

# Package ‘trackViewer’

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**Type** Package

**Title** A bioconductor package with minimalist design for plotting elegant track layers

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**Description**

visualize mapped reads along with annotation as track layers for NGS dataset such as ChIP-seq, RNA-seq, miRNA-seq, DNA-seq.

**License** GPL (>= 2)

**Depends** R (>= 3.1.0), methods, GenomicRanges, grid

**Imports** GenomicAlignments, GenomicFeatures, Gviz, pbapply, Rsamtools, rtracklayer, scales, tools, IRanges

**Suggests** biomaRt, TxDb.Hsapiens.UCSC.hg19.knownGene, RUnit, BiocGenerics, BiocStyle, knitr

**biocViews** Visualization

**VignetteBuilder** knitr

**NeedsCompilation** no

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trackViewer-package    *Minimal designed plotting tool for genomic data*

---

## Description

A package that plot data and annotation information along genomic coordinates in an elegance style. This tool is based on Gviz but want to draw figures in minimal style for publication.

## Details

Package: trackViewer  
 Type: Package  
 Version: 1.0  
 Date: 2013-10-18  
 License: Artistic-2.0

This package is minimal designed to plot figure for publication.

## Author(s)

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## Examples

```
library(TxDb.Hsapiens.UCSC.hg19.knownGene)
trs <- geneModelFromTxdb(TxDb.Hsapiens.UCSC.hg19.knownGene,
  "chr11", 122929275, 122930122, "-")
extdata <- system.file("extdata", package="trackViewer",
  mustWork=TRUE)
```

```

repA <- importScore(paste(extdata, "cpsf160.repA+.wig", sep="/"),
                   paste(extdata, "cpsf160.repA-.wig", sep="/"),
                   format="WIG")
strand(repA@dat) <- "+"
strand(repA@dat2) <- "-"
fox2 <- importScore(paste(extdata, "fox2.bed", sep="/"), format="BED")
dat <- coverageGR(fox2@dat)
fox2@dat <- dat[strand(dat)=="+"]
fox2@dat2 <- dat[strand(dat)=="-"]
gr <- GRanges("chr11", IRanges(122929275, 122930122), strand="-")
vp <- viewTracks(trackList(repA, fox2, trs), gr=gr, autoOptimizeStyle=TRUE)
addGuideLine(c(122929767, 122929969), vp=vp)
addArrowMark(list(x=unit(.5, "npc"),
                  y=unit(.39, "npc")),
             col="blue")

```

---

addArrowMark

*Add arrow mark to the figure at a given position*


---

## Description

A function to add arrow mark for emphasizing peaks

## Usage

```

addArrowMark(pos=grid.locator(), label=NULL, angle=15,
             length=unit(.25, "inches"), col="red", cex=1, quadrant=4,
             type="closed", vp=NULL)

```

## Arguments

pos	A unit object representing the location of arrow mark to be placed at current viewport. Default is the value of grid.locator, which will get the location of the mouse click.
label	A character or expression vector.
angle	A parameter passed into grid::arrow function. The angle of arrow head in degrees (smaller numbers produce narrower, pointier arrows). Essentially describes the width of the arrow head.
length	A parameter passed into grid::arrow function. A unit specifying the length of the arrow head.
col	color of the arrow
cex	Multiplier applied to fontsize
quadrant	the direction of arrow, 1: to bottomleft, 2: to bottomright, 3: to topright, 4: to topleft
type	A parameter passed into grid::arrow function. One of "open" or "closed" indicating whether the arrow head should be a closed triangle.
vp	A Grid viewport object. It must be output of <a href="#">viewTracks</a>

**Value**

NULL

**Author(s)**

Jianhong Ou

**See Also**See Also as [addGuideLine](#), [arrow](#)**Examples**

```
grid.newpage()
addArrowMark(list(x=unit(.5, "npc"),
                  y=unit(.5, "npc")),
              label="label1",
              col="blue")
```

---

addGuideLine	<i>Add guide lines to the tracks</i>
--------------	--------------------------------------

