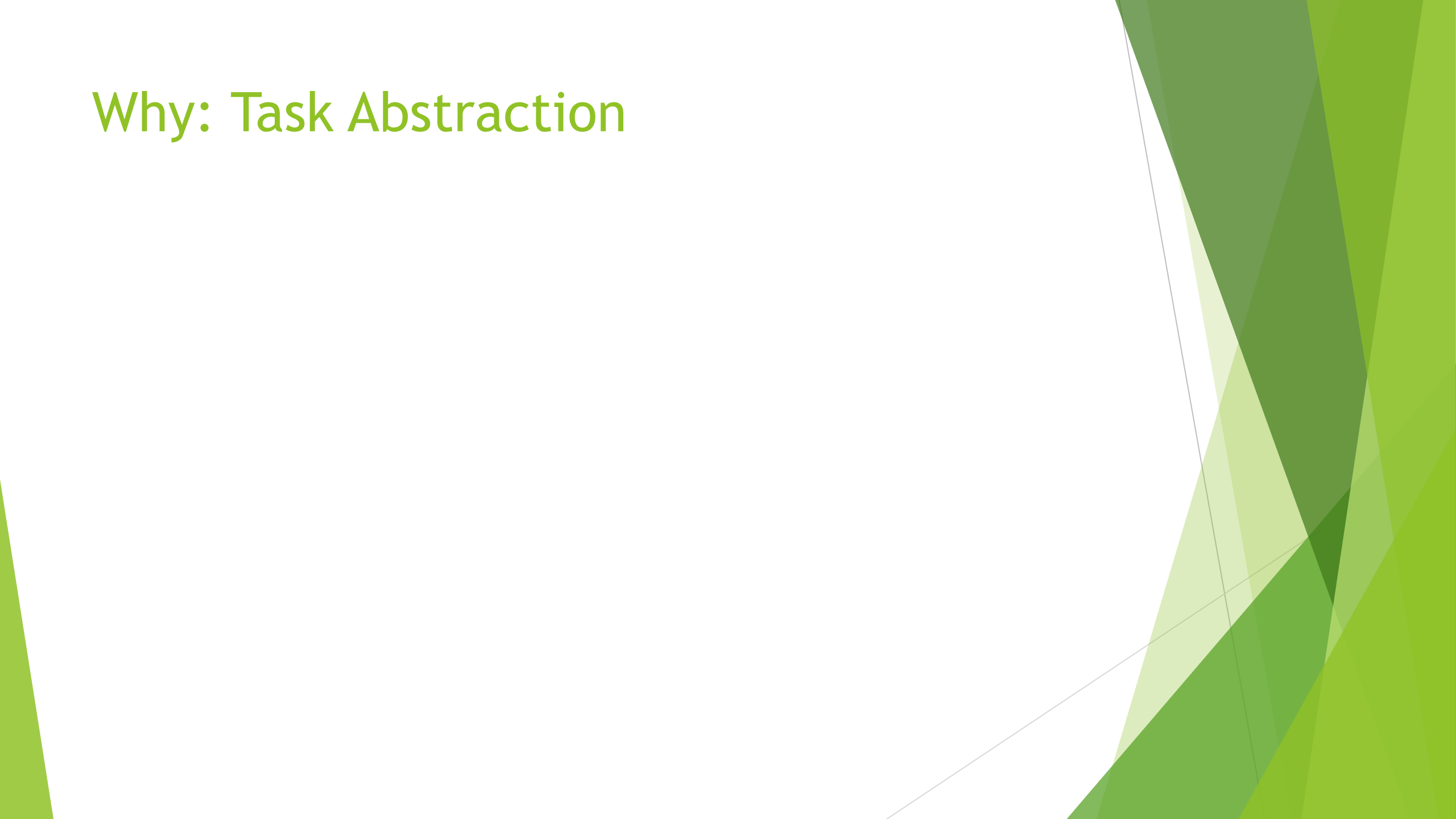


Lecture 3

9/8/2020

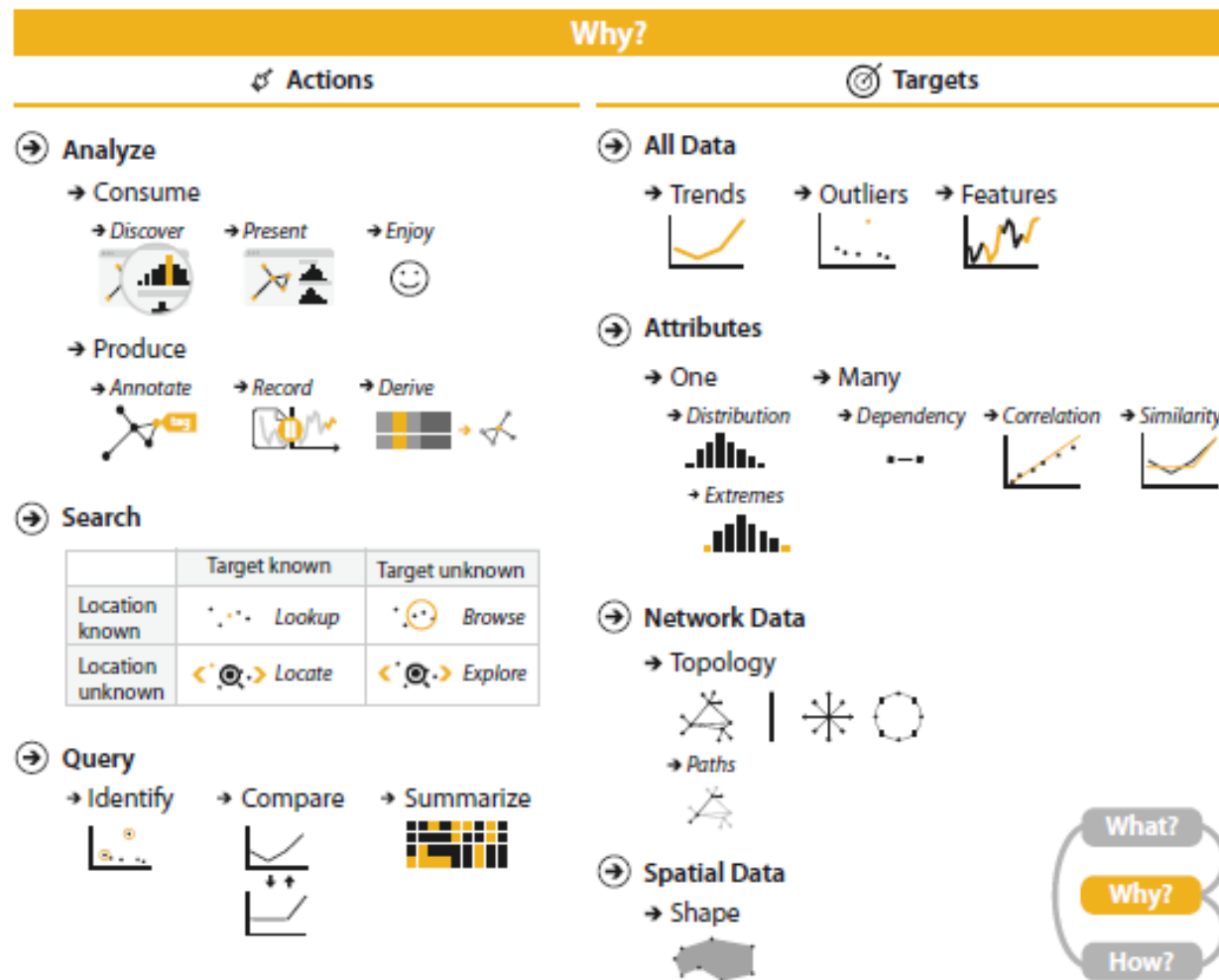
Why: Task Abstraction



Tasks

- ▶ Why? Understand data, but what do I want to do with it?
- ▶ Levels: High (Produce/Consume), Mid (Search), Low (Queries)
- ▶ Another key concern: Who?
 - ▶ Designer <-> User (A spectrum)
 - ▶ General <-> Context-Specific
 - ▶ Flexible <-> Constrained
 - ▶ Complex <-> Easy to Use
 - ▶ Varied Data <-> Specific Data

