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Type Package

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Title Quantile-Quantile Plot Extensions for 'ggplot2'

Description Extensions of 'ggplot2' Q-Q plot functionalities.

URL https://github.com/aloy/qqplotr

BugReports https://github.com/aloy/qqplotr/issues

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Imports dplyr, robustbase, MASS, opdisDownsampling, qqconf (>= 1.3.1)

Suggests shiny, devtools, lattice, shinyBS, knitr, rmarkdown

Repository https://aloy.r-universe.dev

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geom_qq_band *Quantile-quantile confidence bands*

Description

Draws quantile-quantile confidence bands, with an additional detrend option.

Usage

```
geom_qq_band(
  mapping = NULL,
  data = NULL,
  stat = "qq_band",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
  detrend = FALSE,
  identity = FALSE,
  qtype = 7,
  qprobs = c(0.25, 0.75),
  bandType = "pointwise",
  B = 1000,
  conf = 0.95,
  mu = NULL,
  sigma = NULL,
  ...
)

stat_qq_band(
  mapping = NULL,
  data = NULL,
  geom = "qq_band",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
```

```
  detrend = FALSE,
  identity = FALSE,
  qtype = 7,
  qprobs = c(0.25, 0.75),
  bandType = "pointwise",
  B = 1000,
  conf = 0.95,
  mu = NULL,
  sigma = NULL,
  ...
)
```

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	statistic to use to calculate confidence bands. Should be 'qq_band'.
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.
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().
distribution	Character. Theoretical probability distribution function to use. Do not provide the full distribution function name (e.g., "dnorm"). Instead, just provide its shortened name (e.g., "norm"). If you wish to provide a custom distribution, you may do so by first creating the density, quantile, and random functions following the standard nomenclature from the stats package (i.e., for "custom", create the dcustom, pcustom, qcustom, and rcustom functions).
dparams	List of additional parameters passed on to the previously chosen distribution function. If an empty list is provided (default) then the distributional parameters

	are estimated via MLE. MLE for custom distributions is currently not supported, so you must provide the appropriate `dparams` in that case.
`detrend`	Logical. Should the plot objects be detrended? If `TRUE`, the objects will be detrended according to the reference Q-Q line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from Q-Q points to the reference line.
`identity`	Logical. Should an identity line be used as the reference line used to construct the confidence bands? If `TRUE`, the identity line is used. If `FALSE` (default), the commonly-used Q-Q line that intercepts two data quantiles specified in `qprobs` is used. Please notice that the chosen reference line will also be used for the detrending procedure, if `detrend = TRUE`.
`qtype`	Integer between 1 and 9. Type of the quantile algorithm to be used by the `quantile` function to construct the Q-Q line.
`qprobs`	Numeric vector of length two. Represents the quantiles used by the `quantile` function to construct the Q-Q line.
`bandType`	Character. Either `"pointwise"`, `"boot"`, `"ks"` or `"ts"`, or `"ell"`. `"pointwise"` constructs pointwise confidence bands based on Normal confidence intervals. `"boot"` creates pointwise confidence bands based on a parametric bootstrap; parameters are estimated with MLEs. `"ks"` constructs simultaneous confidence bands based on the Kolmogorov-Smirnov test. `"ts"` constructs tail-sensitive confidence bands, as described by Aldor-Noiman et al. (2013) (also, see 'Note' for limitations). Finally, `"ell"` constructs simultaenous bands using the equal local levels test describe by Weine et al. (2021).
`B`	Integer. If `bandType = "boot"`, then `B` is the number of bootstrap replicates. If `bandType = "ts"`, then `B` is the number of simulated samples.
`conf`	Numerical. Confidence level of the bands.
`mu`	Numerical. Only used if `bandType = "ts"`. Center distributional parameter used to construct the simulated tail-sensitive confidence bands. If either `mu` or `sigma` are `NULL`, then those parameters are estimated using `Qn` and `s_Qn`, respectively.
`sigma`	Numerical. Only used if `bandType = "ts"`. Scale distributional parameter used to construct the simulated tail-sensitive confidence bands. If either `mu` or `sigma` are `NULL`, then those parameters are estimated using robust estimates from the **stats** package.
`...`	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.
`geom`	The geometric object to use to display the data, either as a `ggproto` `Geom` subclass or as a string naming the geom stripped of the `geom_` prefix (e.g. `"point"` rather than `"geom_point"`)

Note

- Tail-sensitive confidence bands are only implemented for Normal Q-Q plots. As a future update, we intend to generalize to other distributions.
- Bootstrap bands are constructed based on a MLE parametric bootstrap. Hence, it is not possible to construct such bands if the sample and theoretical distributions present mismatching supports.

