Visualizing Data for Smart Manufacturing

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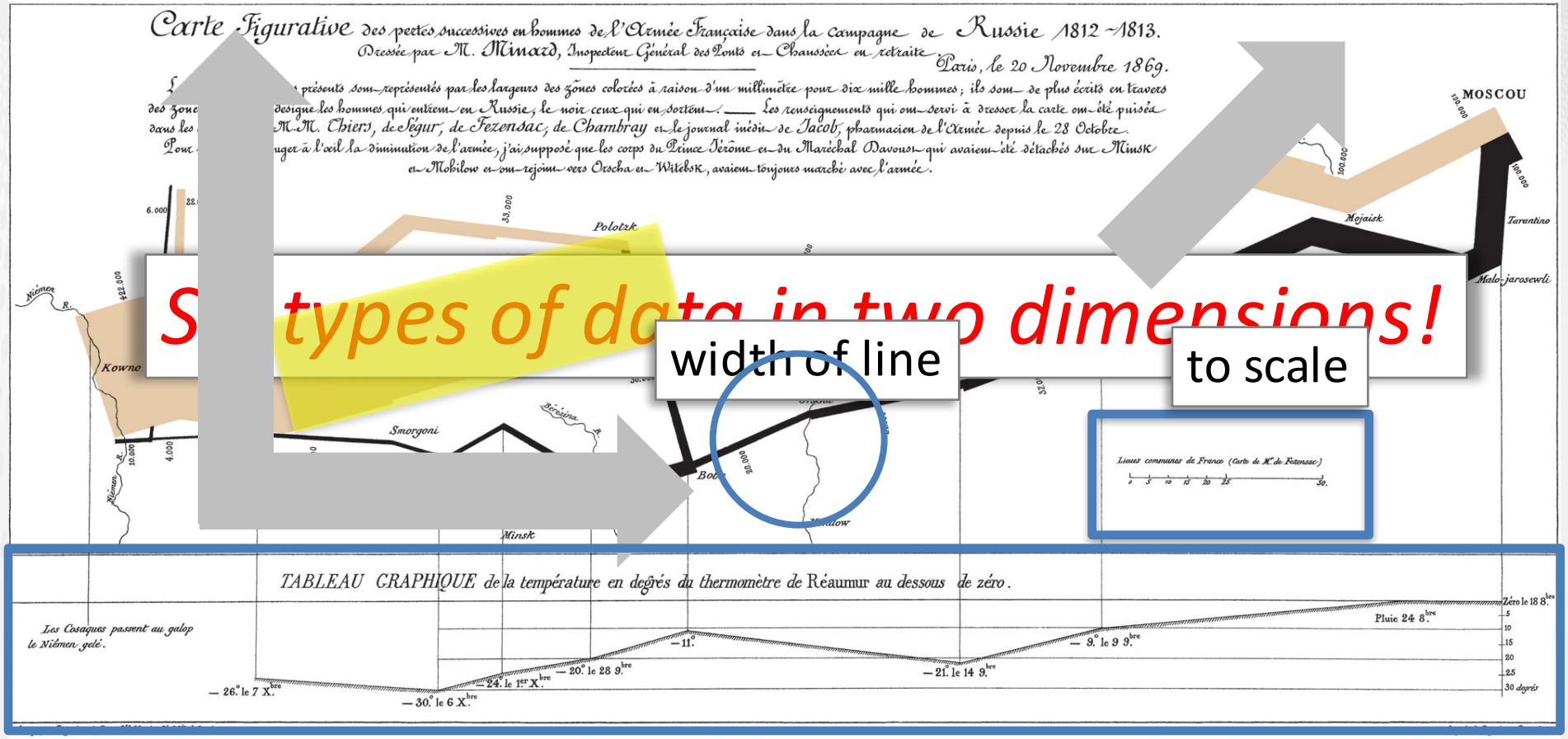
Visualization Can Reveal Criticality of Variables

Number of Napoleon's Troops | Latitude/Longitude | Distance Traveled



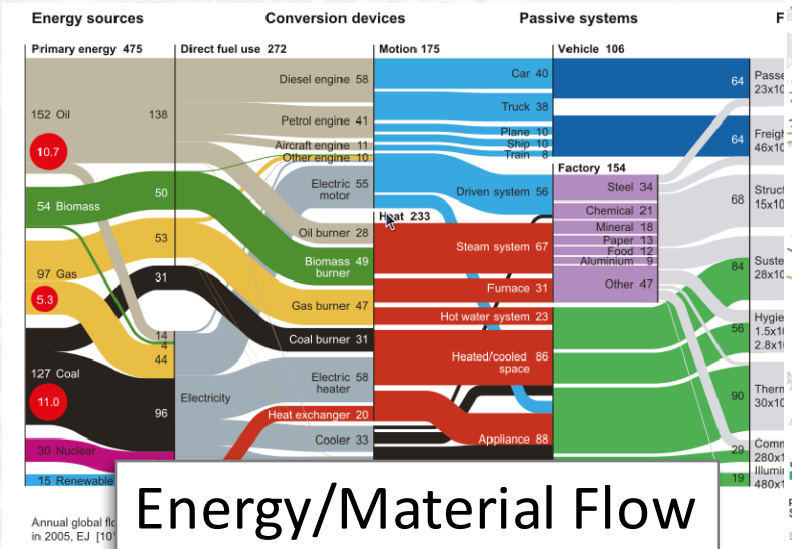
S types of data in two dimensions!

