

Package ‘scviR’

October 5, 2024

Date 2024-01-27

Title experimental interface from R to scvi-tools

Version 1.5.0

Description This package defines interfaces from R to scvi-tools. A vignette works through the totalVI tutorial for analyzing CITE-seq data. Another vignette compares outputs of Chapter 12 of the OSCA book with analogous outputs based on totalVI quantifications. Future work will address other components of scvi-tools, with a focus on building understanding of probabilistic methods based on variational autoencoders.

License Artistic-2.0

Encoding UTF-8

Depends R (>= 4.3), basilisk, shiny, SingleCellExperiment

Imports reticulate, BiocFileCache, utils, pheatmap, SummarizedExperiment, S4Vectors, limma, scater, stats, MatrixGenerics

Suggests knitr, testthat, reshape2, ggplot2, rhdf5, BiocStyle

VignetteBuilder knitr

biocViews Infrastructure, SingleCell, DataImport

RoxygenNote 7.3.1

URL <https://github.com/vjcitn/scviR>

BugReports <https://github.com/vjcitn/scviR/issues>

git_url <https://git.bioconductor.org/packages/scviR>

git_branch devel

git_last_commit ff7fb36

git_last_commit_date 2024-04-30

Repository Bioconductor 3.20

Date/Publication 2024-10-04

Author Vincent Carey [aut, cre] (<<https://orcid.org/0000-0003-4046-0063>>)

Maintainer Vincent Carey <stvjc@channing.harvard.edu>

Contents

adtProfiles	2
anndataR	3
bsklenv	3
cacheCiteSeq5k10kPbmcs	4
cacheCiteSeq5k10kTutvae	4
clusters.adt	5
clusters.rna	5
exploreSubcl	6
getCh12AllSce	6
getCh12Sce	7
getCiteSeq5k10kPbmcs	8
getCiteSeqTutvae	8
getPro5k10kAdata	9
getSubclLM	9
getSubclusteringFeatures	10
getTotalVI5k10kAdata	11
getTotalVINormalized5k10k	11
MuDataR	12
pyHelp2	12
scanpyHelper	13
scanpyR	13
seviHelper	13
seviR	14
Index	15

adtProfiles	<i>produce a heatmap from a specialized CITE-seq SingleCellExperiment</i>
-------------	---

Description

produce a heatmap from a specialized CITE-seq SingleCellExperiment

Usage

```
adtProfiles(x, lb = -3, ub = 3, do_z = FALSE)
```

Arguments

x	SingleCellExperiment instance that has an 'se.averaged' component in its meta-data
lb	numeric(1) lower bound on 'breaks' sequence for ComplexHeatmap::pheatmap, defaults to -3
ub	numeric(1) upper bound on 'breaks' sequence for ComplexHeatmap::pheatmap, defaults to 3
do_z	logical(1) if TRUE, divide the residuals by their standard deviation across clusters, defaults to false

Value

ComplexHeatmap::pheatmap instance
side effect of pheatmap::pheatmap call

Note

See the OSCA book ch12.5.2 for the application.

Examples

```
ch12sce <- getCh12Sce()
adtProfiles(ch12sce)
adtProfiles(ch12sce, do_z = TRUE)
```

anndataR *basic interface to anndata*

Description

basic interface to anndata

Usage

```
anndataR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

```
ad <- anndataR()
ad
ad$read
```

bsklenv *python declarations*

Description

python declarations

Usage

```
bsklenv
```

Format

An object of class BasiliskEnvironment of length 1.

```
cacheCiteseq5k10kPbmcs
```

grab scvi-tools-processed PBMC CITE-seq data in anndata format (gzipped) from Open Storage Network

Description

grab scvi-tools-processed PBMC CITE-seq data in anndata format (gzipped) from Open Storage Network

Usage

```
cacheCiteseq5k10kPbmcs()
```

Value

invisibly, the path to the .h5ad file

Note

Original h5ad files obtained using scvi-tools 0.18.0 `scvi.data.pbmcs_10x_cite_seq`, then processed according to steps in the scviR vignette, which follow the [scvi-tools tutorial](<https://colab.research.google.com/github/scvi-tools/tutorials/blob/0.18.0/totalVI.ipynb>) by Gayoso et al.

It may be advantageous to set `'options(timeout=3600)'` or to allow an even greater time for internet downloads, if working at a relatively slow network connection.

Examples

```
h5path <- cacheCiteseq5k10kPbmcs()
cmeta <- rhdf5::h5ls(h5path)
dim(cmeta)
head(cmeta, 17)
```

```
cacheCiteseq5k10kTutvae
```

grab scvi-tools VAE instance built on the PBMC datasets following the tutorial

Description

grab scvi-tools VAE instance built on the PBMC datasets following the tutorial

Usage

