BD Cellismo™

Data Visualization Tool

More actionable insights. No coding required

BD



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Overview

BD Cellismo™ Data Visualization Tool—now anyone can single cell!

A data visualization tool that does the heavy lifting of secondary bioinformatics data analysis and visualization



Intuitive: Point and click to visualize your data as graphs and plots

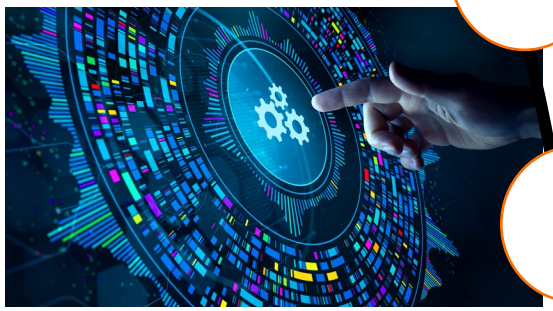


Multiomics enabled: Explore single-cell RNA, protein and ATAC datasets with ease



User friendly: No cost of adoption; no coding required

How to access the BD Cellismo™ Data Visualization Tool



1. Navigate to the BD Cellismo™ Data Visualization Tool landing page
   Available on the BD Biosciences website under Products > Software & Informatics
2. Provide your information*
   Fill out the form with your name, email and institution to access the software
3. Select your operating system
   An install file will begin downloading automatically, which you can then install on your computer
4. Install the BD Cellismo™ Data Visualization Tool and agree to the end-user license agreement (EULA)
   Accept the Terms and Conditions before use

*will be used to notify you of updates and bug fixes

Input files and system requirements

For WTA or AbSeq data:

- (Preferred) .Cellismo output file from the BD Rhapsody™ Sequence Analysis Pipeline
- Alternative inputs formats:
  - Market exchange (MEX)
  - H5MU/H5AD
  - Seurat .rds
  - Market exchange (MEX) compressed with .zip or tar.gz
  - H5

For ATAC data:

- .Cellismo output file from the BD Rhapsody™ Sequence Analysis Pipeline (V3 or later only)

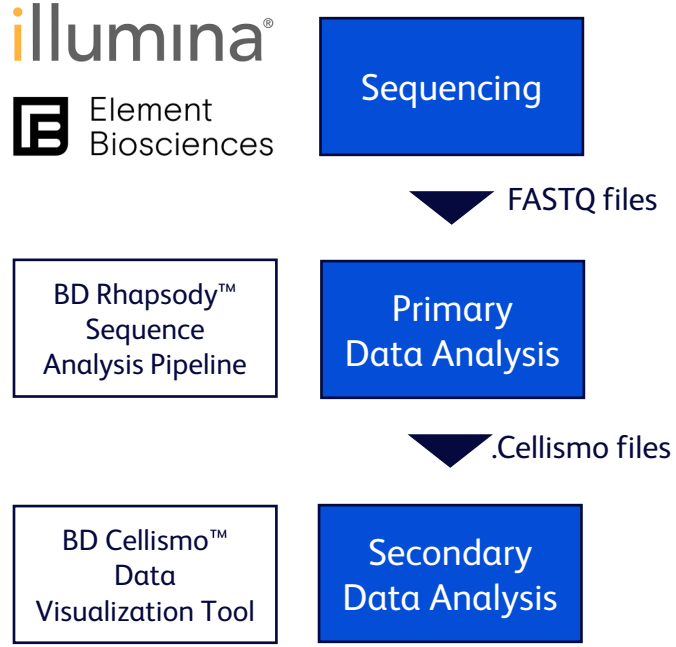
- Windows 10 or later (64-bit)
- MacOS 14 (Sonoma) or later (Intel or Apple silicon chip)
- 8 GB RAM minimum

RNA/AbSeq

- 16 GB RAM for 200,000 cells
- 64 GB RAM for 1M cells

ATAC alone or ATAC multiomic

- 16 GB RAM for 100,000 cells
- 64 GB RAM for 500,000 cells



Features—v1.0, released March 2025

- Load single-cell multiomic data from multiple formats—.Cellismo files, matrix market MEX, Scanpy/Muon or H5AD/H5MU
- Manage multiple single-cell projects and jump between them with a few clicks
- Quality control of single-cell multiomics data (e.g., ribosomal and mitochondrial gene filter) with a visual for the cells being filtered out
- Generate 7 different types of graphs: Dimensionality reduction scatter, Biaxial, Bioproduct correlation, Heatmap, Dot plot, Histogram and Violin plot
- Extensive graph customization with style options (e.g., dot size, opacity, color)
- Save images to a project gallery sidebar and recall them with ease
- Drag gallery images from the sidebar to external applications like Microsoft™ PowerPoint™
- Create new cell annotations by circling cells of interest, running Leiden or K-means clustering or combining existing annotations
- Analyze differential expression between cell groups of interest. Filter genes of interest in a table and view on a Volcano plot
- Generate new dimensionality reduction coordinates
- Supports whole transcriptome or targeted RNA, protein counts with AbSeq/CITE-seq and sample multiplexing

Features—v2.0, released October 2025

Added:

- Support for BD Rhapsody™ ATAC-Seq Assay
  - New modalities: ATAC_PEAKS, ATAC_GENE_ACTIVITY, ATAC_MOTIF
  - Genome browser to view ATAC peaks and ATAC fragments in the context of genomic locations and genes
  - Motif enrichment analysis tool—find transcription factor motifs that are enriched in a given set of peaks, compared to background peaks
  - Peak and RNA expression correlation tool—find peaks whose activity correlate with RNA expression
  - RNA vs ATAC heatmap—see RNA expression and ATAC gene activity correlation for a given cell annotation
  - Ability to combine and reanalyze multiple ATAC datasets
- Doublet detection tool
- Batch correction utility tool, with batch correct counts available to be used in graphing pages
- Integration utility tool
- New cell classification tool, ScType, with the ability to customize marker genes
- Confidence score annotations for cell type classification tools
- Project action recording in the current project page
- Data export options—for R / Seurat, Scanpy (H5AD), Muon (H5MU), FCS and CSV

Features—v2.0, released October 2025 (cont.)

Added (cont.):

- RNA data import option—Seurat RDS
- New DESeq2 method in the Differential Analysis tool
- "Selected Cell Actions" menu on graphing pages, and added "Delete Cells" and "Quick Differential Analysis" options
- Switch to reverse color palette
- Contour lines overlay to biaxial plot
- Options to start project, including flavor of highly variable gene selection, number of highly variable genes and number of PCA/LSI components
- Ability to filter bioproduct dropdown by modality
- Ability to Export and restore app settings

Updated:

- Renamed Differential Expression tool to Differential Analysis and added support for all ATAC modalities
- Cell annotation—Clustering tool to support ATAC modalities
- Dimensionality Reduction utility tool to support ATAC modalities
- Bug fixes

Pricing: Free!

- The BD Cellismo™ Data Visualization Tool is offered free of charge



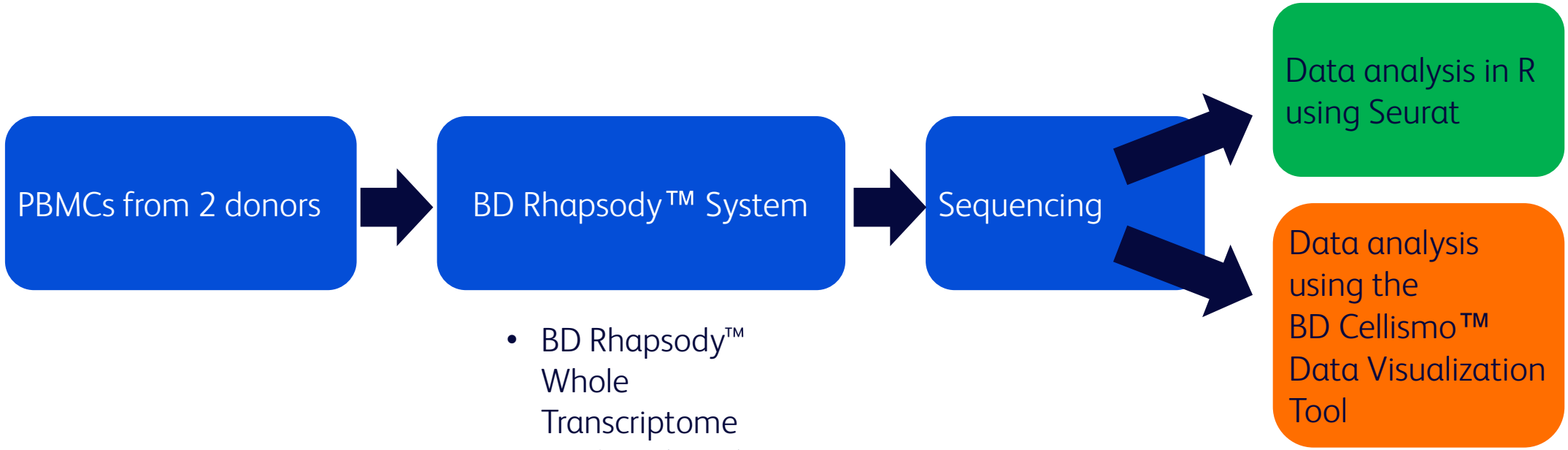
For Research Use Only. Not for use in diagnostic or therapeutic procedures.

