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
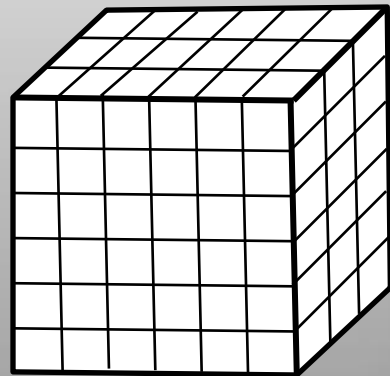
Sales database:
<date, product, location, amount>
(8/7/15, coffee, Seattle, $4)
(8/8/15, tea, Beijing, $3)
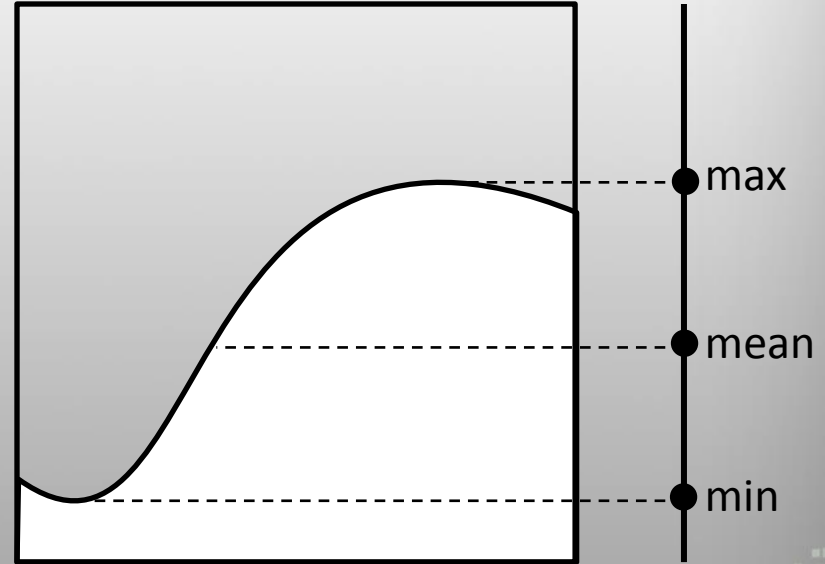(8/5/15, espresso, Rome, $5)
…

Data Aggregation

- **Quantitative**: sum, mean, median, minimum, maximum

- **Count**: converts ordinal or nominal data into quantitative data

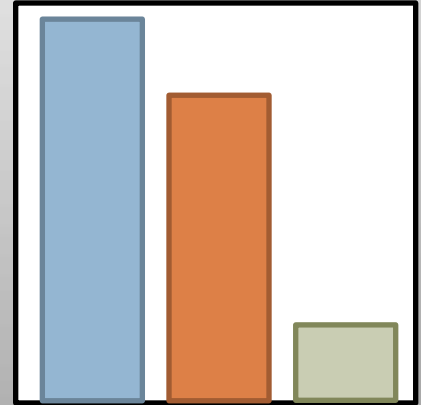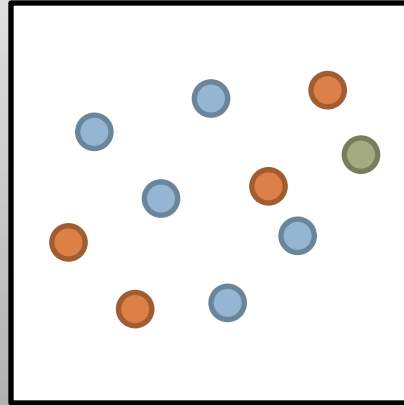- **Binning**: discretizes quantitative data into ordinal or nominal data

