rGMAP

June 12, 2018

Type Package

Title Call hierarchical chromatin domains from HiC matrix by GMAP

Version 1.3

Date 06-12-2018

Author Wenbao Yu

Maintainer Wenbao Yu <yuw1@email.chop.edu>

Description Call hierarchical chromatin domains from HiC contact matrix by Gaussian Mixture model And Proportion test

BugReports https://github.com/wbaopaul/rGMAP/issues

License GPL (>= 2)

LazyData TRUE

Imports data.table,
 ggplot2,
 mclust,
 EMD,
 caTools,
 Matrix,
 Rcpp (>= 0.12.5)

LinkingTo Rcpp

RoxygenNote 6.0.1

Suggests knitr,
 rmarkdown

VignetteBuilder knitr

R topics documented:

| data_simu | *generate simulated hic_mat and true tads* |

Description

generate simulated hic_mat and true tads

Usage

```
data_simu(stype = "poisson-dist", nratio = 2.5, mu0 = 20, resl = 1)
```

Arguments

stype	One of four types of simulated data in the manuscript: poission-dist, poission-dist-hier, nb-dist, nb-dist-hier; poission- or nb- indicates poission distribution or negative bionomial distribution -hier indicated subtads are generated nestly
nratio	The effect size between intra- and inter domain, larger means higher intra-tad contacts
mu0	The mean parameter, default 20
resl	Resolution, default set to 1

Value

A list includes following elements:

hic_mat	n by n contact matrix
hierTads	True heirarchical domains
tads_true	True TADs

---

hic_rao_IMR90_chr15

Normalized Hi-C data for IMR90, chr15 with resolution 10kb.

Description

Normalized Hi-C data for IMR90, chr15 with resolution 10kb.

Usage

```
hic_rao_IMR90_chr15
```

Format

A data table with 3 variables:

n1 bin 1

n2 bin 2

count normalized counts

Source

Rao et al., Cell 2014, A 3D map of the human genome at kilobase resolution reveals principles of chromatin looping

---

plotdom *visualize hierarchical domains*

Description

visualize hierarchical domains

Usage

```
plotdom(hic_dat, hiertads_gmap, start_bin, end_bin, cthr = 20, kb_resl = 10)
```

Arguments

hic_dat
hic contact matrix for a given chromosome with 3 columns matrix or data.frame with columns: bin1, bin2, counts

hiertads_gmap
the hierarchical domains called by GMAP

start_bin
the start bin of the genome

end_bin
the end bin of the genome

cthr
the upper bound count threshold for color, default 20

kb_resl
reslution of Hi-C data in kb

---

rGMAP *Detect hierarchical choromotin domains by GMAP*

Description

Detect hierarchical choromotin domains by GMAP

Usage

```
rGMAP(hic_mat, resl = 10 * 10^3, logt = T, dom_order = 2,
  maxDistInBin = min(200, 2 * 10^6/resl), min_d = 25, max_d = 100,
  min_dp = 5, max_dp = 10, hthr = 0.95, t1thr = 0.5)
```

Arguments

`hic_mat`	Either a 3 columns Hi-C contact matrix for a given chromosome, with each row corrsponding to the start bin, end bin and the contact number; or a n by n matrix, n is the number of bins for a given chromosom
`resl`	The resolution (bin size), default 10kb
`logt`	Do log-transformation or not, default TRUE
`dom_order`	Maximum level of hierarchical structures, default 2 (call TADs and subTADs)
`maxDistInBin`	Only consider contact whose distance is not greater than maxDistInBIn bins, default 200 bins (or 2Mb)
`min_d`	The minimum d (d: window size), default 25
`max_d`	The maximum d (d: window size), default 100
`min_dp`	The minmum dp (dp: lower bound of tad size), defalt 5
`max_dp`	The maximum dp (dp: lower bound of tad size), defalt 10. min_d, max_d, min_dp and max_dp should be specified in number of bins
`hthr`	The lower bound cutoff for posterior probability, default 0.95
`t1thr`	Lower bound for t1 for calling TAD, default 0.5 quantile of test statistics of TADs, 0.9 of subTADs

Value

A list includes following elements:

`tads`	A data frame with columns start, end indicates the start and end coordinates of each domain, respectively
`hierTads`	A data frame with columns start, end, dom_order, where dom_order indicates the hierarchical status of a domain, 1 indicates tads, 2 indicates subtads, and so on
`params`	A data frame gives the final parameters for calling TADs

Examples

```
## On simulated data:
library(rGMAP)
simu_res = data_simu('poisson-dist-hier')
true_domains = simu_res$hierTads
simu_mat = simu_res$hic_mat
predicted_domains = rGMAP(simu_mat, resl = 1)$hierTads
true_domains
predicted_domains

## On an real data example
hic_rao_IMR90_chr15   # normalized Hi-C data for IMR90, chr15 with resolution 10kb
res = rGMAP(hic_rao_IMR90_chr15, resl = 10 * 1000, dom_order = 2)
names(res)
#quickly visualize some hierarchical domains
pp = plotdom(hic_rao_IMR90_chr15, res$hierTads, 6000, 7000, 30, 10)
pp$p2
```

Index