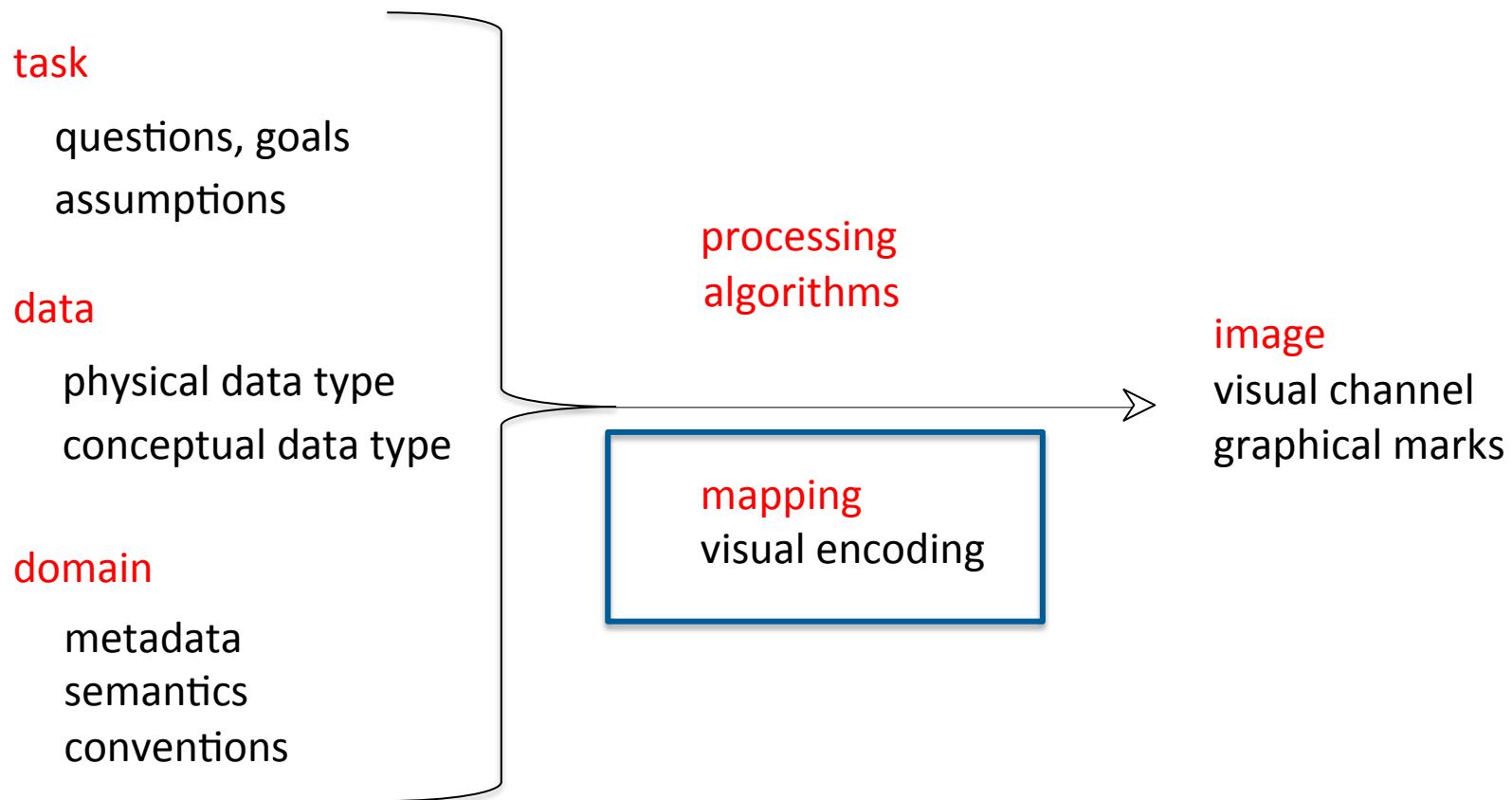




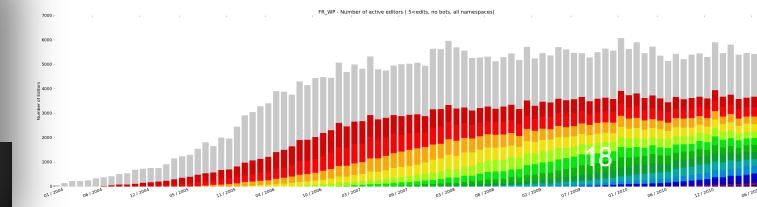
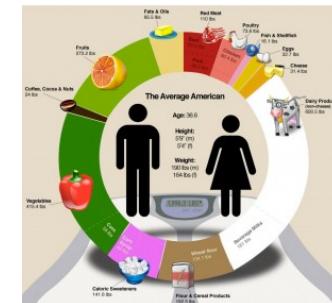
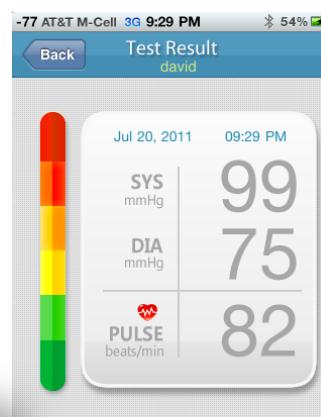
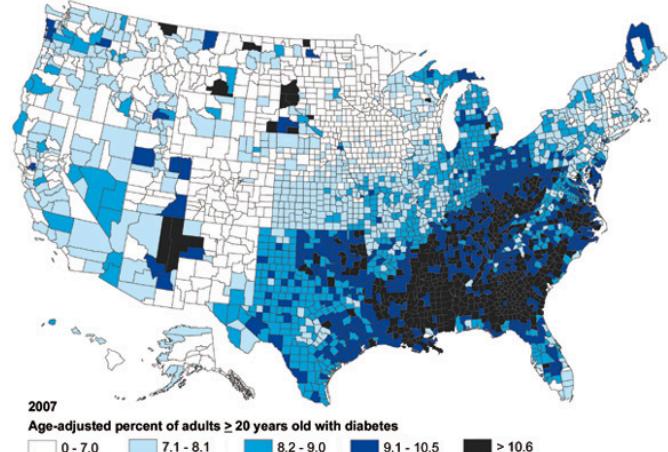
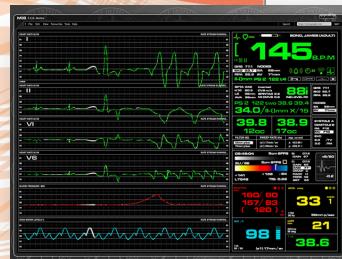
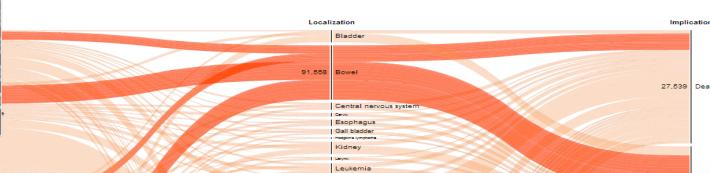
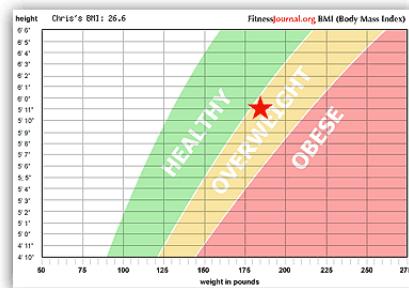
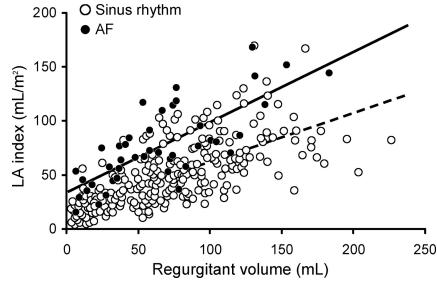
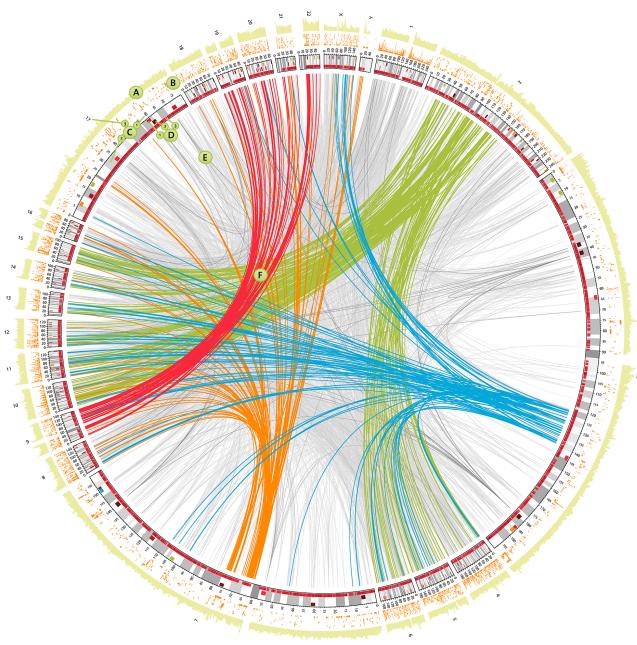
Module #2b: **Basic Visualization Techniques**



