

Package ‘scCustomize’

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Type Package

Title Custom Visualizations & Functions for Streamlined Analyses of Single Cell Sequencing

Description Collection of functions created and/or curated to aid in the visualization and analysis of single-cell data using 'R'. 'scCustomize' aims to provide 1) Customized visualizations for aid in ease of use and to create more aesthetic and functional visuals. 2) Improve speed/reproducibility of common tasks/pieces of code in scRNA-seq analysis with a single or group of functions. For citation please use: Marsh SE (2021) "Custom Visualizations & Functions for Streamlined Analyses of Single Cell Sequencing" <doi:10.5281/zenodo.5706430>.

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R topics documented:

Add_CellBender_Diff	5
Add_Cell_Complexity_LIGER	5
Add_Cell_Complexity_Seurat	6
Add_Mito_Ribo_LIGER	7
Add_Mito_Ribo_Seurat	8
Add_Pct_Diff	10
Add_Sample_Meta	11
Blank_Theme	12
Case_Check	12
CellBender_Diff_Plot	13
CellBender_Feature_Diff	15
Cell_Highlight_Plot	16
Change_Delim_All	17
Change_Delim_Prefix	18
Change_Delim_Suffix	19
CheckMatrix_scCustom	19
Clustered_DotPlot	20
Cluster_Highlight_Plot	23
Cluster_Stats_All_Samples	24
ColorBlind_Pal	25
Copy_From_GCP	25
Copy_To_GCP	26
Create_10X_H5	27
Create_CellBender_Merged_Seurat	28
Create_Cluster_Annotation_File	29
Dark2_Pal	29
DimPlot_All_Samples	30
DimPlot_LIGER	31
DimPlot_scCustom	33
DiscretePalette_scCustomize	35
DotPlot_scCustom	36
ensembl_mito_id	37
ensembl_ribo_id	38
Extract_Sample_Meta	38
Extract_Top_Markers	39

FeaturePlot_DualAssay	41
FeaturePlot_scCustom	42
Fetch_Meta	44
Gene_Present	45
Hue_Pal	46
Iterate_Cluster_Highlight_Plot	46
Iterate_DimPlot_bySample	48
Iterate_FeaturePlot_scCustom	49
Iterate_Meta_Highlight_Plot	51
Iterate_PC>Loading_Plots	52
Iterate_Plot_Density_Custom	53
Iterate_Plot_Density_Joint	55
Iterate_VlnPlot_scCustom	56
JCO_Four	58
Liger_to_Seurat	58
Median_Stats	60
Merge_Seurat_List	61
Merge_Sparse_Data_All	62
Meta_Highlight_Plot	63
Meta_Numeric	64
Meta_Present	65
Meta_Present_LIGER	66
Meta_Remove_Seurat	66
Move_Legend	67
NavyAndOrange	68
PalettePlot	68
PC_Plotting	69
Percent_Expressing	70
plotFactors_scCustom	71
Plot_Cells_per_Sample	73
Plot_Density_Custom	74
Plot_Density_Joint_Only	75
Plot_Median_Genes	76
Plot_Median_Mito	77
Plot_Median_Other	78
Plot_Median_UMIs	79
Pull_Cluster_Annotation	80
Pull_Directory_List	81
QC_Plots_Combined_Vln	82
QC_Plots_Complexity	83
QC_Plots_Feature	85
QC_Plots_Genes	86
QC_Plots_Mito	88
QC_Plots_UMIs	89
QC_Plot_GenevsFeature	91
QC_Plot_UMIvsFeature	92
QC_Plot_UMIvsGene	94
Read10X_GEO	96

Read10X_h5_GEO	97
Read10X_h5_Multi_Directory	98
Read10X_Multi_Directory	100
Read_CellBender_h5_Mat	101
Read_CellBender_h5_Multi_Directory	102
Read_CellBender_h5_Multi_File	103
Read_GEO_Delim	105
Read_Metrics_10X	106
Rename_Clusters	107
Replace_Suffix	108
scCustomize_Palette	108
Seq_QC_Plot_Alignment_Combined	109
Seq_QC_Plot_Antisense	110
Seq_QC_Plot_Basic_Combined	111
Seq_QC_Plot_Exonic	112
Seq_QC_Plot_Genes	113
Seq_QC_Plot_Genome	114
Seq_QC_Plot_Intergenic	115
Seq_QC_Plot_Intronic	116
Seq_QC_Plot_Number_Cells	117
Seq_QC_Plot_Reads_in_Cells	118
Seq_QC_Plot_Reads_per_Cell	119
Seq_QC_Plot_Saturation	120
Seq_QC_Plot_Total_Genes	121
Seq_QC_Plot_Transcriptome	122
Seq_QC_Plot_UMIs	123
Setup_scRNAseq_Project	124
Single_Color_Palette	125
Split_FeatureScatter	126
Stacked_VlnPlot	127
Store_Misc_Info_Seurat	129
Store_Palette_Seurat	130
theme_ggprism_mod	131
Top_Genes_Factor	132
UnRotate_X	133
VariableFeaturePlot_scCustom	133
Variable_Features_ALL_LIGER	134
viridis_plasma_dark_high	136
VlnPlot_scCustom	137

Add_CellBender_Diff *Calculate and add differences post-cell bender analysis*

Description

Calculate the difference in features and UMIs per cell when both cell bender and raw assays are present.

Usage

```
Add_CellBender_Diff(seurat_object, raw_assay_name, cell_bender_assay_name)
```

Arguments

seurat_object object name.
raw_assay_name name of the assay containing the raw data.
cell_bender_assay_name
 name of the assay containing the Cell Bender'ed data.

Value

Seurat object with 2 new columns in the meta.data slot.

Examples

```
## Not run:  
object <- Add_CellBender_Diff(seurat_object = obj, raw_assay_name = "RAW",  
cell_bender_assay_name = "RNA")  
  
## End(Not run)
```

Add_Cell_Complexity_LIGER
 Add Cell Complexity Value

Description

Add measure of cell complexity/novelty (log10PerUMI) for data QC.

Usage

```
Add_Cell_Complexity_LIGER(  
  liger_object,  
  meta_col_name = "log10GenesPerUMI",  
  overwrite = FALSE  
)
```

Arguments

liger_object object name.
meta_col_name name to use for new meta data column. Default is "log10GenesPerUMI".
overwrite Logical. Whether to overwrite existing an meta.data column. Default is FALSE meaning that function will abort if column with name provided to meta_col_name is present in meta.data slot.

Value

A LIGER Object

Examples

```

## Not run:
object <- Add_Cell_Complexity_LIGER(liger_object = object)

## End(Not run)
  
```

Add_Cell_Complexity_Seurat
Add Cell Complexity Value

Description

Add measure of cell complexity/novelty (log10PerUMI) for data QC.

Usage

```

Add_Cell_Complexity_Seurat(
  seurat_object,
  meta_col_name = "log10GenesPerUMI",
  assay = "RNA",
  overwrite = FALSE
)
  
```

Arguments

seurat_object object name.
meta_col_name name to use for new meta data column. Default is "log10GenesPerUMI".
assay assay to use in calculation. Default is "RNA". *Note* This should only be changed if storing corrected and uncorrected assays in same object (e.g. outputs of both Cell Ranger and Cell Bender).
overwrite Logical. Whether to overwrite existing an meta.data column. Default is FALSE meaning that function will abort if column with name provided to meta_col_name is present in meta.data slot.

Value

A Seurat Object

Examples

```
library(Seurat)
pbmc_small <- Add_Cell_Complexity_Seurat(seurat_object = pbmc_small)
```

Add_Mito_Ribo_LIGER *Add Mito and Ribo percentages to LIGER*

Description

Add Mito, Ribo, percentages to meta.data slot of LIGER Object

Usage

```
Add_Mito_Ribo_LIGER(  
  liger_object,  
  species,  
  mito_name = "percent_mito",  
  ribo_name = "percent_ribo",  
  mito_ribo_name = "percent_mito_ribo",  
  mito_pattern = NULL,  
  ribo_pattern = NULL,  
  mito_features = NULL,  
  ribo_features = NULL,  
  ensembl_ids = FALSE,  
  overwrite = FALSE,  
  list_species_names = FALSE  
)
```

Arguments

<code>liger_object</code>	LIGER object name.
<code>species</code>	Species of origin for given Seurat Object. If mouse, human, marmoset, zebrafish, rat, drosophila, or rhesus macaque (name or abbreviation) are provided the function will automatically generate <code>mito_pattern</code> and <code>ribo_pattern</code> values.
<code>mito_name</code>	name to use for the new meta.data column containing percent mitochondrial counts. Default is "percent_mito".
<code>ribo_name</code>	name to use for the new meta.data column containing percent ribosomal counts. Default is "percent_ribo".
<code>mito_ribo_name</code>	name to use for the new meta.data column containing percent mitochondrial+ribosomal counts. Default is "percent_mito_ribo".

mito_pattern	A regex pattern to match features against for mitochondrial genes (will set automatically if species is mouse or human; marmoset features list saved separately).
ribo_pattern	A regex pattern to match features against for ribosomal genes (will set automatically if species is mouse, human, or marmoset).
mito_features	A list of mitochondrial gene names to be used instead of using regex pattern. Will override regex pattern if both are present (including default saved regex patterns).
ribo_features	A list of ribosomal gene names to be used instead of using regex pattern. Will override regex pattern if both are present (including default saved regex patterns).
ensembl_ids	logical, whether feature names in the object are gene names or ensembl IDs (default is FALSE; set TRUE if feature names are ensembl IDs).
overwrite	Logical. Whether to overwrite existing meta.data columns. Default is FALSE meaning that function will abort if columns with any one of the names provided to mito_name ribo_name or mito_ribo_name is present in meta.data slot.
list_species_names	returns list of all accepted values to use for default species names which contain internal regex/feature lists (human, mouse, marmoset, zebrafish, rat, drosophila, and rhesus macaque). Default is FALSE.

Value

A LIGER Object

Examples

```
## Not run:
object <- Add_Mito_Ribo_LIGER(liger_object = object, species = "mouse")

## End(Not run)
```

Add_Mito_Ribo_Seurat *Add Mito and Ribo percentages*

Description

Add Mito, Ribo, & Mito+Ribo percentages to meta.data slot of Seurat Object

Usage

```
Add_Mito_Ribo_Seurat(
  seurat_object,
  species,
  mito_name = "percent_mito",
  ribo_name = "percent_ribo",
```



```

    mito_ribo_name = "percent_mito_ribo",
    mito_pattern = NULL,
    ribo_pattern = NULL,
    mito_features = NULL,
    ribo_features = NULL,
    ensembl_ids = FALSE,
    assay = NULL,
    overwrite = FALSE,
    list_species_names = FALSE
  )

```

Arguments

<code>seurat_object</code>	object name.
<code>species</code>	Species of origin for given Seurat Object. If mouse, human, marmoset, zebrafish, rat, drosophila, or rhesus macaque (name or abbreviation) are provided the function will automatically generate <code>mito_pattern</code> and <code>ribo_pattern</code> values.
<code>mito_name</code>	name to use for the new meta.data column containing percent mitochondrial counts. Default is "percent_mito".
<code>ribo_name</code>	name to use for the new meta.data column containing percent ribosomal counts. Default is "percent_mito".
<code>mito_ribo_name</code>	name to use for the new meta.data column containing percent mitochondrial+ribosomal counts. Default is "percent_mito".
<code>mito_pattern</code>	A regex pattern to match features against for mitochondrial genes (will set automatically if species is mouse or human; marmoset features list saved separately).
<code>ribo_pattern</code>	A regex pattern to match features against for ribosomal genes (will set automatically if species is mouse, human, or marmoset).
<code>mito_features</code>	A list of mitochondrial gene names to be used instead of using regex pattern. Will override regex pattern if both are present (including default saved regex patterns).
<code>ribo_features</code>	A list of ribosomal gene names to be used instead of using regex pattern. Will override regex pattern if both are present (including default saved regex patterns).
<code>ensembl_ids</code>	logical, whether feature names in the object are gene names or ensembl IDs (default is FALSE; set TRUE if feature names are ensembl IDs).
<code>assay</code>	Assay to use (default is the current object default assay).
<code>overwrite</code>	Logical. Whether to overwrite existing meta.data columns. Default is FALSE meaning that function will abort if columns with any one of the names provided to <code>mito_name</code> <code>ribo_name</code> or <code>mito_ribo_name</code> is present in meta.data slot.
<code>list_species_names</code>	returns list of all accepted values to use for default species names which contain internal regex/feature lists (human, mouse, marmoset, zebrafish, rat, drosophila, and rhesus macaque). Default is FALSE.

Value

A Seurat Object

Examples

```
library(Seurat)
pbmc_small <- Add_Mito_Ribo_Seurat(seurat_object = pbmc_small, species = "human")
```

Add_Pct_Diff

Add percentage difference to DE results

Description

Adds new column labeled "pct_diff" to the data.frame output of [FindMarkers](#), [FindAllMarkers](#), or other DE test data.frames.

Usage

```
Add_Pct_Diff(
  marker_dataframe,
  pct.1_name = "pct.1",
  pct.2_name = "pct.2",
  overwrite = FALSE
)
```

Arguments

marker_dataframe	data.frame containing the results of FindMarkers , FindAllMarkers , or other DE test data.frame.
pct.1_name	the name of data.frame column corresponding to percent expressed in group 1. Default is Seurat default "pct.1".
pct.2_name	the name of data.frame column corresponding to percent expressed in group 2. Default is Seurat default "pct.2".
overwrite	logical. If the marker_dataframe already contains column named "pct_diff" whether to overwrite or return error message. Default is FALSE.

Value

Returns input marker_dataframe with additional "pct_diff" column.

Examples

```
## Not run:
marker_df <- FindAllMarkers(object = obj_name)
marker_df <- Add_Pct_Diff(marker_dataframe = marker_df)
# or piped with function
marker_df <- FindAllMarkers(object = obj_name) %>%
  Add_Pct_Diff()

## End(Not run)
```

Add_Sample_Meta	<i>Add Sample Level Meta Data</i>
-----------------	-----------------------------------

Description

Add meta data from ample level data.frame/tibble to cell level `seurat@meta.data` slot

Usage

```
Add_Sample_Meta(  
  seurat_object,  
  meta_data,  
  join_by_seurat,  
  join_by_meta,  
  na_ok = FALSE,  
  overwrite = FALSE  
)
```

Arguments

<code>seurat_object</code>	object name.
<code>meta_data</code>	data.frame/tibble containing meta data or path to file to read. Must be formatted as either data.frame or tibble.
<code>join_by_seurat</code>	name of the column in <code>seurat_object@meta.data</code> that contains matching variables to <code>join_by_meta</code> in <code>meta_data</code> .
<code>join_by_meta</code>	name of the column in <code>meta_data</code> that contains matching variables to <code>join_by_seurat</code> in <code>seurat_object@meta.data</code> .
<code>na_ok</code>	logical, is it ok to add NA values to <code>seurat_object@meta.data</code> . Default is FALSE. Be very careful if setting TRUE because if there is error in join operation it may result in all <code>@meta.data</code> values being replaced with NA.
<code>overwrite</code>	logical, if there are shared columns between <code>seurat_object@meta.data</code> and <code>meta_data</code> should the current <code>seurat_object@meta.data</code> columns be overwritten. Default is FALSE. This parameter excludes values provided to <code>join_by_seurat</code> and <code>join_by_meta</code> .

Value

Seurat object with new `@meta.data` columns

Examples

```
## Not run:  
# meta_data present in environment  
sample_level_meta <- data.frame(...)  
obj <- Add_Sample_Meta(seurat_object = obj, meta_data = sample_level_meta,  
  join_by_seurat = "orig.ident", join_by_meta = "sample_ID")
```

```
# from meta data file
obj <- Add_Sample_Meta(seurat_object = obj, meta_data = "meta_data/sample_level_meta.csv",
  join_by_seurat = "orig.ident", join_by_meta = "sample_ID")

## End(Not run)
```

 Blank_Theme

Blank Theme

Description

Shortcut for thematic modification to remove all axis labels and grid lines

Usage

```
Blank_Theme(...)
```

Arguments

... extra arguments passed to `ggplot2::theme()`.

Value

Returns a list-like object of class *theme*.

Examples

```
# Generate a plot and customize theme
library(ggplot2)
df <- data.frame(x = rnorm(n = 100, mean = 20, sd = 2), y = rbinom(n = 100, size = 100, prob = 0.2))
p <- ggplot(data = df, mapping = aes(x = x, y = y)) + geom_point(mapping = aes(color = 'red'))
p + Blank_Theme()
```

 Case_Check

Check for alternate case features Checks Seurat object for the presence of features with the same spelling but alternate case.

Description

Check for alternate case features Checks Seurat object for the presence of features with the same spelling but alternate case.

Usage

```
Case_Check(  
  seurat_object,  
  gene_list,  
  case_check_msg = TRUE,  
  return_features = TRUE  
)
```

Arguments

`seurat_object` Seurat object name.

`gene_list` vector of genes to check.

`case_check_msg` logical. Whether to print message to console if alternate case features are found in addition to inclusion in returned list. Default is TRUE.

`return_features` logical. Whether to return vector of alternate case features. Default is TRUE.

Value

If features found returns vector of found alternate case features and prints message depending on parameters specified.

Examples

```
## Not run:  
alt_features <- Case_Check(seurat_object = obj_name, gene_list = DEG_list)  
  
## End(Not run)
```

CellBender_Diff_Plot *Plot Number of Cells/Nuclei per Sample*

Description

Plot of total cell or nuclei number per sample grouped by another meta data variable.

Usage

```
CellBender_Diff_Plot(  
  feature_diff_df,  
  pct_diff_threshold = 25,  
  num_features = NULL,  
  label = TRUE,  
  num_labels = 20,  
  repel = TRUE,  
  custom_labels = NULL,
```

```

plot_line = TRUE,
plot_title = "Raw Counts vs. Cell Bender Counts",
x_axis_label = "Raw Data Counts",
y_axis_label = "Cell Bender Counts",
xnudge = 0,
ynudge = 0,
max.overlaps = 100,
label_color = "dodgerblue",
fontface = "bold",
label_size = 3.88,
bg.color = "white",
bg.r = 0.15,
...
)

```

Arguments

feature_diff_df	name of data.frame created using CellBender_Feature_Diff .
pct_diff_threshold	threshold to use for feature plotting. Resulting plot will only contain features which exhibit percent change \geq value. Default is 25.
num_features	Number of features to plot. Will ignore pct_diff_threshold and return plot with specified number of features. Default is NULL.
label	logical, whether or not to label the features that have largest percent difference between raw and CellBender counts (Default is TRUE).
num_labels	Number of features to label if label = TRUE, (default is 20).
repel	logical, whether to use geom_text_repel to create a nicely-repelled labels; this is slow when a lot of points are being plotted. If using repell, set xnudge and ynudge to 0, (Default is TRUE).
custom_labels	A custom set of features to label instead of the features most different between raw and CellBender counts.
plot_line	logical, whether to plot diagonal line with slope = 1 (Default is TRUE).
plot_title	Plot title.
x_axis_label	Label for x axis.
y_axis_label	Label for y axis.
xnudge	Amount to nudge X and Y coordinates of labels by.
ynudge	Amount to nudge X and Y coordinates of labels by.
max.overlaps	passed to geom_text_repel , exclude text labels that overlap too many things. Defaults to 100.
label_color	Color to use for text labels.
fontface	font face to use for text labels ("plain", "bold", "italic", "bold.italic") (Default is "bold").
label_size	text size for feature labels (passed to geom_text_repel).

bg.color color to use for shadow/outline of text labels (passed to `geom_text_repel`) (Default is white).

bg.r radius to use for shadow/outline of text labels (passed to `geom_text_repel`) (Default is 0.15).

... Extra parameters passed to `geom_text_repel` through `LabelPoints`.

Value

A ggplot object

Examples

```
## Not run:
# get cell bender differences data.frame
cb_stats <- CellBender_Feature_Diff(seurat_object = obj, raw_assay = "RAW",
cell_bender_assay = "RNA")

# plot
CellBender_Diff_Plot(feature_diff_df = cb_stats, pct_diff_threshold = 25)

## End(Not run)
```

CellBender_Feature_Diff

CellBender Feature Differences

Description

Get quick values for raw counts, CellBender counts, count differences, and percent count differences per feature.

Usage

```
CellBender_Feature_Diff(seurat_object, raw_assay, cell_bender_assay)
```

Arguments

seurat_object Seurat object name.

raw_assay Name of the assay containing the raw count data.

cell_bender_assay
 Name of the assay containing the CellBender count data.

Value

A data.frame containing summed raw counts, CellBender counts, count difference, and percent difference in counts.

Examples

```
## Not run:
cb_stats <- CellBender_Feature_Diff(seurat_object - obj, raw_assay = "RAW",
cell_bender_assay = "RNA")

## End(Not run)
```

Cell_Highlight_Plot *Meta Highlight Plot*

Description

Create Plot with meta data variable of interest highlighted

Usage

```
Cell_Highlight_Plot(
  seurat_object,
  cells_highlight,
  highlight_color = NULL,
  background_color = "lightgray",
  pt.size = NULL,
  raster = NULL,
  raster.dpi = c(512, 512),
  label = FALSE,
  split.by = NULL,
  split_seurat = FALSE,
  ggplot_default_colors = FALSE,
  ...
)
```

Arguments

seurat_object	Seurat object name.
cells_highlight	Cell names to highlight in named list.
highlight_color	Color to highlight cells.
background_color	non-highlighted cell colors (default is "lightgray")..
pt.size	point size for both highlighted cluster and background.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to geom_scattermore(). Default is c(512, 512).

label	Whether to label the highlighted meta data variable(s). Default is FALSE.
split.by	Variable in @meta.data to split the plot by.
split_seurat	logical. Whether or not to display split plots like Seurat (shared y axis) or as individual plots in layout. Default is FALSE.
ggplot_default_colors	logical. If highlight_color = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
...	Extra parameters passed to <code>DimPlot</code> .

