

# Package ‘seqsetvis’

May 9, 2024

**Type** Package

**Title** Set Based Visualizations for Next-Gen Sequencing Data

**Version** 1.25.0

**Description** seqsetvis enables the visualization and analysis of sets of genomic sites in next gen sequencing data. Although seqsetvis was designed for the comparison of multiple ChIP-seq samples, this package is domain-agnostic and allows the processing of multiple genomic coordinate files (bed-like files) and signal files (bigwig files pileups from bam file).

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**Encoding** UTF-8

**LazyData** true

**Suggests** BiocFileCache, BiocManager, BiocStyle, ChIPpeakAnno, covr, knitr, rmarkdown, testthat

**Depends** R (>= 3.6), ggplot2

**Imports** cowplot, data.table, eulerr, GenomeInfoDb, GenomicAlignments, GenomicRanges, ggplotify, grDevices, grid, IRanges, limma, methods, pbapply, pbmcapply, png, RColorBrewer, Rsamtools, rtracklayer, S4Vectors, scales, stats, UpSetR

**RoxygenNote** 7.3.1

**VignetteBuilder** knitr

**NeedsCompilation** no

**biocViews** Software, ChIPSeq, MultipleComparison, Sequencing, Visualization

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seqsetvis-package	<i>easy awesome peak set vis TESTING seqsetvis allows you to...</i>
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### Description

2 steps [ssvOverlapIntervalSets](#). [ssvFetchBigwig](#). Otherwise refer to the vignettes to see

### Author(s)

**Maintainer:** Joseph R Boyd <jrboyd@uvm.edu>

---

<i>.expand_cigar_dt</i>	<i>Expand intermediate bam fetch by cigar codes</i>
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---

### Description

see [sam specs](#) for cigar details

### Usage

```
.expand_cigar_dt(cigar_dt, op_2count = c("M", "D", "=", "X"))
```

### Arguments

cigar_dt	data.table with 5 required named columns in any order. c("which_label", "seq-names", "strand", "start", "cigar")
op_2count	Cigar codes to count. Default is alignment (M), deletion (D), match (=), and mismatch (X). Other useful codes may be skipped regions for RNA splicing (N). The locations of any insterions (I) or clipping/padding (S, H, or P) will be a single bp immediately before the interval.

### Value

data.table with cigar entries expanded

---

.expand\_cigar\_dt\_recursive

*Expand intermediate bam fetch by cigar codes*

---

**Description**

see [sam specs](#) for cigar details

**Usage**

```
.expand_cigar_dt_recursive(cigar_dt)
```

**Arguments**

cigar\_dt            data.table with 5 required named columns in any order. c("which\_label", "seq-names", "strand", "start", "cigar")

**Value**

data.table with cigar entries expanded

---

.rm\_dupes

*Remove duplicate reads based on stranded start position. This is an over-simplification. For better duplicate handling, duplicates must be marked in bam and flag passed to fetchBam() ... for ScanBamParam*

---

**Description**

flag = scanBamFlag(isDuplicate = FALSE)

**Usage**

```
.rm_dupes(reads_dt, max_dupes)
```

**Arguments**

reads\_dt            data.table of reads as loaded by fetchBam  
max\_dupes            maximum allowed positional duplicates

**Value**

reads\_dt with duplicated reads over max\_dupes removed

---

<code>.rm_dupesPE</code>	<i>Remove duplicate paired-end reads based on start and end position. This is an over-simplification. For better duplicate handling, duplicates must be marked in bam and flag passed to <code>fetchBamPE()</code> ... for <code>ScanBamParam</code></i>
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---

**Description**

```
flag = scanBamFlag(isDuplicate = FALSE)
```

**Usage**

```
.rm_dupesPE(reads_dt, max_dupes)
```

**Arguments**

<code>reads_dt</code>	data.table of reads as loaded by <code>fetchBamPE</code>
<code>max_dupes</code>	maximum allowed positional duplicates

**Value**

`reads_dt` with duplicated reads over `max_dupes` removed

---

<code>add_cluster_annotation</code>	<i>add_cluster_annotation</i>
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---

**Description**

adds rectangle boxes proportional to cluster sizes of heatmap with optional labels.

**Usage**

```
add_cluster_annotation(
  cluster_ids,
  p = NULL,
  xleft = 0,
  xright = 1,
  rect_colors = c("black", "gray"),
  text_colors = rev(rect_colors),
  show_labels = TRUE,
  label_angle = 0,
  row_ = "id",
  cluster_ = "cluster_id"
)
```

**Arguments**

cluster_ids	Vector of cluster ids for each item in heatmap. Should be sorted by plot order for heatmap.
p	Optionally an existing ggplot to add annotation to.
xleft	left side of cluster annotation rectangles. Default is 0.
xright	right side of cluster annotation rectangles. Default is 1.
rect_colors	colors of rectangle fill, repeat to match number of clusters. Default is c("black", "gray").
text_colors	colors of text, repeat to match number of clusters. Default is reverse of rect_colors.
show_labels	logical, should rectangles be labelled with cluster identity. Default is TRUE.
label_angle	angle to add clusters labels at. Default is 0, which is horizontal.
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* outputs.
cluster_	variable name to use for cluster info. Default is "cluster_id".

**Value**

A ggplot with cluster annotations added.

**Examples**

```
#simplest uses
add_cluster_annotation(factor(c(rep("A", 3), "B")))
p = ggplot() + coord_cartesian(xlim = c(0,10))
add_cluster_annotation(factor(c(rep("A", 3), "B")), p)

#intended use with ssvSignalHeatmap
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 3)
assign_dt = unique(clust_dt[, .(id, cluster_id)])[order(id)]
p_heat = ssvSignalHeatmap(clust_dt, show_cluster_bars = FALSE)
add_cluster_annotation(assign_dt$cluster_id, p_heat,
  xleft = -500, xright = -360, rect_colors = rainbow(3), text_colors = "gray")

#when colors are named, the names are used rather than just the order
rect_colors = safeBrew(assign_dt$cluster_id)
text_colors = safeBrew(assign_dt$cluster_id, "greys")
p_clusters = add_cluster_annotation(assign_dt$cluster_id,
  rect_colors = rect_colors, text_colors = text_colors)
#specialized use as plot outside of heatmap
p1 = assemble_heatmap_cluster_bars(plots = list(p_clusters, p_heat), rel_widths = c(1, 3))

#when colors are named, the names are used rather than just the order
#these plots will be identical even though order of colors changes.
rect_colors = rect_colors[c(2, 3, 1)]
text_colors = text_colors[c(3, 1, 2)]
p_clusters = add_cluster_annotation(assign_dt$cluster_id,
  rect_colors = rect_colors, text_colors = text_colors)
#specialized use as plot outside of heatmap
```

```
p2 = assemble_heatmap_cluster_bars(plots = list(p_clusters, p_heat), rel_widths = c(1, 3))
cowplot::plot_grid(p1, p2, ncol = 1)
```

---

append_ynorm	<i>append_ynorm</i>
--------------	---------------------

---

## Description

see [calc\\_norm\\_factors](#) for normalization details.

## Usage

```
append_ynorm(
  full_dt,
  value_ = "y",
  cap_value_ = "y_cap_value",
  norm_value_ = "y_norm",
  by1 = "id",
  by2 = "sample",
  aggFUN1 = max,
  aggFUN2 = function(x) quantile(x, 0.95),
  cap_dt = NULL,
  do_not_cap = FALSE,
  do_not_scaleTo1 = FALSE,
  force_append = FALSE
)
```

## Arguments

full_dt	a data.table, as returned by <code>ssvFetch*(..., return_data.table = TRUE)</code> .
value_	character, attribute in full_dt to normalzie.
cap_value_	character, new attribute name specifying values to cap to.
norm_value_	character, new attribute name specifying normalized values.
by1	character vector, specifies attributes relevant to step 1.
by2	character vector, specifies attributes relevant to step 1 and 2.
aggFUN1	function called on value_ with by = c(by1, by2) in step 1.
aggFUN2	function called on result of aggFUN1 with by = by2 in step 2.
cap_dt	optionally, provide user generated by2 to cap_value_ mapping
do_not_cap	if TRUE, normalized values are not capped to 1. Default is FALSE.
do_not_scaleTo1	if TRUE, normalized values are not scaled to 1. Default is FALSE.
force_append	if TRUE, any previous cap_value or norm_value is overridden. Default is FALSE.



**Value**

data.table, full\_dt with cap\_value\_ and norm\_value\_ values appended.

**Examples**

```
append_ynorm(CTCF_in_10a_profiles_dt)
append_ynorm(CTCF_in_10a_profiles_dt,
  aggFUN1 = mean, aggFUN2 = function(x)quantile(x, .5))
```

---

applyMovingAverage      *applyMovingAverage*

---

**Description**

[http://www.cookbook-r.com/Manipulating\\_data/Calculating\\_a\\_moving\\_average/](http://www.cookbook-r.com/Manipulating_data/Calculating_a_moving_average/)

**Usage**

```
applyMovingAverage(
  dt,
  n,
  centered = TRUE,
  x_ = "x",
  y_ = "y",
  by_ = c("id", "sample"),
  maFun = movingAverage
)
```

**Arguments**

dt	a tidy data.table containing two-dimensional data
n	the number of samples centered: if FALSE, then average
centered	current sample and previous (n-1) samples if TRUE, then average symmetrically in past and future. (If n is even, use one more sample from future.)
x_	the variable name of the x-values
y_	the variable name of the y-values
by_	optionally, any variables that provide grouping to the data. default is none. see details.
maFun	a function that accepts x, y, and n as arguments and returns a list of length 2 with named elements x and y.

**Value**

a newly derived data.table where a movingAverage has been applied.

**Examples**

```
agg_dt = CTCF_in_10a_profiles_dt[, list(y = mean(y)), by = list(sample, x)]
ggplot(agg_dt) +
  geom_line(aes(x = x, y = y, color = sample))

ma_smooth = applyMovingAverage(agg_dt, n = 5,
  y_ = 'y', by_ = c('sample'))
ggplot(ma_smooth) +
  geom_line(aes(x = x, y = y, color = sample))

ma_smooth$method = "moving_average"
agg_dt$method = "none"
ggplot(rbind(ma_smooth, agg_dt)) +
  geom_line(aes(x = x, y = y, color = method)) +
  facet_wrap(~sample)
```

---

applySpline	<i>applies a spline smoothing to a tidy data.table containing x and y values.</i>
-------------	-----------------------------------------------------------------------------------

---

**Description**

applySpline Is intended for two-dimensional tidy data.tables, as returned by ssvFetchBigwig

**Usage**

```
applySpline(
  dt,
  n,
  x_ = "x",
  y_ = "y",
  by_ = c("id", "sample"),
  splineFun = stats::spline
)
```

**Arguments**

dt	a tidy data.table containing two-dimensional data
n	the number of interpolation points to use per input point, see ?spline. n must be > 1.
x_	the variable name of the x-values
y_	the variable name of the y-values
by_	optionally, any variables that provide grouping to the data. default is none. see details.
splineFun	a function that accepts x, y, and n as arguments and returns a list of length 2 with named elements x and y. stats::spline by default. see stats::spline for details.

**Details**

by\_ is quite powerful. If by\_ = c('gene\_id', 'sample\_id'), splines will be calculated individually for each gene in each sample. alternatively if by\_ = c('gene\_id')

**Value**

a newly derived data.table that is n times longer than original.

**See Also**

[ssvFetchBigwig](#)

**Examples**

```
#data may be blockier than we'd like
ggplot(CTCF_in_10a_profiles_dt[, list(y = mean(y)), by = list(sample, x)]) +
  geom_line(aes(x = x, y = y, color = sample))

#can be smoothed by applying a spline (think twice about doing so,
#it may look prettier but may also be deceptive or misleading)

splined_smooth = applySpline(CTCF_in_10a_profiles_dt, n = 10,
  y_ = 'y', by_ = c('id', 'sample'))
ggplot(splined_smooth[, list(y = mean(y)), by = list(sample, x)]) +
  geom_line(aes(x = x, y = y, color = sample))
```

---

assemble\_heatmap\_cluster\_bars

*assemble\_heatmap\_cluster\_bars*

---

**Description**

assemble\_heatmap\_cluster\_bars

**Usage**

```
assemble_heatmap_cluster_bars(plots, ...)
```

**Arguments**

plots	list of plots as returned from ssvSignalHeatmap.ClusterBars when return_unassembled_plots = TRUE
...	arguments passed to cowplot::plot_grid

**Value**

A grob produced by cowplot::plot\_grid

**Examples**

```
plots = ssvSignalHeatmap.ClusterBars(CTCF_in_10a_profiles_gr, return_unassembled_plots = TRUE)
assemble_heatmap_cluster_bars(plots)
```

---

Bcell_peaks	<i>4 random peaks for paired-end data</i>
-------------	-------------------------------------------

---

**Description**

matches `system.file("extdata/Bcell_PE.mm10.bam", package = "seqsetvis")`

**Format**

GRanges length 4

**Details**

this is included only for testing `ssvFetchBamPE` functions.

---

calc_norm_factors	<i>calc_norm_factors</i>
-------------------	--------------------------

---

**Description**

Calculate normalization factors in a two step process:

**Usage**

```
calc_norm_factors(
  full_dt,
  value_ = "y",
  cap_value_ = "y_cap_value",
  by1 = "id",
  by2 = "sample",
  aggFUN1 = max,
  aggFUN2 = function(x) quantile(x, 0.95)
)
```

**Arguments**

full_dt	a data.table, as returned by <code>ssvFetch*(..., return_data.table. = TRUE)</code>
value_	character, attribute in full_dt to normalzie.
cap_value_	character, new attribute name specifying values to cap to.
by1	character vector, specifies attributes relevant to step 1.
by2	character vector, specifies attributes relevant to step 1 and 2.
aggFUN1	function called on value_ with by = c(by1, by2) in step 1.
aggFUN2	function called on result of aggFUN1 with by = by2 in step 2.

**Details**

- 1) summarize every region for each sample (default summary function is max)
- 2) calculate a value to cap each sample to based on regions (default is 95th quantile).

The underlying assumption here is that meaningful enrichment is present at the majority of regions provided. If prevalence varies by a specific factor, say ChIP-seq targets with different characteristics - ie. when analyzing TSSes for H3K4me3 and an infrequent transcription factor it is more appropriate to specify appropriate quantile cutoffs per factor.

**Value**

data.table mapping by2 to cap\_value\_.

**Examples**

```
calc_norm_factors(CTCF_in_10a_profiles_dt)
calc_norm_factors(CTCF_in_10a_profiles_dt,
  aggFUN1 = mean, aggFUN2 = function(x)quantile(x, .5))
```

---

centerAtMax	<i>centers profile of x and y. default is to center by region but across all samples.</i>
-------------	-------------------------------------------------------------------------------------------

---

**Description**

centerAtMax locates the coordinate x of the maximum in y and shifts x such that it is zero at max y.

**Usage**

```
centerAtMax(
  dt,
  x_ = "x",
  y_ = "y",
  by_ = "id",
  view_size = NULL,
  trim_to_valid = TRUE,
  check_by_dupes = TRUE,
  x_precision = 3,
  replace_x = TRUE
)
```

**Arguments**

dt	data.table
x_	the variable name of the x-values. default is 'x'
y_	the variable name of the y-values default is 'y'

by_	optionally, any variables that provide grouping to the data. default is none. see details.
view_size	the size in x_ to consider for finding the max of y_. if length(view_size) == 1, range will be c(-view_size, view_size). if length(view_size) > 1, range will be range(view_size). default value of NULL uses complete range of x.
trim_to_valid	valid x_ values are those with a set y_ value in all by_ combinations
check_by_dupes	default assumption is that there should be on set of x_ for a by_ instance. if this is not the case and you want to disable warnings about set this to FALSE.
x_precision	numerical precision of x, default is 3.
replace_x	logical, default TRUE. if TRUE x_ will be replaced with position relative to summit. if FALSE x_ will be preserved and x_summitPosition added.

### Details

character. by\_ controls at the level of the data centering is applied. If by\_ is "" or NULL, a single max position will be determined for the entire dataset. If by\_ is "id" (the default) then each region will be centered individually across all samples.

### Value

data.table with x (or xnew if replace\_x is FALSE) shifted such that x = 0 matches the maximum y-value define by by\_ grouping

### Examples

```
centerAtMax(CTCF_in_10a_profiles_gr, y_ = 'y', by_ = 'id',
  check_by_dupes = FALSE)
#it's a bit clearer what's happening with trimming disabled
#but results are less useful for heatmaps etc.
centerAtMax(CTCF_in_10a_profiles_gr, y_ = 'y', by_ = 'id',
  check_by_dupes = FALSE, trim_to_valid = FALSE)
#specify view_size to limit range of x values considered, prevents
#excessive data trimming.
centerAtMax(CTCF_in_10a_profiles_gr, y_ = 'y', view_size = 100, by_ = 'id',
  check_by_dupes = FALSE)
```

---

centerFixedSizeGRanges

*Transforms set of GRanges to all have the same size.*

---

### Description

centerFixedSizeGRanges First calculates the central coordinate of each GRange in grs and extends in both direction by half of fixed\_size

### Usage

```
centerFixedSizeGRanges(grs, fixed_size = 2000)
```

**Arguments**

grs                   Set of GRanges with inconsistent and/or incorrect size  
 fixed\_size           The final width of each GRange returned.

