Learning Visualizations by Analogy

Promoting Visual Literacy through Visualization Morphing

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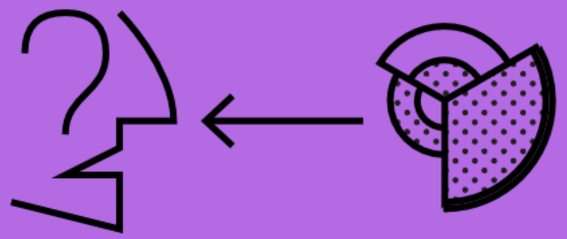
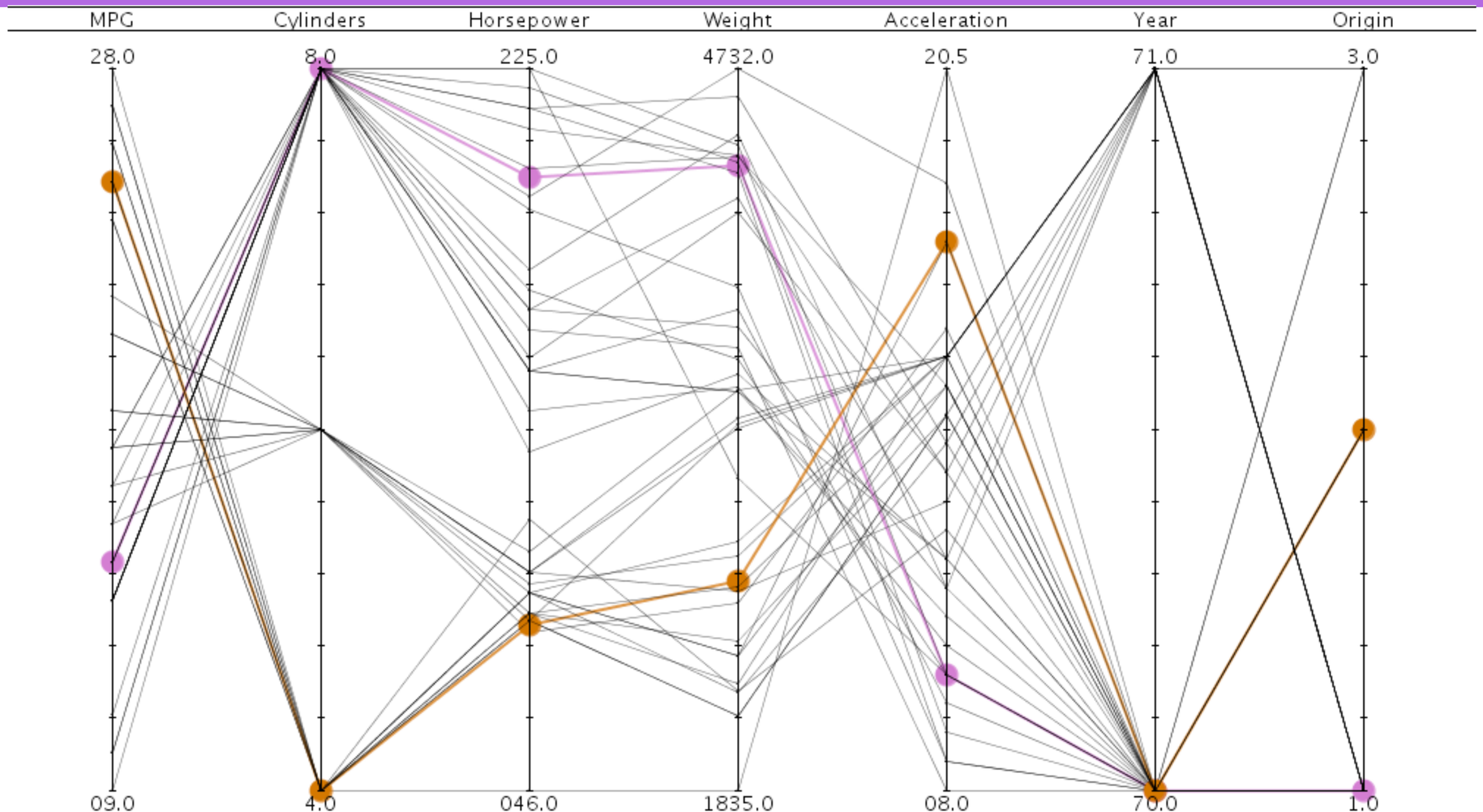
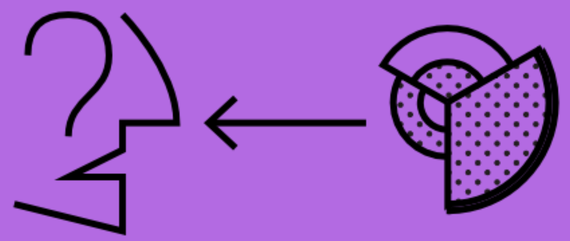
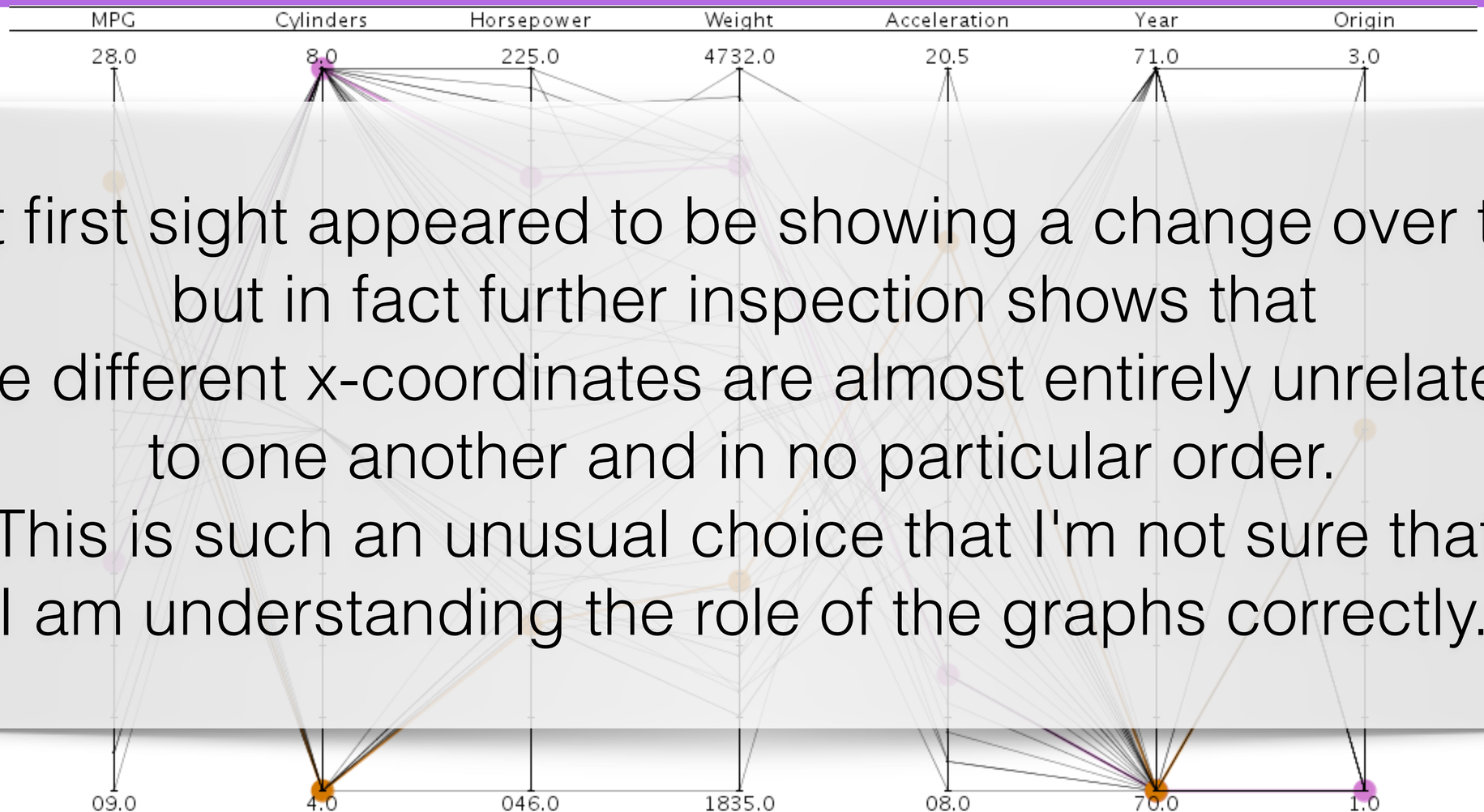
Stony Brook University

Korea
The State University of New York

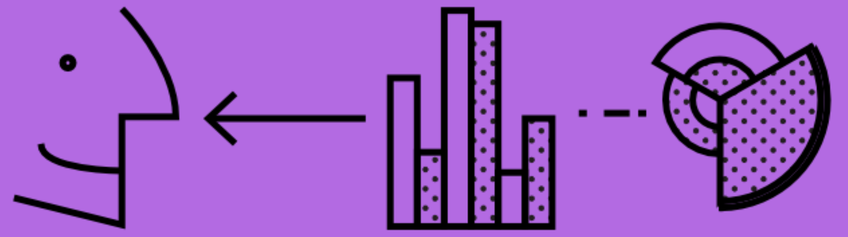



MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
28.0
8.0
225.0
4732.0
20.5
71.0
3.0
09.0
4.0
046.0
1835.0
08.0
70.0
1.0

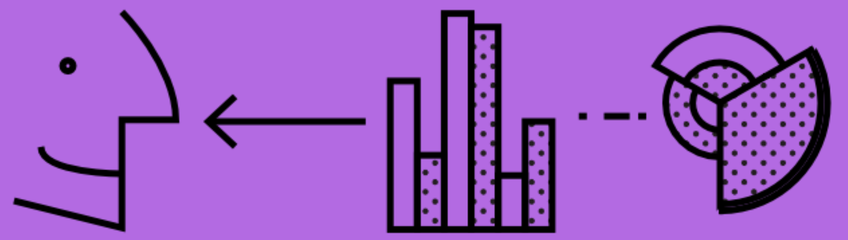


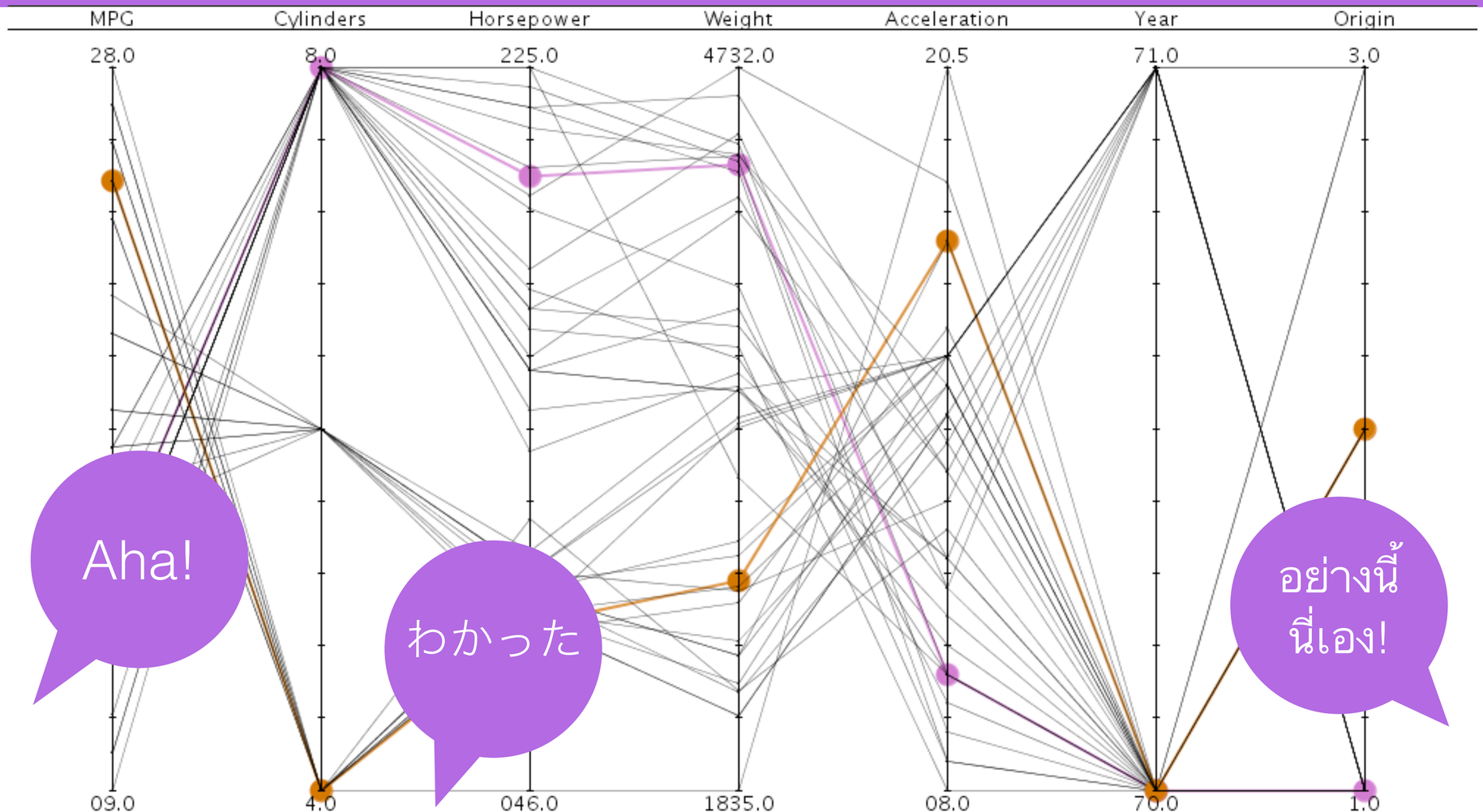


… at first sight appeared to be showing a change over time,
but in fact further inspection shows that
the different x-coordinates are almost entirely unrelated
to one another and in no particular order.
This is such an unusual choice that I'm not sure that
I am understanding the role of the graphs correctly.