Value

A ggplot object

Examples

```
library(Seurat)

# Creating example non-overlapping vectors of cells
MS4A1 <- WhichCells(object = pbmc_small, expression = MS4A1 > 4)
GZMB <- WhichCells(object = pbmc_small, expression = GZMB > 4)

# Format as named list
cells <- list("MS4A1" = MS4A1,
             "GZMB" = GZMB)

Cell_Highlight_Plot(seurat_object = pbmc_small, cells_highlight = cells)
```

Change_Delim_All	<i>Change all delimiters in cell name</i>
------------------	---

Description

Change all instances of delimiter in cell names from list of data.frames/matrices or single data.frame/matrix

Usage

```
Change_Delim_All(data, current_delim, new_delim)
```

Arguments

data	Either matrix/data.frame or list of matrices/data.frames with the cell barcodes in the column names.
current_delim	a single value of current delimiter.
new_delim	a single value of new delimiter desired.

Value

matrix or data.frame with new column names.

Examples

```
## Not run:  
dge_matrix <- Change_Delim_All(data = dge_matrix, current_delim = ".", new_delim = "-")  
  
## End(Not run)
```

Change_Delim_Prefix *Change barcode prefix delimiter*

Description

Change barcode prefix delimiter from list of data.frames/matrices or single data.frame/matrix

Usage

```
Change_Delim_Prefix(data, current_delim, new_delim)
```

Arguments

data	Either matrix/data.frame or list of matrices/data.frames with the cell barcodes in the column names.
current_delim	a single value of current delimiter.
new_delim	a single value of new delimiter desired.

Value

matrix or data.frame with new column names.

Examples

```
## Not run:  
dge_matrix <- Change_Delim_Prefix(data = dge_matrix, current_delim = ".", new_delim = "-")  
  
## End(Not run)
```

Change_Delim_Suffix *Change barcode suffix delimiter*

Description

Change barcode suffix delimiter from list of data.frames/matrices or single data.frame/matrix

Usage

```
Change_Delim_Suffix(data, current_delim, new_delim)
```

Arguments

data Either matrix/data.frame or list of matrices/data.frames with the cell barcodes in the column names.

current_delim a single value of current delimiter.

new_delim a single value of new delimiter desired.

Value

matrix or data.frame with new column names.

Examples

```
## Not run:  
dge_matrix <- Change_Delim_Suffix(data = dge_matrix, current_delim = ".", new_delim = "-")  
  
## End(Not run)
```

CheckMatrix_scCustom *Check Matrix Validity*

Description

Native implementation of SeuratObjects CheckMatrix but with modified warning messages.

Usage

```
CheckMatrix_scCustom(  
  object,  
  checks = c("infinite", "logical", "integer", "na")  
)
```

Arguments

object	A matrix
checks	Type of checks to perform, choose one or more from: <ul style="list-style-type: none"> • “infinite”: Emit a warning if any value is infinite • “logical”: Emit a warning if any value is a logical • “integer”: Emit a warning if any value is <i>not</i> an integer • “na”: Emit a warning if any value is an NA or NaN

Value

Emits warnings for each test and invisibly returns NULL

References

Re-implementing CheckMatrix only for sparse matrices with modified warning messages. Original function from SeuratObject <https://github.com/mojaveazure/seurat-object/blob/9c0eda946e162d8595696e5280aR/utils.R#L625-L650> (License: MIT).

Examples

```
## Not run:
mat <- Read10X(...)
CheckMatrix_scCustom(object = mat)

## End(Not run)
```

Clustered_DotPlot *Clustered DotPlot*

Description

Clustered DotPlots using ComplexHeatmap

Usage

```
Clustered_DotPlot(
  seurat_object,
  features,
  colors_use_exp = viridis_plasma_dark_high,
  exp_color_min = -2,
  exp_color_middle = NULL,
  exp_color_max = 2,
  print_exp_quantiles = FALSE,
  colors_use_idents = NULL,
  x_lab_rotate = TRUE,
  flip = FALSE,
```

```

k = 1,
feature_km_repeats = 1000,
ident_km_repeats = 1000,
row_km_repeats = deprecated(),
column_km_repeats = deprecated(),
row_label_size = 8,
raster = FALSE,
plot_km_elbow = TRUE,
elbow_kmax = NULL,
assay = NULL,
group.by = NULL,
idents = NULL,
show_parent_dend_line = TRUE,
ggplot_default_colors = FALSE,
color_seed = 123,
seed = 123
)

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>features</code>	Features to plot.
<code>colors_use_exp</code>	Color palette to use for plotting expression scale. Default is <code>viridis::plasma(n = 20, direction = -1)</code> .
<code>exp_color_min</code>	Minimum scaled average expression threshold (everything smaller will be set to this). Default is -2.
<code>exp_color_middle</code>	What scaled expression value to use for the middle of the provided <code>colors_use_exp</code> . By default will be set to value in middle of <code>exp_color_min</code> and <code>exp_color_max</code> .
<code>exp_color_max</code>	Maximum scaled average expression threshold (everything smaller will be set to this). Default is 2.
<code>print_exp_quantiles</code>	Whether to print the quantiles of expression data in addition to plots. Default is FALSE. NOTE: These values will be altered by choices of <code>exp_color_min</code> and <code>exp_color_max</code> if there are values below or above those cutoffs, respectively.
<code>colors_use_idents</code>	specify color palette to used for identity labels. By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from <code>DiscretePalette_scCustomize</code> .
<code>x_lab_rotate</code>	How to rotate column labels. By default set to TRUE which rotates labels 45 degrees. If set FALSE rotation is set to 0 degrees. Users can also supply custom angle for text rotation.
<code>flip</code>	logical, whether to flip the axes of final plot. Default is FALSE; rows = features and columns = idents.
<code>k</code>	Value to use for k-means clustering on features Sets (km) parameter in <code>ComplexHeatmap::Heatmap()</code> . From <code>ComplexHeatmap::Heatmap()</code> : Apply k-means clustering on rows. If the

value is larger than 1, the heatmap will be split by rows according to the k-means clustering. For each row slice, hierarchical clustering is still applied with parameters above.

feature_km_repeats	Number of k-means runs to get a consensus k-means clustering for features. Note if feature_km_repeats is set to value greater than one, the final number of groups might be smaller than row_km, but this might mean the original row_km is not a good choice. Default is 1000.
ident_km_repeats	Number of k-means runs to get a consensus k-means clustering. Similar to feature_km_repeats. Default is 1000.
row_km_repeats	[Deprecated] soft-deprecated. See feature_km_repeats
column_km_repeats	[Deprecated] soft-deprecated. See ident_km_repeats
row_label_size	Size of the feature labels. Provided to row_names_gp in Heatmap call.
raster	Logical, whether to render in raster format (faster plotting, smaller files). Default is FALSE.
plot_km_elbow	Logical, whether or not to return the Sum Squared Error Elbow Plot for k-means clustering. Estimating elbow of this plot is one way to determine "optimal" value for k. Based on: https://stackoverflow.com/a/15376462/15568251 .
elbow_kmax	The maximum value of k to use for plot_km_elbow. Suggest setting larger value so the true shape of plot can be observed. Value must be 1 less than number of features provided. If NULL parameter will be set dependent on length of feature list up to elbow_kmax = 20.
assay	Name of assay to use, defaults to the active assay.
group.by	Group (color) cells in different ways (for example, orig.ident).
idents	Which classes to include in the plot (default is all).
show_parent_dend_line	Logical, Sets parameter of same name in ComplexHeatmap::Heatmap(). From ComplexHeatmap::Heatmap(): When heatmap is split, whether to add a dashed line to mark parent dendrogram and children dendrograms. Default is TRUE.
ggplot_default_colors	logical. If colors_use = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.
seed	Sets seed for reproducible plotting (ComplexHeatmap plot).

Value

A ComplexHeatmap or if plot_km_elbow = TRUE a list containing ggplot2 object and ComplexHeatmap.

Author(s)

Ming Tang (Original Code), Sam Marsh (Wrap single function, added/modified functionality)

References

<https://divingintogeneticsandgenomics.rbind.io/post/clustered-dotplot-for-single-cell-rnaseq/>

See Also

<https://twitter.com/tangming2005>

Examples

```
library(Seurat)
Clustered_DotPlot(seurat_object = pbmc_small, features = c("CD3E", "CD8", "GZMB", "MS4A1"))
```

Cluster_Highlight_Plot

Cluster Highlight Plot

Description

Create Plot with cluster of interest highlighted

Usage

```
Cluster_Highlight_Plot(  
  seurat_object,  
  cluster_name,  
  highlight_color = NULL,  
  background_color = "lightgray",  
  pt.size = NULL,  
  raster = NULL,  
  raster.dpi = c(512, 512),  
  label = FALSE,  
  split.by = NULL,  
  split_seurat = FALSE,  
  ggplot_default_colors = FALSE,  
  ...  
)
```

Arguments

seurat_object Seurat object name.

cluster_name Name(s) (or number(s)) identity of cluster to be highlighted.

highlight_color Color(s) to highlight cells. The default is NULL and plot will use `scCustomize_Palette()`.

background_color	non-highlighted cell colors.
pt.size	point size for both highlighted cluster and background.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to geom_scattermore(). Default is c(512, 512).
label	Whether to label the highlighted cluster(s). Default is FALSE.
split.by	Feature to split plots by (i.e. "orig.ident").
split_seurat	logical. Whether or not to display split plots like Seurat (shared y axis) or as individual plots in layout. Default is FALSE.
ggplot_default_colors	logical. If colors_use = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
...	Extra parameters passed to DimPlot .

Value

A ggplot object

Examples

```
Cluster_Highlight_Plot(seurat_object = pbmc_small, cluster_name = "1", highlight_color = "gold",
background_color = "lightgray", pt.size = 2)
```

Cluster_Stats_All_Samples

Calculate Cluster Stats

Description

Calculates both overall and per sample cell number and percentages per cluster based on orig.ident

Usage

```
Cluster_Stats_All_Samples(seurat_object, group_by_var = "orig.ident")
```

Arguments

seurat_object Seurat object name.
group_by_var meta data column to classify samples (default = "orig.ident").

Value

A data.frame

Examples

```
## Not run:  
stats <- Cluster_Stats_All_Samples(seurat_object = object, group_by_var = "orig.ident")  
  
## End(Not run)
```

ColorBlind_Pal

Color Universal Design Short Palette

Description

Shortcut to a modified 8 color palette based on Color Universal Design (CUD) colorblindness friendly palette.

Usage

```
ColorBlind_Pal()
```

Value

modified/reordered color palette (8 colors) based on ditto-seq

References

palette is slightly modified version of the Color Universal Design (CUD) colorblindness friendly palette <https://jfly.uni-koeln.de/color/>.

Examples

```
cols <- ColorBlind_Pal()  
PalettePlot(pal = cols)
```

Copy_From_GCP

Copy folder from GCP bucket from R Console

Description

Run command from R console without moving to terminal to copy folder from GCP bucket to local storage

Usage

```
Copy_From_GCP(folder_file_path, gcp_bucket_path)
```

Arguments

folder_file_path
 folder to be copied to GCP bucket.

gcp_bucket_path
 GCP bucket path to copy to files.

Value

No return value. Performs system copy from GCP bucket.

Examples

```
## Not run:
Copy_From_GCP(folder_file_path = "plots/", gcp_bucket_path = "gs://bucket_name_and_folder_path")

## End(Not run)
```

Copy_To_GCP

Copy folder to GCP bucket from R Console

Description

Run command from R console without moving to terminal to copy folder to GCP bucket

Usage

```
Copy_To_GCP(folder_file_path, gcp_bucket_path)
```

Arguments

folder_file_path
 folder to be copied to GCP bucket.

gcp_bucket_path
 GCP bucket path to copy to files.

Value

No return value. Performs system copy to GCP bucket.

Examples

```
## Not run:
Copy_To_GCP(folder_file_path = "plots/", gcp_bucket_path = "gs://bucket_name_and_folder_path")

## End(Not run)
```

Create_10X_H5	<i>Create H5 from 10X Outputs</i>
---------------	-----------------------------------

Description

Creates HDF5 formatted output analogous to the outputs created by Cell Ranger and can be read into Seurat, LIGER, or SCE class object. Requires DropletUtils package from Bioconductor.

Usage

```
Create_10X_H5(  
  raw_data_file_path,  
  source_type = "10X",  
  save_file_path,  
  save_name  
)
```

Arguments

`raw_data_file_path` file path to raw data file(s).

`source_type` type of source data (Default is "10X"). Alternatively can provide "Matrix" or "data.frame".

`save_file_path` file path to directory to save file.

`save_name` name prefix for output H5 file.

Value

A HDF5 format file that will be recognized as 10X Cell Ranger formatted file by Seurat or LIGER.

Examples

```
## Not run:  
Create_10X_H5(raw_data_file_path = "file_path", save_file_path = "file_path2", save_name = "NAME")  
  
## End(Not run)
```

`Create_CellBender_Merged_Seurat`*Create Seurat Object with Cell Bender and Raw data*

Description

Enables easy creation of Seurat object which contains both cell bender data and raw count data as separate assays within the object.

Usage

```
Create_CellBender_Merged_Seurat(  
  raw_cell_bender_matrix = NULL,  
  raw_counts_matrix = NULL,  
  raw_assay_name = "RAW",  
  min_cells = 5,  
  min_features = 200,  
  ...  
)
```

Arguments

<code>raw_cell_bender_matrix</code>	matrix file containing the cell bender correct counts.
<code>raw_counts_matrix</code>	matrix file contain the uncorrected Cell Ranger (or other) counts.
<code>raw_assay_name</code>	a key value to use specifying the name of assay. Default is "RAW".
<code>min_cells</code>	value to supply to min.cells parameter of CreateSeuratObject . Default is 5.
<code>min_features</code>	value to supply to min.features parameter of CreateSeuratObject . Default is 200.
<code>...</code>	Extra parameters passed to CreateSeuratObject .

Value

A Seurat Object contain both the Cell Bender corrected counts ("RNA" assay) and uncorrected counts ("RAW" assay; or other name specified to `raw_assay_name`).

Examples

```
## Not run:  
seurat_obj <- Create_CellBender_Merged_Seurat(raw_cell_bender_matrix = cb_matrix,  
  raw_counts_matrix = cr_matrix)  
  
## End(Not run)
```

Create_Cluster_Annotation_File
Create cluster annotation csv file

Description

create annotation file

Usage

```
Create_Cluster_Annotation_File(  
  file_path = NULL,  
  file_name = "cluster_annotation"  
)
```

Arguments

file_path	path to directory to save file. Default is current working directory.
file_name	name to use for annotation file. Function automatically adds file type ".csv" suffix. Default is "cluster_annotation".

Value

No value returned. Creates .csv file.

Examples

```
## Not run:  
Create_Cluster_Annotation_File(file_path = "cluster_annotation_folder_name")  
  
## End(Not run)
```

Dark2_Pal *Dark2 Palette*

Description

Shortcut to Dark2 color palette from RColorBrewer (8 Colors)

Usage

```
Dark2_Pal()
```

Value

"Dark2" color palette (8 colors)

References

Dark2 palette from RColorBrewer being called through paletteer. See RColorBrewer for more info on palettes <https://CRAN.R-project.org/package=RColorBrewer>

Examples

```
cols <- Dark2_Pal()
PalettePlot(pal= cols)
```

DimPlot_All_Samples *DimPlot by Meta Data Column*

Description

Creates DimPlot layout containing all samples within Seurat Object from orig.ident column

Usage

```
DimPlot_All_Samples(
  seurat_object,
  meta_data_column = "orig.ident",
  colors_use = "black",
  pt.size = NULL,
  title_size = 15,
  num_columns = NULL,
  reduction = NULL,
  dims = c(1, 2),
  raster = NULL,
  raster.dpi = c(512, 512),
  ...
)
```

Arguments

seurat_object	Seurat object name.
meta_data_column	Meta data column to split plots by.
colors_use	single color to use for all plots or a vector of colors equal to the number of plots.
pt.size	Adjust point size for plotting.
title_size	size for plot title labels.
num_columns	number of columns in final layout plot.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
dims	Which dimensions to plot. Defaults to c(1,2) if not specified.

raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
...	Extra parameters passed to <code>DimPlot</code> .

Value

A ggplot object

Examples

```
library(Seurat)

pbmc_small$sample_id <- sample(c("sample1", "sample2"), size = ncol(pbmc_small), replace = TRUE)

DimPlot_All_Samples(seurat_object = pbmc_small, meta_data_column = "sample_id", color = "black",
num_columns = 2)
```

 DimPlot_LIGER

DimPlot LIGER Version

Description

Standard and modified version of LIGER's `plotByDatasetAndCluster`

Usage

```
DimPlot_LIGER(
  liger_object,
  group_by = NULL,
  split_by = NULL,
  colors_use_cluster = NULL,
  colors_use_meta = NULL,
  pt_size = NULL,
  shuffle = TRUE,
  shuffle_seed = 1,
  reduction_label = "UMAP",
  label = TRUE,
  label_size = NA,
  label_repel = FALSE,
  label_box = FALSE,
  label_color = "black",
  combination = FALSE,
  raster = NULL,
  raster.dpi = c(512, 512),
```

```

num_columns = NULL,
ggplot_default_colors = FALSE,
color_seed = 123
)

```

Arguments

<code>liger_object</code>	<code>liger liger_object</code> . Need to perform clustering before calling this function
<code>group_by</code>	Variable to be plotted. If <code>NULL</code> will plot clusters from <code>liger@clusters</code> slot. If <code>combination = TRUE</code> will plot both clusters and meta data variable.
<code>split_by</code>	Variable to split plots by.
<code>colors_use_cluster</code>	colors to use for plotting by clusters. By default if number of levels plotted is less than or equal to 36 will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from DiscretePalette_scCustomize .
<code>colors_use_meta</code>	colors to use for plotting by meta data (<code>cell.data</code>) variable. By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from DiscretePalette_scCustomize .
<code>pt_size</code>	Adjust point size for plotting.
<code>shuffle</code>	logical. Whether to randomly shuffle the order of points. This can be useful for crowded plots if points of interest are being buried. (Default is <code>TRUE</code>).
<code>shuffle_seed</code>	Sets the seed if randomly shuffling the order of points.
<code>reduction_label</code>	What to label the x and y axes of resulting plots. LIGER does not store name of technique and therefore needs to be set manually. Default is "UMAP".
<code>label</code>	logical. Whether or not to label the clusters. ONLY applies to plotting by cluster. Default is <code>TRUE</code> .
<code>label_size</code>	size of cluster labels.
<code>label_repel</code>	logical. Whether to repel cluster labels from each other if plotting by cluster (if <code>group_by = NULL</code> or <code>group_by = "cluster"</code>). Default is <code>FALSE</code> .
<code>label_box</code>	logical. Whether to put a box around the label text (uses <code>geom_text</code> vs <code>geom_label</code>). Default is <code>FALSE</code> .
<code>label_color</code>	Color to use for cluster labels. Default is "black".
<code>combination</code>	logical, whether to return patchwork displaying both plots side by side. (Default is <code>FALSE</code>).
<code>raster</code>	Convert points to raster format. Default is <code>NULL</code> which will rasterize by default if greater than 200,000 cells.
<code>raster.dpi</code>	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
<code>num_columns</code>	Number of columns in plot layout. Only valid if <code>split.by != NULL</code> .
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default <code>ggplot2</code> "hue" palette instead of default "polychrome" or "varibow" palettes.

color_seed random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot/patchwork object

Examples

```
## Not run:
DimPlot_LIGER(liger_object = obj_name, reduction_label = "UMAP")

## End(Not run)
```

DimPlot_scCustom *DimPlot with modified default settings*

Description

Creates DimPlot with some of the settings modified from their Seurat defaults (colors_use, shuffle, label).

Usage

```
DimPlot_scCustom(
  seurat_object,
  colors_use = NULL,
  pt.size = NULL,
  reduction = NULL,
  group.by = NULL,
  split.by = NULL,
  split_seurat = FALSE,
  figure_plot = FALSE,
  shuffle = TRUE,
  seed = 1,
  label = NULL,
  label.size = 4,
  label.color = "black",
  label.box = FALSE,
  dims = c(1, 2),
  repel = FALSE,
  raster = NULL,
  raster.dpi = c(512, 512),
  num_columns = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>colors_use</code>	color palette to use for plotting. By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from <code>DiscretePalette_scCustomize</code> .
<code>pt.size</code>	Adjust point size for plotting.
<code>reduction</code>	Dimensionality Reduction to use (if NULL then defaults to Object default).
<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>); default is the current <code>active.ident</code> of the object.
<code>split.by</code>	Feature to split plots by (i.e. " <code>orig.ident</code> ").
<code>split_seurat</code>	logical. Whether or not to display split plots like Seurat (shared y axis) or as individual plots in layout. Default is FALSE.
<code>figure_plot</code>	logical. Whether to remove the axes and plot with legend on left of plot denoting axes labels. (Default is FALSE). Requires <code>split_seurat = TRUE</code> .
<code>shuffle</code>	logical. Whether to randomly shuffle the order of points. This can be useful for crowded plots if points of interest are being buried. (Default is TRUE).
<code>seed</code>	Sets the seed if randomly shuffling the order of points.
<code>label</code>	Whether to label the clusters. By default if <code>group.by = NULL</code> <code>label = TRUE</code> , and otherwise it is FALSE.
<code>label.size</code>	Sets size of labels.
<code>label.color</code>	Sets the color of the label text.
<code>label.box</code>	Whether to put a box around the label text (<code>geom_text</code> vs <code>geom_label</code>).
<code>dims</code>	Which dimensions to plot. Defaults to <code>c(1,2)</code> if not specified.
<code>repel</code>	Repel labels.
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
<code>raster.dpi</code>	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
<code>num_columns</code>	Number of columns in plot layout. Only valid if <code>split.by != NULL</code> .
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default <code>ggplot2</code> "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to <code>DimPlot</code> .

