

Package ‘ggdag’

July 16, 2022

Title Analyze and Create Elegant Directed Acyclic Graphs

Version 0.2.5

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 (<<http://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.

License MIT + file LICENSE

URL <https://github.com/malcolmbarrett/ggdag>

BugReports <https://github.com/malcolmbarrett/ggdag/issues>

Depends R (>= 3.4.0)

Imports dagitty, dplyr, forcats, ggplot2 (>= 3.0.0), ggraph (>= 2.0.0), ggrepel, igraph, magrittr, pillar, purrr, stringr, tibble, tidygraph

Suggests covr, knitr, rmarkdown, spelling, testthat (>= 3.0.0), vdiff (>= 1.0.2), withr

VignetteBuilder knitr

Encoding UTF-8

Language en-US

RoxygenNote 7.1.2

Config/testthat/edition 3

NeedsCompilation no

Author Malcolm Barrett [aut, cre] (<<https://orcid.org/0000-0003-0299-5825>>)

Maintainer Malcolm Barrett <malcolmbarrett@gmail.com>

Repository CRAN

Date/Publication 2022-07-16 18:30:05 UTC

R topics documented:

activate_collider_paths	3
Adjust for variables	3
as.data.frame.tidy_dagitty	5
as.tbl.tidy_daggity	5
Assess d-separation between variables	6
Assess familial relationships between variables	9
as_tbl_graph	13
Canonicalize DAGs	14
Colliders	15
coordinates	17
Covariate Adjustment Sets	18
dag	19
DAG Edges	20
DAG Labels	24
dagify	25
dplyr	26
Equivalent DAGs and Classes	28
Exogenous Variables	31
expand_plot	32
fortify	32
geom_dag_collider_edges	33
geom_dag_edges	35
geom_dag_text	37
ggdag	39
ggdag_classic	41
ggplot.tidy_dagitty	42
ggrepel functions	42
Instrumental Variables	45
is.tidy_dagitty	47
is_confounder	47
Nodes	48
Pathways	50
print.tidy_dagitty	52
Quick Plots for Common DAGs	53
remove_axes	56
scale_adjusted	56
simulate_data	57
tbl_df.tidy_daggity	58
Test if Variable Is Collider	58
theme_dag_blank	59
theme_dag_grey	60
tidy_dagitty	60
Variable Status	61

`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(.tidy_dag, adjust_for, ...)
```

Arguments

<code>.tidy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>adjust_for</code>	a character vector, the variable(s) to adjust for.
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>

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, ...)

adjust_for(.tdy_dag, var, as_factor = 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

<code>.tdy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>var</code>	a character vector, the variable(s) to adjust for.
<code>as_factor</code>	logical. Should the adjusted column be a factor?
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . Default is <code>NULL</code> .
<code>collider_lines</code>	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, optional, ...)
```

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_daggitty
```

Convert a tidy_dagitty object to tbl

Description

Convert a tidy_dagitty object to tbl

Usage

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

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

Arguments

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

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

<code>.tidy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>from</code>	a character vector, the starting variable (must be in DAG). If NULL, checks DAG for exposure variable.
<code>to</code>	a character vector, the ending variable (must be in DAG). If NULL, checks DAG for outcome variable.
<code>controlling_for</code>	a character vector, variables in the DAG to control for.
<code>as_factor</code>	logical. Should the <code>d_relationship</code> variable be a factor?
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>edge_type</code>	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . Default is NULL.
<code>collider_lines</code>	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

<code>.tidy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>.var</code>	a character vector, the variable to be assessed (must be in DAG)
<code>as_factor</code>	logical. Should the relationship variable be a factor?
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>edge_type</code>	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . 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()
```

Canonicalize DAGs

Canonicalize a DAG

Description

Takes an input graph with bidirected edges and replaces every bidirected edge $x \leftrightarrow y$ with a sub-structure $x \leftarrow L \rightarrow y$, where L is a latent variable. See [dagitty::canonicalize\(\)](#) for details. Undirected edges are not currently supported in `ggraph`.

