Package ‘spliceGear’

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Title spliceGear

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Description A set of tools to work with alternative splicing

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LazyLoad yes

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NeedsCompilation no

R topics documented:

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as.data.frame.SpliceExprSet

*SpliceExprSet object to data.frame converter*

Description

Converts a SpliceExprSet object to a data.frame.

Usage

```r
## S3 method for class 'SpliceSites'
as.data.frame(x, row.names = NA, optional = NA, ...)

## S3 method for class 'SpliceExprSet'
as.data.frame(x, row.names = NA, optional = NA, ...)
```

Arguments

- `x` object `SpliceSites-class` or `SpliceExprSet-class`.
- `row.names` NULL or a character vector giving the row names for the data frame. Missing values are not allowed.
- `optional` logical. If TRUE, setting row names is optional.
- `...` currently ignored.

Details

Data are traditionally stored in objects of class `data.frame`. This function links the object-oriented design of the package with the large amount of functions working on data.frames.

Value

A `data.frame`. For both functions the first column names are `begin`, `end`, `isintypeI`, `isintypeII`, `exprs` and `genenames`. In the case of `as.data.frame.SpliceExprSet`, the next variable names will the ones in the `AnnotatedDataFrame-class` attribute of the `ExpressionSet-class` object belonging the `SpliceExprSet-class`. The last variable names will be the ones in the slot `info` of the `Probes-class` object.

Author(s)

Laurent Gautier

Examples

```r
data(spliceset)
datf <- as.data.frame(spliceset)

lm.panel <- function(x, y, ...) {
  points(x, y, ...)
  p.lm <- lm(y~x); abline(p.lm)
}
## probe intensity values conditioned by the position of the probes on
## the mRNA
coplot(log(exprs) ~ Material | begin, data=dataf, panel=lm.panel)

### Description
Displays a barplot of the associated AnnotatedDataFrame.

### Usage

```r
## S3 method for class 'SpliceSites'
barplot(height, type.as = c("typeI", "typeII", "all"),
        info = "tissue", ...)
```

### Arguments
- **height**: object of class `SpliceSites-class`.
- **type.as**: the type of alternative splicing (see `SpliceSites-class` for further details).
- **info**: the name of the covariate in the AnnotatedDataFrame (see details).
- **...**: optional parameters to be passed to the underlying function `barplot`.

### Details
When the objects are built from the XML format we propose as an exchange, the parameter `info` can at least take the values "tissue" and "histology". One can refer to the slots `spsiteIpos.pData` and `spsiteIIpos.pData` to know what are the possible choices.

### Value
See the value returned by the function `barplot`.

### See Also
`SpliceSites-class`, `barplot`

### Examples
```r
data(spsites)
barplot(spsites)
```
Functions to make a query on PALSdb, and build objects from the result of a query.

Usage

queryPALSdb(query, disp = c("data", "browser"),
        field = c("keyword", "ug.id", "gb.id", "human.cytoband", "mouse.cytoband", "cluster_count"),
        species = c("human", "mouse"),
        e.value = "1e-1",
        ident.threshold = c("90% 50b", "95% 50b", "90% 45b"))

getPALSdbURL(query, disp = c("data", "browser"),
        field = c("keyword", "ug.id", "gb.id", "human.cytoband", "mouse.cytoband", "cluster_count"),
        species = c("human", "mouse"),
        e.value = "1e-1",
        ident.threshold = c("90% 50b", "95% 50b", "90% 45b"))

buildSpliceSites(xml, verbose=TRUE)

Arguments

query      query string
xml        an object of class XML (as returned by xmlTreeParse)
disp       (idem genbank and pubmed)
field      The field on which the query will be based
species    the specie to work with
e.value    E-value
ident.threshold threshold for matching sequences
verbose    verbose output.

Details

queryPALSdb returns an an object of class XML when disp = "data".
The function buildSpliceSites constructs SpliceSites objects from the XML data. The variables in the slots spsiteIpos.pData and spsiteIIpos.pData are at least tissue (tissue information), histology and site (site numbering).

Value

An object of class XML for queryPALSdb, an URL for getPALSdbURL or a list of objects of class SpliceSites.

Author(s)

laurent@cbs.dtu.dk
getRelSignStrength

References


See Also

queryPALSdb

Examples

library(XML)

filename <- system.file("extdata", "example.xml", package="splicegear")

xml <- xmlTreeParse(filename, asTree=TRUE)

sites <- buildSpliceSites(xml)

getRelSignStrength


descriptions, implementations of the SPLICE algorithm

Usage

getRelSignStrength(x, tissue = as.factor(1:ncol(x)), fun = mean, nipt = 30, nitt = 30, ...)

getFinalRatio(x, tissue = as.factor(1:ncol(x)), fun = mean, ...)

Arguments

x a matrix. One probe per line, one column per sample. Typically this would be
the slot exprs of an instance of class ExprSet.

tissue a covariate (factor) about the samples.

fun a function to obtain a summary value (mean by default)

nipt see reference.

nitt see reference.

... optional parameters for the function fun

Details

getFinalRatio will call getRelSignStrength. The values are log-transformed. It is probably a
good idea to avoid feeding function with values that are already on log scale.

Value

A matrix of the same dimension than the input x, holding 'RSS' (Relative Signal Strength) or 'final
ratios' respectively, as described in the reference. Two attributes nip and nit are attached the
returned matrix.
grid.expand.gp

Convenience function to use the package grid

Usage

grid.expand.gp(n, parlist = list())
grid.make.numeric2npc(x, xlim=NULL, lower.blank=0, upper.blank=0)

Arguments

n  number of parameters
parlist  list of parameters
x  numeric value
xlim  range for Xs
lower.blank, upper.blank  size for margins

Details

call the function gpar on the list of parameters.

Value

Function used for its side effect.
grid.plot.Probes

See Also

lattice

grid.plot.Probes  Plot splicegear objects

Description

Plot objects defined in the package splicegear

Usage

grid.plot.Probes(x, col = "black", add = FALSE, probepos.yscale = NULL, xlim = NULL, vp = NULL, ...)

grid.plot.SpliceSites(x, col.typeI = "orange", col.typeI.window = "yellow", col.typeII = "red", add = FALSE, ylim = NULL, vp = NULL, ...)

grid.plot.SpliceExprSet(x, probes.opt = list(), expr.opt = list(col = NA, lty = 1:6), fig.xratio = c(2, 1), fig.yratio = c(2, 1), probepos.yscale = NULL, ylim = NULL, ...)

Arguments

x  object of Probes-class, SpliceSites-class or SpliceExprSet-class
add  add to an existing plot
col  color(s) for the probes (recycled if necessary).
col.typeI  color(s) for the type I spliced out exons
col.typeI.window  background color for the type I spliced out ‘windows’
col.typeII  color for the type II splicing events
expr.opt  list of options to plot expression values
probes.opt  specify coordinates on the y-axis for the probes.
fig.xratio  ratio for the left and right parts of the plot
fig.yratio  ratio for the upper and lower parts of the plot
vp  a viewport (grid package stuff)
xlim  range for the x-axis (see plot).
ylim  range for the y-axis
...  optional parameters

Details

The ‘type I’/‘type II’ thing is described in the references found in the help files for plot.SpliceSites.
isProbeOnSpliceSite

Value

These functions are mainly used for their side effects. grid.plot.SpliceSites returns the range for the y-axis when needed.

See Also

plot.SpliceSites, plot.Probes

Examples

```r
## plot splice sites
data(spsites)
grid.plot(spsites)

## plot probes
data(probes)
grid.plot(probes)

## combined plot
grid.plot(probes, spsites)
```

isProbeOnSpliceSite  
Check the presence of probes on certain exons

Description

Return whether the probes are located on exons involved in (putative) alternative splicing or not.

Usage

```r
isProbeOnSpliceSite(probes, spSites)
```

## isSpliceSiteOnProbe is not yet implemented

Arguments

- `probes`: object of class Probes
- `spSites`: object of class spliceSites

Value

The returned value in a list of two vectors of mode logical of the same length:

- `isintypeI`: whether the probes are in a 'type I' region or not.
- `isintypeII`: whether the probe are in a 'type II' region or not.

Author(s)

Laurent
matchprobes2Probes

References


matchprobes2Probes create Probes object from matchprobes results

Description

Create Probes object from results the results of the function matchprobes (in the package 'matchprobes').

Usage

matchprobes2Probes(mpo, probes.length, names = NULL)

Arguments

mpo Probes-class object
probes.length Length for the probes (see details).
names names for the elements in the list returned.

Details

Currently only probes of unique length are assumed. In the case of Affymetrix chips, 25 base pairs is the value you probably want.

Value

A list of Probes-class objects.

References

http://www.cbs.dtu.dk/laurent/download/splicegear/

See Also

Probes-class, the package matchprobes
plot.SpliceExprSet  

plot.SpliceExprSet

Description

Plot a object of class SpliceExprSet

Usage

```r
## S3 method for class 'SpliceExprSet'
plot(x,
     probes.opt = list(), expr.opt = list(col = NA, lty = 1:6),
     fig.xratio = c(2, 1), fig.yratio = c(2, 1),
     probepos.yscale = NULL, ylim,
     ...)  
```

Arguments

- **x**: a SpliceExprSet-class
- **probes.opt**: optional parameters to be passed for the plotting of the Probes-class
- **expr.opt**: optional parameters to be passed for the plotting of the ExpressionSet-class
- **fig.xratio**: ratio between the left and right parts of the plot
- **fig.yratio**: ratio between the upper and lower parts of the plot
- **probepos.yscale**: enforce 'y' positions for the probes.
- **ylim**: range for the y-axis
- **...**: optional parameters to be passed to the function plot

Details

The argument probepos.yscale can be used to scale probes according to their position on the reference sequence, as shown in the last example below.

Value

function used for its side-effect(s).

Author(s)

laurent

See Also

SpliceExprSet-class
Examples

```r
data(spliceset)

levels(pData(spliceset@eset)$Material)
## Liver, Mix and SNB19
c.l.mat <- c("red", "yellow","blue")[as.integer(pData(spliceset@eset)$Material)]
## colored in red, yellow and blue respectively
plot(spliceset, expr.opt = list(col = cl.mat, log = "x"))

## sort
spliceset <- sort.SpliceExprSet(spliceset)
begin.pos <- spliceset@probes@pos[, 1]
plot(spliceset, expr.opt = list(col=cl.mat), probepos.yscale = begin.pos)
```

Description

plot objects.

Usage

```r
## S3 method for class 'Probes'
plot(x, col="black",
   xlab = "sequence", ylab = "probes",
   add=FALSE, probepos.yscale=NULL, xlim=NULL,
   ...) 
## S3 method for class 'SpliceSites'
plot(x, col.typeI = "orange",
   col.typeI.window = "yellow",
   col.typeII = "red",
   add=FALSE, ylim=NULL, ...)
```

Arguments

- `x`  
  object of class Probes or SpliceSites.
- `col`  
  color argument for the probes.
- `col.typeI`  
  color argument for the type I splice sites
- `col.typeI.window`  
  color argument for the type I ‘window’
- `col.typeII`  
  color argument for the type II splice sites
- `add`  
  add the plot to an existing plot. Make a new plot if ‘FALSE’
- `probepos.yscale`  
  scaling argument
- `xlim, ylim`  
  range of plotting window
- `xlab, ylab`  
  labels for the axis
- `...`  
  optional parameters to be passed to the function plot.
plot.SpliceSitesGenomic

Details

If the parameter `main` is not specified, the function tries to extract the attribute 'name' from `x`. The two functions can be combined to display both objects on the same plot.

Value

The range for the y-axis is returned whenever needed (see `invisible`).

Author(s)

Laurent

References


See Also

`SpliceSites-class`

Examples

data(spsites)

plot(spsites, main=attr(spsites, "name"))

sp.pData <- spsites@spsiteIpos.pData

##col <- as.integer(factor(sp.pData$tissue))

##plot(spsites, col.typeI=col, main=attr("name", spsites))

plot.SpliceSitesGenomic

Function to plot SpliceSitesGenomic objects

Description

Function to plot SpliceSitesGenomic objects.

Usage

## S3 method for class 'SpliceSitesGenomic'
plot(x, col.variant = par("col"), col.exon = "white",
     split = FALSE, main = names(x@variants), ...)
Probes-class

Arguments

- `x`: SpliceSitesGenomic-class.
- `col.variant`: a vector of colors for the different variants. The colors are recycled as necessary.
- `col.exon`: a vector of colors for the exons. The colors are recycled as necessary.
- `split`: split the plot of the variants in individual plots.
- `main`: character to use as a title. Recycled as necessary.
- `...`: optional graphical parameters.

Value

This function is used for its side-effect.

Author(s)

Laurent

See Also

SpliceSitesGenomic-class

Examples