MPG	Cylinders	Horsepower	Weight	Acceleration	Year	Origin
18.0	8.0	130.0	3504.0	12.0	70.0	1.0
15.0	8.0	165.0	3693.0	11.5	70.0	1.0
18.0	8.0	150.0	3436.0	11.0	70.0	1.0
16.0	8.0	150.0	3433.0	12.0	70.0	1.0
17.0	8.0	140.0	3449.0	10.5	70.0	1.0
15.0	8.0	198.0	4341.0	10.0	70.0	1.0
14.0	8.0	220.0	4354.0	09.0	70.0	1.0
14.0	8.0	215.0	4312.0	08.5	70.0	1.0
14.0	8.0	225.0	4425.0	10.0	70.0	1.0
15.0	8.0	190.0	3850.0	08.5	70.0	1.0
15.0	8.0	170.0	3563.0	10.0	70.0	1.0
14.0	8.0	160.0	3609.0	08.0	70.0	1.0
15.0	8.0	150.0	3761.0	09.5	70.0	1.0
14.0	8.0	225.0	3086.0	10.0	70.0	1.0
24.0	4.0	095.0	2372.0	15.0	70.0	3.0
22.0	6.0	095.0	2833.0	15.5	70.0	1.0
18.0	6.0	097.0	2774.0	15.5	70.0	1.0
21.0	6.0	085.0	2587.0	16.0	70.0	1.0
27.0	4.0	088.0	2130.0	14.5	70.0	3.0
26.0	4.0	046.0	1835.0	20.5	70.0	2.0
25.0	4.0	087.0	2672.0	17.5	70.0	2.0
24.0	4.0	090.0	2430.0	14.5	70.0	2.0
25.0	4.0	095.0	2375.0	17.5	70.0	2.0
26.0	4.0	113.0	2234.0	12.5	70.0	2.0
21.0	6.0	090.0	2648.0	15.0	70.0	1.0
10.0	8.0	215.0	4615.0	14.0	70.0	1.0
10.0	8.0	200.0	4376.0	15.0	70.0	1.0
11.0	8.0	210.0	4382.0	13.5	70.0	1.0
09.0	8.0	193.0	4732.0	18.5	70.0	1.0
27.0	4.0	088.0	2130.0	14.5	71.0	3.0
28.0	4.0	090.0	2264.0	15.5	71.0	1.0
25.0	4.0	095.0	2228.0	14.0	71.0	3.0
19.0	6.0	100.0	2634.0	13.0	71.0	1.0
16.0	6.0	105.0	3439.0	15.5	71.0	1.0
17.0	6.0	100.0	3329.0	15.5	71.0	1.0
19.0	6.0	088.0	3302.0	15.5	71.0	1.0
18.0	6.0	100.0	3288.0	15.5	71.0	1.0
14.0	8.0	165.0	4209.0	12.0	71.0	1.0
14.0	8.0	175.0	4464.0	11.5	71.0	1.0




MPG
Cylinders
Horsepower
Weight
Acceleration
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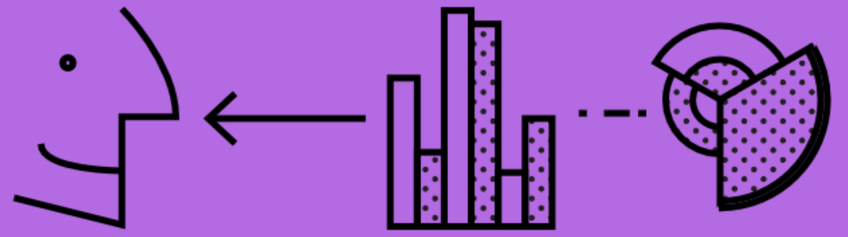
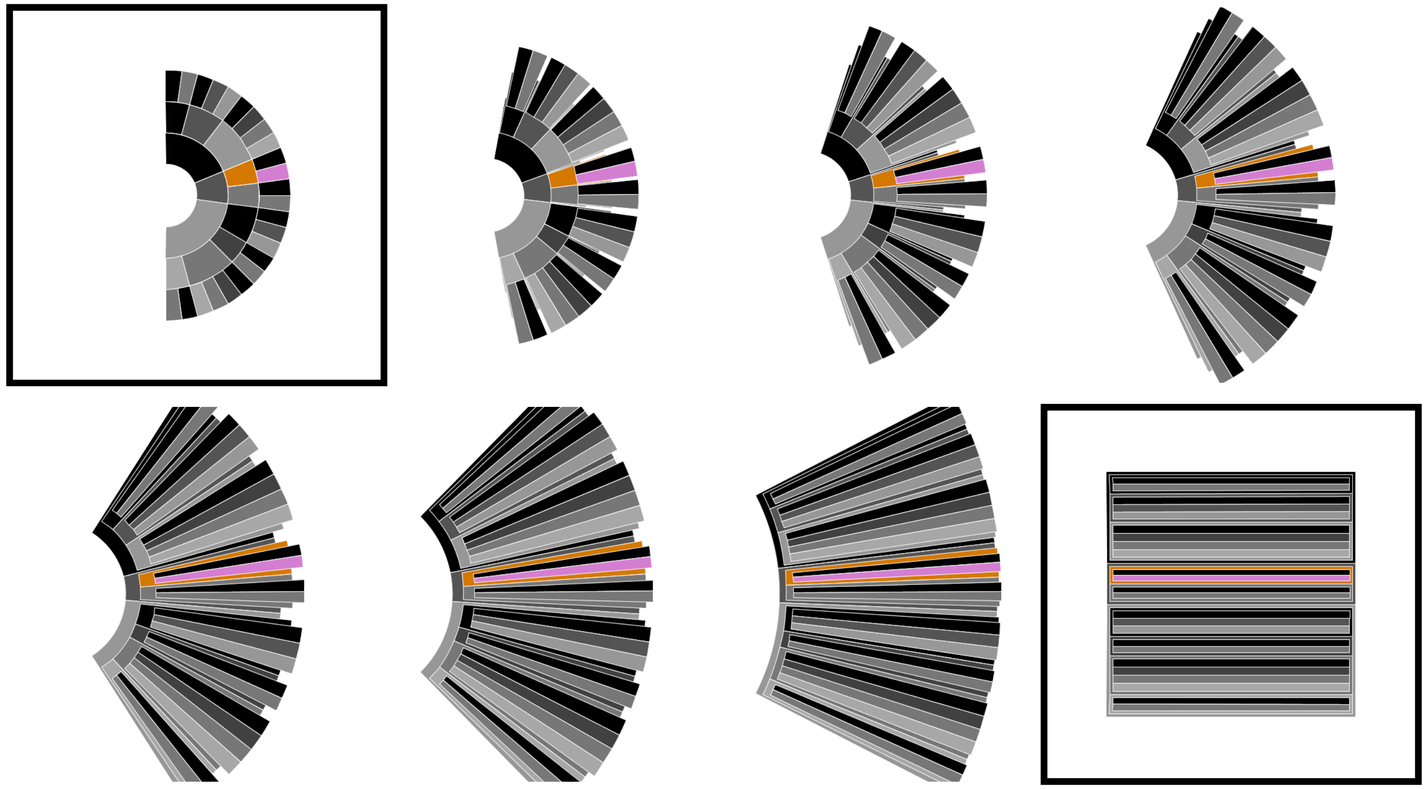
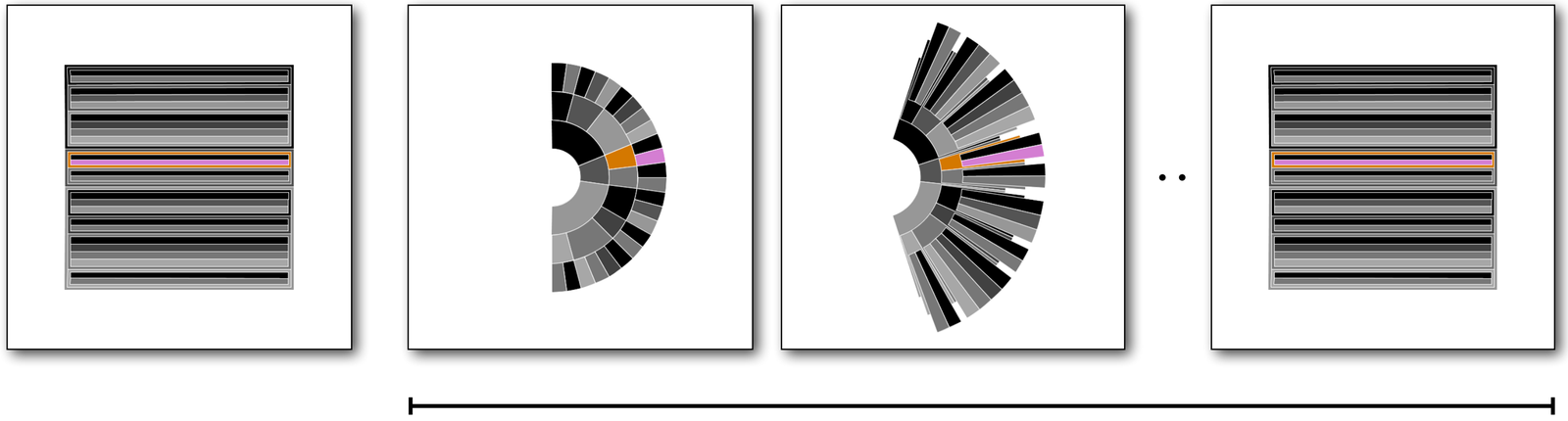
Origin
28.0
8.0
225.0
4732.0
20.5
71.0
3.0
09.0
4.0
046.0
1835.0
08.0
70.0
1.0
Aha!
わかった
อย่างนี้
นี่เอง!