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

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

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

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

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	<i>Manipulate DAG coordinates</i>
-------------	-----------------------------------

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

<code>.tdy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>exposure</code>	a character vector, the exposure variable. Default is <code>NULL</code> , in which case it will be determined from the DAG.
<code>outcome</code>	a character vector, the outcome variable. Default is <code>NULL</code> , in which case it will be determined from the DAG.
<code>...</code>	additional arguments to <code>adjustmentSets</code>
<code>shadow</code>	logical. Show paths blocked by adjustment?
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	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 <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for <code>geom_dag_repel_label()</code> . Default is NULL.
expand_x	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 <code>ggplot2::expansion()</code> to generate the values for the <code>expand</code> argument.
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 <code>ggplot2::expansion()</code> to generate the values for the <code>expand</code> 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("dag...")`

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 <code>aes()</code> or <code>aes_()</code> . If specified and <code>inherit.aes = TRUE</code> (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 <code>NULL</code> , the default, the data is inherited from the plot data as specified in the call to <code>ggplot()</code> . A <code>data.frame</code> , or other object, will override the plot data. All objects will be fortified to produce a data frame. See <code>fortify()</code> for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code> ., and will be used as the layer data.
arrow	specification for arrow heads, as created by <code>arrow()</code>
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If <code>FALSE</code> (the default), removes missing values with a warning. If <code>TRUE</code> silently removes missing values
show.legend	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If <code>FALSE</code> , 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. <code>borders()</code> .
...	Other arguments passed to <code>gggraph::geom_edge_*</code> ()
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 <code>layout.circular = FALSE</code> .
fold	Logical. Should arcs appear on the same side of the nodes despite different directions. Default to <code>FALSE</code> .
n	The number of points to create along the path.
lineend	Line end style (round, butt, square).

<code>linejoin</code>	Line join style (round, mitre, bevel).
<code>linemitre</code>	Line mitre limit (number greater than 1).
<code>label_colour</code>	The colour of the edge label. If NA it will use the colour of the edge.
<code>label_alpha</code>	The opacity of the edge label. If NA it will use the opacity of the edge.
<code>label_parse</code>	If TRUE, the labels will be parsed into expressions and displayed as described in grDevices::plotmath() .
<code>check_overlap</code>	If TRUE, text that overlaps previous text in the same layer will not be plotted. <code>check_overlap</code> happens at draw time and in the order of the data. Therefore data should be arranged by the label column before calling <code>geom_label()</code> or <code>geom_text()</code> .
<code>angle_calc</code>	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.
<code>force_flip</code>	Logical. If <code>angle_calc</code> is either 'along' or 'across' should the label be flipped if it is on it's head. Default to TRUE.
<code>label_dodge</code>	A grid::unit() giving a fixed vertical shift to add to the label in case of <code>angle_calc</code> is either 'along' or 'across'
<code>label_push</code>	A grid::unit() giving a fixed horizontal shift to add to the label in case of <code>angle_calc</code> is either 'along' or 'across'
<code>spread</code>	Deprecated. Use <code>strength</code> 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
.tidy_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. $y \sim x + z$, which gets translated to $y \leftarrow \{x \ z\}$, as well as using a double tilde ($\sim\sim$) to graph bidirected variables, e.g. $x_1 \sim\sim x_2$ is translated to $x_1 \leftrightarrow x_2$.

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)

```

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(.data, ...)  
  
## 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

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

Examples

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

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 reversible edges. `ggdag_equivalent_dags()` plots all equivalent DAGs, while `ggdag_equivalent_class()` plots all reversible edges as undirected.

Usage

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

```
ggdag_equivalent_dags(
  .tidy_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(
  .tidy_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

<code>.dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>n</code>	maximal number of returned graphs.