**Value**

Set of GRanges after resizing all input GRanges, either shortened or lengthened as required to match fixed\_size

**Examples**

```
library(GenomicRanges)
grs = GRanges("chr1", IRanges(1:10+100, 1:10*3+100))
centered_grs = centerFixedSizeGRanges(grs, 10)
width(centered_grs)
```

---

centerGRangesAtMax     *Centers query GRanges at maximum signal in prof\_dt.*

---

**Description**

Centers query GRanges at maximum signal in prof\_dt.

**Usage**

```
centerGRangesAtMax(prof_dt, qgr, x_ = "x", y_ = "y", by_ = "id", width = 1)
```

**Arguments**

prof\_dt               a GRanges or data.table as returned by ssvFetch\*.  
 qgr                   the GRanges used to query ssvFetch\* as the qgr argument.  
 x\_                    positional variable. Should almost always be the default, "x".  
 y\_                    the signal value variable. Likely the default value of "y" but could be "y\_norm" if append\_ynorm was applied to data.  
 by\_                   region identifier variable. Should almost always be the default, "id".  
 width                 Desired width of final regions. Default is 1.

**Value**

a GRanges with same mcols as qgr that has been centered based on signal in prof\_dt and with regions of specified width.

**Examples**

```
centerGRangesAtMax(CTCF_in_10a_profiles_dt, CTCF_in_10a_overlaps_gr)
centerGRangesAtMax(CTCF_in_10a_profiles_gr, CTCF_in_10a_overlaps_gr)
```

---

chromHMM\_demo\_bw\_states\_gr

*MCF10A CTCF profiles at 20 windows per chromHMM state, hg38.*

---

**Description**

MCF10A CTCF profiles at 20 windows per chromHMM state, hg38.

**Format**

a GRanges object of length 4000 with 5 metadata columns sufficient for use with ggplot2

**Details**

part of [chromHMM\\_demo\\_data](#)

the result of `ssvFetchBigwig()` on the MCF10A\_CTCF\_FE.bw near 20 randomly selected windows per chromHMM state.

---

chromHMM\_demo\_chain\_url

*URL to download hg19ToHg38 liftover chain from UCSC*

---

**Description**

URL to download hg19ToHg38 liftover chain from UCSC

**Format**

a character containing a URL

**Details**

file is gzipped .txt

part of [chromHMM\\_demo\\_data](#)



---

chromHMM\_demo\_data      *chromHMM state segmentation in the MCF7 cell line*

---

### Description

Vignette data for seqsetvis was downloaded directly from GEO series [GSE57498](#). This data is the state segmentation by chromHMM in the MCF7 cell line. chromHMM creates a hidden markov model by integrating several ChIP-seq samples, in this case:

- MCF7\_H3K27ac\_ChIP-Seq
- MCF7\_H3K27me3\_ChIP-Seq
- MCF7\_H3K4me1\_ChIP-Seq
- MCF7\_H3K4me3\_ChIP-Seq
- MCF7\_RNApolIIp\_ChIP-Seq

Data from GEO series [GSE57498](#) is from the publication [Taberlay PC et al. 2014](#)

### Details

Contains:

- [chromHMM\\_demo\\_overlaps\\_gr](#)
- [chromHMM\\_demo\\_bw\\_states\\_gr](#)
- [chromHMM\\_demo\\_state\\_total\\_widths](#)
- [chromHMM\\_demo\\_state\\_colors](#)
- [chromHMM\\_demo\\_segmentation\\_url](#)
- [chromHMM\\_demo\\_chain\\_url](#)

---

chromHMM\_demo\_overlaps\_gr  
*overlap of MCF10A CTCF with MCF7 chromHMM states, hg38.*

---

### Description

overlap of MCF10A CTCF with MCF7 chromHMM states, hg38.

### Format

a GRanges object of length 98 with 10 logical metadata columns, 1 per state.

**Details**

part of [chromHMM\\_demo\\_data](#)

the result of `ssvOverlapIntervalSets()` on MCF10A CTCF peaks and MCF7 chromHMM states with `use_first = TRUE`

first (the MCF10A peaks) and `no_hit` columns have been removed each remaining column represents MCF10A peaks overlapping with a state.

---

`chromHMM_demo_segmentation_url`

*URL to download hg19 MCF7 chromHMM segmentation*

---

**Description**

URL to download hg19 MCF7 chromHMM segmentation

**Format**

a character containing a URL

**Details**

file is gzipped bed with name, score, itemRgb and thick meta columns

part of [chromHMM\\_demo\\_data](#)

---

`chromHMM_demo_state_colors`

*original state name to color mappings stored in segmentation bed*

---

**Description**

original state name to color mappings stored in segmentation bed

**Format**

a named character vector mapping states to hex colors

**Details**

part of [chromHMM\\_demo\\_data](#)

---

chromHMM\_demo\_state\_total\_widths  
*state name to total width mappings, hg38*

---

**Description**

state name to total width mappings, hg38

**Format**

named numeric of total widths per state

**Details**

part of [chromHMM\\_demo\\_data](#)

---

clusteringKmeans      *perform kmeans clustering on matrix rows and return reordered matrix along with order matched cluster assignments. clusters are sorted using hclust on centers*

---

**Description**

perform kmeans clustering on matrix rows and return reordered matrix along with order matched cluster assignments. clusters are sorted using hclust on centers

**Usage**

```
clusteringKmeans(mat, nclust, centroids = NULL, iter.max = 30)
```

**Arguments**

mat	numeric matrix to cluster.
nclust	the number of clusters.
centroids	optional matrix with same columns as mat and one centroid per row to base clusters off of. Overrides any setting to nclust. Default of NULL results in randomly initialized k-means.
iter.max	Number of max iterations to allow for k-means. Default is 30.

**Value**

data.table with group\_\_ variable indicating cluster membership and id\_\_ variable that is a factor indicating order based on within cluster similarity

**Examples**

```
dt = data.table::copy(CTCF_in_10a_profiles_dt)
mat = data.table::dcast(dt, id ~ sample + x, value.var = "y" )
rn = mat$id
mat = as.matrix(mat[,-1])
rownames(mat) = rn
clust_dt = clusteringKmeans(mat, nclust = 3)
dt = merge(dt, clust_dt[, .(id = id_, group = group_)])
dt$id = factor(dt$id, levels = clust_dt$id)
dt[order(id)]
```

---

clusteringKmeansNestedHclust

*perform kmeans clustering on matrix rows and return reordered matrix along with order matched cluster assignments clusters are sorted using hclust on centers the contents of each cluster are sorted using hclust*

---

**Description**

perform kmeans clustering on matrix rows and return reordered matrix along with order matched cluster assignments clusters are sorted using hclust on centers the contents of each cluster are sorted using hclust

**Usage**

```
clusteringKmeansNestedHclust(
  mat,
  nclust,
  within_order_strategy = valid_sort_strategies[2],
  centroids = NULL,
  manual_mapping = NULL,
  iter.max = 30
)
```

**Arguments**

mat	A wide format matrix
nclust	the number of clusters
within_order_strategy	one of "hclust", "sort", "right", "left", "reverse". If "hclust", hierarchical clustering will be used. If "sort", a simple decreasing sort of rosSums. If "left", will attempt to put high signal on left ("right" is opposite). If "reverse" reverses existing order (should only be used after meaningful order imposed).
centroids	optional matrix with same columns as mat and one centroid per row to base clusters off of. Overrides any setting to nclust. Default of NULL results in randomly initialized k-means.

`manual_mapping` optional named vector manually specifying cluster assignments. names should be item ids and values should be cluster names the items are assigned to. Default of NULL allows clustering to proceed.

`iter.max` Number of max iterations to allow for k-means. Default is 30.

### Value

data.table with 2 columns of cluster info. `id__` column corresponds with input matrix rownames and is sorted within each cluster using hierarchical clustering `group__` column indicates cluster assignment

### Examples

```
dt = data.table::copy(CTCF_in_10a_profiles_dt)
mat = data.table::dcast(dt, id ~ sample + x, value.var = "y" )
rn = mat$id
mat = as.matrix(mat[,-1])
rownames(mat) = rn
clust_dt = clusteringKmeansNestedHclust(mat, nclust = 3)
clust_dt
```

---

col2hex	<i>converts a valid r color name ("black", "red", "white", etc.) to a hex value</i>
---------	-------------------------------------------------------------------------------------

---

### Description

converts a valid r color name ("black", "red", "white", etc.) to a hex value

### Usage

```
col2hex(color_name)
```

### Arguments

`color_name` character. one or more r color names.

### Value

hex value of colors coded by colors()

### Examples

```
col2hex(c("red", "green", "blue"))
col2hex(c("lightgray", "gray", "darkgray"))
```

---

collapse_gr	<i>collapse_gr</i>
-------------	--------------------

---

**Description**

collapse non-contiguous regions (i.e. exons) into a contiguous coordinate starting at 1. this is strand sensitive and intended for use with all exons of a single gene.

**Usage**

```
collapse_gr(genome_gr)
```

**Arguments**

genome_gr	a GRanges of regions on a single chromosome. Regions are intended to be non-contiguous and may even overlap.
-----------	--------------------------------------------------------------------------------------------------------------

**Value**

a new GRanges object with same mcols as input with all intervals starting at 1 and no empty space between syntenic regions.

**Examples**

```
library(data.table)
library(GenomicRanges)
dev_dat = data.table(seqnames = "chrTest",
                    transcript_id = c(1, 1, 2, 2, 3, 3, 3),
                    start = c(5, 30, 8, 30, 2, 30, 40),
                    end = c(10, 35, 15, 38, 7, 35, 45),
                    strand = "+")

genome_gr = GRanges(dev_dat)
collapse_gr(genome_gr)

neg_gr = genome_gr
strand(neg_gr) = "-"
collapse_gr(neg_gr)
```

---

convert_collapsed_coord	<i>convert_collapsed_coord</i>
-------------------------	--------------------------------

---

**Description**

(preliminary implementation, sub-optimal)

**Usage**

```
convert_collapsed_coord(genome_gr, x)
```

**Arguments**

genome\_gr        non-contiguous regions to collapse a la [collapse\\_gr](#)  
 x                numeric, positions within genome\_gr to convert to collapsed coordinates.

**Details**

see [collapse\\_gr](#) for explanation of intended uses. this function translates all values of x from original genomic coordinates to new coordinate space created by [collapse\\_gr](#).

**Value**

numeric, positions of every value of x within collapse coordinates. values outside of collapsed regions (an intron or outside range) will be NA.

**Examples**

```
library(data.table)
library(GenomicRanges)
dev_dat = data.table(seqnames = "chrTest",
                     transcript_id = c(1, 1, 2, 2, 3, 3, 3),
                     start = c(5, 30, 8, 30, 2, 30, 40),
                     end = c(10, 35, 15, 38, 7, 35, 45),
                     strand = "+")

genome_gr = GRanges(dev_dat)
convert_collapsed_coord(genome_gr, start(genome_gr))
convert_collapsed_coord(genome_gr, end(genome_gr))
```

---

copy\_clust\_info        *copy\_clust\_info*

---

**Description**

copy\_clust\_info

**Usage**

```
copy_clust_info(target, to_copy, row_ = "id", cluster_ = "cluster_id")
```

**Arguments**

target	A data.table or GRanges returned from ssvFetch*, the target to which cluster info will be added.
to_copy	A data.table or GRanges returned from ssvSignalClustering, from which to copy cluster if.
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* output.
cluster_	variable name to use for cluster info. Default is "cluster_id".

**Value**

data.table or GRanges (whichever target is) containing row order and cluster assignment derived from to\_copy. Suitable for ssvSignalHeatmap and related functions.

**Examples**

```
#this takes cluster info from signal and applies to peak hits to
#create a heatmap of peak hits clustered by signal.
clust_dt1 = ssvSignalClustering(CTCF_in_10a_profiles_dt)
peak_hit_gr = ssvFetchGRanges(
  CTCF_in_10a_narrowPeak_grs,
  qgr = CTCF_in_10a_overlaps_gr
)
peak_hit_gr.clust = copy_clust_info(peak_hit_gr, clust_dt1)
peak_hit_gr.clust$hit = peak_hit_gr.clust$y > 0
ssvSignalHeatmap(peak_hit_gr.clust, fill_ = "hit") +
  scale_fill_manual(values = c("FALSE" = "gray90", "TRUE" = "black"))
```

---

crossCorrByRle

*Calculate cross correlation by using shiftApply on read coverage Rle*

---

**Description**

Calculate cross correlation by using shiftApply on read coverage Rle

**Usage**

```
crossCorrByRle(
  bam_file,
  query_gr,
  max_dupes = 1,
  fragment_sizes = 50:300,
  read_length = NULL,
  flip_strand = FALSE,
  ...
)
```



**Arguments**

bam_file	character. Path to .bam file, must have index at .bam.bai.
query_gr	GRanges. Regions to calculate cross correlation for.
max_dupes	integer. Duplicate reads above this value will be removed.
fragment_sizes	integer. fragment size range to search for maximum correlation.
read_length	integer. Any values outside fragment_range that must be searched. If not supplied will be determined from bam_file. Set as NA to disable this behavior.
flip_strand	boolean. if TRUE strands that reads align to are swapped. This is typically only necessary if there was a mismatch between library chemistry and aligner settings. Default is FALSE.
...	arguments passed to ScanBamParam

**Value**

named list of results

**Examples**

```
bam_f = system.file("extdata/test.bam",
  package = "seqsetvis", mustWork = TRUE)
query_gr = CTCF_in_10a_overlaps_gr[1:2]
crossCorrByRle(bam_f, query_gr[1:2], fragment_sizes = seq(50, 300, 50))
```

---

CTCF\_in\_10a\_bigWig\_urls

*FTP URL path for vignette data.*

---

**Description**

FE bigWig tracks for CTCF ChIP-seq in a MCF10A progression model. See GEO series GSE98551 for details.

**Format**

named character vector of length 3

**Details**

part of [CTCF\\_in\\_10a\\_data](#)

---

CTCF\_in\_10a\_data      *CTCF ChIP-seq in breast cancer cell lines*

---

### Description

Vignette data for seqsetvis was downloaded directly from GEO series [GSE98551](#). This data is CTCF ChIP-seq from a model of breast cancer progression derived from the MCF10A cell line.

Data from GEO series [GSE98551](#) is from the publication [Fritz AJ et al. 2018](#)

### Details

Contains:

- [CTCF\\_in\\_10a\\_overlaps\\_gr](#)
- [CTCF\\_in\\_10a\\_profiles\\_dt](#)
- [CTCF\\_in\\_10a\\_bigWig\\_urls](#)
- [CTCF\\_in\\_10a\\_narrowPeak\\_urls](#)

---

CTCF\_in\_10a\_narrowPeak\_grs  
*list of GRanges that results in 100 random subset when overlapped*

---

### Description

list of GRanges that results in 100 random subset when overlapped

### Format

named character vector of length 3

### Details

part of [CTCF\\_in\\_10a\\_data](#)

---

CTCF\_in\_10a\_narrowPeak\_urls

*FTP URL path for vignette data. from*

---

### Description

macs2 peak calls for CTCF ChIP-seq in a MCF10A progression model. See GEO series GSE98551 for details.

### Format

named character vector of length 3

### Details

part of [CTCF\\_in\\_10a\\_data](#)

---

CTCF\_in\_10a\_overlaps\_gr

*100 randomly selected regions from overlapping CTCF peaks in 10a cell ChIP-seq*

---

### Description

MACS2 narrowPeak calls on pooled biological replicates at pval 1e-5 and then 0.05 IDR filtered. IDR cutoffs determined by comparing top 150,000 pvalue sorted peak in replicates.

### Format

GenomicRanges with 3 metadata columns of membership table

### Details

See GEO series GSE98551 for details.

part of [CTCF\\_in\\_10a\\_data](#)

---

CTCF\_in\_10a\_profiles\_dt

*Profiles for 100 randomly selected regions from overlapping CTCF peaks in 10a cell ChIP-seq Results from fetching bigwigs with CTCF\_in\_10a\_overlaps\_gr.*

---

### Description

A tidy data.table at window size 50 bp within 350 bp of peak center The variables are as follows:

### Format

A tidy data.table of 2100 rows and 9 columns

### Details

part of [CTCF\\_in\\_10a\\_data](#)

1. seqnames. chromosome for GRanges compatibility
2. start. start of interval
3. end. end of interval
4. width. width of interval
5. strand. leftover from GRanges.
6. id. unique identifier
7. y. fold-enrichment over input.
8. x. bp relative to center
9. sample. name of originating sample

---

CTCF\_in\_10a\_profiles\_gr

*Profiles for 100 randomly selected regions from overlapping CTCF peaks in 10a cell ChIP-seq Results from CTCF\_in\_10a\_overlaps\_gr*

---

### Description

A tidy GRanges at window size 50 bp within 350 bp of peak center The variables are as follows:

### Format

A tidy GRanges of 2100 rows and 4 metadata columns

**Details**

part of [CTCF\\_in\\_10a\\_data](#)

1. id. unique identifier
2. y. fold-enrichment over input.
3. x. bp relative to center
4. sample. name of originating sample

---

easyLoad_bed	<i>easyLoad_bed takes a character vector of file paths to bed plus files and returning named list of GRanges.</i>
--------------	-------------------------------------------------------------------------------------------------------------------

---

**Description**

Mainly a utility function for loading MACS2 narrowPeak and broadPeak.

**Usage**

```
easyLoad_bed(
  file_paths,
  file_names = NULL,
  extraCols = character(),
  n_cores = getOption("mc.cores", 1)
)
```

**Arguments**

file_paths	character vector of paths to narrowPeak files. If named, those names will be used in output unless overridden by providing file_names.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
extraCols	named character vector of classes. passed to rtracklayer::import for format = "BED". default is character().
n_cores	number of cores to use, uses mc.cores option if set or 1.

**Value**

a named list of GRanges loaded from file\_paths

**Examples**

```
bed_f = system.file("extdata/test_loading.bed",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_bed(bed_f, "my_bed")
```

---

easyLoad_broadPeak	<i>easyLoad_broadPeak takes a character vector of file paths to narrowPeak files from MACS2 and returns a named list of GRanges.</i>
--------------------	--------------------------------------------------------------------------------------------------------------------------------------

---

### Description

easyLoad\_broadPeak takes a character vector of file paths to narrowPeak files from MACS2 and returns a named list of GRanges.

### Usage

```
easyLoad_broadPeak(
  file_paths,
  file_names = NULL,
  n_cores = getOption("mc.cores", 1)
)
```

### Arguments

file_paths	character vector of paths to narrowPeak files. If named, those names will be used in output unless overridden by providing file_names.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
n_cores	number of cores to use, uses mc.cores option if set or 1.

### Value

a named list of GRanges loaded from file\_paths

### Examples

```
bp_f = system.file("extdata/test_loading.broadPeak",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_broadPeak(bp_f, "my_broadPeak")
```

---

easyLoad_FUN	<i>easyLoad_FUN takes a character vector of file paths run an arbitrary function defined in load_FUN</i>
--------------	----------------------------------------------------------------------------------------------------------

---

### Description

easyLoad\_FUN takes a character vector of file paths run an arbitrary function defined in load\_FUN

**Usage**

```
easyLoad_FUN(
  file_paths,
  load_FUN,
  file_names = NULL,
  n_cores = getOption("mc.cores", 1),
  ...
)
```

**Arguments**

file_paths	character vector of paths to narrowPeak files. If named, those names will be used in output unless overridden by providing file_names.
load_FUN	Arbitrary function that takes at least a file path as argument. May take other arguments that should be set in call to easyLoad_FUN.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
n_cores	number of cores to use, uses mc.cores option if set or 1.
...	extra parameters passed to load_FUN

**Value**

a named list of results from load\_FUN

**Examples**

```
bed_f = system.file("extdata/test_loading.bed",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_bed(bed_f, "my_bed")
```

---

easyLoad\_IDRmerged      *easyLoad\_IDRmerged loads "overlapped-peaks.txt" from IDR.*

---

**Description**

easyLoad\_IDRmerged loads "overlapped-peaks.txt" from IDR.

**Usage**

```
easyLoad_IDRmerged(
  file_paths,
  file_names = NULL,
  n_cores = getOption("mc.cores", 1),
  max_idr = 0.05
)
```

**Arguments**

file_paths	character vector of paths to narrowPeak files. If named, those names will be used in output unless overridden by providing file_names.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
n_cores	number of cores to use, uses mc.cores option if set or 1.
max_idr	maximum IDR value allowed

**Value**

named list of GRanges

**Examples**

```
idr_file = system.file("extdata/test_idr.overlapped-peaks.txt",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_IDRmerged(idr_file)
easyLoad_IDRmerged(idr_file, max_idr = .01)
```

---

easyLoad\_narrowPeak    *easyLoad\_narrowPeak takes a character vector of file paths to narrowPeak files from MACS2 and returns a named list of GRanges.*

---

**Description**

easyLoad\_narrowPeak takes a character vector of file paths to narrowPeak files from MACS2 and returns a named list of GRanges.

**Usage**

```
easyLoad_narrowPeak(
  file_paths,
  file_names = NULL,
  n_cores = getOption("mc.cores", 1)
)
```

**Arguments**

file_paths	character vector of paths to narrowPeak files. If named, those names will be used in output unless overridden by providing file_names.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
n_cores	number of cores to use, uses mc.cores option if set or 1.

**Value**

a named list of GRanges loaded from file\_paths



**Examples**

```
np_f = system.file("extdata/test_loading.narrowPeak",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_narrowPeak(np_f, "my_narrowPeak")
```

---

easyLoad_seacr	<i>easyLoad_seacr takes a character vector of file paths to seacr output bed files and returns a named list of GRanges.</i>
----------------	-----------------------------------------------------------------------------------------------------------------------------

---

**Description**

easyLoad\_seacr takes a character vector of file paths to seacr output bed files and returns a named list of GRanges.

**Usage**

```
easyLoad_seacr(
  file_paths,
  file_names = NULL,
  n_cores = getOption("mc.cores", 1)
)
```

**Arguments**

file_paths	character vector of paths to seacr bed files. If named, those names will be used in output unless overridden by providing file_names.
file_names	character vector of names for output list. If not NULL will override any existing names for file_paths. Default is NULL.
n_cores	number of cores to use, uses mc.cores option if set or 1.

**Value**

a named list of GRanges loaded from file\_paths

**Examples**

```
bed_f = system.file("extdata/test_loading.seacr.bed",
  package = "seqsetvis", mustWork = TRUE)
easyLoad_seacr(bed_f, "my_seacr")
```

---

expandCigar	<i>Expand cigar codes to GRanges</i>
-------------	--------------------------------------

---

### Description

see [sam specs](#) for cigar details

### Usage

```
expandCigar(
  cigar_dt,
  op_2count = c("M", "D", "=", "X"),
  return_data.table = FALSE
)
```

### Arguments

cigar_dt	data.table with 5 required named columns in any order. c("which_label", "seq-names", "strand", "start", "cigar")
op_2count	Cigar codes to count. Default is alignment (M), deletion (D), match (=), and mismatch (X). Other useful codes may be skipped regions for RNA splicing (N). The locations of any insertions (I) or clipping/padding (S, H, or P) will be a single bp immediately before the interval.
return_data.table	if TRUE, a data.table is returned, else a GRanges. Default is FALSE.

### Value

data.table with cigar entries expanded

### Examples

```
qgr = CTCF_in_10a_overlaps_gr[1:5]
bam_file = system.file("extdata/test.bam", package = "seqsetvis", mustWork = TRUE)
raw_dt = ssvFetchBam(bam_file, qgr, return_unprocessed = TRUE)
expandCigar(raw_dt)
```

---

fetchBam	<i>fetch a bam file pileup with the ability to consider read extension to fragment size (fragLen)</i>
----------	-------------------------------------------------------------------------------------------------------

---

### Description

fetch a bam file pileup with the ability to consider read extension to fragment size (fragLen)

**Usage**

```

fetchBam(
  bam_f,
  qgr,
  fragLen = NULL,
  target_strand = c("*", "+", "-")[1],
  max_dupes = Inf,
  splice_strategy = c("none", "ignore", "add", "only", "splice_count")[1],
  flip_strand = FALSE,
  return_unprocessed = FALSE,
  ...
)

```

**Arguments**

<code>bam_f</code>	character or BamFile to load
<code>qgr</code>	GRanges regions to fetchs
<code>fragLen</code>	numeric, NULL, or NA. if numeric, supplied value is used. if NULL, value is calculated with <code>fragLen_calcStranded</code> (default) if NA, raw bam pileup with no cross strand shift is returned.
<code>target_strand</code>	character. if one of "+" or "-", reads are filtered to match. ignored if any other value.
<code>max_dupes</code>	numeric $\geq 1$ . duplicate reads by strandd start position over this number are removed, Default is Inf.
<code>splice_strategy</code>	character, one of <code>c("none", "ignore", "add", "only")</code> . Default is "none" and split read alignments are assumed not present. <code>fragLen</code> must be NA for any other value to be valid. "ignore" will not count spliced regions. "add" counts spliced regions along with others, "only" will only count spliced regions and ignore others.
<code>flip_strand</code>	if TRUE, strand alignment is flipped prior to <code>fragLen</code> extension. Default is FALSE.
<code>return_unprocessed</code>	boolean. if TRUE returns read alignment in data.table. Default is FALSE.
<code>...</code>	passed to <code>ScanBamParam()</code> , can't be which or what.

**Value**

GRanges containing tag pileup values in score meta column. tags are optionally extended to fragment length (`fragLen`) prior to pile up.

---

findMaxPos	<i>findMaxPos</i>
------------	-------------------

---

**Description**

findMaxPos

**Usage**

```
findMaxPos(prof_dt, qgr, x_ = "x", y_ = "y", by_ = "id", width = 1)
```

**Arguments**

prof_dt	a GRanges or data.table as returned by ssvFetch*.
qgr	the GRanges used to query ssvFetch* as the qgr argument.
x_	positional variable. Should almost always be the default, "x".
y_	the signal value variable. Likely the default value of "y" but could be "y_norm" if append_ynorm was applied to data.
by_	region identifier variable. Should almost always be the default, "id".
width	Desired width of final regions. Default is 1.

**Value**

data.table of relative x position from center per id

**Examples**

```
findMaxPos(CTCF_in_10a_profiles_dt, CTCF_in_10a_overlaps_gr)
findMaxPos(CTCF_in_10a_profiles_gr, CTCF_in_10a_overlaps_gr)
```

---

fragLen_calcStranded	<i>calculate fragLen from a bam file for specified regions</i>
----------------------	----------------------------------------------------------------

---

**Description**

calculate fragLen from a bam file for specified regions

**Usage**

```
fragLen_calcStranded(
  bam_f,
  qgr,
  n_regions = 100,
  include_plot_in_output = FALSE,
  test_fragLen = seq(100, 400, 5),
  flip_strand = FALSE,
  ...
)
```

**Arguments**

bam_f	character or BamFile. bam file to read from. .bai index file must be in same directory
qgr	GRanges. used as which for ScanBamParam. Can be NULL if it's REALLY important to load the entire bam, force_no_which = TRUE also required.
n_regions	numeric (integer) it's generally overkill to pull all regions at this stage and will slow calculation down. Default is 100.
include_plot_in_output	if TRUE output is a list of fragLen and a ggplot showing values considered by calculation. Default is FALSE.
test_fragLen	numeric. The set of fragment lengths to gather strand cross correlation for.
flip_strand	boolean. if TRUE strands that reads align to are swapped. This is typically only necessary if there was a mismatch between library chemistry and aligner settings. Default is FALSE.
...	passed to Rsamtools::ScanBamParam, can't be which or what.

**Value**

numeric fragment length

**Examples**

```
bam_file = system.file("extdata/test.bam",
  package = "seqsetvis")
qgr = CTCF_in_10a_overlaps_gr[1:5]
fragLen_calcStranded(bam_file, qgr)
#if plot is included, a list is returned, item 2 is the plot
fragLen_calcStranded(bam_file, qgr,
  include_plot_in_output = TRUE)[[2]]
```

---

```
fragLen_fromMacs2Xls  parse fragLen from MACS2 output
```

---

**Description**

parse fragLen from MACS2 output

**Usage**

```
fragLen_fromMacs2Xls(macs2xls_file)
```

**Arguments**

macs2xls\_file character. an xls file output by MACS2 to parse frag length from

**Value**

numeric fragment length

**Examples**

```
xls_file = system.file("extdata/test_peaks.xls",
  package = "seqsetvis")
fragLen_fromMacs2Xls(xls_file)
```

---

```
getReadLength  determine the most common read length for input bam_file. uses 50
randomly selected regions from query_gr. If fewer than 20 reads are
present, loads all of query_gr.
```

---

**Description**

determine the most common read length for input bam\_file. uses 50 randomly selected regions from query\_gr. If fewer than 20 reads are present, loads all of query\_gr.

**Usage**

```
getReadLength(bam_file, query_gr)
```

**Arguments**

bam\_file indexed bam file  
query\_gr GRanges to read from bam file

**Value**

numeric of most common read length.

**Examples**

```
qgr = CTCF_in_10a_overlaps_gr[1:5]
bam_file = system.file("extdata/test.bam", package = "seqsetvis", mustWork = TRUE)
getReadLength(bam_file, qgr)
```

---

get_mapped_reads	<i>get_mapped_reads</i>
------------------	-------------------------

---

**Description**

get\_mapped\_reads

**Usage**

```
get_mapped_reads(bam_files)
```

**Arguments**

bam\_files      Path to 1 or more bam files. Must be indexed.

**Value**

the total mapped reads in each bam file as a named numeric vector.

**Examples**

```
bam_file = system.file("extdata/test.bam", package = "seqsetvis", mustWork = TRUE)
get_mapped_reads(bam_file)
```

---

ggellipse	<i>returns a ggplot with ellipses drawn using specified parameters used by ssvFeatureVenn and ssvFeatureEuler</i>
-----------	-------------------------------------------------------------------------------------------------------------------

---

**Description**

uses eulerr's non-exported ellipse drawing coordinate function

**Usage**

```
ggellipse(
  xcentres,
  ycentres,
  r,
  r2 = r,
  phi = rep(0, length(xcentres)),
  circle_colors = NULL,
  group_names = LETTERS[seq_along(xcentres)],
  line_alpha = 1,
  fill_alpha = 0.3,
  line_width = 2,
  n_points = 200
)
```

**Arguments**

xcentres	numeric x-coord of centers of ellipses
ycentres	numeric y-coord of centers of ellipses, must have same length as xcentres
r	numeric radius1 of ellipse, must have length of 1 or match length of xcentres
r2	numeric radius2 of ellipse, must have length of 1 or match length of xcentres. same as r by default.
phi	numeric phi of ellipse, must have length of 1 or match length of xcentres. 0 by default.
circle_colors	character of rcolors or hex colors or NULL. if null safeBrew of Dark2 is used
group_names	character/factor names of color/fill groups. capital letters by default.
line_alpha	numeric [0,1] alpha of lines, 1 by default
fill_alpha	numeric [0,1] alpha of fill, .3 by default.
line_width	numeric > 0. passed to size. 2 by default
n_points	integer > 1. number of points to approximate circle with. 200 by default

**Value**

a ggplot containing ellipses

**Examples**

```
ggellipse(xcentres = c(1, 1, 2),
  ycentres = c(2, 1, 1),
  r = c(1, 2, 1))
ggellipse(xcentres = c(1, 1, 2),
  ycentres = c(2, 1, 1),
  r = c(1, 2, 1),
  fill_alpha = 0,
  group_names = paste("set", 1:3))
ggellipse(xcentres = c(1, 1, 2),
```



```
ycentres = c(2, 1, 1),  
r = c(1, 2, 1),  
circle_colors = c("red", "orange", "yellow"),  
line_alpha = 0,  
group_names = paste("set", 1:3))
```

---

harmonize\_seqlengths *harmonize\_seqlengths*

---

### Description

ensures compatibility between seqlength of gr and bam\_file based on header

### Usage

```
harmonize_seqlengths(query_gr, bam_file, force_fix = FALSE)
```

### Arguments

query_gr	GRanges, object to harmonize seqlengths for
bam_file	character, a path to a valid bam file
force_fix	Logical, if TRUE incompatible seqnames are removed from the query_gr. Default is FALSE.

### Value

GRanges with seqlengths matching bam\_file

### Examples

```
library(GenomicRanges)  
query_gr = GRanges("chr1", IRanges(1, 100))  
#seqlengths has not been set  
seqlengths(query_gr)  
bam = system.file("extdata/test.bam", package = "seqsetvis")  
gr2 = harmonize_seqlengths(query_gr, bam)  
#seqlengths now set  
seqlengths(gr2)
```

---

```
make_clustering_matrix
      make_clustering_matrix
```

---

## Description

Create a wide matrix from a tidy data.table more suitable for clustering methods

## Usage

```
make_clustering_matrix(
  tidy_dt,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  max_rows = 500,
  max_cols = 100,
  clustering_col_min = -Inf,
  clustering_col_max = Inf,
  dcast_fill = NA,
  fun.aggregate = "mean"
)
```

## Arguments

tidy_dt	the tidy data.table to covert to a wide matrix. Must have entries for variables specified by row_, column_, fill_, and facet_.
row_	variable name mapped to row, likely peak id or gene name for ngs data
column_	variable mapped to column, likely bp position for ngs data
fill_	numeric variable to map to fill
facet_	variable name to facet horizontally by
max_rows	for speed rows are sampled to 500 by default, use Inf to plot full data
max_cols	for speed columns are sampled to 100 by default, use Inf to plot full data
clustering_col_min	numeric minimum for col range considered when clustering, default in -Inf
clustering_col_max	numeric maximum for col range considered when clustering, default in Inf
dcast_fill	value to supply to dcast fill argument. default is NA.
fun.aggregate	Function to aggregate when multiple values present for facet_, row_, and column_. The function should accept a single vector argument or be a character string naming such a function.

**Value**

A wide matrix version of input tidy data.table

**Examples**

```
mat = make_clustering_matrix(CTCF_in_10a_profiles_dt)
mat[1:5, 1:5]
```

---

merge_clusters	<i>merge_clusters</i>
----------------	-----------------------

---

**Description**

merge\_clusters

**Usage**

```
merge_clusters(
  clust_dt,
  to_merge,
  row_ = "id",
  cluster_ = "cluster_id",
  reapply_cluster_names = TRUE
)
```

**Arguments**

clust_dt	data.table output from <a href="#">ssvSignalClustering</a>
to_merge	Clusters to merge. Must be items in clust_dt variable defined by cluster_ parameter.
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* output.
cluster_	variable name to use for cluster info. Default is "cluster_id".
reapply_cluster_names	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.

**Value**

data.table as output from [ssvSignalClustering](#)

**Examples**

```

set.seed(0)
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 6)
ssvSignalHeatmap(clust_dt)
agg_dt = clust_dt[, list(y = mean(y)), list(x, cluster_id, sample)]
ggplot(agg_dt, aes(x = x, y = y, color = sample)) +
  geom_path() +
  facet_grid(cluster_id~.)

to_merge = c(2, 3, 5)
# debug(merge_clusters)
new_dt = merge_clusters(clust_dt, c(2, 3, 5), reapply_cluster_names = FALSE)
new_dt.relabel = merge_clusters(clust_dt, c(2, 3, 5), reapply_cluster_names = TRUE)
new_dt.relabel.sort = within_clust_sort(new_dt.relabel, within_order_strategy = "sort")

table(clust_dt$cluster_id)
table(new_dt$cluster_id)

cowplot::plot_grid(
  ssvSignalHeatmap(clust_dt) + labs(title = "original"),
  ssvSignalHeatmap(new_dt) + labs(title = "2,3,5 merged"),
  ssvSignalHeatmap(new_dt.relabel) + labs(title = "2,3,5 merged, renumbered"),
  ssvSignalHeatmap(new_dt.relabel.sort) + labs(title = "2,3,5 merged, renumbered and sorted")
)

```

---

prepare\_fetch\_GRanges *prepares GRanges for windowed fetching.*

---

**Description**

Deprecated and renamed as `prepare_fetch_GRanges_width`

**Usage**

```

prepare_fetch_GRanges(
  qgr,
  win_size,
  min_quantile = 0.75,
  target_size = NULL,
  skip_centerFix = FALSE
)

```

**Arguments**

qgr	GRanges to prepare
win_size	numeric window size for fetch
min_quantile	numeric [0,1], lowest possible quantile value. Only relevant if target_size is not specified.
target_size	numeric final width of qgr if known. Default of NULL leads to quantile based determination of target_size.
skip_centerFix	boolean, if FALSE (default) all regions will be resized GenomicRanges::resize(x, w, fix = "center") to a uniform size based on min_quantile to a width divisible by win_size.

**Details**

output GRanges parallels input with consistent width evenly divisible by win\_size. Has warning if GRanges needed resizing, otherwise no warning and input GRanges is returned unchanged.

**Value**

GRanges, either identical to qgr or with suitable consistent width applied.

**Examples**

```
#use prepare_fetch_GRanges_width instead:
qgr = prepare_fetch_GRanges_width(CTCF_in_10a_overlaps_gr, win_size = 50)
#no warning if qgr is already valid for windowed fetching
prepare_fetch_GRanges_width(qgr, win_size = 50)
```

---

```
prepare_fetch_GRanges_names
```

*Creates a named version of input GRanges using the same method seqsetvis uses internally to ensure consistency.*

---

**Description**

If \$id is set, that value is used as name and duplicates are checked for.

**Usage**

```
prepare_fetch_GRanges_names(qgr, include_id = FALSE)
```

**Arguments**

qgr	input GRanges object the set/check names on
include_id	if TRUE, \$id is retained. Default is FALSE.

**Value**

and named GRanges based on input qgr.

**Examples**

```
qgr = seqsetvis::CTCF_in_10a_overlaps_gr
names(qgr) = NULL
#default is to paste "region_" and iteration along length of qgr
prepare_fetch_GRanges_names(qgr)
#id gets used is already set
qgr$id = paste0("peak_", rev(seq_along(qgr)), "_of_", length(qgr))
prepare_fetch_GRanges_names(qgr)
```

---

```
prepare_fetch_GRanges_width
```

*prepares GRanges for windowed fetching.*

---

**Description**

output GRanges parallels input with consistent width evenly divisible by win\_size. Has warning if GRanges needed resizing, otherwise no warning and input GRanges is returned unchanged.

**Usage**

```
prepare_fetch_GRanges_width(
  qgr,
  win_size,
  min_quantile = 0.75,
  target_size = NULL,
  skip_centerFix = FALSE
)
```

**Arguments**

qgr	GRanges to prepare
win_size	numeric window size for fetch
min_quantile	numeric [0,1], lowest possible quantile value. Only relevant if target_size is not specified.
target_size	numeric final width of qgr if known. Default of NULL leads to quantile based determination of target_size.
skip_centerFix	boolean, if FALSE (default) all regions will be resized GenomicRanges::resize(x, w, fix = "center") to a uniform size based on min_quantile to a width divisible by win_size.

**Value**

GRanges, either identical to qgr or with suitable consistent width applied.

**Examples**

```
qgr = prepare_fetch_GRanges_width(CTCF_in_10a_overlaps_gr, win_size = 50)
#no warning if qgr is already valid for windowed fetching
prepare_fetch_GRanges_width(qgr, win_size = 50)
```

---

quantileGRangesWidth *Quantile width determination strategy*

---

**Description**

Returns the lowest multiple of win\_size greater than min\_quantile quantile of width(qgr)

**Usage**

```
quantileGRangesWidth(qgr, min_quantile = 0.75, win_size = 1)
```

**Arguments**

qgr	GRanges to calculate quantile width for
min_quantile	numeric [0,1] the minimum quantile of width in qgr
win_size	numeric/integer >=1, returned value will be a multiple of this

**Value**

numeric that is >= min\_quantile and evenly divisible by win\_size

**Examples**

```
gr = CTCF_in_10a_overlaps_gr
quantileGRangesWidth(gr)
quantileGRangesWidth(gr, min_quantile = .5, win_size = 100)
```

---

reorder\_clusters\_hclust  
*reorder\_clusters\_hclust*

---

**Description**

Applies hierarchical clustering to centroids of clusters to reorder.

**Usage**

```
reorder_clusters_hclust(
  clust_dt,
  hclust_result = NULL,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  reapply_cluster_names = TRUE,
  return_hclust = FALSE
)
```

**Arguments**

<code>clust_dt</code>	data.table output from <a href="#">ssvSignalClustering</a>
<code>hclust_result</code>	hclust result returned by a previous call of this function with identical paramters when <code>return_hclust = TRUE</code> .
<code>row_</code>	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with <code>ssvFetch*</code> output.
<code>column_</code>	variable mapped to column, likely bp position for ngs data. Default is "x" and works with <code>ssvFetch*</code> output.
<code>fill_</code>	numeric variable to map to fill. Default is "y" and works with <code>ssvFetch*</code> output.
<code>facet_</code>	variable name to facet horizontally by. Default is "sample" and works with <code>ssvFetch*</code> output. Set to "" if data is not faceted.
<code>cluster_</code>	variable name to use for cluster info. Default is "cluster_id".
<code>reapply_cluster_names</code>	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.
<code>return_hclust</code>	If TRUE, return the result of hclust instead of the reordered clustering data.table. Default is FALSE. Ignored if <code>hclust_result</code> is supplied.

**Value**

data.table as output from [ssvSignalClustering](#)

**Examples**

```
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 10)
new_dt = reorder_clusters_hclust(clust_dt)
cowplot::plot_grid(
  ssvSignalHeatmap(clust_dt),
  ssvSignalHeatmap(new_dt)
)
```



---

```
reorder_clusters_manual
      reorder_clusters_manual
```

---

## Description

Manually applies a new order (top to bottom) for cluster using the result of `ssvSignalClustering`.

## Usage

```
reorder_clusters_manual(
  clust_dt,
  manual_order,
  row_ = "id",
  cluster_ = "cluster_id",
  reapply_cluster_names = TRUE
)
```

## Arguments

<code>clust_dt</code>	data.table output from <a href="#">ssvSignalClustering</a>
<code>manual_order</code>	New order for clusters Does not need to include all clusters. Any colors not included will be at the bottom in their original order.
<code>row_</code>	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with <code>ssvFetch*</code> output.
<code>cluster_</code>	variable name to use for cluster info. Default is "cluster_id".
<code>reapply_cluster_names</code>	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.

## Value

data.table as output from [ssvSignalClustering](#)

## Examples

```
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 3)
new_dt = reorder_clusters_manual(clust_dt = clust_dt, manual_order = 2)
cowplot::plot_grid(
  ssvSignalHeatmap(clust_dt),
  ssvSignalHeatmap(new_dt)
)
```

---

```
reorder_clusters_stepdown
      reorder_clusters_stepdown
```

---

## Description

Attempts to reorder clusters so that rows with highest signal on the left relative to the right appear at the top. Signal should have a roughly diagonal pattern in a "stepdown" pattern.

## Usage

```
reorder_clusters_stepdown(
  clust_dt,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  reapply_cluster_names = TRUE,
  step_by_column = TRUE,
  step_by_facet = FALSE
)
```

## Arguments

<code>clust_dt</code>	data.table output from <a href="#">ssvSignalClustering</a>
<code>row_</code>	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with <code>ssvFetch*</code> output.
<code>column_</code>	variable mapped to column, likely bp position for ngs data. Default is "x" and works with <code>ssvFetch*</code> output.
<code>fill_</code>	numeric variable to map to fill. Default is "y" and works with <code>ssvFetch*</code> output.
<code>facet_</code>	variable name to facet horizontally by. Default is "sample" and works with <code>ssvFetch*</code> output. Set to "" if data is not faceted.
<code>cluster_</code>	variable name to use for cluster info. Default is "cluster_id".
<code>reapply_cluster_names</code>	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.
<code>step_by_column</code>	If TRUE, column is considered for left-right cluster balance. Default is TRUE.
<code>step_by_facet</code>	If TRUE, facet is considered for left-right cluster balance. Default is FALSE.

## Details

This can be done by column (`step_by_column = TRUE`) which averages across facets. By facet (`step_by_column = FALSE, step_by_facet = TRUE`) which averages all columns per facet. Or both column and facet (`step_by_column = TRUE, step_by_facet = TRUE`), which does no averaging so it looks at the full matrix as plotted.

**Value**

data.table as output from [ssvSignalClustering](#)

**Examples**

```
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 10)
new_dt = reorder_clusters_stepdown(clust_dt)
cowplot::plot_grid(
  ssvSignalHeatmap(clust_dt),
  ssvSignalHeatmap(new_dt)
)
```

---

reverse_clusters	<i>reverse_clusters</i>
------------------	-------------------------

---

**Description**

reverse\_clusters

**Usage**

```
reverse_clusters(
  clust_dt,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  reverse_rows_within = TRUE,
  reapply_cluster_names = TRUE
)
```

**Arguments**

clust_dt	data.table output from <a href="#">ssvSignalClustering</a>
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* output.
column_	variable mapped to column, likely bp position for ngs data. Default is "x" and works with ssvFetch* output.
fill_	numeric variable to map to fill. Default is "y" and works with ssvFetch* output.
facet_	variable name to facet horizontally by. Default is "sample" and works with ssvFetch* output. Set to "" if data is not faceted.
cluster_	variable name to use for cluster info. Default is "cluster_id".
reverse_rows_within	If TRUE, rows within clusters will be reversed as well. Default is TRUE.
reapply_cluster_names	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.

**Value**

data.table as output from [ssvSignalClustering](#)

**Examples**

```
set.seed(0)
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 3)
rev_dt = reverse_clusters(clust_dt)
rev_dt.no_relabel = reverse_clusters(clust_dt, reapply_cluster_names = FALSE)
rev_dt.not_rows = reverse_clusters(clust_dt, reverse_rows_within = FALSE)
cowplot::plot_grid(nrow = 1,
  ssvSignalHeatmap(clust_dt) + labs(title = "original"),
  ssvSignalHeatmap(rev_dt) + labs(title = "reversed"),
  ssvSignalHeatmap(rev_dt.no_relabel) + labs(title = "reversed, no relabel"),
  ssvSignalHeatmap(rev_dt.not_rows) + labs(title = "reversed, not rows")
)
```

---

safeBrew

*Allows RColorBrew to handle n values less than 3 and greater than 8 without warnings and return expected number of colors.*

---

**Description**

For convenience, instead of the number n requested, n may be a character or factor vector and outputs will be appropriately named for use with `scale_color/fill_manual`.

**Usage**

```
safeBrew(n, pal = "Dark2")
```

**Arguments**

n	integer value of number of colors to make palette for. Alternatively a character or factor, in which case palette will be generated for each unique item or factor level respectively.
pal	palette recognized by RColorBrewer

**Details**

Additionally, accepts pal as "gg", "ggplot", or "ggplot2" to reproduce default ggplot colors in the same way.

**Value**

a character vector of hex coded colors of length n from the color brewer palette pal. If n is supplied as character or factor, output will be named accordingly.

**Examples**

```
plot(1:2, rep(0, 2), col = safeBrew(2, "dark2"), pch = 16, cex = 6)
plot(1:12, rep(0, 12), col = safeBrew(12, "set1"), pch = 16, cex = 6)
plot(1:12, rep(0, 12), col = safeBrew(12, "set2"), pch = 16, cex = 6)
plot(1:12, rep(0, 12), col = safeBrew(12, "set3"), pch = 16, cex = 6)
```

---

set_list2memb	<i>convert a list of sets, each list item should be a character vector denoting items in sets</i>
---------------	---------------------------------------------------------------------------------------------------

---

**Description**

convert a list of sets, each list item should be a character vector denoting items in sets

**Usage**

```
set_list2memb(set_list)
```

**Arguments**

set\_list            a list of character vectors. default names will be added if missing

**Value**

converts list of characters/numeric to membership table matrix

---

shift_anchor	<i>orients the relative position of x's zero value and extends ranges to be contiguous</i>
--------------	--------------------------------------------------------------------------------------------

---

**Description**

orients the relative position of x's zero value and extends ranges to be contiguous

**Usage**

```
shift_anchor(score_dt, window_size, anchor)
```

**Arguments**

score\_dt            data.table, GRanges() sufficient  
window\_size        numeric, window size used to generate score\_dt  
anchor              character, one of c("center", "center\_unstranded", "left", "left\_unstranded")

**Value**

score\_dt with x values shifted appropriately and start and end extended to make ranges contiguous

---

split_cluster	<i>split_cluster</i>
---------------	----------------------

---

### Description

Splits one specified cluster in number of new clusters determined by nclust

### Usage

```
split_cluster(
  clust_dt,
  to_split,
  nclust = 2,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  reapply_cluster_names = TRUE
)
```

### Arguments

clust_dt	data.table output from <a href="#">ssvSignalClustering</a>
to_split	Cluster to split.
nclust	Number of new clusters to create.
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* output.
column_	variable mapped to column, likely bp position for ngs data. Default is "x" and works with ssvFetch* output.
fill_	numeric variable to map to fill. Default is "y" and works with ssvFetch* output.
facet_	variable name to facet horizontally by. Default is "sample" and works with ssvFetch* output. Set to "" if data is not faceted.
cluster_	variable name to use for cluster info. Default is "cluster_id".
reapply_cluster_names	If TRUE, clusters will be renamed according to new order instead of their original names. Default is TRUE.

### Value

data.table as output from [ssvSignalClustering](#)

**Examples**

```

set.seed(0)
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_dt, nclust = 3)
split_dt = split_cluster(clust_dt, to_split = 2, nclust = 3)
split_dt.no_rename = split_cluster(
  clust_dt,
  to_split = 2,
  nclust = 3,
  reapply_cluster_names = FALSE
)
cowplot::plot_grid(nrow = 1,
  ssvSignalHeatmap(clust_dt),
  ssvSignalHeatmap(split_dt),
  ssvSignalHeatmap(split_dt.no_rename)
)

```

---

**ssvConsensusIntervalSets**

*Intersect a list of GRanges to create a single GRanges object of merged ranges including metadata describing overlaps per input GRanges.*

---

**Description**

In contrast to `ssvOverlapIntervalSets`, only regions where a consensus of input grs are present are preserved and annotated.

**Usage**

```
ssvConsensusIntervalSets(grs, ext = 0, min_number = 2, min_fraction = 0.5, ...)
```

**Arguments**

<code>grs</code>	A list of GRanges
<code>ext</code>	An integer specifying how far to extend ranges before merging. in effect, ranges withing $2 * ext$ of one another will be joined during the merge
<code>min_number</code>	An integer number specifying the absolute minimum of input grs that must overlap for a site to be considered consensus.
<code>min_fraction</code>	A numeric between 0 and 1 specifying the fraction of grs that must overlap to be considered consensus.
<code>...</code>	arguments passed to <code>IRanges::findOverlaps</code> , i.e. <code>maxgap</code> , <code>minoverlap</code> , <code>type</code> , <code>select</code> , <code>invert</code> .

**Details**

Only the most stringent of `min_number` or `min_fraction` will be applied.

**Value**

GRanges with metadata columns describing consensus overlap of input grs.

**Examples**

```
library(GenomicRanges)
a = GRanges("chr1", IRanges(1:7*10, 1:7*10))
b = GRanges("chr1", IRanges(5:10*10, 5:10*10))
ssvConsensusIntervalSets(list(a, b))
```

---

ssvFactorizeMembTable *Convert any object accepted by ssvMakeMembTable to a factor To avoid ambiguity,*

---

**Description**

see [ssvMakeMembTable](#)

**Usage**

```
ssvFactorizeMembTable(object)
```

**Arguments**

object            a valid object for conversion to a membership table and then factor

**Value**

a 2 column ("id" and "group") data.frame. "id" is factor of item names if any or simply order of items. "group" is a factor of set combinations

**Examples**

```
ssvFactorizeMembTable(CTCF_in_10a_overlaps_gr)
ssvFactorizeMembTable(list(1:4, 2:3, 4:6))
```



---

ssvFeatureBars      *bar plots of set sizes*

---

## Description

bar plots of set sizes

## Usage

```
ssvFeatureBars(  
  object,  
  show_counts = TRUE,  
  bar_colors = NULL,  
  counts_text_colors = NULL,  
  return_data = FALSE,  
  count_label_size = 8  
)
```

## Arguments

**object**            passed to ssvMakeMembTable for conversion to membership table

**show\_counts**      logical. should counts be displayed at the center of each bar. default is TRUE

**bar\_colors**        character. rcolor or hex colors. default of NULL uses RColorBrewer Dark2. Will repeat to match number of samples.

**counts\_text\_colors**      character. rcolor or hex colors. default of NULL uses RColorBrewer Dark2. Will repeat to match number of samples.

**return\_data**      logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**count\_label\_size**      Font size bar count labels. Default is 8.

## Value

ggplot of bar plot of set sizes

## Examples

```
ssvFeatureBars(list(1:3, 2:6))  
ssvFeatureBars(CTCF_in_10a_overlaps_gr, count_label_size = 10)  
ssvFeatureBars(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])
```

---

```
ssvFeatureBinaryHeatmap
```

*binary heatmap indicating membership. heatmap is sorted by column left to right. change column order to reveal patterns*

---

### Description

binary heatmap indicating membership. heatmap is sorted by column left to right. change column order to reveal patterns

### Usage

```
ssvFeatureBinaryHeatmap(
  object,
  raster_approximation = TRUE,
  true_color = "black",
  false_color = "#EFEFEF",
  raster_width_min = 1000,
  raster_height_min = 1000,
  return_data = FALSE
)
```

### Arguments

<code>object</code>	passed to <code>ssvMakeMembTable</code>
<code>raster_approximation</code>	If TRUE, instead of standard ggplot, write temporary raster png image and re-draw that as plot background. default is FALSE
<code>true_color</code>	character. rcolor or hex color used for TRUE values. default is "black".
<code>false_color</code>	character. rcolor or hex color used for TRUE values. default is "#EFEFEF", a gray.
<code>raster_width_min</code>	raster width will be minimum multiple of number of columns over this number. ignored if <code>raster_approximation</code> is FALSE.
<code>raster_height_min</code>	raster height will be minimum multiple of number of rows over this number ignored if <code>raster_approximation</code> is FALSE
<code>return_data</code>	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is TRUE

### Value

ggplot using `geom_tile` of membership table sorted from left to right.

**Examples**

```

ssvFeatureBinaryHeatmap(list(1:3, 2:6))
# horizontal version
ssvFeatureBinaryHeatmap(list(1:3, 2:6)) + coord_flip() +
  theme(axis.text.x = element_blank(), axis.text.y = element_text())
ssvFeatureBinaryHeatmap(CTCF_in_10a_overlaps_gr)
ssvFeatureBinaryHeatmap(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])
ssvFeatureBinaryHeatmap(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,3:2])

```

---

ssvFeatureEuler

*Try to load a bed-like file and convert it to a GRanges object*


---

**Description**

Try to load a bed-like file and convert it to a GRanges object

**Usage**

```

ssvFeatureEuler(
  object,
  line_width = 2,
  shape = c("circle", "ellipse")[1],
  n_points = 200,
  fill_alpha = 0.3,
  line_alpha = 1,
  circle_colors = NULL,
  return_data = FALSE
)

```

**Arguments**

object	A membership table
line_width	numeric, passed to size aesthetic to control line width
shape	shape argument passed to eulerr::euler
n_points	number of points to use for drawing ellipses, passed to eulerr::ellipse
fill_alpha	numeric [0,1], alpha value for circle fill
line_alpha	numeric [0,1], alpha value for circle line
circle_colors	colors to choose from for circles. passed to ggplot2 color scales.
return_data	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**Value**

ggplot of venneuler results

**Examples**

```

ssvFeatureEuler(list(1:3, 2:6))
ssvFeatureEuler(CTCF_in_10a_overlaps_gr)
ssvFeatureEuler(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])

```

---

ssvFeaturePie	<i>pie plot of set sizes</i>
---------------	------------------------------

---

**Description**

pie plot of set sizes

**Usage**

```
ssvFeaturePie(object, slice_colors = NULL, return_data = FALSE)
```

**Arguments**

object	object that ssvMakeMembTable can convert to logical matrix membership
slice_colors	colors to use for pie slices
return_data	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**Value**

ggplot pie graph of set sizes

**Examples**

```

ssvFeaturePie(list(1:3, 2:6))
ssvFeaturePie(CTCF_in_10a_overlaps_gr)
ssvFeaturePie(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])

```

---

ssvFeatureUpset	<i>ssvFeatureUpset</i>
-----------------	------------------------

---

**Description**

Uses the UpSetR package to create an upset plot of overlaps.

**Usage**

```
ssvFeatureUpset(
  object,
  return_UpSetR = FALSE,
  nsets = NULL,
  nintersects = 15,
  order.by = "freq",
  ...
)
```

**Arguments**

object	will be passed to <a href="#">ssvMakeMembTable</a> for conversion to membership matrix
return_UpSetR	If TRUE, return the UpSetR object, The default is FALSE and results in a ggplotified version compatible with cowplot etc.
nsets	Number of sets to look at
nintersects	Number of intersections to plot. If set to NA, all intersections will be plotted.
order.by	How the intersections in the matrix should be ordered by. Options include frequency (entered as "freq"), degree, or both in any order.
...	Additional parameters passed to <a href="#">upset</a> in the UpSetR package.

**Value**

ggplot version of UpSetR plot

**Examples**

```
ssvFeatureUpset(list(1:3, 2:6))
ssvFeatureUpset(CTCF_in_10a_overlaps_gr)
ssvFeatureUpset(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])
```

---

ssvFeatureVenn	<i>ggplot implementation of vennDiagram from limma package. currently limited at 3 sets. ssvFeatureUpset and ssvFeatureBinaryHeatmap are good options for more than 3 sets. ssvFeatureEuler can work too but can take a very long time to run for more than 5 or so.</i>
----------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

**Description**

ggplot implementation of vennDiagram from limma package. currently limited at 3 sets. ssvFeatureUpset and ssvFeatureBinaryHeatmap are good options for more than 3 sets. ssvFeatureEuler can work too but can take a very long time to run for more than 5 or so.

**Usage**

```

ssvFeatureVenn(
  object,
  group_names = NULL,
  counts_txt_size = 5,
  counts_as_labels = FALSE,
  show_outside_count = FALSE,
  line_width = 3,
  circle_colors = NULL,
  fill_alpha = 0.3,
  line_alpha = 1,
  counts_color = NULL,
  counts_as_percent = FALSE,
  percentage_digits = 1,
  percentage_suffix = "%",
  n_points = 200,
  return_data = FALSE
)

```

**Arguments**

<code>object</code>	will be passed to <a href="#">ssvMakeMembTable</a> for conversion to membership matrix
<code>group_names</code>	useful if names weren't provided or were lost in creating membership matrix
<code>counts_txt_size</code>	font size for count numbers
<code>counts_as_labels</code>	if TRUE, <code>geom_label</code> is used instead of <code>geom_text</code> . can be easier to read.
<code>show_outside_count</code>	if TRUE, items outside of all sets are counted outside. can be confusing.
<code>line_width</code>	uses size aesthetic to control line width of circles.
<code>circle_colors</code>	colors to use for circle line colors. Uses Dark2 set from RColorBrewer by default.
<code>fill_alpha</code>	alpha value to use for fill, defaults to .3.
<code>line_alpha</code>	numeric [0,1], alpha value for circle line
<code>counts_color</code>	character. single color to use for displaying counts
<code>counts_as_percent</code>	if TRUE, convert counts to percentages in plots.
<code>percentage_digits</code>	The number of digits to round percentages to, default is 1.
<code>percentage_suffix</code>	The character to append to percentages, default is "%".
<code>n_points</code>	integer. number of points to approximate circle with. default is 200.
<code>return_data</code>	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**Value**

ggplot venn diagram

**Examples**

```
ssvFeatureVenn(list(1:3, 2:6))
ssvFeatureVenn(CTCF_in_10a_overlaps_gr)
ssvFeatureVenn(S4Vectors::mcols(CTCF_in_10a_overlaps_gr)[,2:3])
```

```
ssvFeatureVenn(list(1:3, 2:6),
  counts_as_percent = TRUE,
  percentage_digits = 2)
```

```
ssvFeatureVenn(list(1:3, 2:6),
  counts_as_percent = TRUE,
  percentage_digits = 0,
  percentage_suffix = " %",
  counts_txt_size = 12)
```

---

ssvFetchBam	<i>Iterates a character vector (ideally named) and calls ssvFetchBam.single on each. Appends grouping variable to each resulting data.table and uses rbindlist to efficiently combine results</i>
-------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

**Description**

ssvFetchBam iteratively calls `fetchWindowedBam.single`. See [ssvFetchBam.single](#) for more info.

**Usage**

```
ssvFetchBam(
  file_paths,
  qgr,
  unique_names = NULL,
  names_variable = "sample",
  file_attribs = NULL,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  fragLens = "auto",
  target_strand = c("*", "+", "-", "both")[1],
  flip_strand = FALSE,
  anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
  return_data.table = FALSE,
  max_dupes = Inf,
  splice_strategy = c("none", "ignore", "add", "only", "splice_count")[1],
```

```

n_cores = getOption("mc.cores", 1),
n_region_splits = 1,
return_unprocessed = FALSE,
force_skip_centerFix = FALSE,
...
)

```

## Arguments

<code>file_paths</code>	character vector of <code>file_paths</code> to load from. Alternatively, <code>file_paths</code> can be a <code>data.frame</code> or <code>data.table</code> whose first column is a character vector of paths and additional columns will be used as metadata.
<code>qgr</code>	Set of <code>GRanges</code> to query. For valid results the width of each interval should be identical and evenly divisible by <code>win_size</code> .
<code>unique_names</code>	names to use in final <code>data.table</code> to designate source bigwig. Default is 'sample'
<code>names_variable</code>	The column name where <code>unique_names</code> are stored.
<code>file_attribs</code>	optional <code>data.frame</code> / <code>data.table</code> with one row per item in file paths. Each column will be a variable added to final tidy output.
<code>win_size</code>	The window size that evenly divides widths in <code>qgr</code> .
<code>win_method</code>	character. one of <code>c("sample", "summary")</code> . Determines if <code>viewGRangesWinSample_dt</code> or <code>viewGRangesWinSummary_dt</code> is used to represent each region in <code>qgr</code> .
<code>summary_FUN</code>	function. only relevant if <code>win_method</code> is "summary". passed to <code>viewGRangesWinSummary_dt</code> .
<code>fragLens</code>	numeric. The fragment length to use to extend reads. The default value "auto" causes an automatic calculation from 100 regions in <code>qgr</code> . NA causes no extension of reads to fragment size.
<code>target_strand</code>	character. One of <code>c("*", "+", "-")</code> . Controls filtering of reads by strand. Default of "*" combines both strands.
<code>flip_strand</code>	boolean. if TRUE strands are flipped.
<code>anchor</code>	character, one of <code>c("center", "center_unstranded", "left", "left_unstranded")</code>
<code>return_data.table</code>	logical. If TRUE the internal <code>data.table</code> is returned instead of <code>GRanges</code> . Default is FALSE.
<code>max_dupes</code>	numeric $\geq 1$ . duplicate reads by strand and start position over this number are removed, Default is Inf.
<code>splice_strategy</code>	character, one of <code>c("none", "ignore", "add", "only", "splice_count")</code> . Default is "none" and spliced alignment are assumed not present. <code>fragLen</code> will be forced to be NA for any other value. "ignore" will not count spliced regions. "add" counts spliced regions along with others, "only" will only count spliced regions and ignore others.
<code>n_cores</code>	integer number of cores to use. Uses <code>mc.cores</code> option if not supplied.
<code>n_region_splits</code>	integer number of splits to apply to <code>qgr</code> . The query <code>GRanges</code> will be split into this many roughly equal parts for increased parallelization. Default is 1, no split.



```

return_unprocessed
    boolean. if TRUE returns read alignment in data.table. Default is FALSE.
force_skip_centerFix
    boolean, if TRUE all query ranges will be used "as is". This is already the
    case by default if win_method == "summary" but may have applications where
    win_method == "sample".
...
    passed to Rsamtools::ScanBamParam()

```

### Details

if qgr contains the range chr1:1-100 and win\_size is 10, values from positions chr1 5,15,25...85, and 95 will be retrieved from bw\_file

### Value

A tidy formatted GRanges (or data.table if specified) containing fetched values.

### Examples

```

if(Sys.info()['sysname'] != "Windows"){
  library(GenomicRanges)
  bam_f = system.file("extdata/test.bam",
    package = "seqsetvis", mustWork = TRUE)
  bam_files = c("a" = bam_f, "b" = bam_f)
  qgr = CTCF_in_10a_overlaps_gr[1:5]
  bw_gr = ssvFetchBam(bam_files, qgr, win_size = 10)
  bw_gr2 = ssvFetchBam(as.list(bam_files), qgr, win_size = 10)

  bw_dt = ssvFetchBam(bam_files, qgr, win_size = 10,
    return_data.table = TRUE)
}

```

---

ssvFetchBam.single     *fetch a windowed version of a bam file, returns GRanges*

---

### Description

fetch a windowed version of a bam file, returns GRanges

### Usage

```

ssvFetchBam.single(
  bam_f,
  qgr,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  fragLen = NULL,

```

```

target_strand = c("*", "+", "-", "both")[1],
anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
return_data.table = FALSE,
max_dupes = Inf,
splice_strategy = c("none", "ignore", "add", "only", "splice_count")[1],
flip_strand = FALSE,
return_unprocessed = FALSE,
force_skip_centerFix = FALSE,
...
)

```

### Arguments

<code>bam_f</code>	character or BamFile to load
<code>qgr</code>	GRanges regions to fetchs
<code>win_size</code>	numeric $\geq 1$ . pileup grabbed every <code>win_size</code> bp for <code>win_method</code> sample. If <code>win_method</code> is <code>summary</code> , this is the number of windows used (confusing, sorry).
<code>win_method</code>	character. one of <code>c("sample", "summary")</code> . Determines if <a href="#">viewGRangesWinSample_dt</a> or <a href="#">viewGRangesWinSummary_dt</a> is used to represent each region in <code>qgr</code> .
<code>summary_FUN</code>	function. only relevant if <code>win_method</code> is <code>"summary"</code> . passed to <a href="#">viewGRangesWinSummary_dt</a> .
<code>fragLen</code>	numeric, NULL, or NA. if numeric, supplied value is used. if NULL, value is calculated with <code>fragLen_calcStranded</code> if NA, raw bam pileup with no cross strand shift is returned.
<code>target_strand</code>	character. if one of <code>"+"</code> or <code>"-"</code> , reads are filtered accordingly. ignored if any other value.
<code>anchor</code>	character, one of <code>c("center", "center_unstranded", "left", "left_unstranded")</code>
<code>return_data.table</code>	logical. If TRUE the internal <code>data.table</code> is returned instead of GRanges. Default is FALSE.
<code>max_dupes</code>	numeric $\geq 1$ . duplicate reads by strandd start position over this number are removed, Default is Inf.
<code>splice_strategy</code>	character, one of <code>c("none", "ignore", "add", "only", "splice_count")</code> . Default is <code>"none"</code> and spliced alignment are assumed not present. <code>fragLen</code> must be NA for any other value to be valid. <code>"ignore"</code> will not count spliced regions. <code>add</code> counts spliced regions along with others, <code>"only"</code> will only count spliced regions and ignore others.
<code>flip_strand</code>	if TRUE, strand alignment is flipped prior to <code>fragLen</code> extension. Default is FALSE.
<code>return_unprocessed</code>	boolean. if TRUE returns read alignment in <code>data.table</code> . Default is FALSE.
<code>force_skip_centerFix</code>	boolean, if TRUE all query ranges will be used <code>"as is"</code> . This is already the case by default if <code>win_method == "summary"</code> but may have applications where <code>win_method == "sample"</code> .
<code>...</code>	passed to <code>Rsamtools::ScanBamParam()</code>

**Value**

tidy GRanges (or data.table if specified) with pileups from bam file. pileup is calculated only every win\_size bp.

---

ssvFetchBamPE	<i>ssvFetchBam for paired-end ChIP-seq files. Only concordant reads are considered, but this has been minimally tested, please verify.</i>
---------------	--------------------------------------------------------------------------------------------------------------------------------------------

---

**Description**

Iterates a character vector (ideally named) and calls ssvFetchBamPE.single on each. Appends grouping variable to each resulting data.table and uses rbindlist to efficiently combine results

**Usage**

```
ssvFetchBamPE(
  file_paths,
  qgr,
  unique_names = NULL,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  fragLens = "not_used",
  anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
  names_variable = "sample",
  return_data.table = FALSE,
  max_dupes = Inf,
  n_cores = getOption("mc.cores", 1),
  n_region_splits = 1,
  min_isize = 1,
  max_isize = Inf,
  return_unprocessed = FALSE,
  return_fragSizes = FALSE,
  force_skip_centerFix = FALSE,
  ...
)
```

**Arguments**

file_paths	character vector of file_paths to load from. Alternatively, file_paths can be a data.frame or data.table whose first column is a character vector of paths and additional columns will be used as metadata.
qgr	Set of GRanges to query. For valid results the width of each interval should be identical and evenly divisible by win_size.
unique_names	names to use in final data.table to designate source bigwig. Default is 'sample'
win_size	The window size that evenly divides widths in qgr.

win_method	character. one of c("sample", "summary"). Determines if <a href="#">viewGRangesWinSample_dt</a> or <a href="#">viewGRangesWinSummary_dt</a> is used to represent each region in qgr.
summary_FUN	function. only relevant if win_method is "summary". passed to <a href="#">viewGRangesWinSummary_dt</a> .
fragLens	never used by ssvFetchBamPE Ignore.
anchor	character, one of c("center", "center_unstranded", "left", "left_unstranded")
names_variable	The column name where unique_names are stored.
return_data.table	logical. If TRUE the internal data.table is returned instead of GRanges. Default is FALSE.
max_dupes	numeric >= 1. duplicate reads by strand and start position over this number are removed, Default is Inf.
n_cores	integer number of cores to use.
n_region_splits	integer number of splits to apply to qgr. The query GRanges will be split into this many roughly equal parts for increased parallelization. Default is 1, no split.
min_isize	integer. Read pairs must have an isize greater than or equal to this value. Default is 1.
max_isize	integer. Read pairs must have an isize less than or equal to this value. Default is Inf.
return_unprocessed	boolean. if TRUE returns read alignment in data.table. Default is FALSE.
return_fragSizes	boolean. if TRUE returns fragment sizes for all reads per region.
force_skip_centerFix	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if win_method == "summary" but may have applications where win_method == "sample".
...	passed to Rsamtools::ScanBamParam() Uses mc.cores option if not supplied.

## Details

#' In contrast to ssvFetchBam, extension of reads to estimated fragment size is not an issue as each read pair represents a fragment of exact size.

ssvFetchBamPE iteratively calls [fetchWindowedBam.single](#). See [ssvFetchBamPE.single](#) for more info.

if qgr contains the range chr1:1-100 and win\_size is 10, values from positions chr1 5,15,25...85, and 95 will be retrieved from bw\_file

## Value

A tidy formatted GRanges (or data.table if specified) containing fetched values.

**Examples**

```

if(Sys.info()['sysname'] != "Windows"){
  library(GenomicRanges)
  bam_f = system.file("extdata/Bcell_PE.mm10.bam",
    package = "seqsetvis", mustWork = TRUE)
  bam_files = c("a" = bam_f, "b" = bam_f)
  data("Bcell_peaks")
  qgr = Bcell_peaks
  bw_gr = ssvFetchBamPE(bam_files, qgr, win_size = 10)
  bw_gr2 = ssvFetchBamPE(as.list(bam_files), qgr, win_size = 10)

  bw_dt = ssvFetchBamPE(bam_files, qgr, win_size = 10,
    return_data.table = TRUE)
}

```

---

ssvFetchBamPE.single *fetch a windowed version of a paired-end bam file, returns GRanges*  
*In contrast to ssvFetchBam, extension of reads to estimated fragment size is not an issue as each read pair represents a fragment of exact size.*

---

**Description**

fetch a windowed version of a paired-end bam file, returns GRanges In contrast to ssvFetchBam, extension of reads to estimated fragment size is not an issue as each read pair represents a fragment of exact size.

**Usage**

```

ssvFetchBamPE.single(
  bam_f,
  qgr,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
  return_data.table = FALSE,
  max_dupes = Inf,
  min_ysize = 1,
  max_ysize = Inf,
  return_unprocessed = FALSE,
  return_fragSizes = FALSE,
  force_skip_centerFix = FALSE,
  ...
)

```

**Arguments**

bam_f	character or BamFile to load
qgr	GRanges regions to fetchs
win_size	numeric >=1. pileup grabbed every win_size bp for win_method sample. If win_method is summary, this is the number of windows used (confusing, sorry).
win_method	character. one of c("sample", "summary"). Determines if <a href="#">viewGRangesWinSample_dt</a> or <a href="#">viewGRangesWinSummary_dt</a> is used to represent each region in qgr.
summary_FUN	function. only relevant if win_method is "summary". passed to <a href="#">viewGRangesWinSummary_dt</a> .
anchor	character, one of c("center", "center_unstranded", "left", "left_unstranded")
return_data.table	logical. If TRUE the internal data.table is returned instead of GRanges. Default is FALSE.
max_dupes	numeric >= 1. duplicate reads by strandd start position over this number are removed, Default is Inf.
min_isize	integer. Read pairs must have an isize greater than or equal to this value. Default is 1.
max_isize	integer. Read pairs must have an isize less than or equal to this value. Default is Inf.
return_unprocessed	boolean. if TRUE returns read alignment in data.table. Default is FALSE.
return_fragSizes	boolean. if TRUE returns fragment sizes for all reads per region.
force_skip_centerFix	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if win_method == "summary" but may have applications where win_method == "sample".
...	passed to Rsamtools::ScanBamParam()

**Value**

tidy GRanges (or data.table if specified) with pileups from bam file. pileup is calculated only every win\_size bp.

---

ssvFetchBigwig	<i>Iterates a character vector (ideally named) and calls ssvFetchBigwig.single on each. Appends grouping variable to each resulting data.table and uses rbindlist to efficiently combine results.</i>
----------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

**Description**

ssvFetchBigwig iteratively calls [fetchWindowedBigwig.single](#). See [ssvFetchBigwig.single](#) for more info.

**Usage**

```

ssvFetchBigwig(
  file_paths,
  qgr,
  unique_names = NULL,
  names_variable = "sample",
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  fragLens = "not_used",
  anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
  return_data.table = FALSE,
  n_cores = getOption("mc.cores", 1),
  n_region_splits = 1,
  force_skip_centerFix = FALSE
)

```

**Arguments**

<code>file_paths</code>	character vector of <code>file_paths</code> to load from. Alternatively, <code>file_paths</code> can be a <code>data.frame</code> or <code>data.table</code> whose first column is a character vector of paths and additional columns will be used as metadata.
<code>qgr</code>	Set of <code>GRanges</code> to query. For valid results the width of each interval should be identical and evenly divisible by <code>win_size</code> .
<code>unique_names</code>	names to use in final <code>data.table</code> to designate source bigwig.
<code>names_variable</code>	The column name where <code>unique_names</code> are stored. Default is 'sample'
<code>win_size</code>	The window size that evenly divides widths in <code>qgr</code> .
<code>win_method</code>	character. one of <code>c("sample", "summary")</code> . Determines if <code>viewGRangesWinSample_dt</code> or <code>viewGRangesWinSummary_dt</code> is used to represent each region in <code>qgr</code> .
<code>summary_FUN</code>	function. only relevant if <code>win_method</code> is "summary". passed to <code>viewGRangesWinSummary_dt</code> .
<code>fragLens</code>	never used by <code>ssvFetchBigwig</code> . Ignore.
<code>anchor</code>	character, one of <code>c("center", "center_unstranded", "left", "left_unstranded")</code>
<code>return_data.table</code>	logical. If TRUE the internal <code>data.table</code> is returned instead of <code>GRanges</code> . Default is FALSE.
<code>n_cores</code>	integer number of cores to use. Uses <code>mc.cores</code> option if not supplied.
<code>n_region_splits</code>	integer number of splits to apply to <code>qgr</code> . The query <code>GRanges</code> will be split into this many roughly equal parts for increased parallelization. Default is 1, no split.
<code>force_skip_centerFix</code>	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if <code>win_method == "summary"</code> but may have applications where <code>win_method == "sample"</code> .

**Details**

if qgr contains the range chr1:1-100 and win\_size is 10, values from positions chr1 5,15,25...85, and 95 will be retrieved from bw\_file

**Value**

A tidy formatted GRanges (or data.table if specified) containing fetched values.

**Examples**

```
if(Sys.info()['sysname'] != "Windows"){
  library(GenomicRanges)
  bw_f = system.file("extdata/test_loading.bw",
    package = "seqsetvis", mustWork = TRUE)
  bw_files = c("a" = bw_f, "b" = bw_f)
  qgr = GRanges("chrTest", IRanges(1, 30))
  bw_gr = ssvFetchBigwig(bw_files, qgr, win_size = 10)
  bw_gr2 = ssvFetchBigwig(as.list(bw_files), qgr, win_size = 10)

  bw_dt = ssvFetchBigwig(bw_files, qgr, win_size = 10,
    return_data.table = TRUE)
}
```

---

ssvFetchBigwig.single *Fetch values from a bigwig appropriate for heatmaps etc.*

---

**Description**

ssvFetchBigwig.single Gets values for each region of the query GRanges (qgr). Values correspond to the center of each window of size win\_size. A tidy formatted data.table object is returned suitable for plotting using ggplots.

**Usage**

```
ssvFetchBigwig.single(
  bw_file,
  qgr,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  summary_FUN = stats::weighted.mean,
  anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
  return_data.table = FALSE,
  force_skip_centerFix = FALSE
)
```



**Arguments**

<code>bw_file</code>	The character vector path to bigwig files to read from.
<code>qgr</code>	Set of GRanges to query. For valid results the width of each interval should be identical and evenly divisible by <code>win_size</code> .
<code>win_size</code>	The window size that evenly divides widths in <code>qgr</code> .
<code>win_method</code>	character. one of <code>c("sample", "summary")</code> . Determines if <code>viewGRangesWinSample_dt</code> or <code>viewGRangesWinSummary_dt</code> is used to represent each region in <code>qgr</code> .
<code>summary_FUN</code>	function. only relevant if <code>win_method</code> is "summary". passed to <code>viewGRangesWinSummary_dt</code> .
<code>anchor</code>	character, one of <code>c("center", "center_unstranded", "left", "left_unstranded")</code>
<code>return_data.table</code>	logical. If TRUE the internal <code>data.table</code> is returned instead of GRanges. Default is FALSE.
<code>force_skip_centerFix</code>	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if <code>win_method == "summary"</code> but may have applications where <code>win_method == "sample"</code> .

**Details**

if `qgr` contains the range `chr1:1-100` and `win_size` is 10, values from positions `chr1 5,15,25...85`, and 95 will be retrieved from `bw_file`

**Value**

A GRanges (or `data.table` if specified) containing fetched values.

---

<code>ssvFetchGRanges</code>	<i>Fetch coverage values for a list of GRanges.</i>
------------------------------	-----------------------------------------------------

---

**Description**

`ssvFetchGRanges` Gets coverage values for each region of the query GRanges (`qgr`). Values correspond to the center of each window of size `win_size`. A tidy formatted `data.table` object is returned suitable for plotting using `ggplots`.

**Usage**

```
ssvFetchGRanges(
  grs,
  qgr,
  file_attribs = data.frame(matrix(0, nrow = length(grs), ncol = 0)),
  unique_names = names(grs),
  names_variable = "sample",
  win_size = 50,
  win_method = c("sample", "summary")[1],
```

```

summary_FUN = function(x, w) max(x),
target_strand = c("*", "+", "-", "both")[1],
use_coverage = NULL,
attrib_var = "score",
fill_value = 0,
anchor = c("left", "left_unstranded", "center", "center_unstranded")[3],
return_data.table = FALSE,
n_cores = getOption("mc.cores", 1),
force_skip_centerFix = FALSE
)

```

### Arguments

<code>grs</code>	a list of GRanges for which to calculate coverage.
<code>qgr</code>	Set of GRanges to query. For valid results the width of each interval should be identical and evenly divisible by <code>win_size</code> .
<code>file_attribs</code>	data.frame (1 row per item in <code>grs</code> ) containing attributes to append to results.
<code>unique_names</code>	The column name where unique_names are stored. Default is 'sample'
<code>names_variable</code>	The column name where unique_names are stored. Default is 'sample'
<code>win_size</code>	The window size that evenly divides widths in <code>qgr</code> .
<code>win_method</code>	character. one of c("sample", "summary"). Determines if <a href="#">viewGRangesWinSample_dt</a> or <a href="#">viewGRangesWinSummary_dt</a> is used to represent each region in <code>qgr</code> .
<code>summary_FUN</code>	function. only relevant if <code>win_method</code> is "summary". passed to <a href="#">viewGRangesWinSummary_dt</a> .
<code>target_strand</code>	character. if one of "+" or "-", reads are filtered to match. ignored if any other value.
<code>use_coverage</code>	boolean or NULL, if TRUE, query regions are scored by the number of intervals overlapping. Default of NULL checks if <code>attrib_var</code> is "score" and uses coverage if so.
<code>attrib_var</code>	character, column in <code>mccols</code> of GRanges to pull values from. Default of "score" is compatible with internal coverage calculation or bedgraph-like files.
<code>fill_value</code>	numeric or character value to use where queried regions are empty. Default is 0 and appropriate for both calculated coverage and bedgraph/bigwig like files. Will automatically switch to "MISSING" if data is guessed to be qualitative.
<code>anchor</code>	character, one of c("center", "center_unstranded", "left", "left_unstranded")
<code>return_data.table</code>	logical. If TRUE the internal data.table is returned instead of GRanges. Default is FALSE.
<code>n_cores</code>	integer number of cores to use. Uses <code>mc.cores</code> option if not supplied.
<code>force_skip_centerFix</code>	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if <code>win_method == "summary"</code> but may have applications where <code>win_method == "sample"</code> .

### Value

A tidy formatted GRanges (or data.table if specified) containing fetched values.

**Examples**

```
ssvFetchGRanges(CTCF_in_10a_narrowPeak_grs, CTCF_in_10a_overlaps_gr, win_size = 200)
```

---

```
ssvFetchSignal      signal loading framework
```

---

**Description**

Does nothing unless `load_signal` is overridden to carry out reading data from `file_paths` (likely via the appropriate `ssvFetch*` function, ie. [ssvFetchBigwig](#) or [ssvFetchBam](#))

**Usage**

```
ssvFetchSignal(
  file_paths,
  qgr,
  unique_names = NULL,
  names_variable = "sample",
  file_attribs = NULL,
  win_size = 50,
  win_method = c("sample", "summary")[1],
  return_data.table = FALSE,
  load_signal = function(f, nam, qgr) {
    warning("nothing happened, ",
           "supply a function to", "load_signal parameter.")
  },
  n_cores = getOption("mc.cores", 1),
  n_region_splits = 1,
  force_skip_centerFix = FALSE
)
```

**Arguments**

<code>file_paths</code>	character vector of <code>file_paths</code> to load from. Alternatively, <code>file_paths</code> can be a <code>data.frame</code> or <code>data.table</code> whose first column is a character vector of paths and additional columns will be used as metadata.
<code>qgr</code>	<code>GRanges</code> of intervals to return from each file
<code>unique_names</code>	unique file ids for each file in <code>file_paths</code> . Default is names of <code>file_paths</code> vector
<code>names_variable</code>	character, variable name for column containing <code>unique_names</code> entries. Default is "sample"
<code>file_attribs</code>	optional <code>data.frame</code> / <code>data.table</code> with one row per item in file paths. Each column will be a variable added to final tidy output.
<code>win_size</code>	numeric/integer window size resolution to load signal at. Default is 50.
<code>win_method</code>	character. one of <code>c("sample", "summary")</code> . Determines if <a href="#">viewGRangesWinSample_dt</a> or <a href="#">viewGRangesWinSummary_dt</a> is used to represent each region in <code>qgr</code> .

<code>return_data.table</code>	logical. If TRUE <code>data.table</code> is returned instead of <code>GRanges</code> , the default.
<code>load_signal</code>	function taking <code>f</code> , <code>nam</code> , and <code>qgr</code> arguments. <code>f</code> is from <code>file_paths</code> , <code>nam</code> is from <code>unique_names</code> , and <code>qgr</code> is <code>qgr</code> . See details.
<code>n_cores</code>	integer number of cores to use. Uses <code>mc.cores</code> option if not supplied.
<code>n_region_splits</code>	integer number of splits to apply to <code>qgr</code> . The query <code>GRanges</code> will be split into this many roughly equal parts for increased parallelization. Default is 1, no split.
<code>force_skip_centerFix</code>	boolean, if TRUE all query ranges will be used "as is". This is already the case by default if <code>win_method == "summary"</code> but may have applications where <code>win_method == "sample"</code> .

### Details

`load_signal` is passed `f`, `nam`, and `qgr` and is executed in the environment where `load_signal` is defined. See [ssvFetchBigwig](#) and [ssvFetchBam](#) for examples.

### Value

A `GRanges` with values read from `file_paths` at intervals of `win_size`. Originating file is coded by `unique_names` and assigned to column of name `names_variable`. Output is `data.table` is `return_data.table` is TRUE.

### Examples

```
library(GenomicRanges)
bam_f = system.file("extdata/test.bam",
  package = "seqsetvis", mustWork = TRUE)
bam_files = c("a" = bam_f, "b" = bam_f)
qgr = CTCF_in_10a_overlaps_gr[1:2]
qgr = resize(qgr, 500, "center")
load_bam = function(f, nam, qgr) {
  message("loading ", f, " ..")
  dt = seqsetvis::ssvFetchBam.single(bam_f = f,
    qgr = qgr,
    win_size = 50,
    fragLen = NULL,
    target_strand = "*",
    return_data.table = TRUE)

  data.table::set(dt, j = "sample", value = nam)
  message("finished loading ", nam, ".")
  dt
}
ssvFetchSignal(bam_files, qgr, load_signal = load_bam)
```

---

ssvMakeMembTable	<i>generic for methods to convert various objects to a logical matrix indicating membership of items (rows) in sets (columns)</i>
------------------	-----------------------------------------------------------------------------------------------------------------------------------

---

### Description

generic for methods to convert various objects to a logical matrix indicating membership of items (rows) in sets (columns)

list of character vectors input

GRangesList input

GRanges with mcols input

DataFrame input

matrix of logicals, membership table

data.frame input, final output The final method for all inputs, checks column names and returns logical matrix

### Usage

```
ssvMakeMembTable(object)

## S4 method for signature 'list'
ssvMakeMembTable(object)

## S4 method for signature 'GRangesList'
ssvMakeMembTable(object)

## S4 method for signature 'GRanges'
ssvMakeMembTable(object)

## S4 method for signature 'DataFrame'
ssvMakeMembTable(object)

## S4 method for signature 'matrix'
ssvMakeMembTable(object)

## S4 method for signature 'data.frame'
ssvMakeMembTable(object)
```

### Arguments

object	the object to convert. Supported types: list (of character or GRanges), GRanges with membership table metadata, GRangesList, data.frame/matrix/DataFrame of membership table
--------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Value**

a logical matrix indicating membership of items (rows) in sets (columns)

**Examples**

```
char_list = list(letters[1:3], letters[2:4])
ssvMakeMembTable(char_list)
library(GenomicRanges)
gr_list = list(GRanges("chr1", IRanges(1:3*2, 1:3*2)),
              GRanges("chr1", IRanges(2:4*2, 2:4*2)))
ssvMakeMembTable(gr_list)
library(GenomicRanges)
gr_list = list(GRanges("chr1", IRanges(1:3*2, 1:3*2)),
              GRanges("chr1", IRanges(2:4*2, 2:4*2)))
ssvMakeMembTable(GRangesList(gr_list))
gr = GRanges("chr1", IRanges(1:3*2, 1:3*2))
gr$set_a = c(TRUE, TRUE, FALSE)
gr$set_b = c(FALSE, TRUE, TRUE)
ssvMakeMembTable(gr)
gr = GRanges("chr1", IRanges(1:3*2, 1:3*2))
gr$set_a = c(TRUE, TRUE, FALSE)
gr$set_b = c(FALSE, TRUE, TRUE)
ssvMakeMembTable(mcols(gr))
memb_mat = matrix(c(TRUE, TRUE, FALSE, FALSE, TRUE, FALSE, TRUE, FALSE),
                 ncol = 2, byrow = FALSE)
ssvMakeMembTable(memb_mat)
memb_df = data.frame(a = c(TRUE, TRUE, FALSE, FALSE),
                    b = c(TRUE, FALSE, TRUE, FALSE))
ssvMakeMembTable(memb_df)
```

---

ssvOverlapIntervalSets

*Intersect a list of GRanges to create a single GRanges object of merged ranges including metadata describing overlaps per input GRanges*

---

**Description**

Intersect a list of GRanges to create a single GRanges object of merged ranges including metadata describing overlaps per input GRanges

**Usage**

```
ssvOverlapIntervalSets(gr, ext = 0, use_first = FALSE, ...)
```

**Arguments**

<code>gr</code>	A list of GRanges
<code>ext</code>	An integer specifying how far to extend ranges before merging. in effect, ranges withing $2 * ext$ of one another will be joined during the merge

`use_first` A logical. If True, instead of merging all grs, only use first and add metadata logicals for others.

`...` arguments passed to `IRanges::findOverlaps`, i.e. `maxgap`, `minoverlap`, `type`, `select`, `invert`.

**Value**

GRanges with metadata columns describing overlap of input grs.

**Examples**

```
library(GenomicRanges)
a = GRanges("chr1", IRanges(1:7*10, 1:7*10))
b = GRanges("chr1", IRanges(5:10*10, 5:10*10))
ssvOverlapIntervalSets(list(a, b))
```

---

ssvSignalBandedQuantiles

*plot profiles from bigwigs*

---

**Description**

plot profiles from bigwigs

**Usage**

```
ssvSignalBandedQuantiles(
  bw_data,
  y_ = "y",
  x_ = "x",
  by_ = "fake",
  hsv_reverse = FALSE,
  hsv_saturation = 1,
  hsv_value = 1,
  hsv_grayscale = FALSE,
  hsv_hue_min = 0,
  hsv_hue_max = 0.7,
  hsv_symmetric = FALSE,
  n_quantile = 18,
  quantile_min = 0.05,
  quantile_max = 0.95,
  return_data = FALSE
)
```

**Arguments**

<code>bw_data</code>	a GRanges or data.table of bigwig signal. As returned from <code>ssvFetchBam</code> and <code>ssvFetchBigwig</code>
<code>y_</code>	the variable name in <code>bw_data</code> for y axis in plot
<code>x_</code>	the variable name in <code>bw_data</code> for x axis in plot
<code>by_</code>	the variable name in <code>bw_data</code> to facet on
<code>hsv_reverse</code>	logical, should color scale be reversed? default FALSE
<code>hsv_saturation</code>	numeric [0, 1] saturation for color scale. default 1
<code>hsv_value</code>	numeric [0, 1] value for color scale. default 1
<code>hsv_grayscale</code>	logical, if TRUE <code>gray()</code> is used instead of <code>rainbow()</code> . default FALSE
<code>hsv_hue_min</code>	numeric [0, <code>hsv_hue_max</code> ) hue min of color scale
<code>hsv_hue_max</code>	numeric ( <code>hsv_hue_min</code> , 1] hue max of color scale
<code>hsv_symmetric</code>	if TRUE, colorscale is symmetrical, default FALSE.
<code>n_quantile</code>	number of evenly size quantile bins
<code>quantile_min</code>	the lowest quantile start
<code>quantile_max</code>	the highest quantile end
<code>return_data</code>	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**Value**

ggplot object using ribbon plots to show quantile distributions

**Examples**

```
#rainbow colors
qgr = CTCF_in_10a_profiles_gr
ssvSignalBandedQuantiles(qgr)
#grayscale
ssvSignalBandedQuantiles(qgr, hsv_grayscale = TRUE,
  hsv_symmetric = TRUE, hsv_reverse = TRUE)
#using "by_" per sample
ssvSignalBandedQuantiles(qgr, hsv_grayscale = TRUE,
  hsv_symmetric = TRUE, hsv_reverse = TRUE, by_ = "sample")
#adding spline smoothing
splined = applySpline(qgr, n = 10,
  by_ = c("id", "sample"))
ssvSignalBandedQuantiles(splined, n_quantile = 50,
  quantile_min = .25, quantile_max = .75,
  hsv_symmetric = TRUE, hsv_reverse = TRUE, by_ = "sample")
```



---

`ssvSignalClustering` *Clustering as for a heatmap. This is used internally by [ssvSignalHeatmap](#) but can also be run before calling [ssvSignalHeatmap](#) for greater control and access to clustering results directly.*

---

### Description

Clustering is via k-means by default. The number of clusters is determined by `nclust`. Optionally, k-means can be initialized with a `data.frame` provided to `k_centroids`. As an alternative to k-means, a membership table from [ssvMakeMembTable](#) can be provided to determine logical clusters.

### Usage

```
ssvSignalClustering(
  bw_data,
  nclust = NULL,
  k_centroids = NULL,
  memb_table = NULL,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  max_rows = 500,
  max_cols = 100,
  clustering_col_min = -Inf,
  clustering_col_max = Inf,
  within_order_strategy = valid_sort_strategies[2],
  dcast_fill = NA,
  iter.max = 30,
  fun.aggregate = "mean"
)
```

### Arguments

<code>bw_data</code>	a <code>GRanges</code> or <code>data.table</code> of bigwig signal. As returned from <a href="#">ssvFetchBam</a> and <a href="#">ssvFetchBigwig</a>
<code>nclust</code>	Number of clusters. Defaults to 6 if <code>nclust</code> , <code>k_centroids</code> , and <code>memb_table</code> are not set.
<code>k_centroids</code>	<code>data.frame</code> of centroids for k-means clusters. Incompatible with <code>nclust</code> or <code>memb_table</code> .
<code>memb_table</code>	Membership table as from <a href="#">ssvMakeMembTable</a> . Logical groups from membership table will be clusters. Incompatible with <code>nclust</code> or <code>k_centroids</code> .
<code>row_</code>	variable name mapped to row, likely <code>id</code> or gene name for ngs data. Default is <code>"id"</code> and works with <code>ssvFetch*</code> output.
<code>column_</code>	variable mapped to column, likely <code>bp</code> position for ngs data. Default is <code>"x"</code> and works with <code>ssvFetch*</code> output.

fill_	numeric variable to map to fill. Default is "y" and works with ssvFetch* output.
facet_	variable name to facet horizontally by. Default is "sample" and works with ssvFetch* output. Set to "" if data is not faceted.
cluster_	variable name to use for cluster info. Default is "cluster_id".
max_rows	for speed rows are sampled to 500 by default, use Inf to plot full data
max_cols	for speed columns are sampled to 100 by default, use Inf to plot full data
clustering_col_min	numeric minimum for col range considered when clustering, default in -Inf
clustering_col_max	numeric maximum for col range considered when clustering, default in Inf
within_order_strategy	one of "hclust", "sort", "right", "left", "reverse". If "hclust", hierarchical clustering will be used. If "sort", a simple decreasing sort of rosSums. If "left", will attempt to put high signal on left ("right" is opposite). If "reverse" reverses existing order (should only be used after meaningful order imposed).
dcast_fill	value to supply to dcast fill argument. default is NA.
iter.max	Number of max iterations to allow for k-means. Default is 30.
fun.aggregate	Function to aggregate when multiple values present for facet_, row_, and column_. The function should accept a single vector argument or be a character string naming such a function.

### Details

Within each cluster, items will either be sorted by decreasing average signal or hierachically clustered; this is controlled via within\_order\_strategy.

### Value

data.table of signal profiles, ready for ssvSignalHeatmap

### Examples

```

clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_gr)
ssvSignalHeatmap(clust_dt)

clust_dt2 = ssvSignalClustering(CTCF_in_10a_profiles_gr, nclust = 2)
ssvSignalHeatmap(clust_dt2)

#clustering can be targetted to a specific part of the region
clust_dt3 = ssvSignalClustering(CTCF_in_10a_profiles_gr, nclust = 2,
  clustering_col_min = -250, clustering_col_max = -150)
ssvSignalHeatmap(clust_dt3)
clust_dt4 = ssvSignalClustering(CTCF_in_10a_profiles_gr, nclust = 2,
  clustering_col_min = 150, clustering_col_max = 250)
ssvSignalHeatmap(clust_dt4)

```

---

ssvSignalHeatmap	<i>heatmap style representation of membership table. instead of clustering, each column is sorted starting from the left.</i>
------------------	-------------------------------------------------------------------------------------------------------------------------------

---

## Description

See [ssvSignalHeatmap.ClusterBars](#) for an alternative with more control over where the cluster bars appear.

## Usage

```
ssvSignalHeatmap(
  bw_data,
  nclust = 6,
  perform_clustering = c("auto", "yes", "no")[1],
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  max_rows = 500,
  max_cols = 100,
  fill_limits = NULL,
  clustering_col_min = -Inf,
  clustering_col_max = Inf,
  within_order_strategy = c("hclust", "sort")[2],
  dcast_fill = NA,
  return_data = FALSE,
  show_cluster_bars = TRUE,
  rect_colors = c("black", "gray"),
  text_colors = rev(rect_colors),
  show_labels = TRUE,
  label_angle = 0,
  fun.aggregate = "mean"
)
```

## Arguments

bw_data	a GRanges or data.table of bigwig signal. As returned from <a href="#">ssvFetchBam</a> and <a href="#">ssvFetchBigwig</a>
nclust	number of clusters
perform_clustering	should clustering be done? default is auto. auto considers if row_ has been ordered by being a factor and if cluster_ is a numeric.
row_	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch* output.

column_	variable mapped to column, likely bp position for ngs data. Default is "x" and works with ssvFetch* output.
fill_	numeric variable to map to fill. Default is "y" and works with ssvFetch* output.
facet_	variable name to facet horizontally by. Default is "sample" and works with ssvFetch* output. Set to "" if data is not faceted.
cluster_	variable name to use for cluster info. Default is "cluster_id".
max_rows	for speed rows are sampled to 500 by default, use Inf to plot full data
max_cols	for speed columns are sampled to 100 by default, use Inf to plot full data
fill_limits	limits for fill legend. values will be cropped to this range if set. Default of NULL uses natural range of fill_.
clustering_col_min	numeric minimum for col range considered when clustering, default in -Inf
clustering_col_max	numeric maximum for col range considered when clustering, default in Inf
within_order_strategy	one of "hclust" or "sort". if hclust, hierarchical clustering will be used. if sort, a simple decreasing sort of rosSums.
dcast_fill	value to supply to dcast fill argument. default is NA.
return_data	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.
show_cluster_bars	if TRUE, show bars indicating cluster membership.
rect_colors	colors of rectangle fill, repeat to match number of clusters. Default is c("black", "gray").
text_colors	colors of text, repeat to match number of clusters. Default is reverse of rect_colors.
show_labels	logical, should rectangles be labelled with cluster identity. Default is TRUE.
label_angle	angle to add clusters labels at. Default is 0, which is horizontal.
fun.aggregate	Function to aggregate when multiple values present for facet_, row_, and column_. Affects both clustering and plotting. The function should accept a single vector argument or be a character string naming such a function.

### Value

ggplot heatmap of signal profiles, faceted by sample

### Examples

```
#the simplest use
ssvSignalHeatmap(CTCF_in_10a_profiles_gr)
ssvSignalHeatmap(CTCF_in_10a_profiles_gr, show_cluster_bars = FALSE)

#clustering can be done manually beforehand
clust_dt = ssvSignalClustering(CTCF_in_10a_profiles_gr, nclust = 3)
ssvSignalHeatmap(clust_dt)
```

```

ssvSignalHeatmap(clust_dt, max_rows = 20, max_cols = 7)

# aggregation, when facet_ is shared by multiple samples
prof_gr = CTCF_in_10a_profiles_gr
prof_gr$mark = "CTCF"
clust_gr = ssvSignalClustering(
  prof_gr,
  facet_ = "mark",
  fun.aggregate = function(x)as.numeric(x > 10)
)
table(clust_gr$y)
ssvSignalHeatmap(prof_gr, facet_ = "mark",
  fun.aggregate = function(x)as.numeric(x > 10))
ssvSignalHeatmap(prof_gr, facet_ = "mark",
  fun.aggregate = max)
ssvSignalHeatmap(prof_gr, facet_ = "mark",
  fun.aggregate = min)

```

---

ssvSignalHeatmap.ClusterBars

*heatmap style representation of membership table. instead of clustering, each column is sorted starting from the left.*

---

## Description

Compared to `ssvSignalHeatmap`, `cluster_bars` are displayed on the left once instead of for each facet

## Usage

```

ssvSignalHeatmap.ClusterBars(
  bw_data,
  nclust = 6,
  perform_clustering = c("auto", "yes", "no")[1],
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  FUN_format_heatmap = NULL,
  max_rows = 500,
  max_cols = 100,
  fill_limits = NULL,
  clustering_col_min = -Inf,
  clustering_col_max = Inf,
  within_order_strategy = c("hclust", "sort")[2],
  dcast_fill = NA,
  return_data = FALSE,
  return_unassembled_plots = FALSE,

```

```

rel_widths = c(1, 9),
rect_colors = c("black", "gray"),
text_colors = rev(rect_colors),
show_labels = TRUE,
label_angle = 0,
fun.aggregate = "mean",
...
)

```

## Arguments

**bw\_data** a GRanges or data.table of bigwig signal. As returned from [ssvFetchBam](#) and [ssvFetchBigwig](#)

**nclust** number of clusters

**perform\_clustering** should clustering be done? default is auto. auto considers if row\_ has been ordered by being a factor and if cluster\_ is a numeric.

**row\_** variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with ssvFetch\* output.

**column\_** variable mapped to column, likely bp position for ngs data. Default is "x" and works with ssvFetch\* output.

**fill\_** numeric variable to map to fill. Default is "y" and works with ssvFetch\* output.

**facet\_** variable name to facet horizontally by. Default is "sample" and works with ssvFetch\* output. Set to "" if data is not faceted.

**cluster\_** variable name to use for cluster info. Default is "cluster\_id".

**FUN\_format\_heatmap** optional function to modify main ggplot (labels, themes, scales, etc.). Take a ggplot and returns a ggplot. Default is NULL.

**max\_rows** for speed rows are sampled to 500 by default, use Inf to plot full data

**max\_cols** for speed columns are sampled to 100 by default, use Inf to plot full data

**fill\_limits** limits for fill legend. values will be cropped to this range if set. Default of NULL uses natural range of fill\_.

**clustering\_col\_min** numeric minimum for col range considered when clustering, default in -Inf

**clustering\_col\_max** numeric maximum for col range considered when clustering, default in Inf

**within\_order\_strategy** one of "hclust" or "sort". if hclust, hierarchical clustering will be used. if sort, a simple decreasing sort of rosSums.

**dcast\_fill** value to supply to dcast fill argument. default is NA.

**return\_data** logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**return\_unassembled\_plots** logical. If TRUE, return list of heatmap and cluster-bar ggplots. Can be customized and passed to [assemble\\_heatmap\\_cluster\\_bars](#)

<code>rel_widths</code>	numeric of length 2. Passed to <code>cowplot::plot_grid</code> . Default is <code>c(1, 9)</code> .
<code>rect_colors</code>	colors of rectangle fill, repeat to match number of clusters. Default is <code>c("black", "gray")</code> .
<code>text_colors</code>	colors of text, repeat to match number of clusters. Default is reverse of <code>rect_colors</code> .
<code>show_labels</code>	logical, should rectangles be labelled with cluster identity. Default is <code>TRUE</code> .
<code>label_angle</code>	angle to add clusters labels at. Default is 0, which is horizontal.
<code>fun.aggregate</code>	Function to aggregate when multiple values present for <code>facet_</code> , <code>row_</code> , and <code>column_</code> . Affects both clustering and plotting. The function should accept a single vector argument or be a character string naming such a function.
<code>...</code>	additional arguments passed to <code>cowplot::plot_grid</code>

**Value**

ggplot heatmap of signal profiles, faceted by sample

**Examples**

```
#the simplest use
ssvSignalHeatmap.ClusterBars(CTCF_in_10a_profiles_gr)
ssvSignalHeatmap.ClusterBars(CTCF_in_10a_profiles_gr, rel_widths = c(1, 5))

#clustering can be done manually beforehand
clust_dt = ssvSignalClustering(data.table::as.data.table(CTCF_in_10a_profiles_gr), nclust = 3)
ssvSignalHeatmap.ClusterBars(clust_dt)

# aggregation, when facet_ is shared by multiple samples
prof_gr = CTCF_in_10a_profiles_gr
prof_gr$mark = "CTCF"
ssvSignalHeatmap.ClusterBars(prof_gr, facet_ = "mark", fun.aggregate = mean)
ssvSignalHeatmap.ClusterBars(prof_gr, facet_ = "mark", fun.aggregate = "sum")
```

---

`ssvSignalLineplot`      *construct line type plots where each region in each sample is represented*

---

**Description**

construct line type plots where each region in each sample is represented

**Usage**

```
ssvSignalLineplot(
  bw_data,
  x_ = "x",
  y_ = "y",
  color_ = "sample",
  sample_ = "sample",
```

```

    region_ = "id",
    group_ = "auto_grp",
    line_alpha = 1,
    facet_ = "auto_facet",
    facet_method = facet_wrap,
    spline_n = NULL,
    return_data = FALSE
  )

```

### Arguments

<code>bw_data</code>	a GRanges or data.table of bigwig signal. As returned from <a href="#">ssvFetchBam</a> and <a href="#">ssvFetchBigwig</a>
<code>x_</code>	variable name mapped to x aesthetic, x by default.
<code>y_</code>	variable name mapped to y aesthetic, y by default.
<code>color_</code>	variable name mapped to color aesthetic, sample by default.
<code>sample_</code>	variable name, along with <code>region_</code> used to group and facet by default, change <code>group_</code> or <code>facet_</code> to override.
<code>region_</code>	variable name, along with <code>sample_</code> used to group and facet by default, change <code>group_</code> or <code>facet_</code> to override.
<code>group_</code>	group aesthetic keeps lines of <code>geom_path</code> from mis-connecting. <code>auto_grp</code> by default which combines <code>sample_</code> and <code>region_</code> . probably shouldn't change.
<code>line_alpha</code>	alpha value for lines. default is 1.
<code>facet_</code>	facetting divides up plots. <code>auto_facet</code> by default which combines <code>sample_</code> and <code>region_</code> . if overriding <code>facet_method</code> with <code>facet_grid</code> , make sure to include ~ between two variables, ie. "a~b", ".~b", "a~."
<code>facet_method</code>	ggplot2 facetting method or wrapper for same, <code>facet_wrap</code> by default.
<code>spline_n</code>	if not NULL, <code>applySpline</code> will be called with <code>n = spline_n</code> . default is NULL.
<code>return_data</code>	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

### Value

ggplot of signal potentially facetted by region and sample

### Examples

```

bw_gr = CTCF_in_10a_profiles_gr
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)), facet_ = "sample")
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)),
  facet_ = "sample~.",
  facet_method = facet_grid)
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)),
  facet_ = paste("sample", "~", "id"), facet_method = facet_grid)
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)))
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)), facet_ = "id")
ssvSignalLineplot(subset(bw_gr, bw_gr$id %in% seq_len(3)),
  facet_ = "id", spline_n = 10)

```



---

ssvSignalLineplotAgg *aggregate line signals in a single line plot*

---

## Description

aggregate line signals in a single line plot

## Usage

```
ssvSignalLineplotAgg(  
  bw_data,  
  x_ = "x",  
  y_ = "y",  
  sample_ = "sample",  
  color_ = sample_,  
  group_ = sample_,  
  agg_fun = mean,  
  spline_n = NULL,  
  return_data = FALSE  
)
```

## Arguments

bw_data	a GRanges or data.table of bigwig signal. As returned from <a href="#">ssvFetchBam</a> and <a href="#">ssvFetchBigwig</a>
x_	variable name mapped to x aesthetic, x by default.
y_	variable name mapped to y aesthetic, y by default.
sample_	variable name, along with region_ used to group by default,
color_	variable name mapped to color aesthetic, sample_ by default. change group_ to override.
group_	group aesthetic keeps lines of geom_path from mis-connecting. Most useful if you need to supply a variable to later facet upon. Defaults to value of sample_.
agg_fun	the aggregation function to apply by sample_ and x_, default is mean
spline_n	if not NULL, applySpline will be called with n = spline_n. default is NULL.
return_data	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

## Value

ggplot of signal aggregated with agg\_fun() by sample.

**Examples**

```

bw_gr = CTCF_in_10a_profiles_gr
ssvSignalLineplotAgg(bw_gr) +
  labs(title = "agg regions by sample.")
ssvSignalLineplotAgg(CTCF_in_10a_profiles_gr, spline_n = 10) +
  labs(title = "agg regions by sample, with spline smoothing.")
ssvSignalLineplotAgg(subset(bw_gr, bw_gr$id %in% seq_len(10)),
  sample_ = "id", color_ = "id") +
  labs(title = "agg samples by region id (weird)")
ssvSignalLineplotAgg(subset(bw_gr, bw_gr$id %in% seq_len(10)), sample_ = "id",
  color_ = "id", spline_n = 10) +
  labs(title = "agg samples by region id (weird), with spline smoothing")

```

---

`ssvSignalScatterplot` *maps signal from 2 sample profiles to the x and y axis. axes are standard or "volcano" min XY vs fold-change Y/X*

---

**Description**

maps signal from 2 sample profiles to the x and y axis. axes are standard or "volcano" min XY vs fold-change Y/X

**Usage**

```

ssvSignalScatterplot(
  bw_data,
  x_name,
  y_name,
  color_table = NULL,
  value_variable = "y",
  xy_variable = "sample",
  value_function = max,
  by_ = "id",
  plot_type = c("standard", "volcano")[1],
  show_help = FALSE,
  fixed_coords = TRUE,
  return_data = FALSE
)

```

**Arguments**

<code>bw_data</code>	a GRanges or data.table of bigwig signal. As returned from <a href="#">ssvFetchBam</a> and <a href="#">ssvFetchBigwig</a>
<code>x_name</code>	sample name to map to x-axis, must be stored in variable specified in <code>xy_variable</code>
<code>y_name</code>	sample name to map to y-axis, must be stored in variable specified in <code>xy_variable</code>

color_table	data.frame with 2 columns, one of which must be named "group" and gets mapped to color. The other column must be the same as by_ parameter and is used for merging.
value_variable	variable name that stores numeric values for plotting, default is "y"
xy_variable	variable name that stores sample, must contain entires for x_name and y_name
value_function	a function to apply to value_variable in all combintations of by_ per x_name and y_name
by_	variables that store individual measurement ids
plot_type	standard or volcano, default is "standard"
show_help	if TRUE overlay labels to aid plot interpretation, default is FALSE
fixed_coords	if TRUE coordinate system is 1:1 ratio, default is TRUE
return_data	logical. If TRUE, return value is no longer ggplot and is instead the data used to generate that plot. Default is FALSE.

**Value**

ggplot of points comparing signal from 2 samples

**Examples**

```

ssvSignalScatterplot(CTCF_in_10a_profiles_gr,
  x_name = "MCF10A_CTCF", y_name = "MCF10AT1_CTCF")
ssvSignalScatterplot(CTCF_in_10a_profiles_gr,
  x_name = "MCF10A_CTCF", y_name = "MCF10CA1_CTCF")

ssvSignalScatterplot(CTCF_in_10a_profiles_gr,
  x_name = "MCF10A_CTCF", y_name = "MCF10AT1_CTCF",
  value_function = median) + labs(title = "median FE in regions")

ssvSignalScatterplot(CTCF_in_10a_profiles_gr,
  x_name = "MCF10A_CTCF", y_name = "MCF10AT1_CTCF",
  plot_type = "volcano")

ssvSignalScatterplot(CTCF_in_10a_profiles_gr,
  x_name = "MCF10A_CTCF", y_name = "MCF10AT1_CTCF",
  plot_type = "volcano", show_help = TRUE)

```

---

ssv\_mclapply

*ssv\_mclapply*


---

**Description**

ssv\_mclapply

**Usage**

```
ssv_mclapply(X, FUN, mc.cores = getOption("mc.cores", 1), ...)
```

**Arguments**

X	For pbsapply and pblapply, a vector (atomic or list) or an expressions vector (other objects including classed objects will be coerced by as.list.) For pbapply an array, including a matrix. For pbtapply an R object for which a split method exists. Typically vector-like, allowing subsetting with "[".
FUN	The function to be applied to each element of X: see apply, sapply, and lapply. In the case of functions like +, ' function name must be backquoted or quoted. If FUN is NULL, pbtapply returns a vector which can be used to subscript the multi-way array pbtapply normally produces.
mc.cores	Number of cores to use for pbmclapply. Defaults to option mc.cores.
...	passed to pbapply::pbapply or pbmclapply::pbmclapply

**Value**

result of either pblapply or pbmclapply

---

test_peaks	<i>4 random peaks for single-end data and 4 control regions 30kb downstream from each peak.</i>
------------	-------------------------------------------------------------------------------------------------

---

**Description**

matches `system.file("extdata/test_peaks.bam", package = "seqsetvis")`

**Format**

GRanges length 8

**Details**

this is included only for testing `ssvFetchBam` functions.

---

viewGRangesWinSample_dt	<i>get a windowed sampling of score_gr</i>
-------------------------	--------------------------------------------

---

**Description**

This method is appropriate when all GRanges in `qgr` are identical width and when it is practical to use a `window_size` smaller than features in genomic signal. For instance, when retrieving signal around peaks or promoters this method maintains a fixed genomic scale across regions. This allows meaningful comparison of peak widths can be made.

**Usage**

```
viewGRangesWinSample_dt(
  score_gr,
  qgr,
  window_size,
  attrib_var = "score",
  fill_value = 0,
  anchor = c("center", "center_unstranded", "left", "left_unstranded")[1]
)
```

**Arguments**

score_gr	GRanges with a "score" metadata column.
qgr	regions to view by window.
window_size	qgr will be represented by value from score_gr every window_size bp.
attrib_var	character name of attribute to pull data from. Default is "score", compatible with bigWigs or bam coverage.
fill_value	numeric or character value to use where queried regions are empty. Default is 0 and appropriate for both calculated coverage and bedgraph/bigwig like files. Will automatically switch to "MISSING" if data is guessed to be qualitative.
anchor	character. controls how x value is derived from position for each region in qgr. 0 may be the left side or center. If not unstranded, x coordinates are flipped for (-) strand. One of c("center", "center_unstranded", "left", "left_unstranded"). Default is "center".

**Details**

Summarizes score\_gr by grabbing value of "score" every window\_size bp. Columns in output data.table are: standard GRanges columns: seqnames, start, end, width, strand id - matched to names(score\_gr). if names(score\_gr) is missing, added as 1:length(score\_gr). y - value of score from score\_gr. x - relative bp position.

**Value**

data.table that is GRanges compatible

**Examples**

```
bam_file = system.file("extdata/test.bam",
  package = "seqsetvis")
qgr = CTCF_in_10a_overlaps_gr[seq_len(5)]
qgr = GenomicRanges::resize(qgr, width = 500, fix = "center")
bam_gr = seqsetvis::fetchBam(bam_file, qgr)
bam_dt = viewGRangesWinSample_dt(bam_gr, qgr, 50)

if(Sys.info()['sysname'] != "Windows"){
  bw_file = system.file("extdata/MCF10A_CTCF_FE_random100.bw",
    package = "seqsetvis")
}
```

```

    bw_gr = rtracklayer::import.bw(bw_file, which = qgr)
    bw_dt = viewGRangesWinSample_dt(bw_gr, qgr, 50)
}

```

---

viewGRangesWinSummary\_dt

*Summarizes signal in bins. The same number of bins per region in qgr is used and widths can vary in qgr; in contrast to [viewGRangesWinSample\\_dt](#) where width must be constant across regions.*

---

### Description

This function is most appropriate where features are expected to vary greatly in size and feature boundaries are important, ie. gene bodies, enhancers or TADs.

### Usage

```

viewGRangesWinSummary_dt(
  score_gr,
  qgr,
  n_tiles = 100,
  attrib_var = "score",
  attrib_type = NULL,
  fill_value = 0,
  anchor = c("center", "center_unstranded", "left", "left_unstranded")[1],
  summary_FUN = stats::weighted.mean
)

```

### Arguments

score_gr	GRanges with a "score" metadata column.
qgr	regions to view by window.
n_tiles	numeric >= 1, the number of tiles to use for every region in qgr.
attrib_var	character name of attribute to pull data from. Default is "score", compatible with bigWigs or bam coverage.
attrib_type	one of NULL, qualitative or quantitative. If NULL will attempt to guess by casting attrib_var attribute to character or factor. Default is NULL.
fill_value	numeric or character value to use where queried regions are empty. Default is 0 and appropriate for both calculated coverage and bedgraph/bigwig like files. Will automatically switch to "MISSING" if data is guessed to be qualitative.
anchor	character. controls how x value is derived from position for each region in qgr. 0 may be the left side or center. If not unstranded, x coordinates are flipped for (-) strand. One of c("center", "center_unstranded", "left", "left_unstranded"). Default is "center".

summary\_FUN function. used to aggregate score by tile. must accept x=score and w=width numeric vectors as only arguments. default is weighted.mean. limma::weighted.median is a good alternative.

### Details

Columns in output data.table are: standard GRanges columns: seqnames, start, end, width, strand id - matched to names(score\_gr). if names(score\_gr) is missing, added as seq\_along(score\_gr). y - value of score from score\_gr x - relative bp position

### Value

data.table that is GRanges compatible

### Examples

```
bam_file = system.file("extdata/test.bam",
  package = "seqsetvis")
qgr = CTCF_in_10a_overlaps_gr[1:5]
# unlike viewGRangesWinSample_dt, width is not fixed
# qgr = GenomicRanges::resize(qgr, width = 500, fix = "center")
bam_gr = seqsetvis::fetchBam(bam_file, qgr)
bam_dt = viewGRangesWinSummary_dt(bam_gr, qgr, 50)

if(Sys.info()['sysname'] != "Windows"){
  bw_file = system.file("extdata/MCF10A_CTCF_FE_random100.bw",
    package = "seqsetvis")
  bw_gr = rtracklayer::import.bw(bw_file, which = qgr)
  bw_dt = viewGRangesWinSummary_dt(bw_gr, qgr, 50)
}
```

---

within\_clust\_sort      *within\_clust\_sort*

---

### Description

Without modifying cluster assignments, modify the order of rows within each cluster based on within\_order\_strategy.

### Usage

```
within_clust_sort(
  clust_dt,
  row_ = "id",
  column_ = "x",
  fill_ = "y",
  facet_ = "sample",
  cluster_ = "cluster_id",
  within_order_strategy = c("hclust", "sort", "left", "right")[2],
```

```

    clustering_col_min = -Inf,
    clustering_col_max = Inf,
    dcast_fill = NA
  )

```

### Arguments

<code>clust_dt</code>	data.table output from <a href="#">ssvSignalClustering</a>
<code>row_</code>	variable name mapped to row, likely id or gene name for ngs data. Default is "id" and works with <code>ssvFetch*</code> output.
<code>column_</code>	variable mapped to column, likely bp position for ngs data. Default is "x" and works with <code>ssvFetch*</code> output.
<code>fill_</code>	numeric variable to map to fill. Default is "y" and works with <code>ssvFetch*</code> output.
<code>facet_</code>	variable name to facet horizontally by. Default is "sample" and works with <code>ssvFetch*</code> output. Set to "" if data is not faceted.
<code>cluster_</code>	variable name to use for cluster info. Default is "cluster_id".
<code>within_order_strategy</code>	one of "hclust", "sort", "right", "left", "reverse". If "hclust", hierarchical clustering will be used. If "sort", a simple decreasing sort of <code>rosSums</code> . If "left", will attempt to put high signal on left ("right" is opposite). If "reverse" reverses existing order (should only be used after meaningful order imposed).
<code>clustering_col_min</code>	numeric minimum for col range considered when clustering, default in -Inf
<code>clustering_col_max</code>	numeric maximum for col range considered when clustering, default in Inf
<code>dcast_fill</code>	value to supply to <code>dcast</code> fill argument. default is NA.

### Details

This is particularly useful when you want to sort within each cluster by a different variable from cluster assignment. Also if you've imported cluster assignments but want to sort within each for the new data for a prettier heatmap.

TODO refactor shared code with `clusteringKmeansNestedHclust`

### Value

data.table matching input `clust_dt` save for the reassignment of levels of `row_` variable.

### Examples

```

#clustering by relative value per region does a good job highlighting changes
#however, when then plotting raw values the order within clusters is not smooth
#this is a good situation to apply a separate sort within clusters.
prof_dt = CTCF_in_10a_profiles_dt
prof_dt = append_ynorm(prof_dt)
prof_dt[, y_relative := y_norm / max(y_norm), list(id)]

```



```
clust_dt = ssvSignalClustering(prof_dt, fill_ = "y_relative")
clust_dt.sort = within_clust_sort(clust_dt)

cowplot::plot_grid(
  ssvSignalHeatmap(clust_dt) + labs(title = "clustered by relative, sorted by relative"),
  ssvSignalHeatmap(clust_dt.sort) + labs(title = "clustered by relative, sorted by raw value")
)
```

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