

Package ‘txcutr’

March 11, 2025

Title Transcriptome CUTteR

Description Various mRNA sequencing library preparation methods generate sequencing reads specifically from the transcript ends. Analyses that focus on quantification of isoform usage from such data can be aided by using truncated versions of transcriptome annotations, both at the alignment or pseudo-alignment stage, as well as in downstream analysis. This package implements some convenience methods for readily generating such truncated annotations and their corresponding sequences.

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License GPL-3

Encoding UTF-8

Depends R (>= 4.1.0)

Imports AnnotationDbi, GenomicFeatures, txdbmaker, IRanges, GenomicRanges, BiocGenerics, Biostrings, S4Vectors, rtracklayer, BiocParallel, stats, methods, utils

Roxygen list(markdown = TRUE)

RoxygenNote 7.3.1

biocViews Alignment, Annotation, RNASeq, Sequencing, Transcriptomics

Suggests RefManageR, BiocStyle, knitr, sessioninfo, rmarkdown, testthat (>= 3.0.0), TxDb.Scerevisiae.UCSC.sacCer3.sgdGene, BSgenome.Scerevisiae.UCSC.sacCer3

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| | |
|-----------------|--|
| .clipTranscript | <i>Clip Transcript to Given Length</i> |
|-----------------|--|

Description

Internal function for operating on individual GRanges, where ranges represent exons in a transcript. This is designed to be used in an *apply function over a GRangesList object.

Usage

```
.clipTranscript(gr, maxTxLength)
```

Arguments

| | |
|-------------|--------------------|
| gr | a GRanges object |
| maxTxLength | a positive integer |

Value

the clipped GRanges object

| | |
|-------------|--|
| .fillReduce | <i>Convert GRanges to Single Range</i> |
|-------------|--|

Description

Convert GRanges to Single Range

Usage

```
.fillReduce(gr, validate = TRUE)
```

Arguments

| | |
|----------|--|
| gr | a GRanges with ranges to be merged. |
| validate | logical determining whether entries should be checked for compatible seqnames and strands. |

Details

The validation assumes seqnames and strand are R1e objects.

Value

GRanges with single interval

.mutateEach,CompressedGRangesList-method
Efficient Metadata Columns Mutation

Description

Efficient Metadata Columns Mutation

Usage

```
## S4 method for signature 'CompressedGRangesList'  
.mutateEach(gr1, ...)
```

Arguments

| | |
|------------------|---|
| <code>gr1</code> | a <code>CompressedGRangesList</code> |
| <code>...</code> | named list of vectors to insert as metadata columns on each element <code>GRanges</code> . Each vector length must match the length of the <code>GRangesList</code> . |

Value

a `CompressedGRangesList` with all element `GRanges` updated with supplied metadata columns

.propagateMap *Propagate Transcript Merge Map*

Description

Propagate Transcript Merge Map

Usage

```
.propagateMap(df, MAXITERS = 1000)
```

Arguments

| | |
|-----------------------|---|
| <code>df</code> | a <code>data.frame</code> with columns <code>tx_in</code> and <code>tx_out</code> |
| <code>MAXITERS</code> | a numeric controlling the maximum number of iterations |

Value

a converged `data.frame`, such that, `tx_out` is not present in any `tx_in`

| | |
|-------------|--------------------------------------|
| exportFASTA | <i>Export Transcriptome as FASTA</i> |
|-------------|--------------------------------------|

Description

Export Transcriptome as FASTA

Usage

```
exportFASTA(txdb, genome, file, ...)
```

Arguments

| | |
|--------|---|
| txdb | a TxDb object representing a transcriptome annotation |
| genome | a BSgenome object from which to extract sequences |
| file | a string for output FASTA file. File names ending in ".gz" will automatically use gzip compression. |
| ... | additional arguments to pass through to writeXStringSet |

Value

The txdb argument is invisibly returned.

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)
library(BSgenome.Scerevisiae.UCSC.sacCer3)

## load annotation and genome
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene
sacCer3 <- BSgenome.Scerevisiae.UCSC.sacCer3

## restrict to 'chrI' transcripts (makes for briefer example runtime)
seqlevels(txdb) <- c("chrI")

## last 500 nts per tx
txdb_w500 <- truncateTxome(txdb)

## export uncompressed
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".fa")
exportFASTA(txdb_w500, sacCer3, outfile)

## export compressed
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".fa.gz")
exportFASTA(txdb_w500, sacCer3, outfile)
```

exportGTF

Export GTF

Description

Exports a TxDb annotation to a GTF file

Usage

