

# Package ‘regionReport’

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**Type** Package

**Title** Generate HTML or PDF reports for a set of genomic regions or DESeq2/edgeR results

**Version** 1.6.5

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**Description** Generate HTML or PDF reports to explore a set of regions such as the results from annotation-agnostic expression analysis of RNA-seq data at base-pair resolution performed by derfinder. You can also create reports for DESeq2 or edgeR results.

**License** Artistic-2.0

**LazyData** true

**URL** <https://github.com/leekgroup/regionReport>

**BugReports** <https://github.com/leekgroup/regionReport/issues>

**VignetteBuilder** knitr

**biocViews** DifferentialExpression, Sequencing, RNASeq, Software, Visualization, Transcription, Coverage, ReportWriting, DifferentialMethylation, DifferentialPeakCalling

**Depends** R(>= 3.2)

**Imports** derfinder (>= 1.1.0), DEFormats, DESeq2, GenomeInfoDb, GenomicRanges, knitcitations (>= 1.0.1), knitr (>= 1.6), knitrBootstrap (>= 0.9.0), RefManageR, rmarkdown (>= 0.9.5), S4Vectors, SummarizedExperiment

**Suggests** BiocStyle, biovizBase, bumhunter (>= 1.7.6), Cairo, derfinderPlot (>= 1.3.2), devtools (>= 1.6), DT, DESeq, edgeR, ggbio (>= 1.13.13), ggplot2, grid, gridExtra, IRanges, mgcv, pasilla, pheatmap, RColorBrewer, TxDb.Hsapiens.UCSC.hg19.knownGene, whisker

**RoxygenNote** 5.0.1

**NeedsCompilation** no

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regionReport-package	<i>Generate HTML or PDF reports for a set of regions or DESeq2/edgeR results.</i>
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### Description

Generate an HTML reports to explore a set of regions such as the results from annotation-agnostic expression analysis of RNA-seq data at base-pair resolution performed by derfinder. The package can also be used to generate reports for DESeq2 or edgeR results. The HTML and PDF reports are generated using rmarkdown (<http://rmarkdown.rstudio.com/>).

### Author(s)

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derfinderReport	<i>Generate a HTML/PDF report exploring the basic results from derfinder</i>
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### Description

This function generates a HTML report exploring the basic results from single base-level approach derfinder analysis results ([www.bioconductor.org/packages/derfinder](http://www.bioconductor.org/packages/derfinder)). The HTML report itself is generated using rmarkdown (<http://rmarkdown.rstudio.com/>). It works best after using [mergeResults](#).

**Usage**

```
derfinderReport(prefix, outdir = "basicExploration",
  output = "basicExploration", project = prefix, browse = interactive(),
  nBestRegions = 100, makeBestClusters = TRUE, nBestClusters = 2,
  fullCov = NULL, hg19 = TRUE, p.ideos = NULL, txdb = NULL,
  device = "png", significantVar = "qvalue", customCode = NULL,
  template = NULL, theme = NULL, digits = 2, ...)
```

**Arguments**

prefix	The main data directory path where <a href="#">mergeResults</a> was run. It should be the same as <code>mergeResults(prefix)</code> .
outdir	The name of output directory relative to <code>prefix</code> .
output	The name of output HTML file (without the html extension).
project	The title of the project.
browse	If TRUE the HTML report is opened in your browser once it's completed.
nBestRegions	The number of region plots to make, ordered by area.
makeBestClusters	If TRUE, <a href="#">plotCluster</a> is used on the <code>nBestClusters</code> regions by area. Note that these plots take some time to make.
nBestClusters	The number of region cluster plots to make by taking the <code>nBestClusters</code> regions ranked by area of the cluster.
fullCov	A list where each element is the result from <a href="#">loadCoverage</a> used with <code>cutoff=NULL</code> . Can be generated using <a href="#">fullCoverage</a> .
hg19	If TRUE then the reference is assumed to be hg19 and chromosome lengths as well as the default transcription database ( <code>TxDb.Hsapiens.UCSC.hg19.knownGene</code> ) will be used.
p.ideos	A list where each element is the result of <a href="#">plotIdeogram</a> . If it's NULL and <code>hg19=TRUE</code> then they are created for the hg19 human reference.
txdb	Specify the transcription database to use for making the plots for the top regions by area. If NULL and <code>hg19=TRUE</code> then <code>TxDb.Hsapiens.UCSC.hg19.knownGene</code> is used.
device	The graphical device used when knitting. See more at <a href="http://yihui.name/knitr/options">http://yihui.name/knitr/options</a> (dev argument).
significantVar	A character variable specifying whether to use the p-values, the FDR adjusted p-values or the FWER adjusted p-values to determine significance. Has to be either 'pvalue', 'qvalue' or 'fwer'.
customCode	An absolute path to a child R Markdown file with code to be evaluated before the reproducibility section. Its useful for users who want to customize the report by adding conclusions derived from the data and/or further quality checks and plots.
template	Template file to use for the report. If not provided, will use the default file found in <code>basicExploration/basicExploration.Rmd</code> within the package source.

theme	A ggplot2 <a href="#">theme</a> to use for the plots made with ggplot2.
digits	The number of digits to round to in the interactive table of the top nBestRegions. Note that p-values and adjusted p-values won't be rounded.
...	Arguments passed to other methods and/or advanced arguments.

### Details

Set `output_format` to `'knitrBootstrap::bootstrap_document'` or `'pdf_document'` if you want a HTML report styled by knitrBootstrap or a PDF report respectively. If using knitrBootstrap, we recommend the version available only via GitHub at <https://github.com/jimhester/knitrBootstrap> which has nicer features than the current version available via CRAN.

If you modify the YAML front matter of `template`, you can use other values for `output_format`. The HTML report styled with knitrBootstrap can be smaller in size than the default HTML report.

### Value

An HTML report with a basic exploration of the derfinder results.

### Author(s)

Leonardo Collado-Torres

### See Also

[mergeResults](#), [analyzeChr](#), [fullCoverage](#)

### Examples

```
## Load derfinder
library('derfinder')

## The output will be saved in the 'derfinderReport-example' directory
dir.create('derfinderReport-example', showWarnings = FALSE, recursive = TRUE)

## For convenience, the derfinder output has been pre-computed
file.copy(system.file(file.path('extdata', 'chr21'), package='derfinder',
  mustWork=TRUE), 'derfinderReport-example', recursive = TRUE)

## Not run:
## If you prefer, you can generate the output from derfinder
initialPath <- getwd()
setwd(file.path(initialPath, 'derfinderReport-example'))

## Collapse the coverage information
collapsedFull <- collapseFullCoverage(list(genomeData$coverage),
  verbose=TRUE)

## Calculate library size adjustments
sampleDepths <- sampleDepth(collapsedFull, probs=c(0.5), nonzero=TRUE,
```

```

    verbose=TRUE)

## Build the models
group <- genomeInfo$pop
adjustvars <- data.frame(genomeInfo$gender)
models <- makeModels(sampleDepths, testvars=group, adjustvars=adjustvars)

## Analyze chromosome 21
analyzeChr(chr='21', coverageInfo=genomeData, models=models,
  cutoffFstat=1, cutoffType='manual', seeds=20140330, groupInfo=group,
  mc.cores=1, writeOutput=TRUE, returnOutput=FALSE)

## Change the directory back to the original one
setwd(initialPath)

## End(Not run)

## Merge the results from the different chromosomes. In this case, there's
## only one: chr21
mergeResults(chrs = '21', prefix = 'derfinderReport-example',
  genomicState = genomicState$fullGenome)

## Load the options used for calculating the statistics
load(file.path('derfinderReport-example', 'chr21', 'optionsStats.Rdata'))

## Generate the HTML report
report <- derfinderReport(prefix='derfinderReport-example', browse=FALSE,
  nBestRegions=1, makeBestClusters=FALSE,
  fullCov=list('21'=genomeDataRaw$coverage), optionsStats=optionsStats)

if(interactive()) {
  ## Browse the report
  browseURL(report)
}

## Not run:
## Note that you can run the example using:
example('derfinderReport', 'regionReport', ask=FALSE)

## End(Not run)

```

---

DESeq2Report

*Generate a HTML/PDF report exploring DESeq2 results*


---

## Description

This function generates a HTML report with exploratory data analysis plots for DESeq2 results created with [DESeq](#). Other output formats are possible such as PDF but lose the interactivity. Users can easily append to the report by providing a R Markdown file to `customCode`, or can customize the entire template by providing an R Markdown file to `template`.

**Usage**

```
DESeq2Report(dds, project = "", intgroup, colors = NULL, res = NULL,
  nBest = 500, nBestFeatures = 20, customCode = NULL,
  outdir = "DESeq2Exploration", output = "DESeq2Exploration",
  browse = interactive(), device = "png", template = NULL,
  searchURL = "http://www.ncbi.nlm.nih.gov/gene/?term=", theme = NULL,
  digits = 2, ...)
```

**Arguments**

dds	A <a href="#">DESeqDataSet</a> object with the results from running <a href="#">DESeq</a> .
project	The title of the project.
intgroup	interesting groups: a character vector of names in <code>colData(x)</code> to use for grouping. This parameter is passed to functions such as <a href="#">plotPCA</a> .
colors	vector of colors used in heatmap. If NULL, then a default set of colors will be used. This argument is passed to <a href="#">heatmap</a> .
res	A <a href="#">DESeqResults</a> object. If NULL, then <code>results</code> will be used on <code>dds</code> with default parameters.
nBest	The number of features to include in the interactive table. Features are ordered by their adjusted p-values.
nBestFeatures	The number of best features to make plots of their counts. We recommend a small number, say 20.
customCode	An absolute path to a child R Markdown file with code to be evaluated before the reproducibility section. Its useful for users who want to customize the report by adding conclusions derived from the data and/or further quality checks and plots.
outdir	The name of output directory.
output	The name of output HTML file (without the html extension).
browse	If TRUE the HTML report is opened in your browser once it's completed.
device	The graphical device used when knitting. See more at <a href="http://yihui.name/knitr/options">http://yihui.name/knitr/options</a> (dev argument).
template	Template file to use for the report. If not provided, will use the default file found in <code>DESeq2Exploration/DESeq2Exploration.Rmd</code> within the package source.
searchURL	A url used for searching the name of the features in the web. By default <code>http://www.ncbi.nlm.nih.gov/</code> is used which is the recommended option when features are genes. It's only used when the output is a HTML file.
theme	A <a href="#">ggplot2 theme</a> to use for the plots made with <code>ggplot2</code> .
digits	The number of digits to round to in the interactive table of the top <code>nBestFeatures</code> . Note that p-values and adjusted p-values won't be rounded.
...	Arguments passed to other methods and/or advanced arguments.

## Details

Set `output_format` to `'knitrBootstrap::bootstrap_document'` or `'pdf_document'` if you want a HTML report styled by knitrBootstrap or a PDF report respectively. If using knitrBootstrap, we recommend the version available only via GitHub at <https://github.com/jimhester/knitrBootstrap> which has nicer features than the current version available via CRAN.

If you modify the YAML front matter of `template`, you can use other values for `output_format`.

## Value

An HTML report with a basic exploration for the given set of DESeq2 results.

## Author(s)

Leonardo Collado-Torres

## Examples

```
## Load example data from the pasilla package
library('pasilla')
library('DESeq')
library('DESeq2')

## Create DESeqDataSet object from the pasilla package
data('pasillaGenes')
countData <- counts(pasillaGenes)
colData <- pData(pasillaGenes)[, c('condition', 'type')]
dds <- DESeqDataSetFromMatrix(countData = countData,
  colData = colData,
  design = ~ condition)
dds <- DESeq(dds)

## The output will be saved in the 'DESeq2Report-example' directory
dir.create('DESeq2Report-example', showWarnings = FALSE, recursive = TRUE)

## Generate the HTML report
report <- DESeq2Report(dds, 'DESeq2-example', c('condition', 'type'),
  outdir = 'DESeq2Report-example')

if(interactive()) {
  ## Browse the report
  browseURL(report)
}

## Not run:
## Note that you can run the example using:
example('DESeq2Report', 'regionReport', ask=FALSE)

## End(Not run)
```

edgeReport

*Generate a HTML/PDF report exploring edgeR results*

## Description

This function generates a HTML report with exploratory data analysis plots for edgeR results created. Other output formats are possible such as PDF reports but they lose the interactivity. Users can easily append to the report by providing a R Markdown file to `customCode`, or can customize the entire template by providing an R Markdown file to `template`.

## Usage

```
edgeReport(dge, object, project = "", intgroup, colors = NULL,
  pAdjustMethod = "BH", alpha = 0.1, independentFiltering = FALSE, filter,
  theta, filterFun, nBest = 500, nBestFeatures = 20, customCode = NULL,
  outdir = "edgeRexploration", output = "edgeRexploration",
  browse = interactive(), device = "png", template = NULL,
  searchURL = "http://www.ncbi.nlm.nih.gov/gene/?term=", theme = NULL,
  digits = 2, ...)
```

## Arguments

<code>dge</code>	A <a href="#">DGEList</a> object.
<code>object</code>	A <a href="#">DGEEexact</a> or <a href="#">DGELRT</a> object that contains p-values stored in <code>object\$table\$PValue</code> .
<code>project</code>	The title of the project.
<code>intgroup</code>	interesting groups: a character vector of names in <code>colData(x)</code> to use for grouping. This parameter is passed to functions such as <a href="#">plotPCA</a> .
<code>colors</code>	vector of colors used in heatmap. If NULL, then a default set of colors will be used. This argument is passed to <a href="#">pheatmap</a> .
<code>pAdjustMethod</code>	the method to use for adjusting p-values, see <a href="#">p.adjust</a> . This argument will be passed to <a href="#">results</a> .
<code>alpha</code>	the significance cutoff used for optimizing the independent filtering (by default 0.1). If the adjusted p-value cutoff (FDR) will be a value other than 0.1, alpha should be set to that value. This argument will be passed to <a href="#">results</a> .
<code>independentFiltering</code>	logical, whether independent filtering should be applied automatically. By default it's set to FALSE in contrast with the default used in <a href="#">results</a> to match edgeR's behavior.
<code>filter</code>	the vector of filter statistics over which the independent filtering will be optimized. By default the logCPM will be used if <code>independentFiltering</code> is set to TRUE. It can also be a length 1 character vector specifying one of the column names of <code>object\$table</code> .
<code>theta</code>	the quantiles at which to assess the number of rejections from independent filtering. This argument is passed <a href="#">results</a> .



filterFun	an optional custom function as described in <a href="#">results</a> .
nBest	The number of features to include in the interactive table. Features are ordered by their adjusted p-values.
nBestFeatures	The number of best features to make plots of their counts. We recommend a small number, say 20.
customCode	An absolute path to a child R Markdown file with code to be evaluated before the reproducibility section. Its useful for users who want to customize the report by adding conclusions derived from the data and/or further quality checks and plots.
outdir	The name of output directory.
output	The name of output HTML file (without the html extension).
browse	If TRUE the HTML report is opened in your browser once it's completed.
device	The graphical device used when knitting. See more at <a href="http://yihui.name/knitr/options">http://yihui.name/knitr/options</a> (dev argument).
template	Template file to use for the report. If not provided, will use the default file found in DESeq2Exploration/DESeq2Exploration.Rmd within the package source.
searchURL	A url used for searching the name of the features in the web. By default <a href="http://www.ncbi.nlm.nih.gov/">http://www.ncbi.nlm.nih.gov/</a> is used which is the recommended option when features are genes. It's only used when the output is a HTML file.
theme	A ggplot2 <a href="#">theme</a> to use for the plots made with ggplot2.
digits	The number of digits to round to in the interactive table of the top nBestFeatures. Note that p-values and adjusted p-values won't be rounded.
...	Arguments passed to other methods and/or advanced arguments.