Value

A ggplot object

References

Many of the param names and descriptions are from Seurat to facilitate ease of use as this is simply a wrapper to alter some of the default parameters <https://github.com/satijalab/seurat/blob/master/R/visualization.R> (License: GPL-3). `figure_plot` parameter/code modified from code by Tim Stuart via twitter: <https://twitter.com/timoast/status/1526237116035891200?s=20&t=foJOF81aPSjr1t7pk1cUPg>.

Examples

```
library(Seurat)
DimPlot_scCustom(seurat_object = pbmc_small)
```

DiscretePalette_scCustomize
Discrete color palettes

Description

Helper function to return a number of discrete color palettes.

Usage

```
DiscretePalette_scCustomize(
  num_colors,
  palette = NULL,
  shuffle_pal = FALSE,
  seed = 123
)
```

Arguments

<code>num_colors</code>	Number of colors to be generated.
<code>palette</code>	Options are "alphabet", "alphabet2", "glasbey", "polychrome", "stepped", "ditto_seq", "varibow".
<code>shuffle_pal</code>	randomly shuffle the outputted palette. Most useful for <code>varibow</code> palette as that is normally an ordered palette.
<code>seed</code>	random seed for the palette shuffle. Default = 123.

Value

A vector of colors

References

This function uses the paletteer package <https://github.com/EmilHvitfeldt/paletteer> to provide simplified access to color palettes from many different R package sources while minimizing scCustomize current and future dependencies.

The following packages & palettes are called by this function (see individual packages for palette references/citations):

1. pals (via paletteer) <https://CRAN.R-project.org/package=pals>
 - alphabet, alphabet2, glasbey, polychrome, and stepped.
2. dittoSeq <https://bioconductor.org/packages/release/bioc/html/dittoSeq.html>
 - dittoColors.
3. colorway <https://github.com/hypercompetent/colorway>
 - varibow

Function name and implementation modified from Seurat (License: GPL-3). <https://github.com/satijalab/seurat>

Examples

```
pal <- DiscretePalette_scCustomize(num_colors = 36, palette = "varibow")
PalettePlot(pal= pal)
```

DotPlot_scCustom

Customized DotPlot

Description

Code for creating customized DotPlot

Usage

```
DotPlot_scCustom(
  seurat_object,
  features,
  colors_use = viridis_plasma_dark_high,
  remove_axis_titles = TRUE,
  x_lab_rotate = FALSE,
  y_lab_rotate = FALSE,
  facet_label_rotate = FALSE,
  flip_axes = FALSE,
  ...
)
```

Arguments

seurat_object Seurat object name.
 features Features to plot.
 colors_use specify color palette to used. Default is viridis_plasma_dark_high.
 remove_axis_titles
 logical. Whether to remove the x and y axis titles. Default = TRUE.
 x_lab_rotate Rotate x-axis labels 45 degrees (Default is FALSE).
 y_lab_rotate Rotate x-axis labels 45 degrees (Default is FALSE).
 facet_label_rotate
 Rotate facet labels on grouped DotPlots by 45 degrees (Default is FALSE).
 flip_axes whether or not to flip and X and Y axes (Default is FALSE).
 ... Extra parameters passed to [DotPlot](#).

Value

A ggplot object

Examples

```

library(Seurat)
DotPlot_scCustom(seurat_object = pbmc_small, features = c("CD3E", "CD8", "GZMB", "MS4A1"))

```

ensembl_mito_id	<i>Ensembl Mito IDs</i>
-----------------	-------------------------

Description

A list of ensembl ids for mitochondrial genes (Ensembl version 105)

Usage

```
ensembl_mito_id
```

Format

A list of six vectors

Mus_musculus_mito_ensembl Ensembl IDs for mouse mitochondrial genes

Homo_sapiens_mito_ensembl Ensembl IDs for human mitochondrial genes

Danio_rerio_mito_ensembl Ensembl IDs for zebrafish mitochondrial genes

Rattus_norvegicus_mito_ensembl Ensembl IDs for rat mitochondrial genes

Drosophila_melanogaster_mito_ensembl Ensembl IDs for fly mitochondrial genes

Macaca_mulatta_mito_ensembl Ensembl IDs for macaque mitochondrial genes

ensembl_ribo_id	<i>Ensembl Ribo IDs</i>
-----------------	-------------------------

Description

A list of ensembl ids for ribosomal genes (Ensembl version 105)

Usage

```
ensembl_ribo_id
```

Format

A list of seven vectors

Mus_musculus_ribo_ensembl Ensembl IDs for mouse ribosomal genes

Homo_sapiens_ribo_ensembl Ensembl IDs for human ribosomal genes

Callithrix_jacchus_ribo_ensembl Ensembl IDs for marmoset ribosomal genes

Danio_rerio_ribo_ensembl Ensembl IDs for zebrafish ribosomal genes

Rattus_norvegicus_ribo_ensembl Ensembl IDs for rat ribosomal genes

Drosophila_melanogaster_ribo_ensembl Ensembl IDs for fly ribosomal genes

Macaca_mulatta_ribo_ensembl Ensembl IDs for macaque ribosomal genes

Extract_Sample_Meta	<i>Extract sample level meta.data</i>
---------------------	---------------------------------------

Description

Returns a by identity meta.data data.frame with one row per sample. Useful for downstream quick view of sample breakdown, meta data table creation, and/or use in pseudobulk analysis

Usage

```
Extract_Sample_Meta(  
  object,  
  sample_name = "orig.ident",  
  variables_include = NULL,  
  variables_exclude = NULL,  
  include_all = FALSE  
)
```

Arguments

object	Seurat object
sample_name	meta.data column to use as sample. Output data.frame will contain one row per level or unique value in this variable.
variables_include	@meta.data columns to keep in final data.frame. All other columns will be discarded. Default is NULL.
variables_exclude	columns to discard in final data.frame. Many cell level columns are irrelevant at the sample level (e.g., nFeature_RNA, percent_mito). <ul style="list-style-type: none"> • Default parameter value is NULL but internally will set to discard nFeature_ASSAY(s), nCount_ASSAY(s), percent_mito, percent_ribo, percent_mito_ribo, and log10GenesPerUMI. • If sample level median values are desired for these type of variables the output of this function can be joined with output of Median_Stats. • Set parameter to include_all = TRUE to prevent any columns from being excluded.
include_all	logical, whether or not to include all object meta data columns in output data.frame. Default is FALSE.

Value

Returns a data.frame with one row per sample_name.

Examples

```
library(Seurat)
pbmc_small$batch <- sample(c("batch1", "batch2"), size = ncol(pbmc_small), replace = TRUE)

sample_meta <- Extract_Sample_Meta(object = pbmc_small, sample_name = "orig.ident")

# Only return specific columns from meta data (orig.ident and batch)
sample_meta <- Extract_Sample_Meta(object = pbmc_small, sample_name = "orig.ident",
variables_include = "batch")

# Return all columns from meta data
sample_meta <- Extract_Sample_Meta(object = pbmc_small, sample_name = "orig.ident",
include_all = TRUE)
```

Extract_Top_Markers *Extract Top N Marker Genes*

Description

Extract vector gene list (or named gene vector) from data.frame results of [FindAllMarkers](#) or similar analysis.

Usage

```
Extract_Top_Markers(
  marker_dataframe,
  num_genes = 10,
  group_by = "cluster",
  rank_by = "avg_log2FC",
  gene_column = "gene",
  gene_rownames_to_column = FALSE,
  data_frame = FALSE,
  named_vector = TRUE,
  make_unique = FALSE
)
```

Arguments

marker_dataframe	data.frame output from FindAllMarkers or similar analysis.
num_genes	number of genes per group (e.g., cluster) to include in output list.
group_by	column name of marker_dataframe to group data by. Default is "cluster" based on FindAllMarkers .
rank_by	column name of marker_dataframe to rank data by when selecting num_genes per group_by. Default is "avg_log2FC" based on FindAllMarkers .
gene_column	column name of marker_dataframe that contains the gene IDs. Default is "gene" based on FindAllMarkers .
gene_rownames_to_column	logical. Whether gene IDs are stored in rownames and should be moved to column. Default is FALSE.
data_frame	Logical, whether or not to return filtered data.frame of the original markers_dataframe or to return a vector of gene IDs. Default is FALSE.
named_vector	Logical, whether or not to name the vector of gene names that is returned by the function. If TRUE will name the vector using the column provided to group_by. Default is TRUE.
make_unique	Logical, whether an unnamed vector should return only unique values. Default is FALSE. Not applicable when data_frame = TRUE or named_vector = TRUE.

Value

filtered data.frame, vector, or named vector containing gene IDs.

Examples

```
## Not run:
top10_genes <- Extract_Top_Markers(marker_dataframe = markers_results, num_genes = 10,
group_by = "cluster", rank_by = "avg_log2FC")

## End(Not run)
```

 FeaturePlot_DualAssay *Customize FeaturePlot of two assays*

Description

Create Custom FeaturePlots and preserve scale (no binning) from same features in two assays simultaneously. Intended for plotting same modality present in two assays.

Usage

```
FeaturePlot_DualAssay(
  seurat_object,
  features,
  assay1 = "RAW",
  assay2 = "RNA",
  colors_use = viridis_plasma_dark_high,
  na_color = "lightgray",
  order = TRUE,
  pt.size = NULL,
  reduction = NULL,
  na_cutoff = 1e-09,
  raster = NULL,
  raster.dpi = c(512, 512),
  slot = "data",
  num_columns = NULL,
  alpha_exp = NULL,
  alpha_na_exp = NULL,
  ...
)
```

Arguments

seurat_object	Seurat object name.
features	Feature(s) to plot.
assay1	name of assay one. Default is "RAW" as featured in Create_CellBender_Merged_Seurat
assay2	name of assay two Default is "RNA" as featured in Create_CellBender_Merged_Seurat
colors_use	list of colors or color palette to use.
na_color	color to use for points below lower limit.
order	whether to move positive cells to the top (default = TRUE).
pt.size	Adjust point size for plotting.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
na_cutoff	Value to use as minimum expression cutoff. To set no cutoff set to NA.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.

raster.dpi	Pixel resolution for rasterized plots, passed to geom_scattermore(). Default is c(512, 512).
slot	Which slot to pull expression data from? Default is "data".
num_columns	Number of columns in plot layout. If number of features > 1 then num_columns dictates the number of columns in overall layout (num_columns = 1 means stacked layout & num_columns = 2 means adjacent layout).
alpha_exp	new alpha level to apply to expressing cell color palette (colors_use). Must be value between 0-1.
alpha_na_exp	new alpha level to apply to non-expressing cell color palette (na_color). Must be value between 0-1.
...	Extra parameters passed to FeaturePlot .

Value

A ggplot object

Examples

```
## Not run:
FeaturePlot_DualAssay(seurat_object = object, features = "Cx3cr1", assay1 = "RAW", assay2 = "RNA",
  colors_use = viridis_plasma_dark_high, na_color = "lightgray")

## End(Not run)
```

FeaturePlot_scCustom *Customize FeaturePlot*

Description

Create Custom FeaturePlots and preserve scale (no binning)

Usage

```
FeaturePlot_scCustom(
  seurat_object,
  features,
  colors_use = viridis_plasma_dark_high,
  na_color = "lightgray",
  order = TRUE,
  pt.size = NULL,
  reduction = NULL,
  na_cutoff = 1e-09,
  raster = NULL,
  raster.dpi = c(512, 512),
  split.by = NULL,
```

```

    num_columns = NULL,
    slot = "data",
    alpha_exp = NULL,
    alpha_na_exp = NULL,
    label = FALSE,
    label_feature_yaxis = FALSE,
    combine = TRUE,
    ...
)

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>features</code>	Feature(s) to plot.
<code>colors_use</code>	list of colors or color palette to use.
<code>na_color</code>	color to use for points below lower limit.
<code>order</code>	whether to move positive cells to the top (default = TRUE).
<code>pt.size</code>	Adjust point size for plotting.
<code>reduction</code>	Dimensionality Reduction to use (if NULL then defaults to Object default).
<code>na_cutoff</code>	Value to use as minimum expression cutoff. This will be lowest value plotted use palette provided to <code>colors_use</code> . Leave as default value to plot only positive non-zero values using color scale and zero/negative values as NA. To plot all values using color palette set to NA.
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
<code>raster.dpi</code>	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
<code>split.by</code>	Variable in <code>@meta.data</code> to split the plot by.
<code>num_columns</code>	Number of columns in plot layout.
<code>slot</code>	Which slot to pull expression data from? Default is "data".
<code>alpha_exp</code>	new alpha level to apply to expressing cell color palette (<code>colors_use</code>). Must be value between 0-1.
<code>alpha_na_exp</code>	new alpha level to apply to non-expressing cell color palette (<code>na_color</code>). Must be value between 0-1.
<code>label</code>	logical, whether to label the clusters. Default is FALSE.
<code>label_feature_yaxis</code>	logical, whether to place feature labels on secondary y-axis as opposed to above legend key. Default is FALSE. When setting <code>label_feature_yaxis = TRUE</code> the number of columns in plot output will automatically be set to the number of levels in <code>split.by</code>
<code>combine</code>	Combine plots into a single patchworked ggplot object. If FALSE, return a list of ggplot objects.
<code>...</code>	Extra parameters passed to FeaturePlot .

Value

A ggplot object

Examples

```
library(Seurat)
FeaturePlot_scCustom(seurat_object = pbmc_small, features = "CD3E",
  colors_use = viridis_plasma_dark_high, na_color = "lightgray")
```

Fetch_Meta

Get meta data from object

Description

Quick function to properly pull meta.data from objects.

Usage

```
Fetch_Meta(object)

## S3 method for class 'Seurat'
Fetch_Meta(object)

## S3 method for class 'liger'
Fetch_Meta(object)
```

Arguments

object Object of class Seurat or liger.

Value

A data.frame containing cell-level meta data

Examples

```
library(Seurat)
meta_data <- Fetch_Meta(object = pbmc_small)
head(meta_data, 5)
```

Gene_Present	<i>Check if genes/features are present</i>
--------------	--

Description

Check if genes are present in object and return vector of found genes. Return warning messages for genes not found.

Usage

```
Gene_Present(
  data,
  gene_list,
  case_check = TRUE,
  case_check_msg = TRUE,
  print_msg = TRUE,
  omit_warn = TRUE,
  return_none = FALSE,
  seurat_assay = NULL
)
```

Arguments

data	Name of input data. Currently only data of classes: Seurat, liger, data.frame, dgCMatrx, dgTMatrix, tibble are accepted. Gene_IDs must be present in row-names of the data.
gene_list	vector of genes to check.
case_check	logical. Whether or not to check if features are found if the case is changed from the input list (Sentence case to Upper and vice versa). Default is TRUE.
case_check_msg	logical. Whether to print message to console if alternate case features are found in addition to inclusion in returned list. Default is TRUE.
print_msg	logical. Whether message should be printed if all features are found. Default is TRUE.
omit_warn	logical. Whether to print message about features that are not found in current object. Default is TRUE.
return_none	logical. Whether list of found vs. bad features should still be returned if no features are found. Default is FALSE.
seurat_assay	Name of assay to pull feature names from if data is Seurat Object. Defaults to DefaultAssay(OBJ) if NULL.

Value

A list of length 3 containing 1) found features, 2) not found features, 3) features found if case was modified.

Examples

```
## Not run:
features <- Gene_Present(data = obj_name, gene_list = DEG_list, print_msg = TRUE, case_check = TRUE)
found_features <- features[[1]]

## End(Not run)
```

Hue_Pal

Hue_Pal

Description

Shortcut to hue_pal to return to ggplot2 defaults if user desires, from scales package.

Usage

```
Hue_Pal(num_colors)
```

Arguments

num_colors number of colors to return in palette.

Value

hue color palette (as many colors as desired)

Examples

```
cols <- Hue_Pal(num_colors = 8)
PalettePlot(pal= cols)
```

Iterate_Cluster_Highlight_Plot

Iterate Cluster Highlight Plot

Description

Iterate the create plots with cluster of interest highlighted across all cluster (active.idents) in given Seurat Object

Usage

```
Iterate_Cluster_Highlight_Plot(
  seurat_object,
  highlight_color = "navy",
  background_color = "lightgray",
  pt.size = NULL,
  reduction = NULL,
  file_path = NULL,
  file_name = NULL,
  file_type = NULL,
  single_pdf = FALSE,
  dpi = 600,
  raster = NULL,
  ...
)
```

Arguments

seurat_object	Seurat object name.
highlight_color	Color to highlight cells (default "navy"). Can provide either single color to use for all clusters/plots or a vector of colors equal to the number of clusters to use (in order) for the clusters/plots.
background_color	non-highlighted cell colors.
pt.size	point size for both highlighted cluster and background.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
file_path	directory file path and/or file name prefix. Defaults to current wd.
file_name	name suffix to append after sample name.
file_type	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
single_pdf	saves all plots to single PDF file (default = FALSE). 'file_type' must be .pdf
dpi	dpi for image saving.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
...	Extra parameters passed to DimPlot .

Value

Saved plots

Examples

```
## Not run:
Iterate_Cluster_Highlight_Plot(seurat_object = object, highlight_color = "navy",
background_color = "lightgray", file_path = "path/", file_name = "name", file_type = "pdf",
```

```
single_pdf = TRUE)
## End(Not run)
```

```
Iterate_DimPlot_bySample
  Iterate DimPlot By Sample
```

Description

Iterate DimPlot by orig.ident column from Seurat object metadata

Usage

```
Iterate_DimPlot_bySample(
  seurat_object,
  file_path = NULL,
  file_name = NULL,
  file_type = NULL,
  single_pdf = FALSE,
  dpi = 600,
  color = "black",
  reduction = NULL,
  dims = c(1, 2),
  pt.size = NULL,
  ...
)
```

Arguments

seurat_object	Seurat object name.
file_path	directory file path and/or file name prefix. Defaults to current wd.
file_name	name suffix to append after sample name.
file_type	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
single_pdf	saves all plots to single PDF file (default = FALSE). 'file_type' must be .pdf
dpi	dpi for image saving.
color	color scheme to use.
reduction	Dimensionality Reduction to use (default is object default).
dims	Dimensions to plot.
pt.size	Adjust point size for plotting.
...	Extra parameters passed to DimPlot .

Value

A ggplot object

Examples

```
## Not run:  
Iterate_DimPlot_bySample(seurat_object = object, file_path = "plots/", file_name = "tsne",  
file_type = ".jpg", dpi = 600, color = "black")  
  
## End(Not run)
```

Iterate_FeaturePlot_scCustom

Iterative Plotting of Gene Lists using Custom FeaturePlots

Description

Create and Save plots for Gene list with Single Command

Usage

```
Iterate_FeaturePlot_scCustom(  
  seurat_object,  
  gene_list,  
  colors_use = viridis_plasma_dark_high,  
  na_color = "lightgray",  
  na_cutoff = 1e-09,  
  split.by = NULL,  
  order = TRUE,  
  return_plots = FALSE,  
  file_path = NULL,  
  file_name = NULL,  
  file_type = NULL,  
  single_pdf = FALSE,  
  dpi = 600,  
  pt.size = NULL,  
  reduction = NULL,  
  raster = NULL,  
  alpha_exp = NULL,  
  alpha_na_exp = NULL,  
  ...  
)
```

Arguments

seurat_object	Seurat object name.
gene_list	vector of genes to plot. If a named vector is provided then the names for each gene will be incorporated into plot title if <code>single_pdf = TRUE</code> or into file name if <code>FALSE</code> .
colors_use	color scheme to use.
na_color	color for non-expressed cells.
na_cutoff	Value to use as minimum expression cutoff. To set no cutoff set to NA.
split.by	Variable in <code>@meta.data</code> to split the plot by.
order	whether to move positive cells to the top (default = <code>TRUE</code>).
return_plots	logical. Whether to return plots to list instead of saving them to file(s). Default is <code>FALSE</code> .
file_path	directory file path and/or file name prefix. Defaults to current wd.
file_name	name suffix and file extension.
file_type	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
single_pdf	saves all plots to single PDF file (default = <code>FALSE</code>). 'file_type' must be .pdf.
dpi	dpi for image saving.
pt.size	Adjust point size for plotting.
reduction	Dimensionality Reduction to use (if <code>NULL</code> then defaults to Object default).
raster	Convert points to raster format. Default is <code>NULL</code> which will rasterize by default if greater than 200,000 cells.
alpha_exp	new alpha level to apply to expressing cell color palette (<code>colors_use</code>). Must be value between 0-1.
alpha_na_exp	new alpha level to apply to non-expressing cell color palette (<code>na_color</code>). Must be value between 0-1.
...	Extra parameters passed to FeaturePlot .

Value

Saved plots

Examples