width of line

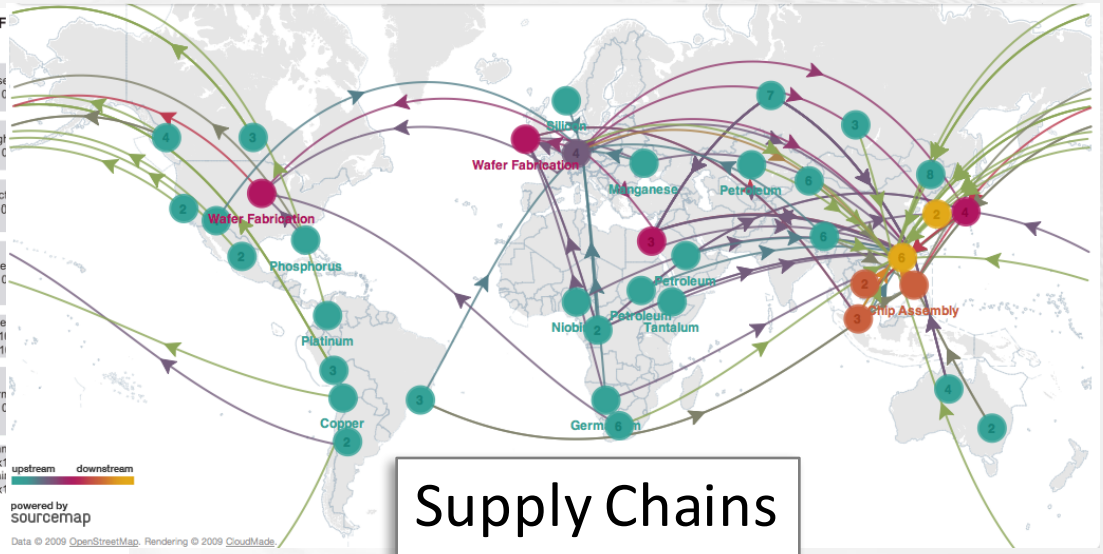
to scale

Temperature | Direction of Travel | Location relative to Specific Dates

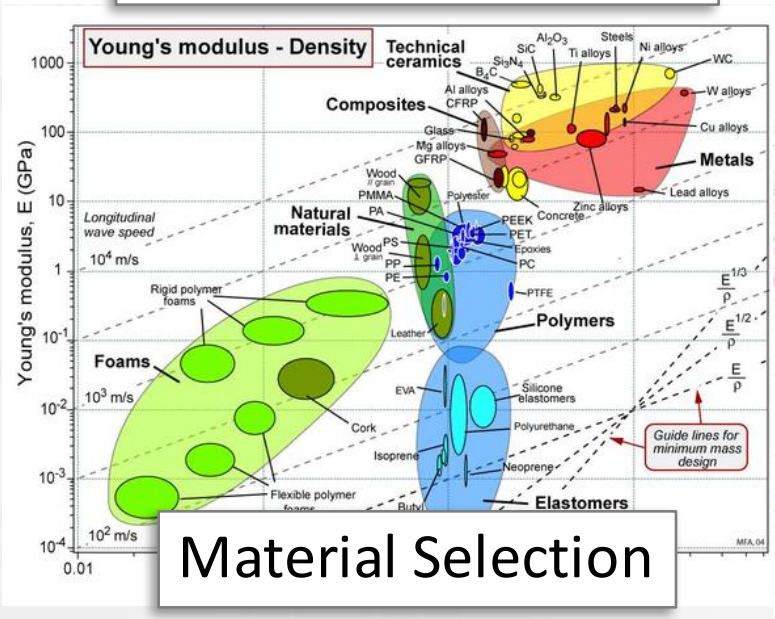
InfoVis applied to engineering/science systems