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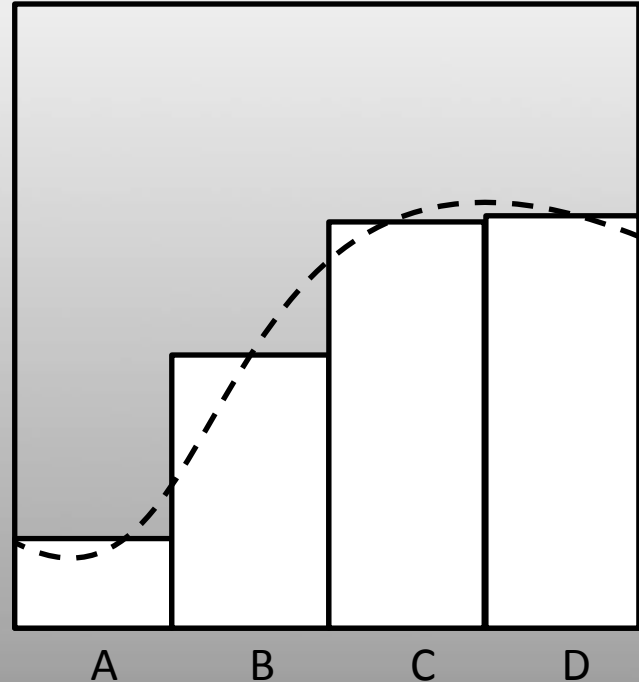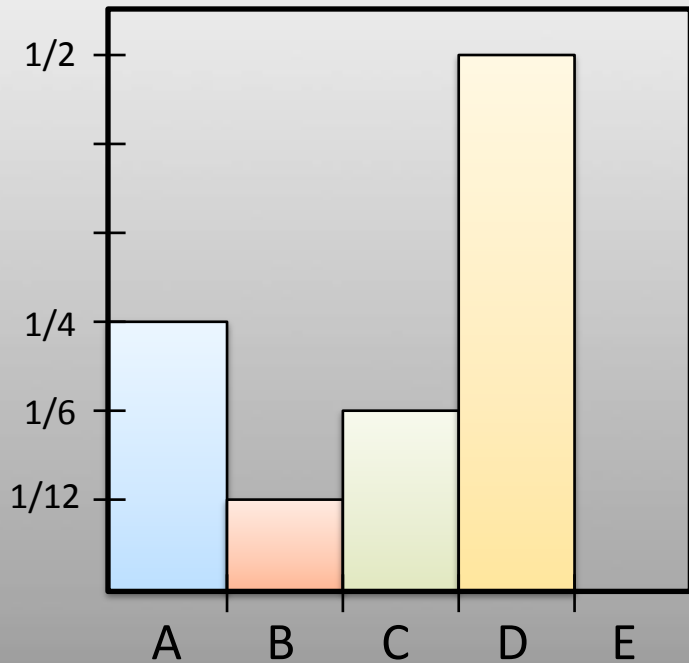- **Binning**: discretizes quantitative data into ordinal or nominal data

