

# Package: eikosograms (via r-universe)

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**Type** Package

**Title** The Picture of Probability

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**URL** <https://github.com/rwoldford/eikosograms>

**Description** An eikosogram (ancient Greek for probability picture) divides the unit square into rectangular regions whose areas, sides, and widths, represent various probabilities associated with the values of one or more categorical variates. Rectangle areas are joint probabilities, widths are always marginal (though possibly joint margins, i.e. marginal joint distributions of two or more variates), and heights of rectangles are always conditional probabilities. Eikosograms embed the rules of probability and are useful for introducing elementary probability theory, including axioms, marginal, conditional, and joint probabilities, and their relationships (including Bayes theorem as a completely trivial consequence). They are markedly superior to Venn diagrams for this purpose, especially in distinguishing probabilistic independence, mutually exclusive events, coincident events, and associations. They also are useful for identifying and understanding conditional independence structure. As data analysis tools, eikosograms display categorical data in a manner similar to Mosaic plots, especially when only two variates are involved (the only case in which they are essentially identical, though eikosograms purposely disallow spacing between rectangles). Unlike Mosaic plots, eikosograms do not alternate axes as each new categorical variate (beyond two) is introduced. Instead, only one categorical variate, designated the ``response'', presents on the vertical axis and all others, designated the ``conditioning'' variates, appear on the horizontal. In this way,

conditional probability appears only as height and marginal probabilities as widths. The eikosogram is therefore much better suited to a response model analysis (e.g. logistic model) than is a Mosaic plot. Mosaic plots are better suited to log-linear style modelling as in discrete multivariate analysis. Of course, eikosograms are also suited to discrete multivariate analysis with each variate in turn appearing as the response. This makes it better suited than Mosaic plots to discrete graphical models based on conditional independence graphs (i.e. "Bayesian Networks" or "BayesNets"). The eikosogram and its superiority to Venn diagrams in teaching probability is described in W.H. Cherry and R.W. Oldford (2003) <https://math.uwaterloo.ca/~rwoldfor/papers/eikosograms/paper.pdf>, its value in exploring conditional independence structure and relation to graphical and log-linear models is described in R.W. Oldford (2003) <https://math.uwaterloo.ca/~rwoldfor/papers/eikosograms/independence/paper.pdf>, and a number of problems, puzzles, and paradoxes that are easily explained with eikosograms are given in R.W. Oldford (2003) <https://math.uwaterloo.ca/~rwoldfor/papers/eikosograms/examples/paper.pdf>.

**License** GPL-3

**Depends** R (>= 3.1.0)

**Imports** plyr, grid

**LazyLoad** yes

**LazyData** true

**BugReports** <https://github.com/rwoldford/eikosograms/issues>

**Encoding** UTF-8

**RoxygenNote** 6.1.1

**NeedsCompilation** no

**Suggests** knitr, rmarkdown, gridExtra

**VignetteBuilder** knitr, rmarkdown

**Repository** <https://rwoldford.r-universe.dev>

**RemoteUrl** <https://github.com/rwoldford/eikosograms>

**RemoteRef** HEAD

**RemoteSha** 55b2b1b39b6296a747ebc2089e46316fde321dac

## Contents

|                         |   |
|-------------------------|---|
| eikos . . . . .         | 3 |
| eikos.default . . . . . | 5 |
| eikos.formula . . . . . | 6 |

|                          |    |
|--------------------------|----|
| eikos_data . . . . .     | 9  |
| eikos_legend . . . . .   | 9  |
| eikos_x_labels . . . . . | 10 |
| eikos_x_probs . . . . .  | 10 |
| eikos_y_labels . . . . . | 11 |
| eikos_y_probs . . . . .  | 11 |

|              |           |
|--------------|-----------|
| <b>Index</b> | <b>13</b> |
|--------------|-----------|

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|       |  |
|-------|--|
| eikos | <i>Generic method for creating an eikosogram</i> |
|-------|--|