## Details

Set `output_format` to `'knitrBootstrap::bootstrap_document'` or `'pdf_document'` if you want a HTML report styled by knitrBootstrap or a PDF report respectively. If using knitrBootstrap, we recommend the version available only via GitHub at <https://github.com/jimhester/knitrBootstrap> which has nicer features than the current version available via CRAN.

If you modify the YAML front matter of `template`, you can use other values for `output_format`.

This report is similar to the one created by [DESeq2Report](#) with two additional plots exclusive for edgeR results. We designed the reports to be very similar intentionally and use the Bioconductor package DEFormats to achieve this goal.

## Value

An HTML report with a basic exploration for the given set of edgeR results.

## Author(s)

Leonardo Collado-Torres

## Examples

```
## Create example data using DEFormats
library('DEFormats')
set.seed(20160407)
counts <- simulateRnaSeqData()
group <- rep(c("A", "B"), each = 3)

## Create DGEList object
library('edgeR')
dge <- DGEList(counts, group = group)

## Perform DE analysis with edgeR
design <- model.matrix(~ group)
dge <- estimateDisp(dge, design)
fit <- glmFit(dge, design)
lrt <- glmLRT(fit, coef = 2)

## The output will be saved in the 'edgeReport-example' directory
dir.create('edgeReport-example', showWarnings = FALSE, recursive = TRUE)

## Generate the HTML report
report <- edgeReport(dge, lrt, project = 'edgeR-example', intgroup = 'group',
  outdir = 'edgeReport-example')

if(interactive()) {
  ## Browse the report
  browseURL(report)
}

## Not run:
## Note that you can run the example using:
example('edgeReport', 'regionReport', ask=FALSE)

## End(Not run)
```

---

load\_install

*Attempt to load the namespace of a package and install it if it's missing*

---

## Description

This function uses `requireNamespace` to try to load a package. But if it's missing it will then install it via Bioconductor.

## Usage

```
load_install(pkg, quietly = TRUE)
```

**Arguments**

pkg	A single character vector with the name of the package.
quietly	Whether to run requireNamespace and biocLite quietly or not.

---

regionReport-defunct *Defunct functions in package 'regionReport'*

---

**Description**

These functions are defunct and no longer available.

**Usage**

```
derfinder_report()
render_report()
```

**Details**

The following functions are defunct; use the replacements indicated below:

- derfinder\_report: [derfinderReport](#)
- render\_report: [renderReport](#)

---

renderReport *Generate a HTML/PDF report exploring a set of genomic regions*

---

**Description**

This function generates a HTML report with quality checks, genome location exploration, and an interactive table with the results. Other output formats are possible such as PDF but lose the interactivity. Users can easily append to the report by providing a R Markdown file to customCode, or can customize the entire template by providing an R Markdown file to template.

**Usage**

```
renderReport(regions, project = "", pvalueVars = c(`P-values` = "pval"),
  densityVars = NULL, significantVar = mcols(regions)$pval <= 0.05,
  annotation = NULL, nBestRegions = 500, customCode = NULL,
  outdir = "regionExploration", output = "regionExploration",
  browse = interactive(), txdb = NULL, device = "png",
  densityTemplates = list(Pvalue = templatePvalueDensity, Common =
  templateDensity, Manhattan = templateManhattan), template = NULL,
  theme = NULL, digits = 2, ...)
```