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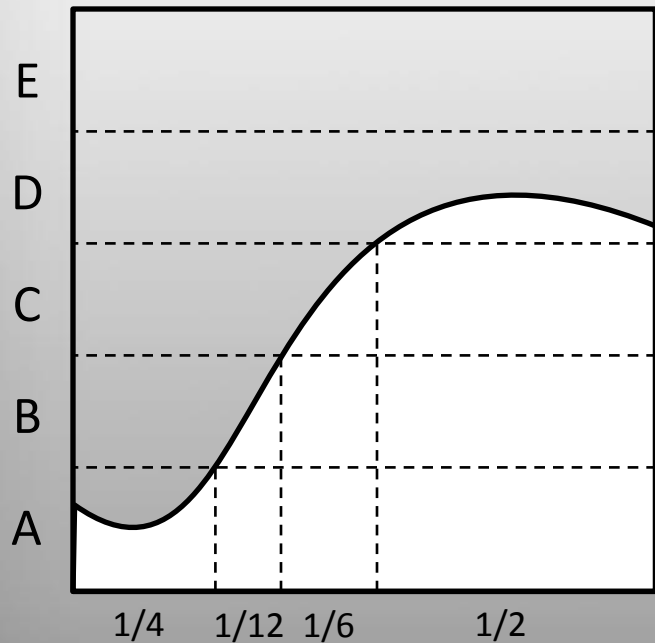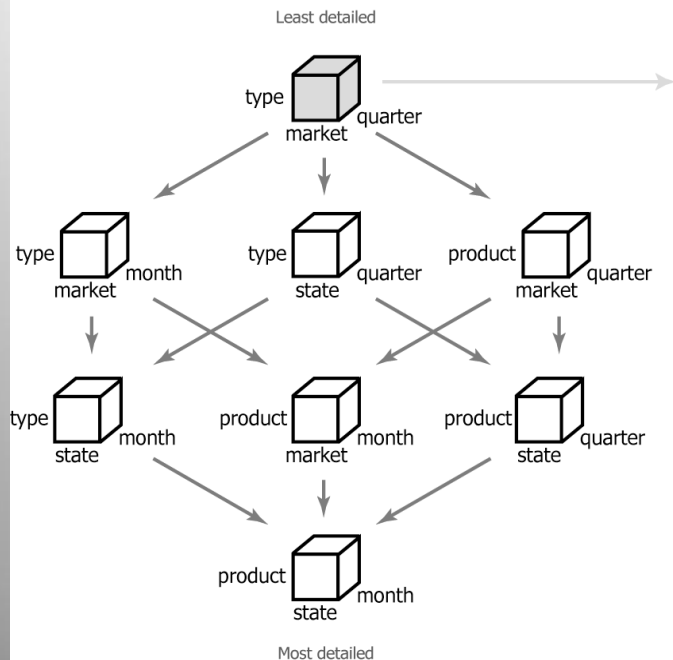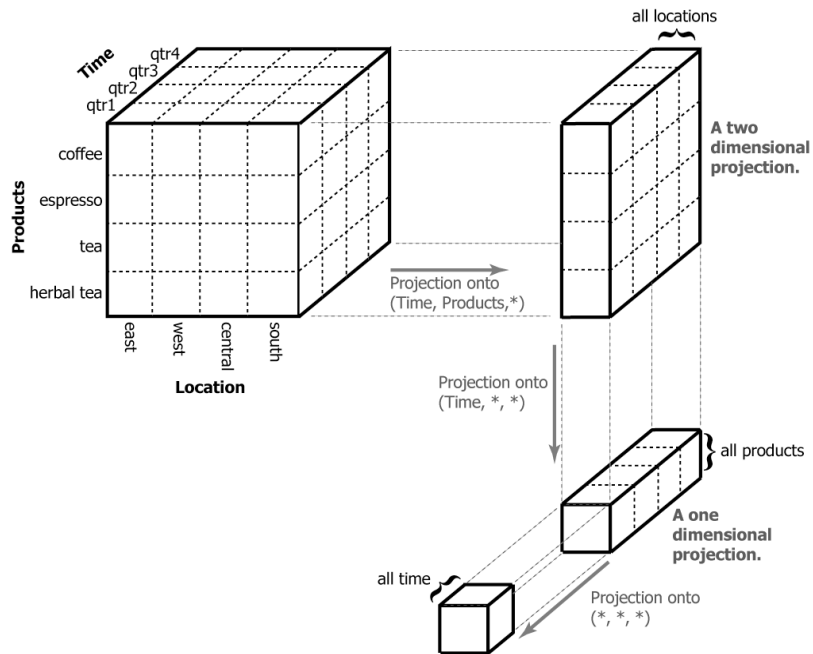
Histogram

Data Cubes

(a) The lattice of data cubes

(b) Projecting a three dimensional data cube

Stolte et al., Multiscale Visualization Using Data Cubes, Proc. Infovis 2002

OLAP ⬌ Infovis

Cube Op	Description	Infovis Op
Slicing	Reduce dimensionality by selecting a singe 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
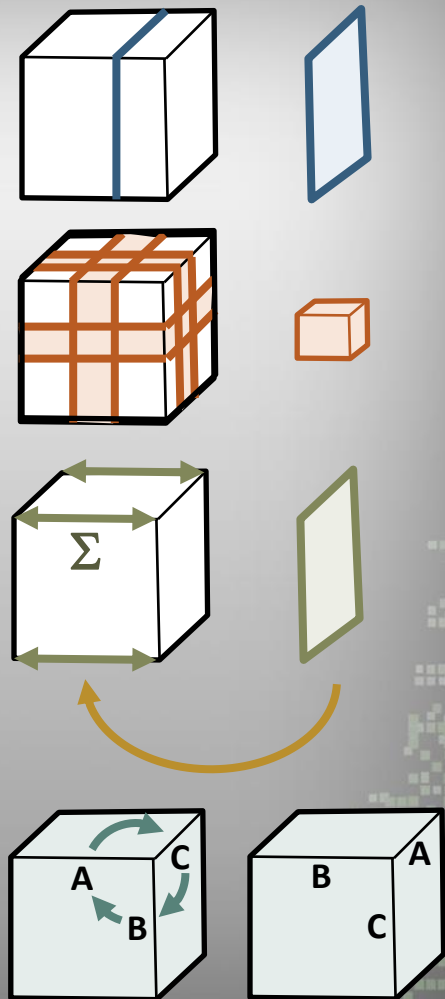
Worlds within Worlds