Tasks



Actions: Analyze

→ Analyze

→ Consume

→ Discover



→ Present



→ Enjoy



→ Produce

→ Annotate



→ Record



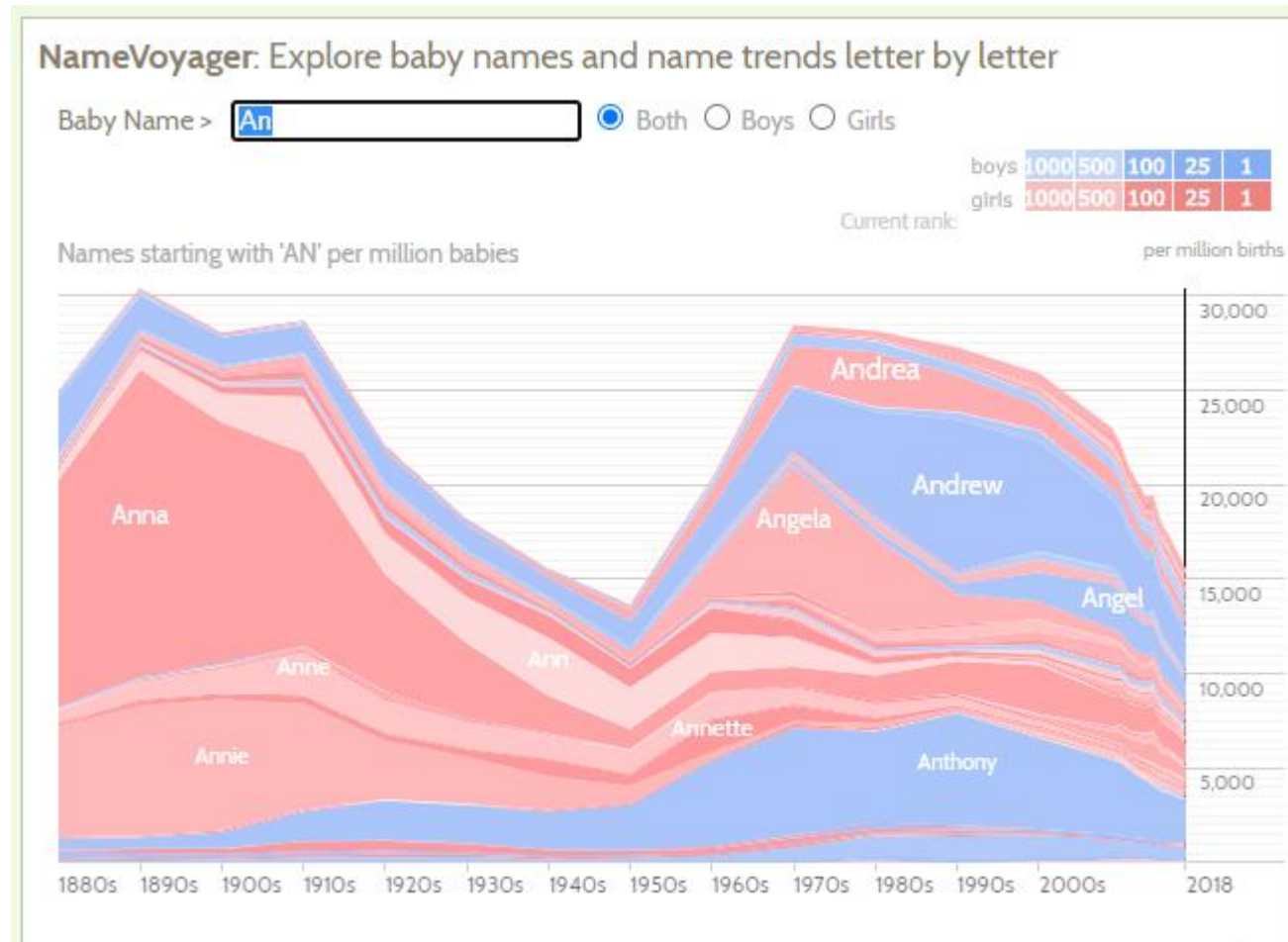
→ Derive



Analyze: Visualization for Consumption

- ▶ Discover new knowledge
 - ▶ Generate new hypothesis or verify existing one
 - ▶ Designer doesn't know what users need to see
 - ▶ "...separate out the questions of *why* the vis is being used from *how* the vis idiom is designed to achieve those goals, so...*why* doesn't dictate *how*."
- ▶ Present known information
 - ▶ Presenter already knows what the data says
 - ▶ Want to communicate this to an audience
 - ▶ Output of a discover session can become input of a present sessions
- ▶ Enjoy
 - ▶ Similar to discover, but without concrete goals
 - ▶ Goal of discovery by creator, but ends up being used for entertainment by a different group of people: e.g. babynamewizard.