---

**Description**

A function to add lines for emphasizing the positions

**Usage**

```
addGuideLine(guideline, col="gray", lty="dashed", lwd=1, vp=NULL)
```

**Arguments**

guideLine	The genomic coordinates to draw the lines
col	A vector for the line color
lty	A vector for the line type
lwd	A vector for the line width
vp	A Grid viewport object. It must be output of <a href="#">viewTracks</a>

**Value**

NULL

**Author(s)**

Jianhong Ou

**See Also**

See Also as [getCurTrackViewport](#), [addArrowMark](#), [viewTracks](#)

**Examples**

```
vp <- getCurTrackViewport(trackViewerStyle(), 10000, 10200)
addGuideLine(c(10010, 10025, 10150), vp=vp)
```

---

coverageGR	<i>calculate coverage</i>
------------	---------------------------

---

**Description**

calculate coverage for [GRanges](#), [GAlignments](#) or [GAlignmentPairs](#)

**Usage**

```
coverageGR(gr)
```

**Arguments**

`gr` an object of [RGanges](#), [GAlignments](#) or [GAlignmentPairs](#)

**Value**

an object of [GRanges](#)

**Author(s)**

Jianhong Ou

**See Also**

See Also as [coverage](#), [coverage-methods](#)

**Examples**

```
bed <- system.file("extdata", "fox2.bed", package="trackViewer",
                  mustWork=TRUE)
fox2 <- importScore(bed)
fox2@dat <- coverageGR(fox2@dat)
```



---

getCurTrackViewport     *Get current track viewport*

---

**Description**

Get current track viewport for addGuideLine

**Usage**

```
getCurTrackViewport(curViewerStyle, start, end)
```

**Arguments**

curViewerStyle    an object of [trackViewerStyle](#)  
start              start position of current track  
end                end position of current track

**Value**

an object of [viewport](#)

**Author(s)**

Jianhong Ou

**See Also**

See Also as [addGuideLine](#)

**Examples**

```
vp <- getCurTrackViewport(trackViewerStyle(), 10000, 10200)  
addGuideLine(c(10010, 10025, 10150), vp=vp)
```

---

GROperator                     *GRanges operator*

---

**Description**

GRanges operations (add, subtract, multiply, divide)

**Usage**

```
GROperator(A, B, col="score", operator = c("+", "-", "*", "/", "^", "%"))
```

**Arguments**

A	an object of GRanges
B	an object of GRanges
col	colname of A and B to be calculated
operator	operator, "+" means A + B, and so on.

**Value**

an object of GRanges

**Author(s)**

Jianhong Ou

**Examples**

```
gr2 <- GRanges(seqnames=c("chr1", "chr1"),
               ranges=IRanges(c(7,13), width=3),
               strand=c("-", "-"), score=3:4)
gr3 <- GRanges(seqnames=c("chr1", "chr1"),
               ranges=IRanges(c(1, 4), c(3, 9)),
               strand=c("-", "-"), score=c(6L, 2L))
GRoperator(gr2, gr3, col="score", operator="+")
GRoperator(gr2, gr3, col="score", operator="-")
GRoperator(gr2, gr3, col="score", operator="*")
GRoperator(gr2, gr3, col="score", operator="/")
```

---

importBam

*Reading data from a BAM file*


---

**Description**

Read a [track](#) object from a BAM file

**Usage**

```
importBam(file, file2, ranges=GRanges(), pairs=FALSE)
```

**Arguments**

file	The path to the BAM file to read.
file2	The path to the second BAM file to read.
ranges	An object of <a href="#">GRanges</a> to indicate the range to be imported
pairs	logical object to indicate the BAM is paired or not. See <a href="#">readGAlignments</a>

**Value**

a [track](#) object

**Author(s)**

Jianhong Ou

**See Also**

See Also as [importScore](#), [track](#), [viewTracks](#)

