# Data Types

# Lesson Objectives

- By the end of this lesson students should be able to:
  - classify data into data types
  - evaluate how appropriate a visual channel is given data of a specified type

This lesson is heavily built on https://jef.works/genomic-data-visualization-2022/course/1-data-visualization-theory/

# Categorical Data

represent qualitative characteristics.

Categorical data can take on numerical values, but those numbers don’t have mathematical meaning i.e. the order and differences aren't meaningful.

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Titles of categorical data can take on numerical values, but those numbers don’t have mathematical meaning i.e. the order and differences aren't meaningful.

Examples:

- shapes (circle, square, triangle, etc.)
- majors at a university (Public Health, Applied Math, Neuroscience, etc.)
- menu items at a restaurant (#7, #3, #12)

# Ordinal Data

represent qualitative characteristics but the categories have meaningful ordering.

If the titles of categories include numerical values, one can interpret directionality of elements in the categories but not distance between elements.

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Examples:

- year in college (freshman, sophomore, junior, senior)
- description of height (short, tall)
- income brackets ($0–$19,999, $20,000–$39,999, $40,000–$59,999)

# Quantitative Data

represent numerical values.

Values can be interpreted mathematically, i.e. between two elements you can observe meaningful direction and distance.

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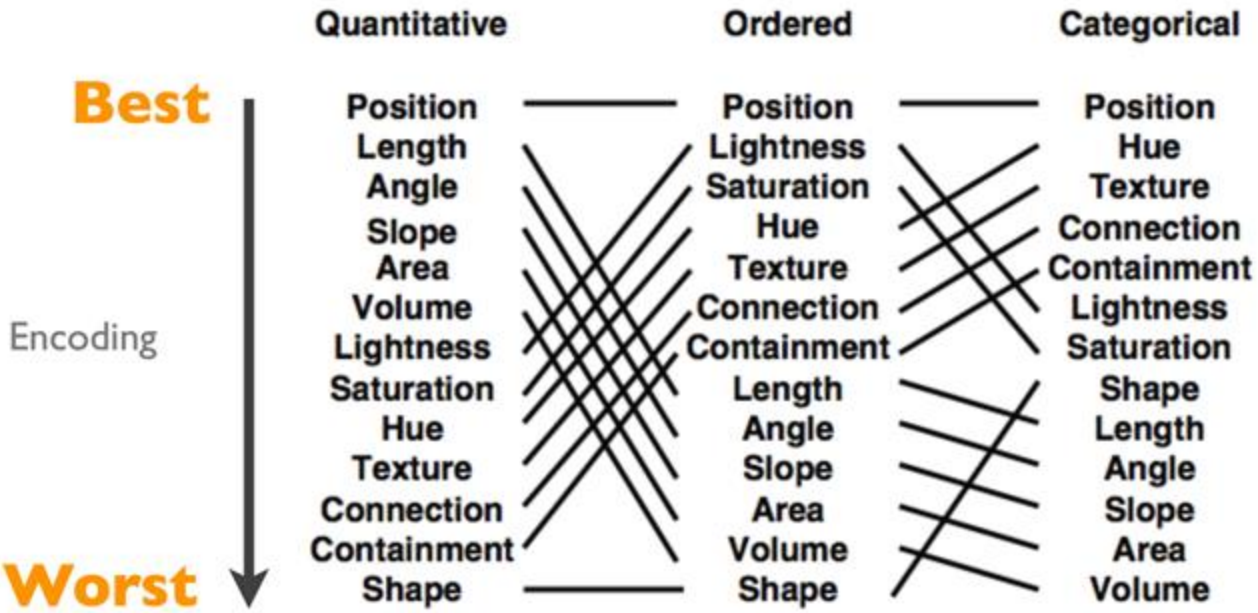
Examples:

- heart rates (60 bpm, 118bpm, 95bpm)
- cloud coverage (75%, 0%, 100%)
- trip length (0.48 km, 3725 km, 12,880 km)

# Ranking Of Visual Channels For Different Data Types




(Image credit: Munzner, Visualization Analysis and Design, 2014; adapted from Mackinlay, Automating the Design of Graphical Presentations of Relati onal Information, 1986)

