

VisBricks: Multiform Visualization of Large, Inhomogeneous Data

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Motivation: Analyzing large, inhomogeneous tabular data sets

Difficult to **process** and **analyze**

E.g.: similarity measures for dimensions of different data type

Visualization is inefficient

E.g.: sparse or homogeneous regions are allowed the same space as diverse or dense regions

Abstraction is difficult

E.g.: meaningless histograms for dimensions of different value ranges

Types of (in)homogeneity

Semantics:

different meanings

Characteristics:

different types (data type, value range)

Statistics:

different distributions

Our Approach: Divide & Conquer

1. **Divide**: Split dataset into homogeneous groups
2. **Conquer**: Re-introduce lost relations

DIVIDE

A tabular dataset

1,1	1,2	1,3	1,4	1,5	1,6	1,7
2,1	2,2	2,3	2,4	2,5	2,6	2,7
3,1	3,2	3,3	3,4	3,5	3,6	3,7
4,1	4,2	4,3	4,4	4,5	4,6	4,7
5,1	5,2	5,3	5,4	5,5	5,6	5,7
6,1	6,2	6,3	6,4	6,5	6,6	6,7

Uncover dimension groups

Split homogeneous dimension inhomogeneities

1,1	1,2	1,3	1,4	1,5	1,6	1,7
2,1	2,2	2,3	2,4	2,5	2,6	2,7
3,1	3,2	3,3	3,4	3,5	3,6	3,7
4,1	4,2	4,3	4,4	4,5	4,6	4,7
5,1	5,2	5,3	5,4	5,5	5,6	5,7
6,1	6,2	6,3	6,4	6,5	6,6	6,7

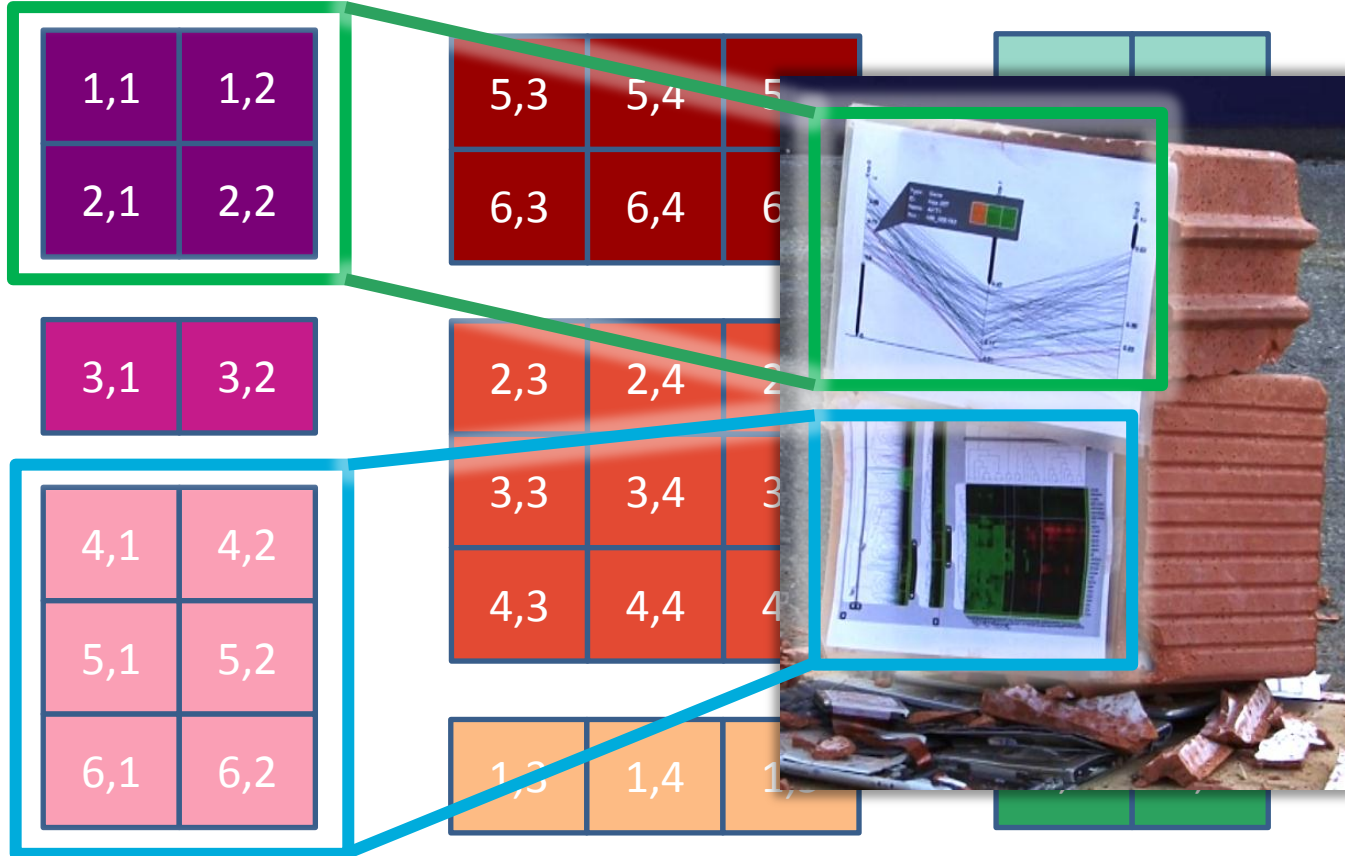
Divide the ring game into smaller goods

1,1	1,2
2,1	2,2
3,1	3,2
4,1	4,2
5,1	5,2
6,1	6,2

1,3	1,4	1,5
2,3	2,4	2,5
3,3	3,4	3,5
4,3	4,4	4,5
5,3	5,4	5,5
6,3	6,4	6,5

1,6	1,7
2,6	2,7
3,6	3,7
4,6	4,7
5,6	5,7
6,6	6,7

Introducing Bricks



What is a Brick?

Shows homogeneous part of a data set

Multiform property:

different visualization **techniques**

different levels of **abstraction**

different **level of detail**

Two types of bricks:

Dimension bricks

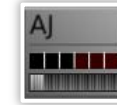
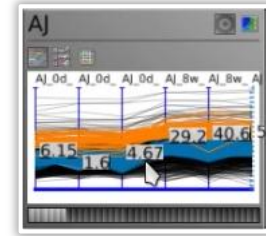
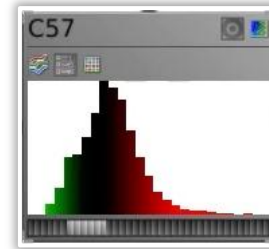
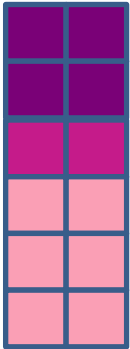
Cluster bricks



Examples for Bricks

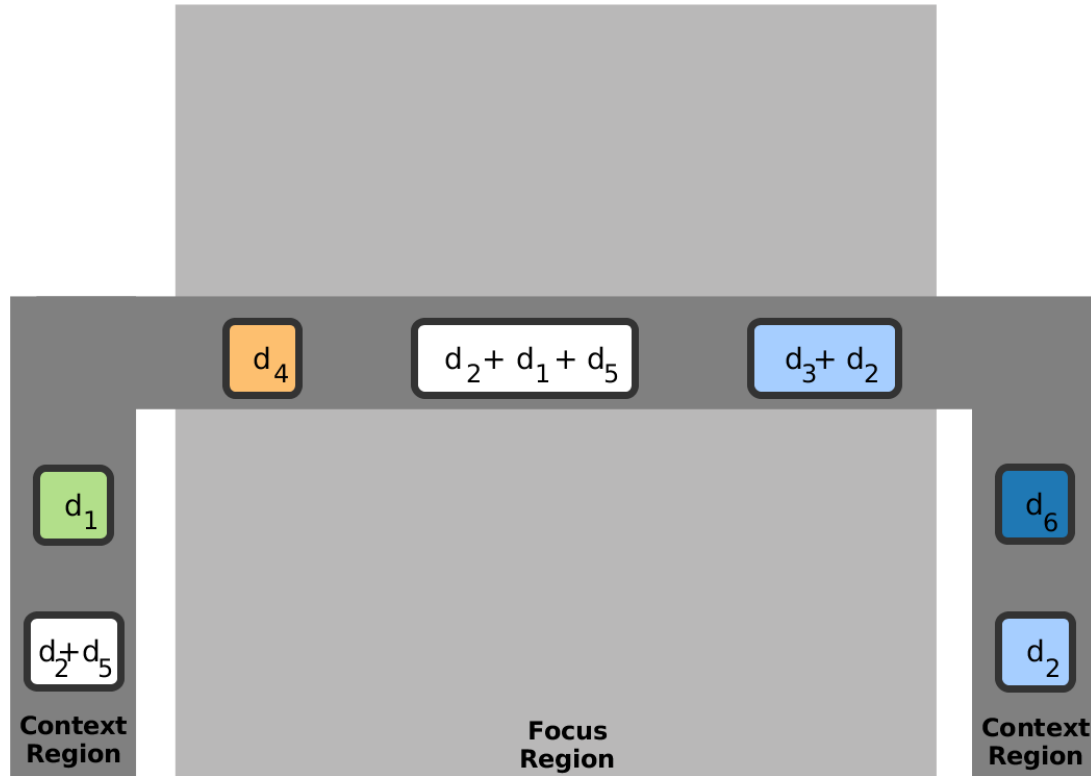
Dimension Bricks

Cluster Bricks

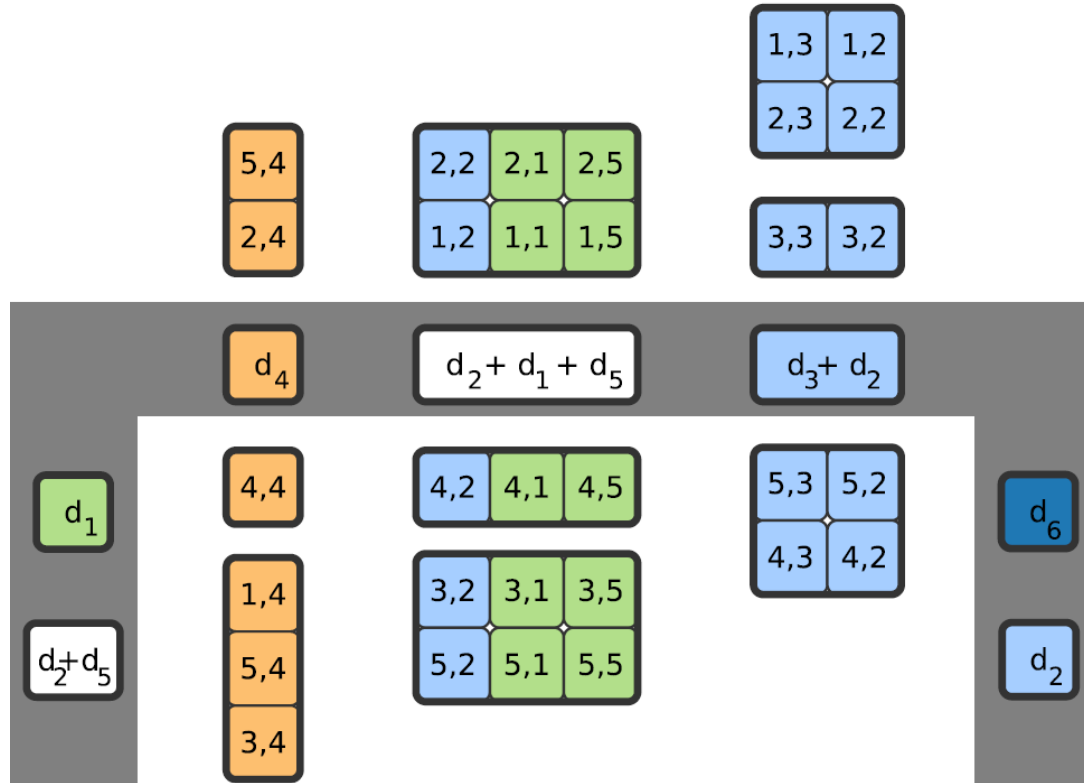


CONQUER

Layout

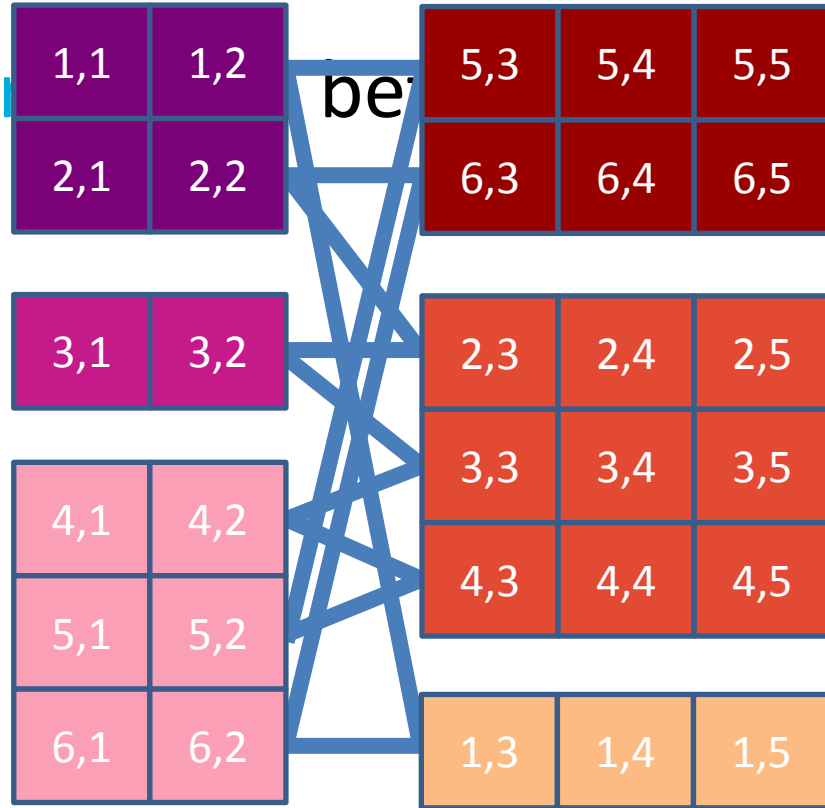


