Package 'ggdag'

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Title Analyze and Create Elegant Directed Acyclic Graphs

Version 0.2.13

Description Tidy, analyze, and plot directed acyclic graphs (DAGs). 'ggdag' is built on top of 'dagitty', an R package that uses the 'DAGitty' web tool (<https://dagitty.net/>) for creating and analyzing DAGs. 'ggdag' makes it easy to tidy and plot 'dagitty' objects using 'ggplot2' and 'ggraph', as well as common analytic and graphical functions, such as determining adjustment sets and node relationships.

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BugReports https://github.com/r-causal/ggdag/issues

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Contents

`activate_collider_paths` *Activate paths opened by stratifying on a collider*

Description

Stratifying on colliders can open biasing pathways between variables. `activate_collider_paths` activates any such pathways given a variable or set of variables to adjust for and adds them to the `tidy_dagitty`.

Usage

```
activate_collider_paths(.tdy_dag, adjust_for, ...)
```

Arguments

`.tdy_dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`adjust_for`	a character vector, the variable(s) to adjust for.
`...`	additional arguments passed to `tidy_dagitty()`

Value

a `tidy_dagitty` with additional rows for collider-activated pathways

See Also

`control_for()`, `ggdag_adjust()`, `geom_dag_collider_edges()`

Examples

```
dag <- dagify(m ~ x + y, x ~ y)

collided_dag <- activate_collider_paths(dag, adjust_for = "m")
collided_dag
```

`Adjust for variables` *Adjust for variables and activate any biasing paths that result*

Description

Adjust for variables and activate any biasing paths that result

Usage

```
control_for(.tdy_dag, var, as_factor = TRUE, activate_colliders = TRUE, ...)

adjust_for(.tdy_dag, var, as_factor = TRUE, activate_colliders = TRUE, ...)

ggdag_adjust(
  .tdy_dag,
  var = NULL,
  ...,
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL,
  collider_lines = TRUE
)
```

Arguments

`.tdy_dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`var`	a character vector, the variable(s) to adjust for.
`as_factor`	logical. Should the `adjusted` column be a factor?
`activate_colliders`	logical. Include colliders activated by adjustment?
`...`	additional arguments passed to `tidy_dagitty()`
`node_size`	size of DAG node
`text_size`	size of DAG text
`label_size`	size of label text
`text_col`	color of DAG text
`label_col`	color of label text
`node`	logical. Should nodes be included in the DAG?

stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.
collider_lines	logical. Should the plot show paths activated by adjusting for a collider?

Value

a tidy_dagitty with a adjusted column for adjusted variables, as well as any biasing paths that arise, or a ggplot

Examples

```
dag <- dagify(m ~ a + b, x ~ a, y ~ b)

control_for(dag, var = "m")
ggdag_adjust(dag, var = "m")
```

---

as.data.frame.tidy_dagitty

Convert a tidy_dagitty *object to data.frame*

Description

Convert a tidy_dagitty object to data.frame

Usage

```
## S3 method for class 'tidy_dagitty'
as.data.frame(x, row.names = NULL, optional = FALSE, ...)
```

Arguments

x	an object of class tidy_dagitty
row.names	NULL or a character vector giving the row names for the data frame. Missing values are not allowed.
optional	logical. If TRUE, setting row names and converting column names (to syntactic names: see make.names) is optional. Note that all of R's base package as.data.frame() methods use optional only for column names treatment, basically with the meaning of data.frame(*, check.names = !optional)
...	optional arguments passed to as.data.frame()

as.tbl.tidy_daggity *Convert a* tidy_dagitty *object to tbl*

Description

Convert a tidy_dagitty object to tbl

Usage

```
## S3 method for class 'tidy_daggity'
as.tbl(x, row.names = NULL, optional = FALSE, ...)

## S3 method for class 'tidy_daggity'
as_tibble(x, row.names = NULL, optional = FALSE, ...)
```

Arguments

x	an object of class tidy_dagitty
row.names	NULL or a character vector giving the row names for the data frame. Missing values are not allowed.
optional	logical. If TRUE, setting row names and converting column names (to syntactic names: see make.names) is optional. Note that all of R's base package as.data.frame() methods use optional only for column names treatment, basically with the meaning of data.frame(*, check.names = !optional)
...	optional arguments passed to dplyr::as_tibble()

Assess d-separation between variables *D-relationship between variables*

Description

D-separation is a key concept in causal structural models. Variables are d-separated if there are no open paths between them. The node_d*() functions label variables as d-connected or d-separated. The ggdag_d*() functions plot the results. The *_dconnected(), *_dseparated(), and *_drelationship() functions essentially produce the same output and are just different ways of thinking about the relationship. See dagitty::dseparated() for details.

Usage

```
node_dconnected(
  .tdy_dag,
  from = NULL,
  to = NULL,
  controlling_for = NULL,
  as_factor = TRUE,
  ...
)

node_dseparated(
  .tdy_dag,
  from = NULL,
  to = NULL,
  controlling_for = NULL,
  as_factor = TRUE
)

node_drelationship(
  .tdy_dag,
  from = NULL,
  to = NULL,
  controlling_for = NULL,
  as_factor = TRUE
)

ggdag_drelationship(
  .tdy_dag,
  from = NULL,
  to = NULL,
  controlling_for = NULL,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL,
  collider_lines = TRUE
)

ggdag_dseparated(
  .tdy_dag,
  from = NULL,
```

```
  to = NULL,
  controlling_for = NULL,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL,
  collider_lines = TRUE
)

ggdag_dconnected(
  .tdy_dag,
  from = NULL,
  to = NULL,
  controlling_for = NULL,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL,
  collider_lines = TRUE
)
```

Arguments

.tdy_dag	input graph, an object of class tidy_dagitty or dagitty
from	a character vector, the starting variable (must by in DAG). If NULL, checks DAG for exposure variable.
to	a character vector, the ending variable (must by in DAG). If NULL, checks DAG for outcome variable.
controlling_for	a character vector, variables in the DAG to control for.
as_factor	logical. Should the d_relationship variable be a factor?
...	additional arguments passed to tidy_dagitty()
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"

node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.
collider_lines	logical. Should the plot show paths activated by adjusting for a collider?

Value

a tidy_dagitty with a d_relationship column for variable D relationship or a ggplot

Examples

```
library(ggplot2)
dag <- dagify(m ~ x + y)
dag %>% ggdag_drelationship("x", "y")
dag %>% ggdag_drelationship("x", "y", controlling_for = "m")

dag %>%
  node_dseparated("x", "y") %>%
 ggplot(aes(x = x, y = y, xend = xend, yend = yend, shape = adjusted, col = d_relationship)) +
  geom_dag_edges() +
  geom_dag_collider_edges() +
  geom_dag_node() +
  geom_dag_text(col = "white") +
  theme_dag() +
  scale_adjusted()

dag %>%
  node_dconnected("x", "y", controlling_for = "m") %>%
 ggplot(aes(x = x, y = y, xend = xend, yend = yend, shape = adjusted, col = d_relationship)) +
  geom_dag_edges() +
  geom_dag_collider_edges() +
  geom_dag_node() +
  geom_dag_text(col = "white") +
  theme_dag() +
  scale_adjusted()

dagify(m ~ x + y, m_jr ~ m) %>%
  tidy_dagitty(layout = "nicely") %>%
  node_dconnected("x", "y", controlling_for = "m_jr") %>%
 ggplot(aes(x = x, y = y, xend = xend, yend = yend, shape = adjusted, col = d_relationship)) +
  geom_dag_edges() +
  geom_dag_collider_edges() +
```

```
  geom_dag_node() +
  geom_dag_text(col = "white") +
  theme_dag() +
  scale_adjusted()
```

`Assess familial relationships between variables`

Familial relationships between variables

Description

Parents and children are those nodes that either directly cause or are caused by the variable, respectively. Ancestors and descendants are those nodes that are on the path to or descend from the variable. The `node_*()` functions label variables depending on their relationship. The `ggdag_*()` functions plot the results. See dagitty::children for details.