```
## Not run:
Iterate_FeaturePlot_scCustom(seurat_object = object, gene_list = DEG_list,
  colors_use = viridis_plasma_dark_high, na_color = "lightgray", file_path = "plots/",
  file_name = "tsne", file_type = ".jpg", dpi = 600)

## End(Not run)
```

Iterate_Meta_Highlight_Plot
Iterate Meta Highlight Plot

Description

Iterate the create plots with meta data variable of interest highlighted.

Usage

```
Iterate_Meta_Highlight_Plot(
  seurat_object,
  meta_data_column,
  new_meta_order = NULL,
  meta_data_sort = TRUE,
  highlight_color = "navy",
  background_color = "lightgray",
  pt.size = NULL,
  reduction = NULL,
  file_path = NULL,
  file_name = NULL,
  file_type = NULL,
  single_pdf = FALSE,
  dpi = 600,
  raster = NULL,
  ...
)
```

Arguments

seurat_object	Seurat object name.
meta_data_column	Name of the column in seurat_object@meta.data slot to pull value from for highlighting.
new_meta_order	The order in which to plot each level within meta_data_column if single_PDF is TRUE.
meta_data_sort	logical. Whether or not to sort and relevel the levels in meta_data_column if single_PDF is TRUE. Default is TRUE.
highlight_color	Color to highlight cells (default "navy"). Can provide either single color to use for all clusters/plots or a vector of colors equal to the number of clusters to use (in order) for the clusters/plots.
background_color	non-highlighted cell colors.
pt.size	point size for both highlighted cluster and background.

reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
file_path	directory file path and/or file name prefix. Defaults to current wd.
file_name	name suffix to append after sample name.
file_type	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
single_pdf	saves all plots to single PDF file (default = FALSE). 'file_type' must be .pdf
dpi	dpi for image saving.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
...	Extra parameters passed to <code>DimPlot</code> .

Value

Saved plots

Examples

```
## Not run:
Iterate_Meta_Highlight_Plot(seurat_object = object, meta_data_column = "sample_id",
highlight_color = "navy", background_color = "lightgray", file_path = "path/",
file_name = "name", file_type = "pdf", single_pdf = TRUE)

## End(Not run)
```

Iterate_PC>Loading_Plots

Iterate PC Loading Plots

Description

Plot PC Heatmaps and Dim Loadings for exploratory analysis

Usage

```
Iterate_PC>Loading_Plots(
  seurat_object,
  dims_plot = NULL,
  file_path = NULL,
  name_prefix = NULL,
  file_name = "PC>Loading_Plots",
  return_plots = FALSE
)
```

Arguments

seurat_object	Seurat object name.
dims_plot	number of PCs to plot (integer). Default is all dims present in PCA.
file_path	directory file path to save file.
name_prefix	prefix for file name (optional).
file_name	suffix for file name. Default is "PC_Loading_Plots".
return_plots	Whether to return the plot list (Default is FALSE). Must assign to environment to save plot list.

Value

A list of plots outputted as pdf

See Also

[PCHeatmap](#) and [VizDimLoadings](#)

Examples

```
## Not run:  
Iterate_PC_Loading_Plots(seurat_object = seurat, dims_plot = 25, file_path = "plots/")  
  
## End(Not run)
```

Iterate_Plot_Density_Custom

Iterative Plotting of Gene Lists using Custom Density Plots

Description

Create and save plots for gene list with single command. Requires Nebulosa package from Bioconductor.

Usage

```
Iterate_Plot_Density_Custom(  
  seurat_object,  
  gene_list,  
  viridis_palette = "magma",  
  custom_palette = NULL,  
  pt.size = 1,  
  file_path = NULL,  
  file_name = NULL,  
  file_type = NULL,  
  single_pdf = FALSE,
```

```

    dpi = 600,
    reduction = NULL,
    combine = TRUE,
    joint = FALSE,
    ...
)

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>gene_list</code>	vector of genes to plot. If a named vector is provided then the names for each gene will be incorporated into plot title if <code>single_pdf = TRUE</code> or into file name if <code>FALSE</code> .
<code>viridis_palette</code>	color scheme to use.
<code>custom_palette</code>	color for non-expressed cells.
<code>pt.size</code>	Adjust point size for plotting.
<code>file_path</code>	directory file path and/or file name prefix. Defaults to current wd.
<code>file_name</code>	name suffix and file extension.
<code>file_type</code>	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
<code>single_pdf</code>	saves all plots to single PDF file (default = <code>FALSE</code>). "file_type" must be .pdf.
<code>dpi</code>	dpi for image saving.
<code>reduction</code>	Dimensionality Reduction to use (if <code>NULL</code> then defaults to Object default)
<code>combine</code>	Create a single plot? If <code>FALSE</code> , a list with ggplot objects is returned.
<code>joint</code>	<code>NULL</code> . This function only supports <code>joint = FALSE</code> . Leave as <code>NULL</code> to generate plots. To iterate joint plots see function: <code>Iterate_Plot_Density_Joint</code> .
<code>...</code>	Extra parameters passed to <code>plot_density</code> .

Value

Saved plots

Examples

```

## Not run:
Iterate_Plot_Density_Custom(seurat_object = object, gene_list = DEG_list, viridis_palette = "magma",
file_path = "plots/", file_name = "_density_plots", file_type = ".jpg", dpi = 600)

## End(Not run)

```

`Iterate_Plot_Density_Joint`*Iterative Plotting of Gene Lists using Custom Joint Density Plots*

Description

Create and save plots for gene list with single command. Requires Nebulosa package from Bioconductor.

Usage

```
Iterate_Plot_Density_Joint(  
  seurat_object,  
  gene_list,  
  viridis_palette = "magma",  
  custom_palette = NULL,  
  pt.size = 1,  
  file_path = NULL,  
  file_name = NULL,  
  file_type = NULL,  
  single_pdf = FALSE,  
  dpi = 600,  
  reduction = NULL,  
  combine = TRUE,  
  joint = NULL,  
  ...  
)
```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>gene_list</code>	a list of vectors of genes to plot jointly. Each entry in the list will be plotted for the joint density. All entries in list must be greater than 2 features. If a named list is provided then the names for each list entry will be incorporated into plot title if <code>single_pdf = TRUE</code> or into file name if <code>FALSE</code> .
<code>viridis_palette</code>	color scheme to use.
<code>custom_palette</code>	color for non-expressed cells.
<code>pt.size</code>	Adjust point size for plotting.
<code>file_path</code>	directory file path and/or file name prefix. Defaults to current wd.
<code>file_name</code>	name suffix and file extension.
<code>file_type</code>	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
<code>single_pdf</code>	saves all plots to single PDF file (default = FALSE). 'file_type' must be .pdf.

dpi	dpi for image saving.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default)
combine	Create a single plot? If FALSE, a list with ggplot objects is returned.
joint	NULL. This function only supports joint = FALSE. Leave as NULL to generate plots. To iterate joint plots see function: Iterate_Plot_Density_Joint.
...	Extra parameters passed to <code>plot_density</code> .

Value

Saved plots

Examples

```
## Not run:
Iterate_Plot_Density_Joint(seurat_object = object, gene_list = DEG_list, viridis_palette = "magma",
file_path = "plots/", file_name = "joint_plots", file_type = ".jpg", dpi = 600)

## End(Not run)
```

Iterate_VlnPlot_scCustom

Iterative Plotting of Gene Lists using VlnPlot_scCustom

Description

Create and Save plots for Gene list with Single Command

Usage

```
Iterate_VlnPlot_scCustom(
  seurat_object,
  gene_list,
  colors_use = NULL,
  pt.size = NULL,
  group.by = NULL,
  split.by = NULL,
  file_path = NULL,
  file_name = NULL,
  file_type = NULL,
  single_pdf = FALSE,
  raster = NULL,
  dpi = 600,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```


Arguments

<code>seurat_object</code>	Seurat object name.
<code>gene_list</code>	list of genes to plot.
<code>colors_use</code>	color palette to use for plotting. By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from <code>DiscretePalette_scCustomize</code> .
<code>pt.size</code>	point size for plotting.
<code>group.by</code>	Name of one or more metadata columns to group (color) plot by (for example, <code>orig.ident</code>); default is the current <code>active.ident</code> of the object.
<code>split.by</code>	Feature to split plots by (i.e. "orig.ident").
<code>file_path</code>	directory file path and/or file name prefix. Defaults to current wd.
<code>file_name</code>	name suffix and file extension.
<code>file_type</code>	File type to save output as. Must be one of following: ".pdf", ".png", ".tiff", ".jpeg", or ".svg".
<code>single_pdf</code>	saves all plots to single PDF file (default = FALSE). 'file_type' must be .pdf.
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>dpi</code>	dpi for image saving.
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to <code>VlnPlot</code> .

Value

Saved plots

Examples

```
## Not run:
Iterate_VlnPlot_scCustom(seurat_object = object, gene_list = DEG_list, colors = color_list,
file_path = "plots/", file_name = "_vln", file_type = ".jpg", dpi = 600)

## End(Not run)
```

JCO_Four	<i>Four Color Palette (JCO)</i>
----------	---------------------------------

Description

Shortcut to a specific JCO 4 color palette from ggsci package.

Usage

```
JCO_Four()
```

Value

4 color palette from the JCO ggsci palette

References

Selection of colors from the JCO palette from ggsci being called through paletteer. See ggsci for more info on palettes <https://CRAN.R-project.org/package=ggsci>

Examples

```
cols <- JCO_Four()
PalettePlot(pal= cols)
```

Liger_to_Seurat	<i>Create a Seurat object containing the data from a liger object</i>
-----------------	---

Description

Merges raw.data and scale.data of object, and creates Seurat object with these values along with tsne.coords, iNMF factorization, and cluster assignments. Supports Seurat V2 and V3.

Usage

```
Liger_to_Seurat(  
  liger_object,  
  nms = names(liger_object@H),  
  renormalize = TRUE,  
  use.liger.genes = TRUE,  
  by.dataset = FALSE,  
  keep_meta = TRUE,  
  reduction_label = NULL,  
  seurat_assay = "RNA"  
)
```

Arguments

<code>liger_object</code>	liger object.
<code>nms</code>	By default, labels cell names with dataset of origin (this is to account for cells in different datasets which may have same name). Other names can be passed here as vector, must have same length as the number of datasets. (default <code>names(H)</code>).
<code>renormalize</code>	Whether to log-normalize raw data using Seurat defaults (default <code>TRUE</code>).
<code>use.liger.genes</code>	Whether to carry over variable genes (default <code>TRUE</code>).
<code>by.dataset</code>	Include dataset of origin in cluster identity in Seurat object (default <code>FALSE</code>).
<code>keep_meta</code>	logical. Whether to transfer additional metadata (nGene/nUMI/dataset already transferred) to new Seurat Object. Default is <code>TRUE</code> .
<code>reduction_label</code>	Name of dimensionality reduction technique used. Enables accurate transfer or name to Seurat object instead of defaulting to "tSNE".
<code>seurat_assay</code>	Name to set for assay in Seurat Object. Default is "RNA".

Details

Stores original dataset identity by default in new object metadata if dataset names are passed in `nms`. iNMF factorization is stored in `dim.reduction` object with key "iNMF".

Value

Seurat object with `raw.data`, `scale.data`, `reduction_label`, `iNMF`, and `ident` slots set.

References

Original function is part of LIGER package <https://github.com/welch-lab/liger> (Licence: GPL-3). Function was slightly modified for use in `scCustomize` with `keep.meta` parameter. Also posted as PR to liger GitHub.

Examples

```
## Not run:  
seurat_object <- Liger_to_Seurat(liger_object = LIGER_OBJ, reduction_label = "UMAP")  
  
## End(Not run)
```

Median_Stats	<i>Median Statistics</i>
--------------	--------------------------

Description

Get quick values for median Genes, UMIs, %mito per cell grouped by meta.data variable.

Usage

```
Median_Stats(  
  seurat_object,  
  group_by_var = "orig.ident",  
  default_var = TRUE,  
  median_var = NULL  
)
```

Arguments

seurat_object	Seurat object name.
group_by_var	Column in meta.data slot to group results by (default = "orig.ident").
default_var	logical. Whether to include the default meta.data variables of: "nCount_RNA", "nFeature_RNA", "percent_mito", "percent_ribo", "percent_mito_ribo" in addition to variables supplied to median_var.
median_var	Column(s) in @meta.data to calculate medians for in addition to defaults. Must be of class() integer or numeric.

Value

A data.frame.

Examples

```
## Not run:  
med_stats <- Median_Stats(seurat_object - obj, group_by_var = "orig.ident")  
  
## End(Not run)
```

Merge_Seurat_List	<i>Merge a list of Seurat Objects</i>
-------------------	---------------------------------------

Description

Enables easy merge of a list of Seurat Objects. See [merge](#) for more information,

Usage

```
Merge_Seurat_List(  
  list_seurat,  
  add.cell.ids = NULL,  
  merge.data = TRUE,  
  project = "SeuratProject"  
)
```

Arguments

<code>list_seurat</code>	list composed of multiple Seurat Objects.
<code>add.cell.ids</code>	A character vector of length(x = c(x, y)). Appends the corresponding values to the start of each objects' cell names. See merge .
<code>merge.data</code>	Merge the data slots instead of just merging the counts (which requires renormalization). This is recommended if the same normalization approach was applied to all objects. See merge .
<code>project</code>	Project name for the Seurat object. See merge .

Value

A Seurat Object

Examples

```
## Not run:  
object_list <- list(obj1, obj2, obj3, ...)  
merged_object <- Merge_Seurat_List(list_seurat = object_list)  
  
## End(Not run)
```

Merge_Sparse_Data_All *Merge a list of Sparse Matrices*

Description

Enables easy merge of a list of sparse matrices

Usage

```
Merge_Sparse_Data_All(  
  matrix_list,  
  add_cell_ids = NULL,  
  prefix = TRUE,  
  cell_id_delimiter = "_"  
)
```

Arguments

`matrix_list` list of matrices to merge.

`add_cell_ids` a vector of sample ids to add as prefix to cell barcode during merge.

`prefix` logical. Whether `add_cell_ids` should be added as prefix to current cell barcodes/names or as suffix to current cell barcodes/names. Default is TRUE, add as prefix.

`cell_id_delimiter`
The delimiter to use when adding cell id prefix/suffix. Default is "_".

Value

A sparse Matrix

References

Original function is part of LIGER package as non-exported function <https://github.com/welch-lab/liger/blob/master/R/utilities.R> (License: GPL-3). Function was modified for use in `scCustomize` (add progress bar, prefix vs. suffix, and delimiter options).

Examples

```
## Not run:  
data_list <- Read10X_GEO(...)  
merged <- Merge_Sparse_Data_All(matrix_list = data_list, add_cell_ids = names(data_list),  
  prefix = TRUE, cell_id_delimiter = "_")  
  
## End(Not run)
```

Meta_Highlight_Plot *Meta Highlight Plot*

Description

Create Plot with meta data variable of interest highlighted

Usage

```
Meta_Highlight_Plot(
  seurat_object,
  meta_data_column,
  meta_data_highlight,
  highlight_color = NULL,
  background_color = "lightgray",
  pt.size = NULL,
  raster = NULL,
  raster.dpi = c(512, 512),
  label = FALSE,
  split.by = NULL,
  split_seurat = FALSE,
  ggplot_default_colors = FALSE,
  ...
)
```

Arguments

seurat_object	Seurat object name.
meta_data_column	Name of the column in seurat_object@meta.data slot to pull value from for highlighting.
meta_data_highlight	Name of variable(s) within meta_data_name to highlight in the plot.
highlight_color	Color to highlight cells (default "navy").
background_color	non-highlighted cell colors.
pt.size	point size for both highlighted cluster and background.
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to geom_scattermore(). Default is c(512, 512).
label	Whether to label the highlighted meta data variable(s). Default is FALSE.
split.by	Variable in @meta.data to split the plot by.

`split_seurat` logical. Whether or not to display split plots like Seurat (shared y axis) or as individual plots in layout. Default is FALSE.

`ggplot_default_colors` logical. If `colors_use = NULL`, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.

... Extra parameters passed to `DimPlot`.

Value

A ggplot object

Examples

```
library(Seurat)
pbmc_small$sample_id <- sample(c("sample1", "sample2"), size = ncol(pbmc_small), replace = TRUE)

Meta_Highlight_Plot(seurat_object = pbmc_small, meta_data_column = "sample_id",
  meta_data_highlight = "sample1", highlight_color = "gold", background_color = "lightgray",
  pt.size = 2)
```

Meta_Numeric

Check if meta data columns are numeric

Description

Check if any present meta data columns are numeric and returns vector of valid numeric columns. Issues warning message if any columns not in numeric form.

Usage

```
Meta_Numeric(data)
```

Arguments

`data` a data.frame contain meta.data.

Value

vector of meta data columns that are numeric.

Examples

```
## Not run:
numeric_meta_columns <- Meta_Numeric(data = meta_data)

## End(Not run)
```

Meta_Present	<i>Check if meta data are present</i>
--------------	---------------------------------------

Description

Check if meta data columns are present in object and return vector of found columns Return warning messages for meta data columns not found.

Usage

```
Meta_Present(  
  seurat_object,  
  meta_col_names,  
  print_msg = TRUE,  
  omit_warn = TRUE,  
  abort = TRUE  
)
```

Arguments

seurat_object	object name.
meta_col_names	vector of column names to check.
print_msg	logical. Whether message should be printed if all features are found. Default is TRUE.
omit_warn	logical. Whether to print message about features that are not found in current object. Default is TRUE.
abort	logical. Whether or not to stop function and print stop message if no input meta_col_names are found. Default is TRUE.

Value

vector of meta data columns that are present

Examples

```
## Not run:  
meta_variables <- Meta_Present(seurat_object = obj_name, gene_list = DEG_list, print_msg = TRUE)  
  
## End(Not run)
```

Meta_Present_LIGER *Check if meta data are present*

Description

Check if meta data columns are present in object and return vector of found columns Return warning messages for meta data columns not found.

Usage

```
Meta_Present_LIGER(liger_object, meta_col_names, print_msg = TRUE)
```

Arguments

liger_object object name.
meta_col_names vector of column names to check.
print_msg logical. Whether message should be printed if all features are found. Default is TRUE.

Value

vector of meta data columns that are present

Examples

```
## Not run:
meta_variables <- Meta_Present_LIGER(liger_object = obj, gene_list = DEG_list, print_msg = TRUE)

## End(Not run)
```

Meta_Remove_Seurat *Remove meta data columns containing Seurat Defaults*

Description

Remove any columns from new meta_data data.frame in preparation for adding back to Seurat Object

Usage

```
Meta_Remove_Seurat(
  meta_data,
  seurat_object,
  barcodes_to_rownames = FALSE,
  barcodes_colname = "barcodes"
)
```

Arguments

meta_data data.frame containing meta data.
seurat_object object name.
barcodes_to_rownames
 logical, are barcodes present as column and should they be moved to rownames
 (to be compatible with `Seurat::AddMetaData`). Default is `FALSE`.
barcodes_colname
 name of barcodes column in `meta_data`. Required if `barcodes_to_rownames =`
 `TRUE`.

Value

data.frame with only new columns.

Examples

```
## Not run:
new_meta <- Meta_Remove_Seurat(meta_data = meta_data_df, seurat_object = object)
object <- AddMetaData(object = object, metadata = new_meta)

## End(Not run)
```

 Move_Legend

Move Legend Position

Description

Shortcut for thematic modification to move legend position.

Usage

```
Move_Legend(position = "right", ...)
```

Arguments

position valid position to move legend. Default is "right".
... extra arguments passed to `ggplot2::theme()`.

Value

Returns a list-like object of class *theme*.

Examples

```
# Generate a plot and customize theme
library(ggplot2)
df <- data.frame(x = rnorm(n = 100, mean = 20, sd = 2), y = rbinom(n = 100, size = 100, prob = 0.2))
p <- ggplot(data = df, mapping = aes(x = x, y = y)) + geom_point(mapping = aes(color = 'red'))
p + Move_Legend("left")
```

NavyAndOrange

Navy and Orange Dual Color Palette

Description

Shortcut to navy orange color plot

Usage

```
NavyAndOrange(flip_order = FALSE)
```

Arguments

`flip_order` Whether to flip the order of colors.

Value

Navy orange palette

Examples

```
cols <- NavyAndOrange()
PalettePlot(pal= cols)
```

PalettePlot

Plot color palette in viewer

Description

Plots given color vector/palette in viewer to evaluate palette before plotting on data.

Usage

```
PalettePlot(pal = NULL, label_color_num = NULL)
```

Arguments

`pal` a vector of colors (either named colors or hex codes).
`label_color_num` logical, whether or not to numerically label the colors in output plot. Default is TRUE if number of colors in `pal` is less than 75 and FALSE if greater than 75.

Value

Plot of all colors in supplied palette/vector

References

Adapted from colorway package `build_palette` internals (License: GPL-3). <https://github.com/hypercompetent/colorway>.

Examples