```r
## a 10 bp window
seq.length <- as.integer(10)
## positions of the exons
spsiteIpos <- matrix(c(1, 3.5, 5, 9, 3, 4, 8, 10), nc=2)
## known variants
variants <- list(a=c(1,2,3,4), b=c(1,2,3), c=c(1,3,4))
##
## n.exons <- nrow(spsiteIpos)

spvar <- new("SpliceSitesGenomic", spsiteIpos=spsiteIpos,
             variants=variants, seq.length=seq.length)

par(mfrow = c(3,1), mar = c(3.1, 2.1, 2.1, 1.1))

plot(spvar, split=TRUE, col.exon=rainbow(n.exons))
```

Probes-class

Class "Probes"

Description

Information about a set of probes

Objects from the Class

Objects can be created by calls of the form `new("Probes", pos)` or `new("Probes", pos, info)`. The object are primarily storing the location of the probe on a matching sequence sequence. Optional information can be stored in the slot info (a data.frame).
Slots

pos: Object of class "matrix". It expects one row per probe. The first column should give the start position while the second column should give the end position.

info: Object of class "data.frame". Optional information one wishes to carry around can be stored here.

Methods

initialize signature(.Object = "Probes"): ...

show signature(object): show minimal information

plot signature(x = "Probes", y = "missing"): plot the position of the probes. (see plot.Probes)

plot signature(x = "Probes", y = "SpliceSites"): plot the positions of the probes and the positions of the splice sites

See Also

SpliceSites-class, SpliceExprSet-class.

Examples

data(probes)

plot(probes)

sort.SpliceExprSet A function to sort a SpliceExprSet

Description

Sort the probes in a SpliceExprSet (and reflect this in all the relevant places).

Usage

## S3 method for class 'SpliceExprSet'

sort(x, decreasing, fun = function(x) order(x@probes@pos[,1]), reverse = FALSE, ...)

Arguments

x a SpliceExprSet.

decreasing currently ignored

fun a function to do the sorting

reverse return the reverse of the sorting order

... currently ignored

Value

An object of class SpliceExprSet
SpliceExprSet-class

Author(s)
Laurent

See Also
SpliceExprSet-class

Examples

data(spliceset)
s.spliceset <- sort.SpliceExprSet(spliceset)

Description
A class to store probe expression values with alternative splicing information

Objects from the Class
Objects can be created by calls of the form new("SpliceExprSet", ...).

Slots
spliceSites: Object of class "SpliceSites". The probes and splice site information.
probes: Object of class "Probes". The matching expression values.
eset: Object of class "ExpressionSet". The matching expression values.

Methods
grid.plot signature(x = "SpliceExprSet", y = "missing"): ...
plot signature(x = "SpliceExprSet", y = "missing"): a plotting method.
show signature(object = "SpliceExprSet"): a printing method.
spliceSites signature(object = "SpliceExprSet"): accessor.

Author(s)
laurant@cbs.dtu.dk

References
a manuscript in preparation

See Also
as.data.frame.SpliceExprSet, sort.SpliceExprSet and SpliceSites-class
spliceset

Examples

```r
data(eset, package="splicegear")
data(probes, package="splicegear")
data(spsites, package="splicegear")

spliceset <- new("SpliceExprSet", eset=eset,
                  probes=probes, spliceSites=spsites)

plot(spliceset)
```

Description

The putative splice variants for a reference sequence, the matching probes from the Affymetrix chip 'HG-U95A' and probe intensities from the 'dilution' dataset.

Usage

```r
#data(eset, package="splicegear")
#data(probes, package="splicegear")
#data(spsites, package="splicegear")
#data(spliceset, package="splicegear")
```

Format

The formats are objects of class `ExpressionSet-class`, `Probes-class`, `SpliceSites-class` and `SpliceExprSet-class` respectively.

Details

The attribute "name" is set to the ID of the Unigene cluster from which the reference sequence is taken.

References

"PALSdb", ref. GeneLogic's dilution dataset.

Examples

