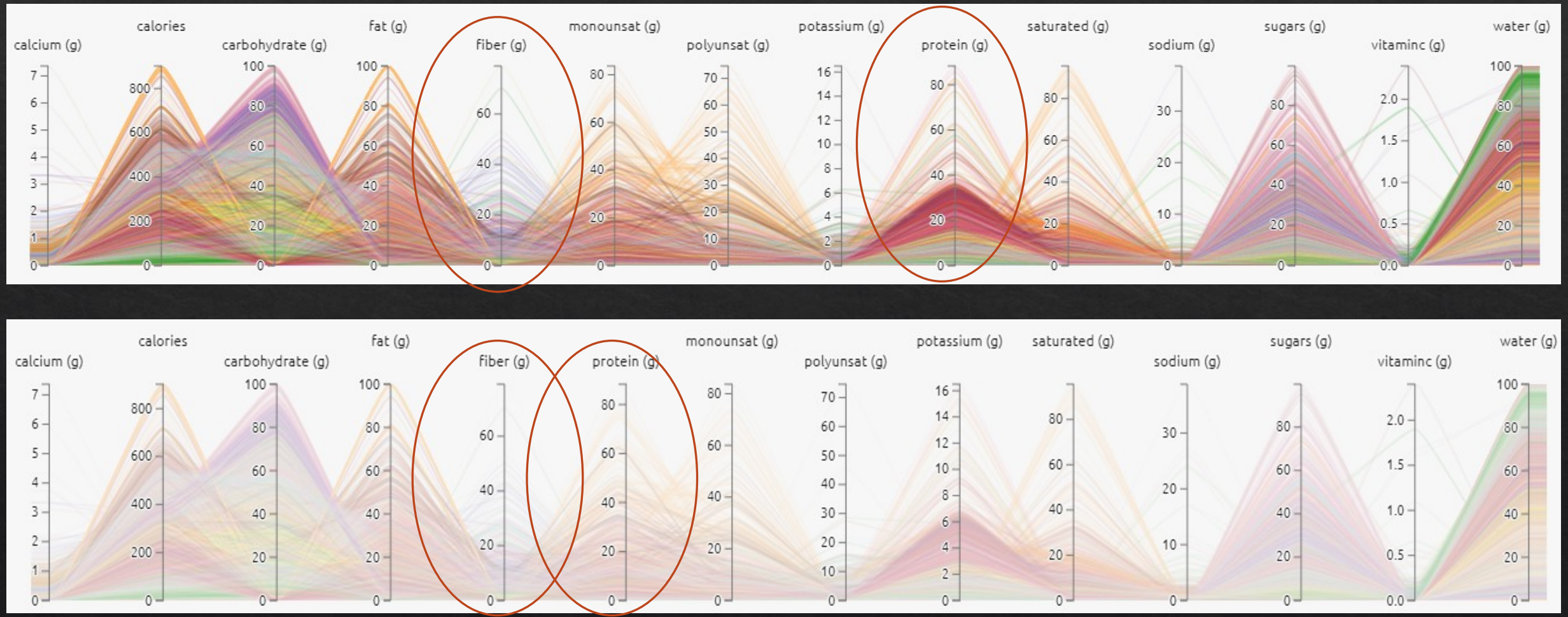
Progressive Rendering





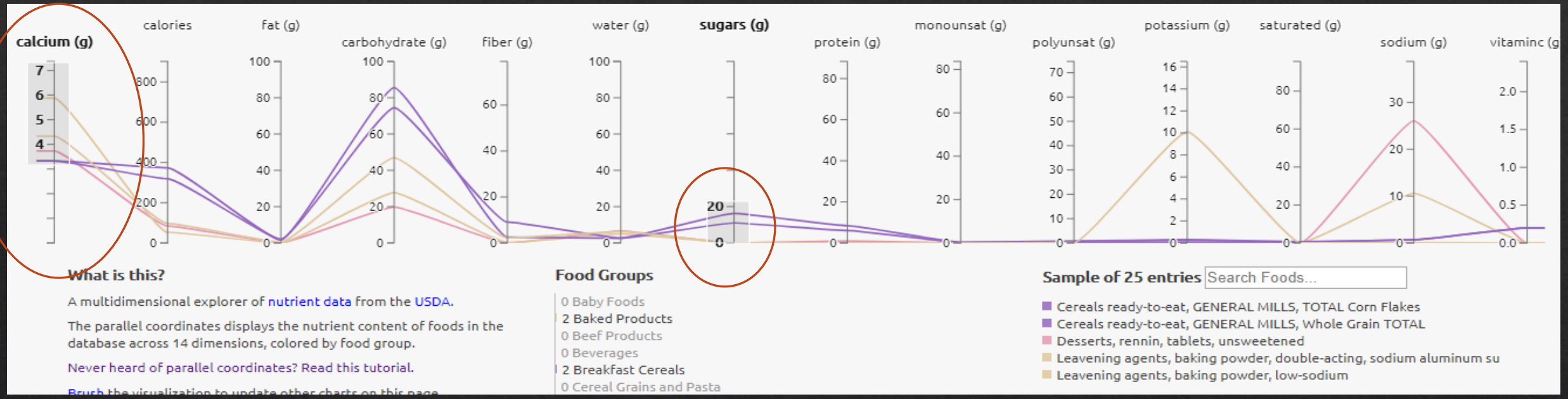
- Gives the user value
- Overkill if the dataset is small