Enjoy



Analyze: Visualization for Production

- ▶ Generate new material; goal is to produce output that is used immediate as input to a next instance
- ▶ Annotate
 - ▶ Add more to a visualization; attach information to a visualization
 - ▶ Usually associated with text, but can be graphical
- ▶ Record
 - ▶ Persist visualizations for historical record
 - ▶ Provenance (graphical histories): how did I get here?
 - ▶ Ex: screen shots, interaction logs
- ▶ Derive (Transform)
 - ▶ Create new data - derived attributes
 - ▶ Create derived attributes (ex: mathematical operations, aggregation, transform numerically or between data types such as from continuous to categories (water temp: hot, warm, cold))
 - ▶ Decide what the right thing to show is

Actions: Search

Discussion: give me an examples of each

➔ Search

	Target known	Target unknown
Location known	 <i>Lookup</i>	 <i>Browse</i>
Location unknown	 <i>Locate</i>	 <i>Explore</i>

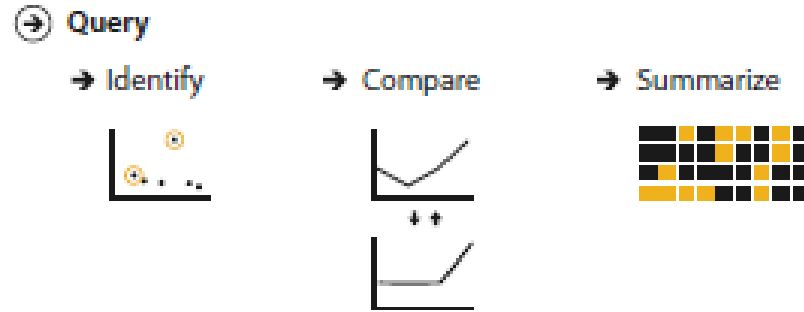
Actions: Search

➔ Search

	Target known	Target unknown
Location known	 <i>Lookup</i>	 <i>Browse</i>
Location unknown	 <i>Locate</i>	 <i>Explore</i>

- What does a user know:
 - Lookup: check bearings
 - Locate: find on a map
 - Browse: what's nearby
 - Explore: where to go (patterns)

Actions: Query



- Number of targets: one, some (often 2), or all
- Identify: characteristics or references
- Compare: similarities and differences
- Summarize: overview of everything

Actions: Query

- ▶ Chloropleth map of US election results
 - ▶ Identify
 - ▶ Election results for one state
 - ▶ Search returns targets by lookup or locate, identify returns characteristics
 - ▶ E.g. winning party (identified by color) for the state of California
 - ▶ Search returns targets matching particular characteristics (via browse or explore), identify returns specific references
 - ▶ E.g. identify the state having the highest margin of victory
 - ▶ Compare
 - ▶ Scope: multiple targets
 - ▶ Typically more difficult than identify
 - ▶ Ex between states
 - ▶ Summarize
 - ▶ Overview
 - ▶ Ex all states

Targets

→ All Data

→ Trends



→ Outliers



→ Features



→ Attributes

→ One

→ Distribution



→ Extremes



→ Many

→ Dependency



→ Correlation

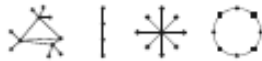


→ Similarity



→ Network Data

→ Topology



→ Paths



→ Spatial Data

→ Shape



Targets: All Data

- ▶ High level for all types of data
 - ▶ Trends
 - ▶ Patterns in the data (example: increases, decreases, peaks, troughs, and plateaus)
 - ▶ Outliers
 - ▶ Elements that don't fit well with the general data
 - ▶ Aka anomalies, novelties, deviants, surprises
 - ▶ Features
 - ▶ Generally task dependent (any particular structures of interest)