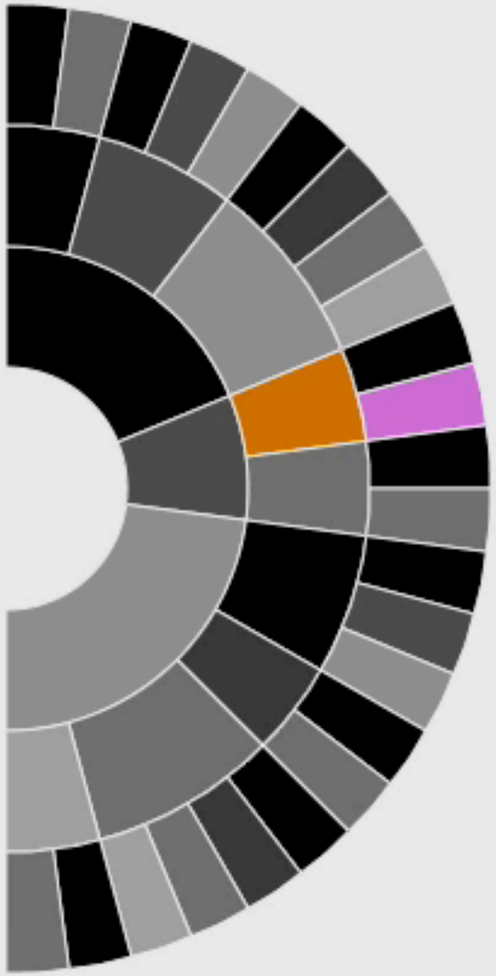
Source Visualization



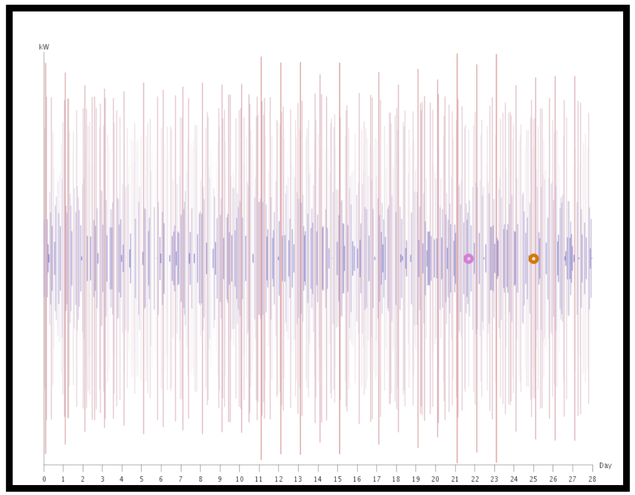
Target Visualization

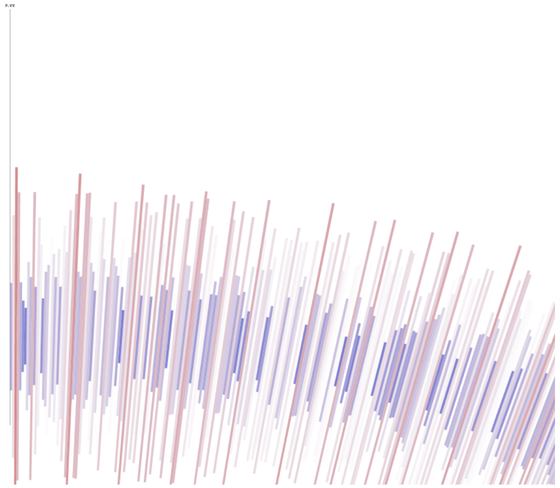

Animate
Pie Chart >

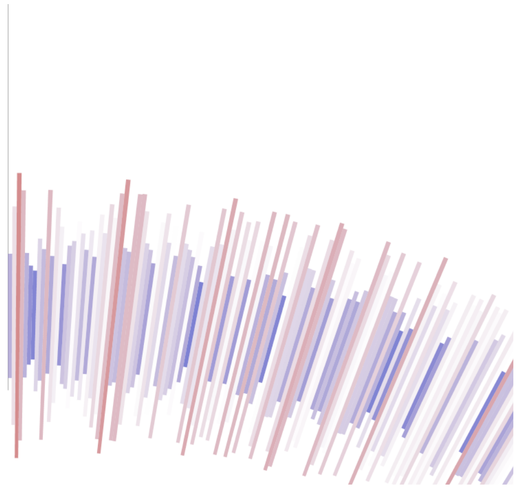
Animate Pie Chart >

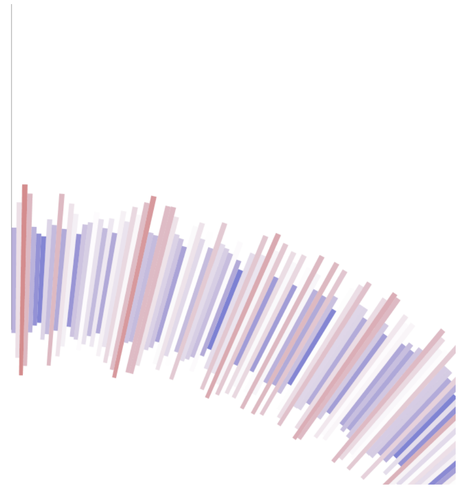


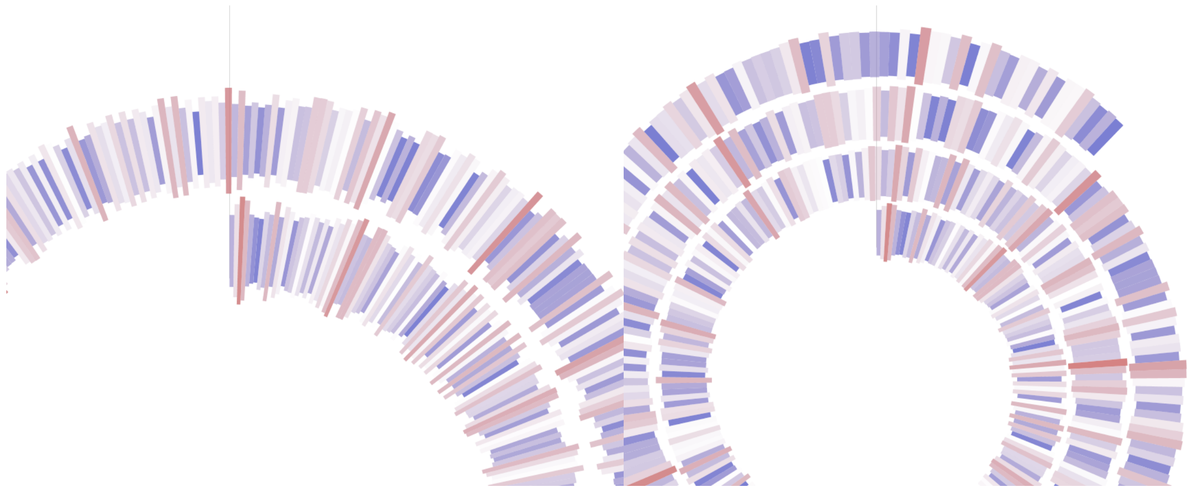
Linear Chart

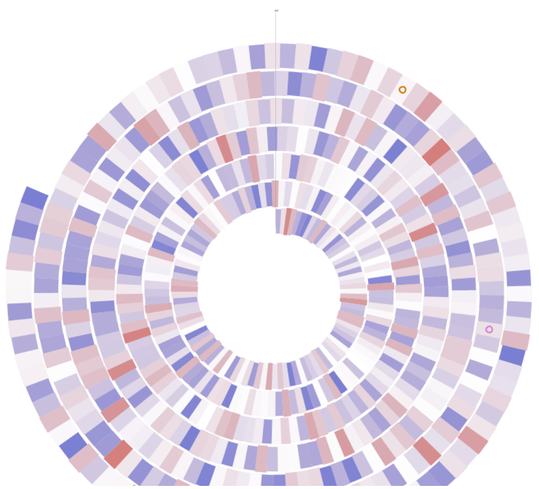


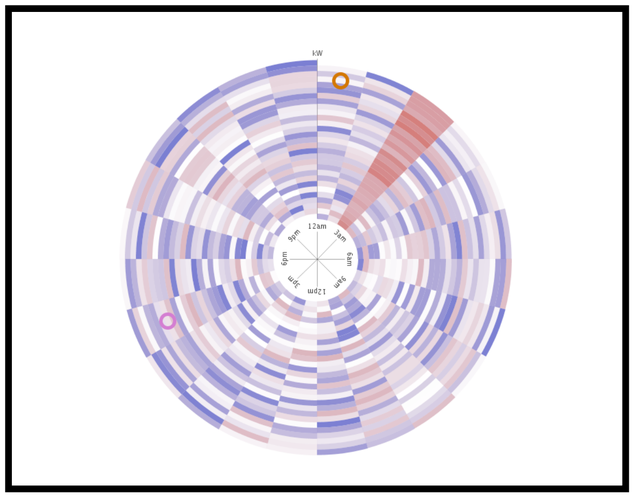




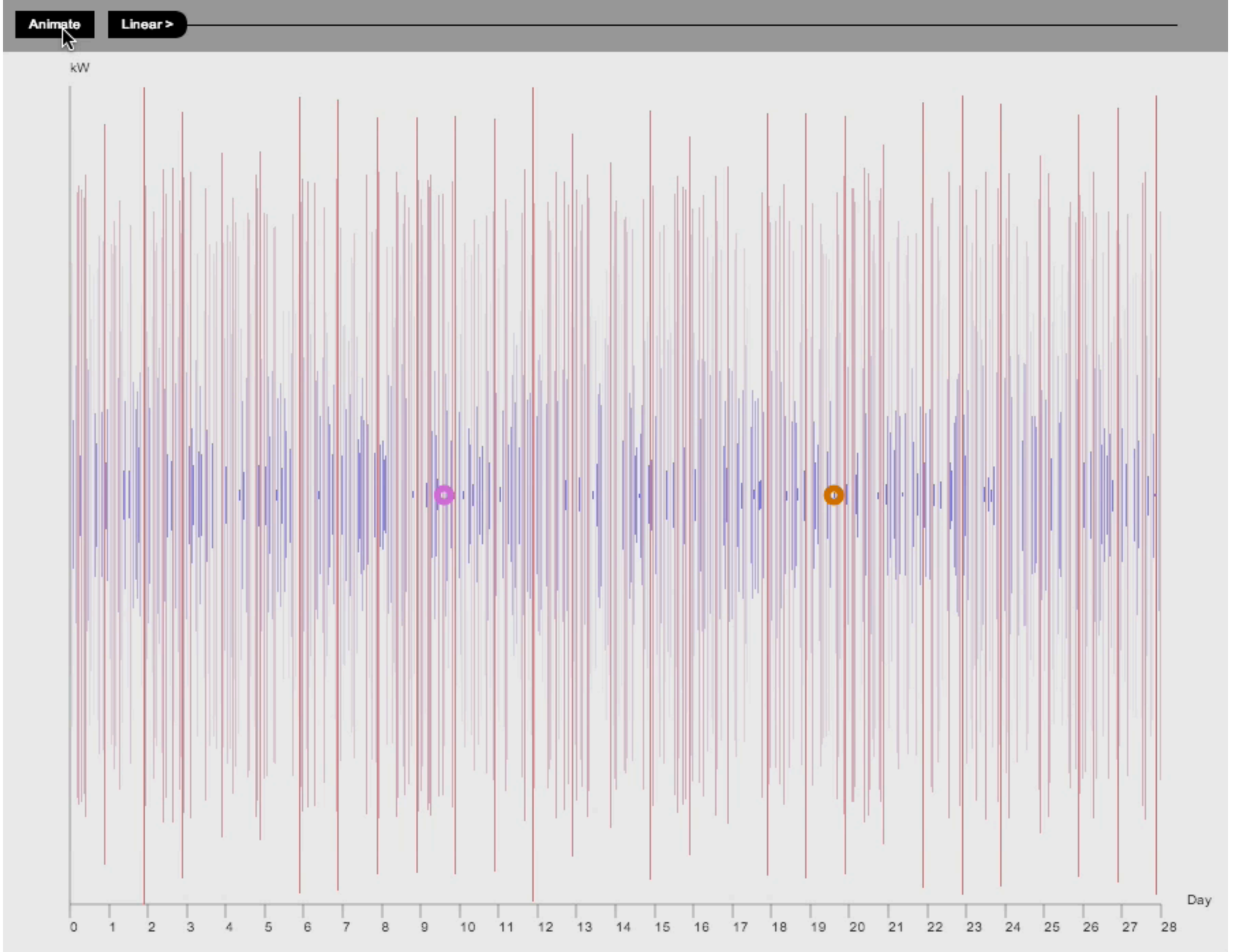








Spiral Chart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kW
Day
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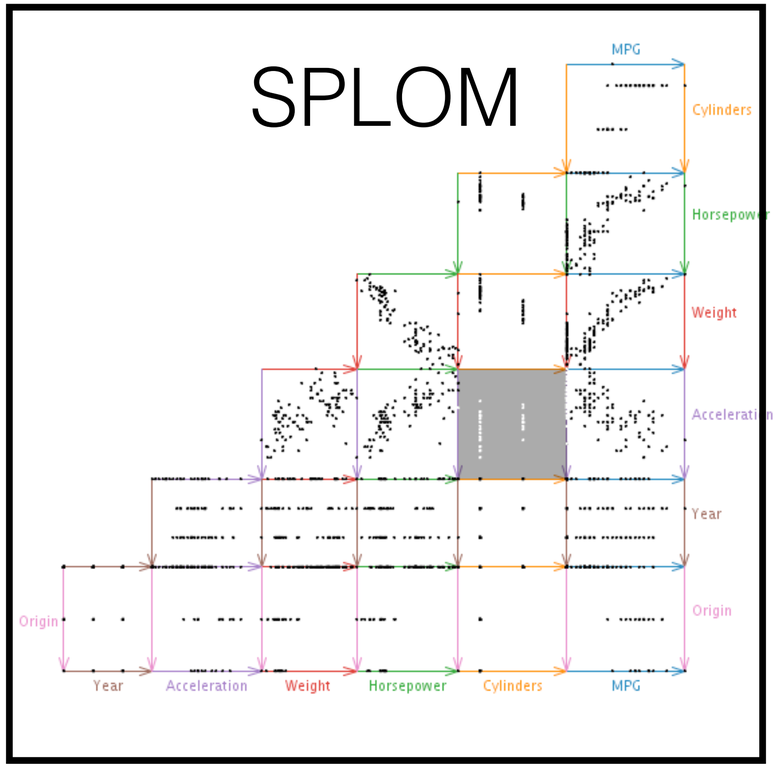
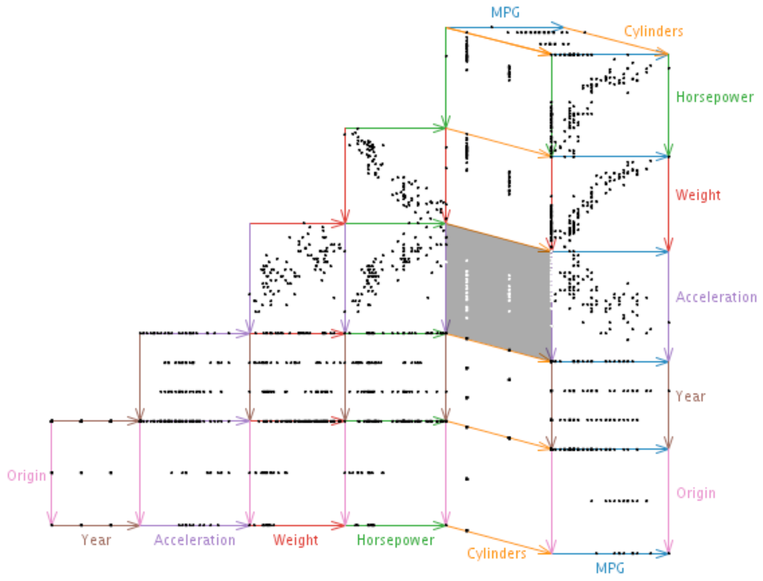
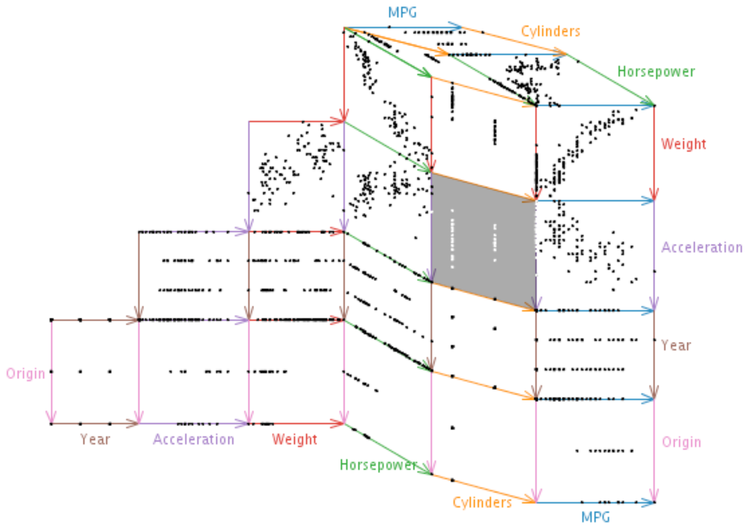
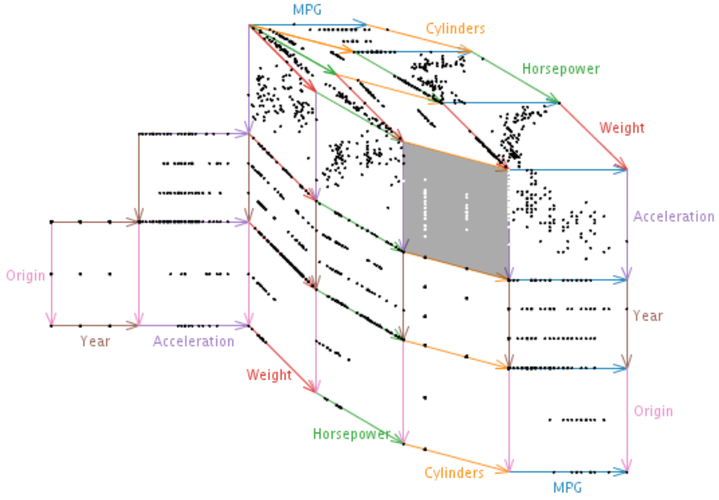
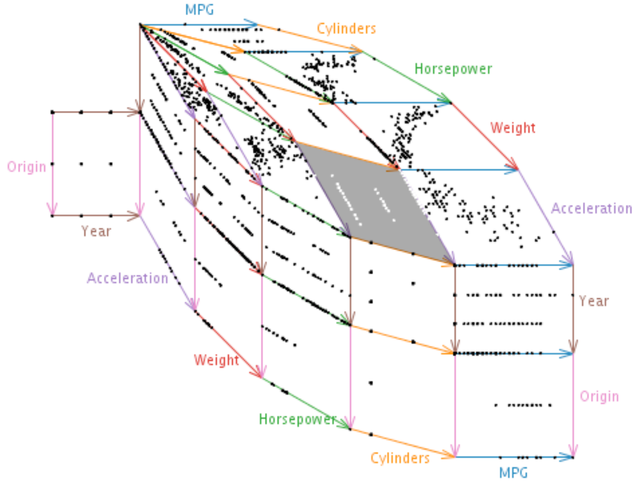
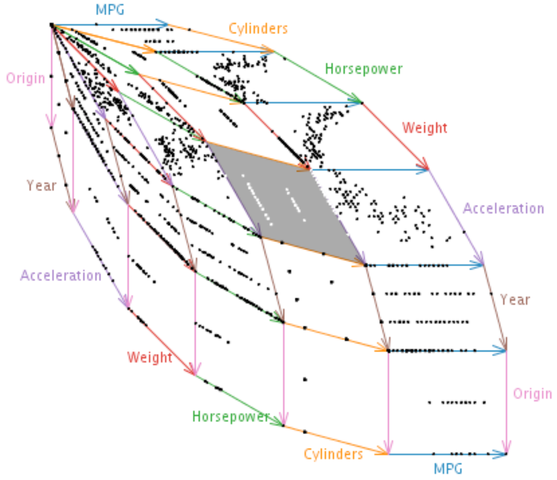