Why should I use the BD Cellismo™ Data Visualization Tool?

1. Code-free experience: Get to your answers without any coding.
2. Effortless: Interpret data quickly with an intuitive interface.
3. Powerful: Find a combination of valuable tools all in one place.
4. Independence: Get answers on your own without relying on a third-party for analysis.
5. End-to-end support: Get support from getting started to answering any questions.
6. Continuous improvement: Benefit from regular updates and enhancements to our software.

Performance v1.0

Generate the same data visualization as Seurat using the BD Cellismo™ Data Visualization Tool

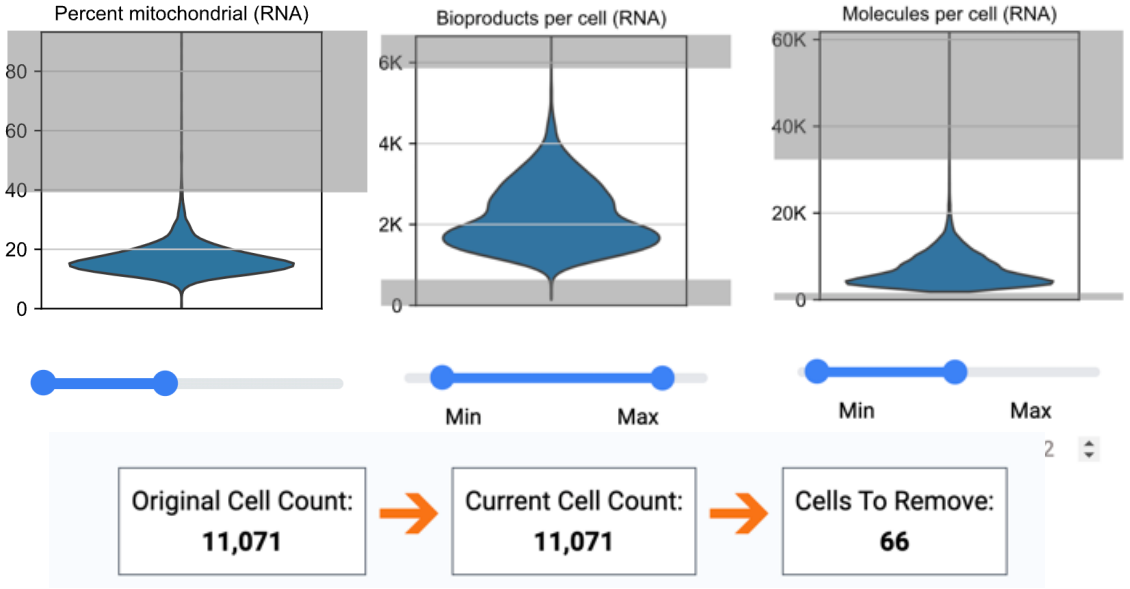


- BD Rhapsody™ Whole Transcriptome Analysis (WTA)
- BD® Single-Cell Multiplexing Kits
- BD® AbSeq Antibody-Oligos (91 markers)

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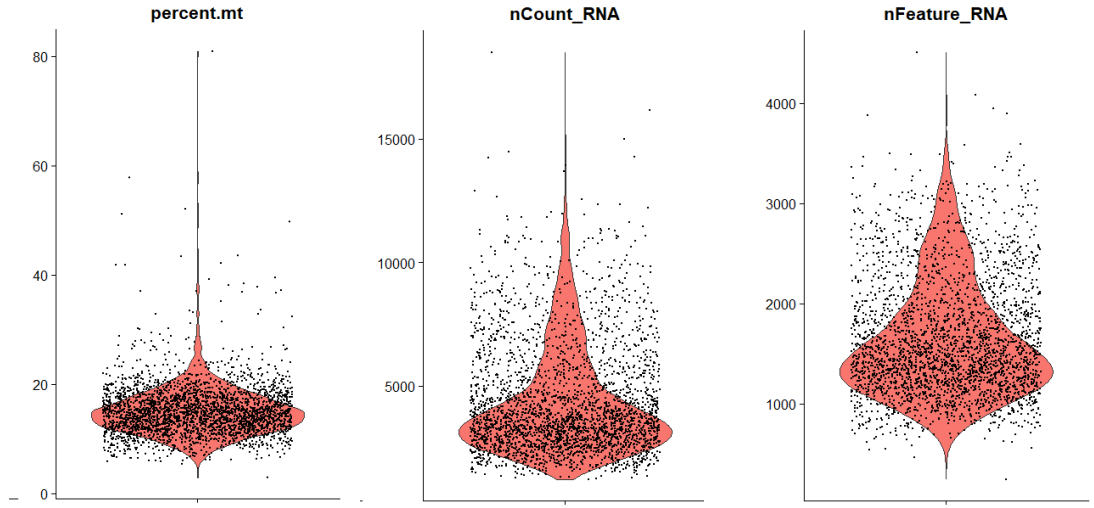
Quality control and filtering out low quality cells

Data analysis using the BD Cellismo™ Data Visualization Tool



- Interactive cell filtering based on molecules and bioproducts (for both RNA and protein modalities)
- Control over cell removal count by changing QC parameters
- Cell Filter Modality based on included mitochondrial gene percentage, which can also be used for QC

Data analysis in R using Seurat

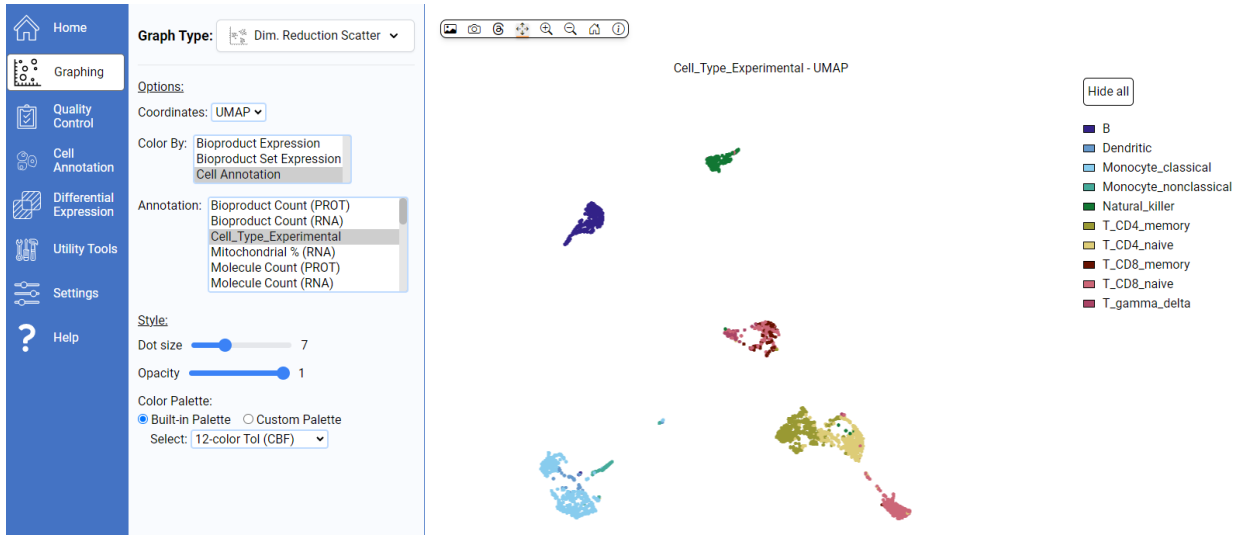



```
# Visualize QC metrics and selecting cells for further analysis
pbmc[["percent.mt"]] <- PercentageFeatureSet(pbmc, pattern = "^MT-")
VlnPlot(pbmc, features = c("nFeature_RNA", "nCount_RNA", "percent.mt"), ncol = 3)
pbmc <- subset(pbmc, subset = nFeature_RNA > 700 & nFeature_RNA < 3000 &
                    nCount_RNA > 1300 & nCount_RNA < 11000 & percent.mt < 25)
```