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## Description

Generic method for creating an eikosogram

## Usage

```
eikos(y, x = NULL, data = NULL, marginalize = NULL, main = "",
      main_size = 16, ylabs = TRUE, ylab_rot = 0, yname_size = 12,
      yvals_size = 12, yaxs = TRUE, yprobs = NULL, yprobs_size = 8,
      xlabs = TRUE, xlab_rot = 0, xname_size = 12, xvals_size = 12,
      xaxs = TRUE, xprobs = NULL, xprobs_size = 8,
      vertical_xprobs = TRUE, ispace = list(bottom = 8, left = 2, top = 2,
      right = 5), legend = FALSE, col = NULL, bottomcol = "steelblue",
      topcol = "snow2", lcol = "black", draw = TRUE, newpage = TRUE,
      lock_aspect = TRUE)
```

## Arguments

|             |  |
|-------------|--|
| y           | Either the name of a variable in the data set (eikos.default), or a formula of such variables (eikos.formula). |
| x           | name(s) of any conditional variable(s) (horizontal axis). Should be null if formula given.                     |
| data        | data frame or table  |
| marginalize | variable(s) to marginalize on, or NULL if none. Marginalized variables still appear in plot.                   |
| main        | title of plot  |
| main_size   | font size of title (in points)   |
| ylabs       | logical, whether y labels should appear or not.  |
| ylab_rot    | rotation of y labels   |
| yname_size  | font size of vertical axis names (in points)   |
| yvals_size  | font size of labels for values of y variable (in points)   |
| yaxs        | logical, whether y axis should appear or not.  |

|                 |  |
|-----------------|--|
| yprobs          | probabilities to be shown on y-axis. NULL if they should be calculated from the data.  |
| yprobs_size     | font size of labels for horizontal probabilities (in points)   |
| xlabs           | logical, whether x labels should appear or not.  |
| xlab_rot        | rotation of x labels   |
| xname_size      | font size of horizontal axis names (in points)   |
| xvals_size      | font size of labels for values of x variables (in points)  |
| xaxs            | logical, whether x axis should appear or not.  |
| xprobs          | probabilities to be shown on x-axis. NULL if they should be calculated from the data.  |
| xprobs_size     | font size of labels for horizontal probabilities (in points)   |
| vertical_xprobs | logical, whether probabilities on x axis should be rotated vertically.   |
| ispace          | list of four items (bottom, left, top, right) indicating the margins separating the text around the diagram. Each value is a positive integer giving a measure in "points".                |
| legend          | logical, whether to include legend   |
| col             | a vector of colours to match the response values. If NULL (the default), the colours are constructed as a smooth transition from 'bottomcol' to 'topcol' via 'grDevices::colorRampPalette' |
| bottomcol       | bottom colour  |
| topcol          | top colour   |
| lcol            | colour of lines  |
| draw            | logical, whether to draw eikosogram.   |
| newpage         | logical, whether to draw on a newpage.   |
| lock_aspect     | logical, whether to force entire plot to 1:1 aspect ratio.   |

### See Also

[eikos.default](#)

[eikos.formula](#)

### Examples

```
eikos("Hair", "Eye", data=HairEyeColor, legend = TRUE)
eikos(gear ~ cyl, data = mtcars)
eikos(Admit ~ Gender + Dept, data = UCBA admissions,
      yaxs = FALSE, xaxs = FALSE,
      lock_aspect = FALSE,
      xlab_rot = 90, xvals_size = 8,
      ispace = list(bottom = 15))
```

---

|               |                                |
|---------------|--------------------------------|
| eikos.default | <i>Create a new eikosogram</i> |
|---------------|--------------------------------|

---

## Description

Return a grid graphic object (grob) and draw an eikosogram if draw = TRUE.