SPLOM
MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG


MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG


MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG

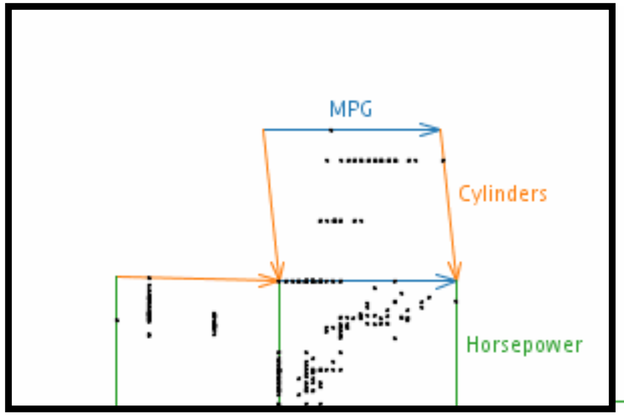

MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG

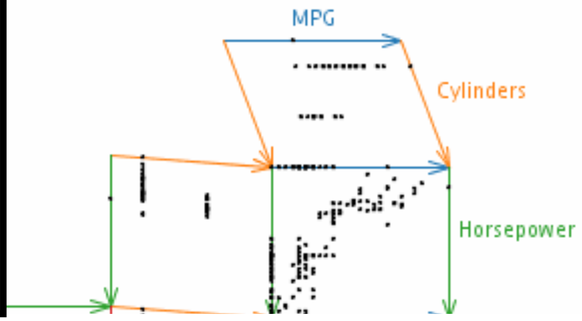

MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG

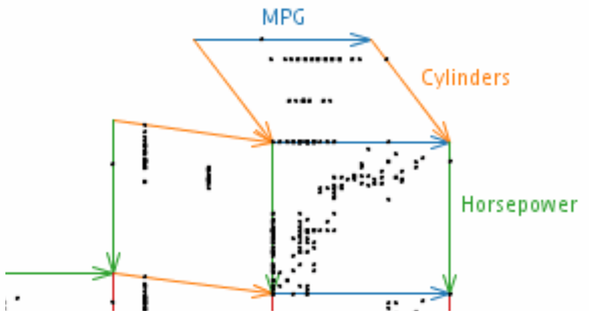

MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG

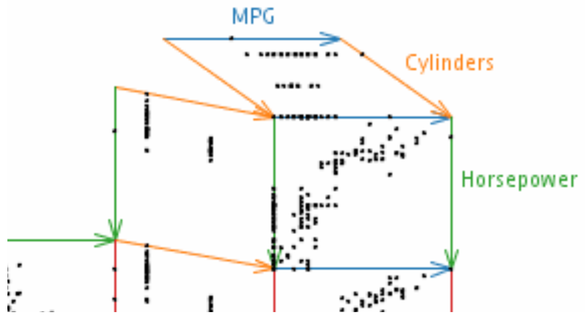
Hyperbox

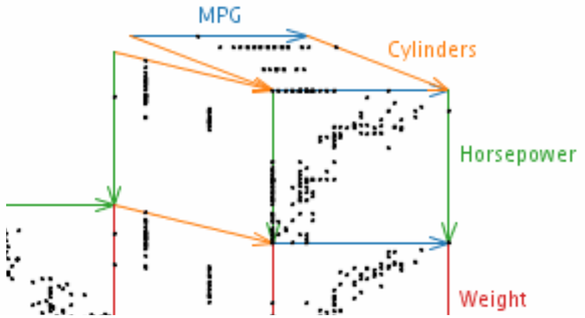
SPLOM

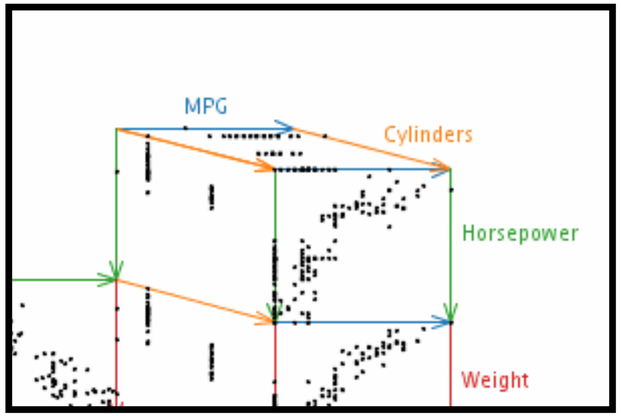




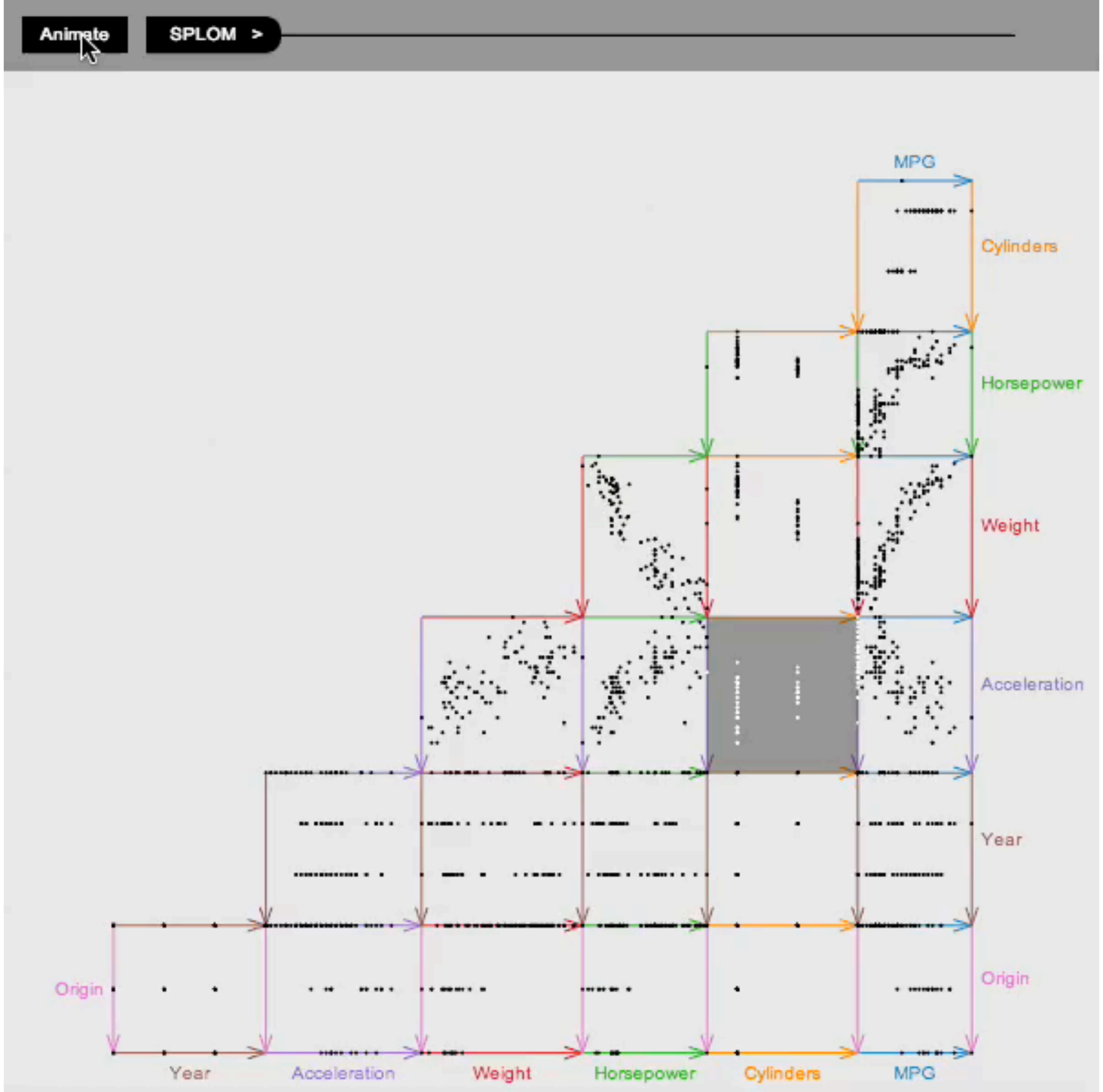


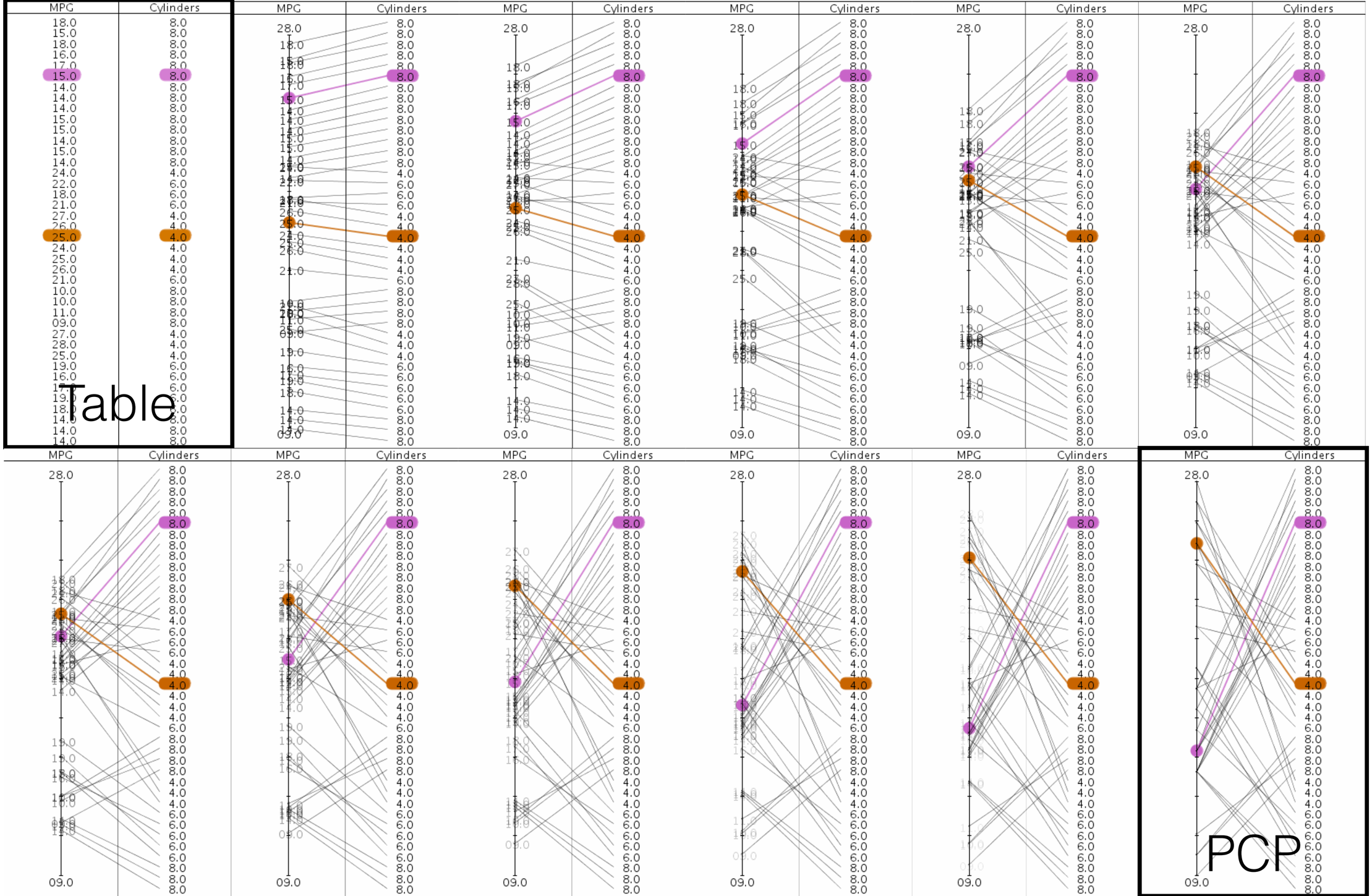






Hyperbox


Animate
SPLOM >
MPG
Cylinders
Horsepower
Weight
Acceleration
Year
Origin
Origin
Year
Acceleration
Weight
Horsepower
Cylinders
MPG


MPG
Cylinders
Table
PCP

MPG	Cylinders	Horsepower	Weight	Acceleration	Year	Origin
