

# Package ‘xdvir’

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**Type** Package

**Title** Render 'LaTeX' in Plots

**Version** 0.1-3

**Maintainer** Paul Murrell <paul@stat.auckland.ac.nz>

**Description** High-level functions to render 'LaTeX' fragments in plots, including as labels and data symbols in 'ggplot2' plots, plus low-level functions to author 'LaTeX' fragments (to produce 'LaTeX' documents), typeset 'LaTeX' documents (to produce 'DVI' files), read 'DVI' files (to produce ``DVI" objects), and render ``DVI" objects.

**Depends** R (>= 4.3.0)

**SystemRequirements** freetype2

**Imports** grDevices, grid, hexView (>= 0.3-4), tinytex, rlang, systemfonts (>= 1.1.0)

**Suggests** gridBezier, knitr, rmarkdown, lattice, gridGraphics, gggrid, ggplot2, cli

**VignetteBuilder** knitr

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**License** GPL-3

**NeedsCompilation** yes

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---

author	<i>Generate a LaTeX Document</i>
--------	----------------------------------

---

## Description

Generate a LaTeX document from a LaTeX fragment.

## Usage

```
author(tex,
       width=NA,
       engine=getOption("xdvir.engine"),
       packages=NULL)
```

## Arguments

tex	LaTeX code. See Details.
width	Either NA or a numeric value. The latter is assumed to be a number of inches.
engine	The TeX engine that should be used for authoring. May be the name of a TeX engine (character) or a "TeXengine" object.
packages	The LaTeX packages to be used.

## Details

author() can be used to generate a complete LaTeX document from a LaTeX fragment, either as a character vector or an external file.

## Value

A "LaTeXdocument" object.

**Author(s)**

Paul Murrell

**See Also**[LaTeXpackage.](#)**Examples**

```
author("this is a test")
```

---

 element\_latex

*ggplot2 Theme Element Supporting Latex Syntax*


---

**Description**

This theme element is an alternative to `ggplot2::element_text()` for producing labels from LaTeX fragments.

Both `hjust` and `vjust` can be character values: one of "left", "bbleft", "centre", "center", "right", "bbright" for horizontal justification; and one of "bottom", "baseline", "centre", "center", or "top" for vertical justification.

**Usage**

```
element_latex(family=NULL,
              fontface=NULL,
              colour=NULL,
              size=NULL,
              hjust=NULL, vjust=NULL,
              angle=NULL,
              lineheight=NULL,
              color=NULL,
              margin=NULL,
              width=NULL,
              packages=NULL,
              engine=getOption("xdvir.engine"),
              rotate_margins=FALSE,
              inherit.blank=FALSE)
```

**Arguments**

family	The default font family.
fontface	The default font face.
colour, color	The default text colour.
size	The default font size.
hjust	Horizontal justification. Typically in [0, 1], but see Details.)

vjust	Vertical justification. Typically in [0, 1], but see Details.)
angle	Angle (in [0, 360])
lineheight	The default lineheight.
margin	The margin around the text.
width	Either NA or a numeric value or a unit specifying the width for typesetting. NA means the natural width of the label.
packages	The LaTeX packages to be used. May be the name of a LaTeX package (character) or a "LaTeXpackage" object.
engine	The TeX engine that should be used to render the LaTeX. May be the name of a TeX engine (character) or a "TeXengine" object.
rotate_margins	Whether margins should follow the orientation of the text.
inherit.blank	Should this element inherit the existence of an element_blank among its parents? If TRUE the existence of a blank element among its parents will cause this element to be blank as well. If FALSE any blank parent element will be ignored when calculating final element state.

### Value

An element\_latex object that can be used in place of element\_text in ggplot2 theme specifications

### Examples

```
## Not run:
# Requires TeX installation and 'ggplot2'
require(ggplot2)
ggplot(mtcars) +
  geom_point(aes(displ, mpg)) +
  ggtitle("\textit{The} \texttt{mtcars} data set") +
  theme(plot.title=element_latex())

## End(Not run)
```

---

fontspec Package

*LaTeX Package fontspec.*

---

### Description

Define a LaTeXPackage for the LaTeX fontspec package.

### Usage

```
fontspecPackage(font=NULL, name=font)
```

**Arguments**

font	The name of a font to use as the main font. See details.
name	The name of the resulting package.

**Details**

This function creates a "LaTeXpackage" object that provides support for the LaTeX fontspec package.

The font argument provides some convenience for setting the main font to be used. The font can be the common name of a system font or a complete path to the font file.