- 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

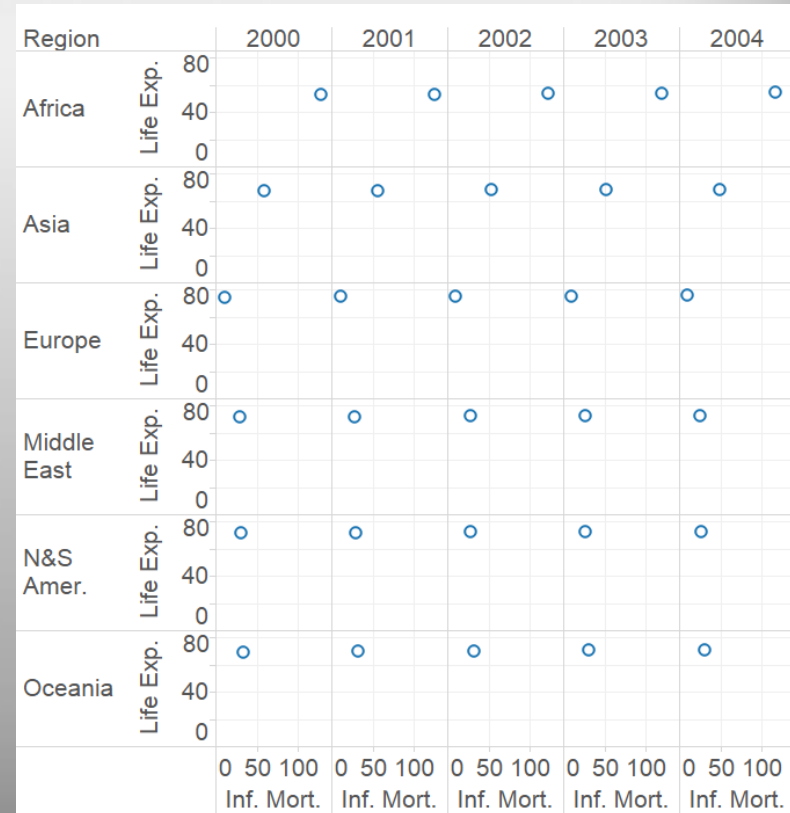- Can work in 3-D or even deeper nesting (worlds within worlds within worlds), but less effectively

Tableau layout of World Bank Indicator Data

Organizing Axes

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

	Q1	Q2	Q3	Q4	Cof.	Esp.	Tea
Sales							
	Q1	Q2	Q3	Q4	J F M A M J J A S O N D
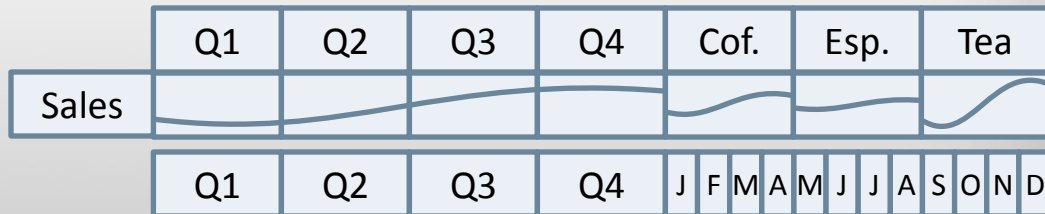
- **Product**
  - View of data by combination
  - Quarter x Product
  - Quarter x Month

- **Nesting**
  - Limit to combinations in database
  - Quarter / Product
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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	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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Q1			Q2			Q3			Q4		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec