

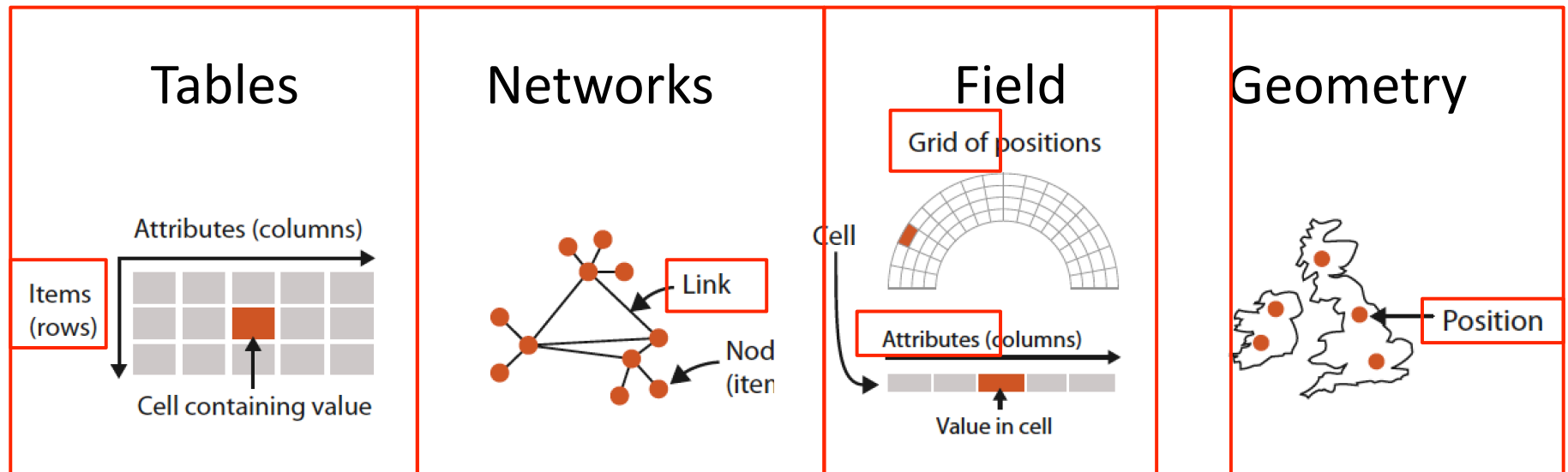
Data Abstraction

What can be visualized

- Basic data set types: tables, networks, fields, and geometry
- Data types: items, attributes, links, positions, and grids
- Data sets can be static or dynamic (streaming)
- Types of an attribute:
 - Categorical
 - Ordered: Ordinal, Quantitative
- Important Properties of data
 - Semantics: meaning of data
 - Types: mathematical or structural interpretation
 - Defined in the attribute level, data level and dataset level
- Additional information – Metadata

Data Set and Data Type

- Four types of data set



- And a data set can contain data of the following types

Items	Attributes	Links	Positions	Grids
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Data Set and Data Type

Tables

Items

Attributes

Networks &
Trees

Items (nodes)

