

# Package ‘flowmapper’

November 15, 2024

**Title** Draw Flows (Migration, Goods, Money, Information) on 'ggplot2'  
Plots

**Version** 0.1.3

**Description** Adds flow maps to 'ggplot2' plots. The flow maps consist of 'ggplot2' layers which visualize the nodes as circles and the bilateral flows between the nodes as bidirectional half-arrows.

**License** MIT + file LICENSE

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**Imports** dplyr, ggplot2, tidyr, forcats, scales, purrr

**URL** <https://github.com/JohMast/flowmapper>

**BugReports** <https://github.com/JohMast/flowmapper/issues>

**Depends** R (>= 2.10)

**LazyData** true

**NeedsCompilation** no

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**Repository** CRAN

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## Contents

add_flowmap . . . . .	2
cantons . . . . .	4
CH_migration_data . . . . .	5
get_circle_coords . . . . .	6
hca_flowdat . . . . .	6
short_scale . . . . .	7
util_data_flow_to_flowdat . . . . .	7

<b>Index</b>	<b>9</b>
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 add\_flowmap

*Add a flow map to a ggplot*


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### Description

Add a flow map to a ggplot

### Usage

```
add_flowmap(
  p,
  flowdat = NULL,
  od = NULL,
  nodes = NULL,
  outline_linewidth = 0.01,
  alpha = 0.8,
  nodes_alpha = 0.8,
  outline_col = "black",
  k_nodes = NULL,
  node_buffer_factor = 1.2,
  node_radius_factor = 1,
  edge_offset_factor = 1,
  node_fill_factor = NULL,
  edge_width_factor = 1.2,
  arrow_point_angle = 45,
  add_legend = "none",
  legend_nudge_x = 0,
  legend_nudge_y = 0,
  legend_col = "gray",
  legend_gradient = FALSE
)
```

### Arguments

p	The plot to which the flowmap should be added.
flowdat	Input dataframe. See details below.
od	As an alternative to flowdat, dataframe with the origin-destination pairs and the flow between them. Must contain the columns o, d, value. nodes must be provided as well. See details below.
nodes	As an alternative to flowdat, a dataframe with the nodes of the network. Must contain the columns name, x, y. See details below.
outline_linewidth	The linewidth of the outline of the arrows.
alpha	Opacity of the edges.
nodes_alpha	Opacity of the nodes.

outline_col	Color of the outline of the edges.
k_nodes	Number of clusters to group nodes into. If defined, nodes will be clustered hierarchically based on spatial proximity. By default, no clustering will be applied.
node_buffer_factor	Controls the distance between the nodes and the edges ( in multiple of the nodes' radii).
node_radius_factor	Controls the size of the nodes.
edge_offset_factor	Controls the distance between the parallel arrows.
node_fill_factor	Controls the downscaling of the fill of the nodes ( as to not outshine the edges ).
edge_width_factor	Controls the width of the edges.
arrow_point_angle	Controls the pointiness of the edges.
add_legend	Add a legend for width to the plot? Must be one of "none", "bottom", "top", "left", or "right". (Experimental)
legend_nudge_x	Adjusts the horizontal position of the legend in map units.
legend_nudge_y	Adjusts the vertical position of the legend in map units.
legend_col	If add_legend, sets a monotone color for the legend. By default is "gray".
legend_gradient	If TRUE, the legend color will be a gradient from min to max flow. If FALSE, the legend will be a single color.

## Details

The function requires as inputs a dataframe `flowdat` which contains for every combination of two nodes `a` and `b` the coordinates of these nodes as well as the intensity of flow between those nodes in both directions (`a` to `b`, `b` to `a`). The dataframe should have the following columns:

- **id\_a**: The unique id of node `a`
- **id\_b**: The unique id of node `b`
- **xa**: The x coordinate of node `a`
- **ya**: The y coordinate of node `a`
- **xb**: The x coordinate of node `b`
- **yb**: The y coordinate of node `b`
- **flow\_ab**: The intensity of flow from node `a` to node `b`
- **flow\_ba**: The intensity of flow from node `b` to node `a`

Alternatively, the function can take as input a dataframe `od` which contains the origin-destination pairs and the flow between them. The dataframe should have the following columns:

- **o**: The unique id of the origin node

- **d:** The unique id of the destination node
- **value:** The intensity of flow between the origin and destination

In this case, the function also requires a dataframe `nodes` which contains the coordinates of the nodes. The dataframe should have the following columns:

- **name:** The unique id of the node
- **x:** The x coordinate of the node
- **y:** The y coordinate of the node

The function will impose `coord_equal()` on the `ggplot`.

Inspired by [flowmap.gl](#).

### Value

The `ggplot` with an additional polygon layer for the flow arrows and an additional polygon layer for the nodes

### Author(s)

Johannes Mast

### Examples

```
testdata <-
data.frame(
  id_a = c("X1", "X2", "X3", "X3", "X1"),
  id_b = c("X8", "X7", "X1", "X8", "X7"),
  xa = c(2,14,10,10,2),
  ya = c(6,10,9,9,6),
  xb = c(10,4,2,10,4),
  yb = c(4,10,6,4,10),
  flow_ab = c(2,1,1,1,1),
  flow_ba = c(5,1,1,1,2)
)
library(ggplot2)
plot <- ggplot()
plot |> add_flowmap(testdata)
```

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cantons

*cantons*

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### Description

Geometries of Cantons of Switzerland. CRS is unassigned, but should be EPSG:3857.

### Usage

`cantons`

**Format**

cantons:  
A sf object with 26 rows and 2 columns:  
**NAME\_1** Name of Canton  
**geometry** polygon coordinates

**Source**

GADM database <https://gadm.org/>

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CH_migration_data	<i>CH_migration_data</i>
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**Description**

Internal migrations between Cantons of Switzerland, 2011-2016.

**Usage**

CH\_migration\_data

**Format**

CH\_migration\_data:  
A data frame with 325 rows and 8 columns:  
**id\_a, id\_b** Names of Cantons A and B  
**flow\_ab** Number of migrations from A to B  
**flow\_ba** Number of migrations from B to A  
**xa,ya** Longitude and latitude of the centroid of Canton A. Web-Mercator projection (EPSG: 3857)  
**xb,yb** Longitude and latitude of the centroid of Canton B. Web-Mercator projection (EPSG: 3857)

**Source**

Federal Statistical Office of Switzerland, under OPEN-BY-ASK terms of use: <https://www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung/migration-integration/binnenwanderung.assetdetail.3222163.html>

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get\_circle\_coords      *Helper function to create coordinates for circles of nodes*

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**Description**

Helper function to create coordinates for circles of nodes

**Usage**

```
get_circle_coords(center = c(0, 0), r = 1, npoints = 25)
```

**Arguments**

center	center x and y coordinates
r	radius
npoints	number of points

**Value**

a dataframe with x and y coordinates of the circle

**Author(s)**

Johannes Mast, Credit to <https://stackoverflow.com/a/6863490>

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hca\_flowdat      *Use hierarchical clustering to merge nodes based on proximity*

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**Description**

Use hierarchical clustering to merge nodes based on proximity

**Usage**

```
hca_flowdat(flowdat, k = 20)
```

**Arguments**

flowdat	The data containing flows from a to b, b to a, and the coordinates of a and b
k	The number of nodes to keep.

**Value**

a dataframe of the same format as flowdat, but with some nodes (and their flows) merged. Note that this will in most cases contain some circular flows (a to a) even if the input flowdat did not.

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short_scale	<i>Create short scale format for numbers in the legend</i>
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**Description**

Create short scale format for numbers in the legend

**Usage**

```
short_scale(x, digits = 3)
```

**Arguments**

x	The number
digits	Significant digits

**Author(s)**

Johannes Mast, credit: <https://stackoverflow.com/a/59086755>

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util_data_flow_to_flowdat	<i>util_data_flow_to_flowdat</i>
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**Description**

This function takes a flow data frame in long format and a data frame with the nodes coordinates and returns a flowdat data frame

**Usage**

```
util_data_flow_to_flowdat(nodes, flows)
```

**Arguments**

nodes	A data frame with the nodes of the network
flows	A data frame with the flow data

**Details**

Helper function to merge od data in long data and nodes to flowdat format

**Value**

A data frame with the flow data in flowdat format

**Author(s)**

Johannes Mast,

**Examples**

```
#nodes <- data.frame(name=c("a", "b", "c"), x=c(0, 1, 2), y=c(0, 1, 2))  
#flow <- data.frame(o=c("a", "b"), d=c("b", "c"), value=c(1, 2))  
#util_data_flow_to_flowdat(nodes, flow)
```



# Index

## \* datasets

cantons, [4](#)

CH\_migration\_data, [5](#)

add\_flowmap, [2](#)

cantons, [4](#)

CH\_migration\_data, [5](#)

get\_circle\_coords, [6](#)

hca\_flowdat, [6](#)

short\_scale, [7](#)

util\_data\_flow\_to\_flowdat, [7](#)