



# 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:

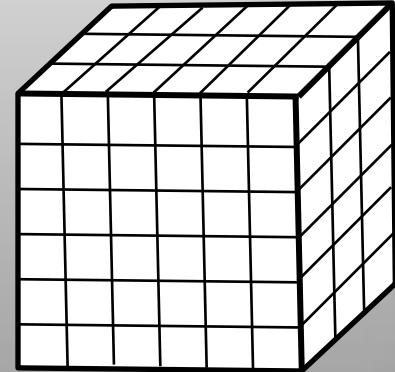
*<date, product, location, amount>*

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

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

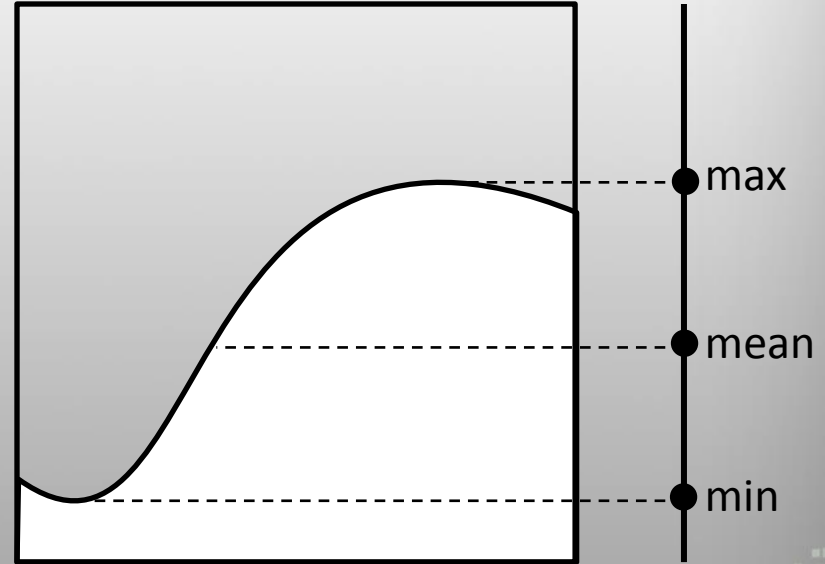
(8/5/15, espresso, Rome, \$5)

...



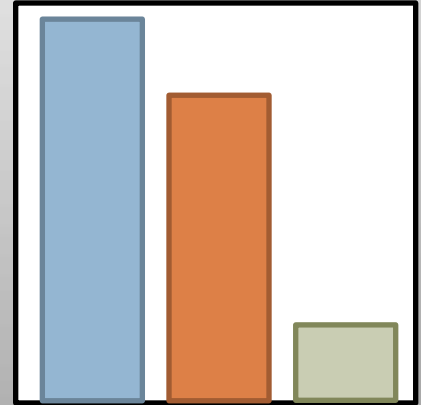
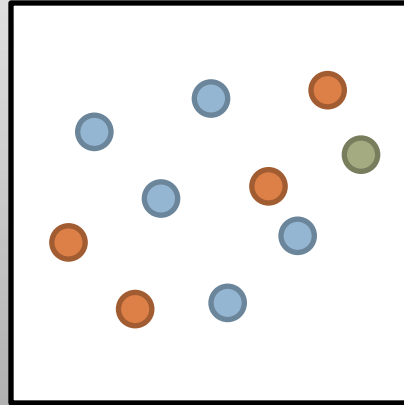
# Data Aggregation