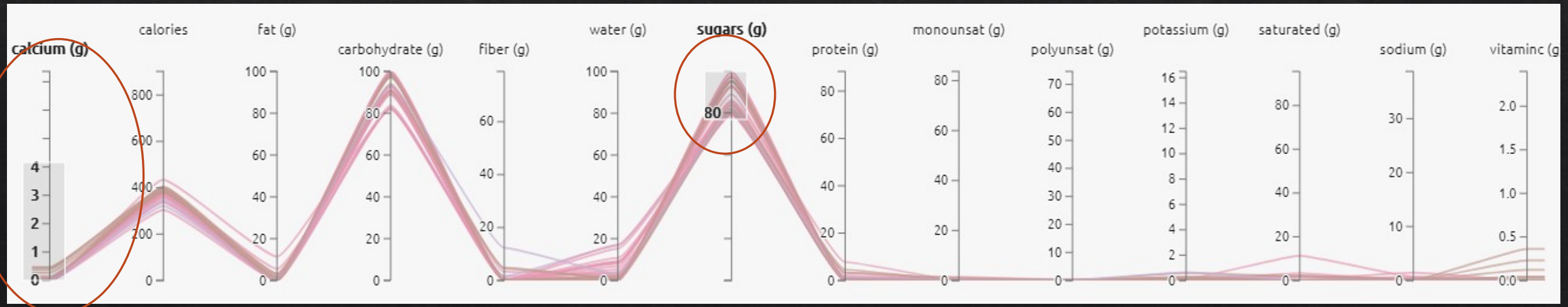
Interaction: Dragging Dimensions