```r
data(spliceset, package="splicegear")
plot(spliceset, main=attr(spliceset, "name"))
```
SpliceSites-class

Class "SpliceSites"

Description

A class to store (putative) splice sites

Objects from the Class

Objects can be created by calls of the form new("SpliceSites", ...).

Slots

seq: Object of class "character". The reference sequence.

seq.length: Object of class "integer". The length for the reference sequence (used when the slot seq is set to ".").

spsiteIpos: Object of class "matrix". A two-columns matrix to store the begin and end positions of type I splice variant.

spsiteIIpos: Object of class "integer". A vector to store the positions for type II splice variants.

spsiteIIIpos: Object of class "matrix". Idem spsiteIpos, but for type III splice variants.

spsiteIpos.pData: Object of class AnnotatedDataFrame. Used to store covariate information related to the splice variants.

spsiteIIpos.pData: Object of class AnnotatedDataFrame.

spsiteIIIpos.pData: Object of class AnnotatedDataFrame.

Methods

show signature(object = "SpliceSites"): A printing method.

plot signature(x = "SpliceSites", y = "missing"): A plotting method

Author(s)

laurent@cbs.dtu.dk

References

"Plenty of splicin’ or ’can regular Affymetrix chips be used to observe alternative splicing ?’", Gautier L. et al., 2003, manuscript in preparation (and the title might have to chang...).
Examples

data(spliceset)

print(spliceset)

par(mfrow=c(1,2))

plot(spliceset, main=attr(spliceset, "name"))

## filter out supporting matches with unique positions

filter.typeI <- function(x) {unique(x[duplicated(x), , drop=FALSE])}

spliceset.filter <- spliceset

sSites <- spliceset.filter@sspliceSites

sSites@sspiteIpos <- filter.typeI(sSites@sspiteIpos)

spliceset.filter@sspliceSites <- sSites

## plot the resulting new object

plot(spliceset.filter)

SpliceSitesGenomic-class

Class “SpliceSitesGenomic”

Description

A class to store alternative splicing information on a genomic point of view.

Objects from the Class

Objects can be created by calls of the form new("SpliceSitesGenomic", seq, seq.length, spsiteIpos, spsiteIIpos, spsiteIIIpos, ...).

Slots

variants: Object of class "list". There is one element per splice variant. Each element in the list should be a vector of integers. Each integer refers to an exon. The sequence of integers determines the sequence of exons in the splice variant.

seq: Object of class "character", from class "SpliceSites".

seq.length: Object of class "integer", from class "SpliceSites".

spsiteIpos: Object of class "matrix", from class "SpliceSites".

spsiteIIpos: Object of class "integer", from class "SpliceSites". This should not have any practical use in this class.

spsiteIIIpos: Object of class "matrix", from class "SpliceSites". This should not have any practical use in this class.

spsiteIpos.pData: Object of class "AnnotatedDataFrame", from class "SpliceSites".

spsiteIIpos.pData: Object of class "AnnotatedDataFrame", from class "SpliceSites". This should not have any practical use in this class.

spsiteIIIpos.pData: Object of class "AnnotatedDataFrame", from class "SpliceSites". This should not have any practical use in this class.
**split.SpliceSites**

**Extends**

Class "SpliceSites", directly.

**Methods**

`plot` signature(x = "SpliceSitesGenomic", y = "missing"): a plotting method for demonstration purposes.

**See Also**

`SpliceSites-class` and `plot.SpliceSitesGenomic`.

**Examples**

```r
## a 10 bp window
seq.length <- as.integer(10)
## positions of the exons
spsiteIpos <- matrix(c(1, 3.5, 5, 9, 3, 4, 8, 10), nc=2)
## known variants
variants <- list(a=c(1,2,3,4), b=c(1,2,3), c=c(1,3,4))
spvar <- new("SpliceSitesGenomic", spsiteIpos=spsiteIpos,
             variants=variants, seq.length=seq.length)
plot(spvar)
```

**Description**

Split an instance of SpliceSites into several instances of SpliceSites

**Usage**

```r
## S3 method for class 'SpliceSites'
split(x, f = list(typeI = NA, typeII = NA), drop=NULL, ...)
```

**Arguments**

- `x` an instance of class `SpliceSites-class`.
- `f` a list of two factors (see details).
- `drop` not used (here to keep R CMD check happy)
- `...` see drop above.

**Details**

The split usually is performed on a factor. Two factors are required because of the two categories of splicing events (type I (deletion of a fragment of the reference sequence) and type II (insertion of an element of the reference sequence). A character can be used instead of a factor. In this case the covariates with the given name, in the slots `spsiteIpos.pData` and `spsiteIIpos.pData` respectively, are used to make the split. When equal to NA, the covariate named site will be used.
Value
A list of objects of class SpliceSites

See Also
SpliceSites-class

Examples
data(spsites)
split(spsites)
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