```
cacheCiteseq5k10kTutvae()
```

Value

invisibly, the path to the .zip file holding the fitted VAE and associated data

Note

VAE construction followed tutorial at <https://docs.scvi-tools.org/en/stable/tutorials/notebooks/totalVI.html>.

It may be advantageous to set `options(timeout=3600)` or to allow an even greater time for internet downloads, if working at a relatively slow network connection.

Examples

```
zpath <- cacheCiteSeq5k10kTutvae()
td <- tempdir()
utils::unzip(zpath, exdir = td)
vaedir <- paste0(td, "/vae2_ov")
scvi <- scviR()
adm <- anndataR()
hpath <- cacheCiteSeq5k10kPbmcs()
adata <- adm$read(hpath)
mod <- scvi$model$`_totalvi`$TOTALVI$load(vaedir, adata) #, use_gpu = FALSE)
mod
```

clusters.adt

ADT-based cluster labels for 7472 cells in OSCA chapter 12 analysis

Description

ADT-based cluster labels for 7472 cells in OSCA chapter 12 analysis

Usage

```
clusters.adt
```

Format

```
factor
```

clusters.rna

mRNA-based cluster labels for 7472 cells in OSCA chapter 12 analysis

Description

mRNA-based cluster labels for 7472 cells in OSCA chapter 12 analysis

Usage

```
clusters.rna
```

Format

```
factor
```

exploreSubcl	<i>app to explore diversity in RNA-subclusters within ADT clusters</i>
--------------	--

Description

app to explore diversity in RNA-subclusters within ADT clusters

Usage

```
exploreSubcl(sce, inlist, adtcls)
```

Arguments

sce	a SingleCellExperiment with altExp with ADT quantification
inlist	list of SingleCellExperiments (SCEs) formed by <code>scrann::quickSubCluster</code>
adtcls	vector of ADT cluster assignments

Value

shinyApp instance

Note

TSNE should already be available in ‘altExp(sce)’; follow OSCA book 12.5.2. If using example, set ‘ask=FALSE’.

Examples

```
sce <- getCh12Sce()
all.sce <- getCh12AllSce()
data(clusters.adt)
runApp(exploreSubcl(sce, all.sce, clusters.adt)) # trips up interactive pkgdown?)
```

getCh12AllSce	<i>get list of cluster-specific SCE for 10k PBMC annotated as in OSCA book chapter 12</i>
---------------	---

Description

get list of cluster-specific SCE for 10k PBMC annotated as in OSCA book chapter 12

Usage

```
getCh12AllSce()
```

Value

SimpleList of SingleCellExperiment instances

Note

This is a list of `SingleCellExperiment` instances with data on a total of 7472 cells from a 10x CITE-seq experiment. An `altExp` component in each list element includes antibody-derived tag (ADT) counts on 17 proteins. The data are acquired and processed as described in ch 12 of the OSCA book, circa February 2023. List elements correspond to mRNA-based sub-clusters of ADT-based clusters.

Examples

```
ch12_allsce <- getCh12AllSce()
vapply(ch12_allsce, ncol, numeric(1))
```

`getCh12Sce`*get SCE for 10k PBMC annotated as in OSCA book chapter 12*

Description

get SCE for 10k PBMC annotated as in OSCA book chapter 12

Usage

```
getCh12Sce(clear_cache = FALSE)
```

Arguments

`clear_cache` logical(1) will delete relevant entries in available cache before continuing, defaults to FALSE

Value

`SingleCellExperiment` instance

Note

This is a `SingleCellExperiment` instance with data on 7472 cells from a 10x CITE-seq experiment. An `altExp` component includes antibody-derived tag (ADT) counts on 17 proteins. The data are acquired and processed as described in ch 12 of the OSCA book, circa February 2023. A metadata element (`se.averaged`) includes the result of averaging protein abundance estimates within ADT-based clusters, as is done to give rise to Figure 12.8 of the OSCA book.

Examples

```
ch12sce <- getCh12Sce()
ch12sce
```

getCiteSeq5k10kPbmcs *helper to get the processed anndata for CITE-seq PBMCs from scvi-tools tutorial*

Description

helper to get the processed anndata for CITE-seq PBMCs from scvi-tools tutorial

Usage

```
getCiteSeq5k10kPbmcs()
```

Value

python reference to anndata

Note

It may be advantageous to set ‘options(timeout=3600)’ or to allow an even greater time for internet downloads, if working at a relatively slow network connection.

Examples

```
getCiteSeq5k10kPbmcs()
```

getCiteSeqTutvae *helper to get the tutorial VAE for PBMCs from scvi-tools tutorial*

Description

helper to get the tutorial VAE for PBMCs from scvi-tools tutorial

Usage

```
getCiteSeqTutvae(use_gpu = FALSE)
```

Arguments

use_gpu logical(1), defaulting to FALSE, passed to TOTALVI.load

Value

python reference to anndata

Note

March 2024 use_gpu ignored

Examples

