Package 'SurfR'

November 12, 2026

Type Package

Title Surface Protein Prediction and Identification

Version 1.8.0

Description Identify Surface Protein coding genes from a list of candidates.
Systematically download data from GEO and TCGA or use your own data.
Perform DGE on bulk RNAseq data.
Perform Meta-analysis. Descriptive enrichment analysis and plots.

License GPL-3 + file LICENSE

Encoding UTF-8

LazyData false

BugReports https://github.com/auroramaurizio/SurfR/issues

URL https://github.com/auroramaurizio/SurfR

biocViews Software, Sequencing, RNASeq, GeneExpression, Transcription,
DifferentialExpression, PrincipalComponent, GeneSetEnrichment,
Pathways, BatchEffect, FunctionalGenomics, Visualization,
DataImport, FunctionalPrediction, GenePrediction, GO

VignetteBuilder knitr

RoxygenNote 7.2.3

Imports httr, BiocFileCache, SPsimSeq, DESeq2, edgeR, openxlsx,
stringr, rhdf5, ggplot2, ggrepel, stats, magrittr, assertr,
tidyr, dplyr, TCGAbiolinks, biomaRt, metaRNASeq, scales, venn,
gridExtra, SummarizedExperiment, knitr, rjson, grDevices,
graphics, curl, utils

Depends R (>= 4.4.0)

Suggests BiocStyle, testthat (>= 3.0.0)

Config/testthat/edition 3

git_url https://git.bioconductor.org/packages/SurfR

git_branch RELEASE_3_23

git_last_commit fba3adc

git_last_commit_date 2026-04-28

Repository Bioconductor 3.23

Date/Publication 2026-11-11

Author Aurora Maurizio [aut, cre] (ORCID:
<https://orcid.org/0000-0002-7194-4637>),
Anna Sofia Tascini [aut, ctb] (ORCID:
<https://orcid.org/0000-0001-5731-5490>)

Maintainer Aurora Maurizio <auroramaurizio1@gmail.com>

Contents

.format_str . . . 2
Annotate_SPID . . . 3
combine_fisher_invnorm . . . 4
countData . . . 6
DGE . . . 6
DownloadArchS4 . . . 8
enrichedList . . . 9
Enrichment . . . 9
Enrichment_barplot . . . 10
enrichr . . . 12
enrichr_connect . . . 13
enrichr_download . . . 13
enrichr_urls . . . 14
Gene2SProtein . . . 14
GEOmetadata . . . 16
getEnrichr . . . 17
ind_deg . . . 17
listEnrichrDbs . . . 18
metadata . . . 18
metaRNAseq . . . 19
plotPCA . . . 20
setEnrichrSite . . . 22
Splot . . . 23
SVenn . . . 24
TCGA_download . . . 25

Index **26**

`.format_str` *Format a string using placeholders - function from hypeR*

Description

Format a string using placeholders - function from hypeR

Usage

```
.format_str(string, ...)
```

Arguments

string	A an unformatted string with placeholders
...	Variables to format placeholders with

Value

A formatted string

Examples

```
## Not run:
format_str("Format with {1} and {2}", "x", "y")

## End(Not run)
```

Annotate_SPID *Annotate_SPID*

Description

Annotate Surface Protein Coding genes according to EnrichR libraries

Usage

```
Annotate_SPID(
  DGE,
  enrich.database = "WikiPathway_2021_Human",
  output_tsv = FALSE
)
```

Arguments

DGE	Data.frame containing annotated DEG list, as the output of DGE or Gene2SProtein functions.
enrich.database	String containing the EnrichR databases you would like to consult. Default: WikiPathway_2021_Human.
output_tsv	Logical. If TRUE, outputs a tsv file with the results. By default, FALSE.

Value

A dataframe with surface protein coding DEGs annotation.

Warning

Be sure that enrich.database exists.