Add Cluster Bricks

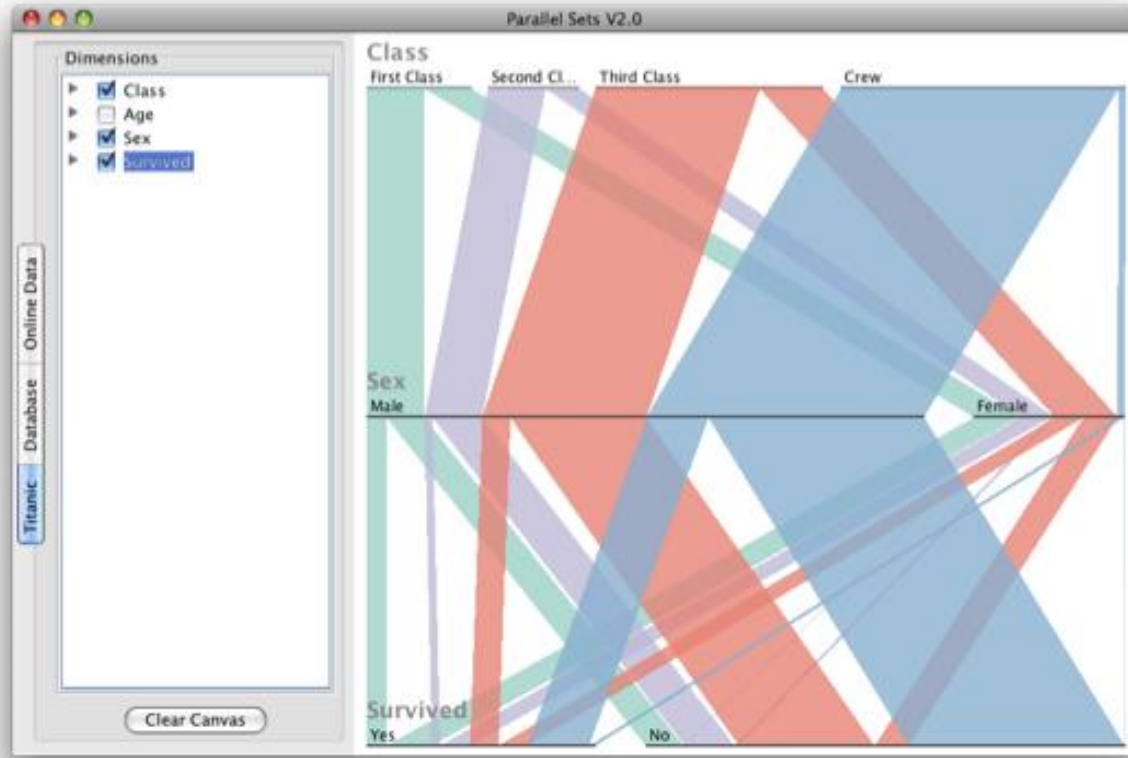


Challenges with Bricks

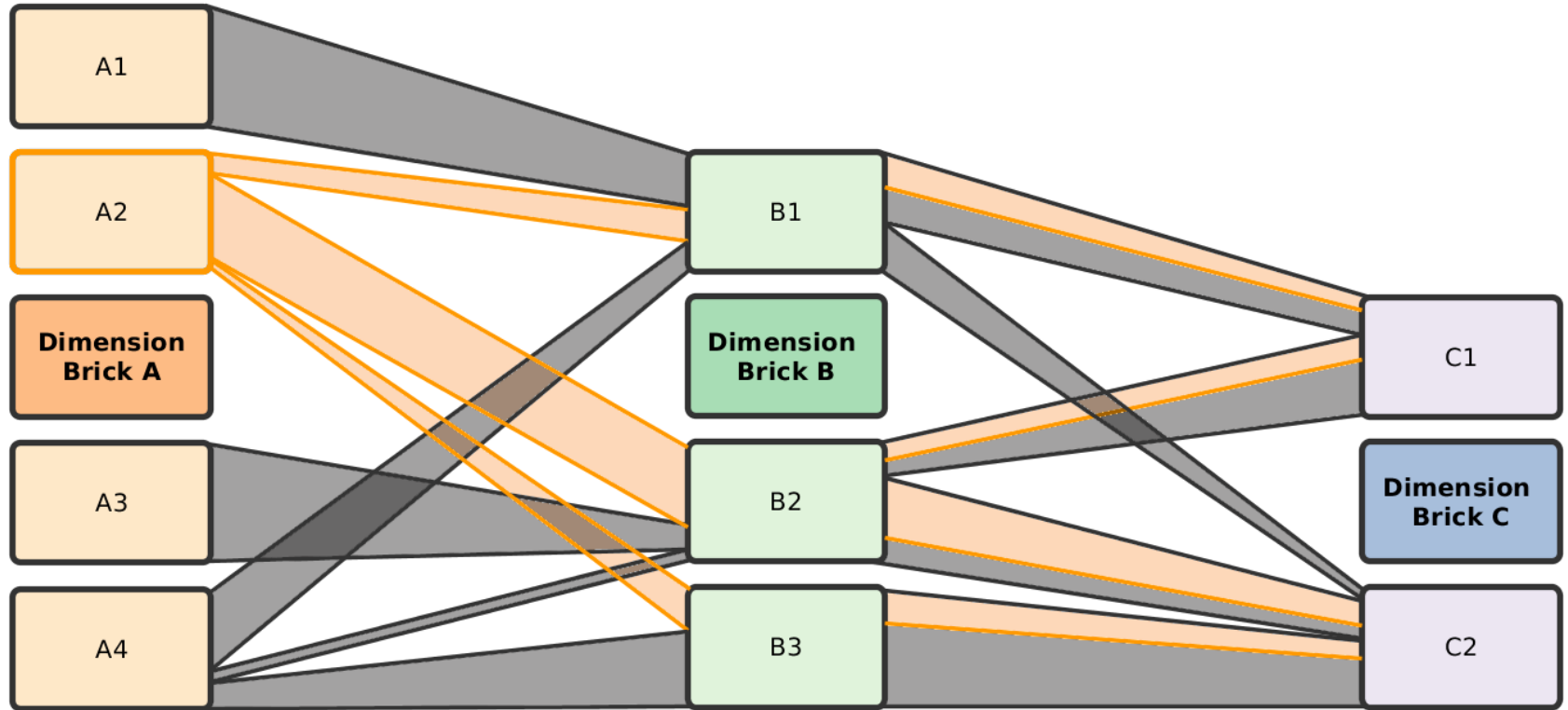
Loss of row-1



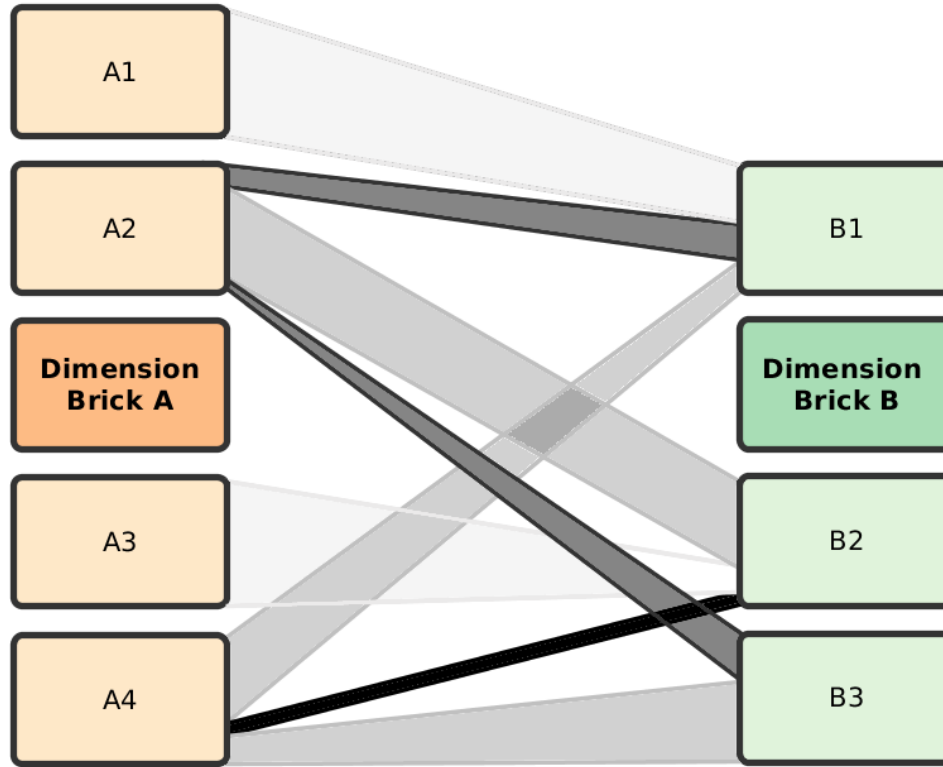