<code>layout</code>	a layout available in <code>ggraph</code> . See <code>ggraph::create_layout()</code> for details.
<code>...</code>	optional arguments passed to <code>ggraph::create_layout()</code>
<code>.tidy_dag</code>	an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . Default is <code>NULL</code> .
<code>expand_x</code>	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 <code>ggplot2::expansion()</code> to generate the values for the <code>expand</code> argument.
<code>expand_y</code>	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 <code>ggplot2::expansion()</code> to generate the values for the <code>expand</code> argument.
<code>breaks</code>	One of: <ul style="list-style-type: none"> • <code>NULL</code> for no breaks • <code>waiver()</code> 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 `reversible` 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()
```

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

<code>.dag</code> , <code>.tdy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>edge_type</code>	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . 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",
  ...,
  size = 0.6,
  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() or aes_() . If specified and <code>inherit.aes = TRUE</code> (the default), it is combined with the default mapping at the top level of the plot. You must supply <code>mapping</code> if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If <code>NULL</code> , the default, the data is inherited from the plot data as specified in the call to ggplot() . A <code>data.frame</code> , 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 <code>data.frame</code> , and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).

stat	The statistical transformation to use on the data for this layer, as a string.
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
...	Other arguments passed on to <code>layer()</code> . These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> . They may also be parameters to the paired geom/stat.
size	a numeric vector of length 1. Edge width
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.
nbp	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 <code>arrow()</code> .
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. <code>borders()</code> .

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 <code>aes()</code> or <code>aes_()</code> . If specified and <code>inherit.aes = TRUE</code> (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 <code>NULL</code> , the default, the data is inherited from the plot data as specified in the call to <code>ggplot()</code> . A <code>data.frame</code> , or other object, will override the plot data. All objects will be fortified to produce a data frame. See <code>fortify()</code> for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code> ., 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 <code>layout_circular = FALSE</code> .
arrow_directed, arrow_bidirected	specification for arrow heads, as created by <code>arrow()</code>
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If <code>FALSE</code> (the default), removes missing values with a warning. If <code>TRUE</code> silently removes missing values

<code>show.legend</code>	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.
<code>inherit.aes</code>	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. <code>borders()</code> .
<code>fold</code>	Logical. Should arcs appear on the same side of the nodes despite different directions. Default to FALSE.
<code>...</code>	Other arguments passed to <code>ggraph::geom_edge_*</code> ()

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_text	<i>Node text</i>
---------------	------------------

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 <code>aes()</code> or <code>aes_()</code> . If specified and <code>inherit.aes = TRUE</code> (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 <code>NULL</code> , the default, the data is inherited from the plot data as specified in the call to <code>ggplot()</code> .

	A <code>data.frame</code> , or other object, will override the plot data. All objects will be fortified to produce a data frame. See <code>fortify()</code> for which variables will be created.
	A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code> , and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).
<code>stat</code>	The statistical transformation to use on the data for this layer, as a string.
<code>position</code>	Position adjustment, either as a string, or the result of a call to a position adjustment function. Cannot be jointly specified with <code>nudge_x</code> or <code>nudge_y</code> .
<code>...</code>	Other arguments passed on to <code>layer()</code> . These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> . They may also be parameters to the paired <code>geom/stat</code> .
<code>parse</code>	If TRUE, the labels will be parsed into expressions and displayed as described in <code>?plotmath</code> .
<code>nudge_x</code>	Horizontal and vertical adjustment to nudge labels by. Useful for offsetting text from points, particularly on discrete scales. Cannot be jointly specified with <code>position</code> .
<code>nudge_y</code>	Horizontal and vertical adjustment to nudge labels by. Useful for offsetting text from points, particularly on discrete scales. Cannot be jointly specified with <code>position</code> .
<code>check_overlap</code>	If TRUE, text that overlaps previous text in the same layer will not be plotted. <code>check_overlap</code> happens at draw time and in the order of the data. Therefore data should be arranged by the label column before calling <code>geom_text()</code> . Note that this argument is not supported by <code>geom_label()</code> .
<code>na.rm</code>	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
<code>show.legend</code>	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.
<code>inherit.aes</code>	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. <code>borders()</code> .

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

<code>.tidy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>edge_type</code>	a character vector, the edge geom to use. One of: "link_arc", which accounts for directed and bidirected edges, "link", "arc", or "diagonal"
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . 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(
  .tidy_dag,
  ...,
  size = 8,
  label_rect_size = NULL,
  text_label = "name",
  text_col = "black"
)
```

Arguments

.tidy_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 to 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 <code>fortify()</code> . 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.
<code>data</code>	A data frame. If specified, overrides the default data frame defined at the top level of the plot.
<code>parse</code>	If TRUE, the labels will be parsed into expressions and displayed as described in <code>?plotmath</code>
<code>...</code>	other arguments passed on to <code>layer</code> . There are three types of arguments you can use here: <ul style="list-style-type: none"> • Aesthetics: to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code>. • Other arguments to the layer, for example you override the default stat associated with the layer. • Other arguments passed on to the stat.
<code>box.padding</code>	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 <code>unit(x, "units")</code>).
<code>point.padding</code>	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 <code>unit(x, "units")</code>).
<code>segment.color</code> , <code>segment.size</code>	See <code>ggrepel::geom_text_repel()</code>
<code>fontface</code>	A character vector. Default is "bold"
<code>arrow</code>	specification for arrow heads, as created by <code>arrow</code>
<code>force</code>	Force of repulsion between overlapping text labels. Defaults to 1.
<code>max.iter</code>	Maximum number of iterations to try to resolve overlaps. Defaults to 10000.
<code>nudge_x</code>	Horizontal and vertical adjustments to nudge the starting position of each text label. The units for <code>nudge_x</code> and <code>nudge_y</code> are the same as for the data units on the x-axis and y-axis.
<code>nudge_y</code>	Horizontal and vertical adjustments to nudge the starting position of each text label. The units for <code>nudge_x</code> and <code>nudge_y</code> are the same as for the data units on the x-axis and y-axis.
<code>na.rm</code>	If FALSE (the default), removes missing values with a warning. If TRUE silently removes missing values.
<code>show.legend</code>	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.
<code>inherit.aes</code>	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. <code>borders</code> .
<code>label.padding</code>	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 <code>unit(x, "units")</code>).
<code>label.r</code>	Radius of rounded corners, as unit or number. Defaults to 0.15. (Default unit is lines, but other units can be specified by passing <code>unit(x, "units")</code>).
<code>label.size</code>	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

<code>.dag</code> , <code>.tdy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>exposure</code>	character vector of length 1, name of exposure variable. Default is <code>NULL</code> , in which case it will check the input DAG for exposure.
<code>outcome</code>	character vector of length 1, name of exposure variable. Default is <code>NULL</code> , in which case it will check the input DAG for exposure.
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	color of label text
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>
<code>text</code>	logical. Should text be included in the DAG?
<code>use_labels</code>	a string. Variable to use for <code>geom_dag_repel_label()</code> . Default is <code>NULL</code> .

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	<i>Test for object class for tidy_dagitty</i>
-----------------	---

Description

Test for object class for tidy_dagitty

Usage

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

Arguments

x	object to be tested
---	---------------------

is_confounder	<i>Assess if a variable confounds a relationship</i>
---------------	--

Description

Assess if a variable confounds a relationship

Usage

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

Arguments

.tidy_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

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

<code>position</code>	Position adjustment, either as a string, or the result of a call to a position adjustment function.
<code>...</code>	Other arguments passed on to <code>layer()</code> . These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> . They may also be parameters to the paired <code>geom/stat</code> .
<code>na.rm</code>	If <code>FALSE</code> , the default, missing values are removed with a warning. If <code>TRUE</code> , missing values are silently removed.
<code>show.legend</code>	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes. It can also be a named logical vector to finely select the aesthetics to display.
<code>inherit.aes</code>	If <code>FALSE</code> , 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. <code>borders()</code> .

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

<code>.dag</code> , <code>.tdy_dag</code>	input graph, an object of class <code>tidy_dagitty</code> or <code>dagitty</code>
<code>from</code>	character vector of length 1, name of exposure variable. Default is <code>NULL</code> , in which case it will check the input DAG for exposure.
<code>to</code>	character vector of length 1, name of exposure variable. Default is <code>NULL</code> , in which case it will check the input DAG for exposure.
<code>adjust_for</code>	character vector, a set of variables to control for. Default is <code>NULL</code> .
<code>limit</code>	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.
<code>directed</code>	logical. Should only directed paths be shown?
<code>paths_only</code>	logical. Should only open paths be returned? Default is <code>FALSE</code> , which includes every variable and edge in the DAG regardless if they are part of the path.
<code>...</code>	additional arguments passed to <code>tidy_dagitty()</code>
<code>shadow</code>	logical. Show edges which are not on an open path? Ignored if <code>paths_only</code> is <code>TRUE</code> .
<code>node_size</code>	size of DAG node
<code>text_size</code>	size of DAG text
<code>label_size</code>	size of label text
<code>text_col</code>	color of DAG text
<code>label_col</code>	label color
<code>node</code>	logical. Should nodes be included in the DAG?
<code>stylized</code>	logical. Should DAG nodes be stylized? If so, use <code>geom_dag_nodes</code> and if not use <code>geom_dag_point</code>

text	logical. Should text be included in the DAG?
use_labels	a string. Variable to use for <code>geom_dag_repel_label()</code> . 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 <code>tidy_dagitty</code>
...	optional arguments passed to <code>print()</code>

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

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

<code>.tdy_dag</code>	the input DAG, which can be a <code>tidy_dagitty</code> or <code>dagitty</code> object.
<code>b.default</code>	default path coefficient applied to arrows for which no coefficient is defined in the model syntax.
<code>b.lower</code>	lower bound for random path coefficients, applied if <code>b.default = NULL</code> .
<code>b.upper</code>	upper bound for path coefficients.
<code>eps</code>	residual variance (only meaningful if <code>standardized=FALSE</code>).
<code>N</code>	number of samples to generate.
<code>standardized</code>	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	<i>Convert a tidy_dagitty object to tbl_df</i>
---------------------	--

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	<i>Minimalist DAG themes</i>
-----------------	------------------------------

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	<i>Simple grey themes for DAGs</i>
----------------	------------------------------------

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	<i>Tidy a dagitty object</i>
--------------	------------------------------

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.
...	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()
```

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

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

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)

```

Index

activate_collider_paths, 3
Adjust for variables, 3
adjust_for (Adjust for variables), 3
aes, 43
aes(), 33, 37, 48
aes_, 43
aes_(), 33, 37, 48
anti_join.tidy_dagitty (dplyr), 26
arrange.tidy_dagitty (dplyr), 26
arrange_.tidy_dagitty (dplyr), 26
arrow, 44
as.data.frame.tidy_dagitty, 5
as.tbl.tidy_dagitty, 5
as_tbl_graph, 13
as_tibble.tidy_dagitty
 (as.tbl.tidy_dagitty), 5
Assess d-separation between variables,
 6
Assess familial relationships between
 variables, 9

borders, 44
borders(), 34, 38, 49
butterfly_bias (Quick Plots for Common
 DAGs), 53

Canonicalize DAGs, 14
collider_triangle (Quick Plots for
 Common DAGs), 53
Colliders, 15
confounder_triangle (Quick Plots for
 Common DAGs), 53
control_for (Adjust for variables), 3
control_for(), 3
coordinates, 17
coords2df (coordinates), 17
coords2df(), 26
coords2list (coordinates), 17
coords2list(), 26
Covariate Adjustment Sets, 18

dag, 19
DAG Edges, 20
DAG Labels, 24
dag(), 26
dag_adjustment_sets (Covariate
 Adjustment Sets), 18
dag_label (DAG Labels), 24
dag_paths (Pathways), 50
dagify, 25
dagitty, 20
dagitty::adjustmentSets(), 18
dagitty::canonicalize(), 14
dagitty::children, 9
dagitty::dseparated(), 6
dagitty::equivalentDAGs(), 29
dagitty::exogenousVariables(), 31
dagitty::instrumentalVariables(), 45
dagitty::paths(), 50
dagitty::simulateSEM(), 57
dagitty::VariableStatus(), 61
distinct.tidy_dagitty (dplyr), 26
dplyr, 26
dplyr::as_tibble(), 6

Equivalent DAGs and Classes, 28
Exogenous Variables, 31
expand_plot, 32

filter.tidy_dagitty (dplyr), 26
filter_.tidy_dagitty (dplyr), 26
fortify, 32
fortify(), 33, 38, 42, 48
full_join.tidy_dagitty (dplyr), 26

geom_dag_collider_edges, 33
geom_dag_collider_edges(), 3, 56
geom_dag_edges, 35
geom_dag_edges_arc (DAG Edges), 20
geom_dag_edges_diagonal (DAG Edges), 20
geom_dag_edges_fan (DAG Edges), 20

- geom_dag_edges_link (DAG Edges), 20
- geom_dag_label_repel (ggrepel functions), 42
- geom_dag_node (Nodes), 48
- geom_dag_point (Nodes), 48
- geom_dag_text, 37
- geom_dag_text_repel (ggrepel functions), 42
- ggdag, 39
- ggdag(), 41
- ggdag_adjacent (Assess familial relationships between variables), 9
- ggdag_adjust (Adjust for variables), 3
- ggdag_adjust(), 3
- ggdag_adjustment_set (Covariate Adjustment Sets), 18
- ggdag_ancestors (Assess familial relationships between variables), 9
- ggdag_butterfly_bias (Quick Plots for Common DAGs), 53
- ggdag_canonical (Canonicalize DAGs), 14
- ggdag_children (Assess familial relationships between variables), 9
- ggdag_classic, 41
- ggdag_classic(), 40
- ggdag_collider (Colliders), 15
- ggdag_collider_triangle (Quick Plots for Common DAGs), 53
- ggdag_confounder_triangle (Quick Plots for Common DAGs), 53
- ggdag_dconnected (Assess d-separation between variables), 6
- ggdag_descendants (Assess familial relationships between variables), 9
- ggdag_drelationship (Assess d-separation between variables), 6
- ggdag_dseparated (Assess d-separation between variables), 6
- ggdag_equivalent_class (Equivalent DAGs and Classes), 28
- ggdag_equivalent_dags (Equivalent DAGs and Classes), 28
- ggdag_exogenous (Exogenous Variables), 31
- ggdag_instrumental (Instrumental Variables), 45
- ggdag_m_bias (Quick Plots for Common DAGs), 53
- ggdag_markov_blanket (Assess familial relationships between variables), 9
- ggdag_mediation_triangle (Quick Plots for Common DAGs), 53
- ggdag_parents (Assess familial relationships between variables), 9
- ggdag_paths (Pathways), 50
- ggdag_paths_fan (Pathways), 50
- ggdag_status (Variable Status), 61
- ggplot(), 33, 37, 48
- ggplot.dagitty (ggplot.tidy_dagitty), 42
- ggplot.tidy_dagitty, 42
- ggplot2::geom_point, 48
- ggraph::create_layout(), 30, 60
- ggrepel functions, 42
- ggrepel::geom_text_repel(), 44
- grDevices::plotmath(), 23
- grid::unit(), 23
- group_by.tidy_dagitty (dplyr), 26
- has_labels (DAG Labels), 24
- inner_join.tidy_dagitty (dplyr), 26
- Instrumental Variables, 45
- is.tidy_dagitty, 47
- is_collider (Test if Variable Is Collider), 58
- is_confounder, 47
- is_downstream_collider (Test if Variable Is Collider), 58
- label (DAG Labels), 24
- label<- (DAG Labels), 24
- layer, 44
- layer(), 34, 38, 49
- left_join.tidy_dagitty (dplyr), 26
- m_bias (Quick Plots for Common DAGs), 53
- mediation_triangle (Quick Plots for Common DAGs), 53
- mutate.tidy_dagitty (dplyr), 26
- mutate_.tidy_dagitty (dplyr), 26

- node_adjacent (Assess familial relationships between variables), 9
- node_ancestors (Assess familial relationships between variables), 9
- node_canonical (Canonicalize DAGs), 14
- node_children (Assess familial relationships between variables), 9
- node_collider (Colliders), 15
- node_dconnected (Assess d-separation between variables), 6
- node_descendants (Assess familial relationships between variables), 9
- node_drelationship (Assess d-separation between variables), 6
- node_dseparated (Assess d-separation between variables), 6
- node_equivalent_class (Equivalent DAGs and Classes), 28
- node_equivalent_dags (Equivalent DAGs and Classes), 28
- node_exogenous (Exogenous Variables), 31
- node_instrumental (Instrumental Variables), 45
- node_markov_blanket (Assess familial relationships between variables), 9
- node_parents (Assess familial relationships between variables), 9
- node_status (Variable Status), 61
- Nodes, 48
- Pathways, 50
- print.tidy_dagitty, 52
- Quick Plots for Common DAGs, 53
- remove_axes, 56
- remove_grid (remove_axes), 56
- right_join.tidy_dagitty (dplyr), 26
- scale_adjusted, 56
- scale_dag (scale_adjusted), 56
- select.tidy_dagitty (dplyr), 26
- select_.tidy_dagitty (dplyr), 26
- semi_join.tidy_dagitty (dplyr), 26
- simulate_data, 57
- slice.tidy_dagitty (dplyr), 26
- slice_.tidy_dagitty (dplyr), 26
- summarise.tidy_dagitty (dplyr), 26
- summarise_.tidy_dagitty (dplyr), 26
- tbl_df.tidy_dagitty, 58
- Test if Variable Is Collider, 58
- theme_dag (theme_dag_blank), 59
- theme_dag_blank, 59
- theme_dag_gray (theme_dag_gray), 60
- theme_dag_gray_grid (theme_dag_gray), 60
- theme_dag_grey, 60
- theme_dag_grey_grid (theme_dag_grey), 60
- theme_dag_grid (theme_dag_blank), 59
- tidy_dagitty, 60
- tidygraph::as_tbl_graph(), 13
- transmute.tidy_dagitty (dplyr), 26
- ungroup.tidy_dagitty (dplyr), 26
- Variable Status, 61