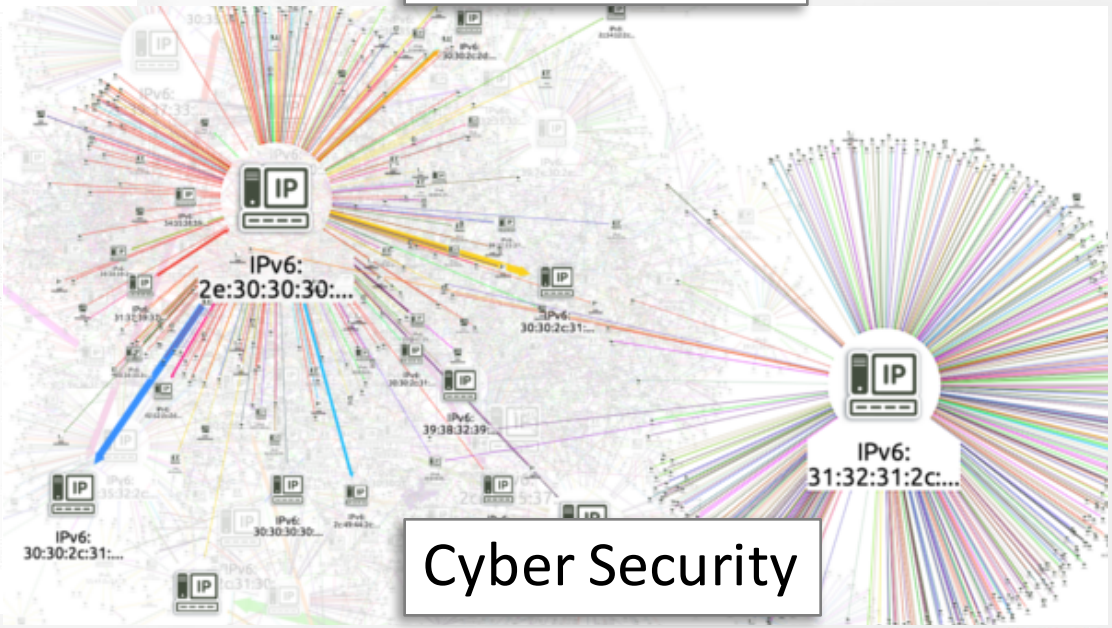
Energy/Material Flow



Supply Chains

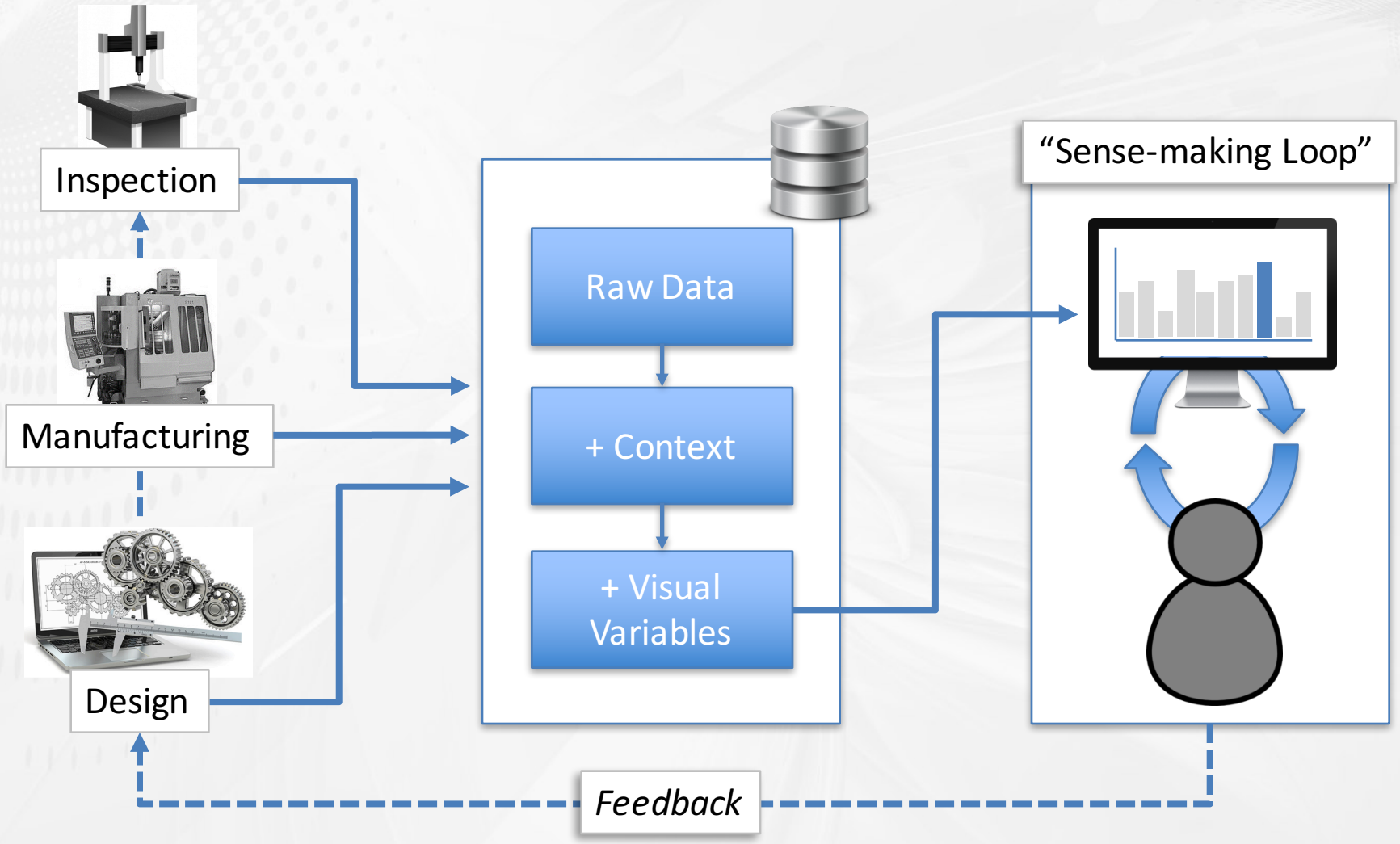


Material Selection