Links

Attributes

Fields

Grids

Positions

Attributes

Geometry

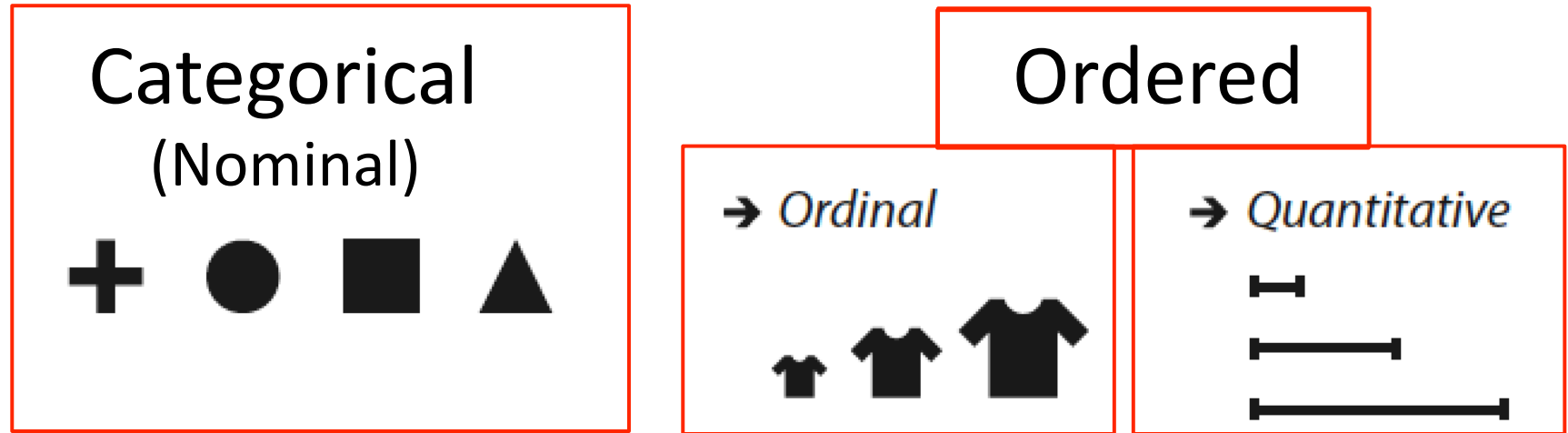
Items

Positions

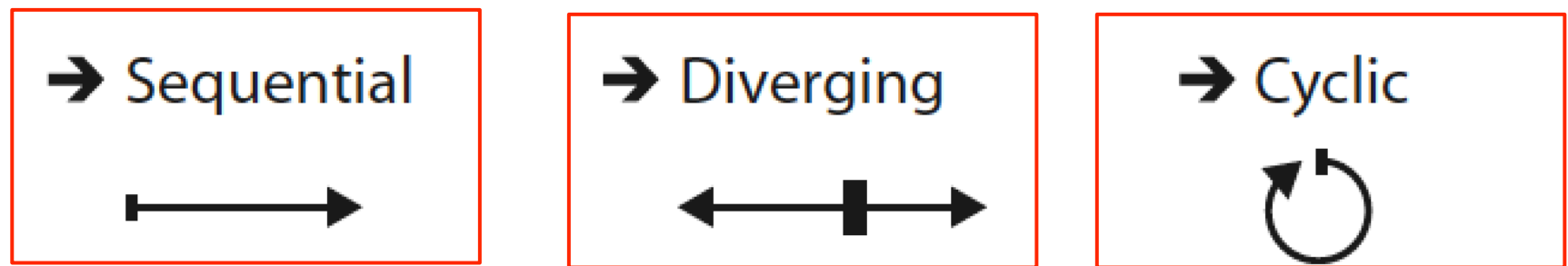
Clusters,
Sets, Lists

Items

Attribute Types



Ordering direction



Attribute Semantics

- Key vs. value semantics
- The key attribute acts as an index to retrieve the data value
- Different data set types will have different ways to define the keys

Flat Table

An item

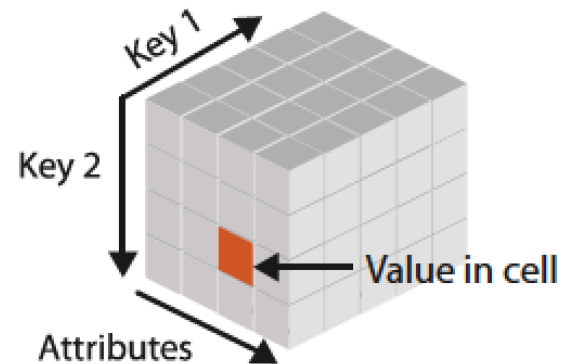
ID	Name	Age	Shirt Size	Favorite Fruit
1	Amy	8	S	Apple
2	Basil	7	S	Pear
3	Clara	9	M	Durian
4	Desmond	13	L	Elderberry
5	Ernest	12	L	Peach
6	Fanny	10	S	Lychee
7	George	9	M	Orange
8	Hector	8	L	Loquat
9	Ida	10	M	Pear
10	Amy	12	M	Orange

Can be used as a key

May not be a good choice of key

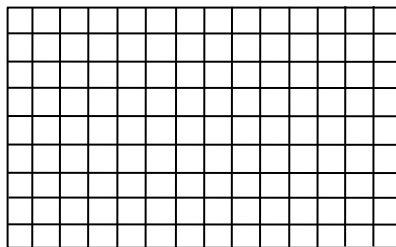
Multi-dimensional Tables

- A key has multiple attributes and needs to be a unique combination of values
- It is not always clear what attributes are keys and what are values
 - Figuring out independent and dependent variables (cause-effect analysis)

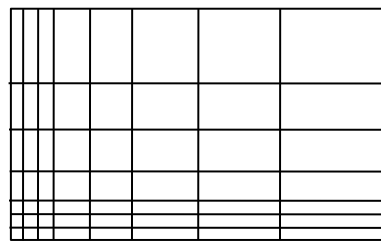


Field Data

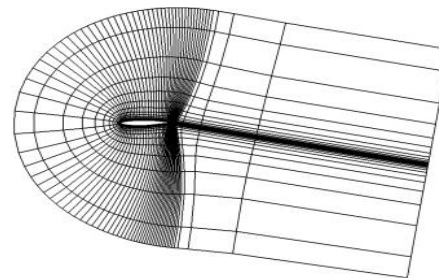
- Field data are mostly seen in scientific applications (temperatures, pressures, etc)
- Values are defined on grids, where the positions of the grid points are the key