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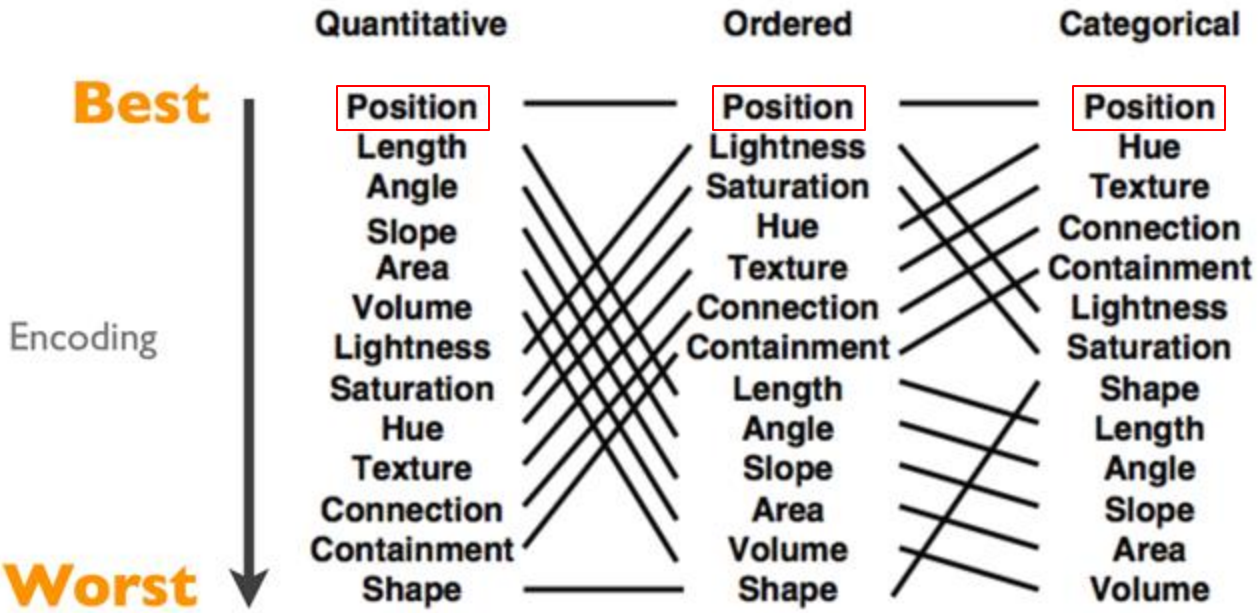


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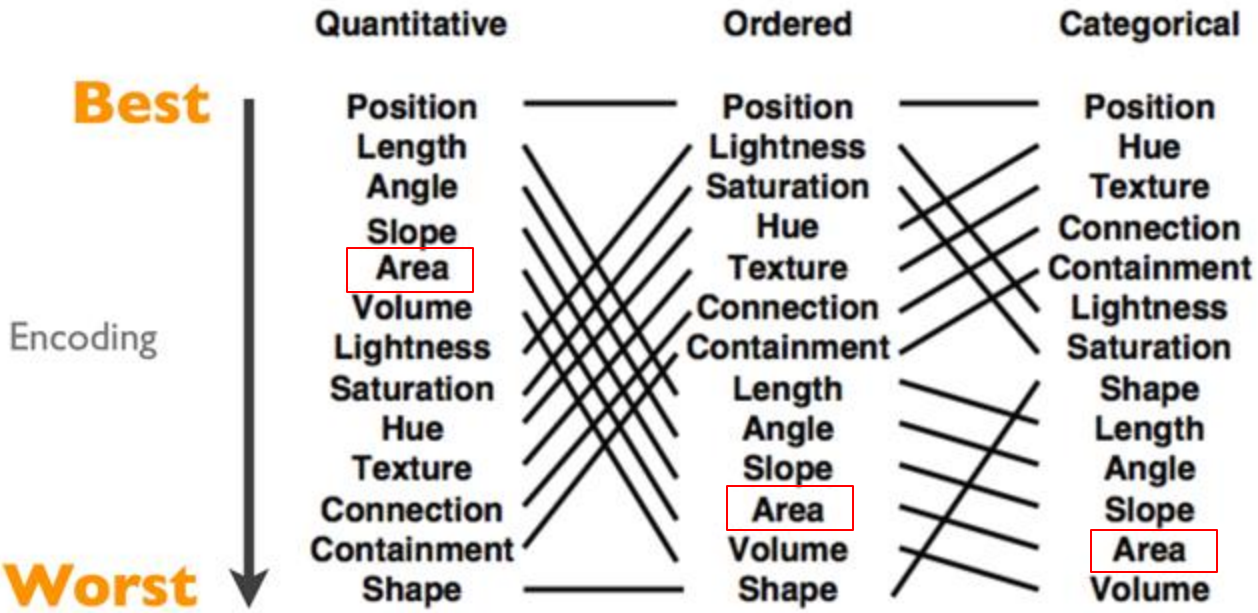