```
pal <- DiscretePalette_scCustomize(num_colors = 36, palette = "varibow")
PalettePlot(pal = pal)
```

PC_Plotting

PC Plots

Description

Plot PC Heatmaps and Dim Loadings for exploratory analysis. Plots a single Heatmap and Gene Loading Plot. Used for `PC>Loading_Plots` function.

Usage

```
PC_Plotting(seurat_object, dim_number)
```

Arguments

`seurat_object` Seurat Object.
`dim_number` A single dim to plot (integer).

Value

A plot of PC heatmap and gene loadings for single

See Also

[PCHeatmap](#) and [VizDimLoadings](#)

Examples

```
library(Seurat)
PC_Plotting(seurat_object = pbmc_small, dim_number = 1)
```

Percent_Expressing *Calculate percent of expressing cells*

Description

Calculates the percent of cells that express a given set of features by various grouping factors

Usage

```
Percent_Expressing(
  seurat_object,
  features,
  threshold = 0,
  group_by = NULL,
  split_by = NULL,
  entire_object = FALSE,
  slot = "data",
  assay = NULL
)
```

Arguments

seurat_object	Seurat object name.
features	Feature(s) to plot.
threshold	Expression threshold to use for calculation of percent expressing (default is 0).
group_by	Factor to group the cells by.
split_by	Factor to split the groups by.
entire_object	logical (default = FALSE). Whether to calculate percent of expressing cells across the entire object as opposed to by cluster or by group_by variable.
slot	Slot to pull feature data for. Default is "data".
assay	Assay to pull feature data from. Default is active assay.

Value

A data.frame

References

Part of code is modified from Seurat package as used by [DotPlot](#) to generate values to use for plotting. Source code can be found here: <https://github.com/satijalab/seurat/blob/4e868fcde49dc0a3df47f94f5fb54R/visualization.R#L3391> (License: GPL-3).

Examples

```
## Not run:
percent_stats <- Percent_Expressing(seurat_object = object, features = "Cx3cr1", threshold = 0)

## End(Not run)
```

plotFactors_scCustom *Customized version of plotFactors*

Description

Modified and optimized version of plotFactors function from LIGER package.

Usage

```
plotFactors_scCustom(
  liger_object,
  num_genes = 8,
  colors_use_factors = NULL,
  colors_use_dimreduc = c("lemonchiffon", "red"),
  pt.size_factors = 1,
  pt.size_dimreduc = 1,
  reduction_label = "UMAP",
  raster = TRUE,
  raster.dpi = c(512, 512),
  order = FALSE,
  plot_dimreduc = TRUE,
  save_plots = TRUE,
  file_path = NULL,
  file_name = NULL,
  return_plots = FALSE,
  cells.highlight = NULL,
  reorder_datasets = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123
)
```

Arguments

liger_object liger liger_object. Need to perform clustering and factorization before calling this function

num_genes Number of genes to display for each factor (Default 8).

colors_use_factors colors to use for plotting factor loadings By default datasets will be plotted using "varibow" with shuffle = TRUE from both from [DiscretePalette_scCustomize](#).

colors_use_dimreduc	colors to use for plotting factor loadings on dimensionality reduction coordinates (tSNE/UMAP). Default is c('lemonchiffon', 'red'),
pt.size_factors	Adjust point size for plotting in the factor plots.
pt.size_dimreduc	Adjust point size for plotting in dimensionality reduction plots.
reduction_label	What to label the x and y axes of resulting plots. LIGER does not store name of technique and therefore needs to be set manually. Default is "UMAP".
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 200,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to geom_scattermore(). Default is c(512, 512).
order	logical. Whether to plot higher loading cells on top of cells with lower loading values in the dimensionality reduction plots (Default = FALSE).
plot_dimreduc	logical. Whether to plot factor loadings on dimensionality reduction coordinates. Default is TRUE.
save_plots	logical. Whether to save plots. Default is TRUE
file_path	directory file path and/or file name prefix. Defaults to current wd.
file_name	name suffix to append after sample name.
return_plots	logical. Whether or not to return plots to the environment. (Default is FALSE)
cells.highlight	Names of specific cells to highlight in plot (black) (default NULL).
reorder_datasets	New order to plot datasets in for the factor plots if different from current factor level order in cell.data slot.
ggplot_default_colors	logical. If colors_use_factors = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "varibow" palette.
color_seed	random seed for the palette shuffle if colors_use_factors = NULL. Default = 123.

Value

A list of ggplot/patchwork objects and/or PDF file.

Author(s)

Velina Kozareva (Original code for modified function), Sam Marsh (Added/modified functionality)

References

Based on plotFactors functionality from original LIGER package.

Examples

```
## Not run:
plotFactors_scCustom(liger_object = liger_obj, return_plots = FALSE, plot_dimreduc = TRUE,
raster = FALSE, save_plots = TRUE)

## End(Not run)
```

Plot_Cells_per_Sample *Plot Number of Cells/Nuclei per Sample*

Description

Plot of total cell or nuclei number per sample grouped by another meta data variable.

Usage

```
Plot_Cells_per_Sample(
  seurat_object,
  sample_col = "orig.ident",
  group_by = NULL,
  colors_use = NULL,
  plot_title = "Cells/Nuclei per Sample",
  y_axis_label = "Number of Cells",
  x_axis_label = NULL,
  legend_title = NULL,
  x_lab_rotate = TRUE,
  color_seed = 123
)
```

Arguments

seurat_object	Seurat object name.
sample_col	Specify which column in meta.data specifies sample ID (i.e. orig.ident).
group_by	Column in meta.data slot to group results by (i.e. "Treatment").
colors_use	List of colors or color palette to use.
plot_title	Plot title.
y_axis_label	Label for y axis.
x_axis_label	Label for x axis.
legend_title	Label for plot legend.
x_lab_rotate	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot object

Examples

```
## Not run:
Plot_Cells_per_Sample(seurat_object = obj, sample_col = "orig.ident", group_by = "Treatment")

## End(Not run)
```

Plot_Density_Custom *Nebulosa Density Plot*

Description

Allow for customization of Nebulosa plot_density. Requires Nebulosa package from Bioconductor.

Usage

```
Plot_Density_Custom(
  seurat_object,
  features,
  joint = FALSE,
  viridis_palette = "magma",
  custom_palette = NULL,
  pt.size = 1,
  reduction = NULL,
  combine = TRUE,
  ...
)
```

Arguments

seurat_object	Seurat object name.
features	Features to plot.
joint	logical. Whether to return joint density plot. Default is FALSE.
viridis_palette	default viridis palette to use (must be one of: "viridis", "magma", "cividis", "inferno", "plasma"). Default is "magma".
custom_palette	non-default color palette to be used in place of default viridis options.
pt.size	Adjust point size for plotting.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
combine	Create a single plot? If FALSE, a list with ggplot objects is returned.
...	Extra parameters passed to <code>plot_density</code> .

Value

A ggplot object

Examples

```
library(Seurat)
Plot_Density_Custom(seurat_object = pbmc_small, features = "CD3E")
```

Plot_Density_Joint_Only

Nebulosa Joint Density Plot

Description

Return only the joint density plot from Nebulosa plot_density function. Requires Nebulosa package from Bioconductor.

Usage

```
Plot_Density_Joint_Only(
  seurat_object,
  features,
  viridis_palette = "magma",
  custom_palette = NULL,
  pt.size = 1,
  reduction = NULL,
  ...
)
```

Arguments

seurat_object	Seurat object name.
features	Features to plot.
viridis_palette	default viridis palette to use (must be one of: "viridis", "magma", "cividis", "inferno", "plasma"). Default is "magma".
custom_palette	non-default color palette to be used in place of default viridis options.
pt.size	Adjust point size for plotting.
reduction	Dimensionality Reduction to use (if NULL then defaults to Object default).
...	Extra parameters passed to plot_density .

Value

A ggplot object

Examples

```
library(Seurat)
Plot_Density_Joint_Only(seurat_object = pbmc_small, features = c("CD8A", "CD3E"))
```

Plot_Median_Genes *Plot Median Genes per Cell per Sample*

Description

Plot of median genes per cell per sample grouped by desired meta data variable.

Usage

```
Plot_Median_Genes(
  seurat_object,
  sample_col = "orig.ident",
  group_by = NULL,
  colors_use = NULL,
  plot_title = "Median Genes/Cell per Sample",
  y_axis_label = "Median Genes",
  x_axis_label = NULL,
  legend_title = NULL,
  x_lab_rotate = TRUE,
  color_seed = 123
)
```

Arguments

seurat_object	Seurat object name.
sample_col	Specify which column in meta.data specifies sample ID (i.e. orig.ident).
group_by	Column in meta.data slot to group results by (i.e. "Treatment").
colors_use	List of colors or color palette to use. Only applicable if group_by is not NULL.
plot_title	Plot title.
y_axis_label	Label for y axis.
x_axis_label	Label for x axis.
legend_title	Label for plot legend.
x_lab_rotate	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot object

Examples

```
library(Seurat)
# Create example groups
pbmc_small$sample_id <- sample(c("sample1", "sample2"), size = ncol(pbmc_small), replace = TRUE)

# Plot
Plot_Median_Genes(seurat_object = pbmc_small, sample_col = "orig.ident", group_by = "sample_id")
```

Plot_Median_Mito	<i>Plot Median Percent Mito per Cell per Sample</i>
------------------	---

Description

Plot of median percent mito per cell per sample grouped by desired meta data variable.

Usage

```
Plot_Median_Mito(
  seurat_object,
  sample_col = "orig.ident",
  group_by = NULL,
  colors_use = NULL,
  plot_title = "Median % Mito per Sample",
  y_axis_label = "Percent Mitochondrial Reads",
  x_axis_label = NULL,
  legend_title = NULL,
  x_lab_rotate = TRUE,
  color_seed = 123
)
```

Arguments

seurat_object	Seurat object name.
sample_col	Specify which column in meta.data specifies sample ID (i.e. orig.ident).
group_by	Column in meta.data slot to group results by (i.e. "Treatment").
colors_use	List of colors or color palette to use. Only applicable if group_by is not NULL.
plot_title	Plot title.
y_axis_label	Label for y axis.
x_axis_label	Label for x axis.
legend_title	Label for plot legend.

`x_lab_rotate` logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
`color_seed` random seed for the "varibow" palette shuffle if `colors_use = NULL` and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot object

Examples

```
## Not run:  
# Add mito  
obj <- Add_Mito_Ribo_Seurat(seurat_object = obj, species = "human")  
  
# Plot  
Plot_Median_Mito(seurat_object = obj, sample_col = "orig.ident", group_by = "sample_id")  
  
## End(Not run)
```

`Plot_Median_Other` *Plot Median other variable per Cell per Sample*

Description

Plot of median other variable per cell per sample grouped by desired meta data variable.

Usage

```
Plot_Median_Other(  
  seurat_object,  
  median_var,  
  sample_col = "orig.ident",  
  group_by = NULL,  
  colors_use = NULL,  
  plot_title = NULL,  
  y_axis_label = NULL,  
  x_axis_label = NULL,  
  legend_title = NULL,  
  x_lab_rotate = TRUE,  
  color_seed = 123  
)
```

Arguments

`seurat_object` Seurat object name.
`median_var` Variable in meta.data slot to calculate and plot median values for.

sample_col	Specify which column in meta.data specifies sample ID (i.e. orig.ident).
group_by	Column in meta.data slot to group results by (i.e. "Treatment").
colors_use	List of colors or color palette to use. Only applicable if group_by is not NULL.
plot_title	Plot title.
y_axis_label	Label for y axis.
x_axis_label	Label for x axis.
legend_title	Label for plot legend.
x_lab_rotate	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot object

Examples

```
## Not run:
library(Seurat)
cd_features <- list(c('CD79B', 'CD79A', 'CD19', 'CD180', 'CD200', 'CD3D', 'CD2', 'CD3E',
'CD7', 'CD8A', 'CD14', 'CD1C', 'CD68', 'CD9', 'CD247'))

pbmc_small <- AddModuleScore(object = pbmc_small, features = cd_features, ctrl = 5,
name = 'CD_Features')

Plot_Median_Other(seurat_object = pbmc_small, median_var = "CD_Features1",
sample_col = "orig.ident", group_by = "Treatment")

## End(Not run)
```

Plot_Median_UMIs	<i>Plot Median UMIs per Cell per Sample</i>
------------------	---

Description

Plot of median UMIs per cell per sample grouped by desired meta data variable.

Usage

```
Plot_Median_UMIs(
  seurat_object,
  sample_col = "orig.ident",
  group_by = NULL,
  colors_use = NULL,
  plot_title = "Median UMIs/Cell per Sample",
```

```

    y_axis_label = "Median UMIs",
    x_axis_label = NULL,
    legend_title = NULL,
    x_lab_rotate = TRUE,
    color_seed = 123
  )

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>sample_col</code>	Specify which column in meta.data specifies sample ID (i.e. orig.ident).
<code>group_by</code>	Column in meta.data slot to group results by (i.e. "Treatment").
<code>colors_use</code>	List of colors or color palette to use. Only applicable if <code>group_by</code> is not NULL.
<code>plot_title</code>	Plot title.
<code>y_axis_label</code>	Label for y axis.
<code>x_axis_label</code>	Label for x axis.
<code>legend_title</code>	Label for plot legend.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use</code> = NULL and number of groups plotted is greater than 36. Default = 123.

Value

A ggplot object

Examples

```

library(Seurat)
# Create example groups
pbmc_small$sample_id <- sample(c("sample1", "sample2"), size = ncol(pbmc_small), replace = TRUE)

# Plot
Plot_Median_UMIs(seurat_object = pbmc_small, sample_col = "orig.ident", group_by = "sample_id")

```

Pull_Cluster_Annotation

Pull cluster information from annotation csv file.

Description

shortcut filter and pull function compatible with annotation files created by `Create_Cluster_Annotation_File` by default but also any other csv file.

Usage

```
Pull_Cluster_Annotation(  
  annotation = NULL,  
  cluster_name_col = "cluster",  
  cell_type_col = "cell_type"  
)
```

Arguments

`annotation` name of the data.frame/tibble or path to CSV file containing cluster annotation.
`cluster_name_col` name of column containing cluster names/numbers (default is "cluster").
`cell_type_col` name of column contain the cell type annotation (default is "cell_type").

Value

a list of named vectors for every cell type in the `cell_type_col` column of the annotation table and vectors new cluster names (for use with `Rename_Clusters` function or manual identity renaming).

Examples

```
## Not run:  
# If pulling from a data.frame/tibble  
cluster_annotation <- Pull_Cluster_Annotation(annotation = annotation_df,  
cluster_name_col = "cluster", cell_type_col = "cell_type")  
  
# If pulling from csv file  
cluster_annotation <- Pull_Cluster_Annotation(annotation = "file_path/file_name.csv",  
cluster_name_col = "cluster", cell_type_col = "cell_type")  
  
## End(Not run)
```

Pull_Directory_List *Pull Directory List*

Description

Enables easy listing of all sub-directories for use as input library lists in Read10X multi functions.

Usage

```
Pull_Directory_List(base_path)
```

Arguments

`base_path` path to the parent directory which contains all of the subdirectories of interest.

Value

A vector of sub-directories within base_path.

Examples

```
## Not run:
data_dir <- 'path/to/data/directory'
library_list <- Pull_Directory_List(base_path = data_dir)

## End(Not run)
```

QC_Plots_Combined_Vln *QC Plots Genes, UMIs, & % Mito*

Description

Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```
QC_Plots_Combined_Vln(
  seurat_object,
  group.by = NULL,
  feature_cutoffs = NULL,
  UMI_cutoffs = NULL,
  mito_cutoffs = NULL,
  mito_name = "percent_mito",
  pt.size = NULL,
  colors_use = NULL,
  x_lab_rotate = TRUE,
  y_axis_log = FALSE,
  raster = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

seurat_object Seurat object name.

group.by Name of one or more metadata columns to group (color) cells by (for example, orig.ident); default is the current active.ident of the object.

feature_cutoffs Numeric vector of length 1 or 2 to plot lines for potential low/high threshold for filtering.

UMI_cutoffs	Numeric vector of length 1 or 2 to plot lines for potential low/high threshold for filtering.
mito_cutoffs	Numeric vector of length 1 or 2 to plot lines for potential low/high threshold for filtering.
mito_name	The column name containing percent mitochondrial counts information. Default value is "percent_mito" which is default value created when using <code>Add_Mito_Ribo_Seurat()</code> .
pt.size	Point size for plotting
colors_use	vector of colors to use for plot.
x_lab_rotate	Rotate x-axis labels 45 degrees (Default is TRUE).
y_axis_log	logical. Whether to change y axis to log10 scale (Default is FALSE).
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
ggplot_default_colors	logical. If colors_use = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.
...	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```
## Not run:
QC_Plots_Combined_Vln(seurat_object = object)

## End(Not run)
```

QC_Plots_Complexity *QC Plots Cell "Complexity"*

Description

Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```

QC_Plots_Complexity(
  seurat_object,
  feature = "log10GenesPerUMI",
  group.by = NULL,
  x_axis_label = NULL,
  y_axis_label = "log10(Genes) / log10(UMIs)",
  plot_title = "Cell Complexity",
  low_cutoff = NULL,
  high_cutoff = NULL,
  pt.size = NULL,
  colors_use = NULL,
  x_lab_rotate = TRUE,
  y_axis_log = FALSE,
  raster = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>feature</code>	Feature from Meta Data to plot.
<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>); default is the current <code>active.ident</code> of the object.
<code>x_axis_label</code>	Label for x axis.
<code>y_axis_label</code>	Label for y axis.
<code>plot_title</code>	Plot Title.
<code>low_cutoff</code>	Plot line a potential low threshold for filtering.
<code>high_cutoff</code>	Plot line a potential high threshold for filtering.
<code>pt.size</code>	Point size for plotting
<code>colors_use</code>	vector of colors to use for plot.
<code>x_lab_rotate</code>	Rotate x-axis labels 45 degrees (Default is TRUE).
<code>y_axis_log</code>	logical. Whether to change y axis to log10 scale (Default is FALSE).
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```
library(Seurat)
pbmc_small <- Add_Cell_Complexity_Seurat(pbmc_small)

QC_Plots_Complexity(seurat_object = pbmc_small)
```

QC_Plots_Feature	<i>QC Plots Feature</i>
------------------	-------------------------

Description

Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```
QC_Plots_Feature(  
  seurat_object,  
  feature,  
  group.by = NULL,  
  x_axis_label = NULL,  
  y_axis_label = NULL,  
  plot_title = NULL,  
  low_cutoff = NULL,  
  high_cutoff = NULL,  
  pt.size = NULL,  
  colors_use = NULL,  
  x_lab_rotate = TRUE,  
  y_axis_log = FALSE,  
  raster = NULL,  
  ggplot_default_colors = FALSE,  
  color_seed = 123,  
  ...  
)
```

Arguments

seurat_object	Seurat object name.
feature	Feature from Meta Data to plot.
group.by	Name of one or more metadata columns to group (color) cells by (for example, orig.ident); default is the current active.ident of the object.
x_axis_label	Label for x axis.

<code>y_axis_label</code>	Label for y axis.
<code>plot_title</code>	Plot Title.
<code>low_cutoff</code>	Plot line a potential low threshold for filtering.
<code>high_cutoff</code>	Plot line a potential high threshold for filtering.
<code>pt.size</code>	Point size for plotting
<code>colors_use</code>	vector of colors to use for plot.
<code>x_lab_rotate</code>	Rotate x-axis labels 45 degrees (Default is TRUE).
<code>y_axis_log</code>	logical. Whether to change y axis to log10 scale (Default is FALSE).
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```
## Not run:
QC_Plots_Feature(seurat_object = object, feature = "FEATURE_NAME",
y_axis_label = "FEATURE per Cell", plot_title = "FEATURE per Cell", high_cutoff = 10,
low_cutoff = 2)

## End(Not run)
```

QC_Plots_Genes

QC Plots Genes

Description

Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```
QC_Plots_Genes(
  seurat_object,
  plot_title = "Genes Per Cell/Nucleus",
  group.by = NULL,
  x_axis_label = NULL,
  y_axis_label = "Features",
  low_cutoff = NULL,
  high_cutoff = NULL,
  pt.size = NULL,
  colors_use = NULL,
  x_lab_rotate = TRUE,
  y_axis_log = FALSE,
  raster = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>plot_title</code>	Plot Title.
<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>); default is the current <code>active.ident</code> of the object.
<code>x_axis_label</code>	Label for x axis.
<code>y_axis_label</code>	Label for y axis.
<code>low_cutoff</code>	Plot line a potential low threshold for filtering.
<code>high_cutoff</code>	Plot line a potential high threshold for filtering.
<code>pt.size</code>	Point size for plotting
<code>colors_use</code>	vector of colors to use for plot.
<code>x_lab_rotate</code>	Rotate x-axis labels 45 degrees (Default is TRUE).
<code>y_axis_log</code>	logical. Whether to change y axis to log10 scale (Default is FALSE).
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```
library(Seurat)
QC_Plots_Genes(seurat_object = pbmc_small, plot_title = "Genes per Cell", low_cutoff = 40,
high_cutoff = 85)
```

QC_Plots_Mito

QC Plots Mito

Description

#' Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```
QC_Plots_Mito(
  seurat_object,
  mito_name = "percent_mito",
  plot_title = "Mito Gene % per Cell/Nucleus",
  group.by = NULL,
  x_axis_label = NULL,
  y_axis_label = "% Mitochondrial Gene Counts",
  low_cutoff = NULL,
  high_cutoff = NULL,
  pt.size = NULL,
  colors_use = NULL,
  x_lab_rotate = TRUE,
  y_axis_log = FALSE,
  raster = NULL,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

seurat_object	Seurat object name.
mito_name	The column name containing percent mitochondrial counts information. Default value is "percent_mito" which is default value created when using Add_Mito_Ribo_Seurat().
plot_title	Plot Title.
group.by	Name of one or more metadata columns to group (color) cells by (for example, orig.ident); default is the current active.ident of the object.
x_axis_label	Label for x axis.
y_axis_label	Label for y axis.
low_cutoff	Plot line a potential low threshold for filtering.

high_cutoff	Plot line a potential high threshold for filtering.
pt.size	Point size for plotting
colors_use	vector of colors to use for plot.
x_lab_rotate	Rotate x-axis labels 45 degrees (Default is TRUE).
y_axis_log	logical. Whether to change y axis to log10 scale (Default is FALSE).
raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
ggplot_default_colors	logical. If colors_use = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
color_seed	random seed for the "varibow" palette shuffle if colors_use = NULL and number of groups plotted is greater than 36. Default = 123.
...	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```
## Not run:
QC_Plots_Mito(seurat_object = object, plot_title = "Percent Mito per Cell", high_cutoff = 10)

## End(Not run)
```