Showing set relations



Showing set relations between bricks



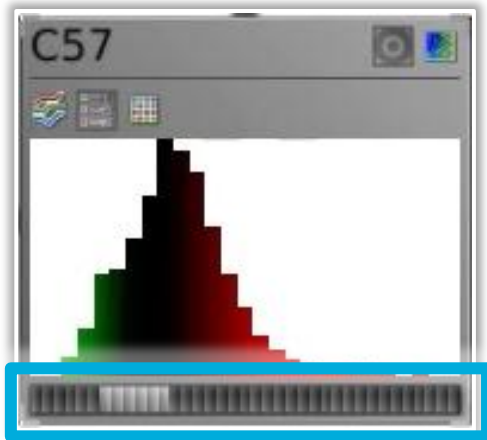
Trends Filter



Challenges with Bricks

Loss of **row-relations** between bricks

Loss of feeling of **scale of data** in brick



Potential Benefits of VisBricks

Right level of abstraction

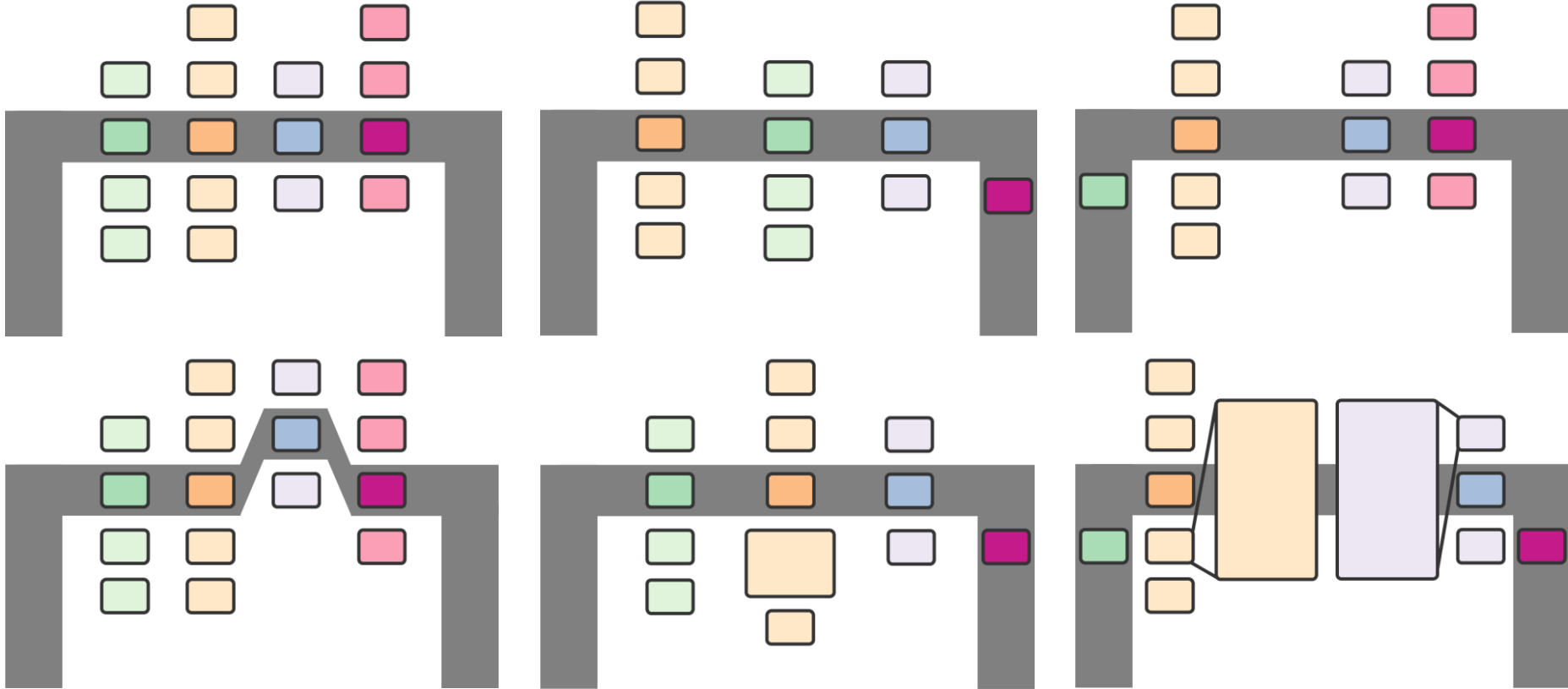
balance between size and level of details

