

# Package ‘ConfidenceEllipse’

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**Type** Package

**Title** Computation of 2D and 3D Elliptical Joint Confidence Regions

**Version** 1.0.0

**Maintainer** Christian L. Goueguel <christian.goueguel@gmail.com>

**Description** Computing elliptical joint confidence regions at a specified confidence level. It provides the flexibility to estimate either classical or robust confidence regions, which can be visualized in 2D or 3D plots. The classical approach assumes normality and uses the mean and covariance matrix to define the confidence regions. Alternatively, the robustified version employs estimators like minimum covariance determinant (MCD) and M-estimator, making them less sensitive to outliers and departures from normality. Furthermore, the functions allow users to group the dataset based on categorical variables and estimate separate confidence regions for each group. This capability is particularly useful for exploring potential differences or similarities across subgroups within a dataset. Varmuza and Filzmoser (2009, ISBN:978-1-4200-5947-2). Johnson and Wichern (2007, ISBN:0-13-187715-1). Raymaekers and Rousseeuw (2019) <[DOI:10.1080/00401706.2019.1677270](https://doi.org/10.1080/00401706.2019.1677270)>.

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**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.1

**Imports** cellWise, dplyr, forcats, ggplot2, magrittr, pcaPP, purrr, rgl, rlang, stats, tibble, tidyr, tidyselect

**URL** <https://christiangoueguel.github.io/ConfidenceEllipse/>,  
<https://github.com/ChristianGoueguel/ConfidenceEllipse>

**Suggests** knitr, rmarkdown, spelling, testthat (>= 3.0.0)

**VignetteBuilder** knitr

**Depends** R (>= 2.10)

**Language** en-US

**Config/testthat/edition** 3

**BugReports** <https://github.com/ChristianGoueguel/ConfidenceEllipse/issues>

**NeedsCompilation** no

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**Repository** CRAN

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confidence_ellipse	<i>Confidence Ellipse Coordinates</i>
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### Description

Compute the coordinate points of confidence ellipses at a specified confidence level.

### Usage

```
confidence_ellipse(
  .data,
  x,
  y,
  .group_by = NULL,
  conf_level = 0.95,
  robust = FALSE
)
```

### Arguments

.data	data frame or tibble.
x	column name for the x-axis variable.
y	column name for the y-axis variable.
.group_by	column name for the grouping variable (NULL by default). Note that this grouping variable must be a factor.
conf_level	confidence level for the ellipse (0.95 by default).
robust	optional (FALSE by default). When set to TRUE, it indicates that robust estimation method is employed to calculate the coordinates of the ellipse. The location is the 1-step M-estimator with the biweight psi function. The scale is the Minimum Covariance Determinant (MCD) estimator. Raymaekers and Rousseeuw (2019).

**Value**

Data frame of the coordinates points.

**Author(s)**

Christian L. Goueguel

**Examples**

```
# Data
data("glass", package = "ConfidenceEllipse")
# Confidence ellipse
ellipse <- confidence_ellipse(.data = glass, x = SiO2, y = Na2O)
ellipse_grp <- confidence_ellipse(
  .data = glass,
  x = SiO2,
  y = Na2O,
  .group_by = glassType
)
```

---

confidence\_ellipsoid *Confidence Ellipsoid Coordinates*

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**Description**

Compute the coordinate points of confidence ellipsoids at a specified confidence level.

**Usage**

```
confidence_ellipsoid(
  .data,
  x,
  y,
  z,
  .group_by = NULL,
  conf_level = 0.95,
  robust = FALSE
)
```

**Arguments**

<code>.data</code>	data frame or tibble.
<code>x</code>	column name for the x-axis variable.
<code>y</code>	column name for the y-axis variable.
<code>z</code>	column name for the z-axis variable.

<code>.group_by</code>	column name for the grouping variable (NULL by default). Note that this grouping variable must be a factor.
<code>conf_level</code>	confidence level for the ellipsoid (0.95 by default).
<code>robust</code>	optional (FALSE by default). When set to TRUE, it indicates that robust estimation method is employed to calculate the coordinates of the ellipsoid. The location is the 1-step M-estimator with the biweight psi function. The scale is the Minimum Covariance Determinant (MCD) estimator. Raymaekers and Rousseeuw (2019).

**Value**

Data frame of the coordinate points.

**Author(s)**

Christian L. Goueguel

**Examples**

```
# Data
data("glass", package = "ConfidenceEllipse")
# Confidence ellipsoid
ellipsoid <- confidence_ellipsoid(.data = glass, x = SiO2, y = Na2O, z = Fe2O3)
ellipsoid_grp <- confidence_ellipsoid(
  .data = glass,
  x = SiO2,
  y = Na2O,
  z = Fe2O3,
  .group_by = glassType
)
```

---

glass

*Glass Vessels Data*

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**Description**

The dataset is comprised of 13 different measurements for 180 archaeological glass vessels from different groups (Janssen, K.H.A., De Raedt, I., Schalm, O., Veeckman, J.: *Microchim. Acta* 15 (suppl.) (1998) 253-267. Compositions of 15th - 17th century archaeological glass vessels excavated in Antwerp.).

**Usage**

glass

**Format**

Data frame of 180 rows and 14 columns.

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