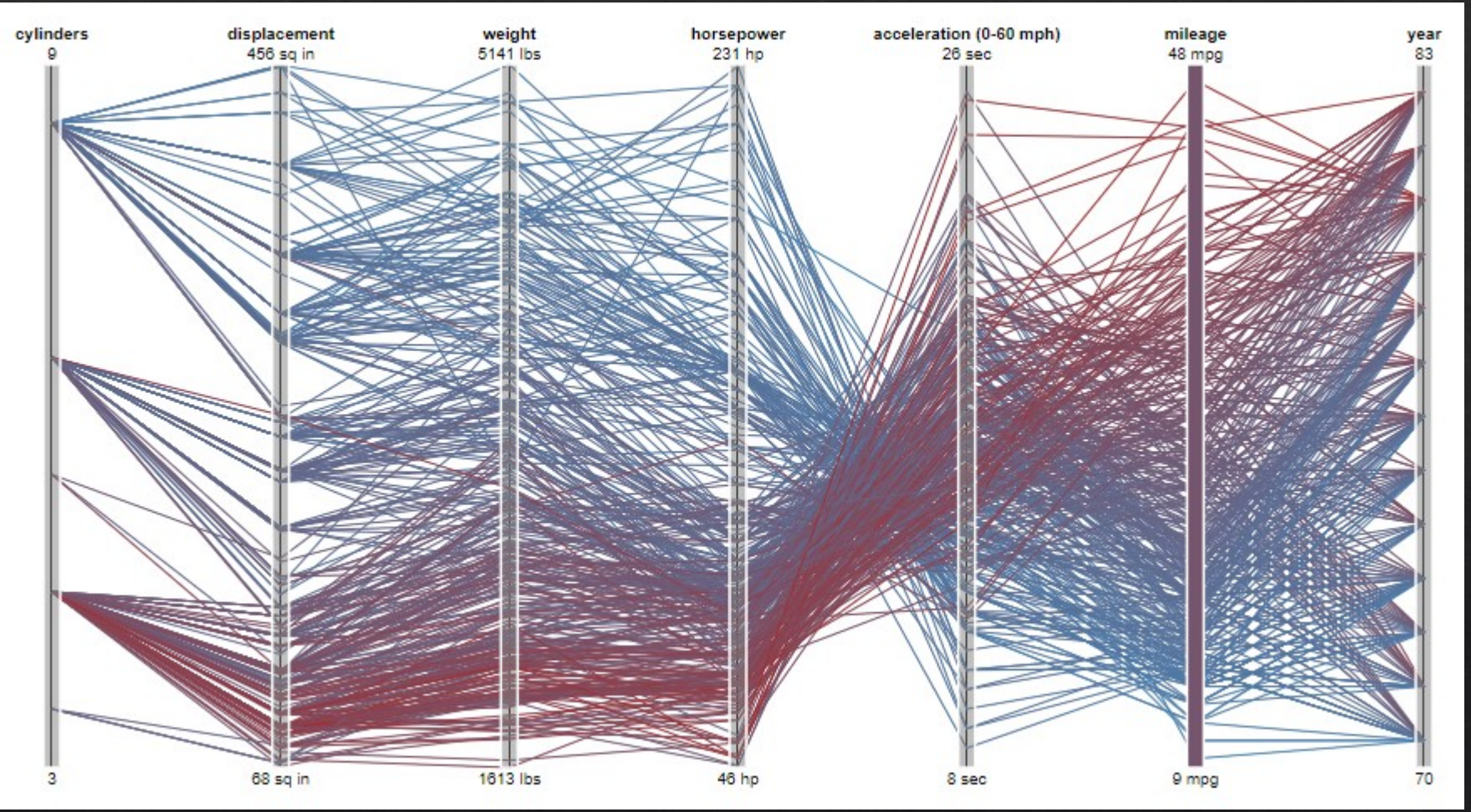
- Very Useful for Analyzing pairs of parameters