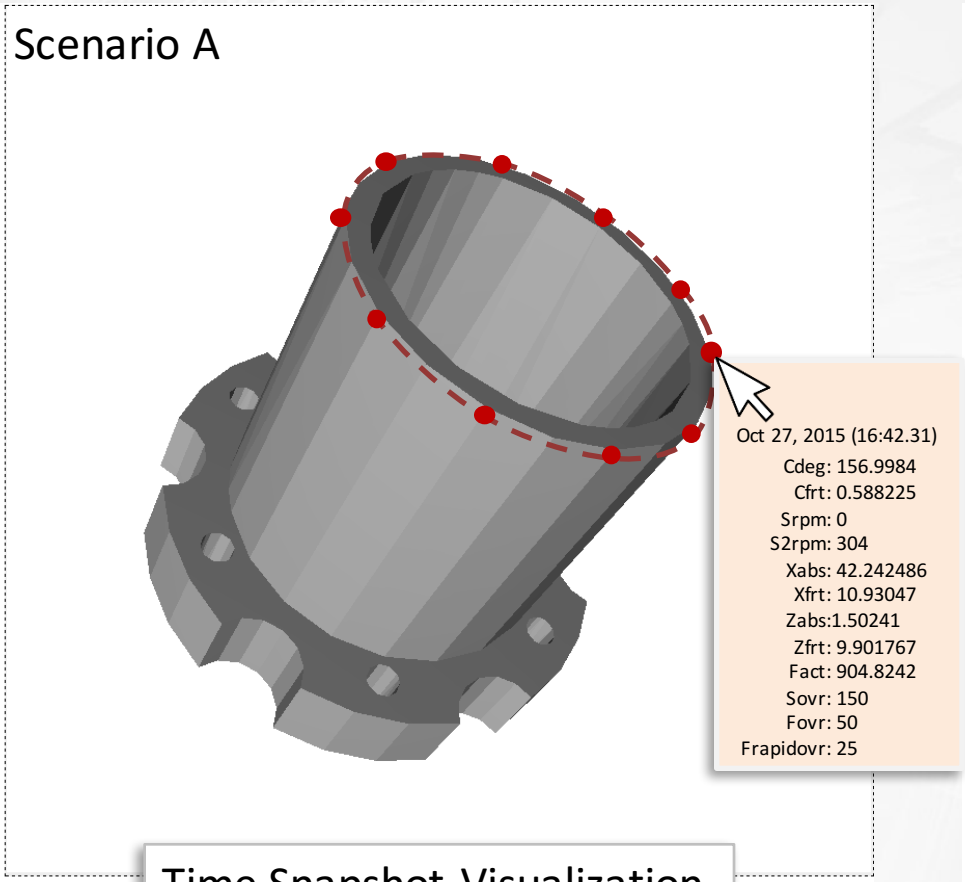


Cyber Security

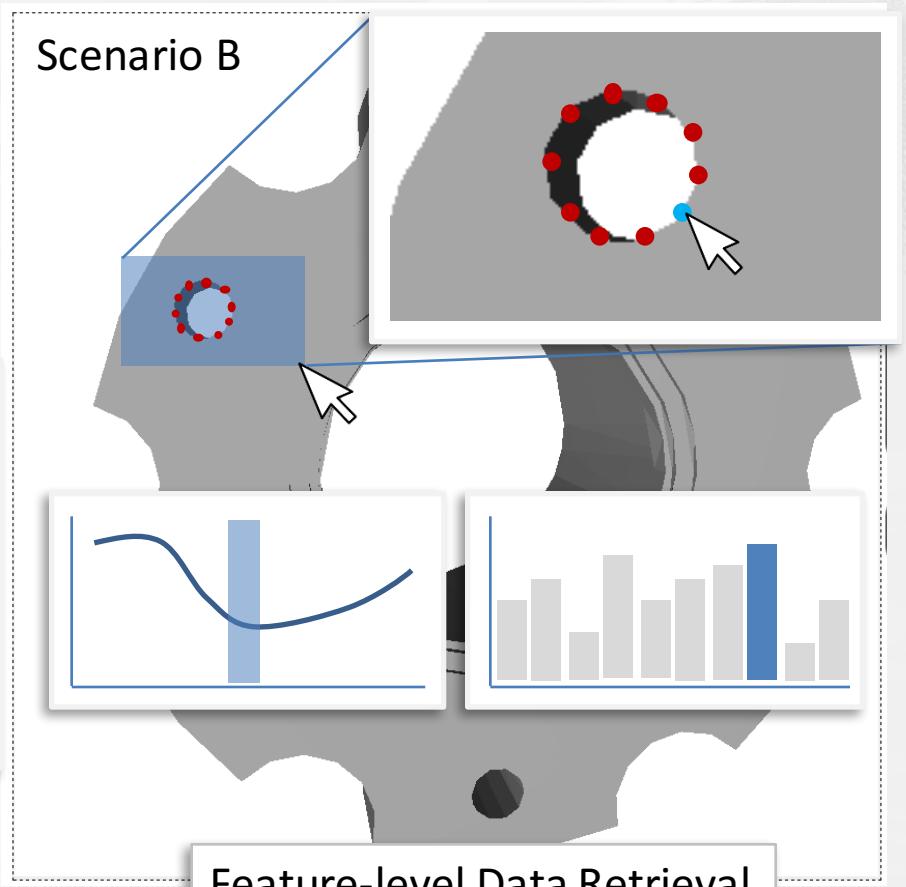
Visualization pipeline for smart manufacturing



