



# Database Visualization

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# Databases

- **OLAP** - OnLine Analytical Processing
- **Data Cube** – multidimensional spreadsheet (hypercube if  $> 3$  dim.)
- **Dimension** – database key
- **Measure** – database values
- **Cell** – element of the data cube holding specific value(s) for each of the dimensions

## Sales database:

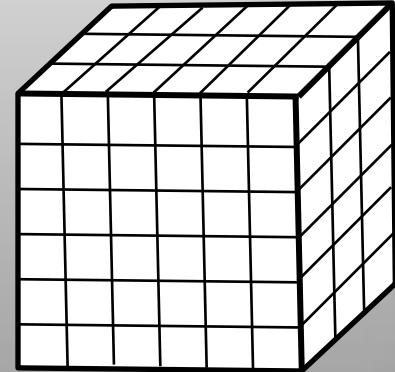
*<date, product, location, amount>*

(8/7/15, coffee, Seattle, \$4)

(8/8/15, tea, Beijing, \$3)

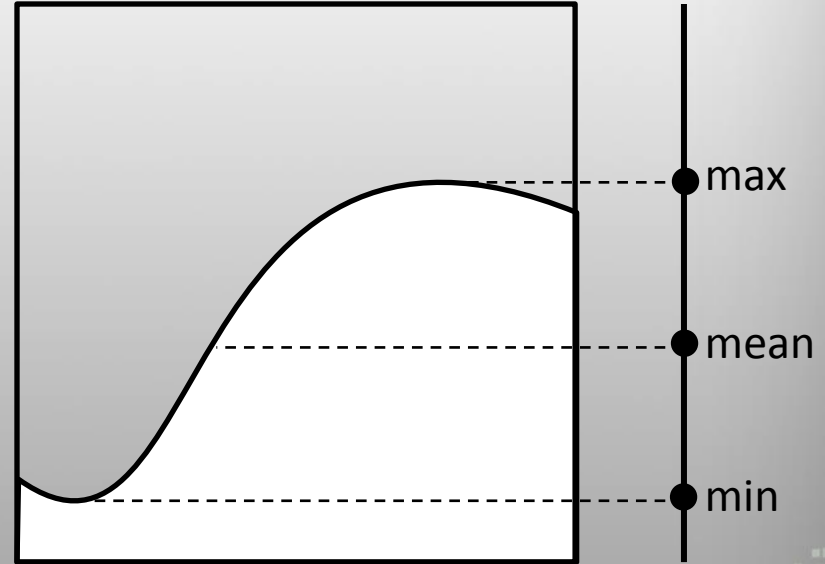
(8/5/15, espresso, Rome, \$5)

...



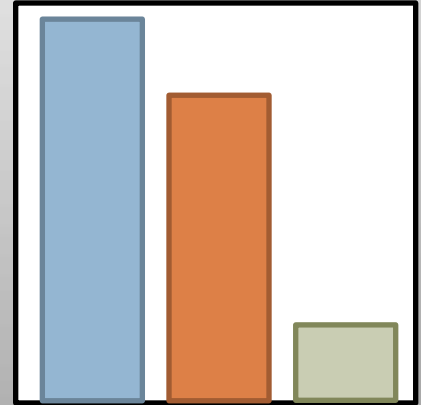
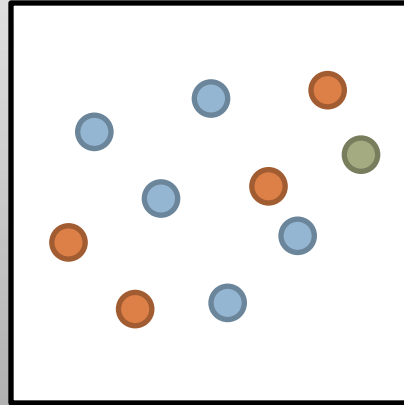
# Data Aggregation

- **Quantitative:** sum, mean, median, minimum, maximum
- **Count:** converts ordinal or nominal data into quantitative data
- **Binning:** discretizes quantitative data into ordinal or nominal data