Usage

```
node_children(.tdy_dag, .var, as_factor = TRUE)

node_parents(.tdy_dag, .var, as_factor = TRUE)

node_ancestors(.tdy_dag, .var, as_factor = TRUE)

node_descendants(.tdy_dag, .var, as_factor = TRUE)

node_markov_blanket(.tdy_dag, .var, as_factor = TRUE)

node_adjacent(.tdy_dag, .var, as_factor = TRUE)

ggdag_children(
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_parents(
```

```
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_ancestors(
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_descendants(
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_markov_blanket(
```

```
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_adjacent(
  .tdy_dag,
  .var,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

.tdy_dag	input graph, an object of class tidy_dagitty or dagitty
.var	a character vector, the variable to be assessed (must by in DAG)
as_factor	logical. Should the relationship variable be a factor?
...	additional arguments passed to tidy_dagitty()
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?

stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a tidy_dagitty with an column related to the given relationship for variable D relationship or a ggplot

Examples

```
library(ggplot2)
dag <- dagify(
  y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2
)

ggdag_children(dag, "w1")

dag %>%
  node_children("w1") %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend, color = children)) +
  geom_dag_edges() +
  geom_dag_node() +
  geom_dag_text(col = "white") +
 geom_dag_label_repel(aes(label = children, fill = children), col = "white", show.legend = FALSE) +
  theme_dag() +
  scale_adjusted() +
  scale_color_hue(breaks = c("parent", "child"))

ggdag_parents(dag, "y")

ggdag_ancestors(dag, "x")

ggdag_descendants(dag, "w1")

dag %>%
  node_parents("y") %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend, color = parent)) +
  geom_dag_edges() +
  geom_dag_point() +
  geom_dag_text(col = "white") +
 geom_dag_label_repel(aes(label = parent, fill = parent), col = "white", show.legend = FALSE) +
  theme_dag() +
  scale_adjusted() +
  scale_color_hue(breaks = c("parent", "child"))
```

as_tbl_graph *Convert DAGS to tidygraph*

Description

A thin wrapper to convert tidy_dagitty and dagitty objects to tbl_graph, which can then be used to work in tidygraph and ggraph directly. See tidygraph::as_tbl_graph().

Usage

```
## S3 method for class 'tidy_dagitty'
as_tbl_graph(x, directed = TRUE, ...)

## S3 method for class 'dagitty'
as_tbl_graph(x, directed = TRUE, ...)
```

Arguments

x	an object of class tidy_dagitty or dagitty
directed	logical. Should the constructed graph be directed? Default is TRUE
...	other arguments passed to as_tbl_graph

Value

a tbl_graph

Examples

```
library(ggraph)
library(tidygraph)
butterfly_bias() %>%
  as_tbl_graph() %>%
  ggraph() +
  geom_edge_diagonal() +
  geom_node_point()
```

as_tidy_dagitty *Convert objects into* tidy_dagitty *objects*

Description

An alternative API and specification to tidy_dagitty(), as_tidy_dagitty() allows you to create tidy_dagitty objects from data frames. There is also a method for dagitty objects, which is a thin wrapper for tidy_dagitty(). To create a DAG from a data frame, it must contain name and to columns, representing the nodes and any edges leading from the nodes. If there are x, y, xend, and yend columns, they will be used as coordinates. Otherwise, layout will be used. See tidy_dagitty for more information about layouts. Additionally, you can specify status (one of exposure, outcome, or latent) by including a status column. Any other columns in the data set will also be joined to the tidy_dagitty data.

Usage

```
as_tidy_dagitty(x, ...)

## S3 method for class 'dagitty'
as_tidy_dagitty(x, seed = NULL, layout = "nicely", ...)

## S3 method for class 'data.frame'
as_tidy_dagitty(x, seed = NULL, layout = "nicely", ...)
```

Arguments

x	An object to convert into a tidy_dagitty. Currently supports dagitty and data.frame objects.
...	optional arguments passed to ggraph::create_layout()
seed	a numeric seed for reproducible layout generation
layout	a layout available in ggraph. See ggraph::create_layout() for details. Alternatively, "time_ordered" will use time_ordered_coords() to algorithmically sort the graph by time.

Value

a tidy_dagitty object

See Also

tidy_dagitty(), pull_dag()

Examples

```
data.frame(name = c("c", "c", "x"), to = c("x", "y", "y")) %>%
  as_tidy_dagitty()
```

`Canonicalize DAGs` *Canonicalize a DAG*

Description

Takes an input graph with bidirected edges and replaces every bidirected edge x <-> y with a substructure x <- L -> y, where L is a latent variable. See `dagitty::canonicalize()` for details. Undirected edges are not currently supported in ggdag.

Usage

```
node_canonical(.dag, ...)

ggdag_canonical(
  .tdy_dag,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

`.dag, .tdy_dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`...`	additional arguments passed to `tidy_dagitty()`
`edge_type`	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
`node_size`	size of DAG node
`text_size`	size of DAG text
`label_size`	size of label text
`text_col`	color of DAG text
`label_col`	color of label text
`node`	logical. Should nodes be included in the DAG?
`stylized`	logical. Should DAG nodes be stylized? If so, use `geom_dag_nodes` and if not use `geom_dag_point`
`text`	logical. Should text be included in the DAG?
`use_labels`	a string. Variable to use for `geom_dag_label_repel()`. Default is `NULL`.

Value

a tidy_dagitty that includes L or a ggplot

Examples

```
dag <- dagify(y ~ x + z, x ~ ~z)

ggdag(dag)

node_canonical(dag)
ggdag_canonical(dag)
```

Colliders *Find colliders*

Description

Detects any colliders given a DAG. node_collider tags colliders and ggdag_collider plots all exogenous variables.

Usage

```
node_collider(.dag, as_factor = TRUE, ...)

ggdag_collider(
  .tdy_dag,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

.dag, .tdy_dag	input graph, an object of class tidy_dagitty or dagitty
as_factor	treat collider variable as factor
...	additional arguments passed to tidy_dagitty()
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"

node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a tidy_dagitty with a collider column for colliders or a ggplot

Examples

```
dag <- dagify(m ~ x + y, y ~ x)

node_collider(dag)
ggdag_collider(dag)
```

---

coordinates *Manipulate DAG coordinates*

Description

Manipulate DAG coordinates

Usage

```
coords2df(coord_list)

coords2list(coord_df)
```

Arguments

coord_list	a named list of coordinates
coord_df	a data.frame with columns x, y, and name

Value

either a list or a data.frame with DAG node coordinates

Examples

```
library(dagitty)
coords <- list(
  x = c(A = 1, B = 2, D = 3, C = 3, F = 3, E = 4, G = 5, H = 5, I = 5),
  y = c(A = 0, B = 0, D = 1, C = 0, F = -1, E = 0, G = 1, H = 0, I = -1)
)
coord_df <- coords2df(coords)
coords2list(coord_df)

x <- dagitty("dag{
             G <-> H <-> I <-> G
             D <- B -> C -> I <- F <- B <- A
             H <- E <- C -> G <- D
             }")
coordinates(x) <- coords2list(coord_df)
```

Covariate Adjustment Sets

Covariate Adjustment Sets

Description

See `dagitty::adjustmentSets()` for details.

Usage

```
dag_adjustment_sets(.tdy_dag, exposure = NULL, outcome = NULL, ...)

ggdag_adjustment_set(
  .tdy_dag,
  exposure = NULL,
  outcome = NULL,
  ...,
  shadow = FALSE,
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL,
  expand_x = expansion(c(0.25, 0.25)),
  expand_y = expansion(c(0.2, 0.2))
)
```

Arguments

.tdy_dag	input graph, an object of class tidy_dagitty or dagitty
exposure	a character vector, the exposure variable. Default is NULL, in which case it will be determined from the DAG.
outcome	a character vector, the outcome variable. Default is NULL, in which case it will be determined from the DAG.
...	additional arguments to adjustmentSets
shadow	logical. Show paths blocked by adjustment?
node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.
expand_x, expand_y	Vector of range expansion constants used to add some padding around the data, to ensure that they are placed some distance away from the axes. Use the convenience function ggplot2::expansion() to generate the values for the expand argument.

Value

a tidy_dagitty with an adjusted column and set column, indicating adjustment status and DAG ID, respectively, for the adjustment sets or a ggplot

Examples

```
dag <- dagify(y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2,
  exposure = "x",
  outcome = "y"
)

tidy_dagitty(dag) %>% dag_adjustment_sets()

ggdag_adjustment_set(dag)

ggdag_adjustment_set(dagitty::randomDAG(10, .5),
```

```
  exposure = "x3",
  outcome = "x5"
)
```

---

dag *Create a dagitty DAG*

Description

A convenience wrapper for `dagitty::dagitty()`.

Usage