Current Effort: Machine Data w/ Virtual Models



Time Snapshot Visualization

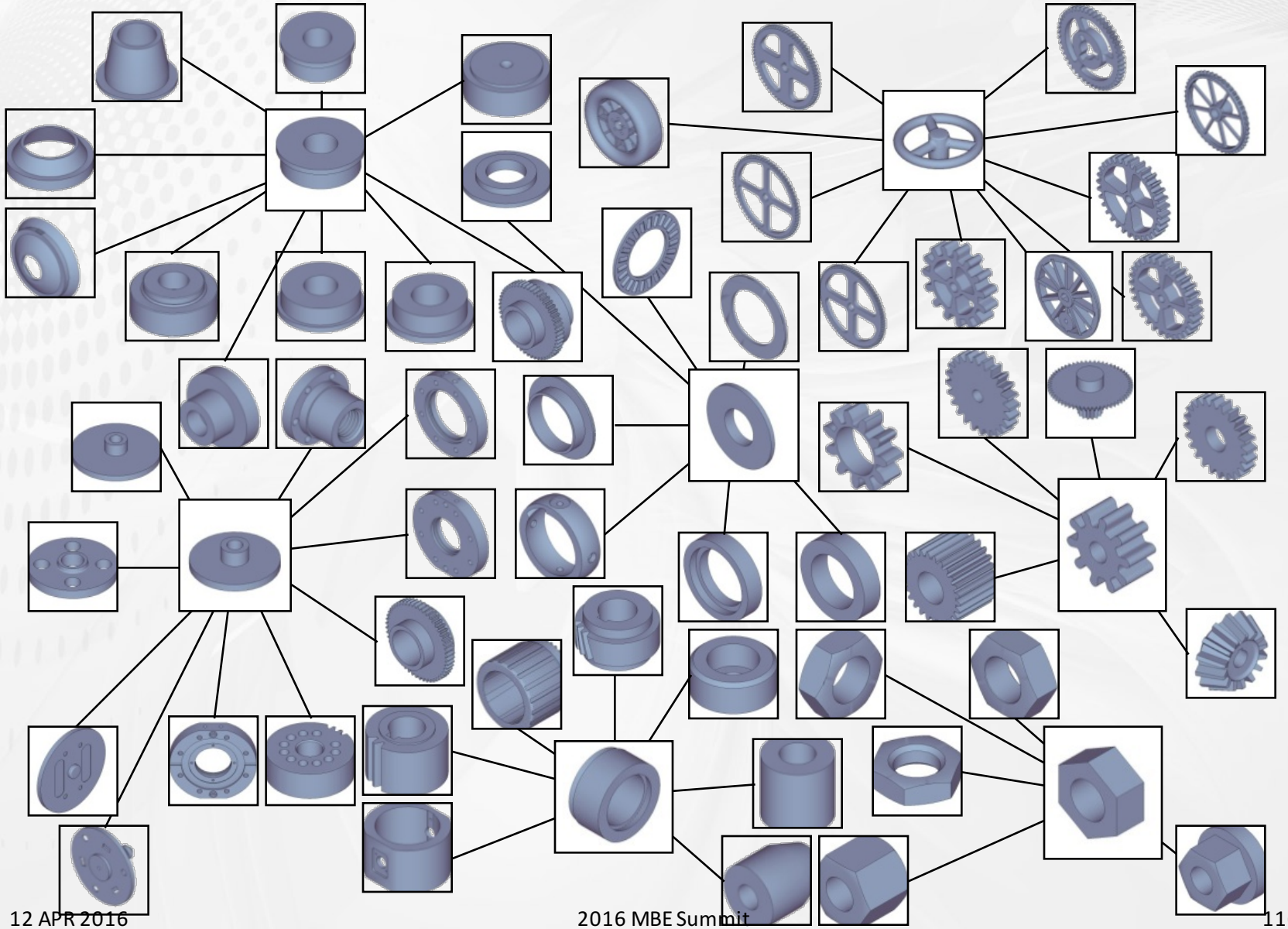


Feature-level Data Retrieval

Virtual Model → *overlay* → Actual Data

Virtual Model ← *validate* ← Actual Data