```
getCiteSeqTutvae()
```

getPro5k10kAdata	<i>get an anndata reference to 5k10k protein after totalVI from tutorial</i>
------------------	--

Description

get an anndata reference to 5k10k protein after totalVI from tutorial

Usage

```
getPro5k10kAdata()
```

Value

python reference to anndata

Note

It may be advantageous to set 'options(timeout=3600)' or to allow an even greater time for internet downloads, if working at a relatively slow network connection.

Examples

```
getPro5k10kAdata()
```

getSubclLM	<i>get lmFit for heterogeneity across subclusters</i>
------------	---

Description

get lmFit for heterogeneity across subclusters

Usage

```
getSubclLM(inlist, clname)
```

Arguments

inlist	list of SingleCellExperiments (SCEs) formed by <code>scran::quickSubCluster</code>
clname	character(1) name of cluster SCE to assess

Value

limma::lmFit output

Note

It is assumed that 'logcounts' is an assay element, and that 'subcluster' is a colData element of each SCE in inlist

Examples

```
all.sce <- getCh12AllSce()
lm3 <- getSubclLM(all.sce, "3")
names(lm3)
```

getSubclusteringFeatures

get lmFit F-stat based collection of n genes most varying in mean across subclusters

Description

get lmFit F-stat based collection of n genes most varying in mean across subclusters

Usage

```
getSubclusteringFeatures(inlist, cname, n = 20)
```

Arguments

inlist	list of SingleCellExperiments (SCEs) formed by <code>scran::quickSubCluster</code>
cname	character(1) name of cluster SCE to assess
n	numeric(1) number to preserve

Value

list with two elements, `feat` = rowData corresponding to variable genes, `stats` = topTable result

Note

Symbol will be taken from `feat` and placed in `stats` component if available

Examples

```
all.sce <- getCh12AllSce()
scl <- getSubclusteringFeatures(all.sce, "3", 10)
names(scl)
```

`getTotalVI5k10kAdata` *get anndata reference to full totalVI processing of 5k10k data*

Description

get anndata reference to full totalVI processing of 5k10k data

Usage

```
getTotalVI5k10kAdata()
```

Value

python reference to anndata

Examples

```
full <- getTotalVI5k10kAdata()
full
```

`getTotalVINormalized5k10k`
get matrices of normalized quantifications from full totalVI 5k10k from tutorial

Description

get matrices of normalized quantifications from full totalVI 5k10k from tutorial

Usage

```
getTotalVINormalized5k10k()
```

Value

list of matrices

Examples

```
nm1ist <- getTotalVINormalized5k10k()
vapply(nm1ist, dim, numeric(2))
```

MuDataR	<i>basic interface to MuData</i>
---------	----------------------------------

Description

basic interface to MuData

Usage

```
MuDataR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

```
md <- MuDataR()
md
head(names(md))
```

pyHelp2	<i>helper to get text from python help utility – may need handling through basilisk</i>
---------	---

Description

helper to get text from python help utility – may need handling through basilisk

Usage

```
pyHelp2(object)
```

Arguments

object a reference to a python module typically with class 'python.builtin.module'

Value

character vector of lines from python help result

scanpyHelper	<i>shiny app that helps access documentation on python-accessible components</i>
--------------	--

Description

shiny app that helps access documentation on python-accessible components

Usage

```
scanpyHelper()
```

Value

shinyApp instance

scanpyR	<i>basic interface</i>
---------	------------------------

Description

basic interface

Usage

```
scanpyR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

```
sc <- scanpyR()
sc
sc$pp
```

scviHelper	<i>shiny app that helps access documentation on python-accessible components</i>
------------	--

Description

shiny app that helps access documentation on python-accessible components

Usage

```
scviHelper()
```

Value

shinyApp instance

`scviR`*basic interface*

Description

basic interface

Usage`scviR()`**Value**

basiliskRun result with import from reticulate, typically a Module

Examples

```
scvi <- scviR()
scvi
scvi$model
```

Index

* datasets

- bsklenv, 3
- clusters.adt, 5
- clusters.rna, 5

adtProfiles, 2
anndataR, 3

bsklenv, 3

cacheCiteseq5k10kPbmcs, 4
cacheCiteseq5k10kTutvae, 4
clusters.adt, 5
clusters.rna, 5

exploreSubcl, 6

getCh12AllSce, 6
getCh12Sce, 7
getCiteseq5k10kPbmcs, 8
getCiteseqTutvae, 8
getPro5k10kAdata, 9
getSubclLM, 9
getSubclusteringFeatures, 10
getTotalVI5k10kAdata, 11
getTotalVINormalized5k10k, 11

MuDataR, 12

pyHelp2, 12

scanpyHelper, 13
scanpyR, 13
scviHelper, 13
scviR, 14