See Also

DGE function for DGE, and Gene2SProtein function for Gene2SProtein analysis

Other functional-annotation functions: Enrichment_barplot(), Enrichment()

Examples

```
## Not run:
# Deseq2 output sample
DGE = data.frame(GeneID = c("DLK1", "TOP2A"),
                 Mean_CPM_T = c(5.92, 9.91),
                 Mean_CPM_C = c(0.04, 0.03),
                 log2FoldChange = c(10.22, 8.42),
                 lfcSE = c(0.80, 0.48),
                 stat = c(12.68, 17.69),
                 pvalue = c(7.30135e-37, 4.37011e-70),
                 padj = c(1.49936e-35, 1.12976e-67))
annotated_DGE = Annotate_SPID(DGE, "WikiPathway_2021_Human")

# Output of Gene2SProtein function
GeneNames = c("CIITA", "EPCAM", "DLK1", "CD24")
SurfaceProteins_df = Gene2SProtein(GeneNames, input_type = "gene_name")
annotated_SP = Annotate_SPID(SurfaceProteins_df, "GO_Biological_Process_2021")
## End(Not run)
```

`combine_fisher_invnorm`

combine_fisher_invnorm

Description

Combine Meta-Analysis results with individual DE tables

Usage

```
combine_fisher_invnorm(
  ind_deg,
  invnorm,
  fishercomb,
  adjpval = 0.05,
  output_tsv = TRUE,
  output_filename = "combine_fisher_invnorm.tsv"
)
```

Arguments

ind_deg	List of indipendent DEG dataframes with p-values to be combined.
invnorm	inverse normal p-value combination technique dataframe (output of metaRNAseq)
fishercomb	Fisher p-value combination technique dataframe (output of metaRNAseq)
adjpval	threshold to represent as binary the Meta-Analysis output adjpval.
output_tsv	logical. If TRUE, it outputs table with results. Default: TRUE
output_filename	File name for the results file.

Value

A dataframe with DEindices and DEname of DEG at the chosen Benjamini Hochberg threshold, and TestStatistic, rawpval, adjpval, binaryadjpval vectors for differential expression in the meta-analysis.

See Also

DGE function for DGE analysis, and https://cran.r-project.org/web/packages/metaRNASeq/vignettes/metaRNASeq.pdf for metaRNASeq package info

Other meta-analysis functions: metaRNAseq()

Examples

```
## Not run:
# Deseq2 output samples
DGE1 <- data.frame(GeneID = c("DLK1", "EPCAM"),
                   Mean_CPM_T = c(5.92, 9.91),
                   Mean_CPM_C = c(0.04, 0.03),
                   log2FoldChange = c(10.22, 8.42),
                   lfcSE = c(0.80, 0.48),
                   stat = c(12.68, 17.69),
                   pvalue = c(7.30135e-37, 4.37011e-70),
                   padj = c(1.49936e-35, 1.12976e-67),
                   row.names = c("DLK1", "EPCAM"))
DGE2 <- data.frame(GeneID = c("DLK1", "EPCAM"),
                   Mean_CPM_T = c(3.92, 8.91),
                   Mean_CPM_C = c(0.04, 0.03),
                   log2FoldChange = c(7.22, 5.81),
                   lfcSE = c(0.80, 0.48),
                   stat = c(12.68, 17.69),
                   pvalue = c(7.30135e-37, 4.37011e-70),
                   padj = c(1.49936e-35, 1.12976e-67),
                   row.names = c("DLK1", "EPCAM"))
# input list
ind_deg <- list(DEG1_df = DGE1, DEG2_df = DGE2)
# perform invnorm meta-analysis
invnorm <- metaRNAseq(ind_deg, test_statistic = "invnorm", BHth = 0.05, nrep = c(2,2))
# perform fishercomb meta-analysis
fishercomb <- metaRNAseq(ind_deg, test_statistic = "fishercomb", BHth = 0.05)
```

```
# combine results
comb_pval_df <- combine_fisher_invnorm(ind_deg,
                                       invnorm, fishercomb,
                                       adjpval = 0.05,
                                       output_tsv = FALSE)
## End(Not run)
```

---

countData *countData*

Description

Simulated raw counts to use as input for DGE and plotPCA functions. metadata is available.

Usage

```
data(countData)
```

Format

dataframe

Details

A dataframe with 2500 rows and 4 columns (sample names).

Value

A dataframe.

DGE *DGE function*

Description

Perform Differential Gene Expression Analysis of RNA-Seq Data

Usage

```
DGE(
  expression,
  metadata,
  Nreplica,
  design = "~condition",
  condition = "condition",
  TEST,
  CTRL,
```

```
  alpha = 0.05,
  FC_filt = 0,
  output_tsv = FALSE,
  output_filename = "DEGs.tsv"
)
```

Arguments

expression	Dataframe with counts
metadata	Dataframe with sample metadata
Nreplica	Double. Minimum number of replicates in each group
design	Design formula for DGE
condition	Column of the metadata ti use for DGE results
TEST	Character. sample name in metadata
CTRL	Character. sample name in metadata
alpha	Double. 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.
FC_filt	Dataframe with counts
output_tsv	Logical. If TRUE, outputs a tsv file with the results. By default, FALSE.
output_filename	Name of the tsv output file. Default is DEGs.tsv.

Value

A dataframe with DEGs

Examples

```
## Not run:
# Simulation of bulk RNA data
countData <- matrix(floor(runif(10000, min=0, max=101)),ncol=4)
colnames(countData) <- paste("sample", seq_len(ncol(countData)), sep = "")
rownames(countData) <- paste("gene", seq_along(seq_len(10000/4)), sep = "")
metadata <- data.frame(samplesID = paste("sample", seq_len(ncol(countData)), sep = ""),
                       condition = factor(c("A","A","B","B")))
row.names(metadata) <- metadata$samplesID
# Perform DGE
DGEresults <- DGE(expression = countData, metadata = metadata,
                  Nreplica = 2,
                  design = "~condition",condition = "condition",
                  TEST = "A", CTRL = "B")
## End(Not run)
```

DownloadArchS4 *DownloadArchS4 function*

Description

Download count matrix from https://maayanlab.cloud/archs4/, given a vector of input GEO Sample accessions numbers (GSM).

Usage

```
DownloadArchS4(GSM, species, print_tsv = FALSE, filename = NULL)
```

Arguments

GSM	Vector with the GSM ids of the samples to consider.
species	Specify the specie of yuor GSM samples. Either human or mouse.
print_tsv	Logical. If TRUE, outputs a tsv file with the count matrix. By default, FALSE.
filename	Name of the tsv output file. Default is matrix.tsv.

Value

A count matrix with gene on the row and GSM ID on the column.

Warning

If the defined GSM ids do not have any match in ArchS4 database, we suggest to contact ArchS4 curator to add them.

See Also

GEOmetadata function for downloading GEO metadata. https://www.ncbi.nlm.nih.gov/geo for info on GSM. https://maayanlab.cloud/archs4/ for info on ArchS4.

Other public-data functions: GEOmetadata(), TCGA_download()

Examples

```
## Not run:
GSM <- c("GSM3447008", "GSM3447009")
GEO_count_matrix <- DownloadArchS4(GSM, species = "human",
                                   print_tsv = FALSE, filename = NULL)
## End(Not run)
```

enrichedList *enrichedList*

Description

Input list for Enrichment_barplot function. enrichedList is the output of Enrichment function applied to ind_deg object when enrich.databases is equal to GO_Cellular_Component_2021, default parameters.

Usage

```
data(enrichedList)
```

Format

list

Details

enrichedListfdr_upGO_Cellular_Component_2021 contains upregulated gene enrichments, enrichedListfdr_downGO_Cellular_Component_2021 contains downregulated gene enrichments.

Value

A list of lists.

Enrichment *Enrichment function*

Description

Perform enrichment Analysis of RNA-Seq Data

Usage

```
Enrichment(
  dfList,
 enrich.databases = c("GO_Biological_Process_2021", "GO_Cellular_Component_2021",
    "GO_Molecular_Function_2021", "KEGG_2021_Human", "MSigDB_Hallmark_2020",
   "WikiPathways_2016", "BioCarta_2016", "Jensen_TISSUES", "Jensen_COMPARTMENTS",
    "Jensen_DISEASES"),
  p_adj = 0.05,
  logFC = 1,
  save.results = FALSE
)
```

Arguments

dfList	Dataframes list
enrich.databases	Vector of EnrichR databases to consult
p_adj	Double. Adjusted pvalue threshold for the enrichment
logFC	Double. Fold change threshold for the enrichment
save.results	Logical. If TRUE saves input gene lists and enrichment results.

Value

A list of enrichment tables for upregulated and downregulated genes in the different enrichr databases

See Also

https://maayanlab.cloud/Enrichr/ for additional information about enrichR.

Other functional-annotation functions: Annotate_SPID(), Enrichment_barplot()

Examples

```
## Not run:
df1 <- data.frame(GeneID  = c("MEST", "CDK1", "PCLAF", "BIRC5"),
                  baseMean = c(13490.22, 10490.23, 8888.33, 750.33),
                  log2FoldChange = c(5.78, 6.76, -7.78, -8.78),
                  padj = c(2.28e-143, 2.18e-115, 2.18e-45, 0.006),
                  row.names = c("MEST", "CDK1", "PCLAF", "BIRC5"))
df2 <- data.frame(GeneID  = c("MEST", "CDK1", "PCLAF", "BIRC5"),
                  baseMean = c(13490.22, 10490.23, 8888.33, 750.33),
                  log2FoldChange = c(5.78, 6.76, -7.78, -8.78),
                  padj = c(2.28e-143, 2.18e-115, 2.18e-45, 0.006),
                  row.names = c("MEST", "CDK1", "PCLAF", "BIRC5"))
dfList <- list(df1 = df1, df2 = df2)
test <- Enrichment(dfList, enrich.databases = c("GO_Cellular_Component_2021"),
                   save.results = FALSE)
## End(Not run)
```

Enrichment_barplot *Enrichment_barplot*

Description

Barplot representing the top up-regulated or down-regulated significant pathways

Usage

```
Enrichment_barplot(
  Enrich,
 enrich.databases = c("GO_Biological_Process_2021", "GO_Cellular_Component_2021",
    "GO_Molecular_Function_2021"),
  p_adj = 0.05,
  num_term = 10,
  cond = "UP",
  plot = FALSE
)
```

Arguments

Enrich	A list of enrichment tables for up and down-regulated genes in the different enrichR databases. Output of Enrichment.R function for one DGE experiment.
enrich.databases	Vector of EnrichR databases to consider. These databases must be present in the Enrich list.
p_adj	Double. Minimum Adjusted pvalue threshold for the enrichment
num_term	Double. Number of up-regulated and dw-regulated terms to represent
cond	String. Title of the plot.
plot	Logical. If TRUE save plot as pdf.

Value

bar plot of significant pathways.

See Also

Other functional-annotation functions: Annotate_SPID(), Enrichment()

Other plot functions: SVenn(), Splot(), plotPCA()

Examples

```
## Not run:
dbs <- c("GO_Biological_Process_2021")
dfList <- list()
dfList[["fdr_up"]]$GO_Biological_Process_2021 <- data.frame(
  Term = c("peripheral nervous system neuron differentiation (GO:0048934)",
           "apoptotic chromosome condensation (GO:0030263)",
        "negative regulation of CD4-positive, alpha-beta T cell differentiation (GO:0043371)"),
  Overlap = c("1/5", "1/5", "1/5"),
  P.value = c(0.0007498315, 0.0007498315, 0.0007498315),
  Adjusted.P.value = c(0.00893491, 0.00893491, 0.00893491),
  Old.P.value = c(0, 0, 0),
  Old.Adjusted.P.value = c(0, 0, 0),
  Odds.Ratio = c(2499.125, 2499.125, 2499.125),
  Combined.Score = c(17982.86, 17982.86, 17982.86),
```

```
  Genes = c("RUNX1", "TOP2A", "RUNX1"))
dfList[["fdr_down"]]$GO_Biological_Process_2021 <- data.frame(
  Term = c("skin morphogenesis (GO:0043589)",
           "skin development (GO:0043588)",
           "collagen fibril organization (GO:0030199)"),
  Overlap = c("2/7", "2/80", "2/89"),
  P.value = c(3.149296e-07, 4.727687e-05, 5.856991e-05),
  Adjusted.P.value = c(1.291211e-05, 8.004554e-04, 8.004554e-04),
  Old.P.value = c(0, 0, 0),
  Old.Adjusted.P.value = c(0, 0, 0),
  Odds.Ratio = c(7996.8000, 510.7436, 457.7011),
  Combined.Score = c(119719.427, 5086.745, 4460.430),
  Genes = c("COL1A1;COL1A2", "COL1A1;COL1A2", "COL1A1;COL1A2"))
Enrichment_barplot(dfList,
                   enrich.databases = dbs,
                   p_adj = 0.01, num_term = 3, cond = "UP")

## End(Not run)
```

`enrichr` *Gene enrichment using Enrichr*

Description

Gene enrichment using Enrichr

Usage

```
enrichr(genes, databases)
```

Arguments

`genes`	(Required). Character vector of Entrez gene symbols as input. A data.frame of gene symbols in first column is also acceptable, optionally a score denoting the degree of membership between 0 and 1 in the second column.
`databases`	(Required). Character vector of databases to search. See https://maayanlab.cloud/Enrichr/ for available databases.

Details

Gene enrichment using Enrichr, slighthly modified by Aurora Maurizio.

Value

Returns a list of data.frame of enrichment terms, p-values, ...

Author(s)

Wajid Jawaid <wj241@alumni.cam.ac.uk>

Examples

```
## Not run:
GeneID  = c("MEST", "CDK1", "PCLAF", "BIRC5")
dbs <- c("GO_Molecular_Function_2023", "GO_Cellular_Component_2023",
         "GO_Biological_Process_2023")
enriched1 <- enrichr(GeneID, dbs)
print(head(enriched1[[1]]))
## End(Not run)
```

`enrichr_connect` *Connect to the enrichr web application - function from hypeR*

Description

Connect to the enrichr web application - function from hypeR

Usage

```
enrichr_connect(endpoint, db = c("Enrichr"))
```

Arguments

`endpoint`	The url endpoint to connect to
`db`	A species

Value

A web response

`enrichr_download` *Download data from enrichr in the form of a named list - function from hypeR*

Description

Download data from enrichr in the form of a named list - function from hypeR

Usage

```
enrichr_download(genesets, db = c("Enrichr"))
```

Arguments

`genesets`	A name corresponding to available genesets
`db`	A species

Value

A list of genesets

Examples

```
ATLAS <- enrichr_download("Human_Gene_Atlas")
```

`enrichr_urls` *Get url base for species-specific enrichr libraries - function from hypeR*

Description

Get url base for species-specific enrichr libraries - function from hypeR

Usage

```
enrichr_urls(db = c("Enrichr"))
```

Arguments

db	A species

Value

A url

`Gene2SProtein` *Gene2SProtein function*

Description

Detect Surface Proteins from a vector of genes. The surface proteins are identified according to the in silico human surfaceome database, available at https://wlab.ethz.ch/surfaceome.

Usage

```
Gene2SProtein(
  genes,
  input_type = "gene_name",
  output_tsv = FALSE,
  output_filename = "surfaceProteins.tsv",
  Surfy_version = "log"
)
```

Arguments

genes	A vector of genes.
input_type	The gene identification type: gene_name, ensembl, entrez or uniProt_name. By default: gene_name.
output_tsv	Logical. If TRUE, outputs a tsv file with the results. By default, FALSE.
output_filename	Name of the tsv output file. Default is surfaceProteins.tsv.
Surfy_version	The version of surfy dataframe you wish to use. Choose between log or newest. By default use the most recent log version. If a log dataframe does not exist the newest is downloaded from https://wlab.ethz.ch/surfaceome.

Value

A data frame with filtered surface proteins from the genes array. The dataframe contains also addition information obtained from surfy.

Warning

The surfy database is interrogated using the gene identification type of your preference between gene_name, ensembl, entrez or uniProt_name. Note that you might loose some matches due to different gene version IDs.

See Also

DGE for DGE analysis, https://wlab.ethz.ch/surfaceome for info on Surfy

Examples

```
## Not run:
# from gene name IDs to Surface proteins
GeneNames <- c("CIITA", "EPCAM", "DLK1", "CD24", "CDCP1", "LYVE1", "ABCD1", "VAMP1")
SurfaceProteins_df <- Gene2SProtein(GeneNames, input_type = "gene_name")

# from ensembl IDs to Surface proteins
Ensembl <- c("ENSG00000178343", "ENSG00000176895", "ENSG00000162419", "ENSG00000170776",
             "ENSG00000092529", "ENSG00000135926", "ENSG00000152595", "ENSG00000121577",
             "ENSG00000186094", "ENSG00000126773", "ENSG00000198918", "ENSG00000167378",
             "ENSG00000095574", "ENSG00000140678", "ENSG00000262484", "ENSG00000133739",
             "ENSG00000172469", "ENSG00000112992", "ENSG00000148343", "ENSG00000138593")
SurfaceProteins_df <- Gene2SProtein(Ensembl, input_type = "ensembl",
                                    output_tsv = FALSE, Surfy_version = "new")
## End(Not run)
```

GEOmetadata *GEOmetadata function*

Description

Download metadata from https://www.ncbi.nlm.nih.gov/geo, given an input GEO accession series.

Usage

```
GEOmetadata(GSE, GPL = "")
```

Arguments

GSE	The GSE series ID.
GPL	The GPL series numbers. Required only if the chosen GSE series ID include data from multiple sequencing platforms.

Value

A dataframe with all the available characteristics in GEO metadata genes array.

Warning

If the GEO accession series has more than 1 sequencing platforms you need to specify the GPL series numbers.

See Also

https://www.ncbi.nlm.nih.gov/geo for info on GEO repository

Other public-data functions: DownloadArchS4(), TCGA_download()

Examples

```
# only one sequencing platform
## Not run:
mGSE133671 <- GEOmetadata(GSE = "GSE133671")
# multiple sequencing platforms
mGSE59483 <- GEOmetadata("GSE59483", GPL = c("GPL11154", "GPL15520"))
## End(Not run)
```

getEnrichr *Check if EnrichR is online*

Description

Helper function

Usage

```
getEnrichr(url, ...)
```

Arguments

url	(Required). URL address to check
...	(Optional). Additional parameters to pass to GET

Details

Helper function for HTTP methods GET

Value

Invisible response object from GET request if successful, or NULL on failure

ind_deg *ind_deg*

Description

Input list for metaRNAseq function made of 2 different small Deseq2 output samples dataframes for testing purposes: DEG1_df and DEG2_df.

Usage

```
data(ind_deg)
```

Format

dataframe list

Details

Each dataframe has 2 rows and 9 columns.

Value

A list of dataframes.

listEnrichrDbs *Look up available databases on Enrichr*

Description

Look up available databases on Enrichr

Usage

```
listEnrichrDbs()
```

Details

Look up available databases on Enrichr

Value

A data.frame of available Enrichr databases

Author(s)

Wajid Jawaid <wj241@alumni.cam.ac.uk>

Examples

```
dbs <- listEnrichrDbs()
```

metadata *metadata*

Description

Metadata associated with countData for testing purposes (functions DGE, plotPCA).

Usage

```
data(metadata)
```

Format

dataframe.

Details

A dataframe with 4 rows (sample names) and 3 columns (samplesID, condition A and B, therapy T1 and T2).

Value

A dataframe.

`metaRNAseq` *metaRNAseq function*

Description

Perform Meta-Analysis of RNA-Seq Data

Usage

```
metaRNAseq(
  ind_deg,
  test_statistic = "fishercomb",
  BHth = 0.05,
  adjpval.t = 0.05,
  nrep = NULL,
  plot = FALSE
)
```

Arguments

`ind_deg`	List of indipendent named DEG dataframes with p-values to be combined.
`test_statistic`	p-value combination technique (inverse normal or Fisher): `fishercomb`, `invnorm`. By default: `fishercomb`.
`BHth`	Benjamini Hochberg threshold.
`adjpval.t`	threshold to represent as binary the Meta-Analysis output adjpval.
`nrep`	Vector of numbers of replicates used in each study to calculate the previous one-sided p-values.
`plot`	Logical. If TRUE plot histogram of pvalues. By default, the False Discovery Rate is controlled at 0.05.

Value

A list with `DEindices` of DEG at the chosen Benjamini Hochberg threshold, and `TestStatistic`, `rawpval`, `adjpval`, `binaryadjpval` vectors for differential expression in the meta-analysis.

See Also

`DGE` for DGE analysis, and `https://cran.r-project.org/web/packages/metaRNASeq/vignettes/metaRNASeq.pdf` for metaRNASeq package info.

Other meta-analysis functions: `combine_fisher_invnorm()`

Examples

```
## Not run:
# Deseq2 output samples
DGE1 <- data.frame(GeneID = c("DLK1", "EPCAM"),
                   Mean_CPM_T = c(5.92, 9.91),
                   Mean_CPM_C = c(0.04, 0.03),
                   log2FoldChange = c(10.22, 8.42),
                   lfcSE = c(0.80, 0.48),
                   stat = c(12.68, 17.69),
                   pvalue = c(7.30135e-37, 4.37011e-70),
                   padj = c(1.49936e-35, 1.12976e-67),
                   row.names = c("DLK1", "EPCAM"))
DGE2 <- data.frame(GeneID = c("DLK1", "EPCAM"),
                   Mean_CPM_T = c(3.92, 8.91),
                   Mean_CPM_C = c(0.04, 0.03),
                   log2FoldChange = c(7.22, 5.81),
                   lfcSE = c(0.80, 0.48),
                   stat = c(12.68, 17.69),
                   pvalue = c(7.30135e-37, 4.37011e-70),
                   padj = c(1.49936e-35, 1.12976e-67),
                   row.names = c("DLK1", "EPCAM"))
# input list
ind_deg <- list(DEG1_df = DGE1, DEG2_df = DGE2)
# perform meta-analysis
comb_pval_df <- metaRNAseq(ind_deg, test_statistic = "invnorm", BHth = 0.05, nrep = c(2,2))
## End(Not run)
```

---

plotPCA *plotPCA function*

Description

Plot PCA highlighting one or two data features

Usage

```
plotPCA(
  matrix,
  metadata,
  nTOP = 500,
  dims = c(1, 2),
  centering = TRUE,
  scaling = TRUE,
  color.by = NULL,
  shape.by = NULL,
  pt.size = 6,
  cols.use = NULL,
  shape.use = NULL,
```

```
  main = "PCA",
  label = FALSE,
  new.label = NULL
)
```

Arguments

matrix	Filtered count matrix in CPM or RPKM with gene on the row and sample ID on the column.
metadata	Sample metadata, row.names must be samples names.
nTOP	number of top genes to use for principal components, selected by highest row variance
dims	Dimensions to plot, must be a two-length numeric vector specifying x- and y-dimensions
centering	Logical. If TRUE center PCs
scaling	Logical. If TRUE scales PCs
color.by	Name of one or more metadata columns to color point by.
shape.by	Name of one or more metadata columns to shape point by. If NULL, all points are circles \(default\).
pt.size	Size of the points in the plot.
cols.use	Vector of colors, each color corresponds to an identity class. By default, ggplot assigns colors.
shape.use	Vector of shape, each shape corresponds to an identity class.
main	Plot title. Default = PCA.
label	Logical. If TRUE adds samples label. Default = FALSE.
new.label	If NULL, use the sample names as in metadata row.names. Otherwise you can specify new labels.

Value

PCA plot objec created by ggplot2, which can be assigned and further customized.

See Also

Other plot functions: Enrichment_barplot(), SVenn(), Splot()

Examples

```
## Not run:
# Simulation of bulk RNA data
countData <- matrix(floor(runif(10000, min=0, max=101)),ncol=4)
colnames(countData) <- paste("sample", seq_len(ncol(countData)), sep = "")
rownames(countData) <- paste("gene", seq_along(seq_len(10000/4)), sep = "")
metadata <- data.frame(samplesID = paste("sample", seq_len(ncol(countData)), sep = ""),
                    condition = factor(c("A","A","B","B")),
                    therapy = factor(c("T1","T2","T1","T2")))
```

```
row.names(metadata) <- metadata$samplesID
library(edgeR)
SurfR::plotPCA(matrix = cpm(countData),
        metadata = metadata,
        nTOP = 100,
        dims = c(1,2),
        color.by = "condition", shape.by = "therapy",
        label = FALSE, main = "PCA")
## End(Not run)
```

`setEnrichrSite` *Set Enrichr Website*

Description

Set Enrichr Website

Set Enrichr Website

Usage

```
setEnrichrSite(site)
```



```
setEnrichrSite(site)
```


Arguments

`site`	site requested

Details

Set Enrichr Website

Set Enrichr Website

Value

Changes Enrichr Website connection

Changes Enrichr Website connection

Author(s)

Alexander Blume

Splot *Splot function*

Description

Plot a barplot with features of Surface Protein

Usage

```
Splot(
  SurfaceProteins_df,
  group.by = "Membranome.Almen.main-class",
  cols.use = NULL,
  main = "Almen main class"
)
```

Arguments

SurfaceProteins_df	Output dataframe of Gene2SProtein function.
group.by	Name of columns to plot. Default = Membranome.Almen.main-class.
cols.use	Vector of colors, each color corresponds to an identity class. By default, ggplot assigns colors.
main	Plot title. Default = Almen main class.

Value

plot objec created by ggplot2, which can be assigned and further customized.

