Package 'sveval'

February 11, 2020

Title SV evaluation

Version 1.2.2

Description Evaluate SV in a call set against a truth set using overlap-based approaches and sequence comparison for insertions.

Depends R (¿= 3.4.4)

License MIT + file LICENSE

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Imports VariantAnnotation,
GenomicRanges,
IRanges,
magrittr,
dplyr,
rlang,
DelayedArray,
Biostrings,
GenomeInfoDb,
parallel,
testthat,
tidyr,
ggplot2,
shiny,
DiagrammeR,
S4Vectors,
DT,
igraph

R topics documented:

`sveval-package` *SV evaluation*

Description

Evaluate SV in a call set against a truth set using overlap-based approaches and sequence comparison for insertions.

Details

Package:	sveval
Type:	Package
Version:	1.2.2
Date:	2019-09-16
License:	MIT

Author(s)

Jean Monlong <jmonlong@ucsc.edu>

See Also

http://www.github.com/jmonlong/sveval

Examples

```
## Not run:
eval = svevalOl('calls.vcf', 'truth.vcf')
plot_prcurve(eval$curve)

# Comparing multiple methods
eval.1 = svevalOl('calls1.vcf', 'truth.vcf')
```

```
eval.2 = svevalOl('calls2.vcf', 'truth.vcf')
plot_prcurve(list(eval.1$curve, eval.2$curve), labels=c('method1', 'method2'))

## End(Not run)
```

`filterSVs` *Filter SVs for size and regions of interest*

Description

Filter SVs for size and regions of interest

Usage

```
filterSVs(sv.gr, regions.gr = NULL, ol.prop = 0.5, min.size = 0,
  max.size = Inf)
```

Arguments

`sv.gr`	the input SVs (e.g. read from `readSVvcf`)
`regions.gr`	the regions of interest. Ignored if NULL (default).
`ol.prop`	minimum proportion of sv.gr that must overlap regions.gr. Default is 0.5
`min.size`	the minimum SV size to be considered. Default 0.
`max.size`	the maximum SV size to be considered. Default is Inf.

Value

a subset of sv.gr that overlaps regions.gr or in the specified size range.

Author(s)

Jean Monlong

`findNocalls` *Find no-calls variants*

Description

Compare calls with a truth set and identifies which variants from the truth set specifically not called (genotype ./.).

Usage

```
findNocalls(calls.gr, truth.gr, max.ins.dist = 20, min.cov = 0.5,
  min.del.rol = 0.1, ins.seq.comp = FALSE, nb.cores = 1,
  sample.name = NULL, check.inv = FALSE)
```

Arguments

calls.gr	call set. A GRanges or the path to a VCF file.
truth.gr	truth set. A GRanges or the path to a VCF file.
max.ins.dist	maximum distance for insertions to be clustered. Default is 20.
min.cov	the minimum coverage to be considered a match. Default is 0.5
min.del.rol	minimum reciprocal overlap for deletions. Default is 0.1
ins.seq.comp	compare sequence instead of insertion sizes. Default is FALSE.
nb.cores	number of processors to use. Default is 1.
sample.name	the name of the sample to use if VCF files given as input. If NULL (default), use first sample.
check.inv	should the sequence of MNV be compared to identify inversions.

Details

Same overlapping strategy as in `svevalOl` although here no-calls are kept and there is no splitting by genotype.

Value

a data.frame with coordinates and variant ids from the truth set corresponding to no-calls.

Author(s)

Jean Monlong

---

freqAnnotate *Annotate SVs with frequency in catalog*

Description

Annotate SVs with frequency in catalog

Usage

```
freqAnnotate(svs, cat, min.cov = 0.5, min.del.rol = 0.1,
  max.ins.dist = 20, ins.seq.comp = FALSE, out.vcf = NULL,
  freq.field = "AF", out.freq.field = "AFMAX")
```

Arguments

svs	a VCF object with SVs to annotate.
cat	a VCF object with the SV catalog with frequency estimates.
min.cov	the minimum coverage to be considered a match. Default is 0.5
min.del.rol	minimum reciprocal overlap for deletions. Default is 0.1
max.ins.dist	maximum distance for insertions to be clustered. Default is 20.
ins.seq.comp	compare sequence instead of insertion sizes. Default is FALSE.
out.vcf	If non-NULL, write output to this VCF file.
freq.field	the field with the frequency estimate in the 'cat' input. Default is 'AF'.
out.freq.field	the new field's name. Default is 'AFMAX'

Value

a GRanges object.

Author(s)

Jean Monlong

Examples

```
## Not run:
## From VCF files with output written to VCF file
freqAnnotate('calls.vcf', 'gnomad.vcf', out.vcf='calls.withFreq.vcf')

## Within R
calls.vcf = readSVvcf('calls.vcf', vcf.object=TRUE)
cat.vcf = readSVvcf('gnomad.vcf', vcf.object=TRUE)
calls.freq.vcf = freqAnnotate(calls.vcf, cat.vcf)

## End(Not run)
```

---

ivg_sv *Interactive exploration of SVs in a variation graph*

Description

Opens a Shiny app with a dynamic table that contains input SVs. Clicking on a SV (row in the table) generates a simplified representation of the variation graph around this SV. The number of flanking nodes (context) can be increased if necessary, e.g. for large insertions. vg needs to be installed (https://github.com/vgteam/vg).

Usage

```
ivg_sv(svs, xg, ucsc.genome = "hg38")
```

Arguments

svs	either a GRanges with SVs (e.g. from readSVvcf) or the path to a VCF file.
xg	the path to the xg object of the variation graph.
ucsc.genome	the genome version for the UCSC Genome Browser automated link.

Value

Starts a Shniy app in a web browser.

Author(s)

Jean Monlong

---

plot_perregion *Recall, precision, F1 per region*

Description

Recall, precision, F1 per region

Usage

```
plot_perregion(eval, regions.gr, min.region.ol = 0.5, plot = TRUE)
```

Arguments

eval	the output of svevalOl.
regions.gr	GRanges object with regions of interest
min.region.ol	minimum proportion of variant that must overlap regions.gr. Default is 0.5
plot	should the function return the plot list. Default is TRUE. If FALSE, returns a data.frame.

Value

a list of ggplot objects if plot=TRUE (default); a data.frame otherwise.

Author(s)

Jean Monlong

plot_persize *Recall, precision, F1 per SV size*

Description

Recall, precision, F1 per SV size

Usage

```
plot_persize(eval, size.breaks = c(50, 100, 500, 1000, 10000, Inf),
  plot = TRUE)
```

Arguments

eval	the output of svevalOl.
size.breaks	a vector for breaking the sizes into classes.
plot	should the function return the plot list. Default is TRUE. If FALSE, returns a data.frame.

Value

a list of ggplot objects if plot=TRUE (default); a data.frame otherwise.

Author(s)

Jean Monlong

plot_prcurve *Create precision-recall graphs*

Description

Create a precision/recall curve using metrics computed by the svevalOl function. The svevalOl function returns a list containing a "curve" data.frame with the evaluation metrics for different quality thresholds.

Usage

```
plot_prcurve(eval, labels = NULL)
```

Arguments

eval	a data.frame, a list of data.frames, or a vector with one or several paths to files with "curve" information.
labels	the labels to use for each input (when multiple inputs are used). Ignored is NULL (default).

Details

If the input is a data.frame (or list of data.frames) it should be the "curve" element of the list returned by the `sveval0l` function. If the input is a character (or a vector of characters), they are considered to be file names and the data will be read from these files.

If multiple inputs are given, either using a list of data.frames or a vectors with several filenames, one curve per input will be created. This is to be used to quickly compare several methods. The "labels" parameters can be used to specify a label for each input to use for the graphs.

Value

list of ggplot graph objects

Author(s)

Jean Monlong

Examples

```
## Not run:
eval = sveval0l('calls.vcf', 'truth.vcf')
plot_prcurve(eval$curve)

# Comparing multiple methods
eval.1 = sveval0l('calls1.vcf', 'truth.vcf')
eval.2 = sveval0l('calls2.vcf', 'truth.vcf')
plot_prcurve(list(eval.1$curve, eval.2$curve), labels=c('method1', 'method2'))

# Or if the results were previously written in files
plot_prcurve(c('methods1-prcurve.tsv', 'methods2-prcurve.tsv'), labels=c('method1', 'method2'))

## End(Not run)
```

---

plot_ranges *Plot variants in a region*

Description

A simple ggplot2 representation of variants in a region. The beginning of the variant is represented as a point (shape=SV type). The point is annotated with the variant size. A line outlines the range (e.g. for deletions or inversions).

Usage

```
plot_ranges(gr.l, region.gr = NULL, pt.size = 2, maxgap = 20)
```

Arguments

gr.l	a list of GRanges. If named, the names are used to name the graph's panel.
region.gr	the region of interest. If NULL (default), all variants are displayed.
pt.size	the point (and line) sizes. Default is 2.
maxgap	the maximum gap allowed when filtering variants in regions. Default is 20.

Value

a ggplot2 object

Author(s)

Jean Monlong

---

prf *Compute precision, recall and F1 score*

Description

Compute the precision, recall and F1 score using the TP, TP.baseline, FP and FN columns.

Usage

```
prf(eval.df)
```

Arguments

eval.df	a data.frame with columns TP, TP.baseline, FP, and FN.

Value

the input data.frame with 3 new columns precision, recall and F1.

Author(s)

Jean Monlong

readSVvcf *Read SVs from a VCF file*

Description

Read a VCF file that contains SVs and create a GRanges with relevant information, e.g. SV size or genotype quality.

Usage

```
readSVvcf(vcf.file, keep.ins.seq = FALSE, sample.name = NULL,
  qual.field = c("GQ", "QUAL"), check.inv = FALSE, keep.ids = FALSE,
  nocalls = FALSE, right.trim = TRUE, vcf.object = FALSE)
```

Arguments

vcf.file	the path to the VCF file
keep.ins.seq	should it keep the inserted sequence? Default is FALSE.
sample.name	the name of the sample to use. If NULL (default), use first sample.
qual.field	fields to use as quality. Will be tried in order.
check.inv	should the sequence of MNV be compared to identify inversions.
keep.ids	keep variant ids? Default is FALSE.
nocalls	if TRUE returns no-calls only (genotype ./.). Default FALSE.
right.trim	if TRUE (default) the REF/ALT sequences are right-trimmed after splitting up multi-ALT variants.
vcf.object	should the output be a VCF object instead. Default is FALSE.

Details

By default, the quality information is taken from the QUAL field. If all values are NA or 0, the function will try other fields as speficied in the "qual.field" vector. Fields can be from the INFO or FORMAT fields.

Value

a GRanges object with relevant information.

Author(s)

Jean Monlong

Examples

```
## Not run:
calls.gr = readSVvcf('calls.vcf')

## End(Not run)
```

svevalOl *SV evaluation based on overlap and variant size*

Description

SV evaluation based on overlap and variant size

Usage

```
svevalOl(calls.gr, truth.gr, max.ins.dist = 20, min.cov = 0.5,
  min.del.rol = 0.1, ins.seq.comp = FALSE, nb.cores = 1,
  min.size = 50, max.size = Inf, bed.regions = NULL,
  bed.regions.ol = 0.5, qual.field = c("QUAL", "GQ"),
  sample.name = NULL, outfile = NULL, out.bed.prefix = NULL,
  qual.ths = c(0, 2, 3, 4, 5, 7, 10, 12, 14, 21, 27, 35, 45, 50, 60, 75,
  90, 99, 110, 133, 167, 180, 250, 350, 450, 550, 650),
  qual.quantiles = seq(0, 1, 0.1), check.inv = FALSE,
  geno.eval = FALSE, stitch.hets = FALSE, stitch.dist = 20,
  merge.hets = FALSE, merge.rol = 0.8, method = c("coverage",
  "bipartite"))
```

Arguments

calls.gr	call set. A GRanges or the path to a VCF file.
truth.gr	truth set. A GRanges or the path to a VCF file.
max.ins.dist	maximum distance for insertions to be clustered. Default is 20.
min.cov	the minimum coverage to be considered a match. Default is 0.5
min.del.rol	minimum reciprocal overlap for deletions. Default is 0.1
ins.seq.comp	compare sequence instead of insertion sizes. Default is FALSE.
nb.cores	number of processors to use. Default is 1.
min.size	the minimum SV size to be considered. Default 50.
max.size	the maximum SV size to be considered. Default is Inf.
bed.regions	If non-NULL, a GRanges object or path to a BED file (no headers) with regions of interest.
bed.regions.ol	minimum proportion of sv.gr that must overlap regions.gr. Default is 0.5
qual.field	fields to use as quality. Will be tried in order.
sample.name	the name of the sample to use if VCF files given as input. If NULL (default), use first sample.
outfile	the TSV file to output the results. If NULL (default), returns a data.frame.
out.bed.prefix	prefix for the output BED files. If NULL (default), no BED output.
qual.ths	the QUAL thresholds for the PR curve. If NULL, will use quantiles. see qual.quantiles.

qual.quantiles	the QUAL quantiles for the PR curve, if qual.ths is NULL. Default is (0, .1, ..., .9, 1).
check.inv	should the sequence of MNV be compared to identify inversions.
geno.eval	should het/hom be evaluated separately (genotype evaluation). Default FALSE.
stitch.hets	should clustered hets be stitched together before genotype evatuation. Default is FALSE.
stitch.dist	the maximum distance to stitch hets during genotype evaluation.
merge.hets	should similar hets be merged into homs before genotype evaluation. Default is FALSE.
merge.rol	the minimum reciprocal overlap to merge hets before genotype evaluation.
method	the method to annotate the overlap. Either 'coverage' (default) for the cumulative coverage (e.g. to deal with fragmented calls); or 'bipartite' for a 1-to-1 matching of variants in the calls and truth sets.

Value

a list with

eval	a data.frame with TP, FP and FN for each SV type when including all variants
curve	a data.frame with TP, FP and FN for each SV type when using different quality thesholds
svs	a list of GRanges object with FP, TP and FN for each SV type (when using QUAL¿=0 threshold).

Author(s)

Jean Monlong

Examples

```
## Not run:
## From VCF files
eval = svevalOl('calls.vcf', 'truth.vcf')

## From GRanges
calls.gr = readSVvcf('calls.vcf')
truth.gr = readSVvcf('truth.vcf')
eval = svevalOl(calls.gr, truth.gr)

## Genotype evaluation
eval = svevalOl(calls.gr, truth.gr, geno.eval=TRUE, merge.hets=TRUE, stitch.hets=TRUE)

## End(Not run)
```

`svOverlap` *Overlap and annotate SV sets with coverage metrics*

Description

Overlap and annotate SV sets with coverage metrics

Usage

```
svOverlap(query, subject, max.ins.dist = 20, min.cov = 0.5,
  min.del.rol = 0.1, ins.seq.comp = FALSE, nb.cores = 1)
```

Arguments

`query`	a GRanges object with SVs
`subject`	another GRanges object with SVs
`max.ins.dist`	maximum distance for insertions to be clustered. Default is 20.
`min.cov`	the minimum coverage to be considered a match. Default is 0.5
`min.del.rol`	minimum reciprocal overlap for deletions. Default is 0.1
`ins.seq.comp`	compare sequence instead of insertion sizes. Default is FALSE.
`nb.cores`	number of processors to use. Default is 1.

Value

a list with:

`query`	the query GRanges object annotated
`subject`	the subject GRanges object annotated

Author(s)

Jean Monlong

Index