Ability to compare different parts of a dataset

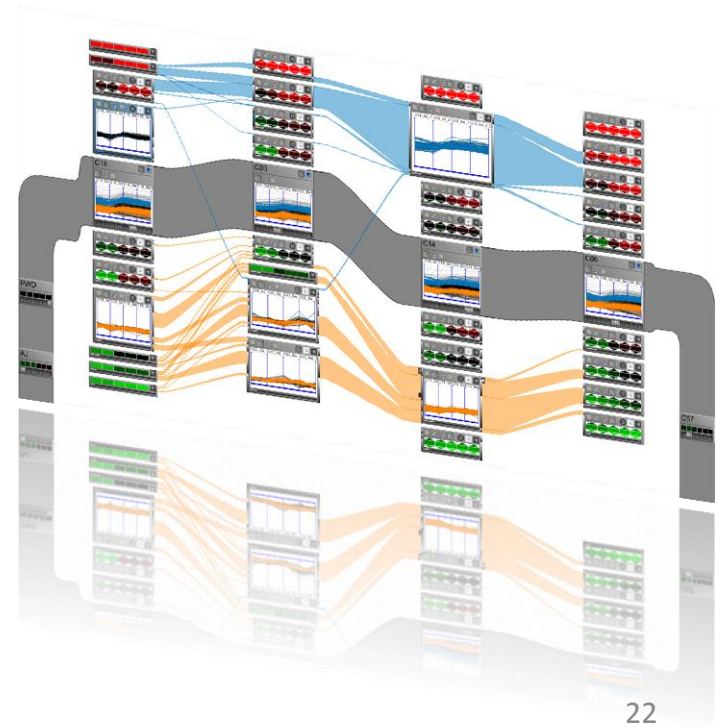
Right level of detail for a given task

Require User Interaction

Interaction Metaphors



USE CASE, DEMONSTRATION



Use Case: Gene Expression Analysis

Goal: compare expression level of several different groups (different genotypes)

Homogeneous groups of dimensions:

Genotype

Homogeneous groups of records:

Clustering

Tool Bar

General

Info

Genes

Hspb3 | NM_019960

Experiments

C18_0d_2

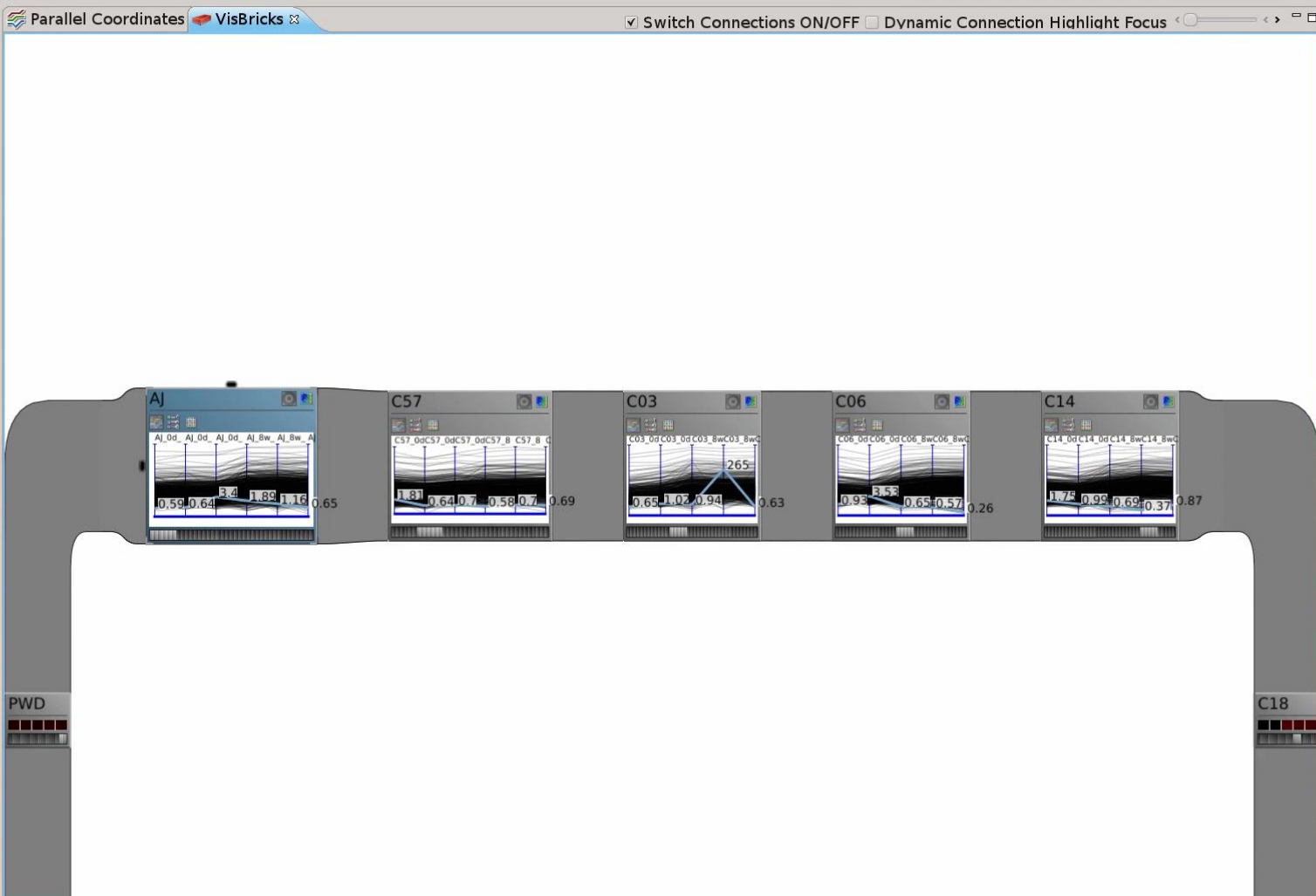
Selection Bro

Content Selections

- Selected by group 1
- Selected by group 2
- Selected by group 3
- Selected by group 4

Merge Selection(s)

Delete Selection(s)



Gr

Root

- AJ
 - AJ_0d_1
 - AJ_0d_2
 - AJ_0d_3
 - AJ_8w_1
 - AJ_8w_2
 - AJ_8w_3
- C57
 - C57_0d_1
 - C57_0d_2
 - C57_0d_3
 - C57_8w_1
 - C57_8w_2
 - C57_8w_3
- C03
 - C03_0d_1
 - C03_0d_2
 - C03_8w_1
 - C03_8w_2
 - C03_8w_3
- C06
 - C06_0d_1
 - C06_0d_2
 - C06_8w_1
 - C06_8w_2
 - C06_8w_3
- C18
 - C18_0d_1
 - C18_0d_2
 - C18_8w_1
 - C18_8w_2
 - C18_8w_3
- C14
 - C14_0d_1
 - C14_0d_2
 - C14_8w_1

Summary

Special treatment for each part of the data

Best visual encoding

Right level of detail

Right level of abstraction

Compare different parts of a dataset



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