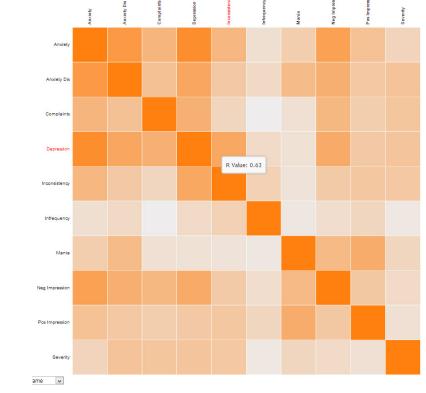
Visualization Process



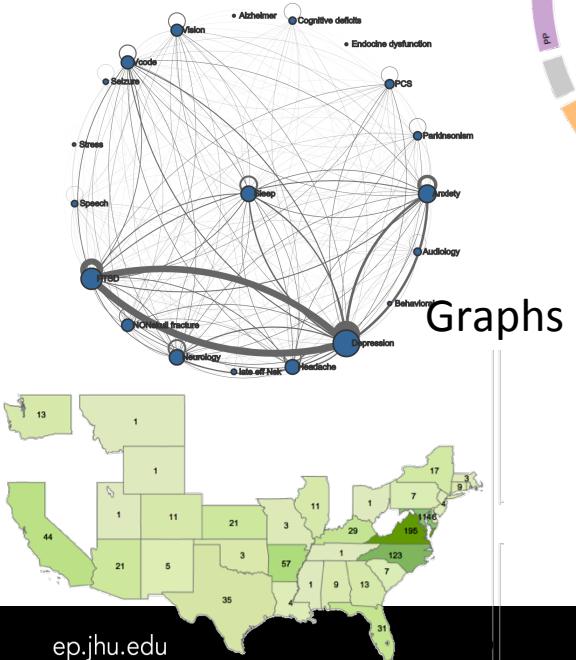
Data Visualization



Popular Visualization Techniques



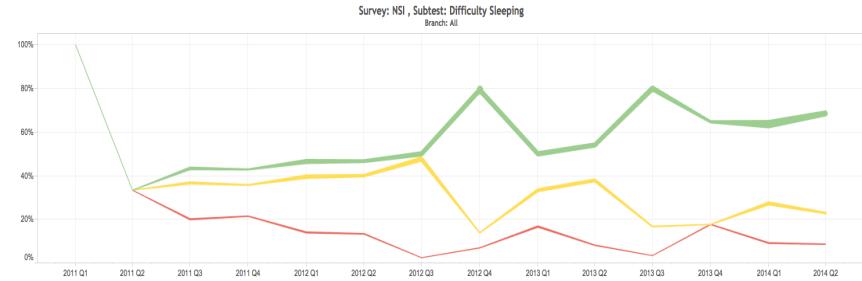
Tables



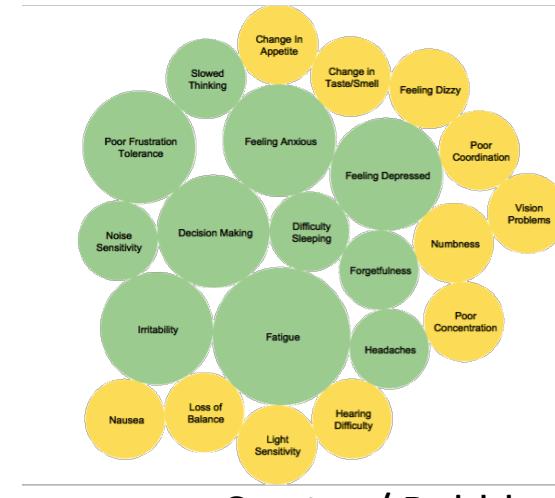
Graphs



Radial / Circular



Lines



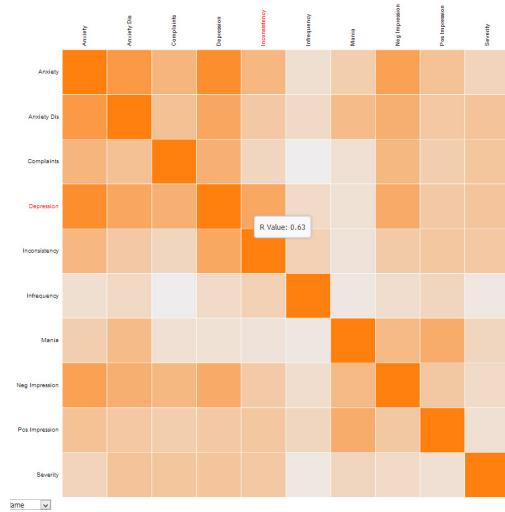
Scatter / Bubbles



Hierarchical / Treemaps



Tables





Tables

- A table is the simplest visualization approach to illustrate data
- **Data:**
 - arranges information in rows (items) and columns (attributes)
 - values dependent on attribute
 - readers can make comparisons across attributes
- **Pros:**
 - very effective for presenting precise data
 - widely used and accepted
- **Cons:**
 - limitations showing trends, developments, or impact
 - don't often convey a single, distinct message

	Sex	Gestational age (weeks completed)	Infant weight (kg)	Infant weight percentile* (%)	Infant weight/length percentile* (%)
Control 1	Male	38	3.10	10–25	25
Control 2	Female	40	3.38	25–50	10–25
Control 3	Male	41	3.98	75–90	25–50
Control 4	Male	39	3.70	50–75	10–25
Control 5	Female	38	2.91	10–25	5–10
Control 6	Female	40	3.45	50–75	90–95
GDM 1	Male	38	4.06	75–90	50
GDM 2	Female	39	4.18	95–97	95–97
GDM 3	Female	39	3.76	75–90	75–90
GDM 4	Male	37	3.09	10–25	5
GDM 5	Female	39	3.21	25–50	25
GDM 6	Male	39	3.61	50–75	50–75
GDM 7	Female	38	3.47	50–75	25–50

GDM, gestational diabetes mellitus.

*Percentiles obtained from Centers for Disease Control and Prevention (CDC) 2000 Clinical Growth Charts (http://www.cdc.gov/growthcharts/clinical_charts.htm).