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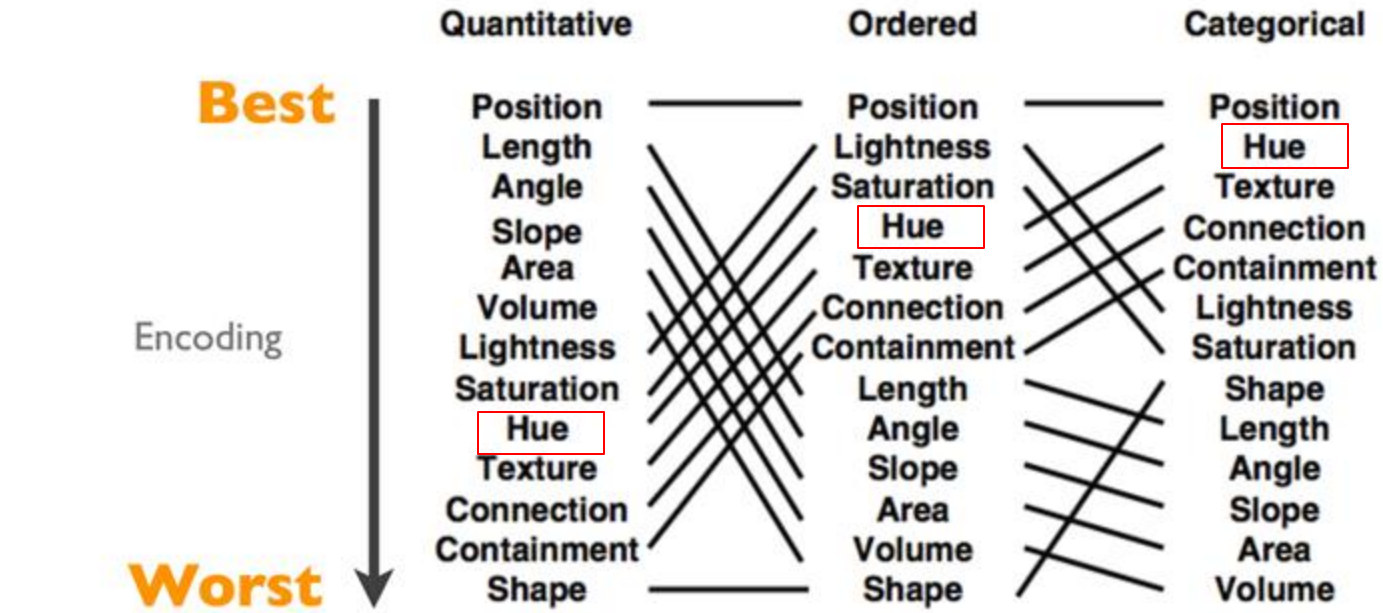



(Image credit: Munzner, Visualization Analysis and Design, 2014; adapted from Mackinlay, Automating the Design of Graphical Presentations of Relational Information, 1986)