18.0	8.0	130.0	3504.0	12.0	70.0	1.0
15.0	8.0	165.0	3693.0	11.5	70.0	1.0
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17.0	8.0	140.0	3449.0	10.5	70.0	1.0
15.0	8.0	198.0	4341.0	10.0	70.0	1.0
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14.0	8.0	225.0	4425.0	10.0	70.0	1.0
15.0	8.0	190.0	3850.0	08.5	70.0	1.0
15.0	8.0	170.0	3563.0	10.0	70.0	1.0
14.0	8.0	160.0	3609.0	08.0	70.0	1.0
15.0	8.0	150.0	3761.0	09.5	70.0	1.0
14.0	8.0	225.0	3086.0	10.0	70.0	1.0
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25.0	4.0	087.0	2672.0	17.5	70.0	2.0
24.0	4.0	090.0	2430.0	14.5	70.0	2.0
25.0	4.0	095.0	2375.0	17.5	70.0	2.0
26.0	4.0	113.0	2234.0	12.5	70.0	2.0
21.0	6.0	090.0	2648.0	15.0	70.0	1.0
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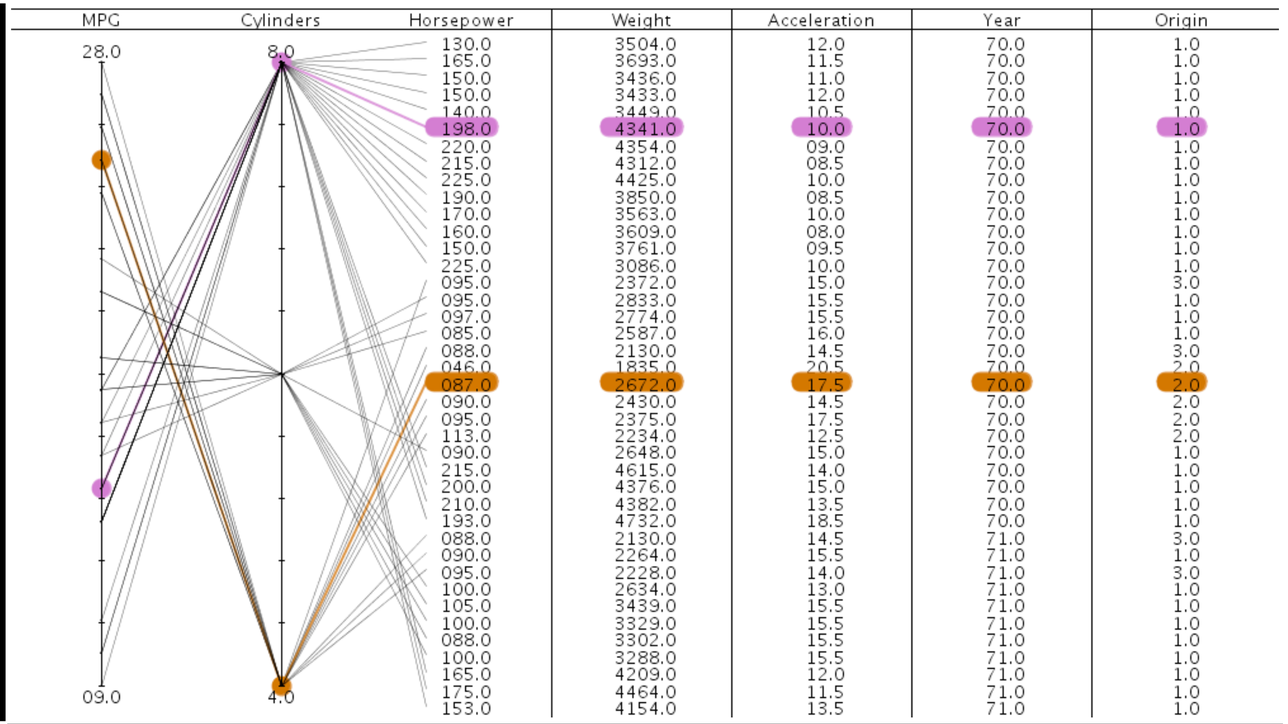
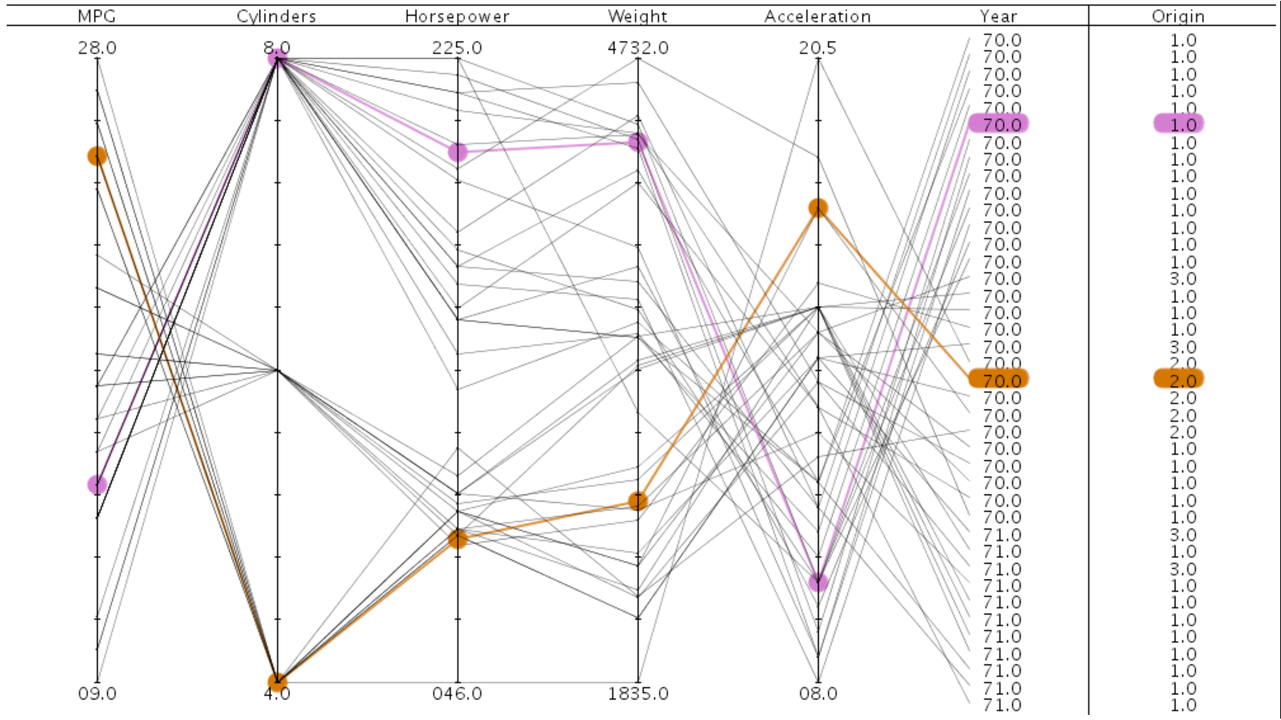
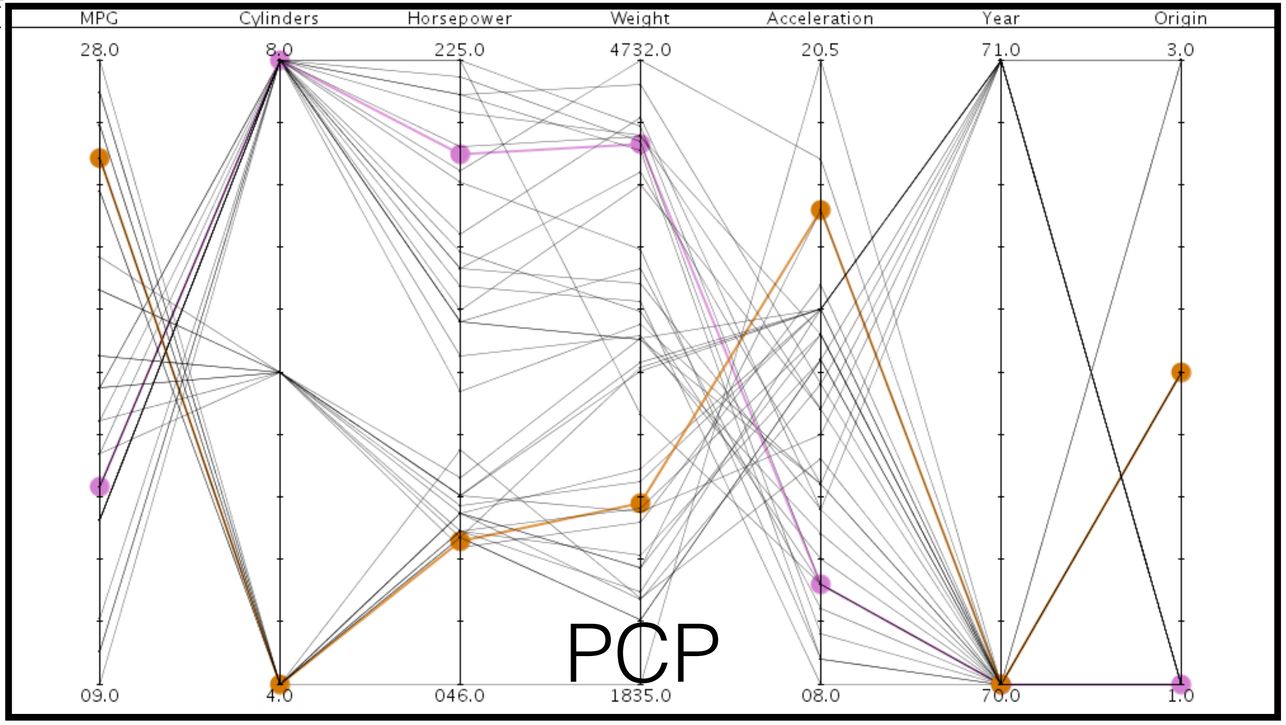
14.0	8.0	175.0	4464.0	11.5	71.0	1.0
14.0	8.0	153.0	4154.0	13.5	71.0	1.0