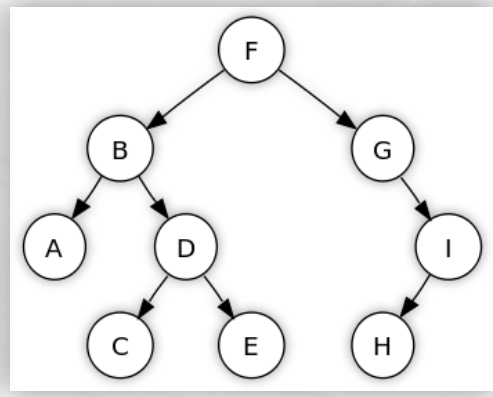
Example: Part Design Exploration



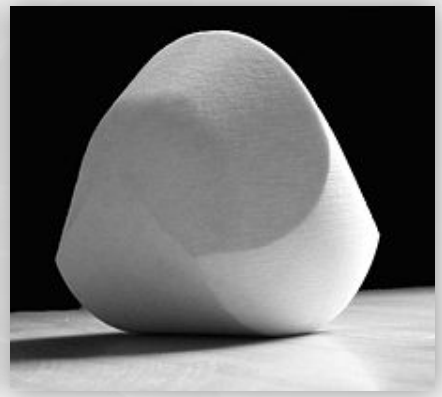
Exploration Variables

Material Similarity

Manufacturing Similarity