**Examples**

```
bamfile <- system.file("extdata", "ex1.bam", package="Rsamtools",
                      mustWork=TRUE)
dat <- importBam(file=bamfile, ranges=GRanges("seq1", IRanges(1, 50), strand="+"))
```

---

importData

*Reading data from a BED or WIG file to RleList*

---

**Description**

Read a [track](#) object from a BED, bedGraph, WIG or BigWig file to RleList

**Usage**

```
importData(files, format=NA, ranges=GRanges())
```

**Arguments**

files	The path to the files to read.
format	The format of import file. Could be BAM, BED, bedGraph, WIG or BigWig
ranges	An object of <a href="#">GRanges</a> to indicate the range to be imported

**Value**

a list of [RleList](#).

**Author(s)**

Jianhong Ou

**Examples**

```

#import a BED file
bedfile <- system.file("tests", "test.bed", package="rtracklayer",
                      mustWork=TRUE)
dat <- importData(files=bedfile, format="BED",
                 ranges=GRanges("chr7", IRanges(127471197, 127474697)))

##import a WIG file
wigfile <- system.file("tests", "step.wig", package = "rtracklayer",
                      mustWork=TRUE)
dat <- importData(files=wigfile, format="WIG",
                 ranges=GRanges("chr19",
                               IRanges(59104701, 59110920)))

##import a BigWig file
if(.Platform$OS.type!="windows"){
  ##this is because we are using rtracklayer::import
  bwfile <- system.file("tests", "test.bw", package = "rtracklayer",
                      mustWork=TRUE)
  dat <- importData(files=bwfile, format="BigWig",
                   ranges=GRanges("chr19", IRanges(1500, 2700)))
}

```

importScore

*Reading data from a BED or WIG file***Description**

Read a [track](#) object from a BED, bedGraph, WIG or BigWig file

**Usage**

```

importScore(file, file2,
            format=c("BED", "bedGraph", "WIG", "BigWig"),
            ranges=GRanges(), ignore.strand=TRUE)

```

**Arguments**

file	The path to the file to read.
file2	The path to the second file to read.
format	The format of import file. Could be BED, bedGraph, WIG or BigWig
ranges	An object of <a href="#">GRanges</a> to indicate the range to be imported
ignore.strand	ignore the strand or not when do filter. default TRUE

**Value**

a [track](#) object

**Author(s)**

Jianhong Ou

**See Also**See Also as [importBam](#), [track](#), [viewTracks](#)**Examples**

```
#import a BED file
bedfile <- system.file("tests", "test.bed", package="rtracklayer",
  mustWork=TRUE)
dat <- importScore(file=bedfile, format="BED",
  ranges=GRanges("chr7", IRanges(127471197, 127474697)))

##import a WIG file
wigfile <- system.file("tests", "step.wig", package = "rtracklayer",
  mustWork=TRUE)
dat <- importScore(file=wigfile, format="WIG")

##import a BigWig file
if(!.Platform$OS.type!="windows"){##this is because we are using rtracklayer::import
  bwfile <- system.file("tests", "test.bw", package = "rtracklayer",
    mustWork=TRUE)
  dat <- importScore(file=bwfile, format="BigWig")
}

##import 2 file
wigfile1 <- system.file("extdata", "cpsf160.repA+.wig", package="trackViewer",
  mustWork=TRUE)
wigfile2 <- system.file("extdata", "cpsf160.repA-.wig", package="trackViewer",
  mustWork=TRUE)
dat <- importScore(wigfile1, wigfile2, format="WIG",
  ranges=GRanges("chr11", IRanges(122817703, 122889073)))
```

---

optimizeStyle

*Optimize the style of plot*

---

**Description**

Automatic optimize the stlye of trackViewer

**Usage**

```
optimizeStyle(trackList, viewerStyle=trackViewerStyle(), theme=NULL)
```

**Arguments**

trackList      An object of [trackList](#)  
viewerStyle    An object of [trackViewerStyle](#)  
theme          A character string. Could be "bw" or "col".