For more complex situations, fontspec commands can be added to the LaTeX code that is sent to functions like [author](#) and [grid.latex](#) (see the Examples).

A predefined package, with no main font defined, is pre-registered under the name "fontspec".

**Value**

A "LaTeXpackage" object.

**Author(s)**

Paul Murrell

**Examples**

```
cat(author("test", packages="fontspec"), sep="\n")
cat(author("test", packages=fontspecPackage(font="Courier")), sep="\n")
tex <- "\\setmainfont{fontname.ttf}[Path=/path/to/font/]\ntest"
cat(author(tex, packages="fontspec"), sep="\n")
```

---

geom\_latex

*Latex Data Symbols in ggplot2 Plots*

---

**Description**

This geom draws text labels similar to `ggplot2::geom_text()`, but with the text interpreted as a LaTeX fragment. Most styling parameters can be used as aesthetics and can be applied separately to each text label drawn.

**Usage**

```
geom_latex(mapping=NULL, data=NULL, stat="identity",
           position="identity", ...,
           nudge_x=0, nudge_y=0,
           width=NA,
           dpi=NA, packages=NULL,
           engine=getOption("xdvir.engine"),
           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> ).
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. Cannot be jointly specified with <code>nudge_x</code> or <code>nudge_y</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> .
nudge_x	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> .
nudge_y	Horizontal and vertical adjustment to nudge labels by. Useful for offsetting text from points, particularly on discrete scales. Cannot be jointly specified with <code>position</code> .
width	Either <code>NA</code> or a numeric value or a unit specifying the width for typesetting. <code>NA</code> means the natural width of the label.
dpi	Resolution (dots per inch).
packages	The LaTeX packages to be used. May be the name of a LaTeX package (character) or a "LaTeXpackage" object.
engine	The TeX engine that should be used to render the LaTeX. May be the name of a TeX engine (character) or a "TeXengine" object.
na.rm	If <code>FALSE</code> , the default, missing values are removed with a warning. If <code>TRUE</code> , missing values are silently removed.
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> .

**Value**

A `ggplot2` layer that can be added to a plot created with `ggplot2::ggplot()`.

## Aesthetics

`geom_latex()` understands the following aesthetics (required aesthetics are in bold; select aesthetics are annotated):

- `x`
- `y`
- `label`
- `alpha`
- `angle`
- `colour` Default color of label text and label outline.
- `family`
- `group`
- `hjust`
- `lineheight`
- `size` Default font size of label text.
- `vjust`

## Examples

```
## Not run:  
# Requires TeX installation and 'ggplot2'  
require(ggplot2)  
mtcars$vsdot <- ifelse(mtcars$vs, "$\vdots$", "$\because$")  
ggplot(mtcars) +  
  geom_latex(aes(displ, mpg, label=vsdot, colour=vsdot)) +  
  theme(legend.position="none")  
  
## End(Not run)
```

---

getMark

*Access LaTeX Marks*

---

## Description

`getMark()` allows access a location within LaTeX output relative to the rendering in R.

`addMark()` allows third-party packages to add marks to the rendering in R.

## Usage

```
getMark(name)  
addMark(name, devx, devy, vpx=NA, vpy=NA, vpPath=NULL)
```

**Arguments**

name	The name of a mark.
devx, devy	The location of the mark on the device (in inches).
vpx, vpy	The location of the mark relative to the viewport in which the mark was rendered.
vpPath	The viewport path to the viewport in which the mark was rendered.

**Details**

Some LaTeX packages, e.g., see [zrefPackage](#), allow positions within text to be saved with a label. This function allows those saved locations to be accessed, e.g., to add further drawing relative to those locations.

**Value**

getMark returns a list containing the location (and viewport) information for the mark.

**Warning**

The saved locations are only relative to the current device size. Resizing the device, or copying between devices will result in incorrect locations.

A call to addMark() using an existing mark name will overwrite the previous mark information.

**Author(s)**

Paul Murrell

---

grid.dvi

*Render DVI File in R*

---

**Description**

Render a DVI file in R graphics.

**Usage**

```
dviGrob(dvi, ...)
## S3 method for class 'character'
dviGrob(dvi, ...)
## S3 method for class 'DVI'
dviGrob(dvi, ...,
        packages=NULL,
        engine=getOption("xdvir.engine"))
## S3 method for class 'list'
dviGrob(dvi, x = 0.5, y = 0.5,
        margin=0, rot=0,
```