See Also

Other plot functions: Enrichment_barplot(), SVenn(), plotPCA()

Examples

```
## Not run:
GeneNames <- c("CIITA", "EPCAM", "DLK1", "CD24", "CDCP1", "LYVE1", "ABCD1", "VAMP1")
SurfaceProteins_df <- Gene2SProtein(GeneNames, input_type = "gene_name")
Splot(SurfaceProteins_df)
## End(Not run)
```

SVenn *SVenn*

Description

Venn diagram of common surface proteins overexpressed among up to 7 different studies

Usage

```
SVenn(
  S_list,
  cols.use = NULL,
  opacity = 0.5,
  output_intersectionFile = TRUE,
  filename = "intersection.xlsx"
)
```

Arguments

S_list	A list of a maximum of 7 surface protein sets detected in different studies.
cols.use	Vector of colors, each color corresponds to a study. By default, ggplot assigns colors.
opacity	Degree of opacity for the colors specified with cols.use (less opacity, more transparency).
output_intersectionFile	logical. If TRUE (default) write an xlsx output of protein in the intersections.
filename	Name of the output file with the intersections.

Value

venn plot of common genes.

See Also

Gene2SProtein for detection of Surface proteins from a list of genes.

Other plot functions: Enrichment_barplot(), Splot(), plotPCA()

Examples

```
## Not run:
S_list <- list(SP1 <- c("EPCAM", "CD24",  "DLK1",  "CDCP1", "LYVE1"),
               SP2 <- c("DLK1", "EPCAM", "EGFR", "UPK1A", "UPK2"))
SP <- SVenn(S_list, cols.use = c("pink", "yellow"), output_intersectionFile = FALSE)
## End(Not run)
```

TCGA_download *TCGA_download function*

Description

Downloads count matrix data from TCGA

Usage

```
TCGA_download(
  project,
  whichcounts = "unstranded",
  save.matrix = FALSE,
  save.metadata = FALSE,
  barcodes = NULL
)
```

Arguments

project	Character. A valid project from TCGAbiolinks:::getGDCprojects()$project_id
whichcounts	Character. Counts data to use. Choose from: unstranded, stranded_first,stranded_second. By default, unstranded.
save.matrix	Logical. If TRUE, outputs a tsv file with the Matrix. By default, FALSE.
save.metadata	Logical. If TRUE, outputs a tsv file with the metadata. By default, FALSE.
barcodes	Character. A vector with names of the barcodes you want to download. If NULL (default) it downloads all the available barcodes in the project.

Value

A list containing the Matrix and the metadata.

See Also

Other public-data functions: DownloadArchS4(), GEOmetadata()

Examples

```
## Not run:
GBM_list_s1 <- TCGA_download(project="TCGA-GBM",
                             whichcounts = "unstranded",
                             save.matrix = FALSE, save.metadata = FALSE,
                             barcodes = c("TCGA-06-0878-01A-01R-1849-01"))
remove downloaded data from TCGA
unlink('GDCdata', recursive = TRUE, force = TRUE)
file.remove("MANIFEST.txt")

## End(Not run)
```

Index

∗ **functional-annotation functions**
  Annotate_SPID, 3
  Enrichment, 9
  Enrichment_barplot, 10
∗ **internal**
  .format_str, 2
  enrichr_connect, 13
  enrichr_urls, 14
∗ **meta-analysis functions**
  combine_fisher_invnorm, 4
  metaRNAseq, 19
∗ **plot functions**
  Enrichment_barplot, 10
  plotPCA, 20
  Splot, 23
  SVenn, 24
∗ **public-data functions**
  DownloadArchS4, 8
  GEOmetadata, 16
  TCGA_download, 25
.format_str, 2

Annotate_SPID, 3, *10, 11*

combine_fisher_invnorm, 4, *19*
countData, 6

DGE, *4, 5*, 6, *15*, *19*
DownloadArchS4, 8, *16*, *25*

enrichedList, 9
Enrichment, *4*, 9, *11*
Enrichment_barplot, *4*, *10*, 10, *21*, *23, 24*
enrichr, 12
enrichr_connect, 13
enrichr_download, 13
enrichr_urls, 14

Gene2SProtein, *4*, 14, *24*
GEOmetadata, *8*, 16, *25*
getEnrichr, 17

ind_deg, 17

listEnrichrDbs, 18

metadata, 18
metaRNAseq, *5*, 19

plotPCA, *11*, 20, *23, 24*

setEnrichrSite, 22
Splot, *11*, *21*, 23, *24*
SVenn, *11*, *21*, *23*, 24

TCGA_download, *8*, *16*, 25