Table

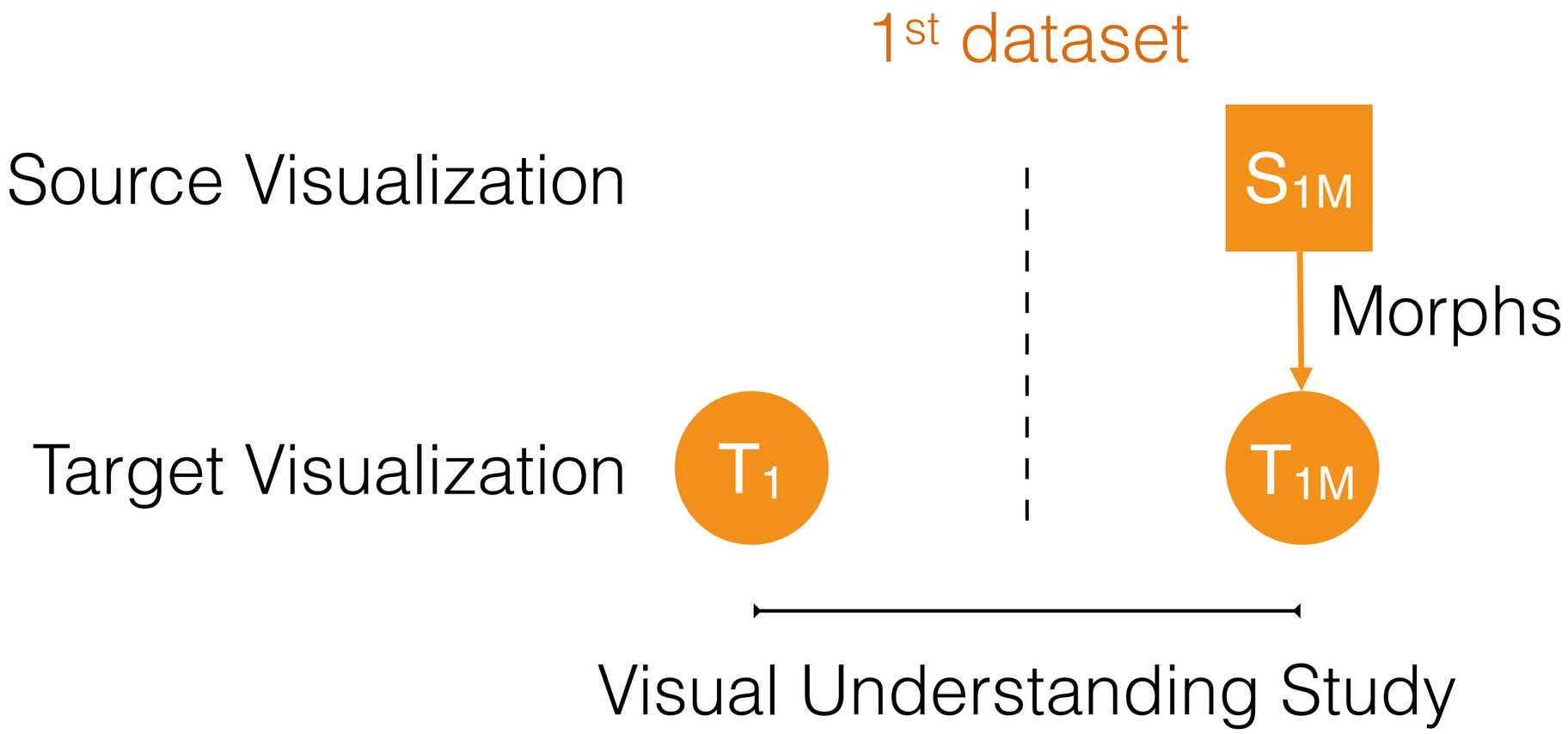


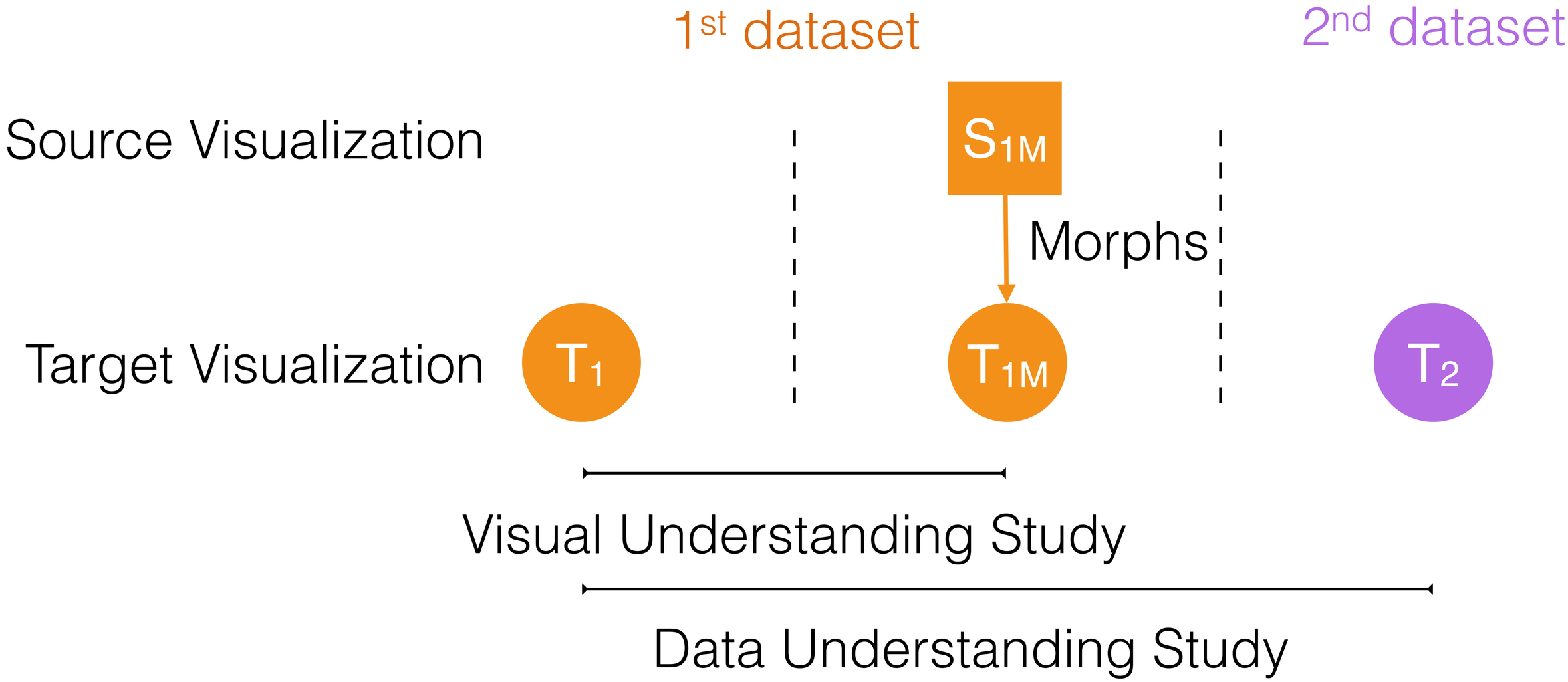




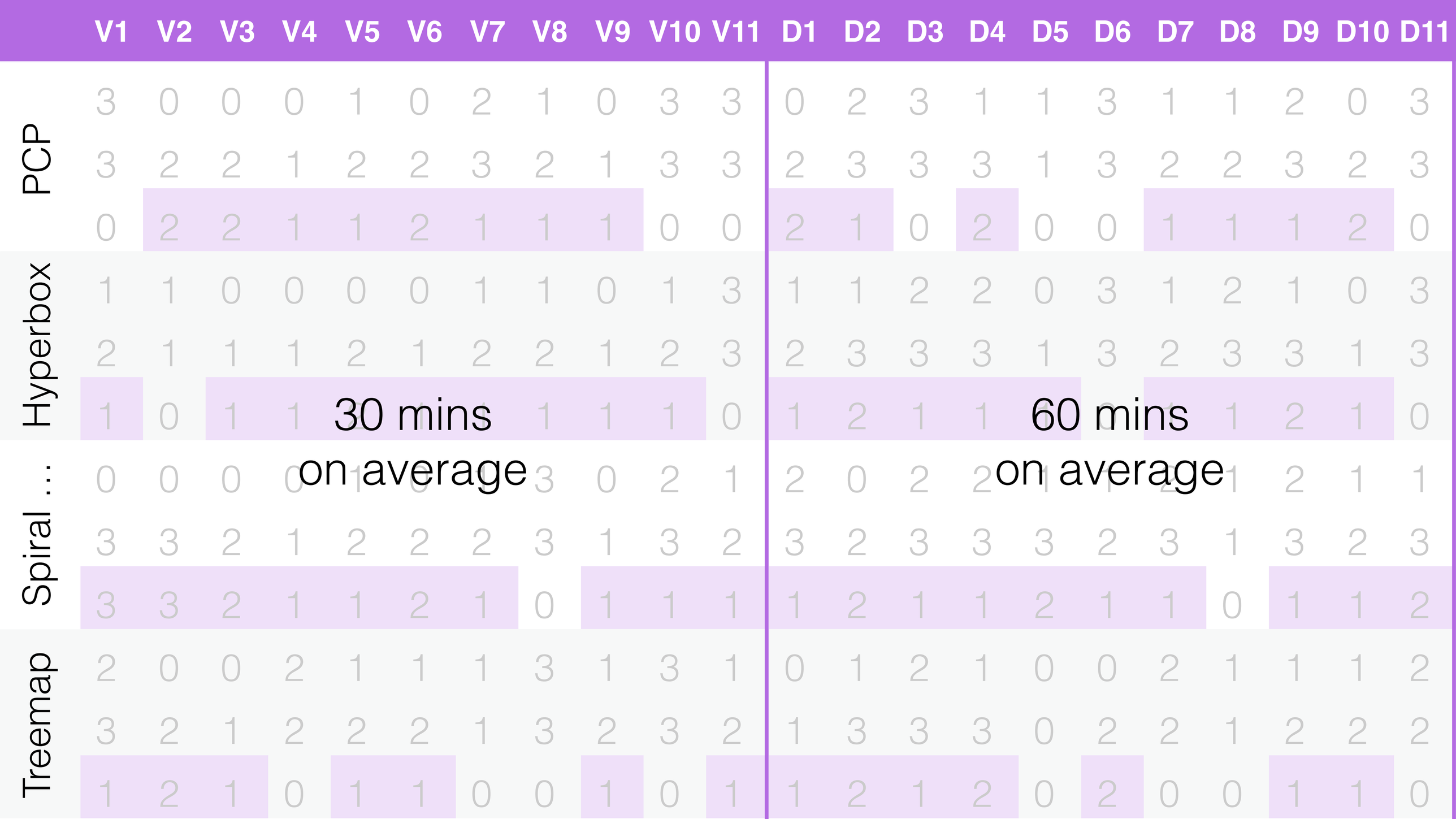
Animate | Data Table >

MPG	Cylinders	Horsepower	Weight	Acceleration	Year	Origin
18.0	8.0	130.0	3504.0	12.0	70.0	1.0
15.0	8.0	165.0	3693.0	11.5	70.0	1.0
18.0	8.0	150.0	3436.0	11.0	70.0	1.0
16.0	8.0	150.0	3433.0	12.0	70.0	1.0
17.0	8.0	140.0	3449.0	10.5	70.0	1.0
15.0	8.0	198.0	4341.0	10.0	70.0	1.0
14.0	8.0	220.0	4354.0	09.0	70.0	1.0
14.0	8.0	215.0	4312.0	08.5	70.0	1.0
14.0	8.0	225.0	4425.0	10.0	70.0	1.0
15.0	8.0	190.0	3850.0	08.5	70.0	1.0
15.0	8.0	170.0	3563.0	10.0	70.0	1.0
14.0	8.0	160.0	3609.0	08.0	70.0	1.0
15.0	8.0	150.0	3761.0	09.5	70.0	1.0
14.0	8.0	225.0	3086.0	10.0	70.0	1.0
24.0	4.0	095.0	2372.0	15.0	70.0	3.0
22.0	6.0	095.0	2833.0	15.5	70.0	1.0
18.0	6.0	097.0	2774.0	15.5	70.0	1.0
21.0	6.0	085.0	2587.0	16.0	70.0	1.0
27.0	4.0	088.0	2130.0	14.5	70.0	3.0
26.0	4.0	046.0	1835.0	20.5	70.0	2.0
25.0	4.0	087.0	2672.0	17.5	70.0	2.0
24.0	4.0	090.0	2430.0	14.5	70.0	2.0
25.0	4.0	095.0	2375.0	17.5	70.0	2.0
26.0	4.0	113.0	2234.0	12.5	70.0	2.0
21.0	6.0	090.0	2648.0	15.0	70.0	1.0
10.0	8.0	215.0	4615.0	14.0	70.0	1.0
10.0	8.0	200.0	4376.0	15.0	70.0	1.0
11.0	8.0	210.0	4382.0	13.5	70.0	1.0
09.0	8.0	193.0	4732.0	18.5	70.0	1.0
27.0	4.0	088.0	2130.0	14.5	71.0	3.0
28.0	4.0	090.0	2264.0	15.5	71.0	1.0
25.0	4.0	095.0	2228.0	14.0	71.0	3.0
19.0	6.0	100.0	2634.0	13.0	71.0	1.0
16.0	6.0	105.0	3439.0	15.5	71.0	1.0
17.0	6.0	100.0	3329.0	15.5	71.0	1.0
19.0	6.0	088.0	3302.0	15.5	71.0	1.0
18.0	6.0	100.0	3288.0	15.5	71.0	1.0
14.0	8.0	165.0	4209.0	12.0	71.0	1.0
14.0	8.0	175.0	4464.0	11.5	71.0	1.0
14.0	8.0	153.0	4154.0	13.5	71.0	1.0


1st dataset
Source Visualization
S1M
Morphs
Target Visualization
T1
T1M
Visual Understanding Study


1st dataset
2nd dataset
Source Visualization
Target Visualization
S1M
Morphs
T1
T1M
T2
Visual Understanding Study
Data Understanding Study

Target Vis	Visual Understanding Study	Data Understanding Study
PCP	1. The MPG of the orange-highlighted car is roughly 40% of its range. 2. There is just one line at the top of the acceleration scale. 3. Heavier cars are faster.	1. The number of cylinders of the orange-highlighted car is 4, one fifth between 3 and 8. 2. Many cars have the same numbers of cylinders, mostly even numbers particularly 4 and 8. 3. Heavier cars have more cylinders and hence more horsepower and speed.
Hyperbox	~	~
Spiral …	~	~
Treemap	~	~


V1 V2 V3 V4 V5 V6 V7 V8 V9 V10 V11 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11
PCP
Hyperbox
Spiral ...
Treemap
30 mins
on average
60 mins
