

RenR 480/711

Good Graphs *Versus* Bad Graphs

See: The Visual Display of Quantitative Information by Edward R. Tufte

Importance

In research and career:

- Accurately and effectively convey information
- Publishing: Journals require high data-to-ink ratios

In life (and research and career):

- Know where the knowledge is coming from
- Avoid being manipulated with bad graphs

Good Graphs

- Reveal data with no distortions
- Encourage absorption of information
 - Reader not distracted by design, method, etc
- Present data in small space
- Large datasets become easily understood
- High data to ink ratio: maximize the ink devoted to data as points or labels (not axes, grids, images, etc)

Bad Graphs

Distortion of graphical integrity occurs:

- Visuals are inconsistent with numbers
 - E.g. graphical perception is purposefully amplified relative to the data (creating a visual impression in the reader that is not supported by the data)
- False or non-intuitive labeling or axes
 - E.g. label sizes, changes in axes meanings, changes in perception of axes, false selection of an appropriate axis

In Conclusion

Critically analyze graphs you encounter

Graphical Excellence:

- Emphasize data
- Remove unnecessary information
- Data-to-ink ratio: multivariate, minimalistic grids
- Avoid chart-junk

Tell the truth about the data

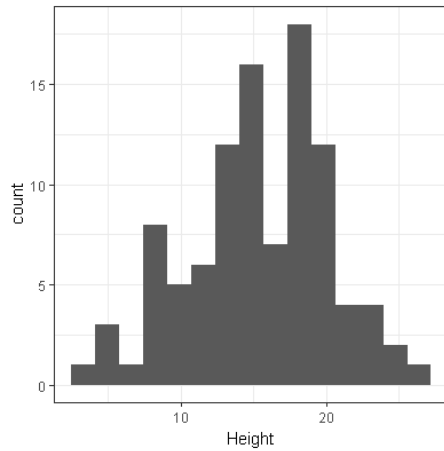
- Be consistent with visual expectations

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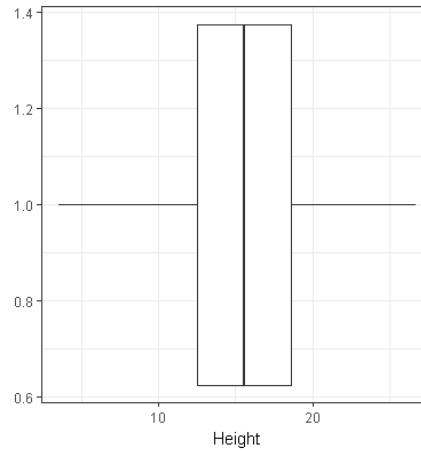
Scientific Graphs Part II

Choosing the right graph

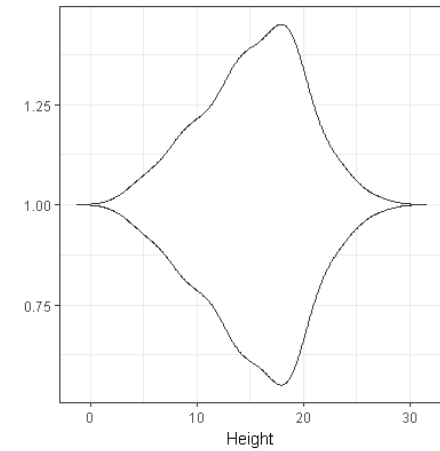
Visualizing Distributions



Histogram



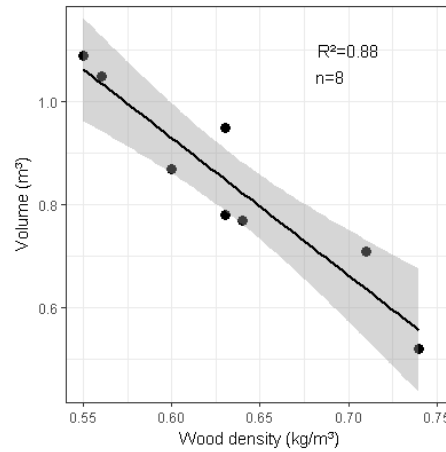
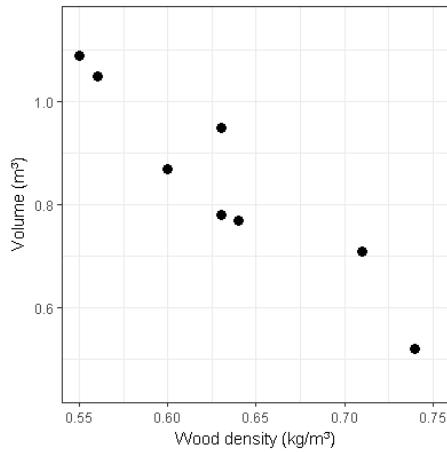
Boxplot



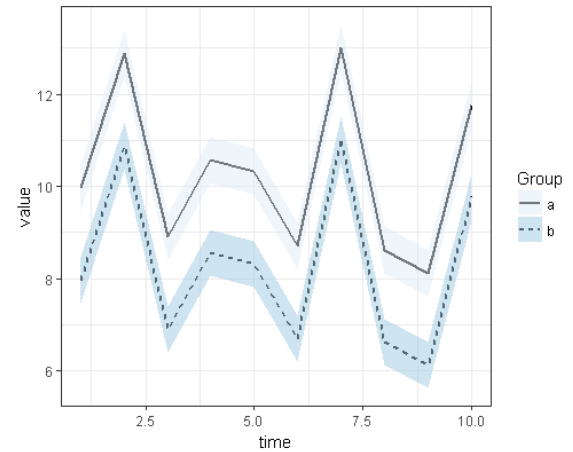
Violin plot

Choosing the right graph

Visualizing relationships among variables



Scatter plots

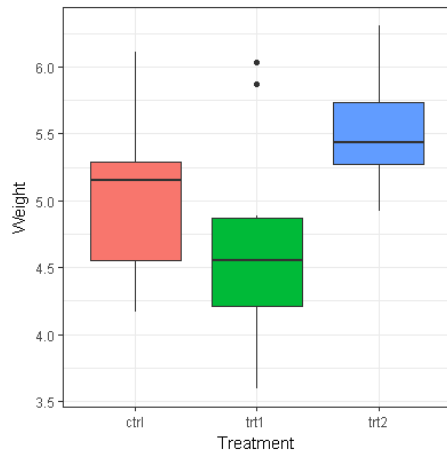


Line plots

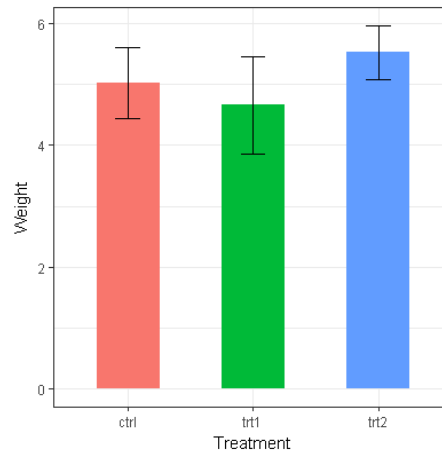
Makes it possible to see lagged correlations and temporal breakdowns of correlations

Choosing the right graph

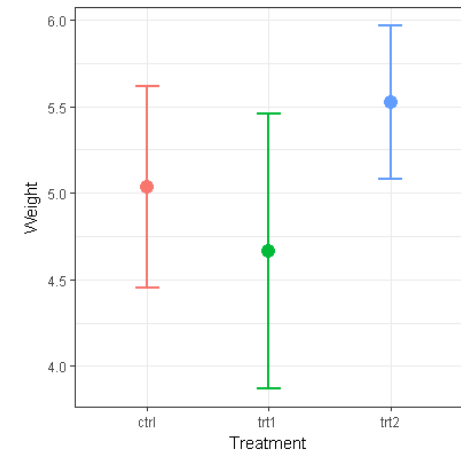
Comparing treatments, populations and classes



Boxplot



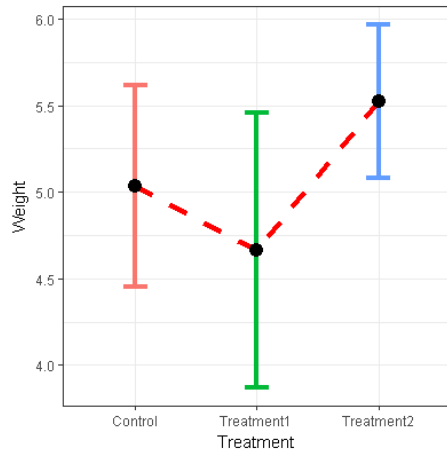
Barplot



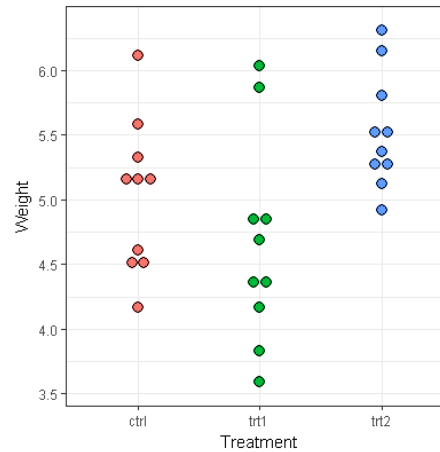
Dotplot

Choosing the right graph

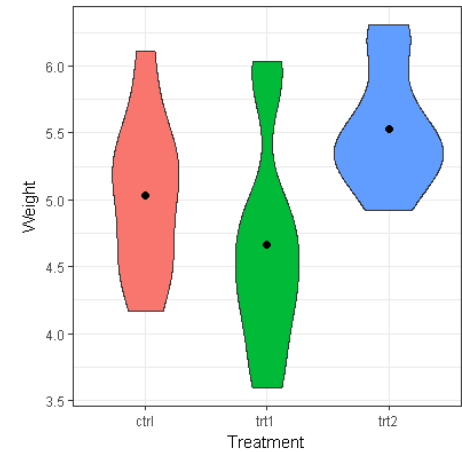
Comparing treatments, populations and classes



Dot-line Plot



Dotplot



Violin plot