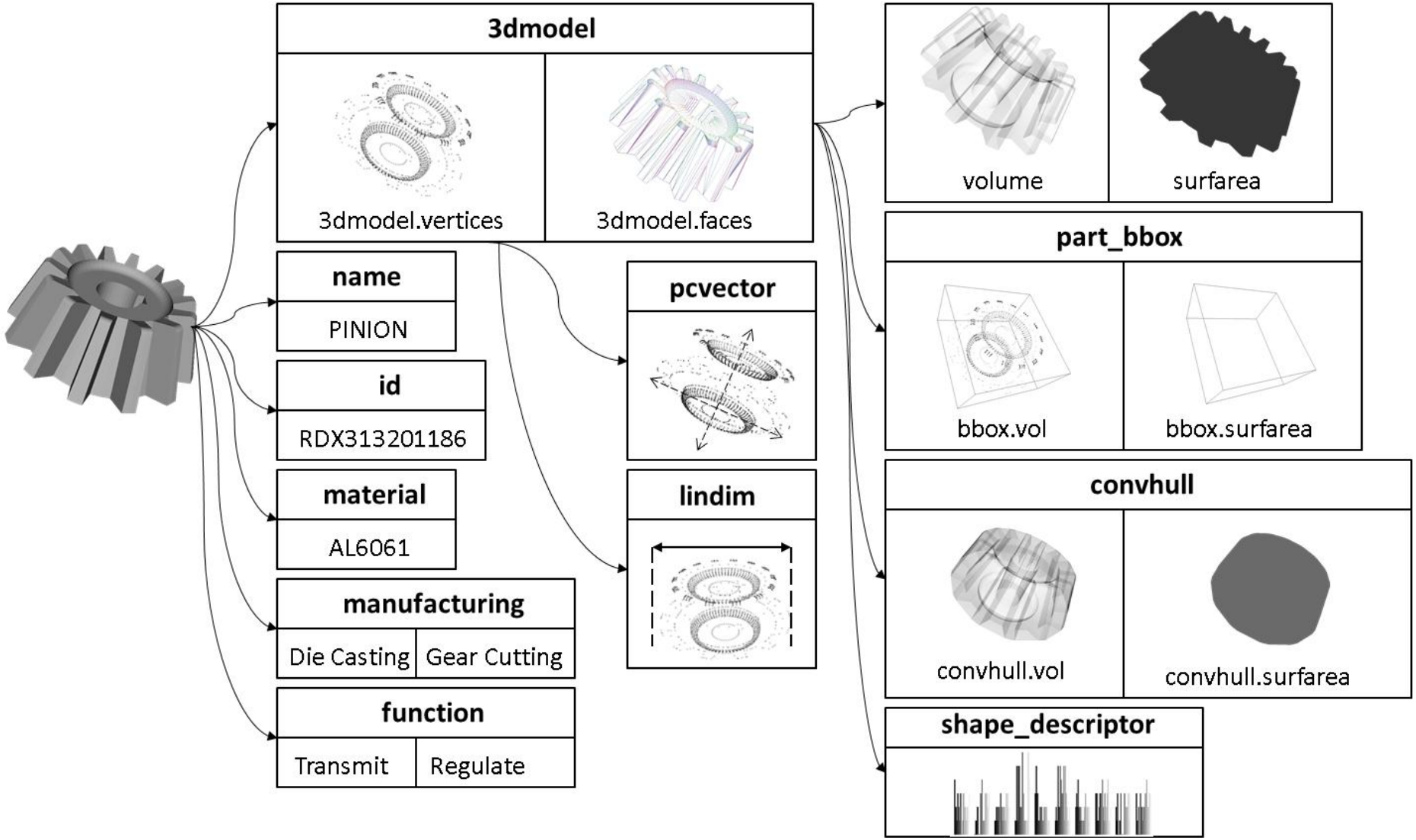
Function Similarity



Shape Similarity

Ramanujan D, *et al.* (2013)

Data Representation: Data w/ Context



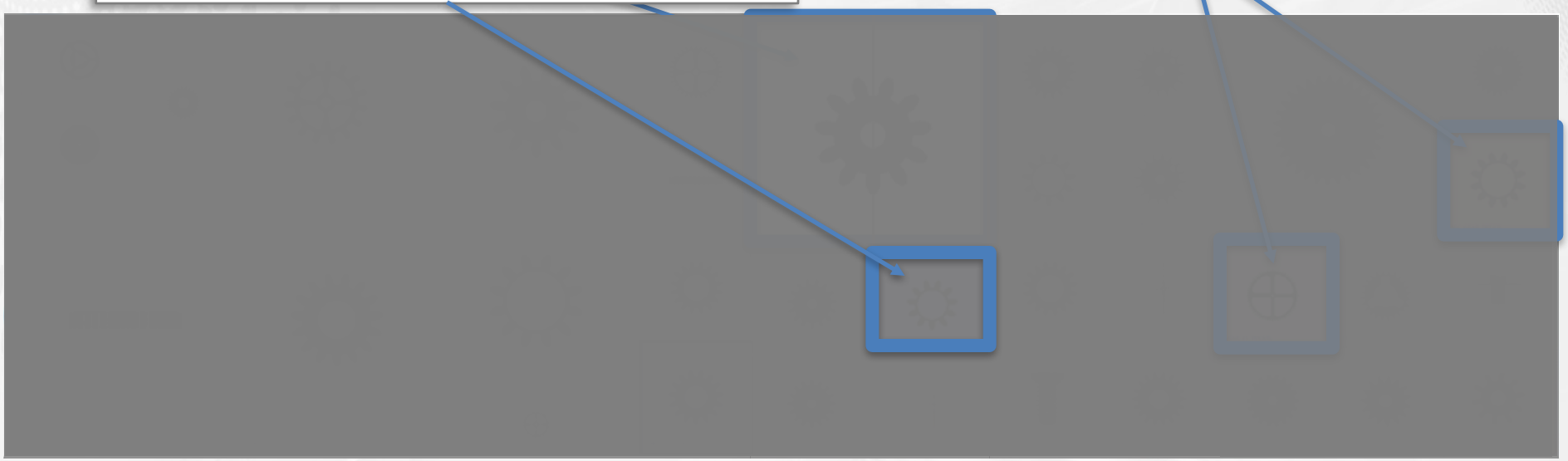
Ramanujan D, *et al.* (2013)