Blue et al, 2014, Nature

Heatmaps

- **Data:**

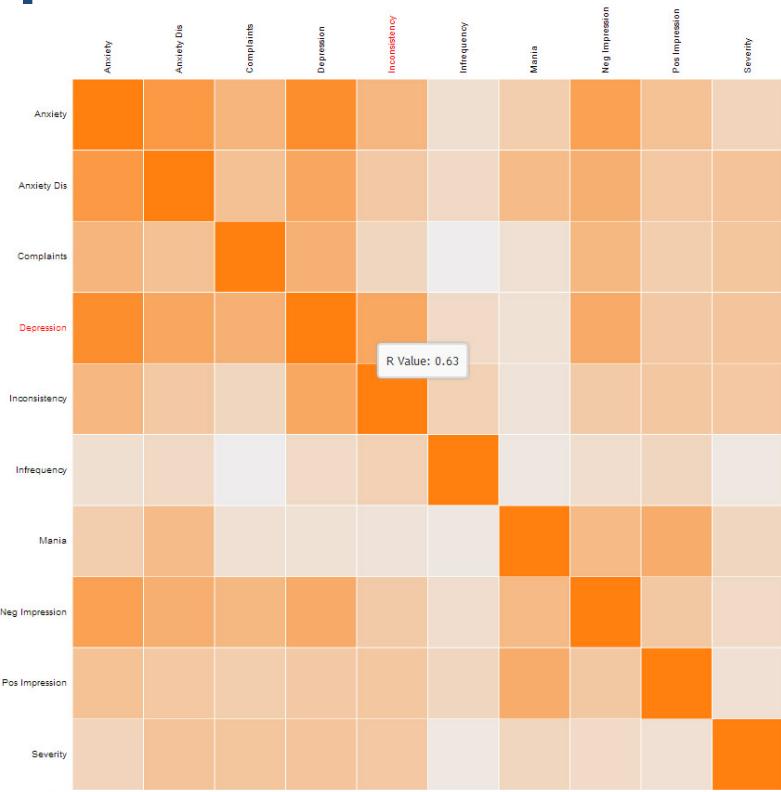
- Two categorical attributes (x,y)
- One quantitative attribute (value)

- **Task:**

- Find clusters
- Find outliers

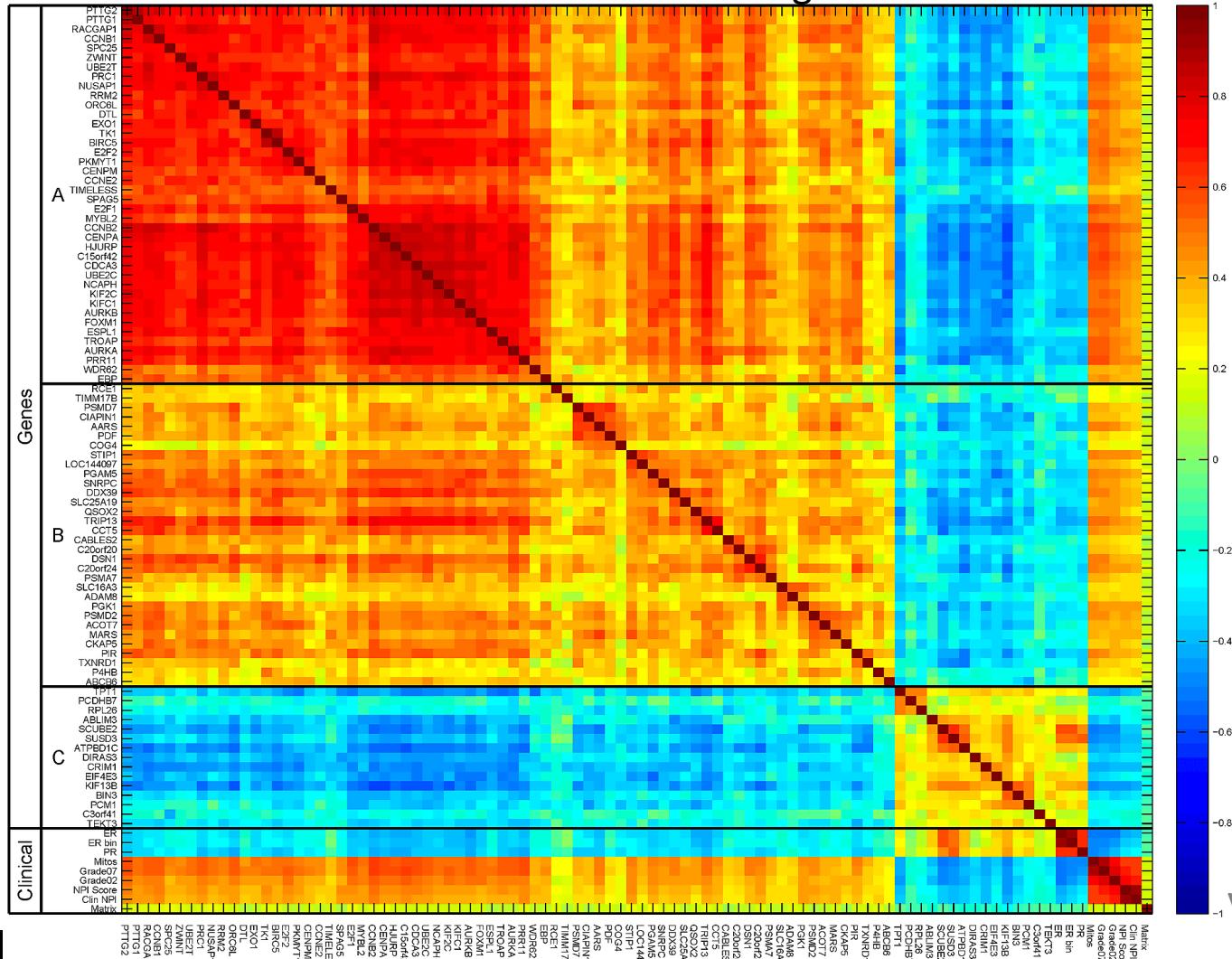
- **Scalability:**

- Millions of items
- Hundreds of attributes
- Around 10 quantitative attribute levels