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



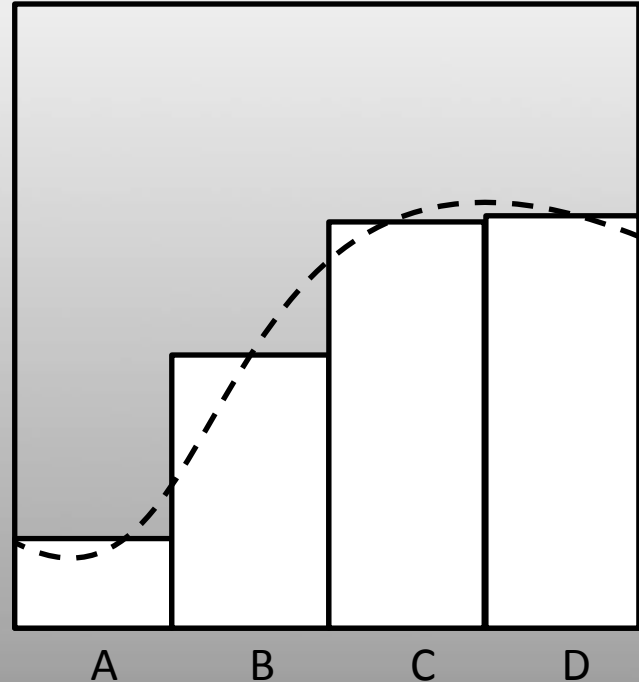
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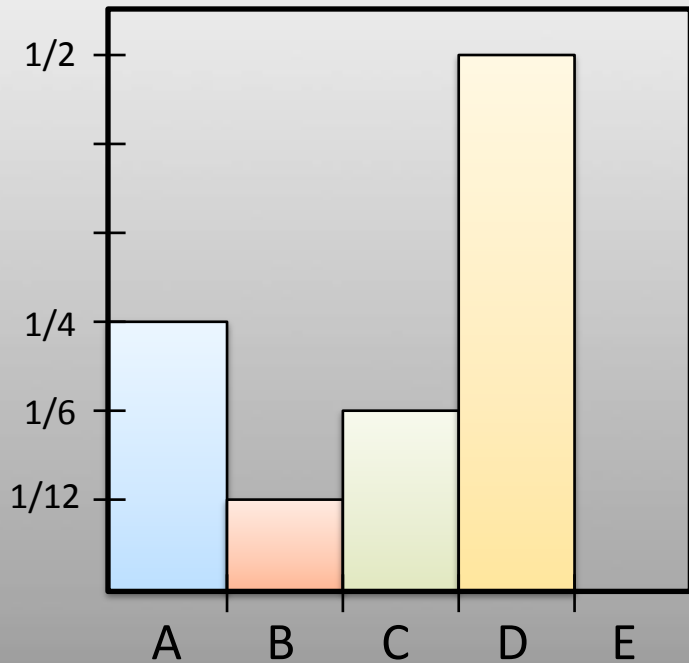
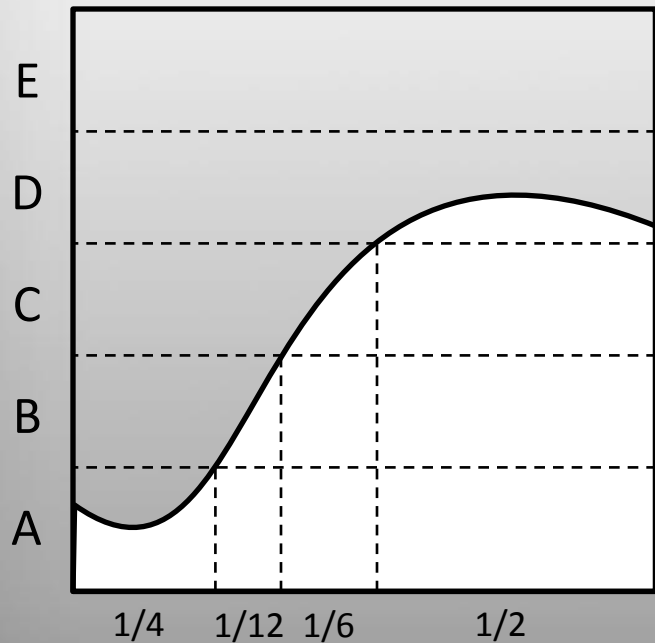


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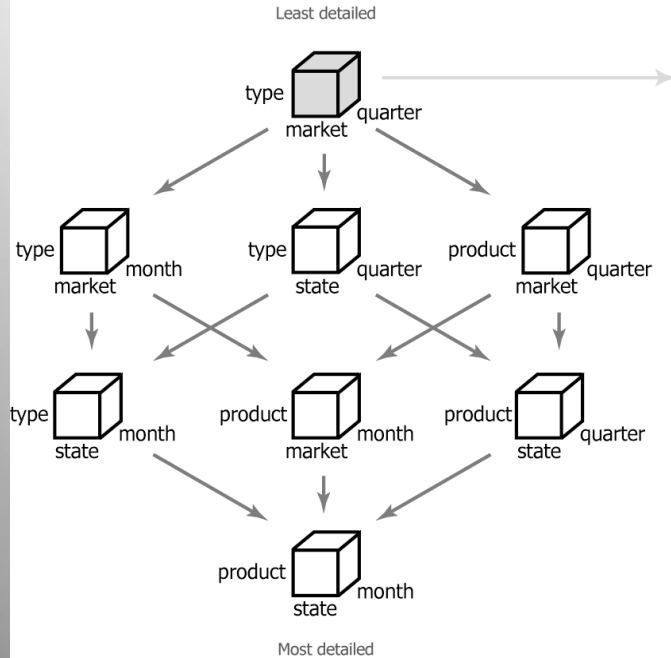