**Value**

a list of a [trackList](#) and a [trackViewerStyle](#)

**Author(s)**

Jianhong Ou

**See Also**

See Also as [viewTracks](#)

**Examples**

```
extdata <- system.file("extdata", package="trackViewer",
                       mustWork=TRUE)
files <- dir(extdata, ".wig")
tracks <- lapply(paste(extdata, files, sep="/"),
                importScore, format="WIG")
re <- optimizeStyle(trackList(tracks))
trackList <- re$tracks
viewerStyle <- re$style
```

---

parse2GRanges

*parse text into GRanges*

---

**Description**

parse text like "chr13:99,443,451-99,848,821:-" into GRanges

**Usage**

```
parse2GRanges(text)
```

**Arguments**

text            character vector like "chr13:99,443,451-99,848,821:-" or "chr13:99,443,451-99,848,821"

**Value**

an object of [GRanges](#)

**Author(s)**

Jianhong Ou

**Examples**

```
parse2GRanges("chr13:99,443,451-99,848,821:-")
```

---

parseWIG

*convert WIG format track to BED format track*

---

**Description**

convert WIG format track to BED format track for a given range

**Usage**

```
parseWIG(trackScore, chrom, from, to)
```

**Arguments**

trackScore	an object of track with WIG format
chrom	sequence name of the chromosome
from	start coordinate
to	end coordinate

**Value**

an object of track

**Author(s)**

Jianhong Ou

**See Also**

[track](#)

**Examples**

```
extdata <- system.file("extdata", package="trackViewer", mustWork=TRUE)
repA <- importScore(file.path(extdata, "cpsf160.repA_-.wig"),
                   file.path(extdata, "cpsf160.repA_+.wig"),
                   format="WIG")
strand(repA$dat) <- "-"
strand(repA$dat2) <- "+"
parseWIG(repA, chrom="chr11", from=122929275, to=122930122)
```

---

plotGRanges	<i>plot GRanges data</i>
-------------	--------------------------

---

### Description

A function to plot GRanges data for given range

### Usage

```
plotGRanges(..., range=GRanges(),
            viewerStyle=trackViewerStyle(),
            autoOptimizeStyle=FALSE,
            newpage=TRUE)
```

### Arguments

...	one or more objects of <a href="#">GRanges</a>
range	an object of <a href="#">GRanges</a>
viewerStyle	an object of <a href="#">trackViewerStyle</a>
autoOptimizeStyle	should use <a href="#">optimizeStyle</a> to optimize style
newpage	should be draw on a new page?

### Value

An object of [viewport](#) for [addGuideLine](#)

### Author(s)

Jianhong Ou

### See Also

See Also as [addGuideLine](#), [addArrowMark](#)

### Examples

```
gr1 <- GRanges("chr1", IRanges(1:50, 51:100))
gr2 <- GRanges("chr1", IRanges(seq(from=10, to=80, by=5),
                               seq(from=20, to=90, by=5)))
vp <- plotGRanges(gr1, gr2, range=GRanges("chr1", IRanges(1, 100)))
addGuideLine(guideLine=c(5, 10, 50, 90), col=2:5, vp=vp)

gr <- GRanges("chr1", IRanges(c(1, 11, 21, 31), width=9),
              score=c(5, 10, 5, 1))
plotGRanges(gr, range=GRanges("chr1", IRanges(1, 50)))
```

---

pos-class	Class "pos"
-----------	-------------

---

**Description**

An object of class "pos" represents a point location

**Objects from the Class**

Objects can be created by calls of the form `new("pos", x, y, unit)`.

**Slots**

x A [numeric](#) value, indicates the x position

y A [numeric](#) value, indicates the y position

unit "character" specifying the units for the corresponding numeric values. See [unit](#)

---

track-class	Class "track"
-------------	---------------

---

**Description**

An object of class "track" represents scores of a given track.

**Usage**

```
## S4 method for signature 'track,character,ANY'
setTrackStyleParam(ts, attr, value)
## S4 method for signature 'track,character,ANY'
setTrackXscaleParam(ts, attr, value)
## S4 method for signature 'track,character,ANY'
setTrackYaxisParam(ts, attr, value)
```

**Arguments**

ts	An object of track.
attr	the name of slot of <a href="#">trackStyle</a> object to be changed.
value	values to be assigned.

**Objects from the Class**

Objects can be created by calls of the form `new("track", dat, dat2, type, format, style, name)`.

**Slots**

**dat** Object of class [GRanges](#) the scores of a given track. It should contain score metadata.

**dat2** Object of class [GRanges](#) the scores of a given track. It should contain score metadata. When **dat2** and **dat** is paired, **dat** will be drawn as positive value where **dat2** will be drawn as negative value ( $-1 * \text{score}$ )

**type** The type of track. It could be 'data' or 'gene'.

**format** The format of the input. It could be "BED", "bedGraph", "WIG", "BigWig" or "BAM"

**style** Object of class [trackStyle](#)

**name** unused yet

**Methods**

**setTrackStyleParam** change the slot values of [trackStyle](#) object for an object of track

**setTrackXscaleParam** change the [xscale](#) slot values for an object of track

**setTrackYaxisParam** change the [yaxisStyle](#) values for an object of track

**\$, \$<-** Get or set the slot of [track](#)

**show** show the details of [track](#)

**See Also**

Please try to use [importScore](#) and [importBam](#) to generate the object.

**Examples**

```
extdata <- system.file("extdata", package="trackViewer",
                      mustWork=TRUE)
fox2 <- importScore(file.path(extdata, "fox2.bed"), format="BED")
setTrackStyleParam(fox2, "color", c("red","green"))
setTrackXscaleParam(fox2, "gp", list(cex=.5))
setTrackYaxisParam(fox2, "gp", list(col="blue"))
fox2$dat <- GRanges(score=numeric(0))
```

---

trackList-class

*List of tracks*

---

**Description**

An extension of List that holds only [track](#) objects.

**constructor**

`trackList(..., heightDist=NA)`: Each tracks in ... becomes an element in the new trackList, in the same order. This is analogous to the list constructor, except every argument in ... must be derived from [track](#). The heightDist is vector or NA to define the height of each track.

**See Also**

[track](#).

---

trackStyle-class	Class "trackStyle"
------------------	--------------------

---

**Description**

An object of class "trackStyle" represents track style.

**Objects from the Class**

Objects can be created by calls of the form `new("trackStyle", tracktype, color, height, marginTop, marginBottom)`

**Slots**

`tracktype` "character" track type, could be peak or cluster. Default is "peak". "cluster" is not supported yet.

`color` "character" track color. If the track has `dat` and `dat2` slot, it should have two values.

`height` "numeric" track height. It should be a value between 0 and 1

`marginTop` "numeric" track top margin

`marginBottom` "numeric" track bottom margin

`xscale` object of [xscale](#), describe the details of x-scale

`yaxis` object of [yaxisStyle](#), describe the details of y-axis

`ylim` "numeric" y-axis range

`ylabpos` "character", ylable position, `ylabpos` should be 'left', 'right', 'topleft', 'bottomleft', 'topright' or 'bottomright'.

`ylablas` "numeric" y lable direction. It should be a integer 0-3. See [par:las](#)

`ylabgp` A "list" object, It will convert to an object of class [gpar](#). This is basically a list of graphical parameter settings of y-label.

---

```
trackViewerStyle-class
      Class "trackViewerStyle"
```

---

### Description

An object of class "trackViewerStyle" represents track viewer style.

### Usage

```
## S4 method for signature 'trackViewerStyle,character,ANY'
setTrackViewerStyleParam(tvs, attr, value)
```

### Arguments

tvs	An object of trackViewerStyle.
attr	the name of slot to be changed.
value	values to be assigned.

### Objects from the Class

Objects can be created by calls of the form `new("trackViewerStyle", margin, xlas,`

xgp

### constructor

`trackViewerStyle(...)`: Each argument in ... becomes an slot in the new trackViewerStyle.

### Slots

`margin` "numeric", specify the bottom, left, top and right margin.  
`xlas` "numeric", label direction of x-axis mark. It should be a integer 0-3. See [par:las](#)  
`xgp` A "list" object, It will convert to an object of class [gpar](#). This is basically a list of graphical parameter settings of x-axis. For y-axis, see [yaxisStyle](#)  
`xaxis` "logical", draw x-axis or not  
`autolas` "logical" automatic determine y label direction  
`flip` "logical" flip the x-axis or not, default FALSE

### Methods

**setTrackViewerStyleParam** change the slot values of an object of trackViewerStyle

### Examples

```
tvs <- trackViewerStyle()
setTrackViewerStyleParam(tvs, "xaxis", TRUE)
```

---

viewTracks                      *plot the tracks*

---

## Description

A function to plot the data for given range

## Usage

```
viewTracks(trackList, chromosome, start, end, strand, gr=GRanges(),
           ignore.strand=TRUE,
           viewerStyle=trackViewerStyle(), autoOptimizeStyle=FALSE,
           newpage=TRUE, operator=NULL)
```

## Arguments

trackList	an object of <a href="#">trackList</a>
chromosome	chromosome
start	start position
end	end position
strand	strand
gr	an object of <a href="#">GRanges</a>
ignore.strand	ignore the strand or not when do filter. default TRUE
viewerStyle	an object of <a href="#">trackViewerStyle</a>
autoOptimizeStyle	should use <a href="#">optimizeStyle</a> to optimize style
newpage	should be draw on a new page?
operator	operator, could be +, -, *, /, ^, %%. "-" means dat - dat2, and so on.

## Value

An object of [viewport](#) for [addGuideLine](#)

## Author(s)

Jianhong Ou

## See Also

See Also as [addGuideLine](#), [addArrowMark](#)

**Examples**

```

extdata <- system.file("extdata", package="trackViewer",
                      mustWork=TRUE)
files <- dir(extdata, "-.wig")
tracks <- lapply(paste(extdata, files, sep="/"),
               importScore, format="WIG")
tracks <- lapply(tracks, function(.ele) {strand(.ele@dat) <- "-"; .ele})
fox2 <- importScore(paste(extdata, "fox2.bed", sep="/"), format="BED")
dat <- coverageGR(fox2@dat)
fox2@dat <- dat[strand(dat)=="+"]
fox2@dat2 <- dat[strand(dat)=="-"]
gr <- GRanges("chr11", IRanges(122929275, 122930122), strand="-")
viewTracks(trackList(tracks, fox2), gr=gr, autoOptimizeStyle=TRUE)

```

---

xscale-class	<i>Class "xscale"</i>
--------------	-----------------------

---

**Description**

An object of class "xscale" represents x-scale style.

**Objects from the Class**

Objects can be created by calls of the form `new("xscale", from, to, label, gp, draw)`.

**Slots**

`from` A [pos](#) class, indicates the start point position of x-scale.

`to` A [pos](#) class, indicates the end point position of x-scale.

`label` "character" the label of x-scale

`gp` A "list" object, It will convert to an object of class [gpar](#). This is basically a list of graphical parameter settings of x-scale.

`draw` A "logical" value indicating whether the x-scale should be draw.

---

yaxisStyle-class	<i>Class "yaxisStyle"</i>
------------------	---------------------------

---

**Description**

An object of class "yaxisStyle" represents y-axis style.

**Objects from the Class**

Objects can be created by calls of the form `new("yaxisStyle", at, label, gp, draw, main)`.

**Slots**

at "numeric" vector of y-value locations for the tick marks

label "logical" value indicating whether to draw the labels on the tick marks.

gp A "list" object, It will convert to an object of class `gpar`. This is basically a list of graphical parameter settings of y-axis.

draw A "logical" value indicating whether the y-axis should be draw.

main A "logical" value indicating whether the y-axis should be draw in left (TRUE) or right (FALSE).

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