Interactive Tables & Heatmaps

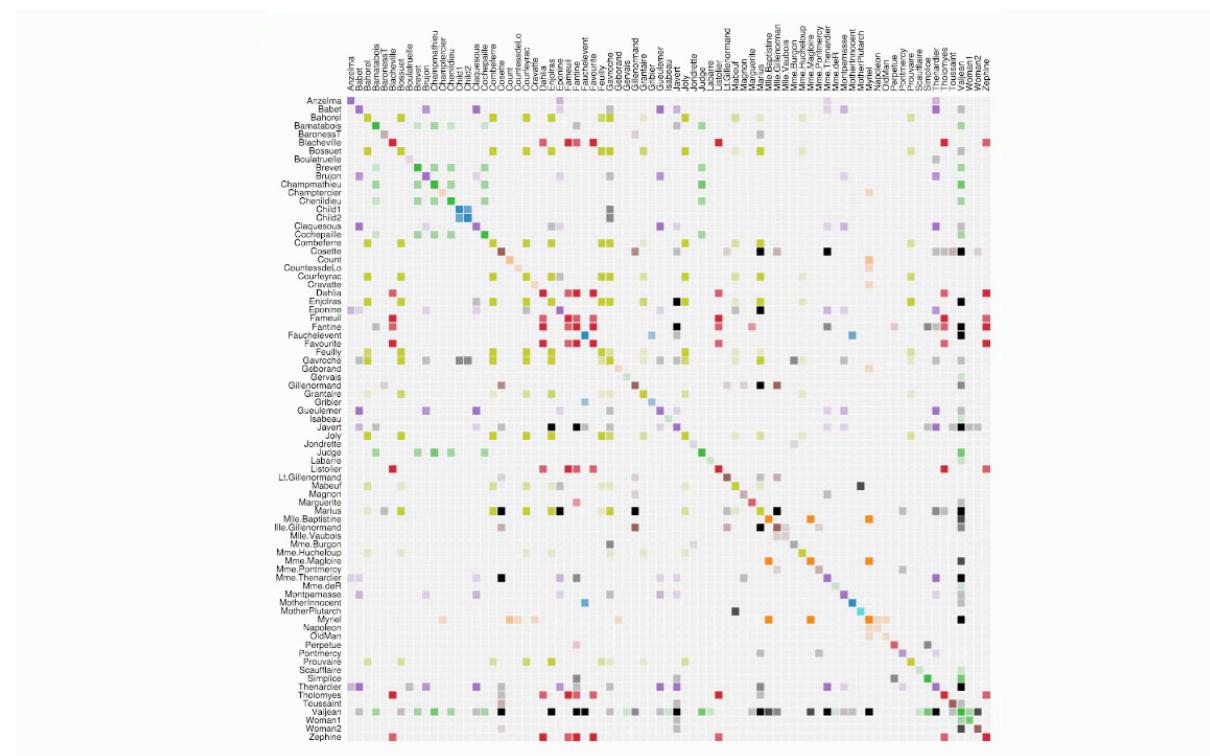
Correlation between 87 genes



Interactive Tables & Heatmaps

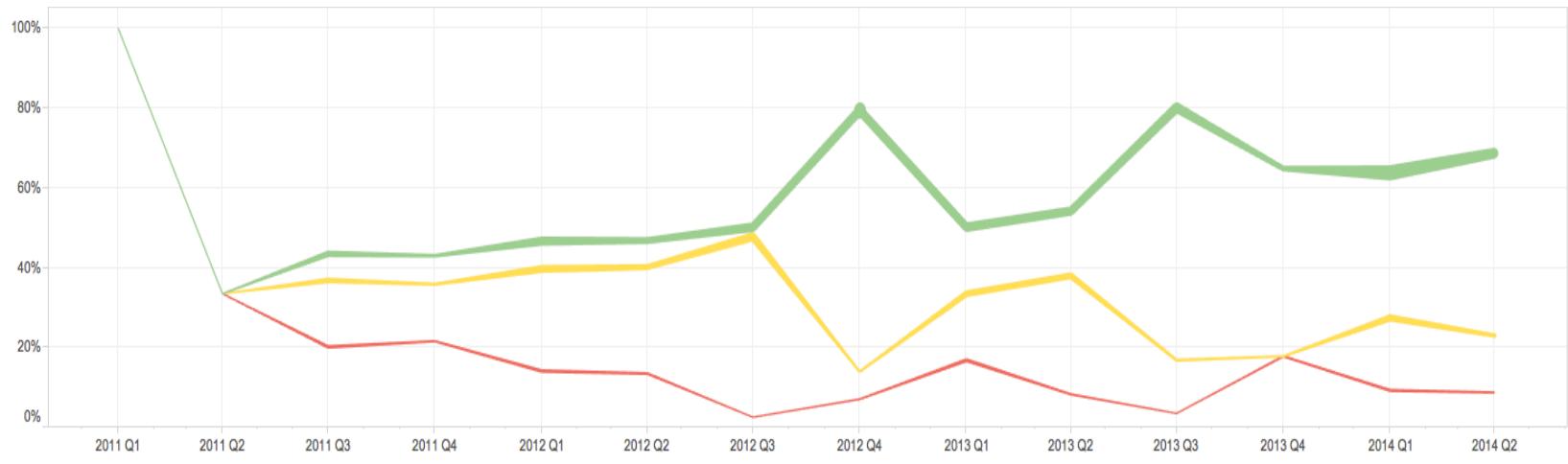


Interaction with mouse





Line Charts





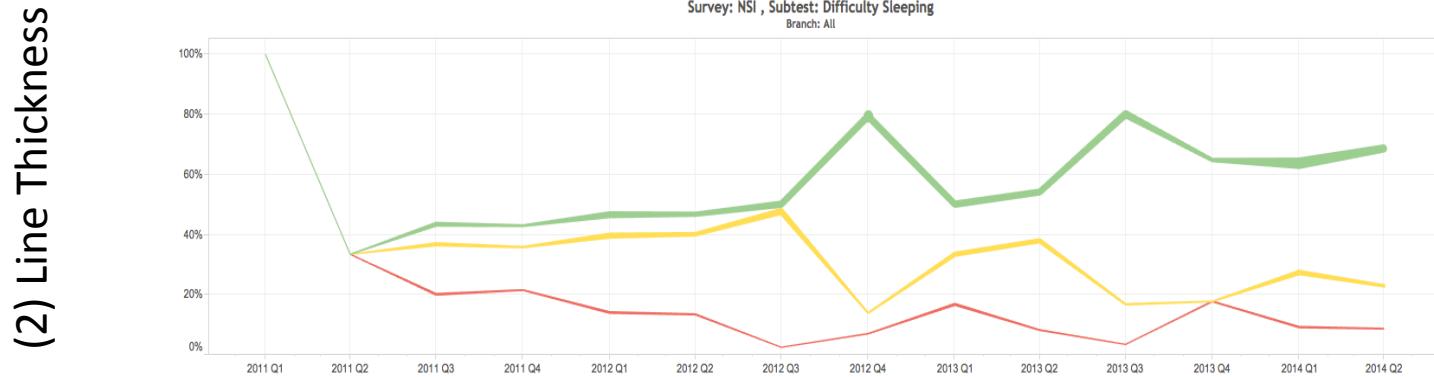
Line Charts

- Lines are one of the most widely used plots in medicine.
- **Data:**
 - two quantitative attributes
- **Pros:**
 - Particularly useful for showing changing trends over time
 - Comparing different categories as they change over time
- **Cons:**
 - Not very effective in terms of identifying discrete data points
- **Glyph(s):**
 - Connection marks emphasize ordering of items by explicitly showing relationship between one item and the next

Line Charts - Extensions

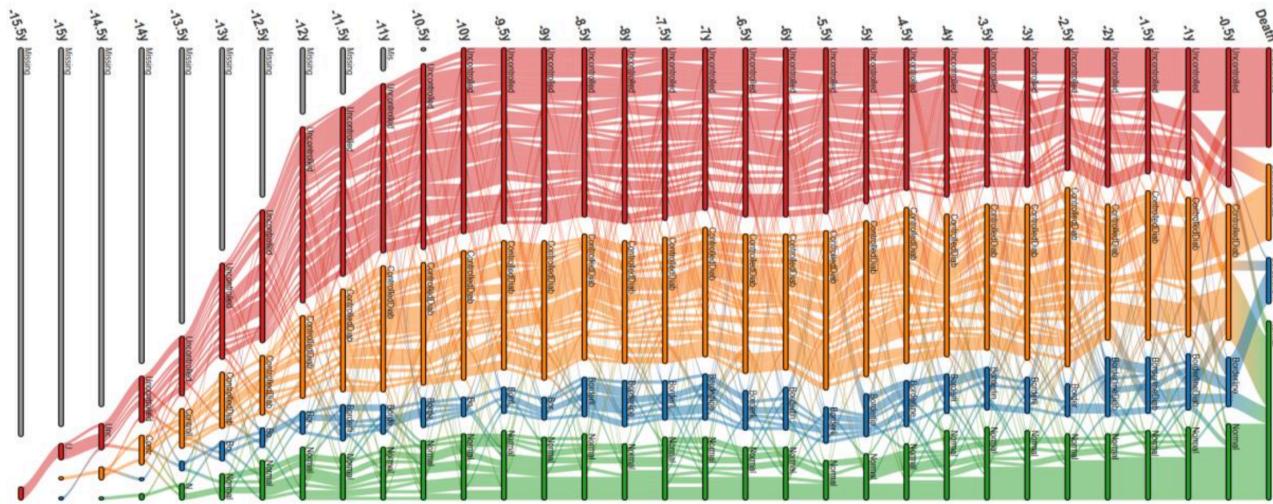
- **Data:**

- What about three quantitative attributes?



Line charts

What else can we do with lines?

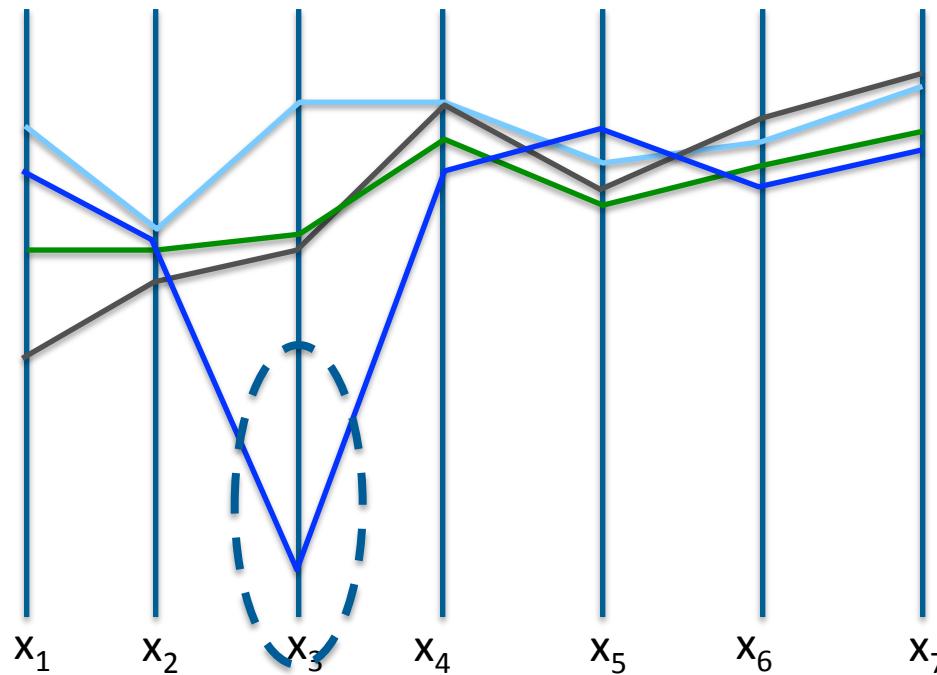


Eugenia McPeek Ninz et al, "Temporal Visualization of Diabetes Mellitus via Hemoglobin A1c Levels", VAHC 2014

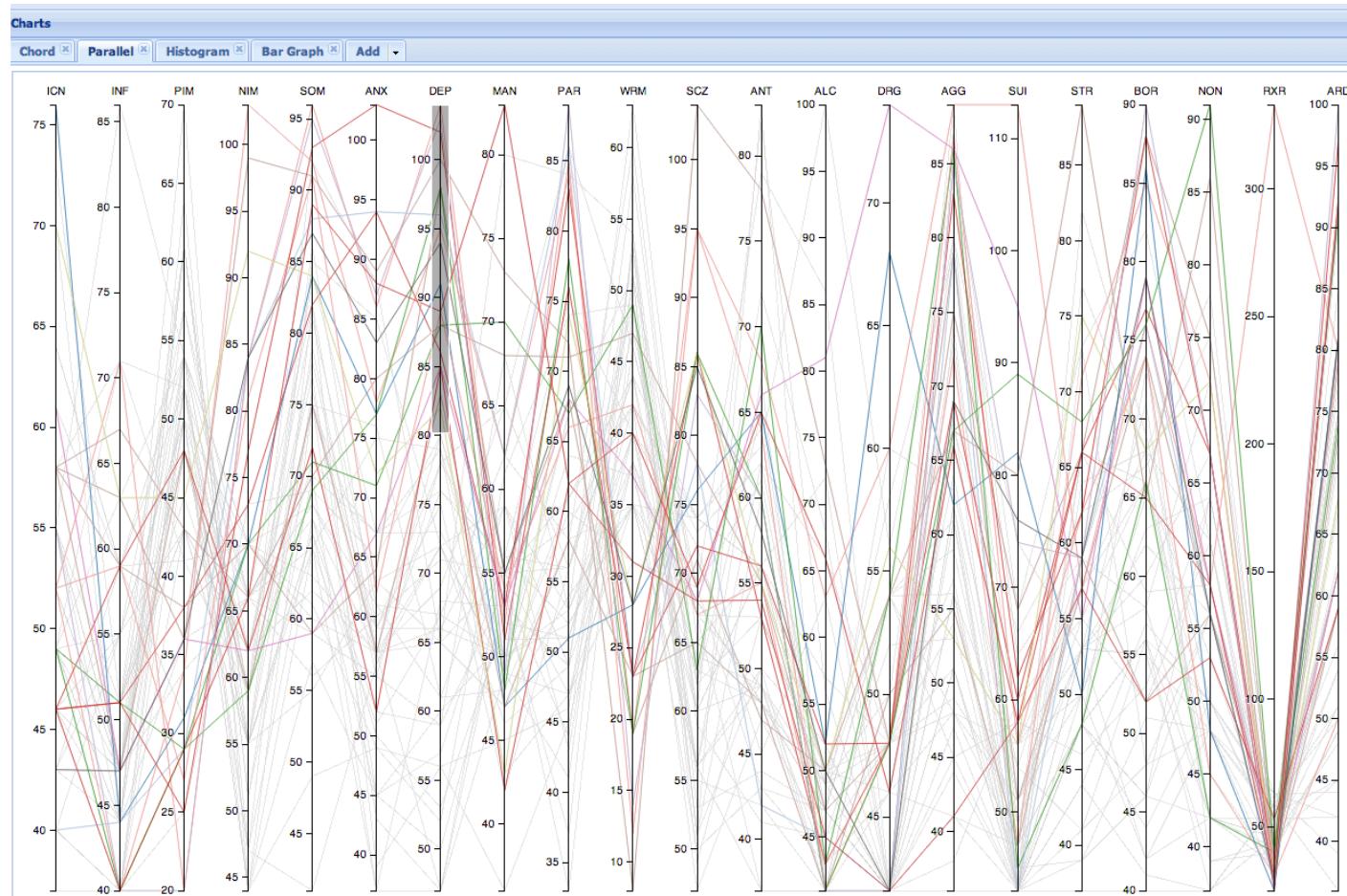


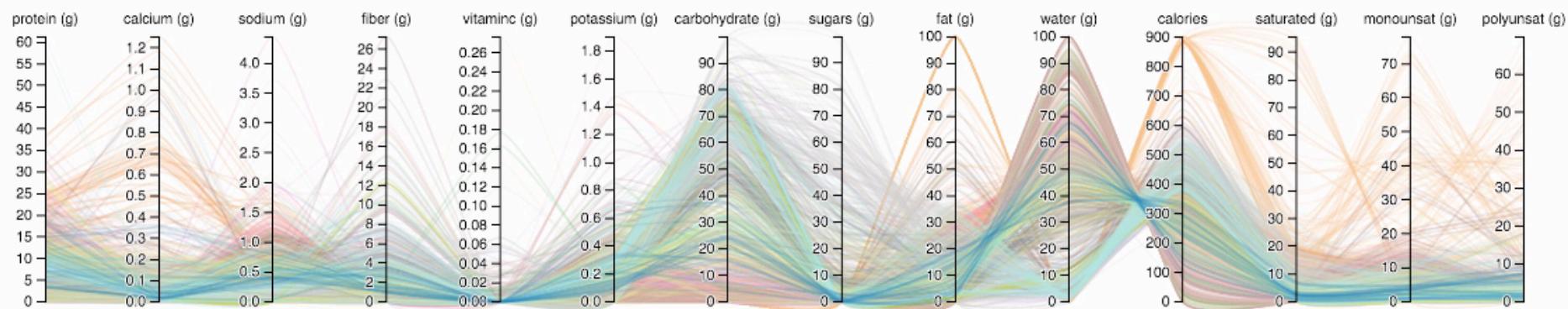
Parallel Coordinates

- Given N records containing M variables (attributes)
 - Display M equally spaced vertical axes with individual ranges.
 - Illustrate each of the record N_i as lines that go through each of the axes.
 - Allow the users to interactively define a range within a single or multiple variables (axes) and explore data



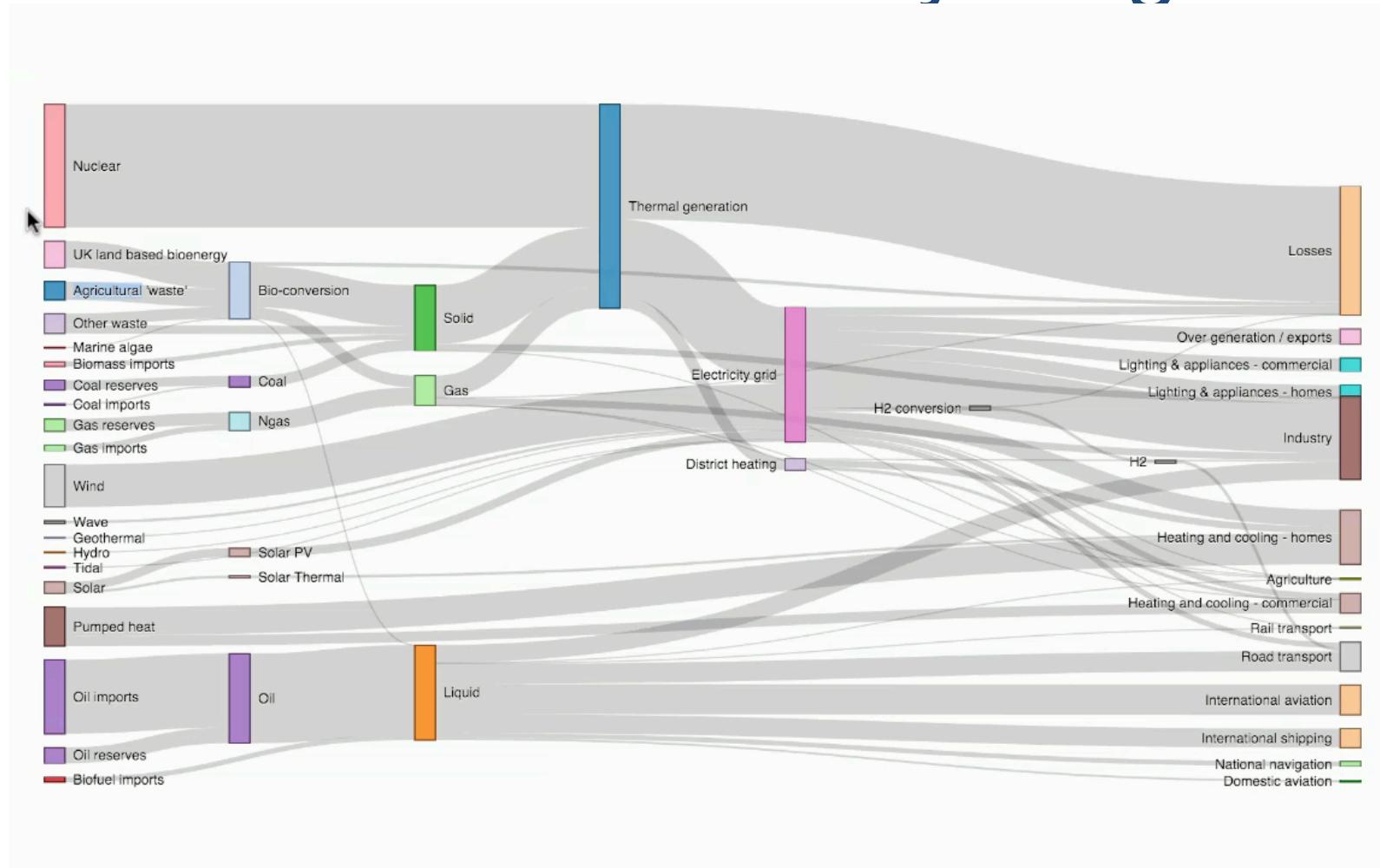
Parallel Coordinates



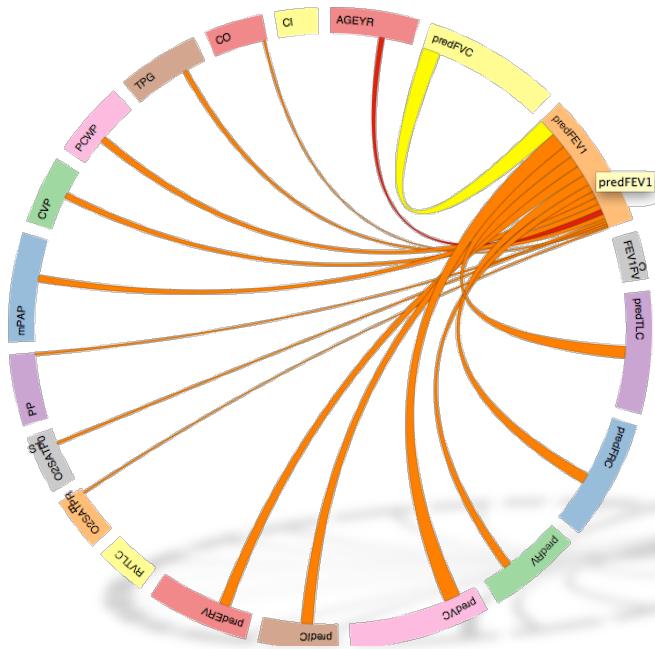




Parallel sets / Sankey Diagrams

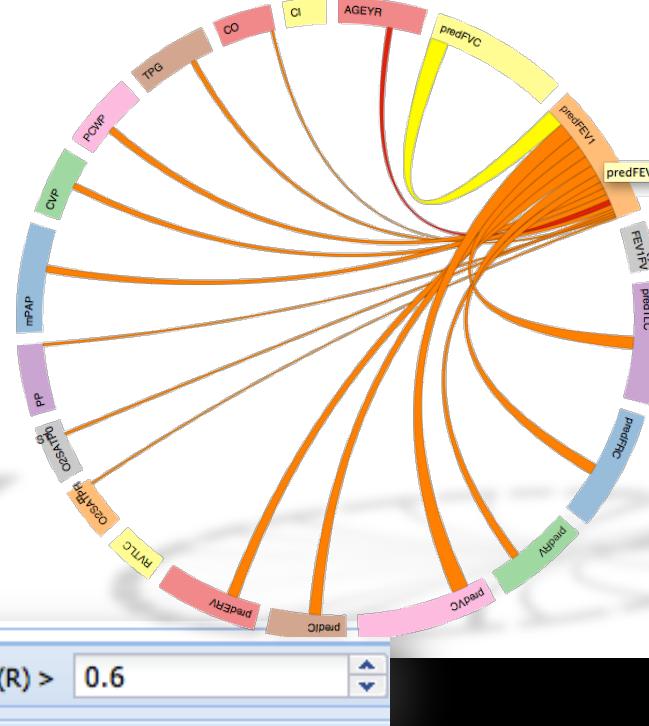
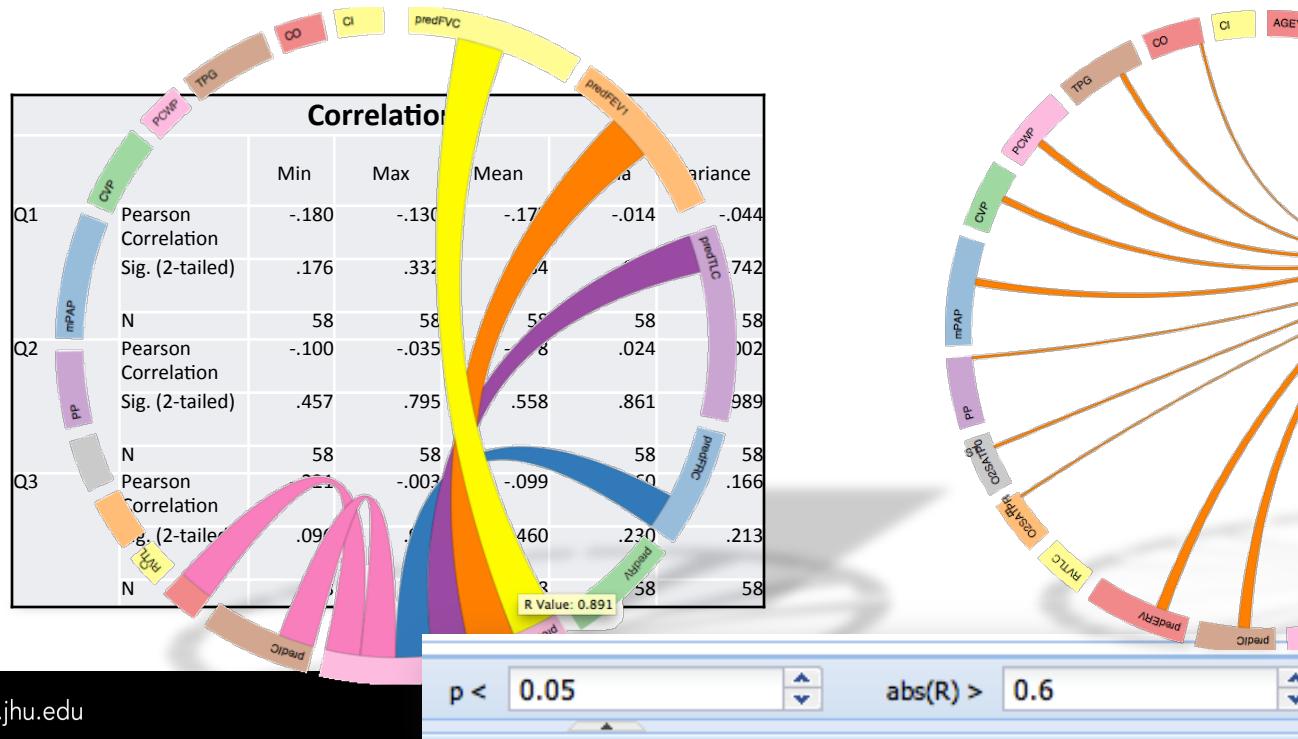


