

Data Driven Visualization

CSV-driven concentric arc charts

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1 What the package does

ddv wraps `wheelchart` and `datatool`. Each CSV row becomes a colored arc on its own concentric ring. Optional stages label the circle, and an optional title follows an outer arc. Category filters and sorting select and order the rings without editing the data file.

2 Quick start

Put `ddv.sty` and `ddv-example.csv` beside your document and compile with LuaLaTeX. This example scales the chart to the text width.

```
\documentclass{article}
\usepackage[dataset={ddv-example.csv}]{ddv}
\begin{document}
\resizebox{\linewidth}{!}{%
  \DDV{stages={{Plan,Collect,Analyse,Share}},
        title={A project overview},
        slices={fontcolor=white}}}
\end{document}
```

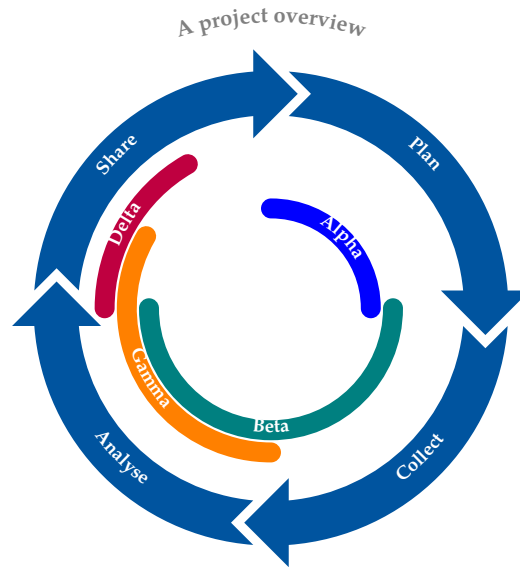
Set shared options in `\usepackage[...]{ddv}`. Pass overrides to `\DDV{...}`. Local overrides affect only that chart. An empty argument uses the package options unchanged.

3 Requirements and installation

Use LaTeX 2022-06-01 or newer, with `wheelchart`, `datatool`, `xcolor`, and `TikZ` including `decorations.text`. This release was tested with LuaLaTeX on TeX Live 2026. Other engines and older dependency versions have not been verified. No shell escape is needed.

For a user-wide installation, place `ddv.sty` under `tex/latex/ddv/` in your user TEXMF tree; refresh the filename database if required by your distribution. The CTAN catalogue name is `data-driven-visualization`; the LaTeX package name remains `ddv`.

4 Example and data format



The included data are fictional. The CSV header is mandatory:

```
category,name,description,startangle,totalangle,color
project,Alpha,Planning,90,90,blue
service,Beta,,0,180,teal
project,Gamma,Analysis,-90,120,orange
service,Delta,Reuse,180,60,purple
```

category

A case-sensitive label used by the filter.

name

Text on the arc; protect LaTeX special characters as usual.

description

Optional text in parentheses after the name. Keep the column even if every value is empty.

startangle

A signed decimal angle in degrees: 90 is the top, 0 is the right, and -90 is the bottom.

totalangle

A clockwise span greater than 0 and at most 360. From the top to the right is a span of 90 degrees.

color

An xcolor name or expression, such as `blue!60!black`. A quoted RGB triple, such as `"0, 84, 159"`, is also accepted.

Quote CSV fields containing commas with double quotes. CSV cells are LaTeX input: escape `&`, `%`, `_` and `#` when they are literal text. Slash characters are delimiters in wheelchart data; protect a literal slash in a label with braces, for example `A { / } B`. Use decimal notation for angles, not formulas or degree symbols.

5 Selecting data and arranging rings

dataset

Filename shorthand: `dataset={ddv-example.csv}`. The explicit form is `dataset={name={ddv-example.csv}}`. No filename is set by default; an empty filename omits the data rings.

dataset/filter

A category or a comma-separated list, for example

`dataset={filter={{project, service}}}`. The default `none` selects all rows; it is reserved for that purpose. An empty list selects no rows. Matching is case-sensitive.

dataset/sorting

One or more comma-separated column names, for example

`dataset={sorting={category, name}}`. Sorting is ascending: numeric columns are compared numerically, and text columns case-insensitively, using `datatool`. The default empty value preserves CSV order. Sorting one chart does not change subsequent charts or databases in the calling document.

innercirclesize

Initial radius offset, an integer from 0 to 9999; default 4. It is not a diameter. Data ring i has inner radius `innercirclesize + i + 1` and outer radius one unit larger, before `wheelchart` gap adjustments. TikZ's normal coordinate unit is used.

```
\DDV{
  dataset={ddv-example.csv,
           filter={{project, service}},
           sorting={category, name}},
  innercirclesize=2,
  stages={{Plan, Collect, Analyse, Share}, inside=true},
  title={Selected activities},
  slices={description=true, bgcolorseries={{blue, red}}}
}
```

6 Text shared by title, stages, and slices

Each of `title`, `stages`, and `slices` accepts these subkeys:

font

Unexpanded LaTeX font commands; default `\bfseries`. Use, for example, `font={\sffamily}`. Load `fontspec` yourself when selecting system fonts. The package imposes no font family.

fontsize

Integer point size from 1 to 9999; default 15.

fontcolor

Named color, `xcolor` mixture, or a braced RGB triple with integer components from 0 to 255. Defaults: `black!50` for title and slices; `white` for stages.

options

Additional `wheelchart` keys, applied after the defaults. See the `wheelchart` manual for their syntax and interaction.

7 Titles and stages

`title={My title}` and `title={name={My title}}` are equivalent. Protect commas within a title, for example `title={name={Research, together}}`. The default title is empty.

`stages={{Plan, Collect, Analyse, Share}}` sets equal-sized stage sectors. The explicit form is `stages={name={Plan, Collect, Analyse, Share}}`. The default list is empty, so no stage ring is drawn.

stages/bgcolor

Color of the stage sectors; default `blue`. Accepts the same color syntax as `fontcolor`.

stages/inside

Boolean; default `false`. If true, stages appear inside the data rings, otherwise outside them. Stages can also be drawn without a dataset.

8 Slice appearance

slices/description

Boolean; default `false`. Append nonempty descriptions in parentheses. Empty cells do not produce empty parentheses.

slices/bgcolor

Use one color for every data ring, overriding the CSV colors. Accepts a named color, mixture, or RGB triple.

slices/bgcolorseries

Exactly two colors, for example `bgcolorseries={{blue, red}}`. Colors run from the first selected row to the last, after filtering and sorting. Both endpoints are included. A one-row chart uses the first color. Without an explicit value the endpoints are blue and red. For RGB endpoints use `bgcolorseries={{0, 84, 159}, {227, 0, 102}}`.

slices/sliceColor

Compatibility boolean. True restores CSV colors (the default); false selects the uniform background, initially blue.

slices/bgcolorSeries

Compatibility boolean. True selects the current gradient (initially blue to red); false selects the uniform color. Prefer the lowercase `bgcolorseries` key for setting a gradient.

The last color-selection key wins. Thus a local `bgcolor` overrides a global gradient, and `sliceColor=true` restores per-row colors.

9 Advanced wheelchart options

Inside a chart, `\thestagesRadius` expands to the current radius offset. Existing option expressions can use this hook:

```
\DDV{dataset={ddv-example.csv}, title={Overview},
options={radius={7+\thestagesRadius}
          {10+\thestagesRadius}}}}
```

For long labels, reduce the font size or enlarge the chart. Text is not automatically shortened or wrapped.

10 Worked examples

These examples adapt the generic poster's overview and category panels to `ddv-example.csv`, the four-row fictional dataset shown earlier. Each listing is the actual source of the result beside it. Load `ddv` in the preamble and place the listed code in your document body. The manual scales each result to its column width.

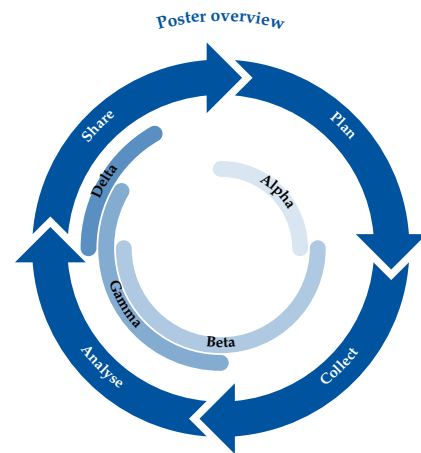
10.1 A poster-style overview

Use the poster's blue palette and a light-to-dark gradient. Black labels remain readable across the gradient; stages sit outside all four data rings.

LaTeX source

```
\definecolor{accent}{RGB}{0,84,159}
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={Poster overview,
    fontsize=28,fontcolor=accent},
  stages={{Plan,Collect,Analyse,Share},
    fontsize=24,bgcolor=accent},
  slices={
    fontsize=24,fontcolor=black,
    bgcolorseries={{accent!15,accent!65}}
  }
}
```

Result



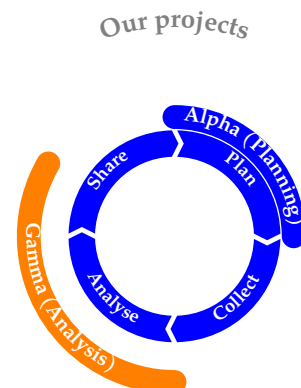
10.2 A project panel with inner stages

As in the poster's project panel, filter to one category and move the stages inside. Enabling descriptions adds Planning and Analysis to the two labels.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv,
    filter=project},
  innercirclesize=2,
  title={Our projects, fontsize=28},
  stages={{Plan,Collect,Analyse,Share},
    inside=true, fontsize=20},
  slices={
    description=true,
    fontsize=22,fontcolor=white
  }
}
```

Result



Worked examples: selection and color

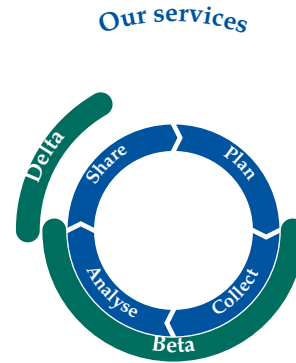
10.3 A service panel with a uniform color

The same panel structure selects services instead. An RGB background replaces the per-row CSV colors, giving both service arcs the same appearance.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv,
    filter=service},
  innercirclesize=2,
  title={Our services,
    fontsize=28, fontcolor={0,84,159}},
  stages={{Plan,Collect,Analyse,Share}},
    inside=true, fontsize=20,
    bgcolor={0,84,159}},
  slices={
    fontsize=24, fontcolor=white,
    bgcolor={0,110,95}
  }
}
```

Result



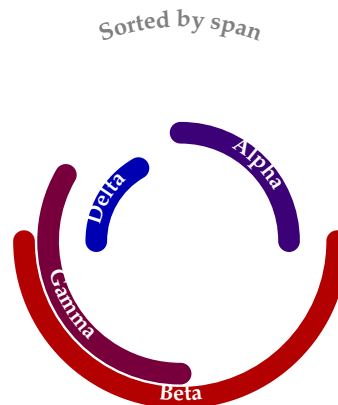
10.4 Sort first, then apply the gradient

Select both categories and sort numerically by angular span. From the inside out the rows are Delta, Alpha, Gamma, Beta; the gradient follows that order. Omitting stages leaves only the data rings and title.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv,
    filter={{project,service}},
    sorting=totalangle},
  innercirclesize=1,
  title={Sorted by span, fontsize=28},
  slices={
    fontsize=26, fontcolor=white,
    bgcolorseries={{blue!70!black,
      red!70!black}}
  }
}
```

Result



Worked examples: typography and geometry

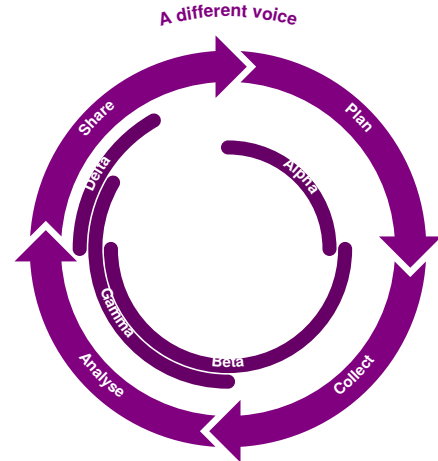
10.5 Change fonts and enlarge the centre

A larger initial radius leaves more central space. Sans-serif text and a uniform violet palette give the same data a different visual style.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=4,
  title={A different voice,
    font=\sffamily\bfseries,
    fontsize=32,fontcolor=violet},
  stages={{Plan,Collect,Analyse,Share}},
  font=\sffamily\bfseries,
  fontsize=28,bgcolor=violet},
  slices={
    font=\sffamily\bfseries,
    fontsize=28,fontcolor=white,
    bgcolor=violet!80!black
  }
}
```

Result



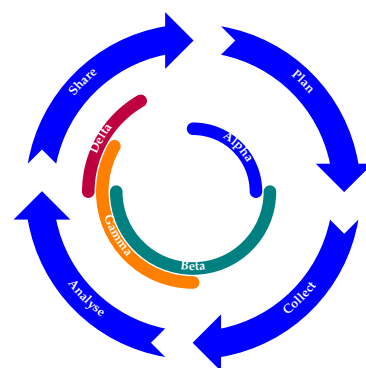
10.6 Customize the stage ring and title position

Adapt the poster's wheelchart radius overrides to move the stage ring outward and increase its gaps. The title moves below the chart; its radius uses the current offset through `\thestagesRadius`.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={A title below the chart,
    fontsize=30,fontcolor=black,
    options={start half=-90,
      arc data dir=-1,
      radius={7+\thestagesRadius}
      {10+\thestagesRadius}}},
  stages={{Plan,Collect,Analyse,Share}},
  fontsize=26,
  options={gap=2,
    radius={2+\thestagesRadius}
    {4+\thestagesRadius}}},
  slices={fontsize=26,fontcolor=white}
}
```

Result



Worked examples: optional layers

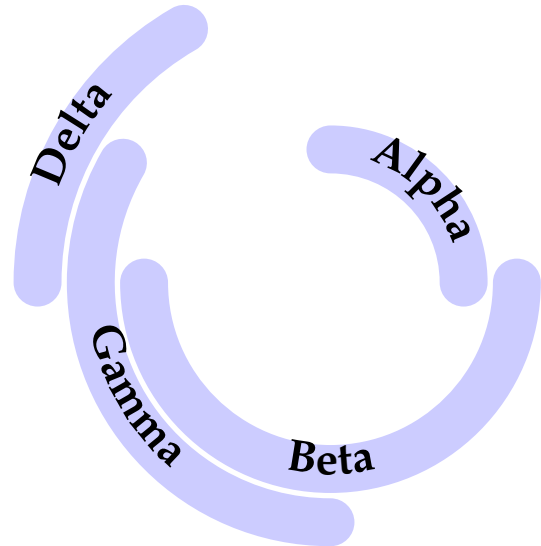
10.7 Data rings without stages or a title

Only the dataset is essential for a data chart. A zero initial offset makes a compact centre; a pale uniform background keeps the labels easy to read.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=0,
  slices={
    fontsize=24,
    fontcolor=black,
    bgcolor=blue!20
  }
}
```

Result



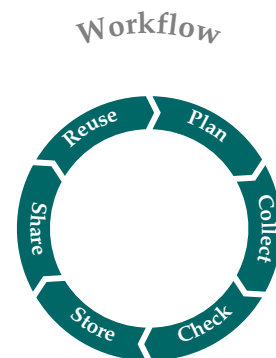
10.8 A stage ring without a dataset

An empty filename omits all data rings. Six stage labels form a standalone workflow diagram, useful before any activities have been entered in the CSV.

LaTeX source

```
\DDV{
  dataset={},
  innercirclesize=2,
  title={Workflow, fontsize=26},
  stages={{Plan, Collect, Check,
    Store, Share, Reuse}},
  inside=true,
  fontsize=18,
  fontcolor=white,
  bgcolor=teal!80!black}
}
```

Result



Worked examples: color precedence

10.9 Override a gradient with one color

The background key follows the gradient key, so the uniform teal color wins. This same ordering rule applies when local settings override package defaults.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={The last color wins,
    fontsize=26},
  slices={
    bgcolorseries={{blue, red}},
    bgcolor=teal!80!black,
    fontsize=24, fontcolor=white
  }
}
```

Result



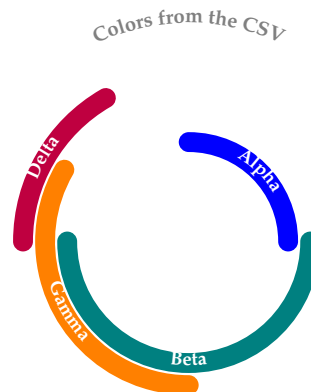
10.10 Restore the colors from the CSV

A later `sliceColor=true` restores the original blue, teal, orange, and purple row colors, overriding the earlier uniform violet background.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={Colors from the CSV,
    fontsize=26},
  slices={
    bgcolor=violet,
    sliceColor=true,
    fontsize=24, fontcolor=white
  }
}
```

Result



Worked examples: wheelchart styling

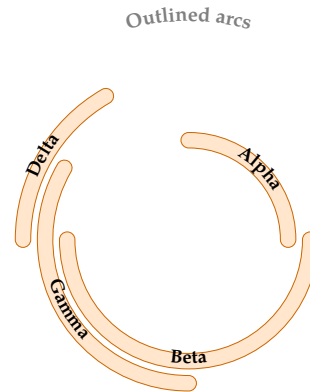
10.11 Add outlines and increase radial gaps

Pass drawing styles directly to wheelchart. The custom slice style supplies both the fill and outline; a larger radial gap separates adjacent rings.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={Outlined arcs, fontsize=26},
  slices={
    fontsize=24, fontcolor=black,
    options={
      gap radius=.15,
      slices style={
        fill=orange!20,
        draw=orange!80!black,
        line width=1pt}
    }
  }
}
```

Result



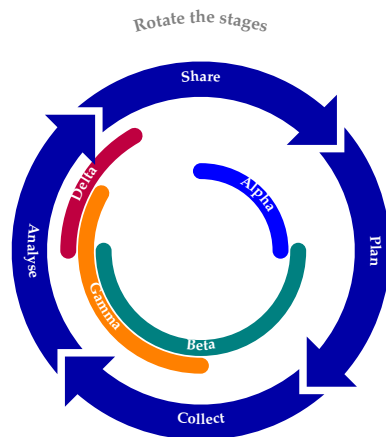
10.12 Rotate the stage sectors

Move the start of the stage ring to 45 degrees. Only the stage labels and arrows rotate; the CSV start angles still determine the positions of data arcs.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv},
  innercirclesize=2,
  title={Rotate the stages,
    fontsize=28},
  stages={ {Plan,Collect,Analyse,Share},
    fontsize=24,
    bgcolor=blue!65!black,
    options={start angle=45}},
  slices={
    fontsize=24, fontcolor=white
  }
}
```

Result



Worked examples: ordering and small datasets

10.13 Sort by category and then by name

Multiple sorting columns group projects before services, then order names within each group. The inner-to-outer sequence is Alpha, Gamma, Beta, Delta.

LaTeX source

```
\DDV{
  dataset={ddv-example.csv,
    sorting={category,name}},
  innercirclesize=2,
  title={name={Groups, then names},
    fontsize=26},
  slices={
    fontsize=24,fontcolor=white,
    bgcolorseries={{violet!80!black,
      teal!80!black}}
  }
}
```

Result



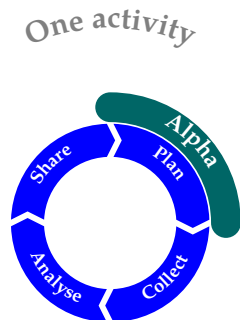
10.14 A gradient with a single selected row

The included `ddv-single.csv` contains only the Alpha row from the original example. A one-row gradient uses its first endpoint, here teal, without interpolating or dividing by zero.

LaTeX source

```
\DDV{
  dataset={ddv-single.csv},
  innercirclesize=1,
  title={One activity,fontsize=26},
  stages={{Plan,Collect,Analyse,Share},
    inside=true,fontsize=16},
  slices={
    fontsize=20,fontcolor=white,
    bgcolorseries={{teal!80!black,
      red!70!black}}
  }
}
```

Result



11 Diagnostics and limitations

A missing dataset, missing required column, unknown key, invalid integer, invalid RGB triple, or invalid angle produces an error. Compile with `-halt-on-error` when checking data. A filter with no matching rows produces a warning and skips the entire chart, including title and stages. Missing columns and invalid selected-row angles also prevent rendering.

Required headers are checked before drawing. Angle validation applies to selected rows. Color expressions and custom wheelchart keys are ultimately validated by `xcolor` and `wheelchart`. Rows with very long labels or unusual TeX code still require visual review. CSV data must be trusted LaTeX input.

12 Building the documentation

The CTAN archive includes the source files needed to rebuild the manual and example. Run these commands in the extracted package directory:

```
lualatex ddv-doc.tex
lualatex ddv-doc.tex
lualatex ddv-example.tex
```

LuaLaTeX uses its configured font cache. No machine-specific cache path is stored in the package. The included makefile also provides `make doc`, `make example`, and `make clean`; plain `make` builds the manual and example. These published targets do not require Python.

The release files are listed in `MANIFEST.txt`. Keep the fourteen `ddv-demo-*.tex` files beside the manual source: each supplies both a listing and its rendered chart. Python development scripts are excluded from the CTAN archive, along with experiments, domain-model material, logos, caches, build logs, Git metadata, and editor state.

13 License, maintenance, and acknowledgements

Copyright 2025–2026 Lukas C. Bossert. This work is distributed under the LaTeX Project Public License, version 1.3c or later, and has maintenance status *maintained*. The Current Maintainer is Lukas C. Bossert, bossert@itc.rwth-aachen.de. The work consists of the files in `MANIFEST.txt`; see `LICENSE` and `LPPL-1.3c.txt` for the distribution terms.

Thanks to matexmatics for [wheelchart](#), Nicola L. C. Talbot for [datatool](#), and the TeX Stack Exchange community for help with the original design. The README lists the relevant discussions.

14 Changes in version 1.0.0

The first CTAN release includes fourteen worked examples and regression checks, fixes chart-state isolation and global radius settings, preserves nested option values, supports RGB triples, makes gradient endpoints and color precedence consistent, and improves validation and empty-filter handling. The unused `dataset/database` key has been removed.