templatePvalueDensity

templateDensity

templateManhattan

templatePvalueHistogram

templateHistogram

## Arguments

regions	The set of genomic regions of interest as a GRanges object. All sequence lengths must be provided.
project	The title of the project.
pvalueVars	The names of the variables with values between 0 and 1 to plot density values by chromosome and a table for commonly used cutoffs. Most commonly used to explore p-value distributions. If a named character vector is provided, the names are used in the plot titles.
densityVars	The names of variables to use for making density plots by chromosome. Commonly used to explore scores and other variables given by region. If a named character vector is provided, the names are used in the plot titles.
significantVar	A logical variable differentiating statistically significant regions from the rest. When provided, both types of regions are compared against each other to see differences in width, location, etc.
annotation	The output from <a href="#">matchGenes</a> used on regions. Note that this can take time for a large set of regions so it's better to pre-compute this information and save it.
nBestRegions	The number of regions to include in the interactive table.
customCode	An absolute path to a child R Markdown file with code to be evaluated before the reproducibility section. Its useful for users who want to customize the report by adding conclusions derived from the data and/or further quality checks and plots.
outdir	The name of output directory.
output	The name of output HTML file (without the html extension).
browse	If TRUE the HTML report is opened in your browser once it's completed.
txdb	Specify the transcription database to use for identifying the closest genes via <a href="#">matchGenes</a> . If NULL it will use TxDb.Hsapiens.UCSC.hg19.knownGene by default.
device	The graphical device used when knitting. See more at <a href="http://yihui.name/knitr/options">http://yihui.name/knitr/options</a> (dev argument).
densityTemplates	A list of length 3 with templates for the p-value density plots (variables from pvalueVars), the continuous variables density plots (variables from densityVars), and Manhattan plots for the p-value variables (pvalueVars). These templates

are processed by [whisker.render](#). Check the default templates for more information. The `densityTemplates` argument is available for those users interested in customizing these plots. For example, to show histograms instead of density plots use `templatePvalueHistogram` and `templateHistogram` instead of `templatePvalueDensity` and `templateDensity` respectively.

<code>template</code>	Template file to use for the report. If not provided, will use the default file found in <code>regionExploration/regionExploration.Rmd</code> within the package source.
<code>theme</code>	A <code>ggplot2</code> <a href="#">theme</a> to use for the plots made with <code>ggplot2</code> .
<code>digits</code>	The number of digits to round to in the interactive table of the top <code>nBestRegions</code> . Note that p-values and adjusted p-values won't be rounded.
<code>...</code>	Arguments passed to other methods and/or advanced arguments.

### Format

An object of class character of length 1.

### Details

Set `output_format` to `'knitrBootstrap::bootstrap_document'` or `'pdf_document'` if you want a HTML report styled by `knitrBootstrap` or a PDF report respectively. If using `knitrBootstrap`, we recommend the version available only via GitHub at <https://github.com/jimhester/knitrBootstrap> which has nicer features than the current version available via CRAN.

If you modify the YAML front matter of `template`, you can use other values for `output_format`.

### Value

An HTML report with a basic exploration for the given set of genomic regions.

### Author(s)

Leonardo Collado-Torres

### Examples

```
## Load derfinder for an example set of regions
library('derfinder')
regions <- genomeRegions$regions

## Assign chr length
library('GenomicRanges')
seqlengths(regions) <- c('chr21' = 48129895)

## The output will be saved in the 'renderReport-example' directory
dir.create('renderReport-example', showWarnings = FALSE, recursive = TRUE)

## Generate the HTML report
report <- renderReport(regions, 'Example run', pvalueVars = c(
  'Q-values' = 'qvalues', 'P-values' = 'pvalues'), densityVars = c(
```

```

'Area' = 'area', 'Mean coverage' = 'meanCoverage'),
significantVar = regions$qvalues <= 0.05, nBestRegions = 20,
outdir = 'renderReport-example')

if(interactive()) {
  ## Browse the report
  browseURL(report)
}

## Not run:
## Note that you can run the example using:
example('renderReport', 'regionReport', ask=FALSE)

## End(Not run)

## Check the default templates. For users interested in customizing these
## plots.
## For p-value variables:
cat(templatePvalueDensity)

## For continuous variables:
cat(templateDensity)

## For Manhattan plots
cat(templateManhattan)

```

---

with\_wd

*Temporarily evaluate an expression in a directory*


---

## Description

Temporarily evaluate an expression in a directory, then set the directory back to the original.

## Usage

```
with_wd(dir, expr)
```

## Arguments

dir	a directory to perform an expression within
expr	expression to evaluate

## Details

See here: <http://plantarum.ca/code/setwd-part2/>

## Author(s)

Tyler Smith, contributed to regionReport by David Robinson <https://github.com/dgtrtwo>

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