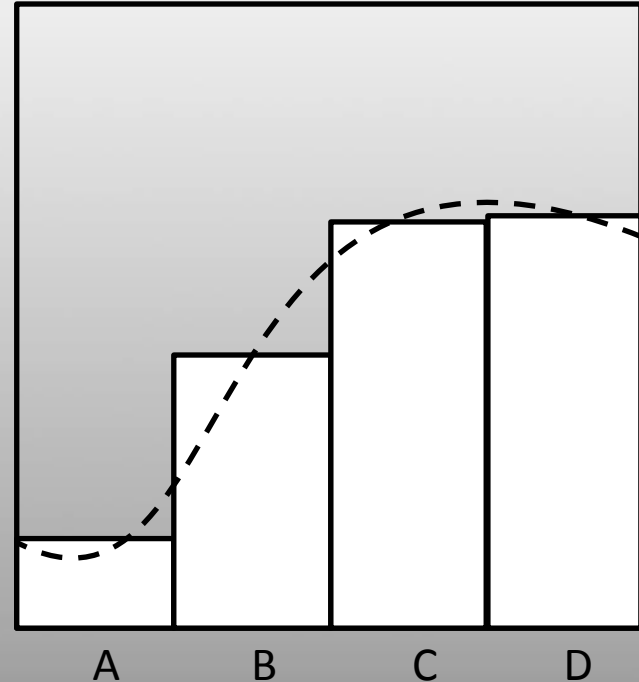
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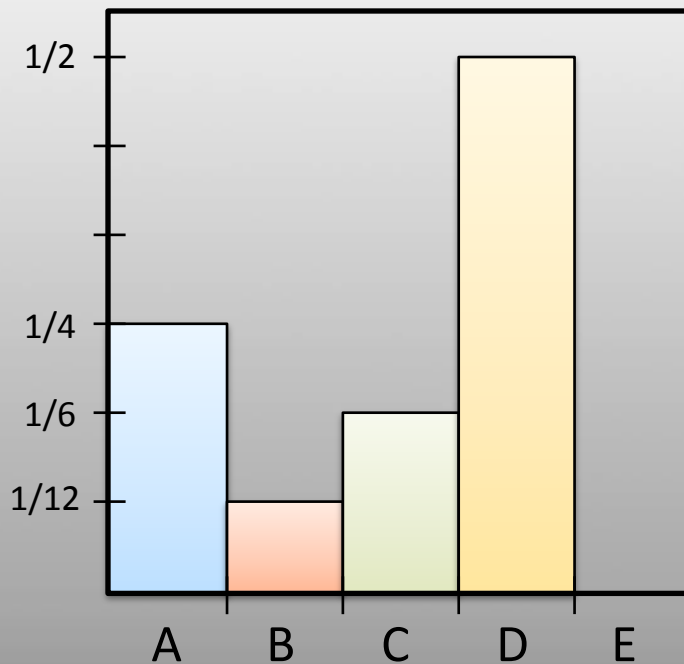
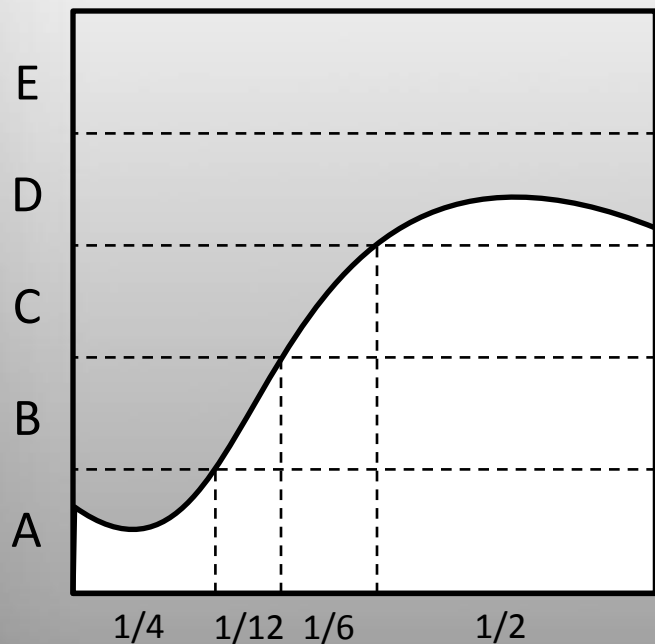
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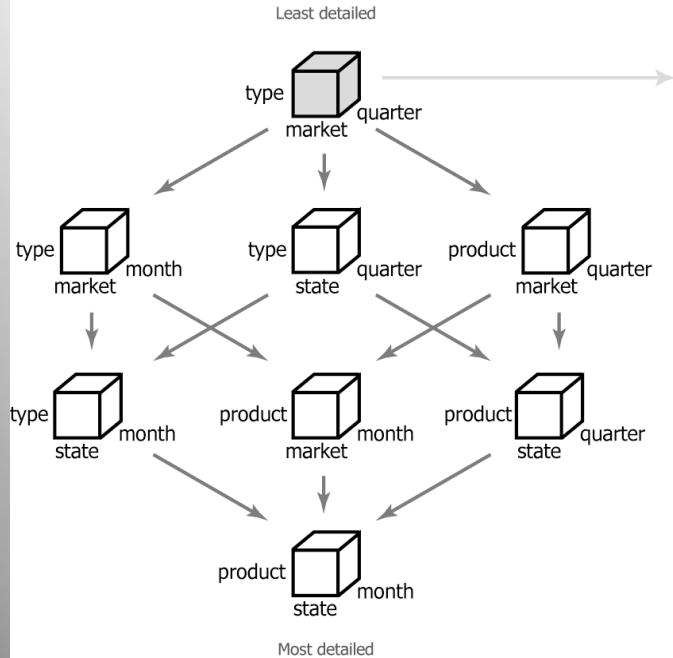
# Histogram

A histogram is a count over buckets of the data values, not the data keys.

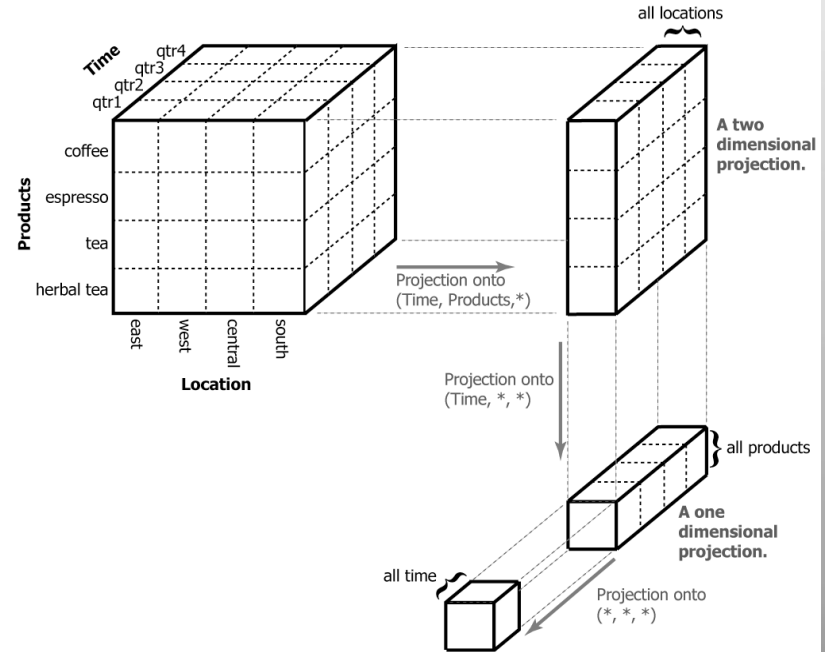


# Data Cubes

(a) The lattice of data cubes

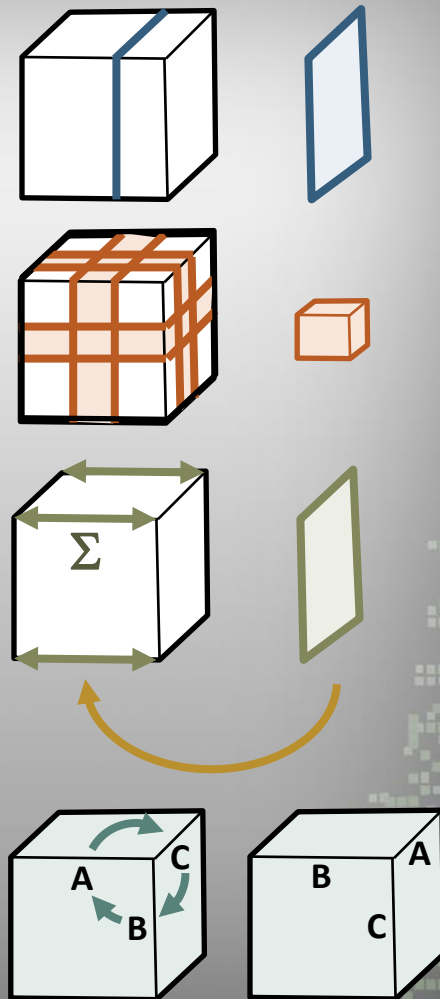


(b) Projecting a three dimensional data cube



# OLAP ⇔ Infovis

Cube Op	Description	Infovis Op
Slicing	Reduce dimensionality by selecting a single attribute value along one of the dimensions	Filter value
Dicing	Focus on a subcube spanning a range of values across one or more dimensions of the cube	Filter range, zoom plot area
Roll-Up	Reduces dimensionality by projecting cube along one of its axes using a summary op	Aggregation
Drill Down	Increases dimensionality by expanding summaries into values, or subdivides dimensions into finer details	Zoom fields, details on demand, (disaggregation)
Pivot	Rotates cube to display a different face comparing different dimensions	Field selection





# Worlds within Worlds

- Each glyph is itself a plot
- E.g. a table of tables
- Different scales for major axis and minor axis for both horizontal and vertical axes
- Can work in 3-D or even deeper nesting (worlds within worlds within worlds), but less effectively

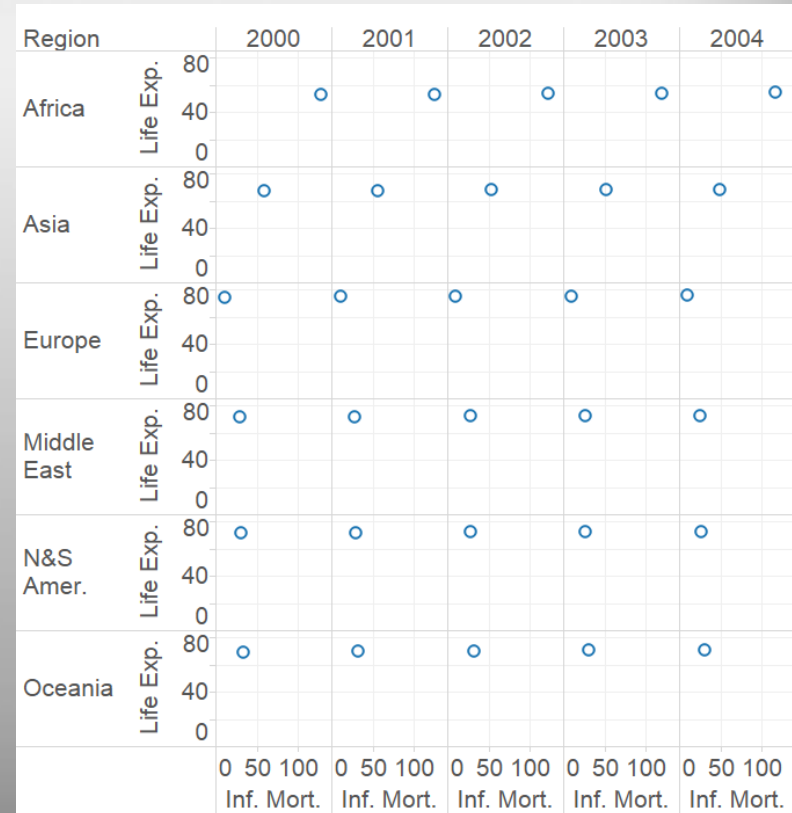


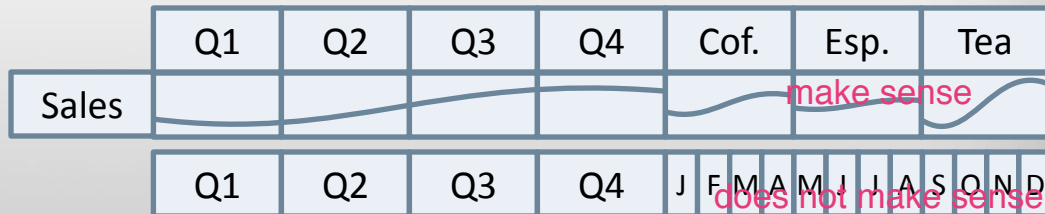
Tableau layout of World Bank Indicator Data

# Organizing Axes

Stolte et al., Polaris...,  
IEEE TVCG 8(1), 2002

- **Concatenation**

- Multiple views of data
- Quarter + Product
- Quarter + Month



- **Product**

- View of data by combination
- Quarter x Product
- Quarter x Month

- **Nesting**

- Limit to combinations in database
- Quarter / Product
- Quarter / Month

Stolte et al., Polaris...,  
IEEE TVCG 8(1), 2002

- | Q1   |      |     | Q2   |      |     | Q3   |      |     | Q4   |      |     |
|------|------|-----|------|------|-----|------|------|-----|------|------|-----|
| Cof. | Esp. | Tea | Cof. | Esp. | Tea | Cof. | Esp. | Tea | Cof. | Esp. | Tea |
| Q1   |      |     | Q2   |      |     | Q3   |      |     | Q4   |      |     |
| J    | F    | M   | A    | M    | J   | J    | A    | S   | O    | N    | D   |

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Q1			Q2			Q3		Q4		
Cof.	Esp.		Cof.	Esp.	Tea	Cof.	Tea	Cof.	Esp.	Tea

Q1			Q2			Q3		Q4			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec