

# Package ‘DEScan2’

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**License** Artistic-2.0

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|                |                       |
|----------------|-----------------------|
| binnedCoverage | <i>binnedCoverage</i> |
|----------------|-----------------------|

---

## Description

this function computes the coverage over a binned chromosome, starting from a per base computed coverage.

## Usage

```
binnedCoverage(
  bins,
  numvar,
  mcolname,
  covMethod = c("max", "mean", "sum", "min"),
```

```
    roundingMethod = c("none", "floor", "ceiling", "round")
  )
```

### Arguments

|                             |                                                                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>bins</code>           | a GRanges object representing a chromosome binned.                                                                                                                  |
| <code>numvar</code>         | an RleList representing the per base coverage over the chr.                                                                                                         |
| <code>mcolname</code>       | the name of column where the sum have to be stored.                                                                                                                 |
| <code>covMethod</code>      | a method to apply for the computing of the coverate it can be one of "max", "mean", "sum", "min". ("max" is default)                                                |
| <code>roundingMethod</code> | a method to apply to round the computations it can be one of "none", "floor", "ceiling", "round". It's useful only when using covMethod="mean". ("none" is default) |

### Value

the bins GRanges with the mcolname attached

### Examples

```
## dividing one chromosome in bins of 50 bp each
seqinfo <- Seqinfo::Seqinfo(genome="mm9")
bins <- GenomicRanges::tileGenome(
  seqlengths=Seqinfo::seqlengths(seqinfo)[1],
  tilewidth=50,
  cut.last.tile.in.chrom=TRUE)
gr <- GenomicRanges::GRanges(seqnames = S4Vectors::Rle("chr1", 100),
  ranges=IRanges::IRanges(start = seq(from=10, to=1000, by=10),
    end=seq(from=20, to=1010, by = 10)))
cov <- GenomicRanges::coverage(x=gr)
(binnedMaxCovGR <- binnedCoverage(bins, cov, "binned_cov"))
(binnedMeanCovGR <- binnedCoverage(bins, cov, "binned_cov",
  covMethod="mean", roundingMethod="floor"))
(binnedSumCovGR <- binnedCoverage(bins, cov, "binned_cov", covMethod="sum"))
```

---

binnedCovOnly

*binnedCovOnly*


---

### Description

it's useful just to coerce the bin coverage to an Rle object

### Usage

```
binnedCovOnly(bins, numvar, mcolname)
```

### Arguments

|                       |                                                            |
|-----------------------|------------------------------------------------------------|
| <code>bins</code>     | a GRanges object representing a chromosome binned          |
| <code>numvar</code>   | an RleList representing the per base coverage over the chr |
| <code>mcolname</code> | the name of column where the sum have to be stored         |

**Value**

an Rle within the per bin computed coverage

---

binToChrCoordMatRowNames

*binToChrCoordMatRowNames*

---

**Description**

computes the starting range of the bins for the binMatrix, taking in input the length of the chromosome of the matrix.

**Usage**

```
binToChrCoordMatRowNames(binMatrix, chrLength, binWidth = 50)
```

**Arguments**

|           |                                                |
|-----------|------------------------------------------------|
| binMatrix | a matrix where each row represents a bin.      |
| chrLength | the length of the chromosome of the binMatrix. |
| binWidth  | the width of the bin.                          |

**Value**

the binMatrix with start range as rownames.

---

computeCoverageMovingWindowOnChr

*computeCoverageMovingWindowOnChr*

---

**Description**

computes the coverage on a chromosome with a set of moving windows of dimensions minWinWidth:maxWinWidth

**Usage**

```
computeCoverageMovingWindowOnChr(
  chrBedGRanges,
  minWinWidth = 50,
  maxWinWidth = 1000,
  binWidth = 50,
  verbose = TRUE
)
```

**Arguments**

|               |                                                         |
|---------------|---------------------------------------------------------|
| chrBedGRanges | a GRanges to compute the coverage                       |
| minWinWidth   | the minimum width of the window to use for the coverage |
| maxWinWidth   | the maximum width of the window to use for the coverage |
| binWidth      | the dimension of the bin in base number                 |

**Value**

RleList where each element is a window within the Rle of its coverage

---

|                    |                           |
|--------------------|---------------------------|
| computeLambdaOnChr | <i>computeLambdaOnChr</i> |
|--------------------|---------------------------|

---

**Description**

computes the lambdas on a chromosome for the winVector windows and other two windows (min/maxCompWinWidth) to compare with

**Usage**

```
computeLambdaOnChr(
  chrGRanges,
  winVector = seq_len(20),
  minChrRleWComp,
  minCompWinWidth = 5000,
  maxChrRleWComp,
  maxCompWinWidth = 10000,
  verbose = TRUE
)
```

**Arguments**

|                 |                                                                           |
|-----------------|---------------------------------------------------------------------------|
| chrGRanges      | the GRanges representing the reads of the chromosome.                     |
| winVector       | the of width of the windows used to compute the coverage.                 |
| minChrRleWComp  | and Rle object within coverage of window of width minCompWinWidth.        |
| minCompWinWidth | the width of the window used for the coverage of minChrRleWComp in bases. |
| maxChrRleWComp  | and Rle object within coverage of window of width minCompWinWidth.        |
| maxCompWinWidth | the width of the window used for the coverage of maxChrRleWComp in bases. |
| verbose         | verbose flag.                                                             |
| binSize         | the size of the bin in bases.                                             |

**Value**

an RleList where each element is a window of winVector, within an Rle representing the lambda computed for that window.

---

computeZ

*computeZ*


---

### Description

Computes Z-Scores returning the z matrix.

### Usage

```
computeZ(
  lambdaChrRleList,
  runWinRleList,
  chrLength,
  minCount = 0.1,
  binSize = 50,
  verbose = FALSE
)
```

### Arguments

|                  |                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| lambdaChrRleList | an RleList of lambda values computed by computeLambdaOnChr function each element of the list is an Rle representing the lambda for the moving window in the list position.                    |
| runWinRleList    | an RleList of coverage values computed. by computeCoverageMovingWindowOnChr function each element of the list is an Rle representing the coverage for the moving window in the list position. |
| chrLength        | the length of the chr in analysis.                                                                                                                                                            |
| minCount         | A small constant (usually no larger than one) to be added to the counts prior to the log transformation to avoid problems with log(0).                                                        |
| binSize          | the size of the bin.                                                                                                                                                                          |
| verbose          | verbose output.                                                                                                                                                                               |

### Value

z a matrix of z scores for each window (column) and bin (row). where the rownames represent the starting base of each bin.

---

constructBedRanges

*constructBedRanges*


---

### Description

Constructs a GRanges object from a bam/bed/bed.zip file in a consistent way.

**Usage**

```
constructBedRanges(
  filename,
  filetype = c("bam", "bed", "bed.zip", "narrow", "broad"),
  genomeName = NULL,
  onlyStdChrs = FALSE,
  arePeaks = FALSE,
  verbose = FALSE
)
```

**Arguments**

|             |                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| filename    | the complete file path of a bam?bed file.                                                                                                                                             |
| filetype    | the file type bam/bed/bed.zip/narrow/broad.                                                                                                                                           |
| genomeName  | the name of the genome used to map the reads (i.e. "mm9"). N.B. if NOT NULL the GRanges Seqinfo will be forced to genomeName Seqinfo (needs Internet access, but strongly suggested!) |
| onlyStdChrs | flag to keep only standard chromosome.                                                                                                                                                |
| arePeaks    | flag indicating if the file contains peaks.                                                                                                                                           |
| verbose     | flag to obtain verbose output.                                                                                                                                                        |

**Value**

a GRanges object.

**Examples**

```
files <- list.files(system.file("extdata/bam/", package="DEScan2"),
  pattern="bam$", full.names=TRUE)
bgr <- constructBedRanges(files[1], filetype="bam", genomeName="mm9",
  onlyStdChrs=TRUE)
bgr
```

---

|                   |                          |
|-------------------|--------------------------|
| countFinalRegions | <i>countFinalRegions</i> |
|-------------------|--------------------------|

---

**Description**

count reads falling within the final regions.

**Usage**

```
countFinalRegions(
  regionsGRanges,
  readsFilePath = NULL,
  fileType = c("bam", "bed"),
  minCarriers = 2,
  genomeName = NULL,
  onlyStdChrs = FALSE,
  carrierscolname = "k-carriers",
```

```

    ignStrandSO = TRUE,
    modeSO = "Union",
    saveFlag = FALSE,
    savePath = "finalRegions",
    verbose = TRUE
  )

```

## Arguments

|                              |                                                                                                                                                           |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>regionsGRanges</code>  | a GRanges objects representing the peaks to compute the coverage, with a "k-carriers" mcols. (typically generated by <code>finalRegions</code> function). |
| <code>readsFilePath</code>   | the filepath of bam or bed files necessary to compute the coverage.                                                                                       |
| <code>fileType</code>        | the file type of the input files.                                                                                                                         |
| <code>minCarriers</code>     | minimum number of carriers (samples).                                                                                                                     |
| <code>genomeName</code>      | code name of the genome of reads files (i.e. "mm9").                                                                                                      |
| <code>onlyStdChrs</code>     | a flag indicating if to keep only the standard chromosomes                                                                                                |
| <code>carrierscolname</code> | character describing the name of the column within the carriers number (default is "k-carriers").                                                         |
| <code>ignStrandSO</code>     | a flag indicating if to ignore the reads strand. (see <code>GenomicAlignments::summarizeOverlaps</code> ).                                                |
| <code>modeSO</code>          | the mode to use, default is "Union". (see <code>GenomicAlignments::summarizeOverlaps</code> ).                                                            |
| <code>saveFlag</code>        | a flag indicating if to save the results.                                                                                                                 |
| <code>savePath</code>        | the path where to store the results.                                                                                                                      |
| <code>verbose</code>         | verbose output.                                                                                                                                           |

## Value

A `SummarizedExperiment` object containing as assays the read counts matrix with regions as rows and samples as columns, and as `rowRanges` the `GRanges` object representing the peaks used as rows in the matrix.

## Examples

```

filename <- system.file("extdata/regions/regions.rds", package="DEScan2")
regionsGR <- readRDS(file=filename)
reads.path <- system.file("extdata/bam", package="DEScan2")
finalRegionsSE <- countFinalRegions(regionsGRanges=regionsGR,
  readsFilePath=reads.path, fileType="bam", minCarriers=1,
  genomeName="mm9", onlyStdChrs=TRUE, ignStrandSO=TRUE, saveFlag=FALSE,
  verbose=TRUE)
library("SummarizedExperiment")
assay(finalRegionsSE) ## matrix of counts
rowRanges(finalRegionsSE) ## the GRanges of the input regions

```



---

|               |                      |
|---------------|----------------------|
| createGranges | <i>createGranges</i> |
|---------------|----------------------|

---

**Description**

a simplified wrapper function to create a GRanges object.

**Usage**

```
createGranges(chrSeqInfo, starts, widths, mcolname = NULL, mcolvalues = NULL)
```

**Arguments**

|            |                                    |
|------------|------------------------------------|
| chrSeqInfo | a seqinfo object.                  |
| starts     | the start ranges.                  |
| widths     | the width of each range.           |
| mcolname   | the name for the mcol attribute.   |
| mcolvalues | the values for the mcol attribute. |

**Value**

a GRanges object.

**Examples**

```
chrSeqInfo <- Seqinfo::Seqinfo(genome="mm9")["chr1"]
starts=sample(seq_len(100), 10)
widths=starts+10;
mcolname <- "z-score";
mcolvalues <- sample(seq_len(100), 10)
chrGR <- createGranges(chrSeqInfo=chrSeqInfo, starts=starts, widths=widths,
                      mcolname=mcolname, mcolvalues=mcolvalues)
```

---

|                         |                                |
|-------------------------|--------------------------------|
| cutGRangesPerChromosome | <i>cutGRangesPerChromosome</i> |
|-------------------------|--------------------------------|

---

**Description**

takes in input a GRanges object, producing a LIST of GRanges, one for each chromosome.

**Usage**

```
cutGRangesPerChromosome(GRanges)
```

**Arguments**

|         |                   |
|---------|-------------------|
| GRanges | a GRanges object. |
|---------|-------------------|

**Value**

a named list of GRanges, one for each chromosome.

**Examples**

```
library("GenomicRanges")
gr <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
(grchrlist <- cutGRangesPerChromosome(gr))
```

---

c\_get\_disjoint\_max\_win

*c\_get\_disjoint\_max\_win*

---

**Description**

just a wrapper for the C function. Useful to modify indexes and colnames.

**Usage**

```
c_get_disjoint_max_win(
  z0,
  sigwin = 10,
  nmax = 9999999,
  zthresh = 10,
  verbose = FALSE
)
```

**Arguments**

|         |                                               |
|---------|-----------------------------------------------|
| z0      | the z matrix.                                 |
| sigwin  | the sigwin.                                   |
| nmax    | the nmax.                                     |
| zthresh | peaks lower than this value will not be kept. |
| verbose | verbose flag.                                 |

**Value**

a matrix

DEScan2

*DEScan2***Description**

integrated peak and differential caller, specifically designed for broad epigenomic signals.

**Author(s)**

Dario Righelli

---

divideEachSampleByChromosomes

*divideEachSampleByChromosomes*

---

**Description**

taken in input a grangeslist of samples, generate a list of samples where each element has a GRanges-List each element of the GRangesList represents a single chromosome.

**Usage**

```
divideEachSampleByChromosomes(samplesGRangesList)
```

**Arguments**

`samplesGRangesList`  
a GRangesList of samples.

**Value**

list of samples where each element is a list of chromosomes and each of these elements is a GRanges.

**Examples**

```
library("GenomicRanges")
gr1 <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
gr2 <- GRanges(
  seqnames=Rle(c("chr1", "chr4", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr4=12, chr3=13))
sgr1 <- GRangesList(gr1, gr2)
names(sgr1) <- c("samp1", "samp2")
(sampChrGr1 <- divideEachSampleByChromosomes(sgr1))
```

---

|             |                    |
|-------------|--------------------|
| evenRunMean | <i>evenRunMean</i> |
|-------------|--------------------|

---

**Description**

this function computes a running mean over *x* with a window width *k* (modified from *S4Vectors* package to work on even *k*, see *evenRunSum*).

**Usage**

```
evenRunMean(x, k, endrule = c("drop", "constant"), na.rm = FALSE)
```

**Arguments**

|                |                                                      |
|----------------|------------------------------------------------------|
| <i>x</i>       | an Rle object, typically a coverage object.          |
| <i>k</i>       | window dimension for the running sum over <i>x</i> . |
| <i>endrule</i> | refer to <i>S4Vectors::runMean</i> .                 |
| <i>na.rm</i>   | refer to <i>S4Vectors::runMean</i> .                 |

**Value**

an Rle within the running mean over *x* with a win of length *k*.

---

|            |                   |
|------------|-------------------|
| evenRunSum | <i>evenRunSum</i> |
|------------|-------------------|

---

**Description**

this function computes a running sum over *x* with a window width *k* (modified from *S4Vectors* package to work on even *k*, in such a case it adds a length at the end of the output Rle).

**Usage**

```
evenRunSum(x, k, endrule = c("drop", "constant"), na.rm = FALSE)
```

**Arguments**

|                |                                                      |
|----------------|------------------------------------------------------|
| <i>x</i>       | an Rle object, typically a coverage object.          |
| <i>k</i>       | window dimension for the running sum over <i>x</i> . |
| <i>endrule</i> | refer to <i>S4Vectors::runSum</i> .                  |
| <i>na.rm</i>   | refer to <i>S4Vectors::runSum</i> .                  |

**Value**

an Rle within the running sum over *x* with a win of length *k*.

---

|              |                     |
|--------------|---------------------|
| finalRegions | <i>finalRegions</i> |
|--------------|---------------------|

---

## Description

Align peaks to form common regions then filter regions for presence in multiple replicates taking in input a GRangesList where each element is a sample of called peaks.

## Usage

```
finalRegions(
  peakSamplesGRangesList,
  zThreshold = 20,
  minCarriers = 2,
  saveFlag = TRUE,
  outputFolder = "overlappedPeaks",
  verbose = FALSE,
  scorecolname = "z-score",
  coverageFlag = FALSE,
  BPPARAM = BiocParallel::bpparam()
)
```

## Arguments

|                        |                                                                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| peakSamplesGRangesList | named GRangesList where each element is a sample of called peaks. A score mcols values is needed for each GRanges. The scorecolname param can be used as reference name for the score. (typically returned by findPeaks function). |
| zThreshold             | a minimum threshold for the z score. All peaks lesser than this value will be ignored.                                                                                                                                             |
| minCarriers            | a threshold of minimum samples (carriers) for overlapped regions.                                                                                                                                                                  |
| saveFlag               | a flag for saving results in a tsv file.                                                                                                                                                                                           |
| outputFolder           | the directory name to store the bed file.                                                                                                                                                                                          |
| verbose                | verbose output.                                                                                                                                                                                                                    |
| scorecolname           | character describing the name of the column within the peaks score.                                                                                                                                                                |
| coverageFlag           | boolean indicating if to compute the scores in a coverage mode (sum of the reads of merged peak) or in a score mode (a normalized score across the merged peaks)                                                                   |
| BPPARAM                | object of class bpparamClass that specifies the back-end to be used for computations. See <a href="#">bpparam</a> for details.                                                                                                     |

## Value

a GRanges of selected overlapping peaks with z-score, n-peaks, k-carriers as mcols object.

**Examples**

```
peak.path <- system.file("extdata/peaks/RData/peaksGRL_all_files.rds",
                          package="DEScan2")
grl <- readRDS(peak.path)
grl

regionsGR <- finalRegions(peakSamplesGRangesList=grl, zThreshold=1,
                           minCarriers=3, saveFlag=FALSE, verbose=TRUE)
```

---

```
findOverlapsOverSamples
```

```
findOverlapsOverSamples
```

---

**Description**

given in input a GRangelist where each element is a sample computes the coverage extending a both direction window of prefixed length.

**Usage**

```
findOverlapsOverSamples(
  samplePeaksGRangelist,
  extendRegions = 200,
  minOverlap = 0L,
  maxGap = -1L,
  zThresh = 10,
  verbose = FALSE,
  scorecolname = "z-score",
  coverageFlag = FALSE
)
```

**Arguments**

|                       |                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| samplePeaksGRangelist | given a granges list of samples finds the overlapping regions between them.                                                                                      |
| extendRegions         | the number of bases to extend each region at its start and end.                                                                                                  |
| minOverlap            | the minimum overlap each peak needs to have. (see ChipPeakAnno::findOverlapsOfPeaks)                                                                             |
| maxGap                | the maximum gap admissible between the peaks. (see ChipPeakAnno::findOverlapsOfPeaks)                                                                            |
| zThresh               | a threshold value on z-score/scorecolname                                                                                                                        |
| verbose               | verbose flag                                                                                                                                                     |
| scorecolname          | character describing the name of the column within the peaks score.                                                                                              |
| coverageFlag          | boolean indicating if to compute the scores in a coverage mode (sum of the reads of merged peak) or in a score mode (a normalized score across the merged peaks) |

**Value**

a GRanges of peaks overlapped and unique between samples.

**Examples**

```
(peaks.file <- system.file("extdata/peaks/RData/peaksGRL_all_files.rds",
                           package="DEScan2"))
peaksGRLFiles <- readRDS(peaks.file)
(overlPeaks <- findOverlapsOverSamples(peaksGRLFiles))
```

---

|           |                  |
|-----------|------------------|
| findPeaks | <i>findPeaks</i> |
|-----------|------------------|

---

**Description**

This function calls peaks from bed or bam inputs using a variable window scan with a poisson model using the surrounding maxCompWinWidth (10kb) as background.

**Usage**

```
findPeaks(
  files,
  filetype = c("bam", "bed"),
  genomeName = NULL,
  binSize = 50,
  minWin = 50,
  maxWin = 1000,
  zthresh = 10,
  minCount = 0.1,
  minCompWinWidth = 5000,
  maxCompWinWidth = 10000,
  outputFolder = "Peaks",
  save = TRUE,
  force = TRUE,
  verbose = FALSE,
  sigwin = 10,
  onlyStdChrs = TRUE,
  chr = NULL,
  BPPARAM = BiocParallel::bpparam()
)
```

**Arguments**

|            |                                                                                                               |
|------------|---------------------------------------------------------------------------------------------------------------|
| files      | Character vector containing paths of files to be analyzed.                                                    |
| filetype   | Character, either "bam" or "bed" indicating format of input file.                                             |
| genomeName | the code of the genome to use as reference for the input files. (cfr. constructBedRanges function parameters) |
| binSize    | Integer size in bases of the minimum window for scanning, 50 is the default.                                  |
| minWin     | Integer indicating the minimum window size in bases notation.                                                 |
| maxWin     | Integer indicating the maximum window size in bases notation.                                                 |
| zthresh    | Cutoff value for z-scores. Only windows with greater z-scores will be kept, default is 10.                    |

|                 |                                                                                                                                        |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| minCount        | A small constant (usually no larger than one) to be added to the counts prior to the log transformation to avoid problems with log(0). |
| minCompWinWidth | minimum bases width of a comparing window for Z-score.                                                                                 |
| maxCompWinWidth | maximum bases width of a comparing window for Z-score.                                                                                 |
| outputFolder    | A string, Name of the folder to save the Peaks (optional) if the directory doesn't exist, it will be created. (Default is "Peaks")     |
| save            | Boolean, if TRUE files will be saved in a "./Peaks/chr*" directory created (if not already present) in the current working directory.  |
| force           | a boolean flag indicating if to force output overwriting.                                                                              |
| verbose         | if to show additional messages                                                                                                         |
| sigwin          | an integer value used to compute the length of the signal of a peak (default value is 10).                                             |
| onlyStdChrs     | a flag to work only with standard chromosomes. (cfr. constructBedRanges function parameters).                                          |
| chr             | if not NULL, a character like "chr#" indicating the chromosomes to use.                                                                |
| BPPARAM         | object of class bpparamClass that specifies the back-end to be used for computations. See <a href="#">bpparam</a> for details.         |

### Value

A GRangesList where each element is a sample. Each GRanges represents the founded peaks and attached the z-score of the peak as mcols.

### Examples

```
bam.files <- list.files(system.file("extdata/bam", package = "DEScan2"),
                        full.names = TRUE)

peaks <- findPeaks(files=bam.files[1], filetype="bam",
                  genomeName="mm9",
                  binSize=50, minWin=50, maxWin=1000,
                  zthresh=5, minCount=0.1, sigwin=10,
                  minCompWinWidth=5000, maxCompWinWidth=10000,
                  save=FALSE,
                  onlyStdChrs=TRUE,
                  chr=NULL,
                  verbose=FALSE)

head(peaks)
```

---

fromSamplesToChrsGRangesList

*fromSamplesToChrsGRangesList*

---

### Description

converts a GRangesList orgnized per samples to a GRangesList organized per Chromosomes where each element is a GRangesList of samples.



**Usage**

```
fromSamplesToChrsGRangesList(samplesGRangesList)
```

**Arguments**

`samplesGRangesList`  
a GRangesList of samples. Typically generated by `findPeaks` function.

**Value**

A GRangesList of chromosomes where each element is a GRanges list of samples.

**Examples**

```
library("GenomicRanges")
gr1 <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
gr2 <- GRanges(
  seqnames=Rle(c("chr1", "chr4", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr4=12, chr3=13))
sgrl <- GRangesList(gr1, gr2)
names(sgrl) <- c("samp1", "samp2")
(chrGr1SampGr <- fromSamplesToChrsGRangesList(sgrl))
```

---

```
generateDFofSamplesPerChromosomes
```

```
generateDFofSamplesPerChromosomes
```

---

**Description**

generates a dataframe where each row is a sample (1st col) and a string with its chromosomes separated by ";" (2nd col) (useful to `fromSamplesToChromosomesGRangesList` function).

**Usage**

```
generateDFofSamplesPerChromosomes(samplesChrGRList)
```

**Arguments**

`samplesChrGRList`  
a GRangesList of samples each divided by chromosome.

**Value**

a dataframe where each row is a sample (1st col) and a string with its chromosomes separated by ";" (2nd col).

---

```
get_disjoint_max_win    get_disjoint_max_win
```

---

**Description**

find significant z score windows keeping the max value without intersections

**Usage**

```
get_disjoint_max_win(
  z0,
  sigwin = 20,
  nmax = Inf,
  zthresh = -Inf,
  two_sided = FALSE,
  verbose = FALSE
)
```

**Arguments**

|                        |                                                                           |
|------------------------|---------------------------------------------------------------------------|
| <code>z0</code>        | Matrix containing z scores with bins as rows and windows size as columns. |
| <code>sigwin</code>    | Integer indicating how many bins per fragment.                            |
| <code>nmax</code>      | Integer indicating the maximum number of windows to return.               |
| <code>zthresh</code>   | Integer indicating the minimum z-score considered significant.            |
| <code>two_sided</code> | not used argument.                                                        |
| <code>verbose</code>   | verbose flag.                                                             |

**Value**

a matrix of integer containing founded peaks

---

```
giveUniqueNamesToPeaksOverSamples
   giveUniqueNamesToPeaksOverSamples
```

---

**Description**

given a GRangesList of samples assigns unique names to the peaks of each sample.

**Usage**

```
giveUniqueNamesToPeaksOverSamples(samplePeaksGRangelist)
```

**Arguments**

|                                    |                                                      |
|------------------------------------|------------------------------------------------------|
| <code>samplePeaksGRangelist</code> | a GRangesList of peaks, one GRanges for each sample. |
|------------------------------------|------------------------------------------------------|

**Value**

a GRangesList of samples within renamed peaks for each element.

---

initMergedPeaksNames    *initMergedPeaksNames*


---

**Description**

given a GRanges of merged peaks assigns them new names.

**Usage**

```
initMergedPeaksNames(mergedGRanges)
```

**Arguments**

mergedGRanges    A GRanges object. (Typically Generated in findOverlapsOverSamples function )

**Value**

a granges of renamed peaks.

---



---

keepRelevantChrs    *keepRelevantChrs*


---

**Description**

subselect a list of GRanges created with cutGRangesPerChromosome returning only the relevant chromosomes GRanges.

**Usage**

```
keepRelevantChrs(chrGRangesList, chr = NULL)
```

**Arguments**

chrGRangesList    where each element is a chromosome, typically created with cutGRangesPerChromosome.

chr    a character vector of chromosomes names of the form "chr#".

**Value**

the input chrGRangesList with only the relevant chromosomes.

**Examples**

```
library("GenomicRanges")
gr1 <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
gr1c <- cutGRangesPerChromosome(gr1)
(gr1Chr <- keepRelevantChrs(gr1c, c("chr1", "chr3")))
```

---

```
rcpparma_get_disjoint_max_win
```

*rcpparma\_get\_disjoint\_max\_win Computes the disjoint max\_win matrix.*

---

### Description

rcpparma\_get\_disjoint\_max\_win Computes the disjoint max\_win matrix.

### Usage

```
rcpparma_get_disjoint_max_win(
  z0,
  sigwin = 10L,
  zthresh = 10,
  nmax = 9999999L,
  verbose = TRUE
)
```

### Arguments

|         |           |
|---------|-----------|
| z0      | a matrix. |
| sigwin  | sigwin.   |
| zthresh | zthresh.  |
| nmax    | nmax.     |
| verbose | verbose.  |

### Value

a matrix of three columns (bin\_idx, win\_idx, z\_val) idxs in C style.

---

```
readBamAsBed
```

*readBamAsBed*

---

### Description

read a bam file into a bed like format. forcing UCSC format for chromosomes names.

### Usage

```
readBamAsBed(file)
```

### Arguments

|      |                                        |
|------|----------------------------------------|
| file | Character indicating path to bam file. |
|------|----------------------------------------|

### Value

GRanges object.

**Examples**

```
files <- list.files(system.file("extdata/bam", package="DEScan2"),
                    full.names=TRUE)
gr <- readBamAsBed(files[1])
```

readBedFile

*readBedFile***Description**

read a bed file into a GenomicRanges like format. forcing UCSC format for chromosomes names.

**Usage**

```
readBedFile(filename, arePeaks = FALSE)
```

**Arguments**

|          |                                                         |
|----------|---------------------------------------------------------|
| filename | the bed filename.                                       |
| arePeaks | a flag indicating if the the bed file represents peaks. |

**Value**

GRanges object

**Examples**

```
bedFile <- list.files(system.file("extdata/bed", package="DEScan2"),
                      full.names=TRUE)
gr <- readBedFile(bedFile)
```

readFilesAsGRangesList

*readFilesAsGRangesList***Description**

Takes in input the path of bam/bed files to process and stores them in a GRangesList object, named with filePath/filenames. (for lazy people)

**Usage**

```
readFilesAsGRangesList(
  filePath,
  fileType = c("bam", "bed", "bed.zip", "narrow", "broad"),
  genomeName = NULL,
  onlyStdChrs = TRUE,
  arePeaks = TRUE,
  verbose = TRUE
)
```

**Arguments**

|             |                                                                               |
|-------------|-------------------------------------------------------------------------------|
| filePath    | the path of input files.                                                      |
| fileType    | the type of the files (bam/bed/bed.zip/narrow/broad).                         |
| genomeName  | the genome code to associate to the files. (recommended) (i.e. "mm9", "hg17") |
| onlyStdChrs | a flag to keep only standard chromosomes.                                     |
| arePeaks    | a flag indicating if the files contain peaks.                                 |
| verbose     | verbose output flag.                                                          |

**Value**

a GRangesList object

**Examples**

```
files.path <- system.file("extdata/bam", package="DEScan2")
grl <- readFilesAsGRangesList(filePath=files.path, fileType="bam",
                              genomeName="mm9", onlyStdChrs=TRUE,
                              verbose=TRUE)

class(grl)
names(grl)
grl
```

---

|                    |                           |
|--------------------|---------------------------|
| RleListToRleMatrix | <i>RleListToRleMatrix</i> |
|--------------------|---------------------------|

---

**Description**

a wrapper to create a RleMatrix from a RleList object.

**Usage**

```
RleListToRleMatrix(RleList, dimnames = NULL)
```

**Arguments**

|          |                                                               |
|----------|---------------------------------------------------------------|
| RleList  | an RleList object with all elements of the same length.       |
| dimnames | the names for dimensions of RleMatrix (see DelayedArray pkg). |

**Value**

a RleMatrix from DelayedArray package.

**Examples**

```
library("DelayedArray")
lengths <- c(3, 1, 2)
values <- c(15, 5, 20)
el1 <- S4Vectors::Rle(values=values, lengths=lengths)

el2 <- S4Vectors::Rle(values=sort(values), lengths=lengths)

rleList <- IRanges::RleList(el1, el2)
names(rleList) <- c("one", "two")
(rleMat <- RleListToRleMatrix(rleList))
```

---

|                  |                         |
|------------------|-------------------------|
| saveGRangesAsBed | <i>saveGRangesAsBed</i> |
|------------------|-------------------------|

---

**Description**

save a GRanges object as bed file.

**Usage**

```
saveGRangesAsBed(
  GRanges,
  filepath = tempdir(),
  filename = tempfile(),
  force = FALSE,
  verbose = FALSE
)
```

**Arguments**

|          |                                |
|----------|--------------------------------|
| GRanges  | the GRanges object.            |
| filepath | the path to store the files.@  |
| filename | the name to give to the files. |
| force    | force overwriting.             |
| verbose  | verbose output flag.           |

**Value**

none

**Examples**

```
library("GenomicRanges")
gr <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))

saveGRangesAsBed(GRanges=gr, filepath=tempdir(), filename=tempfile(),
  verbose=TRUE)
```

---

|                  |                         |
|------------------|-------------------------|
| saveGRangesAsTsv | <i>saveGRangesAsTsv</i> |
|------------------|-------------------------|

---

## Description

save a GRanges object as tsv file.

## Usage

```
saveGRangesAsTsv(
  GRanges,
  filepath = tempdir(),
  filename = tempfile(),
  col.names = NA,
  row.names = TRUE,
  sep = "\t",
  force = FALSE,
  verbose = FALSE
)
```

## Arguments

|           |                                                                                                                                                                                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GRanges   | the GRanges object.                                                                                                                                                                                                                                                            |
| filepath  | the path to store the files.                                                                                                                                                                                                                                                   |
| filename  | the name to give to the files.                                                                                                                                                                                                                                                 |
| col.names | a logical value indicating whether the column names are to be written in the file, or a character vector indicating the column names, or NA for writing column names for writing a TAB for the column name of the row names, default is NA (see <a href="#">write.table</a> ). |
| row.names | a logical value indicating whether the row names are to be written in the file, or a character vector indicating the row names (see <a href="#">write.table</a> ).                                                                                                             |
| sep       | the column separator character (default is "\t").                                                                                                                                                                                                                              |
| force     | force overwriting.                                                                                                                                                                                                                                                             |
| verbose   | verbose output flag.                                                                                                                                                                                                                                                           |

## Value

none

## Examples

```
gr <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
saveGRangesAsTsv(gr, verbose=TRUE)
```



---

|                 |                                                                                                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| setGRGenomeInfo | <i>setGRGenomeInfo</i> given a genome code (i.e. "mm9", "mm10", "hg19", "hg38") retrieve the SeqInfo of that genome and assigns it to the input GRanges. Finally filters out those Infos not necessary to the GRanges. |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

---

## Description

setGRGenomeInfo given a genome code (i.e. "mm9", "mm10", "hg19", "hg38") retrieve the SeqInfo of that genome and assigns it to the input GRanges. Finally filters out those Infos not necessary to the GRanges.

## Usage

```
setGRGenomeInfo(GRanges, genomeName = NULL, verbose = FALSE)
```

## Arguments

|            |                            |
|------------|----------------------------|
| GRanges    | a GRanges object.          |
| genomeName | a genome code (i.e. "mm9") |
| verbose    | verbose output             |

## Value

a GRanges object with the seqinfo of the genome code

## Examples

```
library("GenomicRanges")
gr <- GRanges(
  seqnames=Rle(c("chr1", "chr2", "chr1", "chr3"), c(1, 3, 2, 4)),
  ranges=IRanges(1:10, end=10),
  strand=Rle(strand(c("-", "+", "*", "+", "-")), c(1, 2, 2, 3, 2)),
  seqlengths=c(chr1=11, chr2=12, chr3=13))
mm9gr <- setGRGenomeInfo(GRanges=gr, genomeName="mm9", verbose=TRUE)
```

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