

# v-plots: Designing Hybrid Charts for the Comparative Analysis of Data Distributions – Rule-based System for the Guiding Wizard –

## 1 OVERVIEW

The following algorithm documents the rule-based system which is the foundation of our guiding wizard. The source code of the v-plot designer and guiding wizard are available at [osf.io/jk8rp](https://osf.io/jk8rp). The underlying rules can be customized and tailored towards one's needs. To do so, the following files contain the main properties that can be adjusted:

- `plot.js` – contains the implemented rules; also for the automatic chart recommendation engine.
- `property-service.js` – contains the default properties (color, transparency, etc) of the v-plots.



## 2 IMPLEMENTED RULES

**Data:** List with tasks L1, ..., L5, A1, ..., A10, G1, ..., G5 and indication whether they are *notRelevant*, *relevant*, or *highlighted*.

Initialization:

- Remove all layers and elements from the v-plot;
- Set default color and opacity for all layers and visual elements;

```
/* ----- Initializing Layers ----- */
if relevant(any local task) OR highlighted (any local task) then
  | add layer (i) with mirrored bar charts;
end
if relevant(any global task) OR highlighted (any global task) then
  | add layer (ii) with density distribution;
end
if relevant(any aggregated task) OR highlighted (any aggregated task) then
  | add layer (iv) with statistic measures;
end
if relevant(any of L4, L5, G3, G4, G5) OR highlighted (any of L4, L5, G3, G4, G5) then
  | add layer (iii) with difference encoding;
  | if notRelevant(L4 and L5) then
  |   | use difference-shape;
  | else
  |   | use difference-histogram;
  | end
end

/* ----- Local Analysis Tasks ----- */
if highlight(any of L1, L2, L3) then
  | darken (i) mirrored bar chart by increasing its opacity;
end
if relevant(L1) then
  | add grid with labels of relative frequencies to the plot (layer v);
end
if highlight(L1) then
  | add grid with labels of relative frequencies to the plot (layer v);
  | add labels with the relative frequency to each bin of the mirrored bar chart (layer v);
end
if highlight(any of L4, L5) then
  | darken (iii) difference encoding by increasing its opacity;
end

/* ----- Global Analysis Tasks ----- */
if highlight(any of G1, G2) then
  | darken (ii) density distribution by increasing its opacity;
end
if highlight(any of G3, G4, G5) then
  | darken (iii) difference encoding by increasing its opacity;
end

/* ----- Aggregated Analysis Tasks ----- */
if highlight(any aggregated task) then
  | put layer (iv) with statistic measures at the top layer;
end
if relevant(any of A6, A7) then
  | connect central tendency measure (mean, median) by a straight line;
end
if highlight(any of A6, A7) then
  | connect central tendency measure (mean, median) by a straight line;
  | darken connection of central tendency by increasing its opacity;
end
if relevant(any of A8, A9, A10) then
  | connect variance measure (quartiles, standard deviation, or standard error) by a straight line;
end
if highlight(any of A8, A9, A10) then
  | connect variance measure (quartiles, standard deviation, or standard error) by a straight line;
  | use background color for area between quartiles, standard deviation, or standard error;
end
```

**Algorithm 1:** Implemented rules of the guiding wizard. All rules can be adjusted in the source code.