Package 'scviR'

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Title experimental inferface from R to scvi-tools

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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.

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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 7.3.3

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

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`adtProfiles` *produce a heatmap from a specialized CITE-seq SingleCellExperiment*

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 metadata
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_h5ad
```

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/scvers 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 *Deprecated: grab scvi-tools VAE instance built on the PBMC datasets following the tutorial*

Description

Deprecated: 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

the serialized model is obsolete

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

```
## Not run:
zpath <- cacheCiteseq5k10kTutvae()
td <- tempdir()
utils::unzip(zpath, exdir = td)
vaedir <- paste0(td, "/vae2_ov")
scvi <- scviR()
adm <- anndataR()
hpath <- cacheCiteseq5k10kPbmcs()
adata <- adm$read_h5ad(hpath)
mod <- scvi$model$`_totalvi`$TOTALVI$load(vaedir, adata) #, use_gpu = FALSE)
mod

## End(Not run)
```

`cacheCiteseqHDPdata` *retrieve and cache a 349-protein CITE-seq dataset as employed in scvi-tools tutorial*

Description

retrieve and cache a 349-protein CITE-seq dataset as employed in scvi-tools tutorial

Usage

```
cacheCiteseqHDPdata()
```

`cacheCiteseqHDPmodel` *grab scvi-tools muon-oriented VAE instance built on the PBMC datasets following the tutorial*

Description

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

Usage

```
cacheCiteseqHDPmodel()
```

Value

invisibly, the path to the .zip file holding the weights in pt format for the fitted VAE

Note

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

We are using the scvi tutorial read early may 2025. The notebook uses "h5 format of single-cell multiomic data generated by Proteintech Genomics ... The data is from human resting PBMCs stained with the MultiPro® Human Discovery Panel (HDP) followed by processing using 10x Genomics Flex chemistry with Feature Barcoding Technology."

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 <- cacheCiteseqHDPmodel()
td <- tempdir()
utils::unzip(zpath, exdir = td)
vaedir <- paste0(td, "/vae3_pt")
dir(vaedir)
```

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 *app to explore diversity in RNA-subclusters within ADT clusters*

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 scran::quickSubCluster
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

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

---

getCh12AllSce *get list of cluster-specific SCE for 10k PBMC annotated as in OSCA book chapter 12*

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

```
## Not run:
getCiteseqTutvae()

## End(Not run)
```

`getPro5k10kAdata` *get an anndata reference to 5k10k protein after totalVI from tutorial*

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` *get lmFit for heterogeneity across subclusters*

Description

get lmFit for heterogeneity across subclusters

Usage

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

Arguments

`inlist`	list of SingleCellExperiments (SCEs) formed by scran::quickSubCluster
`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, clname, n = 20)
```

Arguments

inlist	list of SingleCellExperiments (SCEs) formed by scran::quickSubCluster
clname	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

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

MuDataR *basic interface to MuData*

Description

basic interface to MuData

Usage

```
MuDataR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

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

muonR *basic interface to muon*

Description

basic interface to muon

Usage

```
muonR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

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

pyHelp2 *helper to get text from python help utility – may need handling through basilisk*

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 *shiny app that helps access documentation on python-accessible components*

Description

shiny app that helps access documentation on python-accessible components

Usage

```
scanpyHelper()
```

Value

shinyApp instance

scanpyR *basic interface*

Description

basic interface

Usage

```
scanpyR()
```

Value

basiliskRun result with import from reticulate, typically a Module

Examples

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

scviHelper *shiny app that helps access documentation on python-accessible components*

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
```

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