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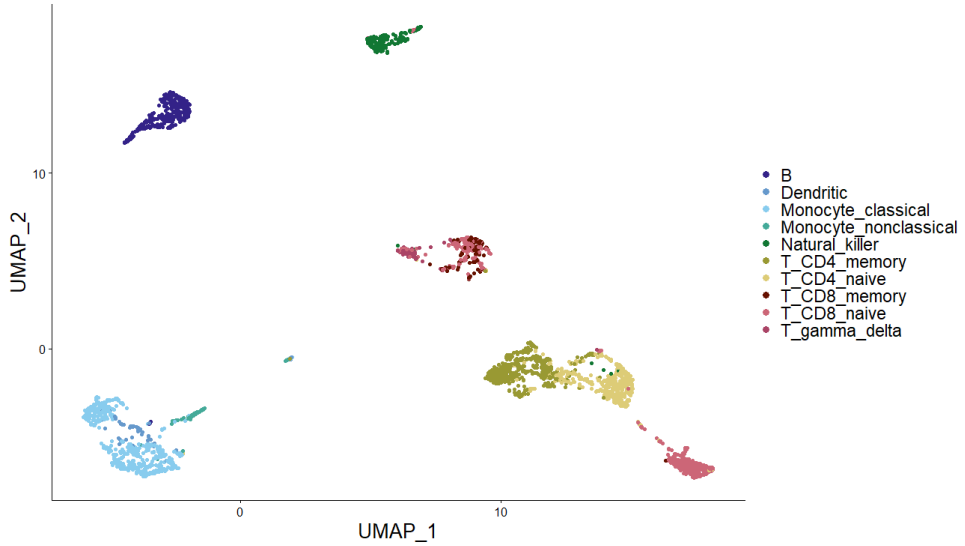
Dimensional reduction (UMAP/tSNE)

Data analysis using the
BD Cellismo™ Data Visualization Tool



- Automatically generated UMAP/tSNE
- Control over dot size and opacity
- Built-in palette (or custom ones) to change cluster colors easily

Data analysis in R
using Seurat




```r
# Normalizing the data
pbmc <- NormalizeData(pbmc, normalization.method = "LogNormalize", scale.factor = 10000)

# Identification of highly variable features
pbmc <- FindVariableFeatures(pbmc, selection.method = "vst", nfeatures = 2000)

# Scaling the data
all.genes <- rownames(pbmc)
pbmc <- ScaleData(pbmc, features = all.genes)

# Perform linear dimensional reduction
pbmc <- RunPCA(pbmc, features = VariableFeatures(object = pbmc))

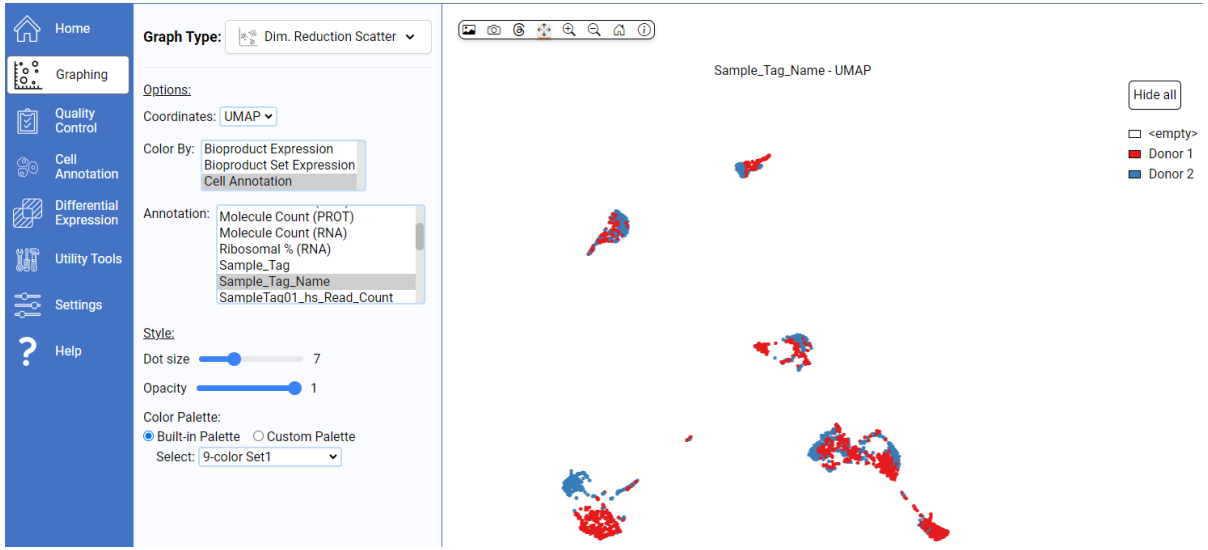
# Cluster the cells
pbmc <- FindNeighbors(pbmc, dims = 1:20)
pbmc <- FindClusters(pbmc, resolution = 0.5)

# Run non-linear dimensional reduction
pbmc <- RunUMAP(pbmc, dims = 1:10)
DimPlot(pbmc, reduction = "umap", pt.size = 1.3, cols = c(ptol_pal()(12)))
```


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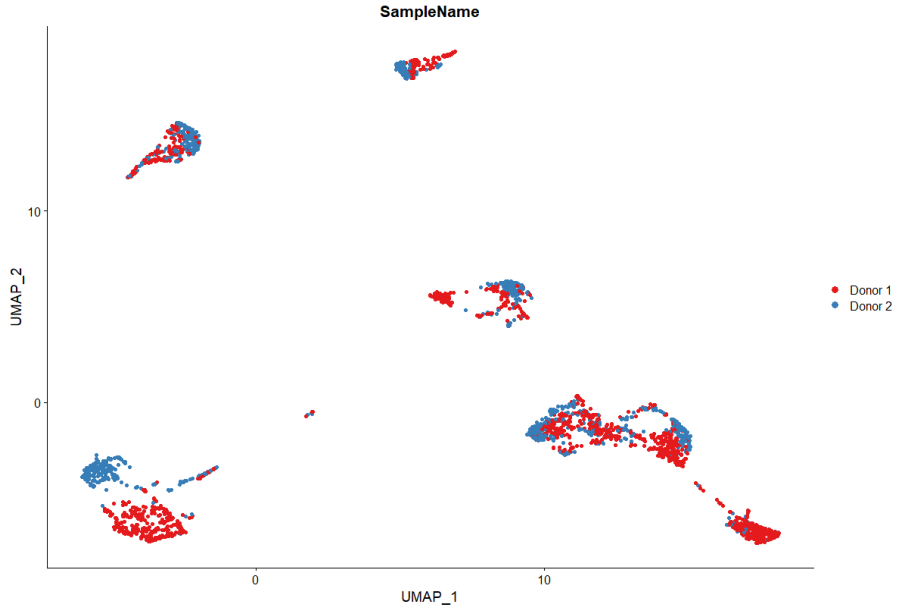
Sample Tags (and assigning sample name)

Data analysis using the
BD Cellismo™ Data Visualization Tool



- Assigning names to sample tags and removing the cells with multiple sample tags (multiplets) or no sample tags (undetermined)

Data analysis in R
using Seurat




```
## Sample Tags

# removing the cells with multiple sample tags (multiplets)
# or no sample tags (undetermined)
Idents(pbmc) <- pbmc@meta.data$Sample_Tag
pbmc <- subset(pbmc, cells = names(Idents(pbmc)[Idents(pbmc) %in% c("SampleTag01_hs",  "SampleTag02_hs")]))

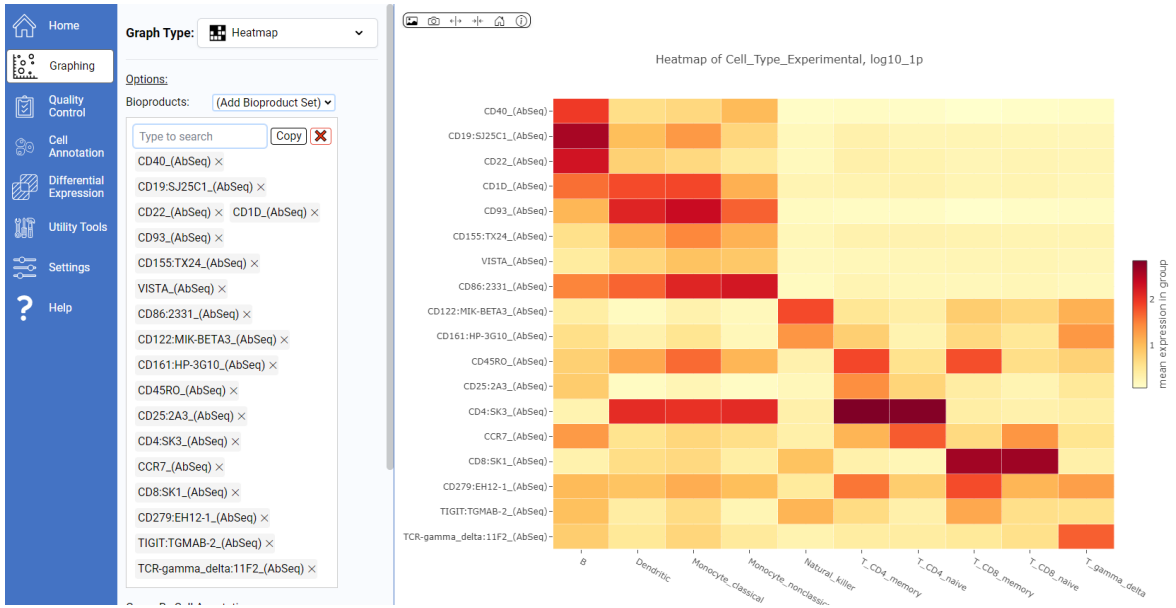
# Assigning names to samples
SampleName <- c()
SampleName[which(colnames(pbmc@assays$RNA) %in% names(Idents(pbmc))[which(Idents(pbmc) %in% c("SampleTag01_hs"))])] <- "Donor 1"
SampleName[which(colnames(pbmc@assays$RNA) %in% names(Idents(pbmc))[which(Idents(pbmc) %in% c("SampleTag02_hs"))])] <- "Donor 2"
pbmc[["SampleName"]] <- SampleName

# Visualization of samples on the UMAP
DimPlot(pbmc, reduction = "umap", group.by = "SampleName",pt.size = 1.3, cols= brewer.pal(9,"Set1"))
```