Mapping Visual Variables to Data Representation

Cell Size → Embodied Energy

Query based on reference part

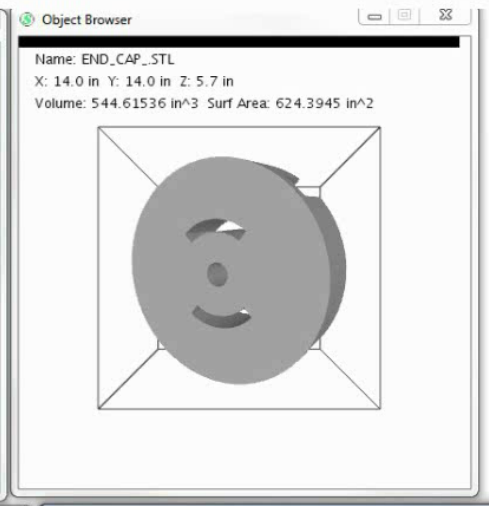
Color → Similarity Dimension

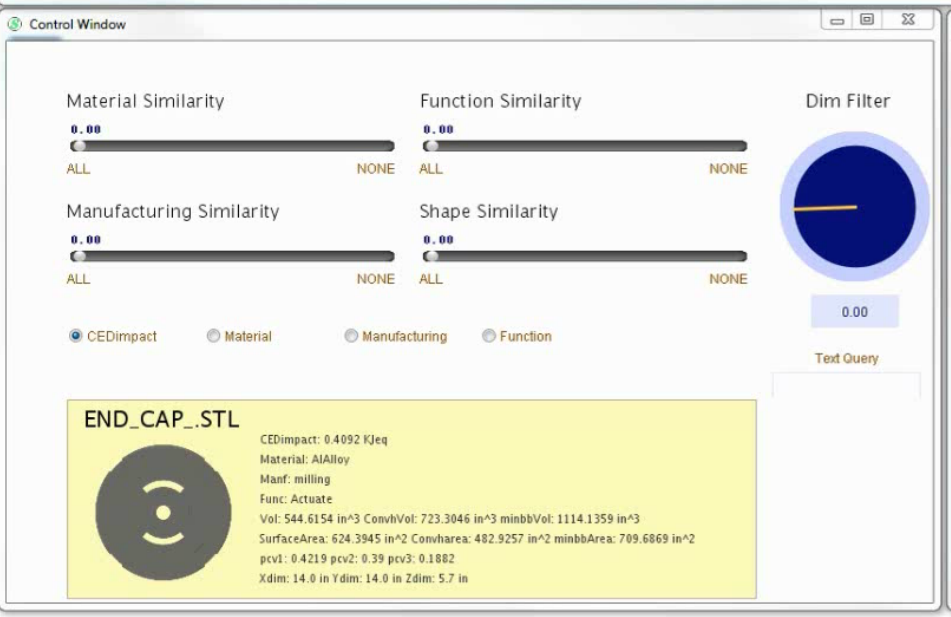


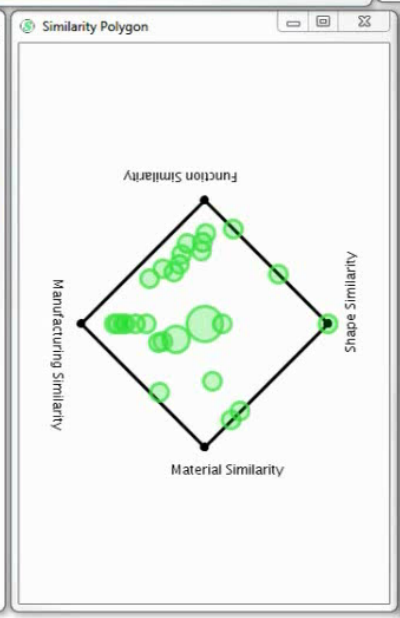
Squarified layout retrieving 35 most similar parts

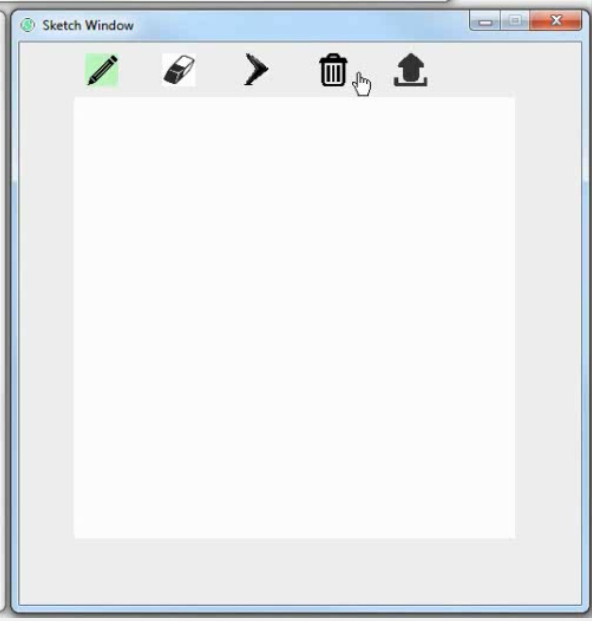
Ramanujan D, *et al.* (2016)

Example: Part Design Exploration









Ramanujan D, *et al.* (2016)