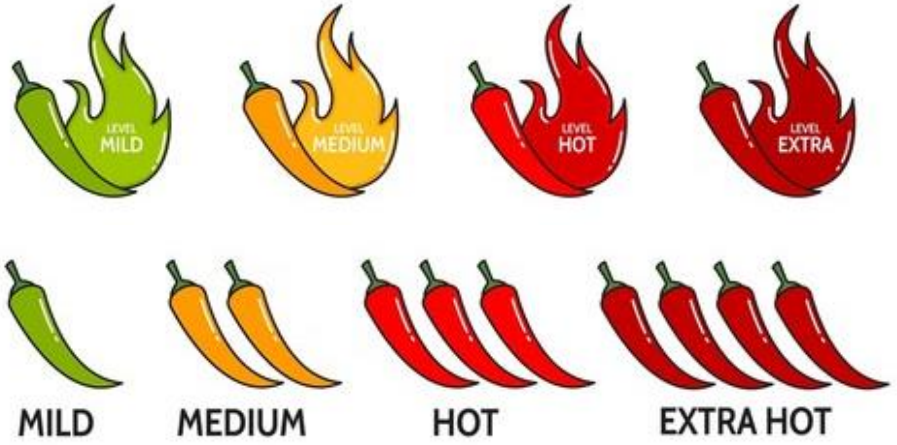
# Example of two ways to encode the same data

**ORDINAL**

Best

Position
Lightness
Saturation
Hue
Texture
Connection
Containment
Length
Angle
Slope
Area
Volume
Shape

Worst



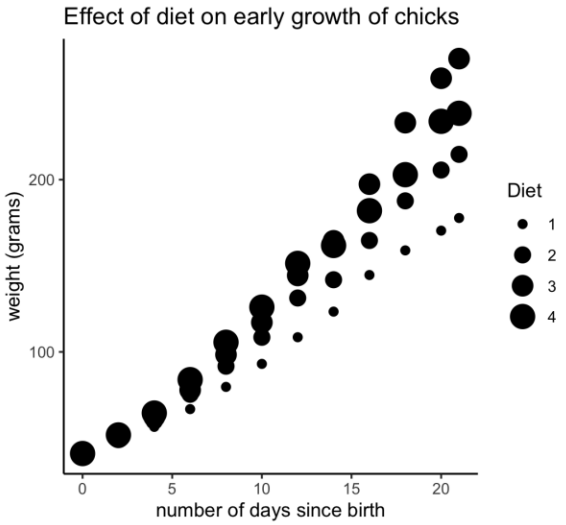
# Examples Of Visual Channels For Categorical Data

**CATEGORICAL**

Best

Position
Hue
Texture
Connection
Containment
Lightness
Saturation
Shape
Length
Angle
Slope
Area
Volume