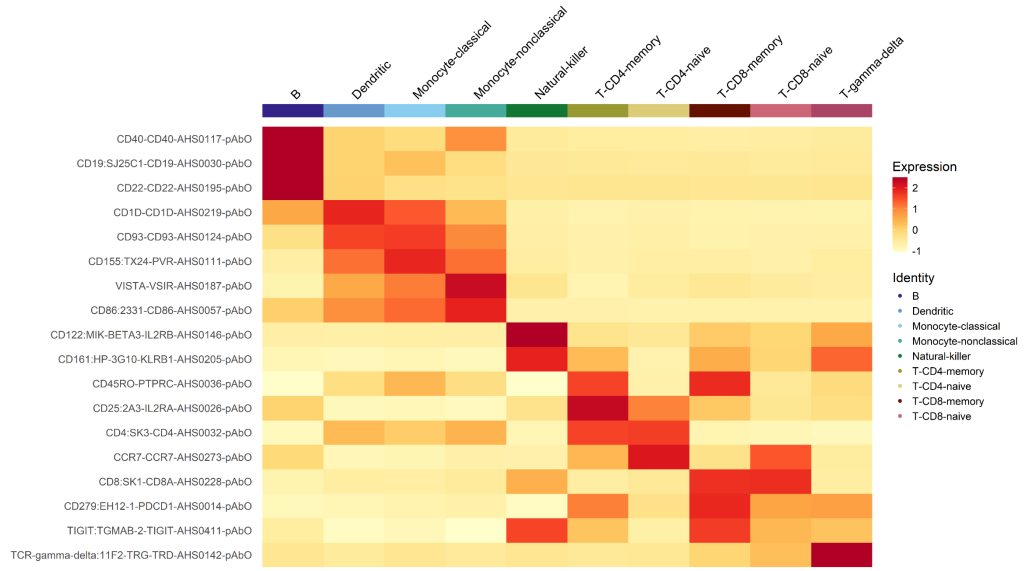

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Heatmap: average expression for BD® AbSeq Protein Markers

Data analysis using the BD Cellismo™ Data Visualization Tool



Data analysis in R using Seurat

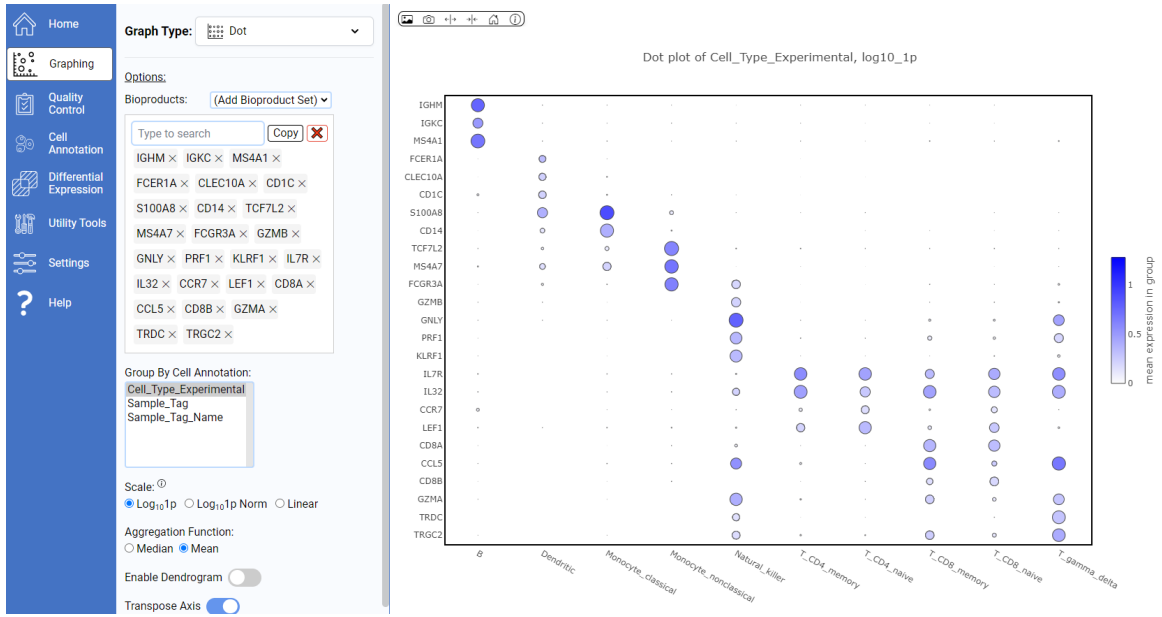



```
DefaultAssay(pbmc) <- "ADT"
avgexpabseq = AverageExpression(pbmc, return.seurat = T)
mapal <- colorRampPalette(RColorBrewer::brewer.pal(8, "YlOrRd"))(256)
DoHeatmap(avgexpabseq, group.bar.height = 0.03, group.bar = TRUE, group.colors  = c(ptol_pal()(12)),
          features = abseq, size = 5, hjust = 0, vjust = 0, angle = 45,
          combine = TRUE, draw.lines = FALSE) + scale_fill_gradientn(colours = (mapal)) & theme(text= element_text(size = 15))
```

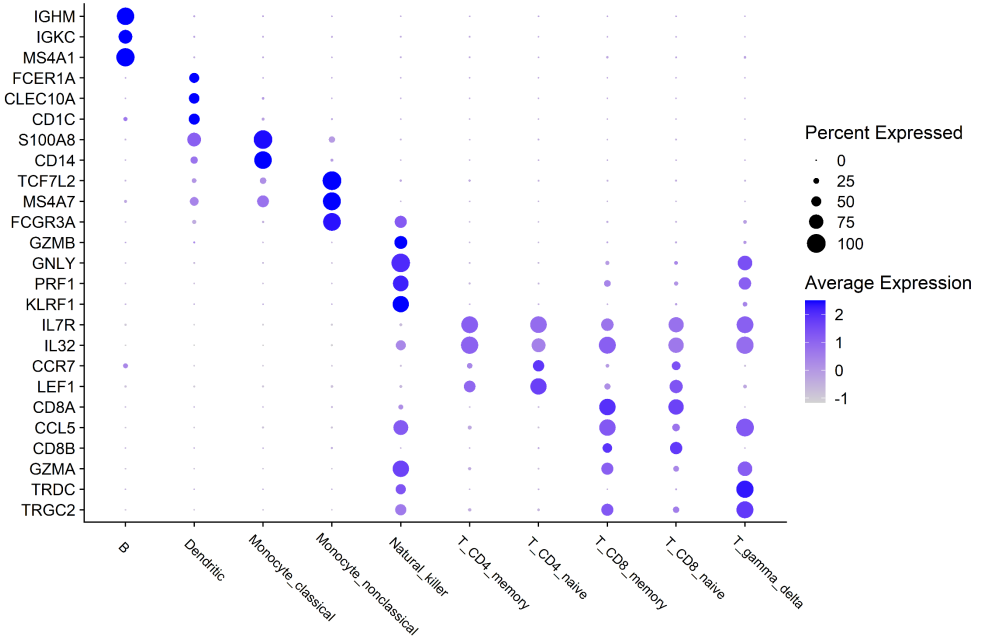

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Dotplot: average gene expression for biomarkers (RNA)