Polar / Circular Plots

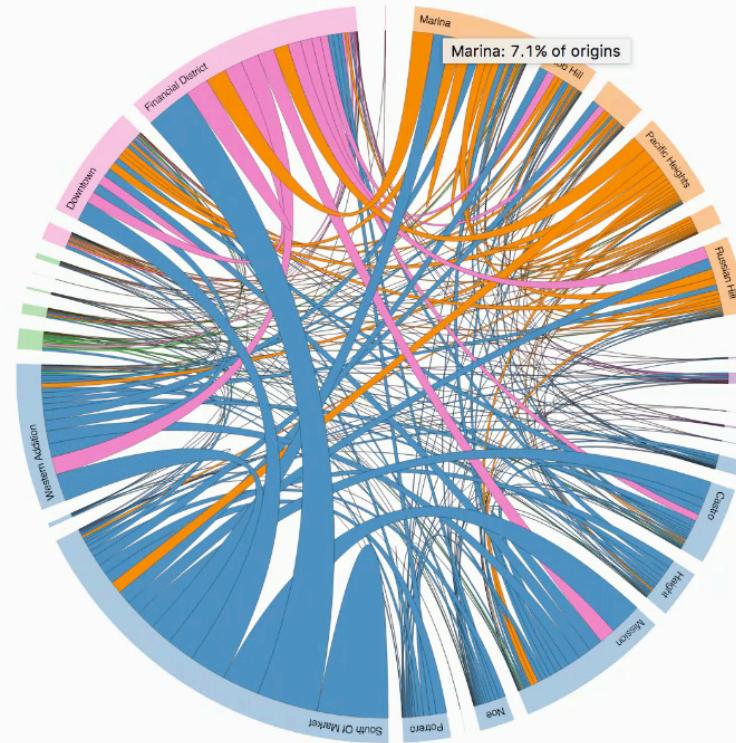
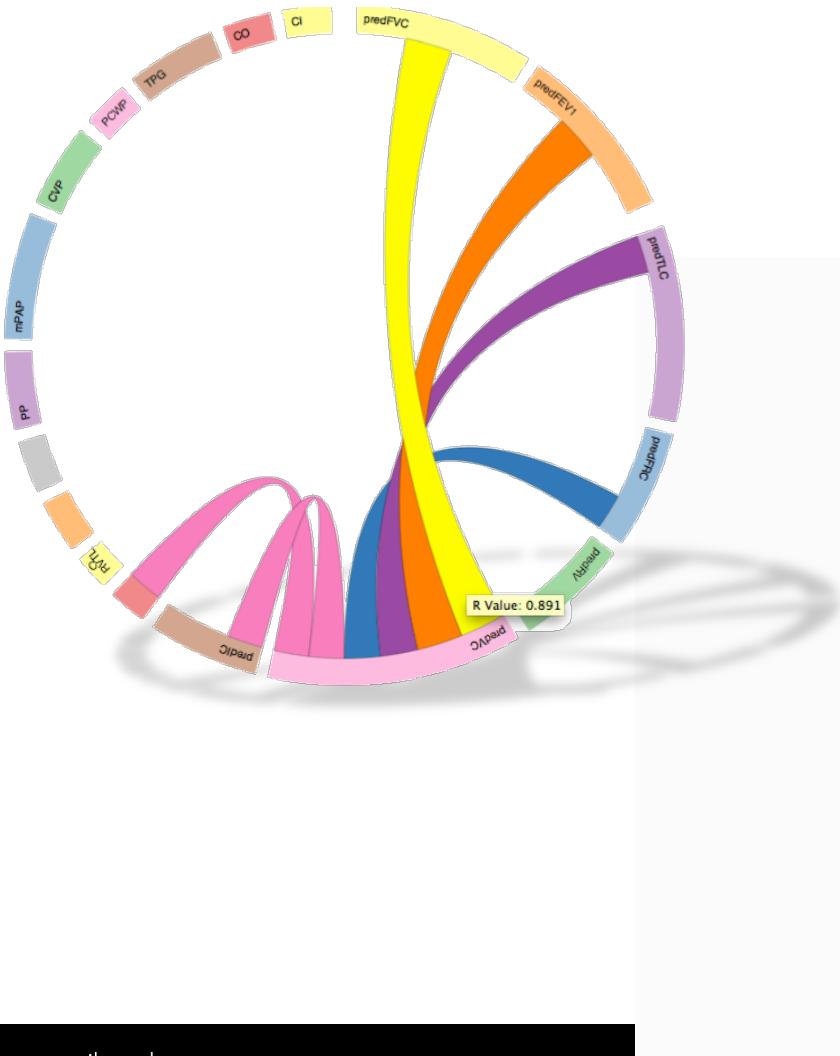


Circular Plots and Correlations

- Given M variables, we would like to analyze the correlation between them
 - Create a circular plot
 - Each area around the boundaries is a variable
 - Each connection is a correlation
 - Thickness of the connection represents the strength of the correlation



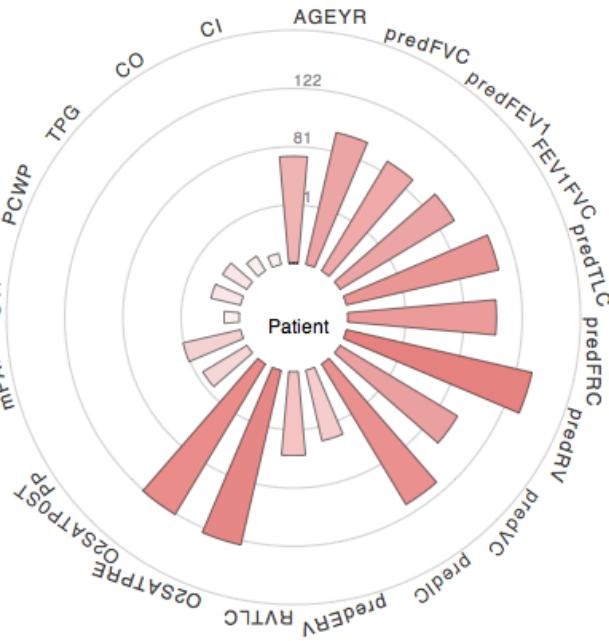
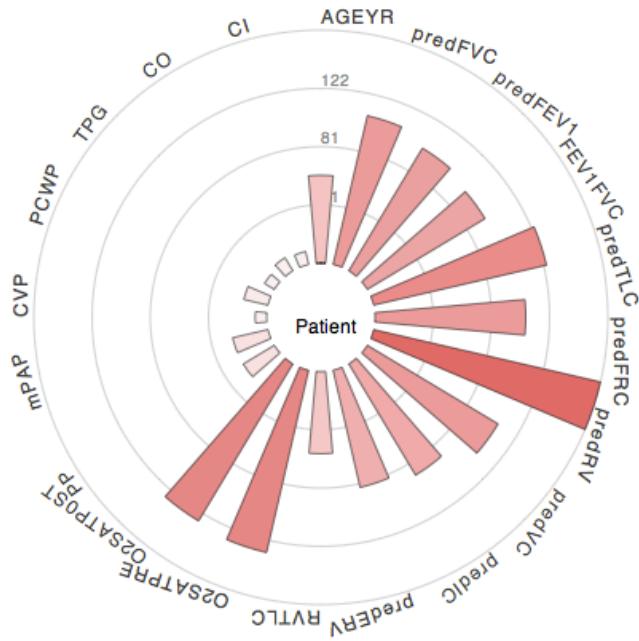
Example: Chord Diagram