```
dag(...)
```

Arguments

`...`	a character vector in the style of dagitty. See `dagitty::dagitty` for details.

Value

a `dagitty`

Examples

```
dag("{x m} -> y")
```

DAG Edges *Directed DAG edges*

Description

Directed DAG edges

Usage

```
geom_dag_edges_link(
  mapping = NULL,
  data = NULL,
  arrow = grid::arrow(length = grid::unit(5, "pt"), type = "closed"),
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
```

```
  ...
)

geom_dag_edges_arc(
  mapping = NULL,
  data = NULL,
  curvature = 0.5,
  arrow = grid::arrow(length = grid::unit(5, "pt"), type = "closed"),
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  fold = FALSE,
  n = 100,
  lineend = "butt",
  linejoin = "round",
  linemitre = 1,
  label_colour = "black",
  label_alpha = 1,
  label_parse = FALSE,
  check_overlap = FALSE,
  angle_calc = "rot",
  force_flip = TRUE,
  label_dodge = NULL,
  label_push = NULL,
  ...
)

geom_dag_edges_diagonal(
  mapping = NULL,
  data = NULL,
  position = "identity",
  arrow = grid::arrow(length = grid::unit(5, "pt"), type = "closed"),
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  curvature = 1,
  n = 100,
  lineend = "butt",
  linejoin = "round",
  linemitre = 1,
  label_colour = "black",
  label_alpha = 1,
  label_parse = FALSE,
  check_overlap = FALSE,
  angle_calc = "rot",
  force_flip = TRUE,
  label_dodge = NULL,
```

```
  label_push = NULL,
  ...
)

geom_dag_edges_fan(
  mapping = NULL,
  data = NULL,
  position = "identity",
  arrow = grid::arrow(length = grid::unit(5, "pt"), type = "closed"),
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  spread = 0.7,
  n = 100,
  lineend = "butt",
  linejoin = "round",
  linemitre = 1,
  label_colour = "black",
  label_alpha = 1,
  label_parse = FALSE,
  check_overlap = FALSE,
  angle_calc = "rot",
  force_flip = TRUE,
  label_dodge = NULL,
  label_push = NULL,
  ...
)
```

Arguments

mapping	Set of aesthetic mappings created by aes() or aes_(). If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If NULL, the default, the data is inherited from the plot data as specified in the call to ggplot(). A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a data.frame., and will be used as the layer data.
arrow	specification for arrow heads, as created by arrow()
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If FALSE (the default), removes missing values with a warning. If TRUE silently removes missing values
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.

inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().
...	Other arguments passed to ggraph::geom_edge_*()
curvature	The bend of the curve. 1 approximates a halfcircle while 0 will give a straight line. Negative number will change the direction of the curve. Only used if layout circular = FALSE.
fold	Logical. Should arcs appear on the same side of the nodes despite different directions. Default to FALSE.
n	The number of points to create along the path.
lineend	Line end style (round, butt, square).
linejoin	Line join style (round, mitre, bevel).
linemitre	Line mitre limit (number greater than 1).
label_colour	The colour of the edge label. If NA it will use the colour of the edge.
label_alpha	The opacity of the edge label. If NA it will use the opacity of the edge.
label_parse	If TRUE, the labels will be parsed into expressions and displayed as described in grDevices::plotmath().
check_overlap	If TRUE, text that overlaps previous text in the same layer will not be plotted. check_overlap happens at draw time and in the order of the data. Therefore data should be arranged by the label column before calling geom_text(). Note that this argument is not supported by geom_label().
angle_calc	Either 'none', 'along', or 'across'. If 'none' the label will use the angle aesthetic of the geom. If 'along' The label will be written along the edge direction. If 'across' the label will be written across the edge direction.
force_flip	Logical. If angle_calc is either 'along' or 'across' should the label be flipped if it is on it's head. Default to TRUE.
label_dodge	A grid::unit() giving a fixed vertical shift to add to the label in case of angle_calc is either 'along' or 'across'
label_push	A grid::unit() giving a fixed horizontal shift to add to the label in case of angle_calc is either 'along' or 'across'
spread	Deprecated. Use strength instead.

Aesthetics

geom_dag_edges_link, geom_dag_edges_arc, geom_dag_edges_diagonal, and geom_dag_edges_fan understand the following aesthetics. Bold aesthetics are required.

- **x**
- **y**
- **xend**
- **yend**
- edge_colour
- edge_width

- edge_linetype
- edge_alpha
- start_cap
- end_cap
- label
- label_pos
- label_size
- angle
- hjust
- vjust
- family
- fontface
- lineheight

`geom_dag_edges_arc` and `geom_dag_edges_diagonal` also require **circular**, but this is automatically set.

`geom_dag_edges_fan` requires **to** and **from**, but these are also automatically set.

Examples

```
library(ggplot2)
p <- dagify(
  y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  L ~ w1 + w2
) %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_point() +
  geom_dag_text() +
  theme_dag()

p + geom_dag_edges_link()
p + geom_dag_edges_arc()
p + geom_dag_edges_diagonal()
p + geom_dag_edges_fan()
```

DAG Labels *DAG labels*

Description

Label or otherwise retrieve labels from objects of either class `tidy_dagitty` or `dagitty`

Usage

```
label(x) <- value

## S3 replacement method for class 'dagitty'
label(x) <- value

## S3 replacement method for class 'tidy_dagitty'
label(x) <- value

dag_label(.tdy_dag, labels = NULL)

label(.tdy_dag)

has_labels(.tdy_dag)
```

Arguments

`x`	an object of either class `tidy_dagitty` or `dagitty`
`value`	a character vector
`.tdy_dag`	an object of class `tidy_dagitty`
`labels`	a character vector

Value

`label` returns the label attribute of x

Examples

```
labelled_dag <- dagify(y ~ z, x ~ z) %>%
  tidy_dagitty() %>%
  dag_label(labels = c("x" = "exposure", "y" = "outcome", "z" = "confounder"))

has_labels(labelled_dag)
```

dagify *Create a dagitty DAG using R-like syntax*

Description

`dagify()` creates dagitty DAGs using a more R-like syntax. It currently accepts formulas in the usual R style, e.g. `y ~ x + z`, which gets translated to `y <- {x z}`, as well as using a double tilde (`~~`) to graph bidirected variables, e.g. `x1 ~~ x2` is translated to `x1 <-> x2`.

Usage

```
dagify(
  ...,
  exposure = NULL,
  outcome = NULL,
  latent = NULL,
  labels = NULL,
  coords = NULL
)
```

Arguments

`...`	formulas, which are converted to `dagitty` syntax
`exposure`	a character vector for the exposure (must be a variable name in the DAG)
`outcome`	a character vector for the outcome (must be a variable name in the DAG)
`latent`	a character vector for any latent variables (must be a variable name in the DAG)
`labels`	a named character vector, labels for variables in the DAG
`coords`	coordinates for the DAG nodes. Can be a named list or a `data.frame` with columns x, y, and name

Value

a `dagitty` DAG

See Also

`dag()`, `coords2df()`, `coords2list()`

Examples

```
dagify(y ~ x + z, x ~ z)

coords <- list(
  x = c(A = 1, B = 2, D = 3, C = 3, F = 3, E = 4, G = 5, H = 5, I = 5),
  y = c(A = 0, B = 0, D = 1, C = 0, F = -1, E = 0, G = 1, H = 0, I = -1)
)
```

```
dag <- dagify(G ~ ~H,
  G ~ ~I,
  I ~ ~G,
  H ~ ~I,
  D ~ B,
  C ~ B,
  I ~ C + F,
  F ~ B,
  B ~ A,
  H ~ E,
  C ~ E + G,
  G ~ D,
  coords = coords
)

dagitty::is.dagitty(dag)

ggdag(dag)

dag2 <- dagify(y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2,
  exposure = "x",
  outcome = "y"
)

ggdag(dag2)
```

`dplyr` *Dplyr verb methods for* `tidy_dagitty` *objects*

Description

Dplyr verb methods for `tidy_dagitty` objects.

Usage

```
## S3 method for class 'tidy_dagitty'
select(.data, ...)

## S3 method for class 'tidy_dagitty'
filter(.data, ...)

## S3 method for class 'tidy_dagitty'
mutate(.data, ...)
```

```
## S3 method for class 'tidy_dagitty'
summarise(.data, ...)

## S3 method for class 'tidy_dagitty'
distinct(.data, ..., .keep_all = FALSE)

## S3 method for class 'tidy_dagitty'
arrange(.data, ...)

## S3 method for class 'tidy_dagitty'
group_by(.data, ...)

## S3 method for class 'tidy_dagitty'
ungroup(x, ...)

## S3 method for class 'tidy_dagitty'
transmute(.data, ...)

## S3 method for class 'tidy_dagitty'
distinct(.data, ..., .keep_all = FALSE)

## S3 method for class 'tidy_dagitty'
full_join(x, y, by = NULL, copy = FALSE, suffix = c(".x", ".y"), ...)

## S3 method for class 'tidy_dagitty'
inner_join(x, y, by = NULL, copy = FALSE, suffix = c(".x", ".y"), ...)

## S3 method for class 'tidy_dagitty'
left_join(x, y, by = NULL, copy = FALSE, suffix = c(".x", ".y"), ...)

## S3 method for class 'tidy_dagitty'
right_join(x, y, by = NULL, copy = FALSE, suffix = c(".x", ".y"), ...)

## S3 method for class 'tidy_dagitty'
anti_join(x, y, by = NULL, copy = FALSE, ...)

## S3 method for class 'tidy_dagitty'
semi_join(x, y, by = NULL, copy = FALSE, ...)

## S3 method for class 'tidy_dagitty'
slice(.data, ..., .dots = list())

## S3 method for class 'tidy_dagitty'
select_(.data, ..., .dots = list())

## S3 method for class 'tidy_dagitty'
filter_(.data, ..., .dots = list())
```

```
## S3 method for class 'tidy_dagitty'
mutate_(.data, ..., .dots = list())

## S3 method for class 'tidy_dagitty'
summarise_(.data, ..., .dots = list())

## S3 method for class 'tidy_dagitty'
arrange_(.data, ..., .dots = list())

## S3 method for class 'tidy_dagitty'
slice_(.data, ..., .dots = list())
```

Arguments

.data	data object of class tidy_dagitty
...	other arguments passed to the dplyr function
.dots, x, y, by, copy, suffix, .keep_all	see corresponding function in package dplyr

Examples

```
library(dplyr)
tidy_dagitty(m_bias()) %>%
  group_by(name) %>%
  summarize(n = n())
```

Equivalent DAGs and Classes

Generating Equivalent Models

Description

Returns a set of complete partially directed acyclic graphs (CPDAGs) given an input DAG. CPDAGs are Markov equivalent to the input graph. See dagitty::equivalentDAGs() for details. node_equivalent_dags() returns a set of DAGs, while node_equivalent_class() tags reversable edges. ggdag_equivalent_dags() plots all equivalent DAGs, while ggdag_equivalent_class() plots all reversable edges as undirected.

Usage

```
node_equivalent_dags(.dag, n = 100, layout = "auto", ...)

ggdag_equivalent_dags(
  .tdy_dag,
  ...,
  node_size = 16,
  text_size = 3.88,
```

```
  label_size = text_size,
  text_col = "white",
  label_col = "black",
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

node_equivalent_class(.dag, layout = "auto")

ggdag_equivalent_class(
  .tdy_dag,
  expand_x = expansion(c(0.1, 0.1)),
  expand_y = expansion(c(0.1, 0.1)),
  breaks = ggplot2::waiver(),
  ...,
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

`.dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`n`	maximal number of returned graphs.
`layout`	a layout available in `ggraph`. See `ggraph::create_layout()` for details. Alternatively, `"time_ordered"` will use `time_ordered_coords()` to algorithmically sort the graph by time.
`...`	optional arguments passed to `ggraph::create_layout()`
`.tdy_dag`	an object of class `tidy_dagitty` or `dagitty`
`node_size`	size of DAG node
`text_size`	size of DAG text
`label_size`	size of label text
`text_col`	color of DAG text
`label_col`	color of label text
`node`	logical. Should nodes be included in the DAG?
`stylized`	logical. Should DAG nodes be stylized? If so, use `geom_dag_nodes` and if not use `geom_dag_point`

`text` logical. Should text be included in the DAG?

`use_labels` a string. Variable to use for `geom_dag_label_repel()`. Default is `NULL`.

`expand_x, expand_y`
Vector of range expansion constants used to add some padding around the data, to ensure that they are placed some distance away from the axes. Use the convenience function `ggplot2::expansion()` to generate the values for the expand argument.

`breaks` One of:

- NULL for no breaks
- waiver() for the default breaks computed by the transformation object
- A numeric vector of positions
- A function that takes the limits as input and returns breaks as output

Value

a `tidy_dagitty` with at least one DAG, including a `dag` column to identify graph set for equivalent DAGs or a `reversable` column for equivalent classes, or a `ggplot`

Examples

```
g_ex <- dagify(y ~ x + z, x ~ z)

g_ex %>% node_equivalent_class()

g_ex %>% ggdag_equivalent_dags()
```

Exogenous Variables *Find Exogenous Variables*

Description

`node_exogenous` tags exogenous variables given an exposure and outcome. `ggdag_exogenous` plots all exogenous variables. See `dagitty::exogenousVariables()` for details.

Usage

```
node_exogenous(.dag, ...)

ggdag_exogenous(
  .tdy_dag,
  ...,
  node_size = 16,
  text_size = 3.88,
  edge_type = "link_arc",
  label_size = text_size,
```

```
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

.dag, .tdy_dag	input graph, an object of class tidy_dagitty or dagitty
...	additional arguments passed to tidy_dagitty()
node_size	size of DAG node
text_size	size of DAG text
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a tidy_dagitty with an exogenous column for exogenous variables or a ggplot

Examples

```
dag <- dagify(y ~ x1 + x2 + x3, b ~ x1 + x2)
ggdag_exogenous(dag)
node_exogenous(dag)
```

---

expand_plot *Quickly scale the size of a ggplot*

Description

expand_plot() is a convenience function that expands the scales of a ggplot, as the large node sizes in a DAG will often get clipped in themes that don't have DAGs in mind.

Usage

```
expand_plot(
  expand_x = expansion(c(0.1, 0.1)),
  expand_y = expansion(c(0.1, 0.1))
)
```

Arguments

expand_x, expand_y
: Vector of range expansion constants used to add some padding around the data, to ensure that they are placed some distance away from the axes. Use the convenience function `ggplot2::expansion()` to generate the values for the expand argument.

---

fortify *Fortify a* tidy_dagitty *object for* ggplot2

Description

Fortify a `tidy_dagitty` object for `ggplot2`

Usage

```
## S3 method for class 'tidy_dagitty'
fortify(model, data = NULL, ...)

## S3 method for class 'dagitty'
fortify(model, data = NULL, ...)
```

Arguments

model	an object of class `tidy_dagitty` or `dagitty`
data	(not used)
...	(not used)

---

geom_dag_collider_edges *Edges for paths activated by stratification on colliders*

Description

Adjusting for a collider activates pathways between the parent of the collider. This geom adds a curved edge between any such parent nodes.

Usage

```
geom_dag_collider_edges(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  ...,
  linewidth = 0.6,
  size = NULL,
  curvature = 0.5,
  angle = 90,
  ncp = 5,
  arrow = NULL,
  lineend = "butt",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by aes(). If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If NULL, the default, the data is inherited from the plot data as specified in the call to ggplot(). A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a data.frame, and will be used as the layer data. A function can be created from a formula (e.g. ~ head(.x, 10)).
stat	The statistical transformation to use on the data for this layer, either as a ggproto Geom subclass or as a string naming the stat stripped of the stat_ prefix (e.g. "count" rather than "stat_count")
position	Position adjustment, either as a string naming the adjustment (e.g. "jitter" to use position_jitter), or the result of a call to a position adjustment function. Use the latter if you need to change the settings of the adjustment.
...	Other arguments passed on to layer(). These are often aesthetics, used to set an aesthetic to a fixed value, like colour = "red" or size = 3. They may also be parameters to the paired geom/stat.
linewidth	a numeric vector of length 1. Edge width
size	deprecated. Please use linewidth.
curvature	A numeric value giving the amount of curvature. Negative values produce left-hand curves, positive values produce right-hand curves, and zero produces a straight line.

angle	A numeric value between 0 and 180, giving an amount to skew the control points of the curve. Values less than 90 skew the curve towards the start point and values greater than 90 skew the curve towards the end point.
ncp	The number of control points used to draw the curve. More control points creates a smoother curve.
arrow	specification for arrow heads, as created by grid::arrow().
lineend	Line end style (round, butt, square).
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().

Examples

```
library(dagitty)
library(ggplot2)
dagify(m ~ a + b, x ~ a, y ~ b) %>%
  tidy_dagitty() %>%
  control_for("m") %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend, shape = adjusted)) +
  geom_dag_edges() +
  geom_dag_collider_edges() +
  geom_dag_point() +
  geom_dag_text() +
  theme_dag() +
  scale_adjusted()
```

---

geom_dag_edges *Directed and bidirected DAG edges*

Description

Directed and bidirected DAG edges

Usage

```
geom_dag_edges(
  mapping = NULL,
  data_directed = filter_direction("->"),
  data_bidirected = filter_direction("<->"),
  curvature = 0.3,
  arrow_directed = grid::arrow(length = grid::unit(5, "pt"), type = "closed"),
```

```
 arrow_bidirected = grid::arrow(length = grid::unit(5, "pt"), ends = "both", type =
    "closed"),
 position = "identity",
 na.rm = TRUE,
 show.legend = NA,
 inherit.aes = TRUE,
 fold = FALSE,
 ...
)
```

Arguments

mapping	Set of aesthetic mappings created by aes() or aes_(). If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data_directed, data_bidirected	The data to be displayed in this layer. There are three options: If NULL, the default, the data is inherited from the plot data as specified in the call to ggplot(). A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a data.frame., and will be used as the layer data.
curvature	The bend of the curve. 1 approximates a halfcircle while 0 will give a straight line. Negative number will change the direction of the curve. Only used if layout circular = FALSE.
arrow_directed, arrow_bidirected	specification for arrow heads, as created by arrow()
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If FALSE (the default), removes missing values with a warning. If TRUE silently removes missing values
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().
fold	Logical. Should arcs appear on the same side of the nodes despite different directions. Default to FALSE.
...	Other arguments passed to ggraph::geom_edge_*()

Aesthetics

geom_dag_edges understand the following aesthetics. Bold aesthetics are required.

- **x**
- **y**

- **xend**
- **yend**
- edge_colour
- edge_width
- edge_linetype
- edge_alpha
- start_cap
- end_cap
- label
- label_pos
- label_size
- angle
- hjust
- vjust
- family
- fontface
- lineheight

`geom_dag_edges` also uses `geom_dag_edges_arc`, which requires the **circular** aesthetic, but this is automatically set.

Examples

```
library(ggplot2)
dagify(
  y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2
) %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_edges() +
  geom_dag_point() +
  geom_dag_text() +
  theme_dag()
```

`geom_dag_label` *Node text labels*

Description

Node text labels

Usage

```
geom_dag_label(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  ...,
  parse = FALSE,
  nudge_x = 0,
  nudge_y = 0,
  check_overlap = FALSE,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

`mapping`	Set of aesthetic mappings created by `aes()`. If specified and `inherit.aes = TRUE` (the default), it is combined with the default mapping at the top level of the plot. You must supply `mapping` if there is no plot mapping.
`data`	The data to be displayed in this layer. There are three options: If `NULL`, the default, the data is inherited from the plot data as specified in the call to `ggplot()`. A `data.frame`, or other object, will override the plot data. All objects will be fortified to produce a data frame. See `fortify()` for which variables will be created. A `function` will be called with a single argument, the plot data. The return value must be a `data.frame`, and will be used as the layer data. A `function` can be created from a `formula` (e.g. `~ head(.x, 10)`).
`stat`	The statistical transformation to use on the data for this layer, either as a `ggproto` `Geom` subclass or as a string naming the stat stripped of the `stat_` prefix (e.g. `"count"` rather than `"stat_count"`)
`position`	Position adjustment, either as a string, or the result of a call to a position adjustment function. Cannot be jointly specified with `nudge_x` or `nudge_y`.
`...`	Other arguments passed on to `layer()`. These are often aesthetics, used to set an aesthetic to a fixed value, like `colour = "red"` or `size = 3`. They may also be parameters to the paired geom/stat.

parse	If TRUE, the labels will be parsed into expressions and displayed as described in ?plotmath.
nudge_x, nudge_y	Horizontal and vertical adjustment to nudge labels by. Useful for offsetting text from points, particularly on discrete scales. Cannot be jointly specified with position.
check_overlap	If TRUE, text that overlaps previous text in the same layer will not be plotted. check_overlap happens at draw time and in the order of the data. Therefore data should be arranged by the label column before calling geom_text(). Note that this argument is not supported by geom_label().
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().

Aesthetics

geom_dag_label understand the following aesthetics (required aesthetics are in bold):

- **x**
- **y**
- **label**
- alpha
- angle
- colour
- family
- fontface
- group
- hjust
- lineheight
- size
- vjust

Examples

```
library(ggplot2)
library(ggraph)
g <- dagify(m ~ x + y, y ~ x)

ggdag(g, text = FALSE) + geom_dag_label()
```

```
g %>%
  tidy_dagitty() %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_edges(aes(
    start_cap = label_rect(name, padding = margin(2.5, 2.5, 2.5, 2.5, "mm")),
    end_cap = label_rect(name, padding = margin(2.5, 2.5, 2.5, 2.5, "mm"))
  )) +
  geom_dag_label(size = 5, fill = "black", color = "white") +
  theme_dag()
```

`geom_dag_text` *Node text*

Description

Node text

Usage

```
geom_dag_text(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  ...,
  parse = FALSE,
  nudge_x = 0,
  nudge_y = 0,
  check_overlap = FALSE,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

`mapping`	Set of aesthetic mappings created by `aes()`. If specified and `inherit.aes = TRUE` (the default), it is combined with the default mapping at the top level of the plot. You must supply `mapping` if there is no plot mapping.
`data`	The data to be displayed in this layer. There are three options: If `NULL`, the default, the data is inherited from the plot data as specified in the call to `ggplot()`. A `data.frame`, or other object, will override the plot data. All objects will be fortified to produce a data frame. See `fortify()` for which variables will be created. A `function` will be called with a single argument, the plot data. The return value must be a `data.frame`, and will be used as the layer data. A `function` can be created from a `formula` (e.g. `~ head(.x, 10)`).

stat	The statistical transformation to use on the data for this layer, either as a ggproto Geom subclass or as a string naming the stat stripped of the stat_ prefix (e.g. "count" rather than "stat_count")
position	Position adjustment, either as a string, or the result of a call to a position adjustment function. Cannot be jointly specified with nudge_x or nudge_y.
...	Other arguments passed on to layer(). These are often aesthetics, used to set an aesthetic to a fixed value, like colour = "red" or size = 3. They may also be parameters to the paired geom/stat.
parse	If TRUE, the labels will be parsed into expressions and displayed as described in ?plotmath.
nudge_x, nudge_y	Horizontal and vertical adjustment to nudge labels by. Useful for offsetting text from points, particularly on discrete scales. Cannot be jointly specified with position.
check_overlap	If TRUE, text that overlaps previous text in the same layer will not be plotted. check_overlap happens at draw time and in the order of the data. Therefore data should be arranged by the label column before calling geom_text(). Note that this argument is not supported by geom_label().
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().

Aesthetics

geom_dag_text understand the following aesthetics (required aesthetics are in bold):

- **x**
- **y**
- **label**
- alpha
- angle
- colour
- family
- fontface
- group
- hjust
- lineheight
- size
- vjust

Examples

```
library(ggplot2)
g <- dagify(m ~ x + y, y ~ x)
g %>%
  tidy_dagitty() %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_point() +
  geom_dag_edges() +
  geom_dag_text() +
  theme_dag()
```

---

ggdag *Quickly plot a DAG in ggplot2*

Description

`ggdag()` is a wrapper to quickly plot DAGs.

Usage

```
ggdag(
  .tdy_dag,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = "black",
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

`.tdy_dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`...`	additional arguments passed to `tidy_dagitty()`
`edge_type`	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
`node_size`	size of DAG node
`text_size`	size of DAG text
`label_size`	size of label text
`text_col`	color of DAG text

label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a ggplot

See Also

ggdag_classic()

Examples

```
dag <- dagify(
  y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2
)

ggdag(dag)
ggdag(dag) + theme_dag_blank()

ggdag(dagitty::randomDAG(5, .5))
```

---

ggdag_classic *Quickly plot a DAG in ggplot2*

Description

ggdag_classic() is a wrapper to quickly plot DAGs in a more traditional style.

Usage

```
ggdag_classic(
  .tdy_dag,
  ...,
  size = 8,
  label_rect_size = NULL,
  text_label = "name",
  text_col = "black"
)
```

Arguments

.tdy_dag	input graph, an object of class tidy_dagitty or dagitty
...	additional arguments passed to tidy_dagitty()
size	text size, with a default of 8.
label_rect_size	specify the fontsize argument in ggraph::label_rect; default is NULL, in which case it is scaled relative ti size
text_label	text variable, with a default of "name"
text_col	text color, with a default of "black"

Value

a ggplot

See Also

ggdag()

Examples

```
dag <- dagify(
  y ~ x + z2 + w2 + w1,
  x ~ z1 + w1,
  z1 ~ w1 + v,
  z2 ~ w2 + v,
  w1 ~ ~w2
)

ggdag_classic(dag)
ggdag_classic(dag) + theme_dag_blank()

ggdag_classic(dagitty::randomDAG(5, .5))
```

---

ggplot.tidy_dagitty *Create a new ggplot*

Description

Create a new ggplot

Usage

```
## S3 method for class 'tidy_dagitty'
ggplot(data = NULL, mapping = aes(), ...)

## S3 method for class 'dagitty'
ggplot(data = NULL, mapping = aes(), ...)
```

Arguments

data	Default dataset to use for plot. If not already a data.frame, will be converted to one by fortify(). If not specified, must be supplied in each layer added to the plot.
mapping	Default list of aesthetic mappings to use for plot. If not specified, must be supplied in each layer added to the plot.
...	Other arguments passed on to methods. Not currently used.

---

ggrepel functions *Repulsive textual annotations*

Description

These functions are minor modifications of those in the ggrepel package. geom_dag_text_repel adds text directly to the plot. geom_dag_label_repel draws a rectangle underneath the text, making it easier to read. The text labels repel away from each other and away from the data points.

Usage

```
geom_dag_text_repel(
  mapping = NULL,
  data = NULL,
  parse = FALSE,
  ...,
  box.padding = 0.35,
  point.padding = 1.5,
  segment.color = "#666666",
  fontface = "bold",
  segment.size = 0.5,
  arrow = NULL,
  force = 1,
  max.iter = 2000,
  nudge_x = 0,
  nudge_y = 0,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)

geom_dag_label_repel(
  mapping = NULL,
  data = NULL,
  parse = FALSE,
  ...,
  box.padding = grid::unit(0.35, "lines"),
  label.padding = grid::unit(0.25, "lines"),
```

```
  point.padding = grid::unit(1.5, "lines"),
  label.r = grid::unit(0.15, "lines"),
  label.size = 0.25,
  segment.color = "grey50",
  segment.size = 0.5,
  arrow = NULL,
  force = 1,
  max.iter = 2000,
  nudge_x = 0,
  nudge_y = 0,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by aes or aes_. If specified and inherit.aes = TRUE (the default), is combined with the default mapping at the top level of the plot. You only need to supply mapping if there isn't a mapping defined for the plot.
data	A data frame. If specified, overrides the default data frame defined at the top level of the plot.
parse	If TRUE, the labels will be parsed into expressions and displayed as described in ?plotmath
...	other arguments passed on to layer. There are three types of arguments you can use here: • Aesthetics: to set an aesthetic to a fixed value, like colour = "red" or size = 3. • Other arguments to the layer, for example you override the default stat associated with the layer. • Other arguments passed on to the stat.
box.padding	Amount of padding around bounding box, as unit or number. Defaults to 0.25. (Default unit is lines, but other units can be specified by passing unit(x, "units")).
point.padding	Amount of padding around labeled point, as unit or number. Defaults to 0. (Default unit is lines, but other units can be specified by passing unit(x, "units")).
segment.color, segment.size	See ggrepel::geom_text_repel()
fontface	A character vector. Default is "bold"
arrow	specification for arrow heads, as created by arrow
force	Force of repulsion between overlapping text labels. Defaults to 1.
max.iter	Maximum number of iterations to try to resolve overlaps. Defaults to 10000.
nudge_x, nudge_y	Horizontal and vertical adjustments to nudge the starting position of each text label. The units for nudge_x and nudge_y are the same as for the data units on the x-axis and y-axis.

na.rm	If FALSE (the default), removes missing values with a warning. If TRUE silently removes missing values.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders.
label.padding	Amount of padding around label, as unit or number. Defaults to 0.25. (Default unit is lines, but other units can be specified by passing unit(x, "units")).
label.r	Radius of rounded corners, as unit or number. Defaults to 0.15. (Default unit is lines, but other units can be specified by passing unit(x, "units")).
label.size	Size of label border, in mm.

Examples

```
library(ggplot2)
g <- dagify(m ~ x + y,
  y ~ x,
  exposure = "x",
  outcome = "y",
  latent = "m",
  labels = c("x" = "Exposure", "y" = "Outcome", "m" = "Collider")
)

g %>%
  tidy_dagitty() %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_edges() +
  geom_dag_point() +
  geom_dag_text_repel(aes(label = name), show.legend = FALSE) +
  theme_dag()

g %>%
  tidy_dagitty() %>%
  dag_label(labels = c(
    "x" = "This is the exposure",
    "y" = "Here's the outcome",
    "m" = "Here is where they collide"
  )) %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_edges() +
  geom_dag_point() +
  geom_dag_text() +
  geom_dag_label_repel(aes(label = label, fill = label),
    col = "white", show.legend = FALSE
  ) +
  theme_dag()
```

Instrumental Variables

Find Instrumental Variables

Description

`node_instrumental` tags instrumental variables given an exposure and outcome. `ggdag_instrumental` plots all instrumental variables. See `dagitty::instrumentalVariables()` for details.

Usage

```
node_instrumental(.dag, exposure = NULL, outcome = NULL, ...)

ggdag_instrumental(
  .tdy_dag,
  exposure = NULL,
  outcome = NULL,
  ...,
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

`.dag, .tdy_dag`	input graph, an object of class `tidy_dagitty` or `dagitty`
`exposure`	character vector of length 1, name of exposure variable. Default is `NULL`, in which case it will check the input DAG for exposure.
`outcome`	character vector of length 1, name of exposure variable. Default is `NULL`, in which case it will check the input DAG for exposure.
`...`	additional arguments passed to `tidy_dagitty()`
`node_size`	size of DAG node
`text_size`	size of DAG text
`label_size`	size of label text
`text_col`	color of DAG text
`label_col`	color of label text
`node`	logical. Should nodes be included in the DAG?

stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a tidy_dagitty with an instrumental column for instrumental variables or a ggplot

Examples

```
library(dagitty)

node_instrumental(dagitty("dag{ i->x->y; x<->y }"), "x", "y")
ggdag_instrumental(dagitty("dag{ i->x->y; i2->x->y; x<->y }"), "x", "y")
```

---

is.tidy_dagitty *Test for object class for tidy_dagitty*

Description

Test for object class for tidy_dagitty

Usage

```
is.tidy_dagitty(x)
```

Arguments

x	object to be tested

---

is_confounder *Assess if a variable confounds a relationship*

Description

Assess if a variable confounds a relationship

Usage

```
is_confounder(.tdy_dag, z, x, y, direct = FALSE)
```

Arguments

.tdy_dag	input graph, an object of class tidy_dagitty or dagitty
z	a character vector, the potential confounder
x, y	a character vector, the variables z may confound.
direct	logical. Only consider direct confounding? Default is FALSE

Value

Logical. Is the variable a confounder?

Examples

```
dag <- dagify(y ~ z, x ~ z)

is_confounder(dag, "z", "x", "y")
is_confounder(dag, "x", "z", "y")
```

Nodes *DAG Nodes*

Description

geom_dag_node and geom_dag_point are very similar to ggplot2::geom_point but with a few defaults changed. geom_dag_node is slightly stylized and includes an internal white circle, while geom_dag_point plots a single point.

Usage

```
geom_dag_node(
  mapping = NULL,
  data = NULL,
  position = "identity",
  ...,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)

geom_dag_point(
  mapping = NULL,
  data = NULL,
  position = "identity",
  ...,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by aes(). If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If NULL, the default, the data is inherited from the plot data as specified in the call to ggplot(). A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a data.frame, and will be used as the layer data. A function can be created from a formula (e.g. ~ head(.x, 10)).
position	Position adjustment, either as a string naming the adjustment (e.g. "jitter" to use position_jitter), or the result of a call to a position adjustment function. Use the latter if you need to change the settings of the adjustment.
...	Other arguments passed on to layer(). These are often aesthetics, used to set an aesthetic to a fixed value, like colour = "red" or size = 3. They may also be parameters to the paired geom/stat.
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders().

Aesthetics

geom_dag_node and geom_dag_point understand the following aesthetics (required aesthetics are in bold):

- **x**
- **y**
- alpha
- colour
- fill
- shape
- size
- stroke
- filter

geom_dag_node also accepts:

- internal_colour

Examples

```
library(ggplot2)
g <- dagify(m ~ x + y, y ~ x)
p <- g %>%
  tidy_dagitty() %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_edges() +
  theme_dag()

p +
  geom_dag_node() +
  geom_dag_text()

p +
  geom_dag_point() +
  geom_dag_text()
```

Pathways *Find Open Paths Between Variables*

Description

dag_paths finds open paths between a given exposure and outcome. ggdag_paths and ggdag_paths_fan plot all open paths. See dagitty::paths() for details.

Usage

```
dag_paths(
  .dag,
  from = NULL,
  to = NULL,
  adjust_for = NULL,
  limit = 100,
  directed = FALSE,
  paths_only = FALSE,
  ...
)

ggdag_paths(
  .tdy_dag,
  from = NULL,
  to = NULL,
  adjust_for = NULL,
  limit = 100,
  directed = FALSE,
  shadow = FALSE,
  ...,
  node_size = 16,
```

```
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_paths_fan(
  .tdy_dag,
  from = NULL,
  to = NULL,
  adjust_for = NULL,
  limit = 100,
  directed = FALSE,
  ...,
  shadow = FALSE,
  spread = 0.7,
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

.dag, .tdy_dag	input graph, an object of class tidy_dagitty or dagitty
from	character vector of length 1, name of exposure variable. Default is NULL, in which case it will check the input DAG for exposure.
to	character vector of length 1, name of exposure variable. Default is NULL, in which case it will check the input DAG for exposure.
adjust_for	character vector, a set of variables to control for. Default is NULL.
limit	maximum amount of paths to show. In general, the number of paths grows exponentially with the number of variables in the graph, such that path inspection is not useful except for the most simple models.
directed	logical. Should only directed paths be shown?
paths_only	logical. Should only open paths be returned? Default is FALSE, which includes every variable and edge in the DAG regardless if they are part of the path.
...	additional arguments passed to tidy_dagitty()

shadow	logical. Show edges which are not on an open path? Ignored if paths_only is TRUE.
node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	label color
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.
spread	the width of the fan spread

Value

a tidy_dagitty with a path column for path variables and a set grouping column or a ggplot.

Examples

```
confounder_triangle(x_y_associated = TRUE) %>%
  dag_paths(from = "x", to = "y")

confounder_triangle(x_y_associated = TRUE) %>%
  ggdag_paths(from = "x", to = "y")

butterfly_bias(x_y_associated = TRUE) %>%
  ggdag_paths_fan(shadow = TRUE)
```

---

print.tidy_dagitty *Print a* tidy_dagitty

Description

Print a tidy_dagitty

Usage

```
## S3 method for class 'tidy_dagitty'
print(x, ...)
```

Arguments

x	an object of class tidy_dagitty
...	optional arguments passed to print()

pull_dag *Pull components from DAG objects*

Description

pull_dag() and pull_dag_data() are generic methods to pull components of DAG objects, e.g. tidy_dagitty, such as the dagitty object or the data frame associated with it. These methods are recommended over extracting components manually, e.g. my_dag$data, because the internal structure of these objects may change over time. Similarly, use update_dag() if you want to sync the data back to the DAG object or override it with another DAG; use update_dag_data() to do update the data frame. This is useful with pull_dag_data().

Usage

```
pull_dag(x, ...)

## S3 method for class 'tidy_dagitty'
pull_dag(x, ...)

## S3 method for class 'dagitty'
pull_dag(x, ...)

pull_dag_data(x, ...)

## S3 method for class 'tidy_dagitty'
pull_dag_data(x, ...)

## S3 method for class 'dagitty'
pull_dag_data(x, ...)

update_dag_data(x) <- value

## S3 replacement method for class 'tidy_dagitty'
update_dag_data(x) <- value

update_dag(x, ...)

update_dag(x) <- value

## S3 method for class 'tidy_dagitty'
update_dag(x, ...)

## S3 replacement method for class 'tidy_dagitty'
update_dag(x) <- value
```

Arguments

x	a tidy_dagitty or dagitty object.

`...`	For `dagitty` objects, passed to `tidy_dagitty()` if needed, otherwise currently unused.
`value`	a value to set, either a `dagitty` or `data.frame` object, depending on the function.

Value

a DAG object, e.g. `dagitty`, or data frame

Examples

```
tidy_dagitty_obj <- dagify(y ~ x + z, x ~ z) %>%
  tidy_dagitty()
dag <- pull_dag(tidy_dagitty_obj)
dag_data <- pull_dag_data(tidy_dagitty_obj)

tidy_dagitty_obj %>%
  dplyr::mutate(name = toupper(name)) %>%
  # recreate the DAG component
  update_dag()

dag_data$label <- paste0(dag_data$name, "(observed)")
update_dag_data(tidy_dagitty_obj) <- dag_data
```

Quick Plots for Common DAGs

Quickly create a DAGs with common structures of bias

Description

base functions create an object of class `dagitty`; `ggdag_*` functions are wrappers that also call `ggdag()` on the `dagitty` object.

Usage

```
m_bias(
  x = NULL,
  y = NULL,
  a = NULL,
  b = NULL,
  m = NULL,
  x_y_associated = FALSE
)

butterfly_bias(
  x = NULL,
  y = NULL,
```

```
  a = NULL,
  b = NULL,
  m = NULL,
  x_y_associated = FALSE
)

confounder_triangle(x = NULL, y = NULL, z = NULL, x_y_associated = FALSE)

collider_triangle(x = NULL, y = NULL, m = NULL, x_y_associated = FALSE)

mediation_triangle(x = NULL, y = NULL, m = NULL, x_y_associated = FALSE)

ggdag_m_bias(
  x = NULL,
  y = NULL,
  a = NULL,
  b = NULL,
  m = NULL,
  x_y_associated = FALSE,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_butterfly_bias(
  x = NULL,
  y = NULL,
  a = NULL,
  b = NULL,
  m = NULL,
  x_y_associated = FALSE,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
```

```
)

ggdag_confounder_triangle(
  x = NULL,
  y = NULL,
  z = NULL,
  x_y_associated = FALSE,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_collider_triangle(
  x = NULL,
  y = NULL,
  m = NULL,
  x_y_associated = FALSE,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)

ggdag_mediation_triangle(
  x = NULL,
  y = NULL,
  m = NULL,
  x_y_associated = FALSE,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
```

```
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

x, y, a, b, m, z	Character vector. Optional label. Default is NULL
x_y_associated	Logical. Are x and y associated? Default is FALSE.
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Value

a DAG of class dagitty or a ggplot

Examples

```
m_bias() %>% ggdag_adjust("m")
ggdag_confounder_triangle()
```

---

remove_axes *Quickly remove plot axes and grids*

Description

remove_axes() and remove_grid() are convenience functions that removes the axes and grids from a ggplot, respectively. This is useful when you want to use an existing theme, e.g. those included in ggplot2, for a DAG.

Usage

```
remove_axes()

remove_grid()
```

Examples

```
library(ggplot2)
ggdag(confounder_triangle()) +
  theme_bw() +
  remove_axes()
```

`scale_adjusted` *Common scale adjustments for DAGs*

Description

`scale_adjusted()` is a convenience function that implements ways of visualizing adjustment for a variable. By convention, a square shape is used to indicate adjustment and a circle when not adjusted. Arrows out of adjusted variables are often eliminated or de-emphasized, and `scale_adjusted()` uses a lower `alpha` for these arrows. When adjusting a collider, a dashed line is sometimes used to demarcate opened pathways, and `scale_adjusted()` does this whenever `geom_dag_collider_edges()` is used. `scale_dag()` is deprecated in favor of `scale_adjusted()`.

Usage

```
scale_adjusted()

scale_dag(breaks = ggplot2::waiver())
```

Arguments

`breaks` One of:

- NULL for no breaks
- waiver() for the default breaks computed by the transformation object
- A numeric vector of positions
- A function that takes the limits as input and returns breaks as output

---

`simulate_data` *Simulate Data from Structural Equation Model*

Description

This is a thin wrapper for the `simulateSEM()`function in `dagitty` that works with tidied dagitty objects. It treats the input DAG as a structural equation model, generating random path coefficients and simulating corresponding data. See `dagitty::simulateSEM()` for details.

Usage

```
simulate_data(
  .tdy_dag,
  b.default = NULL,
  b.lower = -0.6,
  b.upper = 0.6,
  eps = 1,
  N = 500,
  standardized = TRUE
)
```

Arguments

.tdy_dag	the input DAG, which can be a tidy_dagitty or dagitty object.
b.default	default path coefficient applied to arrows for which no coefficient is defined in the model syntax.
b.lower	lower bound for random path coefficients, applied if b.default = NULL.
b.upper	upper bound for path coefficients.
eps	residual variance (only meaningful if standardized=FALSE).
N	number of samples to generate.
standardized	whether a standardized output is desired (all variables have variance 1).

Value

a tblwith N values for each variable in .tdy_dag

Examples

```
dagify(y ~ z, x ~ z) %>%
  tidy_dagitty() %>%
  simulate_data()
```

---

tbl_df.tidy_daggity *Convert a* tidy_dagitty *object to tbl_df*

Description

Convert a tidy_dagitty object to tbl_df

Usage

```
tbl_df.tidy_daggity(.tdy_dag)
```

Arguments

.tdy_dag	an object of class tidy_dagitty

Test if Variable Is Collider

Detecting colliders in DAGs

Description

Detecting colliders in DAGs

Usage

```
is_collider(.dag, .var, downstream = TRUE)

is_downstream_collider(.dag, .var)
```

Arguments

.dag	an input graph, an object of class tidy_dagitty or dagitty
.var	a character vector of length 1, the potential collider to check
downstream	Logical. Check for downstream colliders? Default is TRUE.

Value

Logical. Is the variable a collider or downstream collider?

Examples

```
dag <- dagify(m ~ x + y, m_jr ~ m)
is_collider(dag, "m")
is_downstream_collider(dag, "m_jr")

#  a downstream collider is also treated as a collider
is_collider(dag, "m_jr")

#  but a direct collider is not treated as a downstream collider
is_downstream_collider(dag, "m")
```

theme_dag_blank *Minimalist DAG themes*

Description

Minimalist DAG themes

Usage

```
theme_dag_blank(base_size = 12, base_family = "", ...)

theme_dag(base_size = 12, base_family = "", ...)

theme_dag_grid(base_size = 12, base_family = "", ...)
```

Arguments

base_size	base font size, given in pts.
base_family	base font family
...	additional arguments passed to theme()

Examples

```
ggdag(m_bias()) + theme_dag_blank() # the default
```

---

theme_dag_grey *Simple grey themes for DAGs*

Description

Simple grey themes for DAGs

Usage

```
theme_dag_grey(base_size = 12, base_family = "", ...)

theme_dag_gray(base_size = 12, base_family = "", ...)

theme_dag_grey_grid(base_size = 12, base_family = "", ...)

theme_dag_gray_grid(base_size = 12, base_family = "", ...)
```

Arguments

base_size	base font size, given in pts.
base_family	base font family
...	additional arguments passed to theme()

Examples

```
ggdag(m_bias()) + theme_dag_grey()
```

tidy_dagitty *Tidy a* dagitty *object*

Description

Tidy a dagitty object

Usage

```
tidy_dagitty(.dagitty, seed = NULL, layout = "nicely", ...)
```

Arguments

.dagitty	a dagitty
seed	a numeric seed for reproducible layout generation
layout	a layout available in ggraph. See ggraph::create_layout() for details. Alternatively, "time_ordered" will use time_ordered_coords() to algorithmically sort the graph by time.
...	optional arguments passed to ggraph::create_layout()

Value

a tidy_dagitty object

Examples

```
library(dagitty)
library(ggplot2)

dag <- dagitty("dag {
  Y <- X <- Z1 <- V -> Z2 -> Y
  Z1 <- W1 <-> W2 -> Z2
  X <- W1 -> Y
  X <- W2 -> Y
  X [exposure]
  Y [outcome]
  }")

tidy_dagitty(dag)

tidy_dagitty(dag, layout = "fr") %>%
  ggplot(aes(x = x, y = y, xend = xend, yend = yend)) +
  geom_dag_node() +
  geom_dag_text() +
  geom_dag_edges() +
  theme_dag()
```

`time_ordered_coords` *Create a time-ordered coordinate data frame*

Description

`time_ordered_coords()` is a helper function to create time-ordered DAGs. Pass the results to the `coords` argument of `dagify()`. If `.vars` if not specified, these coordinates will be determined automatically. If you want to be specific, you can also use a list or data frame. The default is to assume you want variables to go from left to right in order by time. Variables are spread along the y-axis using a simple algorithm to stack them. You can also work along the y-axis by setting `direction = "y"`.

Usage

```
time_ordered_coords(
  .vars = NULL,
  time_points = NULL,
  direction = c("x", "y"),
  auto_sort_direction = c("right", "left")
)
```

Arguments

`.vars`	A list of character vectors, where each vector represents a single time period. Alternatively, a data frame where the first column is the variable name and the second column is the time period.
`time_points`	A vector of time points. Default is `NULL`, which creates a sequence from 1 to the number of variables.
`direction`	A character string indicating the axis along which the variables should be time-ordered. Either "x" or "y". Default is "x".
`auto_sort_direction`	If `.vars` is `NULL`: nodes will be placed as far `"left"` or `"right"` of in the graph as is reasonable. Default is right, meaning the nodes will be as close as possible in time to their descendants.

Value

A tibble with three columns: `name`, `x`, and `y`.

See Also

`dagify()`, `coords2df()`, `coords2list()`

Examples

```
dagify(
  d ~ c1 + c2 + c3,
  c1 ~ b1 + b2,
  c3 ~ a,
  b1 ~ a,
  coords = time_ordered_coords()
) %>% ggdag()

coords <- time_ordered_coords(list(
  # time point 1
  "a",
  # time point 2
  c("b1", "b2"),
  # time point 3
  c("c1", "c2", "c3"),
  # time point 4
  "d"
))

dagify(
  d ~ c1 + c2 + c3,
  c1 ~ b1 + b2,
  c3 ~ a,
  b1 ~ a,
  coords = coords
) %>% ggdag()

# or use a data frame
x <- data.frame(
  name = c("x1", "x2", "y", "z1", "z2", "z3", "a"),
  time = c(1, 1, 2, 3, 3, 3, 4)
)
dagify(
  z3 ~ y,
  y ~ x1 + x2,
  a ~ z1 + z2 + z3,
  coords = time_ordered_coords(x)
) %>%
  ggdag()
```

`Variable Status` *Find variable status*

Description

Detects variable status given a DAG (exposure, outcome, latent). See `dagitty::VariableStatus()` for details.

Usage

```
node_status(.dag, as_factor = TRUE, ...)

ggdag_status(
  .tdy_dag,
  ...,
  edge_type = "link_arc",
  node_size = 16,
  text_size = 3.88,
  label_size = text_size,
  text_col = "white",
  label_col = text_col,
  node = TRUE,
  stylized = FALSE,
  text = TRUE,
  use_labels = NULL
)
```

Arguments

.dag, .tdy_dag	input graph, an object of class tidy_dagitty or dagitty
as_factor	treat status variable as factor
...	additional arguments passed to tidy_dagitty()
edge_type	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
node_size	size of DAG node
text_size	size of DAG text
label_size	size of label text
text_col	color of DAG text
label_col	color of label text
node	logical. Should nodes be included in the DAG?
stylized	logical. Should DAG nodes be stylized? If so, use geom_dag_nodes and if not use geom_dag_point
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for geom_dag_label_repel(). Default is NULL.

Details

node_collider tags variable status and ggdag_collider plots all variable statuses.

Value

a tidy_dagitty with a status column for variable status or a ggplot

Examples

```
dag <- dagify(l ~ x + y,
  y ~ x,
  exposure = "x",
  outcome = "y",
  latent = "l"
)

node_status(dag)
ggdag_status(dag)
```

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