## Usage

```
## Default S3 method:
eikos(y, x = NULL, data = NULL, marginalize = NULL,
      main = "", main_size = 16, ylabs = TRUE, ylab_rot = 0,
      yname_size = 12, yvals_size = 12, yaxs = TRUE, yprobs = NULL,
      yprobs_size = 8, xlabs = TRUE, xlab_rot = 0, xname_size = 12,
      xvals_size = 12, xaxs = TRUE, xprobs = NULL, xprobs_size = 8,
      vertical_xprobs = TRUE, ispace = list(bottom = 8, left = 2, top = 2,
      right = 5), legend = FALSE, col = NULL, bottomcol = "steelblue",
      topcol = "snow2", lcol = "black", draw = TRUE, newpage = TRUE,
      lock_aspect = TRUE)
```

## Arguments

|             |  |
|-------------|--|
| y           | Either the name of a variable in the data set (eikos.default), or a formula of such variables (eikos.formula). |
| x           | name(s) of any conditional variable(s) (horizontal axis). Should be null if formula given.                     |
| data        | data frame or table  |
| marginalize | variable(s) to marginalize on, or NULL if none. Marginalized variables still appear in plot.                   |
| main        | title of plot  |
| main_size   | font size of title (in points)   |
| ylabs       | logical, whether y labels should appear or not.  |
| ylab_rot    | rotation of y labels   |
| yname_size  | font size of vertical axis names (in points)   |
| yvals_size  | font size of labels for values of y variable (in points)   |
| yaxs        | logical, whether y axis should appear or not.  |
| yprobs      | probabilities to be shown on y-axis. NULL if they should be calculated from the data.                          |
| yprobs_size | font size of labels for horizontal probabilities (in points)   |
| xlabs       | logical, whether x labels should appear or not.  |
| xlab_rot    | rotation of x labels   |
| xname_size  | font size of horizontal axis names (in points)   |

|                 |  |
|-----------------|--|
| xvals_size      | font size of labels for values of x variables (in points)  |
| xaxis           | logical, whether x axis should appear or not.  |
| xprobs          | probabilities to be shown on x-axis. NULL if they should be calculated from the data.  |
| xprobs_size     | font size of labels for horizontal probabilities (in points)   |
| vertical_xprobs | logical, whether probabilities on x axis should be rotated vertically.   |
| ispace          | list of four items (bottom, left, top, right) indicating the margins separating the text around the diagram. Each value is a positive integer giving a measure in "points".                |
| legend          | logical, whether to include legend   |
| col             | a vector of colours to match the response values. If NULL (the default), the colours are constructed as a smooth transition from 'bottomcol' to 'topcol' via 'grDevices::colorRampPalette' |
| bottomcol       | bottom colour  |
| topcol          | top colour   |
| lcol            | colour of lines  |
| draw            | logical, whether to draw eikosogram.   |
| newpage         | logical, whether to draw on a newpage.   |
| lock_aspect     | logical, whether to force entire plot to 1:1 aspect ratio.   |

### Examples

```
eikos("Hair", "Eye", data=HairEyeColor, legend = TRUE)
eikos("Hair", "Eye", data=HairEyeColor,
      legend = TRUE, ylabs = FALSE,
      yname_size = 16, yvals_size = 8)
eikos("Hair", "Eye", data=HairEyeColor,
      legend = TRUE, ylabs = FALSE,
      yprobs = seq(0.2, 1, .2))
eikos("Eye", "Hair", data=HairEyeColor, yprobs = seq(0,1,0.25),
      yname_size = 20, xname_size = 20,
      col = c("sienna4", "steelblue", "darkkhaki", "springgreen3"),
      lcol = "grey10",
      lock_aspect = FALSE)
```

---

|               |   |
|---------------|---|
| eikos.formula | <i>Draw eikosogram using a formula to identify response and conditioning variates</i> |
|---------------|---|

---

### Description

Draw eikosogram using a formula to identify response and conditioning variates

**Usage**

```
## S3 method for class 'formula'
eikos(y, x = NULL, data = NULL, marginalize = NULL,
      main = "", main_size = 16, ylabs = TRUE, ylab_rot = 0,
      yname_size = 12, yvals_size = 12, yaxs = TRUE, yprobs = NULL,
      yprobs_size = 8, xlabs = TRUE, xlab_rot = 0, xname_size = 12,
      xvals_size = 12, xaxs = TRUE, xprobs = NULL, xprobs_size = 8,
      vertical_xprobs = TRUE, ispace = list(bottom = 8, left = 2, top = 2,
      right = 5), legend = FALSE, col = NULL, bottomcol = "steelblue",
      topcol = "snow2", lcol = "black", draw = TRUE, newpage = TRUE,
      lock_aspect = TRUE)
```

**Arguments**

|                 |  |
|-----------------|--|
| y               | Either the name of a variable in the data set (eikos.default), or a formula of such variables (eikos.formula). |
| x               | name(s) of any conditional variable(s) (horizontal axis). Should be null if formula given.                     |
| data            | data frame or table  |
| marginalize     | variable(s) to marginalize on, or NULL if none. Marginalized variables still appear in plot.                   |
| main            | title of plot  |
| main_size       | font size of title (in points)   |
| ylabs           | logical, whether y labels should appear or not.  |
| ylab_rot        | rotation of y labels   |
| yname_size      | font size of vertical axis names (in points)   |
| yvals_size      | font size of labels for values of y variable (in points)   |
| yaxs            | logical, whether y axis should appear or not.  |
| yprobs          | probabilities to be shown on y-axis. NULL if they should be calculated from the data.                          |
| yprobs_size     | font size of labels for horizontal probabilities (in points)   |
| xlabs           | logical, whether x labels should appear or not.  |
| xlab_rot        | rotation of x labels   |
| xname_size      | font size of horizontal axis names (in points)   |
| xvals_size      | font size of labels for values of x variables (in points)  |
| xaxs            | logical, whether x axis should appear or not.  |
| xprobs          | probabilities to be shown on x-axis. NULL if they should be calculated from the data.                          |
| xprobs_size     | font size of labels for horizontal probabilities (in points)   |
| vertical_xprobs | logical, whether probabilities on x axis should be rotated vertically.   |

|             |  |
|-------------|--|
| ispace      | list of four items (bottom, left, top, right) indicating the margins separating the text around the diagram. Each value is a positive integer giving a measure in "points".                |
| legend      | logical, whether to include legend   |
| col         | a vector of colours to match the response values. If NULL (the default), the colours are constructed as a smooth transition from 'bottomcol' to 'topcol' via 'grDevices::colorRampPalette' |
| bottomcol   | bottom colour  |
| topcol      | top colour   |
| lcol        | colour of lines  |
| draw        | logical, whether to draw eikosogram.   |
| newpage     | logical, whether to draw on a newpage.   |
| lock_aspect | logical, whether to force entire plot to 1:1 aspect ratio.   |

### Examples

```
eikos(Eye ~ Hair + Sex, data=HairEyeColor)
eikos(Hair ~ ., data=HairEyeColor,
      yaxs = FALSE, ylabs = FALSE,
      legend = TRUE,
      col = c("black", "sienna4",
              "orangered", "lightgoldenrod" ))
eikos(Hair ~ ., data=HairEyeColor, xlab_rot = 30,
      yprobs = seq(0.1, 1, 0.1),
      yvals_size = 10,
      xvals_size = 8,
      ispace = list(bottom = 10),
      bottomcol = "grey30", topcol = "grey70",
      lcol = "white")
eikos(Hair ~ ., data=HairEyeColor, xlab_rot = 30,
      marginalize = "Eye",
      yvals_size = 10,
      xvals_size = 8,
      ispace = list(bottom = 10),
      bottomcol = "grey30", topcol = "grey70",
      lcol = "white")
eikos(Hair ~ ., data=HairEyeColor, xlab_rot = 30,
      marginalize = c("Eye", "Sex"),
      yvals_size = 10,
      xvals_size = 8,
      ispace = list(bottom = 10),
      bottomcol = "grey30", topcol = "grey70",
      lcol = "white")
```



---

|            |                                     |
|------------|-------------------------------------|
| eikos_data | <i>Create eikosogram data frame</i> |
|------------|-------------------------------------|

---

**Description**

Eikos helper function used to convert data.

**Usage**

```
eikos_data(y, x, data, marginalize = NULL)
```

**Arguments**

|             |   |
|-------------|---|
| y           | response variable.                                |
| x           | conditional variables.                            |
| data        | data frame or table to be converted.              |
| marginalize | name of variable to marginalize on, NULL if none. |

---

|              |                                 |
|--------------|---------------------------------|
| eikos_legend | <i>Create eikosogram legend</i> |
|--------------|---------------------------------|

---

**Description**

Eikos helper function used to create legend.

**Usage**

```
eikos_legend(labels, title = NULL, yname_size = 12, yvals_size = 12,
  col, margin = unit(2, "points"), lcol = "black")
```

**Arguments**

|            |  |
|------------|--|
| labels     | labels to be included in legend                          |
| title      | if non-NULL a string to give as the legend title         |
| yname_size | font size of vertical axis names (in points)             |
| yvals_size | font size of labels for values of y variable (in points) |
| col        | colours od   |
| margin     | unit specifying margin between legend entries            |
| lcol       | line colour  |

---

eikos\_x\_labels            *eikos helper function. Returns grob with x axis labels.*

---

### Description

eikos helper function. Returns grob with x axis labels.

### Usage

```
eikos_x_labels(x, data, margin = unit(10, "points"), xname_size = 12,
              xvals_size = 10, lab_rot = 0)
```

### Arguments

|            |   |
|------------|---|
| x          | vector of conditional variables                                     |
| data       | data frame from eikos_data.   |
| margin     | unit specifying margin  |
| xname_size | font size for x axis variable names (in points)                     |
| xvals_size | font size of labels for values of x variables (in points)           |
| lab_rot    | integer indicating the rotation of the label, default is horizontal |

### Value

gList with x labels and x-axis names as grob frames.

---

eikos\_x\_probs            *Create grob with eikosogram x-axis probabilities*

---

### Description

Creates x axis grob to be placed on eikosogram. Called by eikos functions.

### Usage

```
eikos_x_probs(data, xprobs = NULL, xprobs_size = 8, margin = unit(2,
                        "points"), rotate = TRUE)
```

### Arguments

|             |   |
|-------------|---|
| data        | data frame from eikos_data object   |
| xprobs      | vector of probabilities to be shown. NULL if they should be calculated from the data. |
| xprobs_size | font size of labels for horizontal probabilities (in points)                          |
| margin      | unit specifying margin between y axis and eikosogram                                  |
| rotate      | logical, whether probabilities should be rotated vertically.                          |

**Value**

textGrob with x-axis probabilities.

---

|                |  |
|----------------|--|
| eikos_y_labels | <i>eikos helper function. Returns grob with y axis labels.</i> |
|----------------|--|

---

**Description**

eikos helper function. Returns grob with y axis labels.

**Usage**

```
eikos_y_labels(y, data, margin = unit(2, "points"), yname_size = 12,
  yvals_size = 10, lab_rot = 0)
```

**Arguments**

|            |   |
|------------|---|
| y          | response variable   |
| data       | data frame from eikos_data.   |
| margin     | unit specifying margin  |
| yname_size | font size for y axis variable names (in points)                     |
| yvals_size | font size of labels for values of y variable (in points)            |
| lab_rot    | integer indicating the rotation of the label, default is horizontal |

**Value**

gList with x labels and x-axis names as grob frames.  
grobFrame with response variable labels and axis text

---

|               |   |
|---------------|---|
| eikos_y_probs | <i>Create grob with eikosogram y-axis probabilities</i> |
|---------------|---|

---

**Description**

Creates y axis grob to be placed on eikosogram. Called by eikos functions.

**Usage**

```
eikos_y_probs(data, yprobs, yprobs_size = 8, margin = unit(2,
  "points"))
```

**Arguments**

|                          |   |
|--------------------------|---|
| <code>data</code>        | data frame from <code>eikos_data</code> object  |
| <code>yprobs</code>      | vector of probabilities to be shown. NULL if they should be calculated from the data. |
| <code>yprobs_size</code> | font size of labels for horizontal probabilities (in points)                          |
| <code>margin</code>      | unit specifying margin between y axis and eikosogram                                  |

**Value**

textGrob with y-axis probabilities.

# Index

eikos, [3](#)  
eikos.default, [4, 5](#)  
eikos.formula, [4, 6](#)  
eikos\_data, [9](#)  
eikos\_legend, [9](#)  
eikos\_x\_labels, [10](#)  
eikos\_x\_probs, [10](#)  
eikos\_y\_labels, [11](#)  
eikos\_y\_probs, [11](#)