Worst

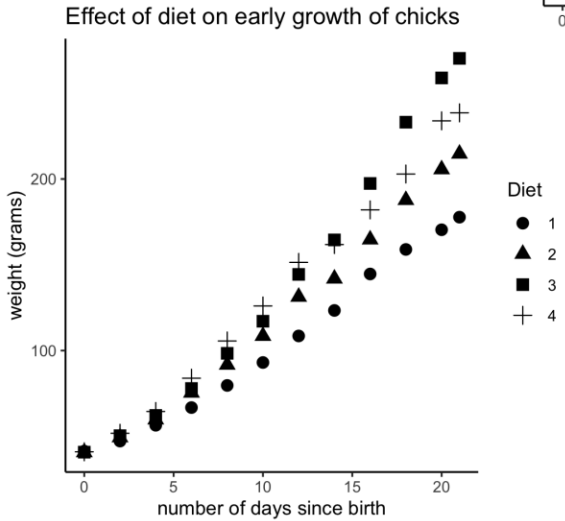


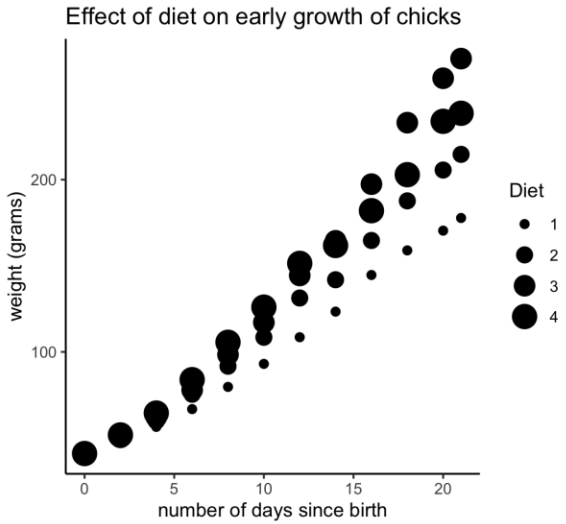
## CATEGORICAL

Best

Position
Hue
Texture
Connection
Containment
Lightness
Saturation
Shape
Length
Angle
Slope
Area
Volume

Worst



## CATEGORICAL

Best

Position
Hue
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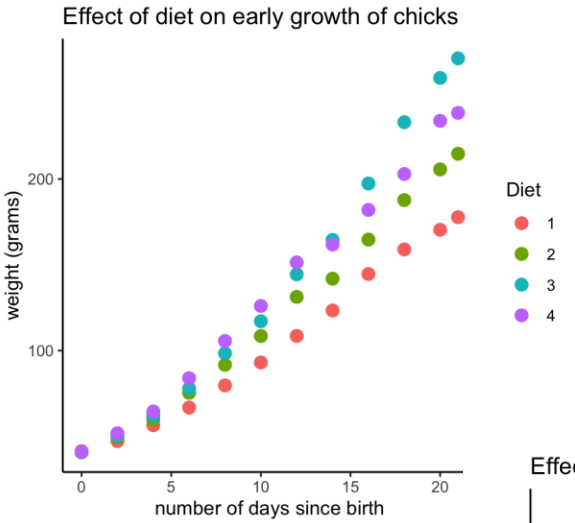


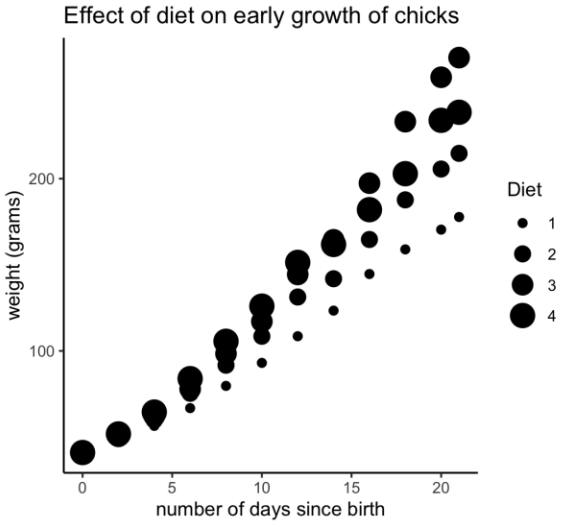


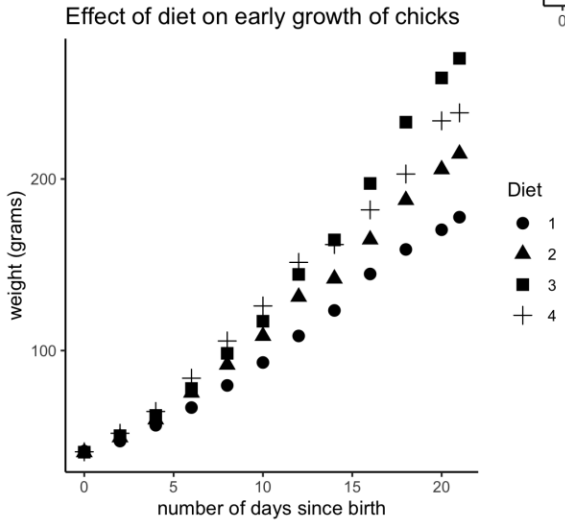

# Examples Of Visual Channels For Quantitative Data

**QUANTITATIVE**

Best

**Position**
Length
Angle
Slope
Area
Volume
Lightness
**Saturation**
Hue
Texture
Connection
Containment
Shape

Worst