Interaction: Brushing & Sliding





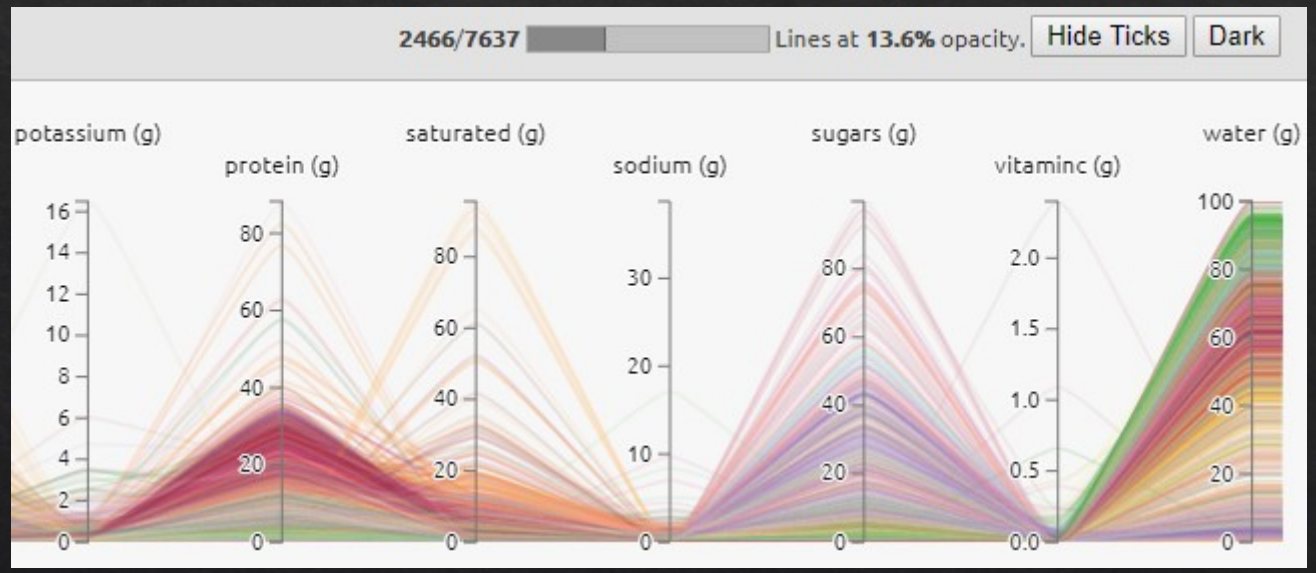
Interaction: Brushing & Sliding

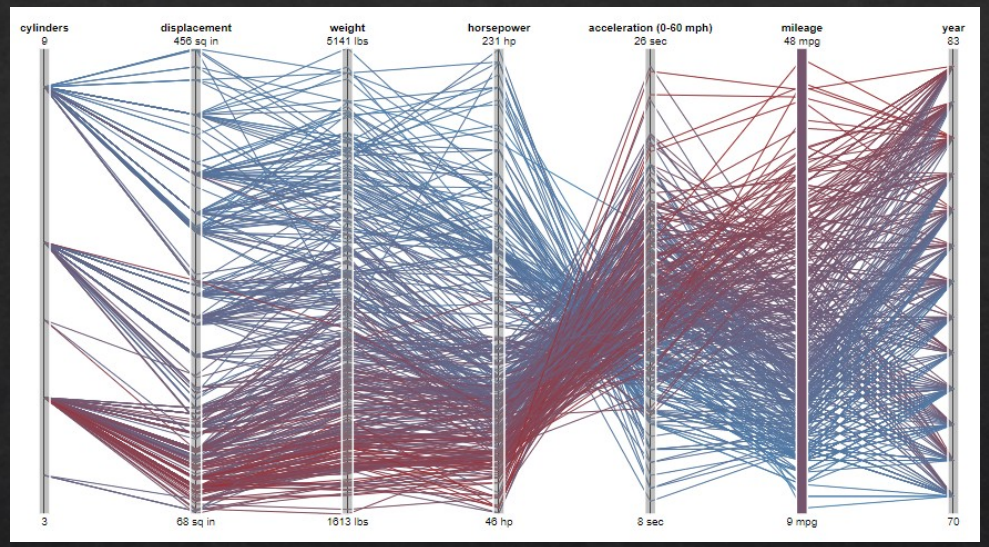