References

- Thode, H. (2002), Testing for Normality. CRC Press, 1st Ed.
- Aldor-Noiman, S. et al. (2013). The Power to See: A New Graphical Test of Normality. The American Statistician. 67:4.
- Weine, E. et al. (2021). Application of Equal Local Levels to Improve Q-Q Plot Testing Bands with R Package qqconf.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100))

# Normal Q-Q plot of Normal data
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_band() +
 stat_qq_line() +
 stat_qq_point()
gg + labs(x = "Theoretical Quantiles", y = "Sample Quantiles")

# Normal Q-Q plot of Normal data with equal local levels (ell) bands
bt <- "ell"
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_band(bandType = bt) +
 stat_qq_line() +
 stat_qq_point() +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

# Exponential Q-Q plot of mean ozone levels (airquality dataset)
di <- "exp"
dp <- list(rate = 1)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_qq_band(distribution = di, dparams = dp) +
 stat_qq_line(distribution = di, dparams = dp) +
 stat_qq_point(distribution = di, dparams = dp) +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

# Detrended Exponential Q-Q plot of mean ozone levels
di <- "exp"
dp <- list(rate = 1)
de <- TRUE
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_qq_band(distribution = di, detrend = de) +
 stat_qq_line(distribution = di, detrend = de) +
 stat_qq_point(distribution = di, detrend = de) +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

## Not run:
```

```
# Normal Q-Q plot of Normal data with bootstrap confidence bands
bt <- "boot"
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_band(bandType = bt) +
 stat_qq_line() +
 stat_qq_point() +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

# Normal Q-Q plot of Normal data with tail-sensitive confidence bands
bt <- "ts"
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_band(bandType = bt) +
 stat_qq_line() +
 stat_qq_point() +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

## End(Not run)
```

`iowa` *2012 BRFSS sample for the state of Iowa*

Description

2012 BRFSS sample for the state of Iowa

Usage

```
data(iowa)
```

Format

A data frame with 7166 observations on 3 variables:

SEX Gender

WTKG3 Weight in kg

HTIN4 Height in inch

Source

https://www.cdc.gov/brfss/annual_data/annual_2012.html

longjump *Men's Olympic Long Jump Qualifiers 2012*

Description

Men's Olympic Long Jump Qualifiers 2012

Usage

```
data(longjump)
```

Format

A data frame with 42 observations on the following 4 variables:

rank Athlete's rank at the qualifying event

name Athlete's name

country Athlete's country of origin

distance Result in meters

Source

https://olympics.com/en/olympic-games/london-2012/results/athletics/long-jump-men

qqplotr *Q-Q and P-P plot extensions for 'ggplot2'*

Description

This package extends some `ggplot2` functionalities by permitting the drawing of both quantile-quantile (Q-Q) and probability-probability (P-P) points, lines, and confidence bands. The functions of this package also allow the detrend adjustment, proposed by Thode (2002), which helps reduce visual bias when assessing those plots.

Details

The functions of this package, presented as `ggplot2` Stats, are divided into two groups: Q-Q and P-P related.

Each of the groups is composed of three Stats: `point`, `line`, and `band`. Those Stats, while independent, complement each other when plotted together.

stat_pp_band *Probability-probability confidence bands*

Description

Draws probability-probability confidence bands.

Usage

```
stat_pp_band(
  mapping = NULL,
  data = NULL,
  geom = "ribbon",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
  bandType = "boot",
  B = 1000,
  conf = 0.95,
  detrend = FALSE,
  ...
)
```

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)).
geom	The geometric object to use to display the data, either as a ggproto Geom subclass or as a string naming the geom stripped of the geom_ prefix (e.g. "point" rather than "geom_point")
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.

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().
distribution	Character. Theoretical probability distribution function to use. Do not provide the full distribution function name (e.g., "dnorm"). Instead, just provide its shortened name (e.g., "norm"). If you wish to provide a custom distribution, you may do so by first creating the density, quantile, and random functions following the standard nomenclature from the stats package (i.e., for "custom", create the dcustom, pcustom, qcustom, and rcustom functions).
dparams	List of additional parameters passed on to the previously chosen distribution function. If an empty list is provided (default) then the distributional parameters are estimated via MLE. MLE for custom distributions is currently not supported, so you must provide the appropriate dparams in that case.
bandType	Character. Only "boot" and "ell" are available for now. "boot" creates pointwise confidence bands based on a bootstrap. "ell" constructs simultaenous bands using the equal local levels test.
B	Integer. If bandType = "boot", then B is the number of bootstrap replicates.
conf	Numerical. Confidence level of the bands.
detrend	Logical. Should the plot objects be detrended? If TRUE, the objects will be detrended according to the default identity P-P line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from P-P points to the reference line.
...	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.

References

- Thode, H. (2002), Testing for Normality. CRC Press, 1st Ed.
- Aldor-Noiman, S. et al. (2013). The Power to See: A New Graphical Test of Normality. The American Statistician. 67:4.
- Weine, E. et al. (2021). Application of Equal Local Levels to Improve Q-Q Plot Testing Bands with R Package qqconf.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100), exp = rexp(100))

# Normal P-P plot of Normal data
```

```
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_band() +
 stat_pp_line() +
 stat_pp_point() +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Shifted Normal P-P plot of Normal data
dp <- list(mean = 1.5)
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_band(dparams = dp, bandType = "ell") +
 stat_pp_line() +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Exponential P-P plot of Exponential data
di <- "exp"
gg <- ggplot(data = smp, mapping = aes(sample = exp)) +
 stat_pp_band(distribution = di, bandType = "ell") +
 stat_pp_line() +
 stat_pp_point(distribution = di) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

## Not run:
# Normal P-P plot of mean ozone levels (airquality dataset)
dp <- list(mean = 38, sd = 27)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_pp_band(dparams = dp) +
 stat_pp_line() +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

## End(Not run)
```

`stat_pp_line` *Probability-probability lines*

Description

Draws a probability-probability line.

Usage

```
stat_pp_line(
  mapping = NULL,
  data = NULL,
```

```
  geom = "path",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  ab = c(0, 1),
  detrend = FALSE,
  ...
)
```

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)).
geom	The geometric object to use to display the data, either as a ggproto Geom subclass or as a string naming the geom stripped of the geom_ prefix (e.g. "point" rather than "geom_point")
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.
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().
ab	Numeric vector of length two. The intercept (a) and slope (b) of the P-P line. Defaults to the identity line (a = 0, b = 1).
detrend	Logical. Should the plot objects be detrended? If TRUE, the objects will be detrended according to the default identity P-P line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from P-P points to the reference line.
...	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.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100))

# Normal P-P plot of Normal data
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_line() +
 stat_pp_point() +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Shifted Normal P-P plot of Normal data
dp <- list(mean = 1.5)
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_line() +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Normal P-P plot of mean ozone levels (airquality dataset)
dp <- list(mean = 38, sd = 27)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_pp_line() +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg
```

---

stat_pp_point *Probability-probability points*

Description

Draws probability-probability points.

Usage

```
stat_pp_point(
  mapping = NULL,
  data = NULL,
  geom = "point",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
  detrend = FALSE,
```

```
  down.sample = NULL,
  ...
)
```

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)).
geom	The geometric object to use to display the data, either as a ggproto Geom subclass or as a string naming the geom stripped of the geom_ prefix (e.g. "point" rather than "geom_point")
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.
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().
distribution	Character. Theoretical probability distribution function to use. Do not provide the full distribution function name (e.g., "dnorm"). Instead, just provide its shortened name (e.g., "norm"). If you wish to provide a custom distribution, you may do so by first creating the density, quantile, and random functions following the standard nomenclature from the stats package (i.e., for "custom", create the dcustom, pcustom, qcustom, and rcustom functions).
dparams	List of additional parameters passed on to the previously chosen distribution function. If an empty list is provided (default) then the distributional parameters are estimated via MLE. MLE for custom distributions is currently not supported, so you must provide the appropriate dparams in that case.
detrend	Logical. Should the plot objects be detrended? If TRUE, the objects will be detrended according to the default identity P-P line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from P-P points to the reference line.

down.sample	Integer specifying how many points you want to sample in a reduced sample (i.e., a down sample). The default value is NULL indicating no downsampling.
...	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.

References

- Thode, H. (2002), Testing for Normality. CRC Press, 1st Ed.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100))

# Normal P-P plot of Normal data
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_point() +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Shifted Normal P-P plot of Normal data
dp <- list(mean = 1.5)
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg

# Normal P-P plot of mean ozone levels (airquality dataset)
dp <- list(mean = 38, sd = 27)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_pp_point(dparams = dp) +
 labs(x = "Probability Points", y = "Cumulative Probability")
gg
```

---

stat_qq_line *Quantile-quantile lines*

Description

Draws a quantile-quantile line, with an additional detrend option.

Usage

```
stat_qq_line(
  mapping = NULL,
  data = NULL,
```

```
  geom = "path",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
  detrend = FALSE,
  identity = FALSE,
  qtype = 7,
  qprobs = c(0.25, 0.75),
  ...
)
```

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)).
geom	The geometric object to use to display the data, either as a ggproto Geom subclass or as a string naming the geom stripped of the geom_ prefix (e.g. "point" rather than "geom_point")
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.
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().
distribution	Character. Theoretical probability distribution function to use. Do not provide the full distribution function name (e.g., "dnorm"). Instead, just provide its shortened name (e.g., "norm"). If you wish to provide a custom distribution, you may do so by first creating the density, quantile, and random functions following

	the standard nomenclature from the stats package (i.e., for "custom", create the dcustom, pcustom, qcustom, and rcustom functions).
dparams	List of additional parameters passed on to the previously chosen distribution function. If an empty list is provided (default) then the distributional parameters are estimated via MLE. MLE for custom distributions is currently not supported, so you must provide the appropriate dparams in that case.
detrend	Logical. Should the plot objects be detrended? If TRUE, the objects will be detrended according to the reference Q-Q line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from Q-Q points to the reference line.
identity	Logical. Should an identity line be used as the reference line? If TRUE, the identity line is used. If FALSE (default), the commonly-used Q-Q line that intercepts two data quantiles specified in qprobs is used. Please notice that the chosen reference line will also be used for the detrending procedure, if detrend = TRUE.
qtype	Integer between 1 and 9. Only used if detrend = TRUE and identity = FALSE. Type of the quantile algorithm to be used by the quantile function to construct the Q-Q line.
qprobs	Numeric vector of length two. Only used if detrend = TRUE and identity = FALSE. Represents the quantiles used by the quantile function to construct the Q-Q line.
...	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.

References

- Thode, H. (2002), Testing for Normality. CRC Press, 1st Ed.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100))

# Normal Q-Q plot of Normal data
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_line() +
 stat_qq_point() +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

# Exponential Q-Q plot of mean ozone levels (airquality dataset)
di <- "exp"
dp <- list(rate = 1)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_qq_line(distribution = di, dparams = dp) +
 stat_qq_point(distribution = di, dparams = dp) +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
```

```
gg

# Detrended Exponential Q-Q plot of mean ozone levels
di <- "exp"
dp <- list(rate = 1)
de <- TRUE
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_qq_line(distribution = di, detrend = de) +
 stat_qq_point(distribution = di, detrend = de) +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg
```

`stat_qq_point` *Quantile-quantile points*

Description

Draws quantile-quantile points, with an additional detrend option.

Usage

```
stat_qq_point(
  mapping = NULL,
  data = NULL,
  geom = "point",
  position = "identity",
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  distribution = "norm",
  dparams = list(),
  detrend = FALSE,
  identity = FALSE,
  qtype = 7,
  qprobs = c(0.25, 0.75),
  down.sample = NULL,
  ...
)
```

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)).
geom	The geometric object to use to display the data, either as a ggproto Geom subclass or as a string naming the geom stripped of the geom_ prefix (e.g. "point" rather than "geom_point")
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.
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().
distribution	Character. Theoretical probability distribution function to use. Do not provide the full distribution function name (e.g., "dnorm"). Instead, just provide its shortened name (e.g., "norm"). If you wish to provide a custom distribution, you may do so by first creating the density, quantile, and random functions following the standard nomenclature from the stats package (i.e., for "custom", create the dcustom, pcustom, qcustom, and rcustom functions).
dparams	List of additional parameters passed on to the previously chosen distribution function. If an empty list is provided (default) then the distributional parameters are estimated via MLE. MLE for custom distributions is currently not supported, so you must provide the appropriate dparams in that case.
detrend	Logical. Should the plot objects be detrended? If TRUE, the objects will be detrended according to the reference Q-Q line. This procedure was described by Thode (2002), and may help reducing visual bias caused by the orthogonal distances from Q-Q points to the reference line.
identity	Logical. Only used if detrend = TRUE. Should an identity line be used as the reference line for the plot detrending? If TRUE, the points will be detrended according to the reference identity line. If FALSE (default), the commonly-used Q-Q line that intercepts two data quantiles specified in qprobs is used.
qtype	Integer between 1 and 9. Only used if detrend = TRUE and identity = FALSE. Type of the quantile algorithm to be used by the quantile function to construct the Q-Q line.
qprobs	Numeric vector of length two. Only used if detrend = TRUE and identity = FALSE. Represents the quantiles used by the quantile function to construct the Q-Q line.

down.sample	Integer specifying how many points you want to sample in a reduced sample (i.e., a down sample). The default value is NULL indicating no downsampling.
...	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.

References

- Thode, H. (2002), Testing for Normality. CRC Press, 1st Ed.

Examples

```
# generate random Normal data
set.seed(0)
smp <- data.frame(norm = rnorm(100))

# Normal Q-Q plot of simulated Normal data
gg <- ggplot(data = smp, mapping = aes(sample = norm)) +
 stat_qq_point() +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg

# Exponential Q-Q plot of mean ozone levels (airquality dataset)
di <- "exp"
dp <- list(rate = 1)
gg <- ggplot(data = airquality, mapping = aes(sample = Ozone)) +
 stat_qq_point(distribution = di, dparams = dp) +
 labs(x = "Theoretical Quantiles", y = "Sample Quantiles")
gg
```

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