on average

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
PCP	3	0	0	0	1	0	2	1	0	3	3	0	2	3	1	1	3	1	1	2	0	3
	3	2	2	1	2	2	3	2	1	3	3	2	3	3	3	1	3	2	2	3	2	3
	0	2	2	1	1	2	1	1	1	0	0	2	1	0	2	0	0	1	1	1	2	0
Hyperbox	1	1	0	0	0	0	1	1	0	1	3	1	1	2	2	0	3	1	2	1	0	3
	2	1	1	1	2	1	2	2	1	2	3	2	3	3	3	1	3	2	3	3	1	3
	1	0	1	1	2	1	1	1	1	1	0	1	2	1	1	1	0	1	1	2	1	0
Spiral …	0	0	0	0	1	0	1	3	0	2	1	2	0	2	2	1	1	2	1	2	1	1
	3	3	2	1	2	2	2	3	1	3	2	3	2	3	3	3	2	3	1	3	2	3
	3	3	2	1	1	2	1	0	1	1	1	1	2	1	1	2	1	1	0	1	1	2
Treemap	2	0	0	2	1	1	1	3	1	3	1	0	1	2	1	0	0	2	1	1	1	2
	3	2	1	2	2	2	1	3	2	3	2	1	3	3	3	0	2	2	1	2	2	2
	1	2	1	0	1	1	0	0	1	0	1	1	2	1	2	0	2	0	0	1	1	0

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
PCP	3	0	0	0	1	0	2	1	0	3	3	0	2	3	1	1	3	1	1	2	0	3
	3	2	2	1	2	2	3	2	1	3	3	2	3	3	3	1	3	2	2	3	2	3
	0	2	2	1	1	2	1	1	1	0	0	2	1	0	2	0	0	1	1	1	2	0
Hyperbox	1	1	0	0	0	0	1	1	0	1	3	1	1	2	2	0	3	1	2	1	0	3
	2	1	1	1	2	1	2	2	1	2	3	2	3	3	3	1	3	2	3	3	1	3
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Spiral …	0	0	0	0	1	0	1	3	0	2	1	2	0	2	2	1	1	2	1	2	1	1
	3	3	2	1	2	2	2	3	1	3	2	3	2	3	3	3	2	3	1	3	2	3
	3	3	2	1	1	2	1	0	1	1	1	1	2	1	1	2	1	1	0	1	1	2
Treemap	2	0	0	2	1	1	1	3	1	3	1	0	1	2	1	0	0	2	1	1	1	2
	3	2	1	2	2	2	1	3	2	3	2	1	3	3	3	0	2	2	1	2	2	2
	1	2	1	0	1	1	0	0	1	0	1	1	2	1	2	0	2	0	0	1	1	0

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
PCP	3	0	0	0	1	0	2	1	0	3	3	0	2	3	1	1	3	1	1	2	0	3
	3	2	2	1	2	2	3	2	1	3	3	2	3	3	3	1	3	2	2	3	2	3
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Hyperbox	1	1	0	0	0	0	1	1	0	1	3	1	1	2	2	0	3	1	2	1	0	3
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Spiral …	0	0	0	0	1	0	1	3	0	2	1	2	0	2	2	1	1	2	1	2	1	1
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	3	3	2	1	1	2	1	0	1	1	1	1	2	1	1	2	1	1	0	1	1	2
Treemap	2	0	0	2	1	1	1	3	1	3	1	0	1	2	1	0	0	2	1	1	1	2
	3	2	1	2	2	2	1	3	2	3	2	1	3	3	3	0	2	2	1	2	2	2
	1	2	1	0	1	1	0	0	1	0	1	1	2	1	2	0	2	0	0	1	1	0

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
PCP	3	0	0	0	1	0	2	1	0	3	3	0	2			1	3			2	0	3
	3	2	2	1	2	2	3	2	1	3	3						3					
	0	2	2	1	1	2	1	1	1	0	0						0	1				
Hyperbox	1	1	0	0	0	0	1	1	0	1	3	1						1	2		0	3
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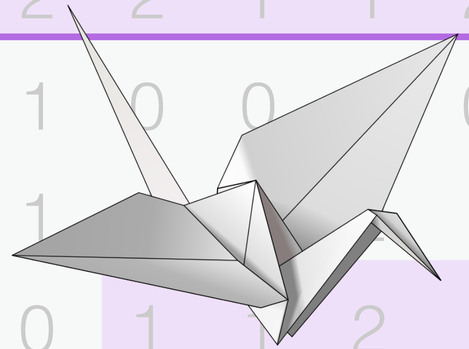
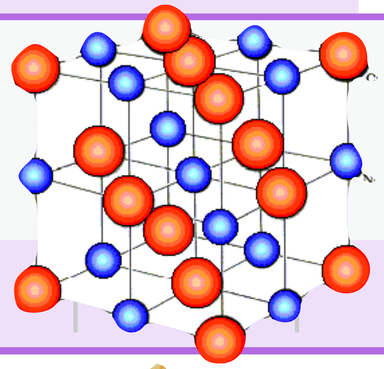
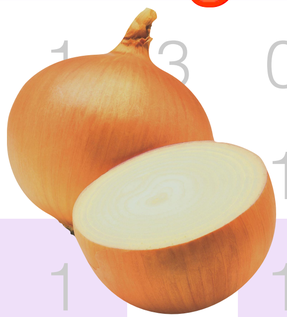
	1	0	1	1	2	1	1	1	1	1	0	1	2	1	1	1	0	1	1	2	1	0
Spiral …	0	0	0	0	1	0	1	3	0	2	1	2	0	2	2	1	1	2	1	2	1	1
	3	3	2	1	2	2	2	3	1	3	2	3	2	3	3	3	2	3	1	3	2	3
	3	3	2	1	1	2	1	0	1	1	1	1	2	1	1	2	1	1	0	1	1	2
Treemap	2	0	0	2	1	1	1	3	1	3	1	0	1	2	1	0	0	2	1	1	1	2
	3	2	1	2	2	2	1	3	2	3	2	1	3	3	3	0	2	2	1	2	2	2
	1	2	1	0	1	1	0	0	1	0	1	1	2	1	2	0	2	0	0	1	1	0