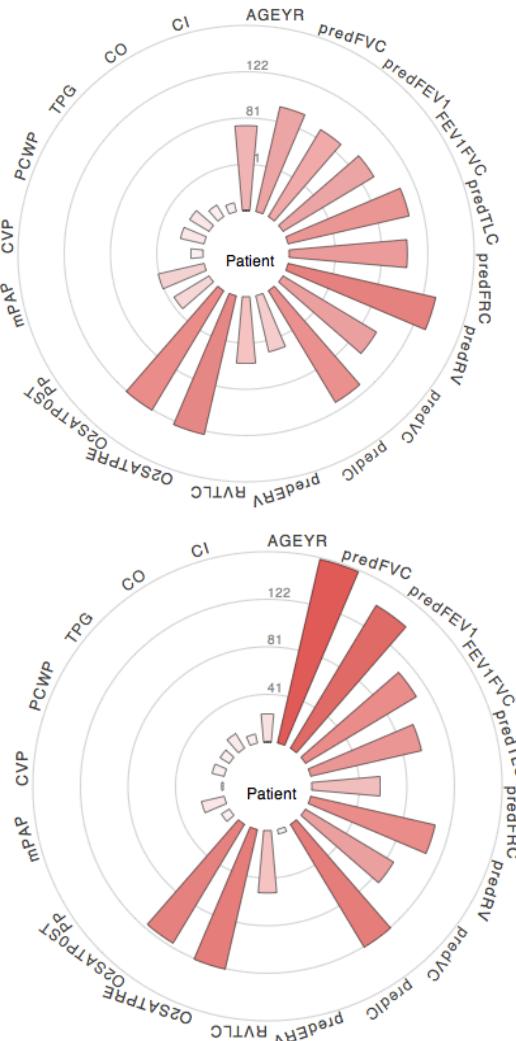
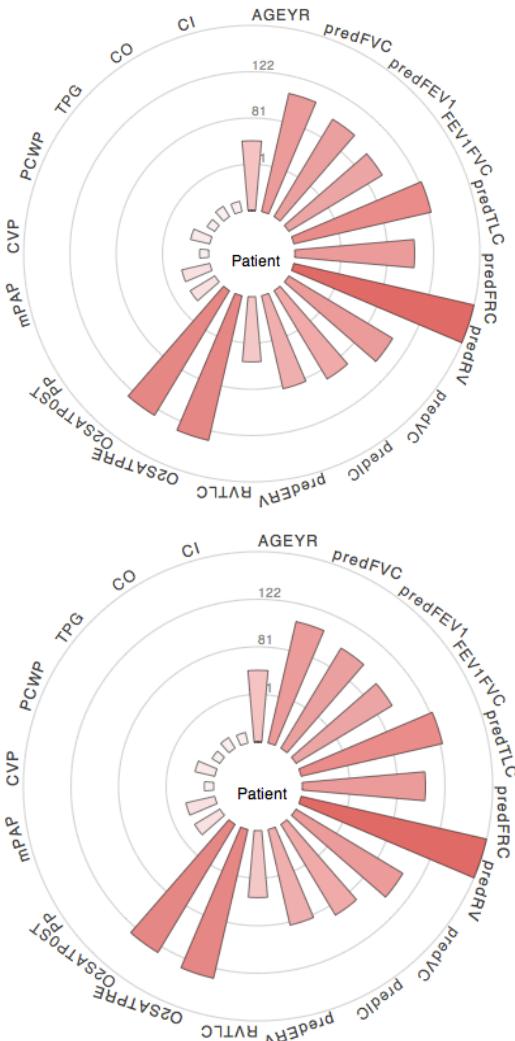


Circular Plots & Polar Area Chart (Windrose)

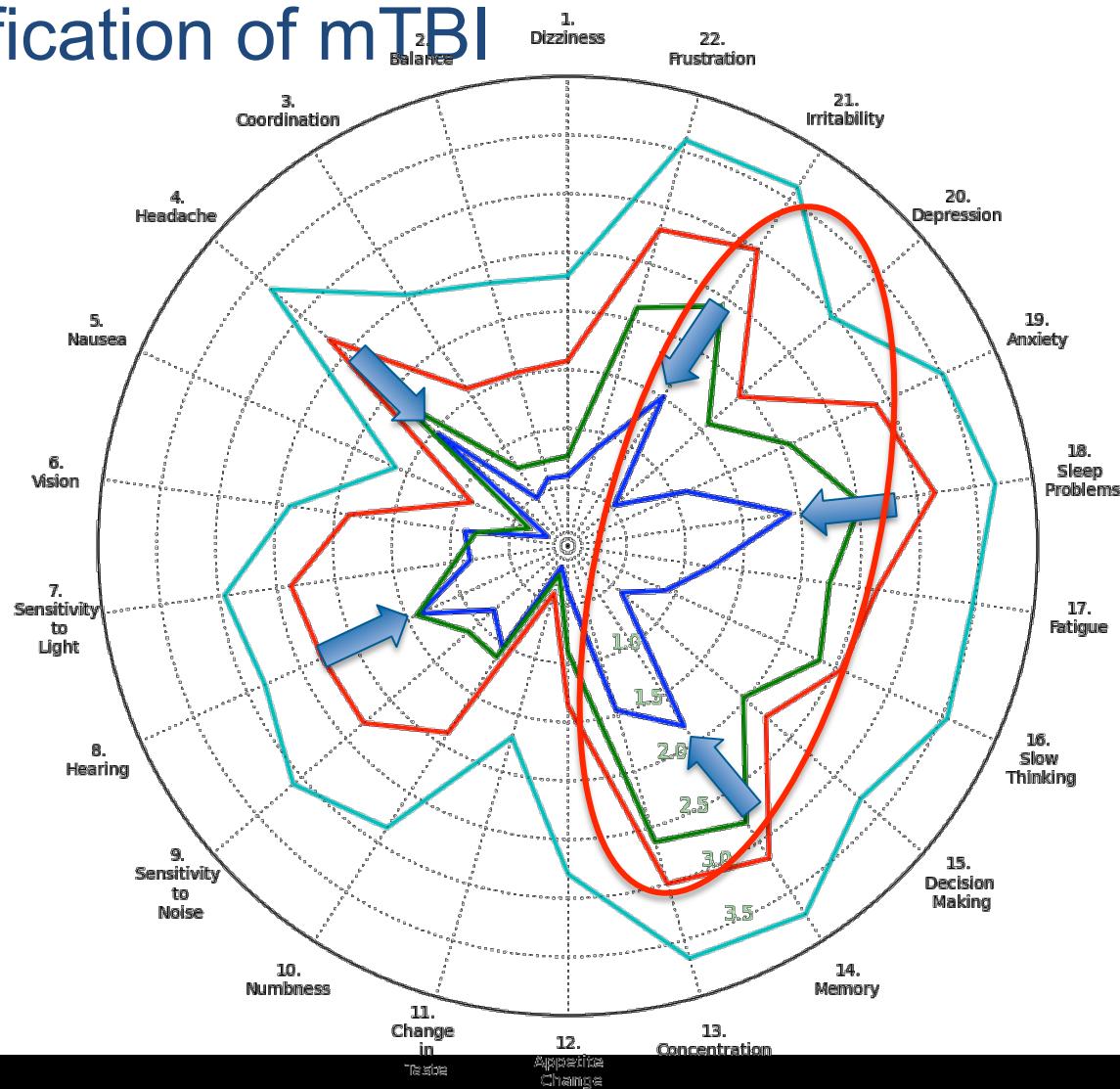
- Given M variables, and two records
 - Create side-by-side charts
 - Instead of a bar chart, create a circular bar chart
 - Similar records have similar shapes



Technique: Windrose



More of Circular Plots: Sub-classification of mTBI





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of ENGINEERING

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