http://mbostock.github.io/protovis/ex/cars.html

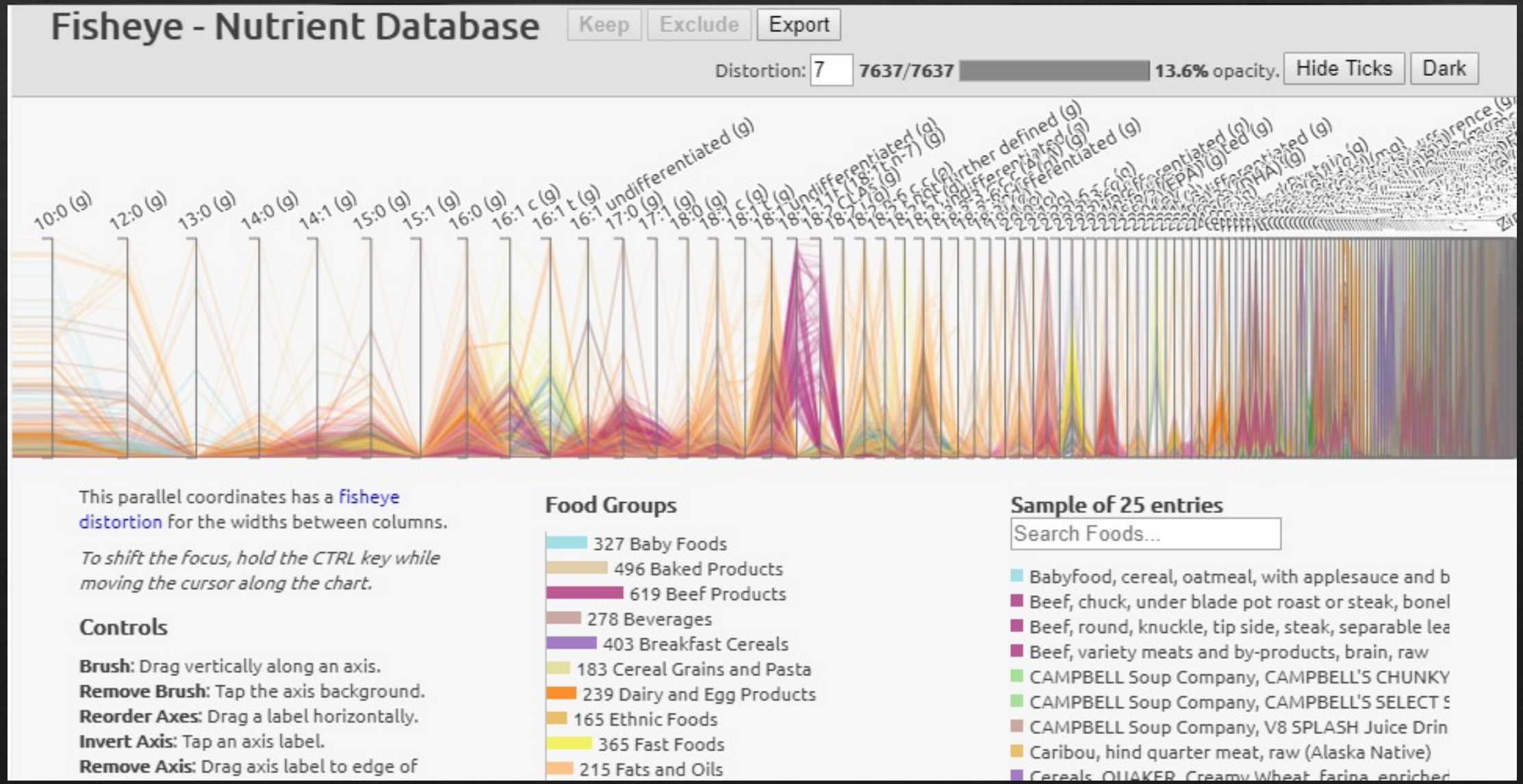
Curve vs Straight-Line

Which one you like? Why?

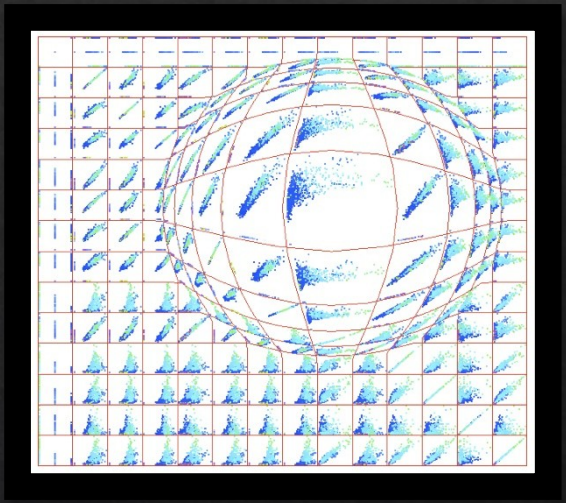


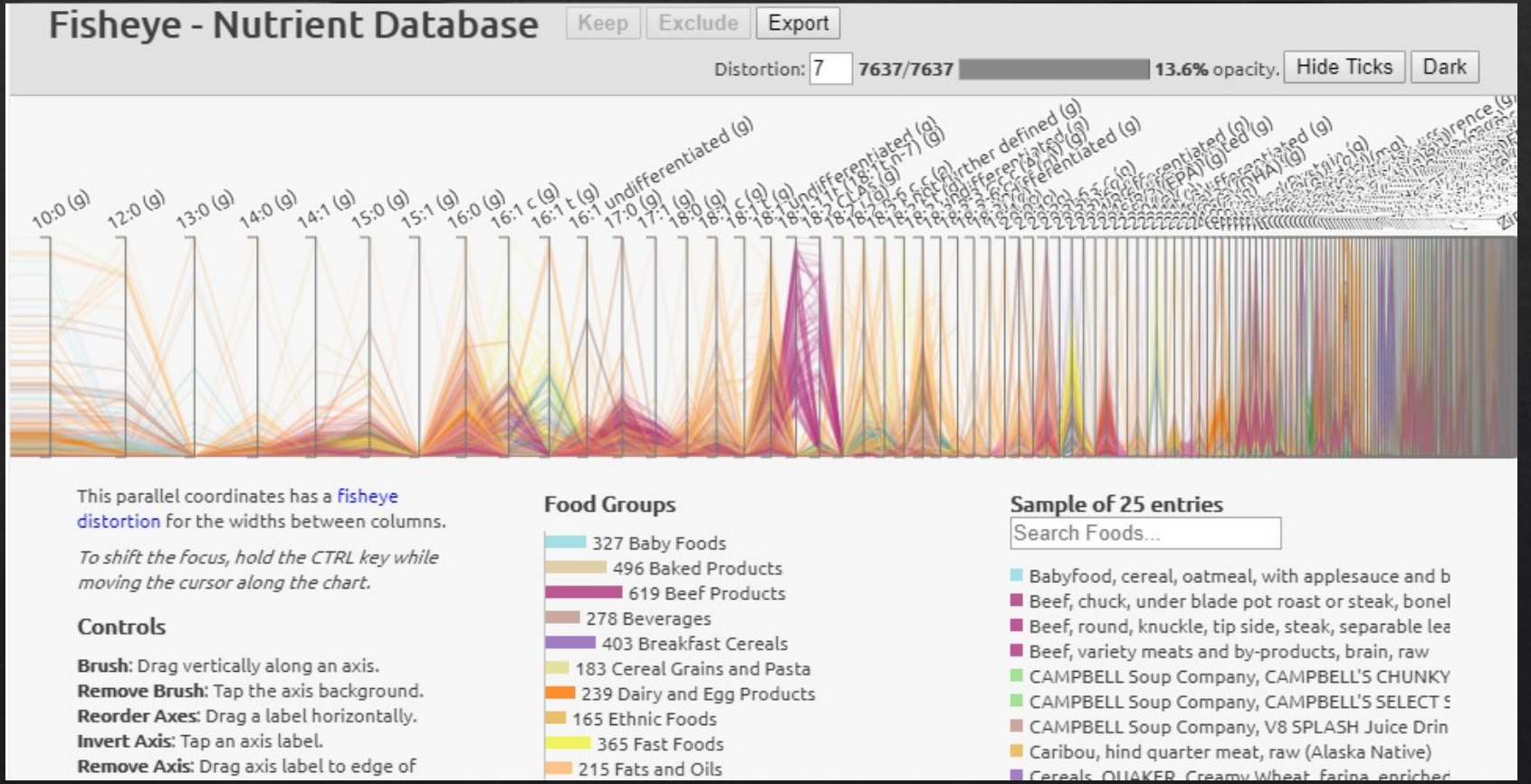


Fisheye Interaction

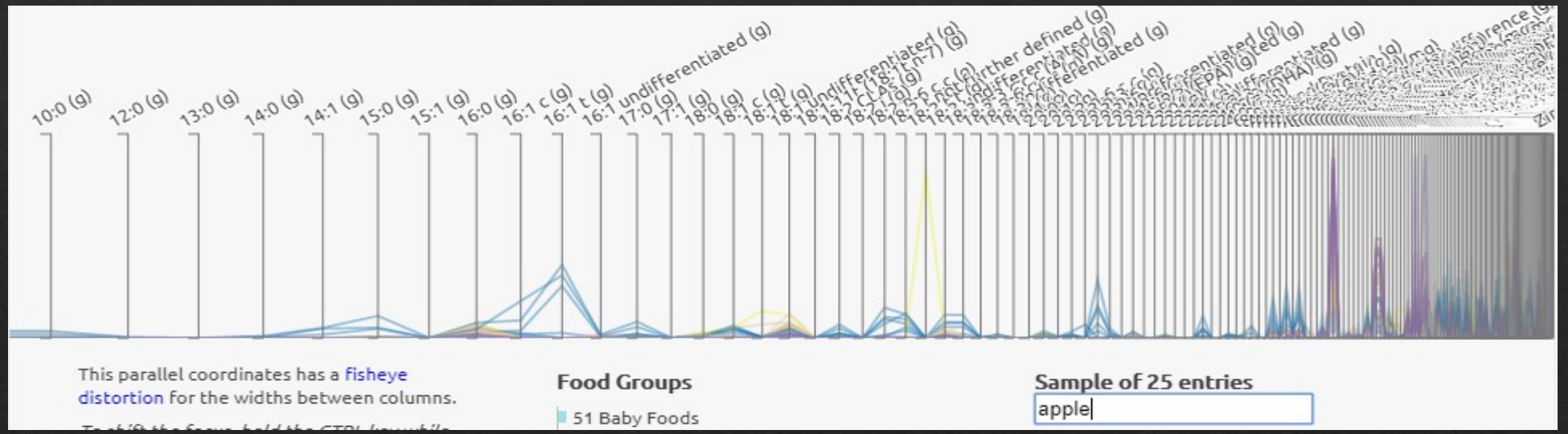


Fisheye Interaction