Data analysis using the BD Cellismo™ Data Visualization Tool



Data analysis in R using Seurat



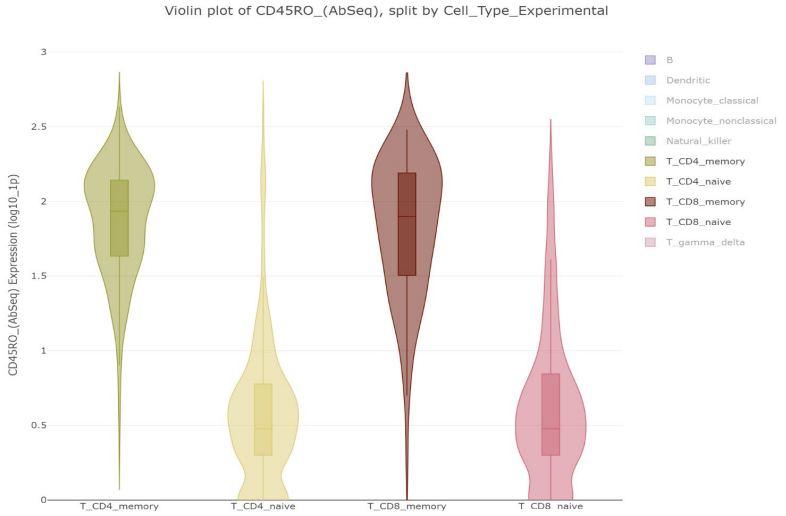

```
genes <- c("IGHM", "IGKC", "MS4A1", "FCER1A", "CLEC10A", "CD1C", "S100A8", "CD14", "TCF7L2", "MS4A7", "FCGR3A",
"GZMB", "GNLY", "PRF1", "KLRF1", "IL7R", "IL32", "CCR7", "LEF1", "CD8A", "CCL5", "CD8B", "GZMA","TRDC", "TRGC2")

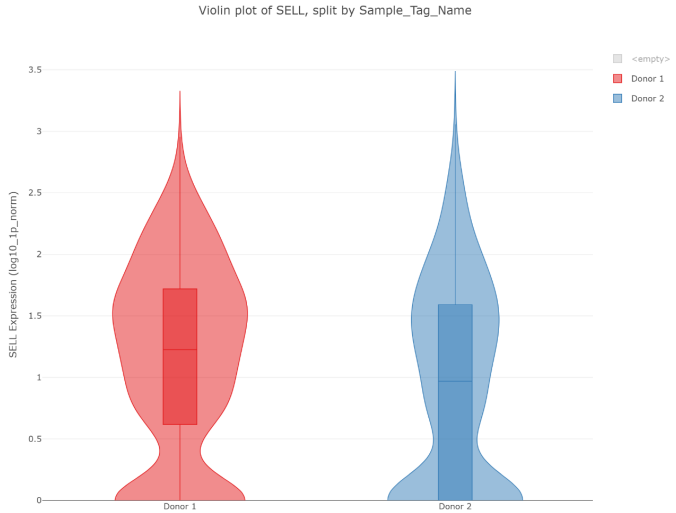
DotPlot(pbmc, features = genes, dot.scale=6, assay = "RNA") + theme(axis.text.x = element_text(size = 10, angle = -45,hjust = 0.1)) + coord_flip()
```


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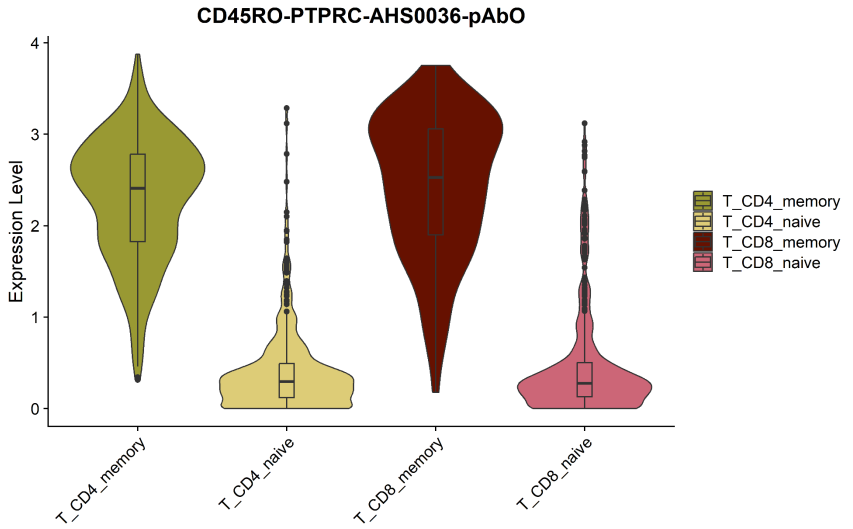
Violin plots

Data analysis using the BD Cellismo™ Data Visualization Tool

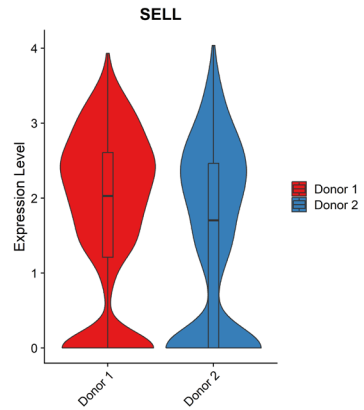




Data analysis in R using Seurat




```
VlnPlot(pbmc, features = "CD45RO-PTPRC-AHS0036-pAbO", pt.size = 0, assay = "ADT", cols = c("#999933","#DDCC77", "#661100", "#CC6677"),
group.by = "Cell_Type_Experimental",idents = c("T_CD4_memory", "T_CD4_naive","T_CD8_memory", "T_CD8_naive")) + geom_boxplot(width=0.1)
```

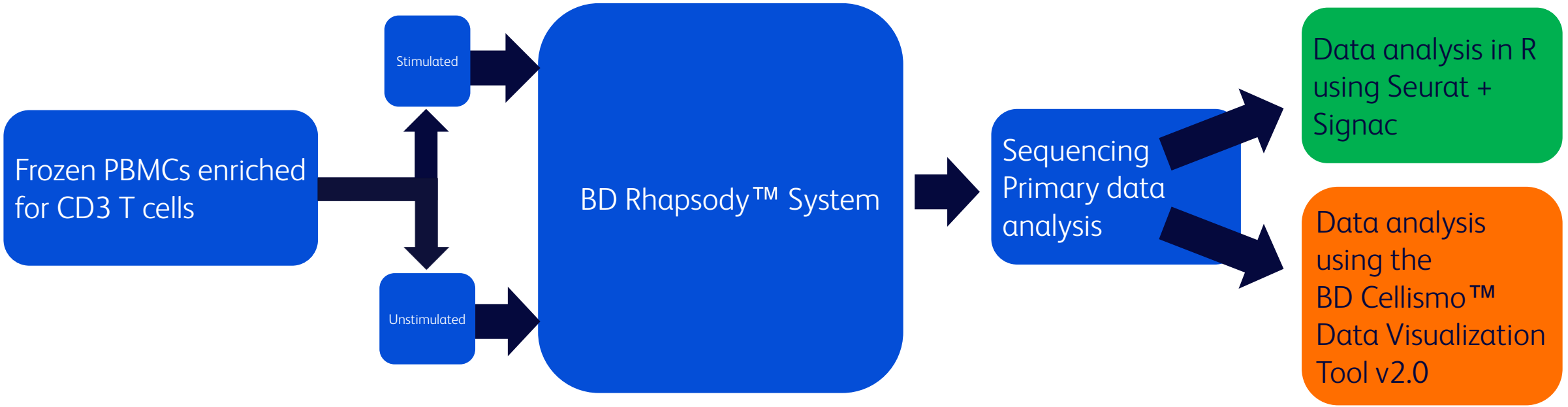



```
VlnPlot(pbmc, features = "SELL", pt.size = 0, cols= brewer.pal(9,"Set1"), assay = "RNA") + geom_boxplot(width=0.1)
```


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Performance v2.0

For ATAC-Seq data, generate the same visualization as R using the BD Cellismo™ Data Visualization Tool v2.0



- BD Rhapsody™ Single-Cell Multiomic ATAC-Seq Assay

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Data analysis workflow

Primary data analysis

Secondary data analysis

FASTQ files from sequencer

BD Rhapsody™ Sequence Analysis Pipeline

- Pre-processing and dimensional reduction on RNA (normalizing, finding variables, scaling, PCA)
- Pre-processing and dimensional reduction on ATAC (adding gene annotation information and normalization)
- Calculating transcriptional activity of each gene (gene activity matrix)
- Adding motif information and computing motif activities
- Computing QC metrics (RNA and ATC)
- Weighted nearest neighbor (WNN) analysis of RNA + ATAC

Pipeline output

- .RDS file
- .Cellismo file

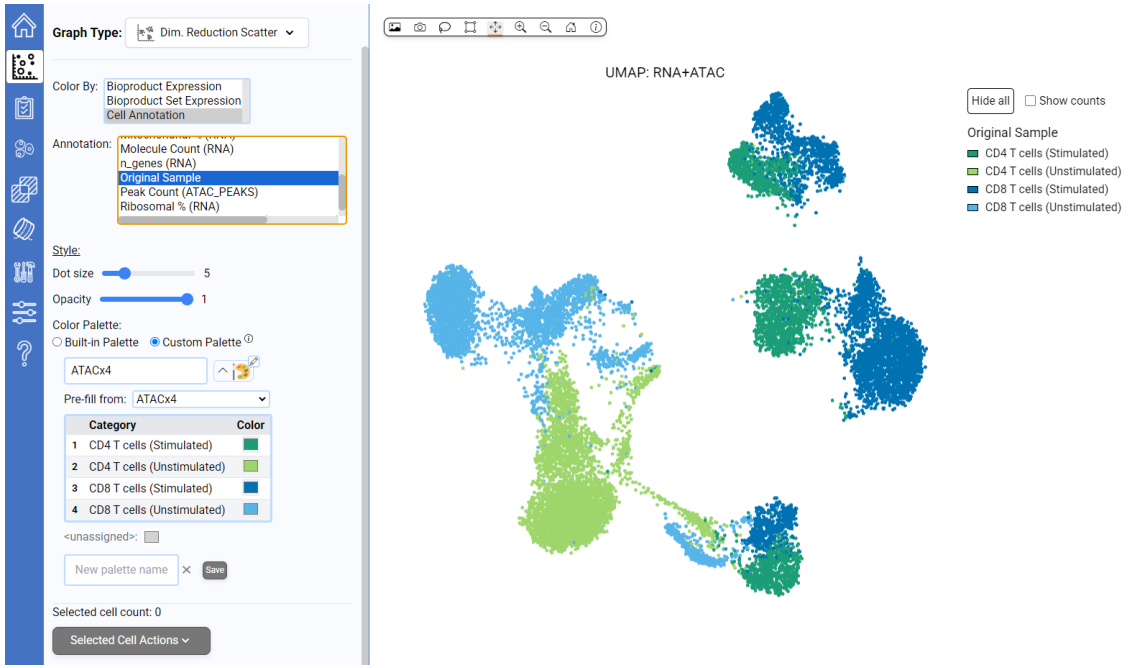
Seurat and Signac packages in R

BD Cellismo™ Data Visualization Tool

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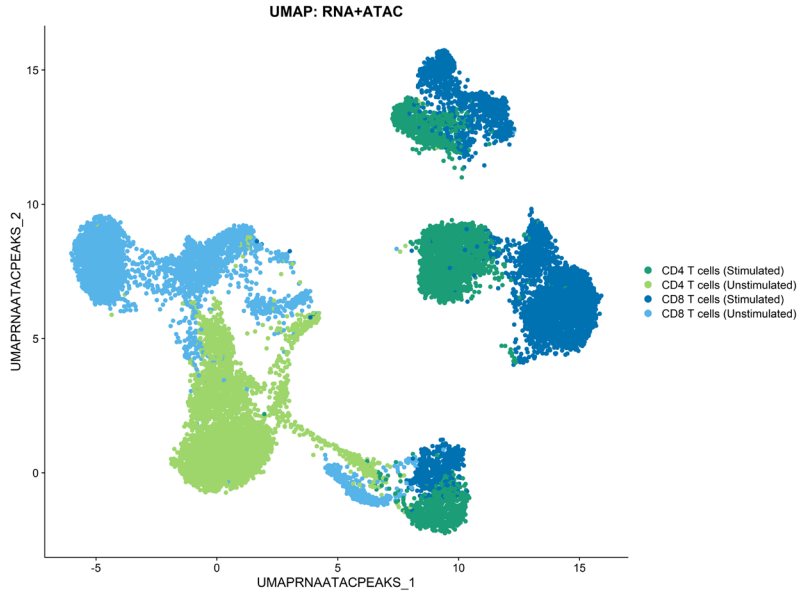
Dimensionality reduction (UMAP/t-SNE)

Data analysis using the
BD Cellismo™ Data Visualization Tool v2.0



Interactive customization of colors, dot size, displayed annotations, and selected modalities for dimensionality reduction

Data analysis in R using
Seurat + Signac



Code in R:

```
# RNA analysis
DefaultAssay(Seurat_object) <- "RNA"
Seurat_object <- SCTransform(Seurat_object, verbose = FALSE) %>% RunPCA() %>%
                 RunUMAP(dims = 1:50, reduction.name = 'umap.rna', reduction.key = 'rnaUMAP_')

# ATAC analysis
DefaultAssay(Seurat_object) <- "peaks"
Seurat_object <- RunTFIDF(Seurat_object)
Seurat_object <- FindTopFeatures(Seurat_object, min.cutoff = 'q0')
Seurat_object <- RunSVD(Seurat_object)
Seurat_object <- RunUMAP(Seurat_object, reduction = 'lsi', dims = 2:50, reduction.name = "umap.atac", reduction.key = "atacUMAP_")

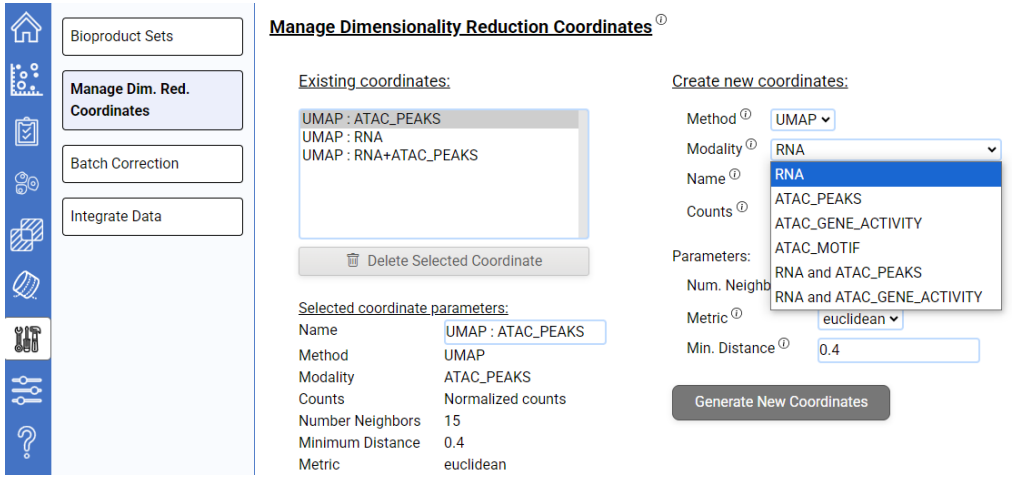
# WNN graph, representing a weighted combination of RNA and ATAC-seq modalities.
Seurat_object <- FindMultiModalNeighbors(Seurat_object, reduction.list = list("pca", "lsi"), dims.list = list(1:50, 2:50))
Seurat_object <- RunUMAP(Seurat_object, nn.name = "weighted.nn", reduction.name = "UMAP.RNA.ATAC_PEAKS", reduction.key = "wnnUMAP_")
Seurat_object <- FindClusters(Seurat_object, graph.name = "wsnn", algorithm = 3, verbose = FALSE, resolution = 0.3)

DimPlot(my_seurat_object, reduction = 'UMAP.RNA.ATAC_PEAKS', group.by = "Original Sample",
        cols = c(col4s,col4us,col8s,col8us), pt.size = 1.5) + ggtitle("UMAP: RNA+ATAC")
```

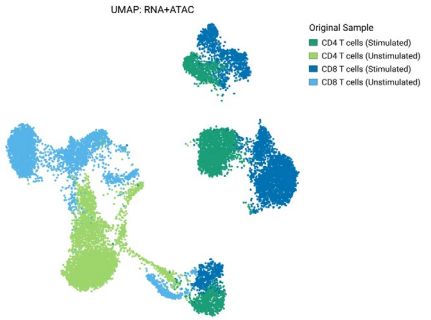

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UMAP /t-SNE visualization across modalities: RNA, ATAC and RNA+ATAC

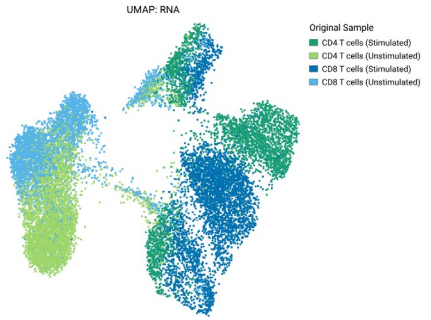
Data analysis using the BD Cellismo™ Data Visualization Tool v2.0



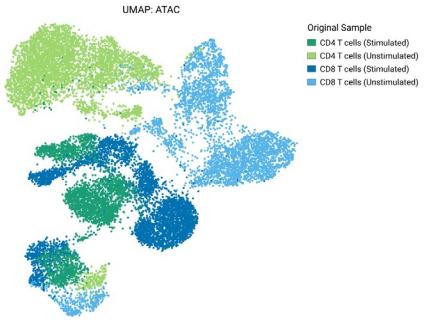
RNA + ATAC



RNA



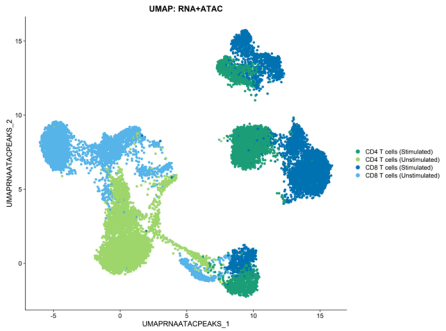
ATAC



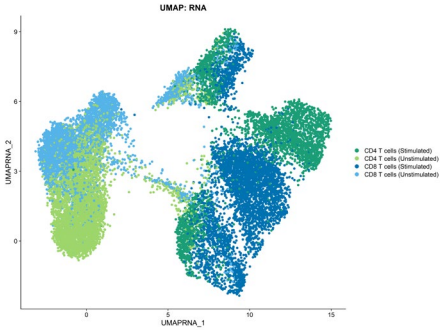
Manage dimensionality reduction by choosing either RNA data, ATAC data, or a combination of both modalities.

Data analysis in R using Seurat + Signac

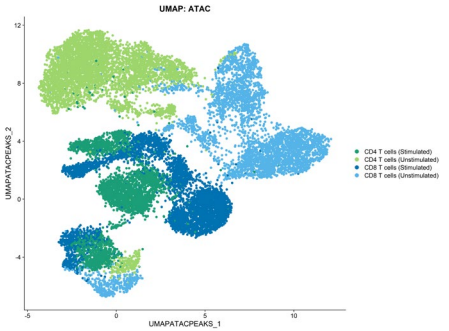
RNA + ATAC



RNA



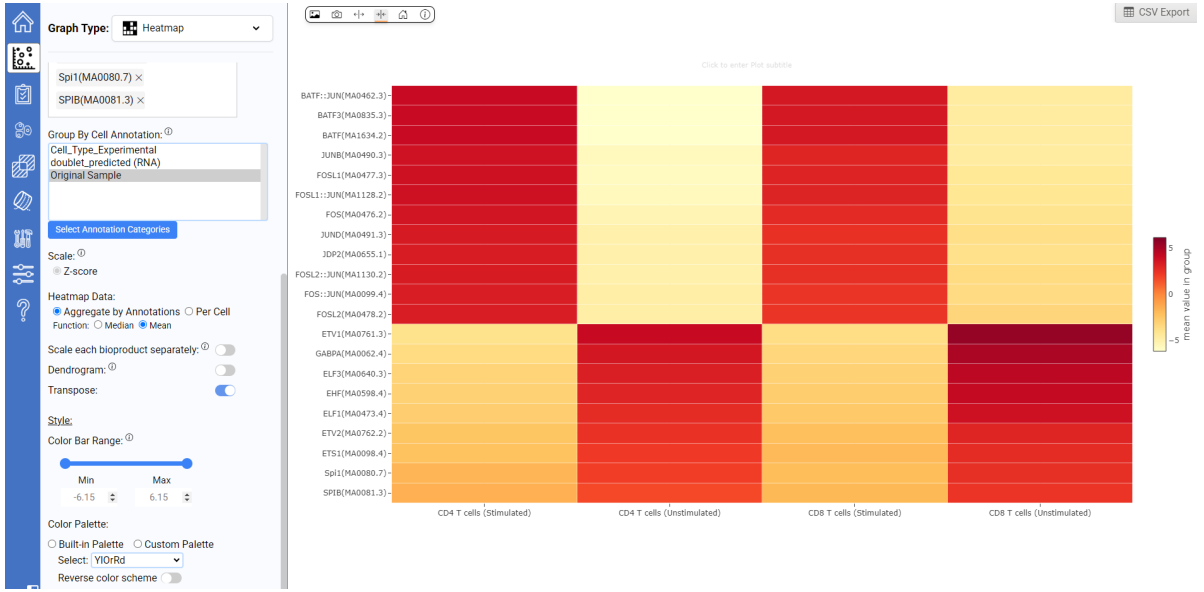
ATAC



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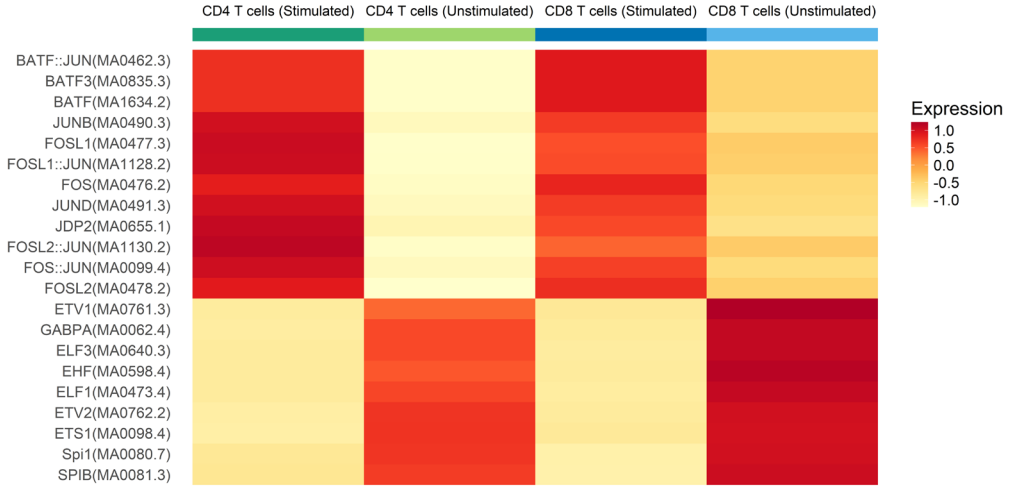
Transcription factor activity

Data analysis using the BD Cellismo™ Data Visualization Tool v2.0



- Flexible data computation and visualization options, including mean or median display, per-cell or aggregated display, and support for built-in or custom color palettes
- Differential analysis to identify up and down-regulated transcription factors for each sample or subset of interest
- Interactive environment for adjusting scale and adding or removing parameters

Data analysis in R using Seurat + Signac



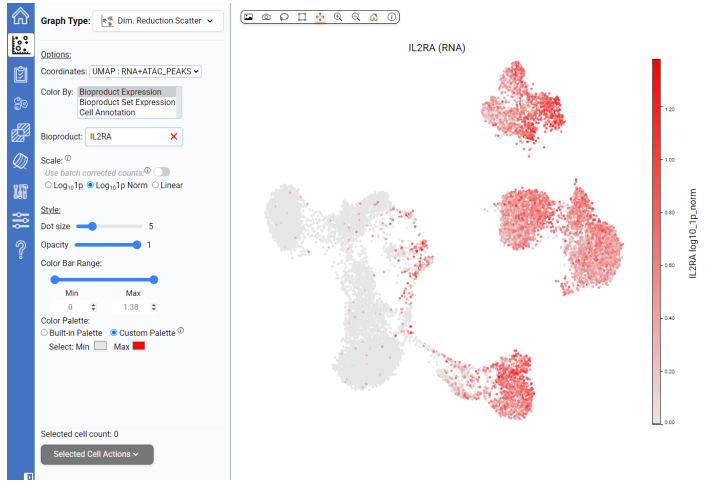
Code in R:

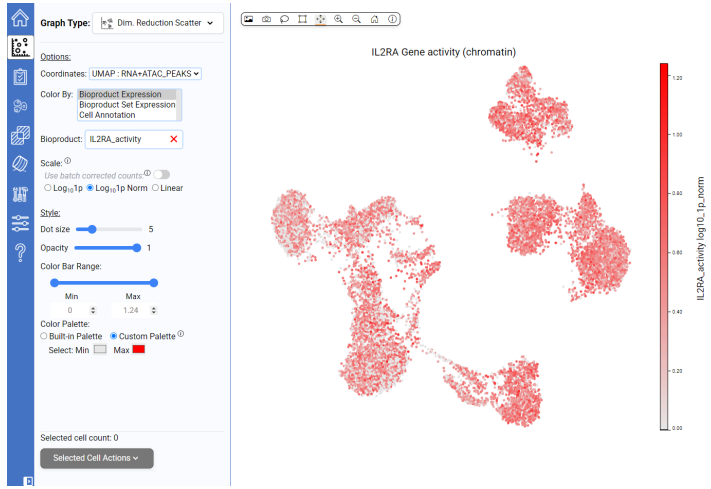
```
library(chromVAR)
library(BSgenome.Hsapiens.UCSC.hg38)
Seurat_object <- RunChromVAR(object = Seurat_object, genome = BSgenome.Hsapiens.UCSC.hg38,
                             new.assay.name = "atac_motif", assay = "peaks")
DefaultAssay(Seurat_object) <- "atac_motif"
avg_motif_activity <- AverageExpression(Seurat_object, return.seurat = TRUE, group.by = "Original Sample")
Motif list <- c("BATF::JUN(MA0462.3)", "BATF3(MA0835.3)", ...)
mapal <- colorRampPalette(RColorBrewer::brewer.pal(8, "YlOrRd"))(256)
DoHeatmap(avg_motif_activity, group.bar.height = 0.03, group.bar = TRUE, group.colors =c(col4s, col4us, col8s, col8us), label = TRUE,
          features = Motif list, assay = "atac_motif", size = 5, hjust = 0.5, vjust = 0.5, angle = 0, group.by = "Original Sample",
          combine = TRUE, draw.lines = FALSE) +  theme(text = element_text(size = 19)) + scale_fill_gradientn(colours = (mapal))
```


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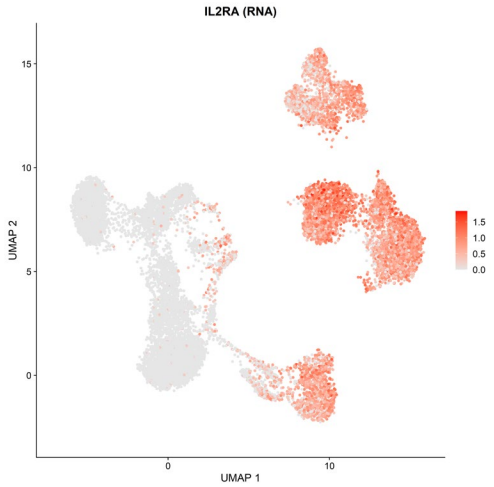
Gene activity and RNA expression

Data analysis using the BD Cellismo™ Data Visualization Tool v2.0

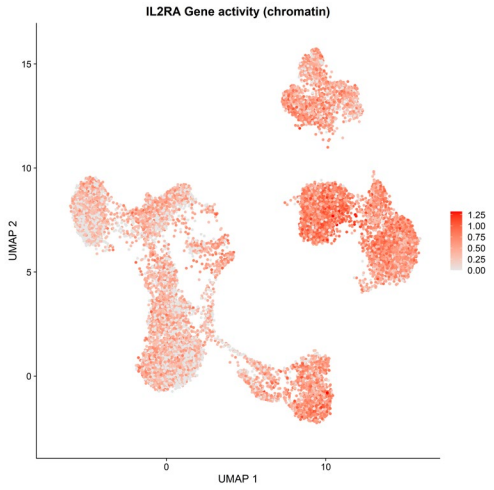




Data analysis in R using Seurat + Signac



IL2RA (RNA)

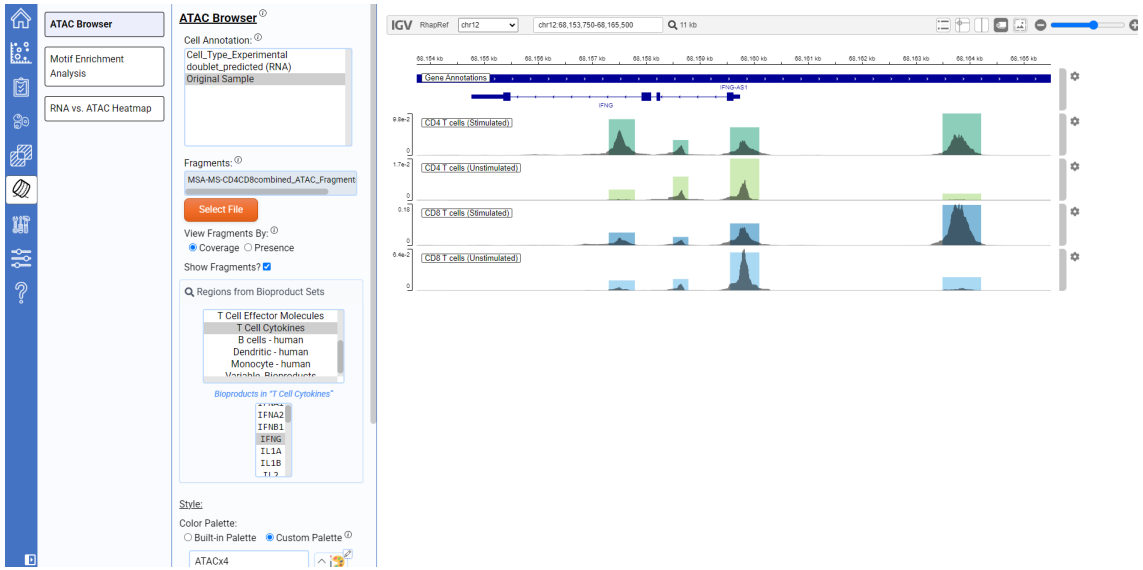


IL2RA (Gene activity)

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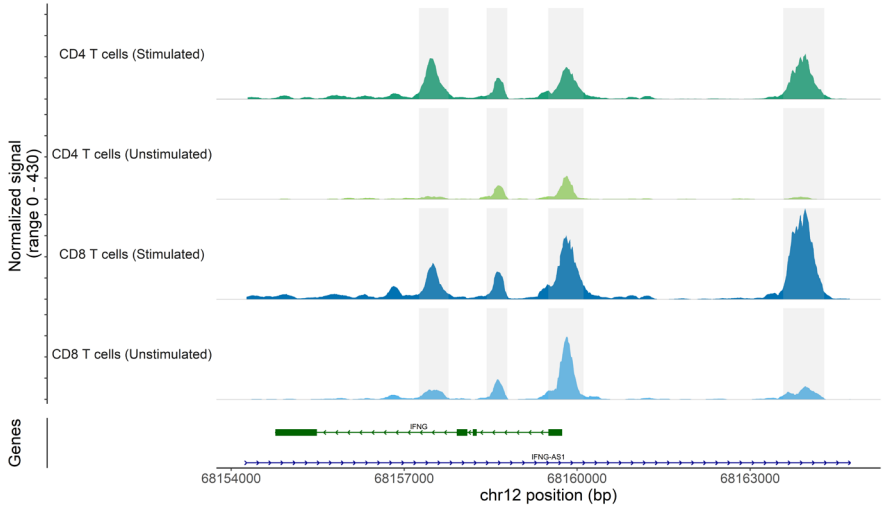
Visualization of genomic regions

Data analysis using the BD Cellismo™ Data Visualization Tool v2.0



Easy-to-use Integrative Genomics Viewer (IGV) for exploring genomic regions.

Data analysis in R using Seurat + Signac



IFNG Genomic region

Code in R:

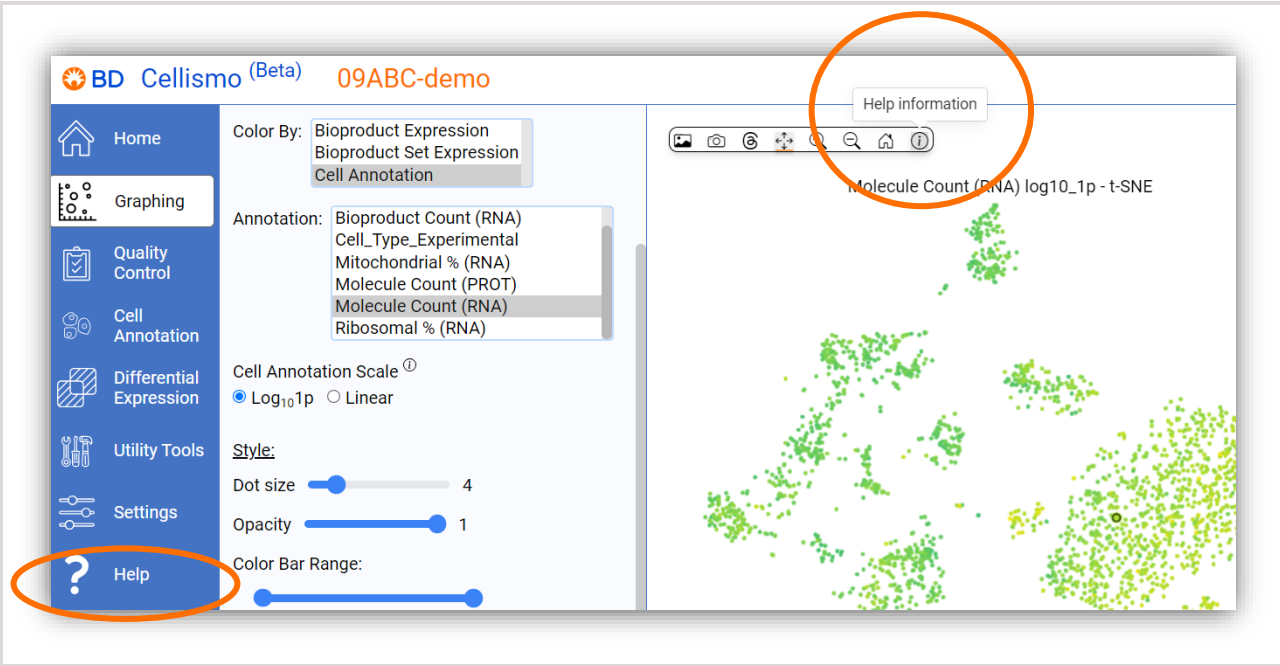
```
ranges.show <- StringToGRanges(c("chr12-68159500-68160100", "chr12-68163500-68164200",
                                 "chr12-68158450-68158800","chr12-68157300-68157800"))
CoveragePlot(Seurat_object, region = c("IFNG"), annotation = T, peaks = F, links = F, heights = 8,
             extend.upstream = 500, extend.downstream = 5000, group.by = "Original Sample",  window = 150, region.highlight = ranges.show)
             & scale_fill_manual(values= c(col4s, col4us, col8s, col8us)) & theme(text = element_text(size=16))
```


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Support

Support resources

- Click on the information icon within the software for help ⓘ
- Access training videos on:
  - Scomix
  - BD Biosciences YouTube channel
- For any further questions, email us (emails also available in the Help section)
  - Europe: biox_support_emea@bd.com
  - China: bd-scm-bioinformatic@bd.com
  - USA: gmb-us-scm_bioinformatics@bd.com
  - Rest of the world: scomix@bd.com



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Thank you



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