```
exportGTF(txdb, file, source = "txcutr")
```

Arguments

| | |
|--------|---|
| txdb | transcriptome to be output |
| file | a string or connection to output GTF file. Automatically recognizes strings ending with ".gz" for zipped output. |
| source | a string to go in the source column |

Value

The txdb argument is invisibly returned.

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)

## load annotation
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene

## restrict to 'chrI' transcripts
seqlevels(txdb) <- c("chrI")

## last 500 nts per tx
txdb_w500 <- truncateTxome(txdb)

## export uncompressed
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".gtf")
exportGTF(txdb_w500, outfile)

## export compressed
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".gtf.gz")
exportGTF(txdb_w500, outfile)
```

| | |
|------------------|---|
| exportMergeTable | <i>Export Merge Table for Transcriptome</i> |
|------------------|---|

Description

Export Merge Table for Transcriptome

Usage

```
exportMergeTable(txdb, file, minDistance = 200L)
```

Arguments

| | |
|-------------|---|
| txdb | a TxDb object representing a transcriptome annotation |
| file | a string or connection to output TSV file. Automatically recognizes strings ending with ".gz" for zipped output. |
| minDistance | the minimum separation to regard overlapping transcripts as unique. |

Value

The txdb argument is invisibly returned.

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)

## load annotation
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene

## restrict to 'chrI' transcripts (makes for briefer example runtime)
seqlevels(txdb) <- c("chrI")

## last 500 nts per tx
txdb_w500 <- truncateTxome(txdb)

## export plain format
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".tsv")
exportMergeTable(txdb_w500, outfile)

## export compressed format
outfile <- tempfile("sacCer3.sgdGene.w500", fileext=".tsv.gz")
exportMergeTable(txdb_w500, outfile)
```

| | |
|--------------------|-----------------------------|
| generateMergeTable | <i>Generate Merge Table</i> |
|--------------------|-----------------------------|

Description

Generate Merge Table

Usage

```
generateMergeTable(txdb, minDistance = 200)

## S4 method for signature 'TxDb'
generateMergeTable(txdb, minDistance = 200L)
```

Arguments

| | |
|-------------|--|
| txdb | an object representing a transcriptome |
| minDistance | the minimum separation to regard overlapping transcripts as unique |

Value

a data.frame with three columns - tx_in the input transcript - tx_out the transcript merged into - gene_out the gene merged into

a data.frame with three columns - tx_in the input transcript - tx_out the transcript merged into - gene_out the gene merged into

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)

## load annotation
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene

## restrict to 'chrI' transcripts
seqlevels(txdb) <- c("chrI")

## last 500 nts per tx
txdb_w500 <- truncateTxome(txdb)
txdb_w500

## last 100 nts per tx
txdb_w100 <- truncateTxome(txdb, maxTxLength=100)
txdb_w100
```

| | |
|---------------|-------------------------------|
| truncateTxome | <i>Truncate Transcriptome</i> |
|---------------|-------------------------------|

Description

Truncate Transcriptome

Usage

```
truncateTxome(txdb, maxTxLength = 500, ...)  
  
## S4 method for signature 'TxDb'  
truncateTxome(txdb, maxTxLength = 500, BPPARAM = bpparam())
```

Arguments

| | |
|-------------|--|
| txdb | a TxDb object |
| maxTxLength | the maximum length of transcripts |
| ... | additional arguments |
| BPPARAM | A BiocParallelParam object specifying whether and how the method should be parallelized. |

Value

a TxDb object
a TxDb object

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)  
  
## load annotation  
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene  
  
## restrict to 'chrI' transcripts  
seqlevels(txdb) <- c("chrI")  
  
## last 500 nts per tx  
txdb_w500 <- truncateTxome(txdb)  
txdb_w500  
  
## last 100 nts per tx  
txdb_w100 <- truncateTxome(txdb, maxTxLength=100)  
txdb_w100
```

| | |
|-------------------|---|
| txdbToGRangesList | <i>Convert TxDb object to GRangesList</i> |
|-------------------|---|

Description

Convert TxDb object to GRangesList

Usage

```
txdbToGRangesList(  
  txdb,  
  geneCols = c("gene_id"),  
  transcriptCols = c("gene_id", "tx_name"),  
  exonCols = c("gene_id", "tx_name", "exon_id", "exon_rank")  
)
```

Arguments

| | |
|----------------|---|
| txdb | a TxDb object |
| geneCols | names of columns to include in the genes ranges |
| transcriptCols | names of columns to include in the transcripts ranges |
| exonCols | names of columns to include in the exons ranges |

Value

a GRangesList object with entries c(genes, transcripts, exons)

Examples

```
library(TxDb.Scerevisiae.UCSC.sacCer3.sgdGene)  
  
## load annotation  
txdb <- TxDb.Scerevisiae.UCSC.sacCer3.sgdGene  
  
grl <- txdbToGRangesList(txdb)  
grl
```

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