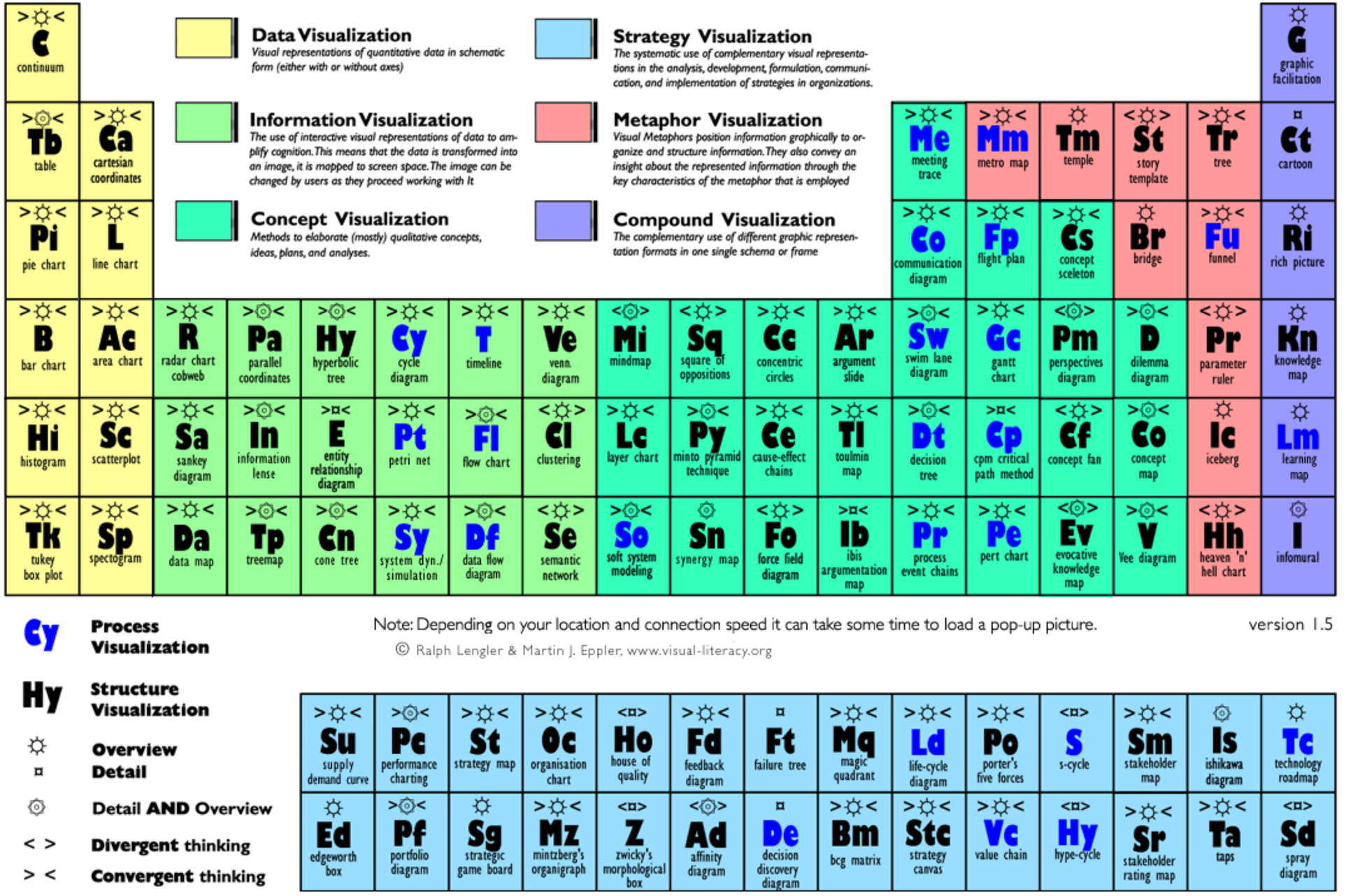
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
PCP	3	0	0	0	1	0	2	1	0	3	3	0	2	3	1	1	3	1	1	2	0	3
	3	2	2	1	2	2	3	2	1	3	3	2	3	3	3	1	3	2	2	3	2	3
	0	2	2	1	1	2	1	1	1	0	0	2	1	0	2	0	0	1	1	1	2	0
Hyperbox	1	1	0	0		0				1	3	1	1	2	2	0	3	1	2	1	0	3
	2	1				1				2	3	2	3	3	3	1	3	2	3	3	1	3
	1	0	1	1	2	1	1	1	1	1	0	1	2	1	1	1	0	1	1	2	1	0
Spiral ...	0	0		1	0	1	3	0	2	1		2	0	2	2	1	1	2	1	2	1	1
	3	3			2			1	3	2		3	2	3	3	3	2	3	1	3	2	3
	3	3	2	1	2	1		1	1	1		1	2	1	1	2	1	1	0	1	1	2
Treemap	2	0		1	1				3	1		0	1	2	1	0	0	2	1	1	1	2
	3	2			2				3	2		1	3	3	3	0	2	2	1	2	2	2
	1	2			1				0	1		1	2	1	2	0	2	0	0	1	1	0







A PERIODIC TABLE OF VISUALIZATION METHODS



Note: Depending on your location and connection speed it can take some time to load a pop-up picture.

version 1.5

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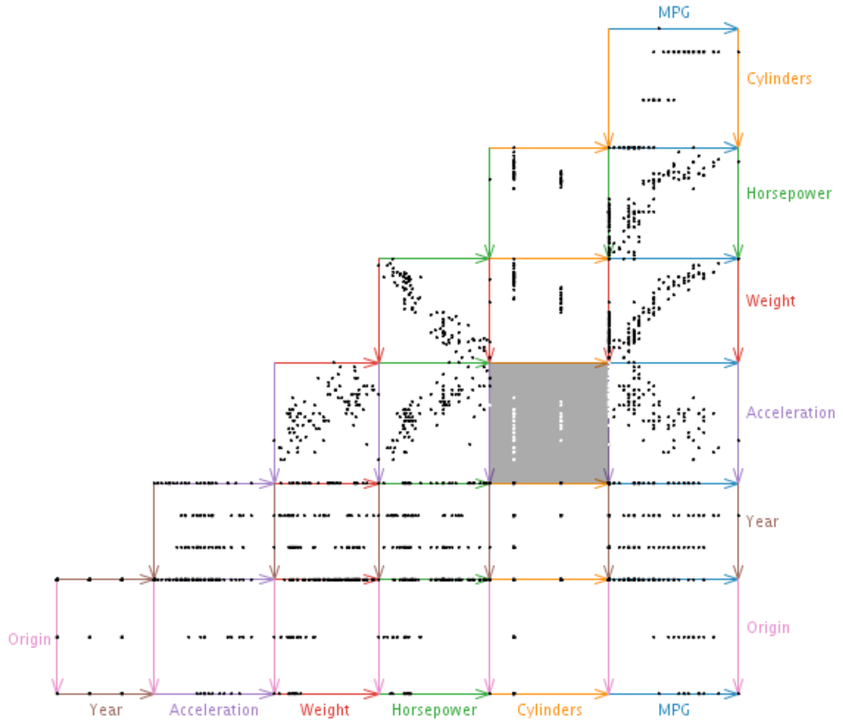
A PERIODIC TABLE OF VISUALIZATION METHODS

Data Visualization
Visual representations of quantitative data in schematic form (either with or without axes)

Strategy Visualization
The systematic use of complementary visual representations in the analysis, development, formulation, communication, and implementation of strategies in organizations.

Information Visualization

Metaphor Visualization



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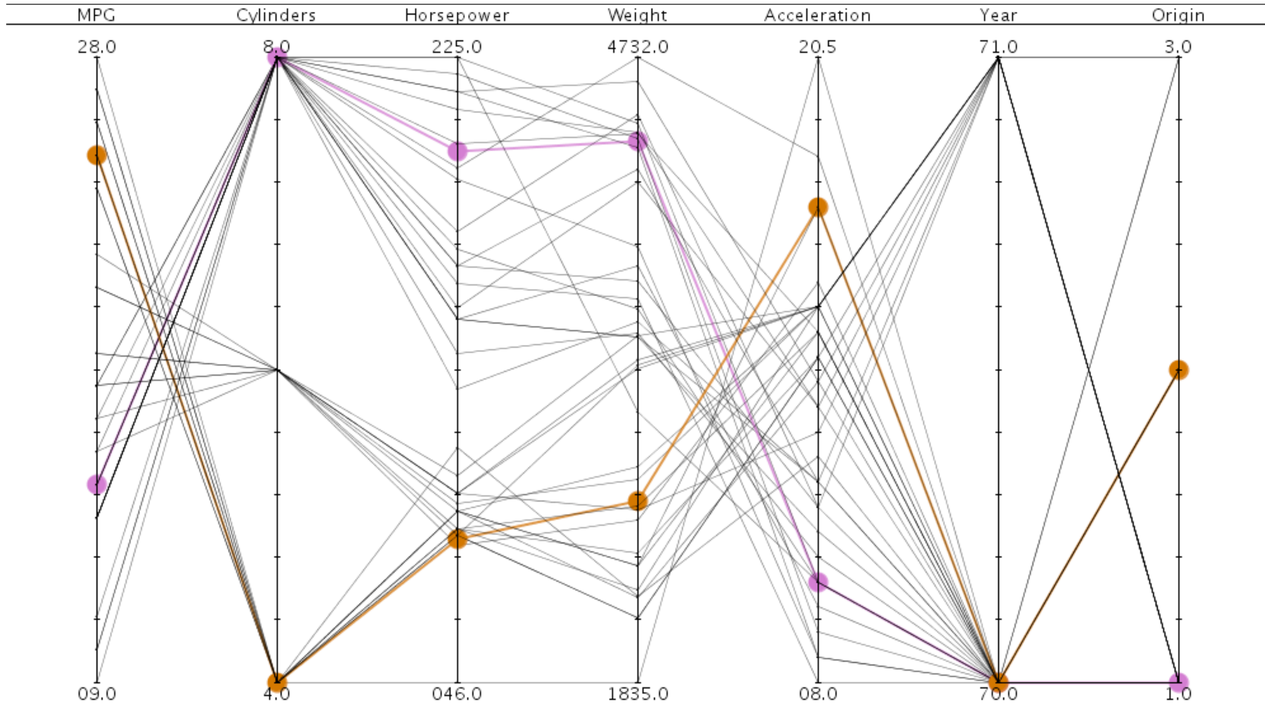
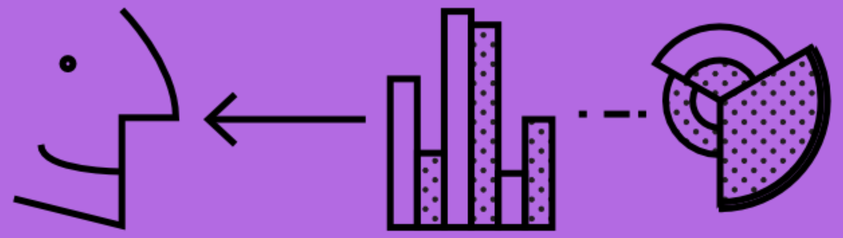


Overview
Detail
Detail AND Overview
< > Divergent thinking
> < Convergent thinking

Su supply demand curve	Pe performance charting	St strategy map	Oc organisation chart	Ho house of quality	Fd feedback diagram	Ft failure tree	Mq magic quadrant	Ld life-cycle diagram	Po porter's five forces	S s-cycle	Sm stakeholder map	Is ishikawa diagram	Tc technology roadmap
Ed edgeworth box	Pf portfolio diagram	Sg strategic game board	Mz mintzberg's organigraph	Z zwicky's morphological box	Ad affinity diagram	De decision discovery diagram	Bm bcg matrix	Stc strategy canvas	Vc value chain	Hy hype-cycle	Sr stakeholder rating map	Ta taps	Sd spray diagram

Learning Visualizations by Analogy

Promoting Visual Literacy through Visualization Morphing

http://tinyurl.com/VisAnalogy