QC_Plots_UMIs

QC Plots UMIs

Description

#' Custom VlnPlot for initial QC checks including lines for thresholding

Usage

```
QC_Plots_UMIs(
  seurat_object,
  plot_title = "UMIs per Cell/Nucleus",
  group.by = NULL,
  x_axis_label = NULL,
  y_axis_label = "UMIs",
  low_cutoff = NULL,
  high_cutoff = NULL,
  pt.size = NULL,
  colors_use = NULL,
```

```

    x_lab_rotate = TRUE,
    y_axis_log = FALSE,
    raster = NULL,
    ggplot_default_colors = FALSE,
    color_seed = 123,
    ...
)

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>plot_title</code>	Plot Title.
<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>); default is the current <code>active.ident</code> of the object.
<code>x_axis_label</code>	Label for x axis.
<code>y_axis_label</code>	Label for y axis.
<code>low_cutoff</code>	Plot line a potential low threshold for filtering.
<code>high_cutoff</code>	Plot line a potential high threshold for filtering.
<code>pt.size</code>	Point size for plotting
<code>colors_use</code>	vector of colors to use for plot.
<code>x_lab_rotate</code>	Rotate x-axis labels 45 degrees (Default is TRUE).
<code>y_axis_log</code>	logical. Whether to change y axis to log10 scale (Default is FALSE).
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to VlnPlot .

Value

A ggplot object

Examples

```

library(Seurat)
QC_Plots_UMIs(seurat_object = pbmc_small, plot_title = "UMIs per Cell", low_cutoff = 75,
high_cutoff = 600)

```

QC_Plot_GenevsFeature *QC Plots Genes vs Misc*

Description

Custom FeatureScatter for initial QC checks including lines for thresholding

Usage

```
QC_Plot_GenevsFeature(
  seurat_object,
  feature1,
  x_axis_label = NULL,
  y_axis_label = "Genes per Cell/Nucleus",
  low_cutoff_gene = NULL,
  high_cutoff_gene = NULL,
  low_cutoff_feature = NULL,
  high_cutoff_feature = NULL,
  colors_use = NULL,
  pt.size = 1,
  group.by = NULL,
  raster = NULL,
  raster.dpi = c(512, 512),
  ggplot_default_colors = FALSE,
  color_seed = 123,
  shuffle_seed = 1,
  ...
)
```

Arguments

seurat_object	Seurat object name.
feature1	First feature to plot.
x_axis_label	Label for x axis.
y_axis_label	Label for y axis.
low_cutoff_gene	Plot line a potential low threshold for filtering genes per cell.
high_cutoff_gene	Plot line a potential high threshold for filtering genes per cell.
low_cutoff_feature	Plot line a potential low threshold for filtering feature1 per cell.
high_cutoff_feature	Plot line a potential high threshold for filtering feature1 per cell.
colors_use	vector of colors to use for plotting by identity.
pt.size	Adjust point size for plotting.

<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>). Default is <code>@active.ident</code> .
<code>raster</code>	Convert points to raster format. Default is <code>NULL</code> which will rasterize by default if greater than 100,000 cells.
<code>raster.dpi</code>	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default <code>ggplot2</code> "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>shuffle_seed</code>	Sets the seed if randomly shuffling the order of points (Default is 1).
<code>...</code>	Extra parameters passed to FeatureScatter .

Value

A `ggplot` object

Examples

```
## Not run:
QC_Plot_GenevsFeature(seurat_object = obj, y_axis_label = "Feature per Cell")

## End(Not run)
```

QC_Plot_UMIvsFeature *QC Plots UMI vs Misc*

Description

Custom `FeatureScatter` for initial QC checks including lines for thresholding

Usage

```
QC_Plot_UMIvsFeature(
  seurat_object,
  feature1,
  x_axis_label = NULL,
  y_axis_label = "UMIs per Cell/Nucleus",
  low_cutoff_UMI = NULL,
  high_cutoff_UMI = NULL,
  low_cutoff_feature = NULL,
  high_cutoff_feature = NULL,
  colors_use = NULL,
  pt.size = 1,
```

```

    group.by = NULL,
    raster = NULL,
    raster.dpi = c(512, 512),
    ggplot_default_colors = FALSE,
    color_seed = 123,
    shuffle_seed = 1,
    ...
)

```

Arguments

seurat_object Seurat object name.

feature1 First feature to plot.

x_axis_label Label for x axis.

y_axis_label Label for y axis.

low_cutoff_UMI Plot line a potential low threshold for filtering UMI per cell.

high_cutoff_UMI Plot line a potential high threshold for filtering UMI per cell.

low_cutoff_feature Plot line a potential low threshold for filtering feature1 per cell.

high_cutoff_feature Plot line a potential high threshold for filtering feature1 per cell.

colors_use vector of colors to use for plotting by identity.

pt.size Adjust point size for plotting.

group.by Name of one or more metadata columns to group (color) cells by (for example, `orig.ident`). Default is `@active.ident`.

raster Convert points to raster format. Default is `NULL` which will rasterize by default if greater than 100,000 cells.

raster.dpi Pixel resolution for rasterized plots, passed to `geom_scattermore()`. Default is `c(512, 512)`.

ggplot_default_colors logical. If `colors_use = NULL`, Whether or not to return plot using default `ggplot2` "hue" palette instead of default "polychrome" or "varibow" palettes.

color_seed random seed for the "varibow" palette shuffle if `colors_use = NULL` and number of groups plotted is greater than 36. Default = 123.

shuffle_seed Sets the seed if randomly shuffling the order of points (Default is 1).

... Extra parameters passed to [FeatureScatter](#).

Value

A `ggplot` object

Examples

```
## Not run:
QC_Plot_UMIvsFeature(seurat_object = obj, y_axis_label = "Feature per Cell")

## End(Not run)
```

QC_Plot_UMIvsGene *QC Plots Genes vs UMIs*

Description

Custom FeatureScatter for initial QC checks including lines for thresholding

Usage

```
QC_Plot_UMIvsGene(
  seurat_object,
  x_axis_label = "UMIs per Cell/Nucleus",
  y_axis_label = "Genes per Cell/Nucleus",
  low_cutoff_gene = -Inf,
  high_cutoff_gene = Inf,
  low_cutoff_UMI = -Inf,
  high_cutoff_UMI = Inf,
  colors_use = NULL,
  meta_gradient_name = NULL,
  meta_gradient_color = viridis_plasma_dark_high,
  meta_gradient_na_color = "lightgray",
  meta_gradient_low_cutoff = NULL,
  cells = NULL,
  combination = FALSE,
  pt.size = 1,
  group.by = NULL,
  raster = NULL,
  raster.dpi = c(512, 512),
  ggplot_default_colors = FALSE,
  color_seed = 123,
  shuffle_seed = 1,
  ...
)
```

Arguments

seurat_object Seurat object name.
x_axis_label Label for x axis.
y_axis_label Label for y axis.

<code>low_cutoff_gene</code>	Plot line a potential low threshold for filtering genes per cell.
<code>high_cutoff_gene</code>	Plot line a potential high threshold for filtering genes per cell.
<code>low_cutoff_UMI</code>	Plot line a potential low threshold for filtering UMIs per cell.
<code>high_cutoff_UMI</code>	Plot line a potential high threshold for filtering UMIs per cell.
<code>colors_use</code>	vector of colors to use for plotting by identity.
<code>meta_gradient_name</code>	Name of continuous meta data variable to color points in plot by. (MUST be continuous variable i.e. "percent_mito").
<code>meta_gradient_color</code>	The gradient color palette to use for plotting of meta variable (default is viridis "Plasma" palette with dark colors high).
<code>meta_gradient_na_color</code>	Color to use for plotting values when a <code>meta_gradient_low_cutoff</code> is set (default is "lightgray").
<code>meta_gradient_low_cutoff</code>	Value to use as threshold for plotting. <code>meta_gradient_name</code> values below this value will be plotted using <code>meta_gradient_na_color</code> .
<code>cells</code>	Cells to include on the scatter plot (default is all cells).
<code>combination</code>	logical (default FALSE). Whether or not to return a plot layout with both the plot colored by identity and the meta data gradient plot.
<code>pt.size</code>	Passes size of points to both <code>FeatureScatter</code> and <code>geom_point</code> .
<code>group.by</code>	Name of one or more metadata columns to group (color) cells by (for example, <code>orig.ident</code>). Default is <code>@active.ident</code> .
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 cells.
<code>raster.dpi</code>	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default <code>ggplot2</code> "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	Random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>shuffle_seed</code>	Sets the seed if randomly shuffling the order of points (Default is 1).
<code>...</code>	Extra parameters passed to <code>FeatureScatter</code> .

Value

A ggplot object

Examples

```
library(Seurat)
QC_Plot_UMIvsGene(seurat_object = pbmc_small, x_axis_label = "UMIs per Cell/Nucleus",
y_axis_label = "Genes per Cell/Nucleus")
```

Read10X_GEO

Load in NCBI GEO data from 10X

Description

Enables easy loading of sparse data matrices provided by 10X genomics. That have file prefixes added to them by NCBI GEO or other repos.

Usage

```
Read10X_GEO(
  data_dir = NULL,
  sample_list = NULL,
  sample_names = NULL,
  gene.column = 2,
  cell.column = 1,
  unique.features = TRUE,
  strip.suffix = FALSE,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE
)
```

Arguments

<code>data_dir</code>	Directory containing the matrix.mtx, genes.tsv (or features.tsv), and barcodes.tsv files provided by 10X.
<code>sample_list</code>	A vector of file prefixes/names if specific samples are desired. Default is NULL and will load all samples in given directory.
<code>sample_names</code>	a set of sample names to use for each sample entry in returned list. If NULL will set names to the file name of each sample.
<code>gene.column</code>	Specify which column of genes.tsv or features.tsv to use for gene names; default is 2.
<code>cell.column</code>	Specify which column of barcodes.tsv to use for cell names; default is 1.
<code>unique.features</code>	Make feature names unique (default TRUE).
<code>strip.suffix</code>	Remove trailing "-1" if present in all cell barcodes.
<code>parallel</code>	logical (default FALSE). Whether to use multiple cores when reading in data. Only possible on Linux based systems.

`num_cores` if `parallel = TRUE` indicates the number of cores to use for multicore processing.

`merge` logical (default `FALSE`) whether or not to merge samples into a single matrix or return list of matrices. If `TRUE` each sample entry in list will have cell barcode prefix added. The prefix will be taken from `sample_names`.

Value

If `features.csv` indicates the data has multiple data types, a list containing a sparse matrix of the data from each type will be returned. Otherwise a sparse matrix containing the expression data will be returned.

References

Code used in function has been slightly modified from `Seurat::Read10X` function of `Seurat` package <https://github.com/satijalab/seurat> (License: GPL-3). Function was modified to support file prefixes and altered loop by Samuel Marsh for `scCustomize` (also previously posted as potential PR to `Seurat` GitHub).

Examples

```
## Not run:
data_dir <- 'path/to/data/directory'
expression_matrices <- Read10X_GEO(data_dir = data_dir)
# To create object from single file
seurat_object = CreateSeuratObject(counts = expression_matrices[[1]])

## End(Not run)
```

Read10X_h5_GEO

Load in NCBI GEO data from 10X in HDF5 file format

Description

Enables easy loading of HDF5 data matrices provided by 10X genomics. That have file prefixes added to them by NCBI GEO or other repos or programs (i.e. Cell Bender)

Usage

```
Read10X_h5_GEO(
  data_dir = NULL,
  sample_list = NULL,
  sample_names = NULL,
  shared_suffix = NULL,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE,
  ...
)
```

Arguments

<code>data_dir</code>	Directory containing the .h5 files provided by 10X.
<code>sample_list</code>	A vector of file prefixes/names if specific samples are desired. Default is NULL and will load all samples in given directory.
<code>sample_names</code>	a set of sample names to use for each sample entry in returned list. If NULL will set names to the file name of each sample.
<code>shared_suffix</code>	a suffix and file extension shared by all samples.
<code>parallel</code>	logical (default FALSE). Whether to use multiple cores when reading in data. Only possible on Linux based systems.
<code>num_cores</code>	if <code>parallel = TRUE</code> indicates the number of cores to use for multicore processing.
<code>merge</code>	logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from <code>sample_names</code> .
<code>...</code>	Additional arguments passed to Read10X_h5

Value

If the data has multiple data types, a list containing a sparse matrix of the data from each type will be returned. Otherwise a sparse matrix containing the expression data will be returned.

Examples

```
## Not run:
data_dir <- 'path/to/data/directory'
expression_matrices <- Read10X_h5_GEO(data_dir = data_dir)
# To create object from single file
seurat_object = CreateSeuratObject(counts = expression_matrices[[1]])

## End(Not run)
```

Read10X_h5_Multi_Directory

Load 10X h5 count matrices from multiple directories

Description

Enables easy loading of sparse data matrices provided by 10X genomics that are present in multiple subdirectories. Can function with either default output directory structure of Cell Ranger or custom directory structure.

Usage

```

Read10X_h5_Multi_Directory(
  base_path,
  secondary_path = NULL,
  default_10X_path = TRUE,
  h5_filename = "filtered_feature_bc_matrix.h5",
  cell_bender = FALSE,
  sample_list = NULL,
  sample_names = NULL,
  replace_suffix = FALSE,
  new_suffix_list = NULL,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE,
  ...
)

```

Arguments

<code>base_path</code>	path to the parent directory which contains all of the subdirectories of interest.
<code>secondary_path</code>	path from the parent directory to count matrix files for each sample.
<code>default_10X_path</code>	logical (default TRUE) sets the secondary path variable to the default 10X directory structure.
<code>h5_filename</code>	name of h5 file (including .h5 suffix). If all h5 files have same name (i.e. Cell Ranger output) then use full file name. By default function uses Cell Ranger name: "filtered_feature_bc_matrix.h5". If h5 files have sample specific prefixes (i.e. from Cell Bender) then use only the shared part of file name (e.g., "_filtered_out.h5").
<code>cell_bender</code>	logical (default FALSE). Is the h5 file from cell bender output, needed to set correct file names.
<code>sample_list</code>	a vector of sample directory names if only specific samples are desired. If NULL will read in subdirectories in parent directory.
<code>sample_names</code>	a set of sample names to use for each sample entry in returned list. If NULL will set names to the subdirectory name of each sample.
<code>replace_suffix</code>	logical (default FALSE). Whether or not to replace the barcode suffixes of matrices using Replace_Suffix .
<code>new_suffix_list</code>	a vector of new suffixes to replace existing suffixes if <code>replace_suffix = TRUE</code> . See Replace_Suffix for more information. To remove all suffixes set <code>new_suffix_list = ""</code> .
<code>parallel</code>	logical (default FALSE) whether or not to use multi core processing to read in matrices.
<code>num_cores</code>	how many cores to use for parallel processing.

merge logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from `sample_names`.

... Extra parameters passed to [Read10X_h5](#).

Value

a list of sparse matrices (merge = FALSE) or a single sparse matrix (merge = TRUE).

Examples

```
## Not run:
base_path <- 'path/to/data/directory'
expression_matrices <- Read10X_h5_Multi_Directory(base_path = base_path)

## End(Not run)
```

Read10X_Multi_Directory

Load 10X count matrices from multiple directories

Description

Enables easy loading of sparse data matrices provided by 10X genomics that are present in multiple subdirectories. Can function with either default output directory structure of Cell Ranger or custom directory structure.

Usage

```
Read10X_Multi_Directory(
  base_path,
  secondary_path = NULL,
  default_10X_path = TRUE,
  sample_list = NULL,
  sample_names = NULL,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE,
  ...
)
```

Arguments

`base_path` path to the parent directory which contains all of the subdirectories of interest.

`secondary_path` path from the parent directory to count matrix files for each sample.

default_10X_path	logical (default TRUE) sets the secondary path variable to the default 10X directory structure.
sample_list	a vector of sample directory names if only specific samples are desired. If NULL will read in subdirectories in parent directory.
sample_names	a set of sample names to use for each sample entry in returned list. If NULL will set names to the subdirectory name of each sample.
parallel	logical (default FALSE) whether or not to use multi core processing to read in matrices.
num_cores	how many cores to use for parallel processing.
merge	logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from sample_names.
...	Extra parameters passed to Read10X .

Value

a list of sparse matrices (merge = FALSE) or a single sparse matrix (merge = TRUE).

Examples

```
## Not run:
base_path <- 'path/to/data/directory'
expression_matrices <- Read10X_Multi_Directory(base_path = base_path)

## End(Not run)
```

Read_CellBender_h5_Mat

Load CellBender h5 matrices (corrected)

Description

Extract sparse matrix with corrected counts from CellBender h5 output file.

Usage

```
Read_CellBender_h5_Mat(file_name, use.names = TRUE, unique.features = TRUE)
```

Arguments

file_name	Path to h5 file.
use.names	Label row names with feature names rather than ID numbers (default TRUE).
unique.features	Make feature names unique (default TRUE).

Value

sparse matrix

References

Code used in function has been modified from `Seurat::Read10X_h5` function of Seurat package <https://github.com/satijalab/seurat> (License: GPL-3).

Examples

```
## Not run:
mat <- Read_CellBender_h5_Mat(file_name = "/SampleA_out_filtered.h5")

## End(Not run)
```

Read_CellBender_h5_Multi_Directory

Load CellBender h5 matrices (corrected) from multiple directories

Description

Extract sparse matrix with corrected counts from CellBender h5 output file across multiple sample subdirectories.

Usage

```
Read_CellBender_h5_Multi_Directory(
  base_path,
  secondary_path = NULL,
  filtered_h5 = TRUE,
  custom_name = NULL,
  sample_list = NULL,
  sample_names = NULL,
  replace_suffix = FALSE,
  new_suffix_list = NULL,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE,
  ...
)
```

Arguments

`base_path` path to the parent directory which contains all of the subdirectories of interest.
`secondary_path` path from the parent directory to count matrix files for each sample.

filtered_h5	logical (default TRUE). Will set the shared file name suffix custom_name is NULL.
custom_name	if file name was customized in CellBender then this parameter should contain the portion of file name that is shared across all samples. Must included the ".h5" extension as well.
sample_list	a vector of sample directory names if only specific samples are desired. If NULL will read in subdirectories in parent directory.
sample_names	a set of sample names to use for each sample entry in returned list. If NULL will set names to the subdirectory name of each sample.
replace_suffix	logical (default FALSE). Whether or not to replace the barcode suffixes of matrices using Replace_Suffix .
new_suffix_list	a vector of new suffixes to replace existing suffixes if replace_suffix = TRUE. See Replace_Suffix for more information. To remove all suffixes set new_suffix_list = "".
parallel	logical (default FALSE) whether or not to use multi core processing to read in matrices.
num_cores	how many cores to use for parallel processing.
merge	logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from sample_names.
...	Extra parameters passed to Read_CellBender_h5_Mat .

Value

list of sparse matrices

Examples

```
## Not run:
base_path <- 'path/to/data/directory'
mat_list <- Read_CellBender_h5_Multi_Directory(base_path = base_path)

## End(Not run)
```

Read_CellBender_h5_Multi_File

Load CellBender h5 matrices (corrected) from multiple files

Description

Extract sparse matrix with corrected counts from CellBender h5 output file across multiple samples within the same directory.

Usage

```

Read_CellBender_h5_Multi_File(
  data_dir = NULL,
  filtered_h5 = TRUE,
  custom_name = NULL,
  sample_list = NULL,
  sample_names = NULL,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE,
  ...
)

```

Arguments

<code>data_dir</code>	Directory containing the .h5 files output by CellBender.
<code>filtered_h5</code>	logical (default TRUE). Will set the shared file name suffix if <code>custom_name</code> is NULL.
<code>custom_name</code>	if file name was customized in CellBender then this parameter should contain the portion of file name that is shared across all samples. Must include the ".h5" extension as well.
<code>sample_list</code>	a vector of sample names if only specific samples are desired. If NULL will read in all files within <code>data_dir</code> directory.
<code>sample_names</code>	a set of sample names to use for each sample entry in returned list. If NULL will set names to the subdirectory name of each sample.
<code>parallel</code>	logical (default FALSE) whether or not to use multi core processing to read in matrices.
<code>num_cores</code>	how many cores to use for parallel processing.
<code>merge</code>	logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from <code>sample_names</code> .
<code>...</code>	Extra parameters passed to Read_CellBender_h5_Mat .

Value

list of sparse matrices

Examples

```

## Not run:
base_path <- 'path/to/data/directory'
mat_list <- Read_CellBender_h5_Multi_File(data_dir = base_path)

## End(Not run)

```

Read_GEO_Delim	<i>Load in NCBI GEO data formatted as single file per sample</i>
----------------	--

Description

Can read delimited file types (i.e. csv, tsv, txt)

Usage

```
Read_GEO_Delim(
  data_dir,
  file_suffix,
  move_genes_rownames = TRUE,
  sample_list = NULL,
  full_names = FALSE,
  sample_names = NULL,
  barcode_suffix_period = FALSE,
  parallel = FALSE,
  num_cores = NULL,
  merge = FALSE
)
```

Arguments

<code>data_dir</code>	Directory containing the files.
<code>file_suffix</code>	The file suffix of the individual files. Must be the same across all files being imported. This is used to detect files to import and their GEO IDs.
<code>move_genes_rownames</code>	logical. Whether gene IDs are present in first column or in row names of delimited file. If TRUE will move the first column to row names before creating final matrix. Default is TRUE.
<code>sample_list</code>	a vector of samples within directory to read in (can be either with or without <code>file_suffix</code> see <code>full_names</code>). If NULL will read in all subdirectories.
<code>full_names</code>	logical (default FALSE). Whether or not the <code>sample_list</code> vector includes the file suffix. If FALSE the function will add suffix based on <code>file_suffix</code> parameter.
<code>sample_names</code>	a set of sample names to use for each sample entry in returned list. If NULL will set names to the directory name of each sample.
<code>barcode_suffix_period</code>	Is the barcode suffix a period and should it be changed to "-". Default (FALSE; barcodes will be left identical to their format in input files.). If TRUE "." in barcode suffix will be changed to "-".
<code>parallel</code>	logical (default FALSE). Whether to use multiple cores when reading in data. Only possible on Linux based systems.

num_cores	if parallel = TRUE indicates the number of cores to use for multicore processing.
merge	logical (default FALSE) whether or not to merge samples into a single matrix or return list of matrices. If TRUE each sample entry in list will have cell barcode prefix added. The prefix will be taken from sample_names.

Value

List of gene x cell matrices in list format named by sample name.

Examples

```
## Not run:
data_dir <- 'path/to/data/directory'
expression_matrices <- Read_GEO_Delim(data_dir = data_dir)

## End(Not run)
```

Read_Metrics_10X

Read Overall Statistics from 10X Cell Ranger Count

Description

Get data.frame with all metrics from the Cell Ranger count analysis (present in web_summary.html)

Usage

```
Read_Metrics_10X(
  base_path,
  secondary_path = NULL,
  default_10X = TRUE,
  lib_list = NULL,
  lib_names = NULL
)
```

Arguments

base_path	path to the parent directory which contains all of the subdirectories of interest.
secondary_path	path from the parent directory to count "outs/" folder which contains the "metrics_summary.csv" file.
default_10X	logical (default TRUE) sets the secondary path variable to the default 10X directory structure.
lib_list	a list of sample names (matching directory names) to import. If NULL will read in all samples in parent directory.
lib_names	a set of sample names to use for each sample. If NULL will set names to the directory name of each sample.

Value

A data frame with sample metrics from cell ranger.

Examples

```
## Not run:
metrics <- Read_Metrics_10X(base_path = "/path/to/directories", default_10X = TRUE)

## End(Not run)
```

Rename_Clusters	<i>Rename Cluster Seurat</i>
-----------------	------------------------------

Description

Wrapper function to rename active identities in Seurat Object with new idents.

Usage

```
Rename_Clusters(seurat_object, new_idents, meta_col_name = NULL, ...)
```

Arguments

`seurat_object` object name.

`new_idents` vector of new cluster names. Must be equal to the length of current active.ident in Seurat Object. Will accept named vector (with old idents as names) or will name the new_idents vector internally.

`meta_col_name` (Optional). Whether or not to create new named column in Object@meta.data to store the old identities.

`...` Extra parameters passed to [RenameIdents](#).

Value

Seurat Object with new identities placed in active.ident slot.

Examples

```
## Not run:
obj <- Rename_Clusters(seurat_object = obj_name, new_idents = new_idents_vec,
meta_col_name = "Round01_Res0.6_Idents")

## End(Not run)
```

Replace_Suffix *Replace barcode suffixes*

Description

Replace barcode suffixes in matrix, data.frame, or list of matrices/data.frames

Usage

```
Replace_Suffix(data, current_suffix, new_suffix)
```

Arguments

data Either matrix/data.frame or list of matrices/data.frames with the cell barcodes in the column names.

current_suffix a single value or vector of values representing current barcode suffix. If suffix is the same for all matrices/data.frames in list only single value is required.

new_suffix a single value or vector of values representing new barcode suffix to be added. If desired suffix is the same for all matrices/data.frames in list only single value is required. If no suffix is desired set `new_suffix = ""`.

Value

matrix or data.frame with new column names.

Examples

```
## Not run:
dge_matrix <- Replace_Suffix(data = dge_matrix, current_suffix = "-1", new_suffix = "-2")

## End(Not run)
```

scCustomize_Palette *Color Palette Selection for scCustomize*

Description

Function to return package default discrete palettes depending on number of groups plotted.

Usage

```
scCustomize_Palette(num_groups, ggplot_default_colors, color_seed = 123)
```

Arguments

<code>num_groups</code>	number of groups to be plotted. If <code>ggplot_default_colors = FALSE</code> then by default: <ul style="list-style-type: none"> • If number of levels plotted equal to 2 then colors will be <code>NavyAndOrange()</code>. • If number of levels plotted greater than 2 but less than or equal to 36 it will use "polychrome" from <code>DiscretePalette_scCustomize</code>. • If greater than 36 will use "varibow" with <code>shuffle = TRUE</code> from <code>DiscretePalette_scCustomize</code>.
<code>ggplot_default_colors</code>	logical. Whether to use default ggplot hue palette or not.
<code>color_seed</code>	random seed to use for shuffling the "varibow" palette.

Value

vector of colors to use for plotting.

Examples

```
cols <- scCustomize_Palette(num_groups = 24, ggplot_default_colors = FALSE)
PalettePlot(pal= cols)
```

Seq_QC_Plot_Alignment_Combined

QC Plots Sequencing metrics (Alignment) (Layout)

Description

Plot a combined plot of the Alignment QC metrics from sequencing output.

Usage

```
Seq_QC_Plot_Alignment_Combined(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  patchwork_title = "Sequencing QC Plots: Read Alignment Metrics",
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and <code>DiscretePalette_scCustomize(palette = "polychrome")</code> if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>patchwork_title</code>	Title to use for the patchworked plot output.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Alignment_Combined(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Antisense *QC Plots Sequencing metrics (Alignment)*

Description

Plot the fraction of reads mapped Antisense to Gene

Usage

```
Seq_QC_Plot_Antisense(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Antisense(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Basic_Combined

QC Plots Sequencing metrics (Layout)

Description

Plot a combined plot of the basic QC metrics from sequencing output.

Usage

```
Seq_QC_Plot_Basic_Combined(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  patchwork_title = "Sequencing QC Plots: Basic Cell Metrics",
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and <code>DiscretePalette_scCustomize(palette = "polychrome")</code> if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>patchwork_title</code>	Title to use for the patchworked plot output.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Basic_Combined(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Exonic *QC Plots Sequencing metrics (Alignment)*

Description

Plot the fraction of reads confidently mapped to Exonic regions

Usage

```
Seq_QC_Plot_Exonic(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```


Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Exonic(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Genes *QC Plots Sequencing metrics*

Description

Plot the median genes per cell per sample

Usage

```
Seq_QC_Plot_Genes(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Genes(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Genome *QC Plots Sequencing metrics (Alignment)*

Description

Plot the fraction of reads confidently mapped to genome

Usage

```
Seq_QC_Plot_Genome(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:  
Seq_QC_Plot_Genome(metrics_dataframe = metrics)  
  
## End(Not run)
```

Seq_QC_Plot_Intergenic

QC Plots Sequencing metrics (Alignment)

Description

Plot the fraction of reads confidently mapped to intergenic regions

Usage

```
Seq_QC_Plot_Intergenic(  
  metrics_dataframe,  
  plot_by = "sample_id",  
  colors_use = NULL,  
  x_lab_rotate = FALSE,  
  significance = FALSE,  
  ...  
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Intergenic(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Intronic *QC Plots Sequencing metrics (Alignment)*

Description

Plot the fraction of reads confidently mapped to intronic regions

Usage

```
Seq_QC_Plot_Intronic(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and <code>DiscretePalette_scCustomize(palette = "polychrome")</code> if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:  
Seq_QC_Plot_Intronic(metrics_dataframe = metrics)  
  
## End(Not run)
```

Seq_QC_Plot_Number_Cells

QC Plots Sequencing metrics

Description

Plot the number of cells per sample

Usage

```
Seq_QC_Plot_Number_Cells(  
  metrics_dataframe,  
  plot_by = "sample_id",  
  colors_use = NULL,  
  x_lab_rotate = FALSE,  
  significance = FALSE,  
  ...  
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Number_Cells(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Reads_in_Cells
QC Plots Sequencing metrics

Description

Plot the fraction of reads in cells per sample

Usage

```
Seq_QC_Plot_Reads_in_Cells(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Reads_in_Cells(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Reads_per_Cell
QC Plots Sequencing metrics

Description

Plot the mean number of reads per cell

Usage

```
Seq_QC_Plot_Reads_per_Cell(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Reads_per_Cell(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Saturation

QC Plots Sequencing metrics

Description

Plot the sequencing saturation percentage per sample

Usage

```
Seq_QC_Plot_Saturation(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```


Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Saturation(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Total_Genes

QC Plots Sequencing metrics

Description

Plot the total genes detected per sample

Usage

```
Seq_QC_Plot_Total_Genes(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Total_Genes(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_Transcriptome

QC Plots Sequencing metrics (Alignment)

Description

Plot the fraction of reads confidently mapped to transcriptome

Usage

```
Seq_QC_Plot_Transcriptome(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_Transcriptome(metrics_dataframe = metrics)

## End(Not run)
```

Seq_QC_Plot_UMIs	<i>QC Plots Sequencing metrics</i>
------------------	------------------------------------

Description

Plot the median UMIs per cell per sample

Usage

```
Seq_QC_Plot_UMIs(
  metrics_dataframe,
  plot_by = "sample_id",
  colors_use = NULL,
  x_lab_rotate = FALSE,
  significance = FALSE,
  ...
)
```

Arguments

<code>metrics_dataframe</code>	data.frame contain Cell Ranger QC Metrics (see Read_Metrics_10X).
<code>plot_by</code>	Grouping factor for the plot. Default is to plot as single group with single point per sample.
<code>colors_use</code>	colors to use for plot if plotting by group. Defaults to RColorBrewer Dark2 palette if less than 8 groups and DiscretePalette_scCustomize(palette = "polychrome") if more than 8.
<code>x_lab_rotate</code>	logical. Whether to rotate the axes labels on the x-axis. Default is FALSE.
<code>significance</code>	logical. Whether to calculate and plot p-value comparisons when plotting by grouping factor. Default is FALSE.
<code>...</code>	Other variables to pass to <code>ggpubr::stat_compare_means</code> when doing significance testing.

Value

A ggplot object

Examples

```
## Not run:
Seq_QC_Plot_UMIs(metrics_dataframe = metrics)

## End(Not run)
```

Setup_scRNAseq_Project

Setup project directory structure

Description

Create reproducible project directory organization when initiating a new analysis.

Usage

```
Setup_scRNAseq_Project(
  custom_dir_file = NULL,
  cluster_annotation_path = NULL,
  cluster_annotation_file_name = "cluster_annotation.csv"
)
```

Arguments

`custom_dir_file` file to file containing desired directory structure. Default is NULL and will provide generic built-in directory structure.

`cluster_annotation_path` path to place cluster annotation file using [Create_Cluster_Annotation_File](#).

`cluster_annotation_file_name` name to use for annotation file if created (optional).

Value

no return value. Creates system folders.

Examples

```
## Not run:  
# If using built-in directory structure.  
Setup_scrNAseq_Project()  
  
## End(Not run)
```

Single_Color_Palette *Single Color Palettes for Plotting*

Description

Selects colors from modified versions of RColorBrewer single colors palettes

Usage

```
Single_Color_Palette(pal_color, num_colors = NULL, seed_use = 123)
```

Arguments

`pal_color` color palette to select (Options are: 'reds', 'blues', 'greens', 'purples', 'oranges', 'grays').

`num_colors` set number of colors (max = 7).

`seed_use` set seed for reproducibility (default: 123).

Value

A vector of colors

References

See RColorBrewer for more info on palettes <https://CRAN.R-project.org/package=RColorBrewer>

Examples

```
pal <- Single_Color_Palette(pal_color = "reds", num_colors = 7)
PalettePlot(pal= pal)
```

Split_FeatureScatter *Split FeatureScatter*

Description

Create FeatureScatter using split.by

Usage

```
Split_FeatureScatter(
  seurat_object,
  feature1 = NULL,
  feature2 = NULL,
  split.by = NULL,
  group.by = NULL,
  colors_use = NULL,
  pt.size = NULL,
  title_size = 15,
  num_columns = NULL,
  raster = NULL,
  raster.dpi = c(512, 512),
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

seurat_object	Seurat object name.
feature1	First feature to plot.
feature2	Second feature to plot.
split.by	Feature to split plots by (i.e. "orig.ident").
group.by	Name of one or more metadata columns to group (color) cells by (for example, orig.ident). Use 'ident' to group.by active.ident class.
colors_use	color for the points on plot.
pt.size	Adjust point size for plotting.
title_size	size for plot title labels.
num_columns	number of columns in final layout plot.

raster	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 cells.
raster.dpi	Pixel resolution for rasterized plots, passed to <code>geom_scattermore()</code> . Default is <code>c(512, 512)</code> .
ggplot_default_colors	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
color_seed	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
...	Extra parameters passed to FeatureScatter .

Value

A ggplot object

Examples

```
library(Seurat)
pbmc_small$sample_id <- sample(c("sample1", "sample2"), size = ncol(pbmc_small), replace = TRUE)

Split_FeatureScatter(seurat_object = pbmc_small, feature1 = "nCount_RNA", feature2 = "nFeature_RNA",
split.by = "sample_id")
```

Stacked_VlnPlot

Stacked Violin Plot

Description

Code for creating stacked violin plot gene expression.

Usage

```
Stacked_VlnPlot(
  seurat_object,
  features,
  group.by = NULL,
  split.by = NULL,
  idents = NULL,
  x_lab_rotate = FALSE,
  plot_legend = FALSE,
  colors_use = NULL,
  color_seed = 123,
  ggplot_default_colors = FALSE,
  plot_spacing = 0.15,
  spacing_unit = "cm",
  vln_linewidth = NULL,
```

```

    pt.size = NULL,
    raster = NULL,
    add.noise = TRUE,
    ...
  )

```

Arguments

<code>seurat_object</code>	Seurat object name.
<code>features</code>	Features to plot.
<code>group.by</code>	Group (color) cells in different ways (for example, <code>orig.ident</code>).
<code>split.by</code>	A variable to split the violin plots by,
<code>idents</code>	Which classes to include in the plot (default is all).
<code>x_lab_rotate</code>	logical or numeric. If logical whether to rotate x-axis labels 45 degrees (Default is FALSE). If numeric must be either 45 or 90. Setting 45 is equivalent to setting TRUE.
<code>plot_legend</code>	logical. Adds plot legend containing <code>idents</code> to the returned plot.
<code>colors_use</code>	specify color palette to used in <code>VlnPlot</code> . By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with <code>shuffle = TRUE</code> both from <code>DiscretePalette_scCustomize</code> .
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use = NULL</code> and number of groups plotted is greater than 36. Default = 123.
<code>ggplot_default_colors</code>	logical. If <code>colors_use = NULL</code> , Whether or not to return plot using default <code>ggplot2</code> "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>plot_spacing</code>	Numerical value specifying the vertical spacing between each plot in the stack. Default is 0.15 ("cm"). Spacing dependent on unit provided to <code>spacing_unit</code> .
<code>spacing_unit</code>	Unit to use in specifying vertical spacing between plots. Default is "cm".
<code>vln_linewidth</code>	Adjust the linewidth of violin outline. Must be numeric.
<code>pt.size</code>	Adjust point size for plotting. Default for <code>StackedVlnPlot</code> is 0 to avoid issues with rendering so many points in vector form. Alternatively, see <code>raster</code> parameter.
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>add.noise</code>	logical, determine if adding a small noise for plotting (Default is TRUE).
<code>...</code>	Extra parameters passed to <code>VlnPlot</code> .

Value

A `ggplot` object

Author(s)

Ming Tang (Original Code), Sam Marsh (Wrap single function, added/modified functionality)

References

<https://divingintogeneticsandgenomics.rbind.io/post/stacked-violin-plot-for-visualizing-single-cells/>

See Also

<https://twitter.com/tangming2005>

Examples

```
library(Seurat)
Stacked_VlnPlot(seurat_object = pbmc_small, features = c("CD3E", "CD8", "GZMB", "MS4A1"),
  x_lab_rotate = TRUE)
```

Store_Misc_Info_Seurat

Store misc data in Seurat object

Description

Wrapper function save variety of data types to the `object@misc` slot of Seurat object.

Usage

```
Store_Misc_Info_Seurat(
  seurat_object,
  data_to_store,
  data_name,
  list_as_list = FALSE,
  overwrite = FALSE
)
```

Arguments

<code>seurat_object</code>	object name.
<code>data_to_store</code>	data to be stored in <code>@misc</code> slot. Can be single piece of data or list. If list of data see <code>list_as_list</code> parameter for control over data storage.
<code>data_name</code>	name to give the entry in <code>@misc</code> slot. Must be of equal length of the number of data items being stored.
<code>list_as_list</code>	logical. If <code>data_to_store</code> is a list, this dictates whether to store in <code>@misc</code> slot as list (TRUE) or whether to store each entry in the list separately (FALSE). Default is FALSE.
<code>overwrite</code>	Logical. Whether to overwrite existing items with the same name. Default is FALSE, meaning that function will abort if item with <code>data_name</code> is present in <code>misc</code> slot.

Value

Seurat Object with new entries in the @misc slot.

Examples

```
library(Seurat)
clu_pal <- c("red", "green", "blue")

pbmc_small <- Store_Misc_Info_Seurat(seurat_object = pbmc_small, data_to_store = clu_pal,
data_name = "rd1_colors")
```

Store_Palette_Seurat *Store color palette in Seurat object*

Description

Wrapper function around Store_Misc_Info_Seurat to store color palettes.

Usage

```
Store_Palette_Seurat(
  seurat_object,
  palette,
  palette_name,
  list_as_list = FALSE,
  overwrite = FALSE
)
```

Arguments

seurat_object	object name.
palette	vector or list of vectors containing color palettes to store. If list of palettes see list_as_list parameter for control over data storage.
palette_name	name to give the palette(s) in @misc slot. Must be of equal length to the number of data items being stored.
list_as_list	logical. If data_to_store is a list, this dictates whether to store in @misc slot as list (TRUE) or whether to store each entry in the list separately (FALSE). Default is FALSE.
overwrite	Logical. Whether to overwrite existing items with the same name. Default is FALSE, meaning that function will abort if item with data_name is present in misc slot.

Value

Seurat Object with new entries in the @misc slot.

Examples

```
library(Seurat)
clu_pal <- c("red", "green", "blue")

pbmc_small <- Store_Misc_Info_Seurat(seurat_object = pbmc_small, data_to_store = clu_pal,
data_name = "rd1_colors")
```

theme_ggprism_mod	<i>Modified ggprism theme</i>
-------------------	-------------------------------

Description

Modified ggprism theme which restores the legend title.

Usage

```
theme_ggprism_mod(
  palette = "black_and_white",
  base_size = 14,
  base_family = "sans",
  base_fontface = "bold",
  base_line_size = base_size/20,
  base_rect_size = base_size/20,
  axis_text_angle = 0,
  border = FALSE
)
```

Arguments

palette	string. Palette name, use <code>names(ggprism_data\$themes)</code> to show all valid palette names.
base_size	numeric. Base font size, given in "pt".
base_family	string. Base font family, default is "sans".
base_fontface	string. Base font face, default is "bold".
base_line_size	numeric. Base linewidth for line elements
base_rect_size	numeric. Base linewidth for rect elements
axis_text_angle	integer. Angle of axis text in degrees. One of: 0, 45, 90, 270.
border	logical. Should a border be drawn around the plot? Clipping will occur unless e.g. <code>coord_cartesian(clip = "off")</code> is used.

Value

Returns a list-like object of class *theme*.

References

theme is a modified version of theme_prism from ggprism package <https://github.com/cs daw/ggprism> (License: GPL-3). Param text is from ggprism:theme_prism() documentation [theme_prism](#). Theme adaptation based on ggprism vignette <https://csdaw.github.io/ggprism/articles/themes.html#make-your-own-ggprism-theme-1>.

Examples

```
# Generate a plot and customize theme
library(ggplot2)
df <- data.frame(x = rnorm(n = 100, mean = 20, sd = 2), y = rbinom(n = 100, size = 100, prob = 0.2))
p <- ggplot(data = df, mapping = aes(x = x, y = y)) + geom_point(mapping = aes(color = 'red'))
p + theme_ggprism_mod()
```

Top_Genes_Factor

Extract top loading genes for LIGER factor

Description

Extract vector to the top loading genes for specified LIGER iNMF factor

Usage

```
Top_Genes_Factor(liger_object, liger_factor, num_genes = 10)
```

Arguments

liger_object	LIGER object name.
liger_factor	LIGER factor number to pull genes from.
num_genes	number of top loading genes to return as vector.

Value

A LIGER Object

Examples

```
## Not run:
top_genes_factor10 <- Top_Genes_Factor(liger_object = object, num_genes = 10)

## End(Not run)
```

`UnRotate_X`*Unrotate x axis on VlnPlot*

Description

Shortcut for thematic modification to unrotate the x axis (e.g., for Seurat VlnPlot is rotated by default).

Usage

```
UnRotate_X(...)
```

Arguments

```
...          extra arguments passed to ggplot2::theme().
```

Value

Returns a list-like object of class *theme*.

Examples

```
library(Seurat)
p <- VlnPlot(object = pbmc_small, features = "CD3E")
p + UnRotate_X()
```

`VariableFeaturePlot_scCustom`*Custom Labeled Variable Features Plot*

Description

Creates variable features plot with N number of features already labeled by default.

Usage

```
VariableFeaturePlot_scCustom(
  seurat_object,
  num_features = 10,
  label = TRUE,
  pt.size = 1,
  colors_use = c("black", "red"),
  repel = TRUE,
  y_axis_log = FALSE,
  assay = NULL,
```

```

    selection.method = NULL,
    ...
  )

```

Arguments

`seurat_object` Seurat object name.

`num_features` Number of top variable features to highlight by color/label.

`label` logical. Whether to label the top features. Default is TRUE.

`pt.size` Adjust point size for plotting.

`colors_use` colors to use for plotting. Default is "black" and "red".

`repel` logical (default TRUE). Whether or not to repel the feature labels on plot.

`y_axis_log` logical. Whether to change y axis to log10 scale (Default is FALSE).

`assay` Assay to pull variable features from.

`selection.method` If more then one method use to calculate variable features specify which method to use for plotting. See `selection.method` parameter in [VariableFeaturePlot](#) for list of options.

`...` Extra parameters passed to [VariableFeaturePlot](#).

Value

A ggplot object

Examples

```

library(Seurat)
VariableFeaturePlot_scCustom(seurat_object = pbmc_small, num_features = 10)

```

Variable_Features_ALL_LIGER

Perform variable gene selection over whole dataset

Description

Performs variable gene selection for LIGER object across the entire object instead of by dataset and then taking union.

Usage

```
Variable_Features_ALL_LIGER(  
  liger_object,  
  num_genes = NULL,  
  var.thresh = 0.3,  
  alpha.thresh = 0.99,  
  tol = 1e-04,  
  do.plot = FALSE,  
  pt.size = 0.3,  
  chunk = 1000  
)
```

Arguments

<code>liger_object</code>	LIGER object name.
<code>num_genes</code>	Number of genes to find. Optimizes the value of <code>var.thresh</code> to get this number of genes, (Default is NULL).
<code>var.thresh</code>	Variance threshold. Main threshold used to identify variable genes. Genes with expression variance greater than threshold (relative to mean) are selected. (higher threshold -> fewer selected genes).
<code>alpha.thresh</code>	Alpha threshold. Controls upper bound for expected mean gene expression (lower threshold -> higher upper bound). (default 0.99)
<code>tol</code>	Tolerance to use for optimization if <code>num_genes</code> values passed in (default 0.0001).
<code>do.plot</code>	Display log plot of gene variance vs. gene expression. Selected genes are plotted in green. (Default FALSE)
<code>pt.size</code>	Point size for plot.
<code>chunk</code>	size of chunks in hdf5 file. (Default 1000)

Value

A LIGER Object with variable genes in correct slot.

References

Matching function parameter text descriptions are taken from `rliger::selectGenes` which is called by this function after creating new temporary object/dataset. <https://github.com/welch-lab/liger>. (License: GPL-3).

Examples

```
## Not run:  
liger_obj <- Variable_Features_ALL_LIGER(liger_object = liger_obj, num_genes = 2000)  
  
## End(Not run)
```

viridis_plasma_dark_high

Viridis Shortcuts

Description

Quick shortcuts to access viridis palettes

Usage

viridis_plasma_dark_high

viridis_plasma_light_high

viridis_inferno_dark_high

viridis_inferno_light_high

viridis_magma_dark_high

viridis_magma_light_high

viridis_dark_high

viridis_light_high

Format

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

An object of class character of length 250.

Value

A color palette for plotting

Examples

```
## Not run:
FeaturePlot_scCustom(object = seurat_object, features = "Cx3cr1",
  colors_use = viridis_plasma_dark_high, na_color = "lightgray")

## End(Not run)
```

VlnPlot_scCustom

VlnPlot with modified default settings

Description

Creates DimPlot with some of the settings modified from their Seurat defaults (colors_use, shuffle, label).

Usage

```
VlnPlot_scCustom(
  seurat_object,
  features,
  colors_use = NULL,
  pt.size = NULL,
  group.by = NULL,
  split.by = NULL,
  idents = NULL,
  num_columns = NULL,
  raster = NULL,
  add.noise = TRUE,
  ggplot_default_colors = FALSE,
  color_seed = 123,
  ...
)
```

Arguments

seurat_object	Seurat object name.
features	Feature(s) to plot.
colors_use	color palette to use for plotting. By default if number of levels plotted is less than or equal to 36 it will use "polychrome" and if greater than 36 will use "varibow" with shuffle = TRUE both from DiscretePalette_scCustomize.
pt.size	Adjust point size for plotting.
group.by	Name of one or more metadata columns to group (color) cells by (for example, orig.ident); default is the current active.ident of the object.
split.by	Feature to split plots by (i.e. "orig.ident").

<code>idents</code>	Which classes to include in the plot (default is all).
<code>num_columns</code>	Number of columns in plot layout. Only valid if <code>split.by</code> != NULL.
<code>raster</code>	Convert points to raster format. Default is NULL which will rasterize by default if greater than 100,000 total points plotted (# Cells x # of features).
<code>add.noise</code>	logical, determine if adding a small noise for plotting (Default is TRUE).
<code>ggplot_default_colors</code>	logical. If <code>colors_use</code> = NULL, Whether or not to return plot using default ggplot2 "hue" palette instead of default "polychrome" or "varibow" palettes.
<code>color_seed</code>	random seed for the "varibow" palette shuffle if <code>colors_use</code> = NULL and number of groups plotted is greater than 36. Default = 123.
<code>...</code>	Extra parameters passed to <code>VlnPlot</code> .

Value

A ggplot object

References

Many of the param names and descriptions are from Seurat to facilitate ease of use as this is simply a wrapper to alter some of the default parameters <https://github.com/satijalab/seurat/blob/master/R/visualization.R> (License: GPL-3).

Examples

```
library(Seurat)
VlnPlot_scCustom(seurat_object = pbmc_small, features = "CD3E")
```

Index

- * **datasets**
 - ensembl_mito_id, [37](#)
 - ensembl_ribo_id, [38](#)
 - viridis_plasma_dark_high, [136](#)
- * **data**
 - ensembl_mito_id, [37](#)
 - ensembl_ribo_id, [38](#)
- * **helper_util**
 - Case_Check, [12](#)
 - Change_Delim_All, [17](#)
 - Change_Delim_Prefix, [18](#)
 - Change_Delim_Suffix, [19](#)
 - CheckMatrix_scCustom, [19](#)
 - Fetch_Meta, [44](#)
 - Gene_Present, [45](#)
 - Merge_Sparse_Data_All, [62](#)
 - Meta_Numeric, [64](#)
 - Meta_Present, [65](#)
 - Replace_Suffix, [108](#)
- * **iterative_plotting**
 - Iterate_Cluster_Highlight_Plot, [46](#)
 - Iterate_DimPlot_bySample, [48](#)
 - Iterate_FeaturePlot_scCustom, [49](#)
 - Iterate_Meta_Highlight_Plot, [51](#)
 - Iterate_PC>Loading_Plots, [52](#)
 - Iterate_Plot_Density_Custom, [53](#)
 - Iterate_Plot_Density_Joint, [55](#)
 - Iterate_VlnPlot_scCustom, [56](#)
- * **liger_object_util**
 - Add_Cell_Complexity_LIGER, [5](#)
 - Add_Mito_Ribo_LIGER, [7](#)
 - Meta_Present_LIGER, [66](#)
 - Top_Genes_Factor, [132](#)
 - Variable_Features_ALL_LIGER, [134](#)
- * **liger_plotting**
 - DimPlot_LIGER, [31](#)
 - plotFactors_scCustom, [71](#)
- * **marker_annotation_util**
 - Add_Pct_Diff, [10](#)
 - Create_Cluster_Annotation_File, [29](#)
 - Extract_Top_Markers, [39](#)
 - Pull_Cluster_Annotation, [80](#)
- * **object_qc_plotting**
 - QC_Plot_GenevsFeature, [91](#)
 - QC_Plot_UMIvsFeature, [92](#)
 - QC_Plot_UMIvsGene, [94](#)
 - QC_Plots_Combined_Vln, [82](#)
 - QC_Plots_Complexity, [83](#)
 - QC_Plots_Feature, [85](#)
 - QC_Plots_Genes, [86](#)
 - QC_Plots_Mito, [88](#)
 - QC_Plots_UMIs, [89](#)
- * **object_util**
 - Add_Cell_Complexity_Seurat, [6](#)
 - Add_CellBender_Diff, [5](#)
 - Add_Mito_Ribo_Seurat, [8](#)
 - Add_Sample_Meta, [11](#)
 - Extract_Sample_Meta, [38](#)
 - Liger_to_Seurat, [58](#)
 - Merge_Seurat_List, [61](#)
 - Meta_Remove_Seurat, [66](#)
 - Rename_Clusters, [107](#)
 - Store_Misc_Info_Seurat, [129](#)
 - Store_Palette_Seurat, [130](#)
- * **organization_util**
 - Copy_From_GCP, [25](#)
 - Copy_To_GCP, [26](#)
 - Setup_scrNaseq_Project, [124](#)
- * **other_seurat_plotting**
 - Plot_Density_Custom, [74](#)
 - Plot_Density_Joint_Only, [75](#)
- * **palettes**
 - ColorBlind_Pal, [25](#)
 - Dark2_Pal, [29](#)
 - DiscretePalette_scCustomize, [35](#)
 - Hue_Pal, [46](#)
 - JCO_Four, [58](#)
 - NavyAndOrange, [68](#)

- PalettePlot, [68](#)
- scCustomize_Palette, [108](#)
- Single_Color_Palette, [125](#)
- viridis_plasma_dark_high, [136](#)
- * read_&_write**
 - Create_10X_H5, [27](#)
 - Create_CellBender_Merged_Seurat, [28](#)
 - Pull_Directory_List, [81](#)
 - Read10X_GEO, [96](#)
 - Read10X_h5_GEO, [97](#)
 - Read10X_h5_Multi_Directory, [98](#)
 - Read10X_Multi_Directory, [100](#)
 - Read_CellBender_h5_Mat, [101](#)
 - Read_CellBender_h5_Multi_Directory, [102](#)
 - Read_CellBender_h5_Multi_File, [103](#)
 - Read_GEO_Delim, [105](#)
 - Read_Metrics_10X, [106](#)
- * seq_qc_plotting_alignment**
 - Seq_QC_Plot_Antisense, [110](#)
 - Seq_QC_Plot_Exonic, [112](#)
 - Seq_QC_Plot_Genome, [114](#)
 - Seq_QC_Plot_Intergenic, [115](#)
 - Seq_QC_Plot_Intronic, [116](#)
 - Seq_QC_Plot_Transcriptome, [122](#)
- * seq_qc_plotting_basic**
 - Seq_QC_Plot_Genes, [113](#)
 - Seq_QC_Plot_Number_Cells, [117](#)
 - Seq_QC_Plot_Reads_in_Cells, [118](#)
 - Seq_QC_Plot_Reads_per_Cell, [119](#)
 - Seq_QC_Plot_Saturation, [120](#)
 - Seq_QC_Plot_Total_Genes, [121](#)
 - Seq_QC_Plot_UMIs, [123](#)
- * seq_qc_plotting_layout**
 - Seq_QC_Plot_Alignment_Combined, [109](#)
 - Seq_QC_Plot_Basic_Combined, [111](#)
- * seurat_plotting**
 - Cell_Highlight_Plot, [16](#)
 - Cluster_Highlight_Plot, [23](#)
 - Clustered_DotPlot, [20](#)
 - DimPlot_All_Samples, [30](#)
 - DimPlot_scCustom, [33](#)
 - DotPlot_scCustom, [36](#)
 - FeaturePlot_DualAssay, [41](#)
 - FeaturePlot_scCustom, [42](#)
 - Meta_Highlight_Plot, [63](#)
 - PC_Plotting, [69](#)
 - Split_FeatureScatter, [126](#)
 - Stacked_VlnPlot, [127](#)
 - VariableFeaturePlot_scCustom, [133](#)
 - VlnPlot_scCustom, [137](#)
- * stats_plotting**
 - CellBender_Diff_Plot, [13](#)
 - Plot_Cells_per_Sample, [73](#)
 - Plot_Median_Genes, [76](#)
 - Plot_Median_Mito, [77](#)
 - Plot_Median_Other, [78](#)
 - Plot_Median_UMIs, [79](#)
- * stats**
 - CellBender_Feature_Diff, [15](#)
 - Cluster_Stats_All_Samples, [24](#)
 - Median_Stats, [60](#)
 - Percent_Expressing, [70](#)
- * themes**
 - Blank_Theme, [12](#)
 - Move_Legend, [67](#)
 - theme_ggprism_mod, [131](#)
 - UnRotate_X, [133](#)
- Add_Cell_Complexity_LIGER, [5](#)
- Add_Cell_Complexity_Seurat, [6](#)
- Add_CellBender_Diff, [5](#)
- Add_Mito_Ribo_LIGER, [7](#)
- Add_Mito_Ribo_Seurat, [8](#)
- Add_Pct_Diff, [10](#)
- Add_Sample_Meta, [11](#)
- Blank_Theme, [12](#)
- Case_Check, [12](#)
- Cell_Highlight_Plot, [16](#)
- CellBender_Diff_Plot, [13](#)
- CellBender_Feature_Diff, [14, 15](#)
- Change_Delim_All, [17](#)
- Change_Delim_Prefix, [18](#)
- Change_Delim_Suffix, [19](#)
- CheckMatrix_scCustom, [19](#)
- Cluster_Highlight_Plot, [23](#)
- Cluster_Stats_All_Samples, [24](#)
- Clustered_DotPlot, [20](#)
- ColorBlind_Pal, [25](#)
- Copy_From_GCP, [25](#)
- Copy_To_GCP, [26](#)
- Create_10X_H5, [27](#)
- Create_CellBender_Merged_Seurat, [28, 41](#)

- Create_Cluster_Annotation_File, [29](#), [125](#)
 CreateSeuratObject, [28](#)
- Dark2_Pal, [29](#)
 DimPlot, [17](#), [24](#), [31](#), [34](#), [47](#), [48](#), [52](#), [64](#)
 DimPlot_All_Samples, [30](#)
 DimPlot_LIGER, [31](#)
 DimPlot_scCustom, [33](#)
 DiscretePalette_scCustomize, [32](#), [35](#), [71](#)
 DotPlot, [37](#), [70](#)
 DotPlot_scCustom, [36](#)
- ensembl_mito_id, [37](#)
 ensembl_ribo_id, [38](#)
 Extract_Sample_Meta, [38](#)
 Extract_Top_Markers, [39](#)
- FeaturePlot, [42](#), [43](#), [50](#)
 FeaturePlot_DualAssay, [41](#)
 FeaturePlot_scCustom, [42](#)
 FeatureScatter, [92](#), [93](#), [95](#), [127](#)
 Fetch_Meta, [44](#)
 FindAllMarkers, [10](#), [39](#), [40](#)
 FindMarkers, [10](#)
- Gene_Present, [45](#)
 geom_text_repel, [14](#), [15](#)
- Hue_Pal, [46](#)
- Iterate_Cluster_Highlight_Plot, [46](#)
 Iterate_DimPlot_bySample, [48](#)
 Iterate_FeaturePlot_scCustom, [49](#)
 Iterate_Meta_Highlight_Plot, [51](#)
 Iterate_PC>Loading_Plots, [52](#)
 Iterate_Plot_Density_Custom, [53](#)
 Iterate_Plot_Density_Joint, [55](#)
 Iterate_VlnPlot_scCustom, [56](#)
- JCO_Four, [58](#)
- LabelPoints, [15](#)
 Liger_to_Seurat, [58](#)
- Median_Stats, [39](#), [60](#)
 merge, [61](#)
 Merge_Seurat_List, [61](#)
 Merge_Sparse_Data_All, [62](#)
 Meta_Highlight_Plot, [63](#)
 Meta_Numeric, [64](#)
- Meta_Present, [65](#)
 Meta_Present_LIGER, [66](#)
 Meta_Remove_Seurat, [66](#)
 Move_Legend, [67](#)
- NavyAndOrange, [68](#)
- PalettePlot, [68](#)
 patchwork, [43](#)
 PC_Plotting, [69](#)
 PCHeatmap, [53](#), [69](#)
 Percent_Expressing, [70](#)
 Plot_Cells_per_Sample, [73](#)
 plot_density, [54](#), [56](#), [74](#), [75](#)
 Plot_Density_Custom, [74](#)
 Plot_Density_Joint_Only, [75](#)
 Plot_Median_Genes, [76](#)
 Plot_Median_Mito, [77](#)
 Plot_Median_Other, [78](#)
 Plot_Median_UMIs, [79](#)
 plotFactors_scCustom, [71](#)
 Pull_Cluster_Annotation, [80](#)
 Pull_Directory_List, [81](#)
- QC_Plot_GenevsFeature, [91](#)
 QC_Plot_UMIvsFeature, [92](#)
 QC_Plot_UMIvsGene, [94](#)
 QC_Plots_Combined_Vln, [82](#)
 QC_Plots_Complexity, [83](#)
 QC_Plots_Feature, [85](#)
 QC_Plots_Genes, [86](#)
 QC_Plots_Mito, [88](#)
 QC_Plots_UMIs, [89](#)
- Read10X, [101](#)
 Read10X_GEO, [96](#)
 Read10X_h5, [98](#), [100](#)
 Read10X_h5_GEO, [97](#)
 Read10X_h5_Multi_Directory, [98](#)
 Read10X_Multi_Directory, [100](#)
 Read_CellBender_h5_Mat, [101](#), [103](#), [104](#)
 Read_CellBender_h5_Multi_Directory, [102](#)
 Read_CellBender_h5_Multi_File, [103](#)
 Read_GEO_Delim, [105](#)
 Read_Metrics_10X, [106](#), [110–124](#)
 Rename_Clusters, [107](#)
 RenameIdents, [107](#)
 Replace_Suffix, [99](#), [103](#), [108](#)

scCustomize_Palette, 108
Seq_QC_Plot_Alignment_Combined, 109
Seq_QC_Plot_Antisense, 110
Seq_QC_Plot_Basic_Combined, 111
Seq_QC_Plot_Exonic, 112
Seq_QC_Plot_Genes, 113
Seq_QC_Plot_Genome, 114
Seq_QC_Plot_Intergenic, 115
Seq_QC_Plot_Intronic, 116
Seq_QC_Plot_Number_Cells, 117
Seq_QC_Plot_Reads_in_Cells, 118
Seq_QC_Plot_Reads_per_Cell, 119
Seq_QC_Plot_Saturation, 120
Seq_QC_Plot_Total_Genes, 121
Seq_QC_Plot_Transcriptome, 122
Seq_QC_Plot_UMIs, 123
Setup_scRNAseq_Project, 124
Single_Color_Palette, 125
Split_FeatureScatter, 126
Stacked_VlnPlot, 127
Store_Misc_Info_Seurat, 129
Store_Palette_Seurat, 130

theme_ggprism_mod, 131
theme_prism, 132
Top_Genes_Factor, 132

UnRotate_X, 133

Variable_Features_ALL_LIGER, 134
VariableFeaturePlot, 134
VariableFeaturePlot_scCustom, 133
viridis_dark_high
 (viridis_plasma_dark_high), 136
viridis_inferno_dark_high
 (viridis_plasma_dark_high), 136
viridis_inferno_light_high
 (viridis_plasma_dark_high), 136
viridis_light_high
 (viridis_plasma_dark_high), 136
viridis_magma_dark_high
 (viridis_plasma_dark_high), 136
viridis_magma_light_high
 (viridis_plasma_dark_high), 136
viridis_plasma_dark_high, 136
viridis_plasma_light_high
 (viridis_plasma_dark_high), 136
VizDimLoadings, 53, 69
VlnPlot, 57, 83, 84, 86, 87, 89, 90, 128, 138
VlnPlot_scCustom, 137