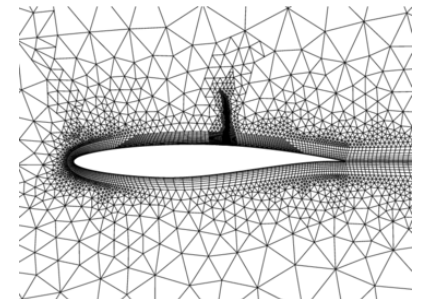
Cartesian Grid



Rectilinear Grid



Curvilinear Grid

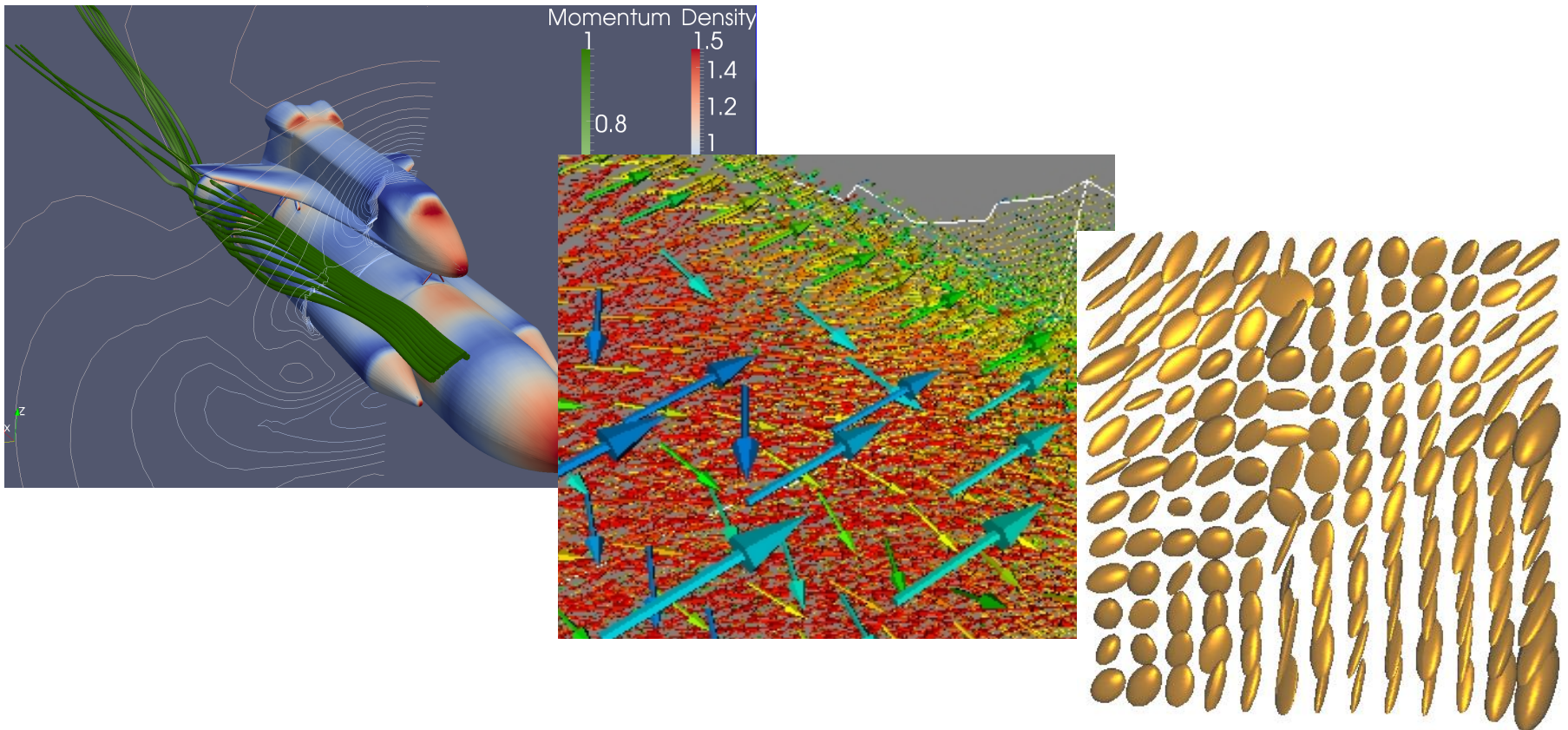


Irregular Grid

- Value attributes: scalar, vector, tensor

Attributes

- Scalars (e.g. density), Vectors (e.g. momentum), , Tensors (e.g. stress tensor)



Temporal Semantics

- Any kind of information that is related to time
- Temporal data are often more complex to deal with
- Temporal attributes can be either keys or values
- Time-varying data often means time is the key attribute
 - e.g Time series data