```

    default.units = "npc",
    hjust="centre", vjust="centre",
    dpi=NA,
    page=1,
    packages=NULL,
    engine=getOption("xdvir.engine"),
    fontLib=getOption("xdvir.fontLib"),
    ...,
    name=NULL,
    gp=gpar(),
    vp=NULL)
grid.dvi(...)
render(...)

```

### Arguments

dvi	A "DVI" object, as produced by <a href="#">readDVI</a> , or a "DVIfile" object, as produced by <a href="#">typeset</a> , or the name of a DVI file, or a list containing some combination of all three.
x, y	Numeric values or units specifying where to draw the output.
margin	Numeric values or units specifying margins (in the order bottom, left, top, right). Recycled if necessary.
rot	Rotation angle (in degrees).
default.units	Units to use if x or y are numeric.
hjust, vjust	Justification of the output relative to the x/y location.
dpi	Resolution (dots per inch) for rendering.
page	Which page should be drawn.
engine	The TeX engine that should be used to render the DVI file (see <a href="#">Details</a> ).
fontLib	The font library the should be used to query fonts and glyphs.
packages	The LaTeX packages to be used in rendering the DVI.
name	Character value giving name for the grob.
gp	Graphical parameter settings.
vp	A viewport or NULL.
...	Arguments specific to methods of <code>dviGrob</code> .

### Details

If the engine is NULL (the default), one is chosen based on the engine attribute of the dvi input (if an engine of that name has been registered).

If the engine is specified, but does not match the engine attribute of the dvi then, if the dvi engine was guessed the engine will be used, otherwise the conflict will result in an error.

`render()` is an alias for `grid.dvi()`.

**Value**

A "DVIgrob" object.

**Author(s)**

Paul Murrell

**See Also**

[readDVI](#), [LaTeXpackage](#).

---

grid.latex

*Render LaTeX in R*

---

**Description**

Author, typeset, and render LaTeX in R graphics.

**Usage**

```
latexGrob(tex,  
          x=0.5, y=0.5,  
          margin=0, rot=0,  
          default.units="npc",  
          hjust="centre", vjust="centre",  
          width=NA,  
          dpi=NA,  
          page=1,  
          packages=NULL,  
          engine=getOption("xdvir.engine"),  
          fontLib=getOption("xdvir.fontLib"),  
          texFile=NULL,  
          name=NULL,  
          gp=gpar(),  
          vp=NULL)  
grid.latex(...)  
  
xelatexGrob(tex, ...)  
grid.xelatex(...)  
  
lualatexGrob(tex, ...)  
grid.lualatex(...)
```

**Arguments**

<code>tex</code>	LaTeX code as a character vector.
<code>x, y</code>	Numeric values or units specifying where to draw the output.
<code>margin</code>	Numeric values or units specifying margins (in the order bottom, left, top, right). Recycled if necessary.
<code>rot</code>	Rotation angle (in degrees).
<code>default.units</code>	Units to use if <code>x</code> or <code>y</code> are numeric.
<code>hjust, vjust</code>	Justification of the output relative to the <code>x/y</code> location.
<code>width</code>	Either NA or a numeric value or a unit specifying the width for typesetting. NA means the natural width of <code>tex</code> .
<code>dpi</code>	Resolution (dots per inch) for rendering.
<code>page</code>	Which page should be drawn.
<code>packages</code>	The LaTeX packages to be used. May be the name of a LaTeX package (character) or a "LaTeXpackage" object.
<code>engine</code>	The TeX engine that should be used to render the LaTeX. May be the name of a TeX engine (character) or a "TeXengine" object.
<code>fontLib</code>	The font library the should be used to query fonts and glyphs.
<code>name</code>	Character value giving name for the grob.
<code>gp</code>	Graphical parameter settings.
<code>vp</code>	A viewport or NULL.
<code>texFile</code>	Name of a file to use for LaTeX code.
<code>...</code>	Arguments passed to <code>dviGrob</code> .

**Details**

`grid.latex()` takes a LaTeX fragment, generates a LaTeX document, typesets it, reads the resulting DVI file and renders the result.

`grid.xelatex()` is just a convenient front end for `grid.latex()`, with appropriate default engine.

`grid.latex()` attempts to be smart about delaying typesetting until drawing time if necessary in order to get the correct context for `width` and `gp` settings. This means that, unless `gp` is set to NULL and `width` is set to either NA or an absolute unit (e.g., a number of inches), the calculation of, for example, the width of a grob will be less efficient because the typesetting has to be performed all over again.

**Value**

A "DVIgrob" object.

**Author(s)**

Paul Murrell

**See Also**

[LaTeXpackage](#).

**Examples**

```
## Not run:
# Requires TeX installation
grid.latex("this is a test")

## End(Not run)
```

---

LaTeXpackage

*Define a LaTeX Package.*


---

**Description**

Define and register a LaTeX package for authoring, typesetting, and rendering LaTeX documents.

**Usage**

```
LaTeXpackage(name,
              preamble=NULL,
              prefix=NULL,
              suffix=NULL,
              special=NULL,
              init=NULL,
              final=NULL)
registerPackage(package)
```

**Arguments**

<code>name</code>	Character name for the package.
<code>preamble, prefix, suffix</code>	Character preamble, prefix, and suffix for authoring LaTeX documents.
<code>special</code>	Function for handling DVI specials during rendering.
<code>init, final</code>	Functions to initialise package before rendering and finalise after rendering.
<code>package</code>	A "LaTeXpackage" object.

**Details**

For simple cases, all that is required is a package name and a preamble that just contains a `\usepackage` command. See the example below.

More complex cases may involve adding a `prefix` and a `suffix` that, for example, begins and ends a 'LaTeX' environment.

Advanced cases may involve writing functions `init`, `special`, and `final`, which are called to handle DVI specials. The predefined support for 'TikZ' is a particularly complicated example.

**Value**

LaTeXpackage() returns a "LaTeXpackage" object.

**Author(s)**

Paul Murrell

**Examples**

```
LaTeXpackage("times", "\\usepackage{times}")
```

---

preview Package	<i>LaTeX Package preview.</i>
-----------------	-------------------------------

---

**Description**

Define a LaTeXPackage for the LaTeX preview package.

**Usage**

```
previewPackage()
```

**Details**

This function creates a "LaTeXpackage" object that provides support for the LaTeX preview package.

This adds a "preview-baseline" anchor to use for aligning the rendered LaTeX in R.

A predefined package is pre-registered under the name "preview".

**Value**

A "LaTeXpackage" object.

**Warning**

This package wraps LaTeX snippets in a preview environment, which may not work for complex LaTeX snippets.

**Author(s)**

Paul Murrell

**Examples**

```
cat(author("test", packages="preview"), sep="\n")
```

---

readDVI

*Read DVI File*

---

### Description

Read a DVI file (produced by LaTeX) into R.

### Usage

```
readDVI(file)
```

### Arguments

`file`            A character value giving the name of a DVI file.

### Details

A "DVI" object is a list of memory blocks (as produced by functions from the **hexView** package), with one block per DVI operation.

This is the detailed, byte-level contents of the DVI file.

### Value

A "DVI" object.

There is a print method that produces a nice human-readable format.

### Author(s)

Paul Murrell

### Examples

```
readDVI(system.file("DVI", "test-pdftex.dvi", package="xdvir"))
readDVI(system.file("DVI", "test-luatex.dvi", package="xdvir"))
readDVI(system.file("DVI", "test-xetex.xdv", package="xdvir"))
readDVI(system.file("DVI", "test-uptex.dvi", package="xdvir"))
```

---

TeXengine

*Define a TeX Engine.*


---

### Description

Define and register a TeX engine for authoring, typesetting, and rendering LaTeX documents.

### Usage

```
TeXengine(name,
           version,
           command,
           isEngine,
           fontFile,
           glyphIndex,
           options=NULL,
           preamble="",
           dviSuffix=".dvi")
registerEngine(engine)
```

### Arguments

name	Character name for the engine.
version	A function with no arguments that returns the engine version as a character value.
command	The command used to typeset a latex document with this engine.
isEngine	A function with one argument, a "DVI" object, that returns a logical indicating whether this engine was used to generate that DVI output.
fontFile	A function with one argument, a font description from a font definition operation in DVI output, that returns a path to the appropriate font file.
glyphIndex	A function with one argument, a raw vector of bytes from a set char operation in DVI output, that returns an integer index of the appropriate glyph.
options	Any required options to command to ensure that the engine generates DVI output.
preamble	A preamble that is added during authoring of a complete LaTeX document from a LaTeX snippet. See <a href="#">author</a> and <a href="#">grid.latex</a> .
dviSuffix	The file suffix used for DVI files that are generated by this engine.
engine	A "TeXengine" object, as generated by TeXengine().

### Details

TeXengine() can be used to create a typesetting engine for use with, e.g., [grid.latex](#). Registering the engine via registerEngine() means that the engine can be specified by name.

**Value**

TeXEngine() returns a "TeXEngine" object.

**Author(s)**

Paul Murrell

---

TeXstatus	<i>Report on TeX Installation.</i>
-----------	------------------------------------

---

**Description**

Report on the availability of TeX and the versions of available TeX engines.

**Usage**

TeXstatus()

**Author(s)**

Paul Murrell

**Examples**

TeXstatus()

---

tikz Package	<i>LaTeX Package tikz.</i>
--------------	----------------------------

---

**Description**

Define a LaTeXPackage for the LaTeX tikz package.

**Usage**

```
tikzPackage(name="tikz", packages=NULL, bbox=TRUE, quote=TRUE)
tikzPicture(name="tikzPicture", packages=NULL, bbox=TRUE, quote=TRUE)
```

**Arguments**

name	The name of the resulting package.
packages	A character list of TikZ package names.
bbox	Either a logical indicating whether to use (or ignore) the TikZ bounding box at the end of a TikZ picture, or a numeric vector of 4 values (left, bottom, right, top) describing the bounding box to use for the TikZ picture.
quote	Whether to place single quotes around the path to the pgfsysdriver file. This might help if the path to the R installation contains spaces. Conversely, at least some LuaTeX versions require this to be FALSE.



**Details**

This function creates a "LaTeXpackage" object that provides support for the LaTeX xcolor package.

This allows TikZ pictures to be included in LaTeX snippets. when calling `grid.latex`.

The "tikzPicture" package is provided for convenience if the LaTeX snippet only consists of TikZ code.

Two predefined packages are pre-registered under the names "tikz" and "tikzPicture".

**Value**

A "LaTeXpackage" object.

**Note**

If "tikzmark" is one of the packages, then a new command, `\xdvirtikzmark{label}`, is defined to allow saved positions also to be recorded in the rendered LaTeX in R. This produces `nullGrob` objects at the relevant locations plus anchors (for justification) at the relevant locations.

**Author(s)**

Paul Murrell

**Examples**

```
cat(author("test", packages="tikz"), sep="\n")
cat(author("test", packages="tikzPicture"), sep="\n")
```

---

typeset

*Typeset a LaTeX Document*

---

**Description**

Typeset a LaTeX document, either from a character value or from an external file.

**Usage**

```
typeset(tex,
        engine=getOption("xdvir.engine"),
        ...)
## S3 method for class 'LaTeXdocument'
typeset(tex,
        engine=NULL,
        texFile=NULL,
        ...)
## S3 method for class 'character'
typeset(tex,
        engine=NULL,
```

```
texFile=NULL,  
sig=FALSE,  
...)
```

### Arguments

tex	LaTeX code. See Details.
engine	The TeX engine that should be used to typeset the LaTeX. May be the name of a TeX engine (character) or a "TeXengine" object.
texFile	Name of a file to use for LaTeX code.
sig	Add a signature to the DVI output?
...	Arguments passed to other <a href="#">typeset</a> methods.

### Details

`typeset()` expects input to be either a "TeXdocument", as generated by author, or a character value containing LaTeX code.

### Value

A "DVI" object as produced by [readDVI](#).

### Author(s)

Paul Murrell

### See Also

[LaTeXpackage](#).

### Examples

```
## Not run:  
# Requires TeX installation  
tex <- author("this is a test")  
typeset(tex)  
  
## End(Not run)
```

---

xcolor Package      *LaTeX Package xcolor.*

---

**Description**

Define a LaTeXPackage for the LaTeX xcolor package.

**Usage**

```
xcolorPackage()
```

**Details**

This function creates a "LaTeXpackage" object that provides support for the LaTeX xcolor package.

This allows commands like `\color{blue}` to be included in LaTeX snippets when calling [grid.latex](#).

A predefined package is pre-registered under the name "xcolor".

**Value**

A "LaTeXpackage" object.

**Author(s)**

Paul Murrell

**Examples**

```
cat(author("test", packages="xcolor"), sep="\n")
```

---

zref Package      *LaTeX Package zref.*

---

**Description**

Define a LaTeXPackage for the LaTeX zref package.

**Usage**

```
zrefPackage()
```

**Details**

This function creates a "LaTeXpackage" object that provides support for the LaTeX zref package.

This allows commands like `\zsavepos{label}` to be included in LaTeX snippets when calling [grid.latex](#).

A new command, `\xdvirzmark{label}`, is defined to allow saved positions also to be recorded in the rendered LaTeX in R. This produces [nullGrob](#) objects at the relevant locations plus anchors (for justification) at the relevant locations.

A predefined package is pre-registered under the name "zref".

**Value**

A "LaTeXpackage" object.

**Author(s)**

Paul Murrell

**Examples**

```
cat(author("test", packages="zref"), sep="\n")
```

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