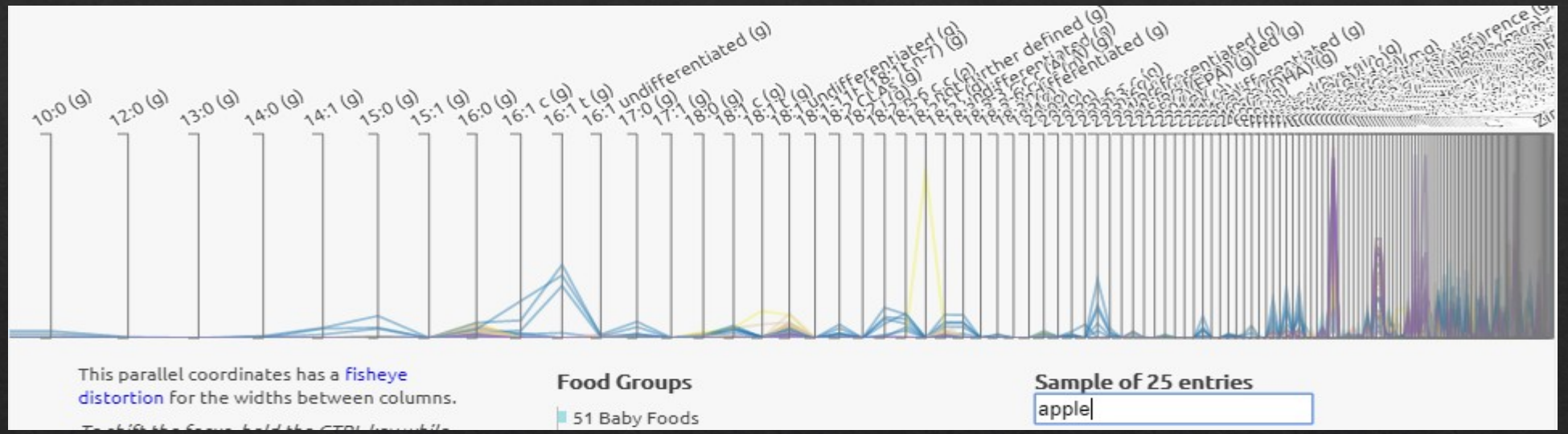


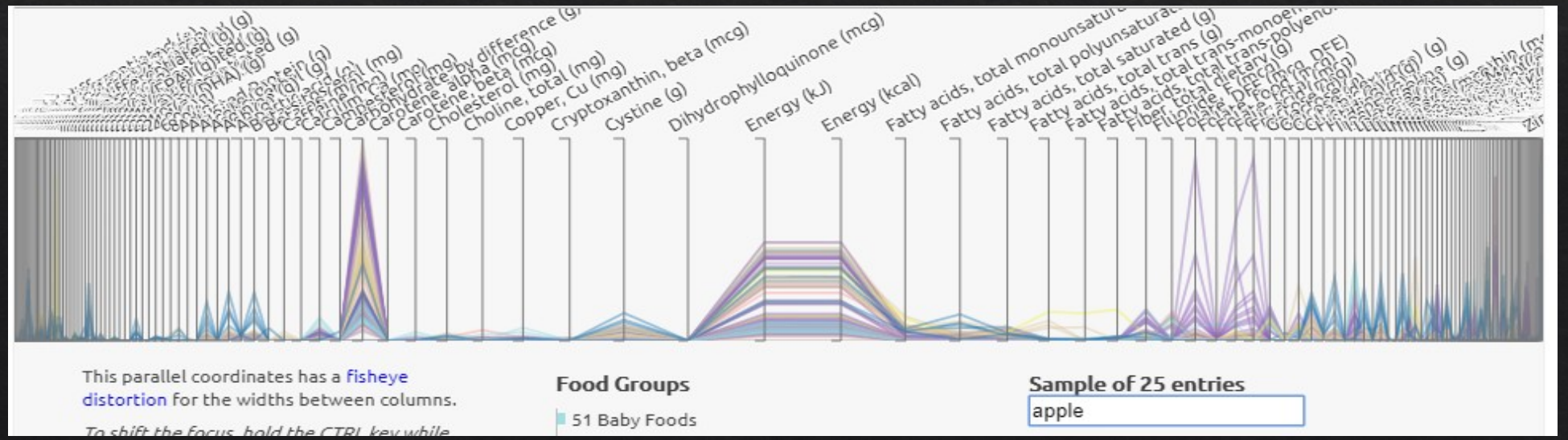


Fisheye Interaction



Fisheye Interaction





Limitations

Lots of **over-plotting** can make it impossible to read

Number of **dimensions** on screen also needs to be **below about a dozen**

A **few thousand** records.

The data needs to be **numerical**.