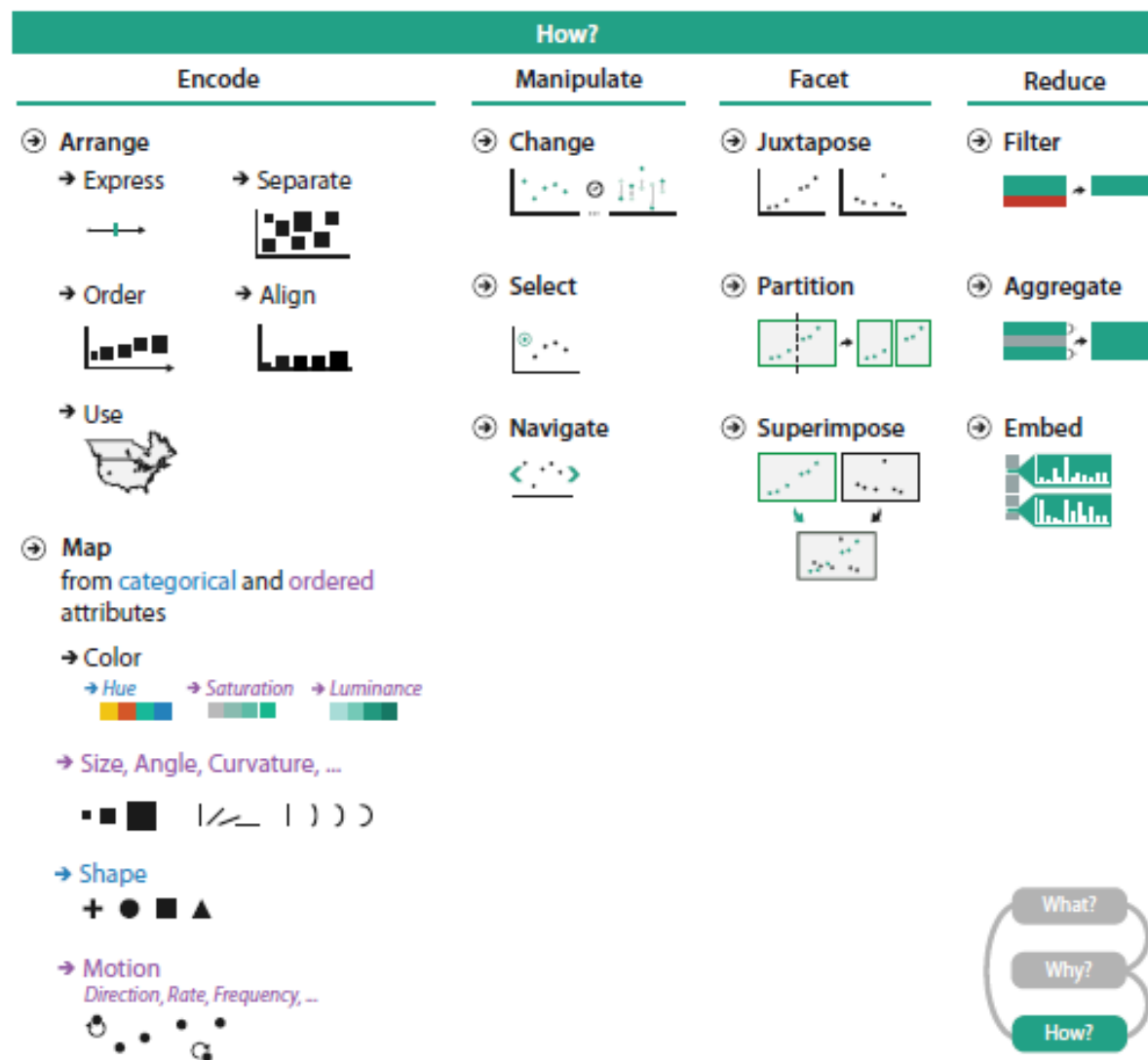
Targets: Attributes

- ▶ Attributes - specific properties that are visually encoded
 - ▶ Lowest level - individual value
 - ▶ Extremes - min or max across the range
 - ▶ Common target with high-level scope - distribution of all values for an attribute
- ▶ Some targets have multiple attributes
 - ▶ Dependencies
 - ▶ Values for one depend on a second
 - ▶ Correlation
 - ▶ Tendency for the values of one attribute tied to the values of a second attribute
 - ▶ Similarity
 - ▶ Quantitative measurement on all values of two or more attributes
 - ▶ Allows ranking of attributes with respect to how similar or different they are from each other

Targets: Network and Spatial Data

- ▶ Some targets have specific types of datasets
 - ▶ Network data specifies relationships between nodes as links
 - ▶ Target is to understand structure of these interconnections (network's topology)
 - ▶ Path (more specific topological target) of one or more links that connects two nodes
 - ▶ Spatial data
 - ▶ Understanding and comparing the geometric shape is the common target of user actions

How?



Sources/Credits

- ▶ Tamara Munzner, Visualization Analysis & Design, A K Peters Visualization Series, CRC Press, 2014.
- ▶ Utah, Miriah Meyer, Visualization (2014).
- ▶ UMass Dartmouth, David Koop, Data Visualization (2015).