# Histogram

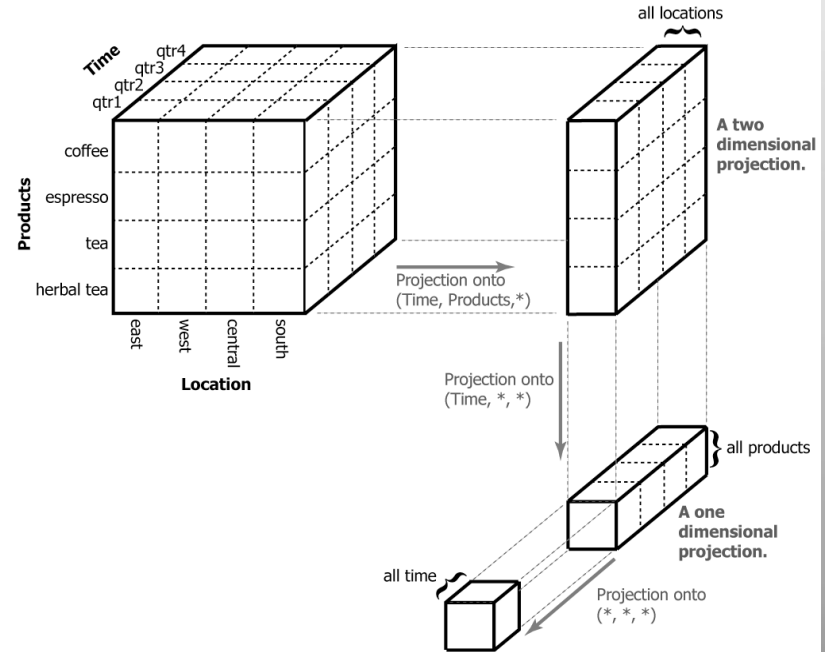


# Data Cubes

(a) The lattice of data cubes

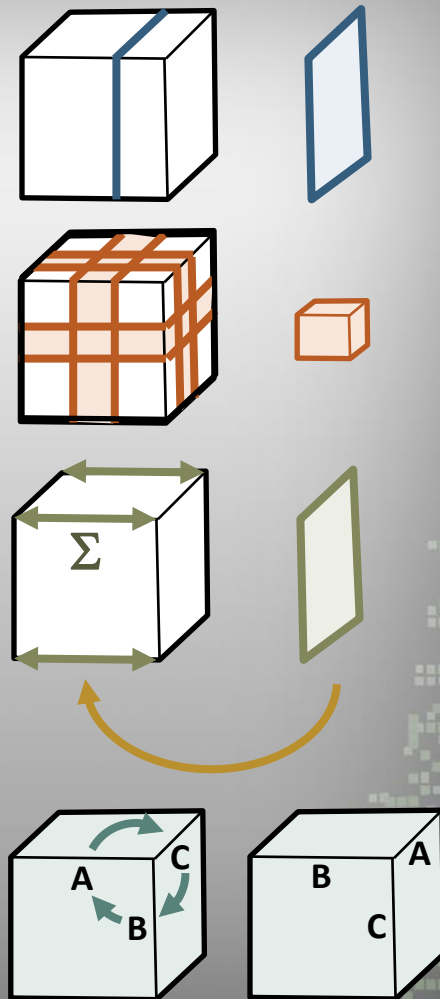


(b) Projecting a three dimensional data cube



# 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

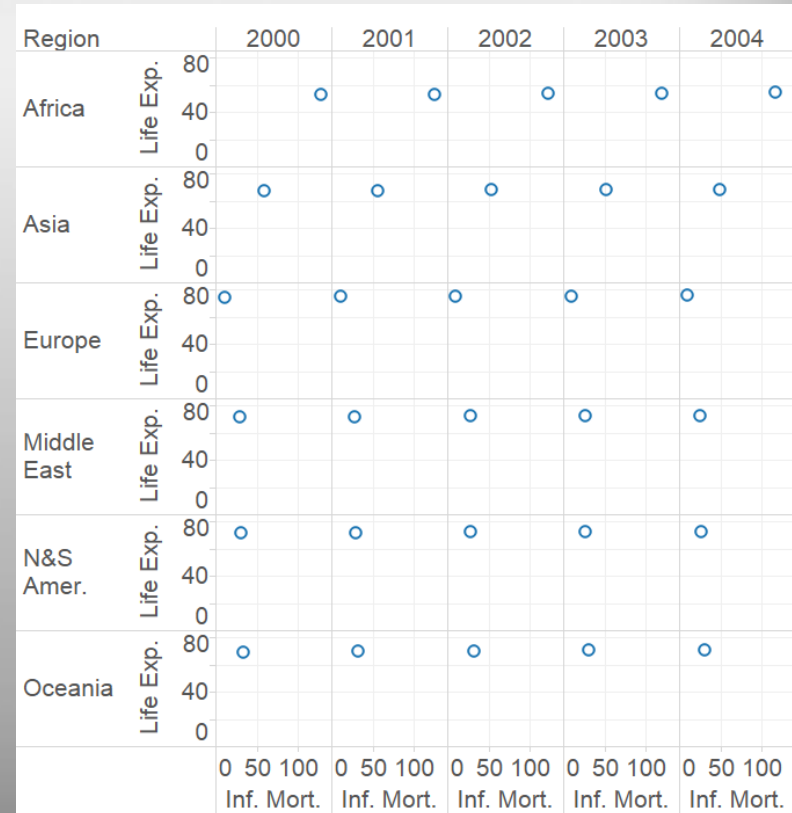


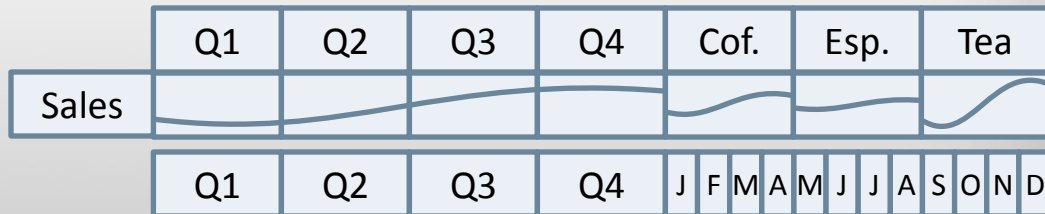
Tableau layout of World Bank Indicator Data

# 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
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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	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec