

Process Single Cell RNA-Seq reads using *scruff*

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scruff is a toolkit for processing single cell RNA-seq FASTQ reads generated by CEL-Seq and CEL-Seq2 protocols. It does demultiplexing, alignment, Unique Molecular Identifier (UMI) filtering, and transcript counting in an automated fashion and generates the gene count matrix, QC metrics and provides visualizations of data quality. This vignette provides a brief introduction to the **scruff** package by walking through the demultiplexing, alignment, and UMI-counting of a built-in publicly available example dataset (*van den Brink, et al. 2017*).

Quick Start

```
# Run scruff on example dataset
# NOTE: Requires Rsubread index and TxDb objects for the reference genome.
# For generation of these files, please refer to the Stepwise Tutorial.

library(scruff)

# Get the paths to example FASTQ, FASTA, and GTF files.
v1h1R1 <- system.file("extdata",
                      "vandenBrink_1h1_L001_R1_001.fastq.gz",
                      package = "scruff")
v1h1R2 <- system.file("extdata",
                      "vandenBrink_1h1_L001_R2_001.fastq.gz",
                      package = "scruff")
vb1R1 <- system.file("extdata",
                    "vandenBrink_b1_L001_R1_001.fastq.gz",
                    package = "scruff")
vb1R2 <- system.file("extdata",
                    "vandenBrink_b1_L001_R2_001.fastq.gz",
                    package = "scruff")
fasta <- system.file("extdata", "GRCm38_MT.fa", package = "scruff")
gtf <- system.file("extdata", "GRCm38_MT.gtf", package = "scruff")
```

Build Rsubread alignment index. This is for the alignment step. For test porpurpose, here we are aligning the example FASTQ files to the genes on mitochondrial chromosome only.

```
# NOTE: Rsubread package does not support Windows environment.
library(Rsubread)
# Create index files for GRCm38_MT. For details, please refer to Rsubread user manual.
# Specify the basename for Rsubread index
indexBase <- "GRCm38_MT"
buildindex(basename = indexBase, reference = fasta, indexSplit = FALSE)
```

```
##
##      =====
##      ===== / ____| | | | _ \ | | | | _ \ | | | | _ \ | | | | _ \ | | | | _ \
```

```

##          ===== | (___ | | | | |_) | |_) | |__ / \ | | | |
##          ===== \___ \ | | | | |_ <| _ / | |__ / \ \ | | | |
##          ===== ) | | | | |_) | | \ \ | |__ / \___ \ | | | |
##          ===== |_____/ \___/ |____/ | | \ \___/ \ / \___/
##      Rsubread 1.28.0
##
## //===== indexBuilder setting =====\\
## ||
## ||          Index name : GRCm38_MT
## ||          Index space : base-space
## ||          Memory : 8000 Mbytes
## ||          Repeat threshold : 100 repeats
## ||      Distance to next subread : 3
## ||
## ||          Input files : 1 file in total
## ||                          o /usr3/graduate/zhe/R/x86_64-pc-linux-gnu ...
## ||
## \\===== http://subread.sourceforge.net/ =====\\
##
## //===== Running =====\\
## ||
## || Check the integrity of provided reference sequences ...
## || No format issues were found
## || Scan uninformative subreads in reference sequences ...
## ||      8%, 0 mins elapsed, rate=2.2k bps/s, total=0m
## ||      16%, 0 mins elapsed, rate=4.5k bps/s, total=0m
## ||      24%, 0 mins elapsed, rate=6.7k bps/s, total=0m
## ||      33%, 0 mins elapsed, rate=9.0k bps/s, total=0m
## ||      41%, 0 mins elapsed, rate=11.2k bps/s, total=0m
## ||      49%, 0 mins elapsed, rate=13.4k bps/s, total=0m
## ||      58%, 0 mins elapsed, rate=15.6k bps/s, total=0m
## ||      66%, 0 mins elapsed, rate=17.9k bps/s, total=0m
## ||      74%, 0 mins elapsed, rate=20.1k bps/s, total=0m
## ||      83%, 0 mins elapsed, rate=22.3k bps/s, total=0m
## ||      91%, 0 mins elapsed, rate=24.5k bps/s, total=0m
## ||      99%, 0 mins elapsed, rate=26.8k bps/s, total=0m
## || Build the index...
## ||      8%, 0 mins elapsed, rate=671.5k bps/s, total=0m
## ||      16%, 0 mins elapsed, rate=671.5k bps/s, total=0m
## ||      24%, 0 mins elapsed, rate=575.6k bps/s, total=0m
## ||      33%, 0 mins elapsed, rate=596.9k bps/s, total=0m
## ||      41%, 0 mins elapsed, rate=610.4k bps/s, total=0m
## ||      49%, 0 mins elapsed, rate=619.8k bps/s, total=0m
## ||      58%, 0 mins elapsed, rate=587.6k bps/s, total=0m
## ||      66%, 0 mins elapsed, rate=596.9k bps/s, total=0m
## ||      74%, 0 mins elapsed, rate=604.4k bps/s, total=0m
## ||      83%, 0 mins elapsed, rate=610.5k bps/s, total=0m
## ||      91%, 0 mins elapsed, rate=590.9k bps/s, total=0m
## ||      99%, 0 mins elapsed, rate=596.9k bps/s, total=0m
## ||      108%, 0 mins elapsed, rate=602.0k bps/s, total=0m
## || Save current index block...
## || [ 0.0% finished ]
## || [ 10.0% finished ]
## || [ 20.0% finished ]

```

```
## || [ 30.0% finished ] ||
## || [ 40.0% finished ] ||
## || [ 50.0% finished ] ||
## || [ 60.0% finished ] ||
## || [ 70.0% finished ] ||
## || [ 80.0% finished ] ||
## || [ 90.0% finished ] ||
## || [ 100.0% finished ] ||
## || ||
## || Total running time: 0.0 minutes. ||
## || Index GRCm38_MT was successfully built! ||
## || ||
## \\===== http://subread.sourceforge.net/ =====//
```

Now that everything is ready, we can run `scruff`. In sample 1h1, cell barcodes 95 and 96 are empty well controls. In sample b1, cell barcode 95 is bulk sample containing 300 cells. These information can be set by the `cellPerWell` argument. The following command returns a `SingleCellExperiment` object containing UMI filtered count matrix as well as gene and sample annotations and QC metrics.

```
sce <- scruff(project = "example",
             sample = c("1h1", "b1"),
             lane = c("L001", "L001"),
             read1Path = c(v1h1R1, vb1R1),
             read2Path = c(v1h1R2, vb1R2),
             bc = barcodeExample,
             index = indexBase,
             unique = FALSE,
             nBestLocations = 1,
             reference = gtf,
             bcStart = 1,
             bcStop = 8,
             umiStart = 9,
             umiStop = 12,
             keep = 75,
             cellPerWell = c(rep(1, 94), 0, 0, rep(1, 94), 300, 1),
             cores = 2,
             verbose = TRUE)
```

```
## 2018-05-23 11:25:27 Start running scruff ...
```

```
## scruff(project = "example", sample = c("1h1", "b1"), lane = c("L001",
## "L001"), read1Path = c(v1h1R1, vb1R1), read2Path = c(v1h1R2,
## vb1R2), bc = barcodeExample, index = indexBase, reference = gtf,
## bcStart = 1, bcStop = 8, umiStart = 9, umiStop = 12, keep = 75,
## cellPerWell = c(rep(1, 94), 0, 0, rep(1, 94), 300, 1), unique = FALSE,
## nBestLocations = 1, verbose = TRUE, cores = 2)
```

```
## 2018-05-23 11:25:27 Start demultiplexing ...
```

```
## demultiplex(project = project, sample = sample, lane = lane,
## read1Path = read1Path, read2Path = read2Path, bc = bc, bcStart = bcStart,
## bcStop = bcStop, bcEdit = bcEdit, umiStart = umiStart, umiStop = umiStop,
## keep = keep, minQual = minQual, yieldReads = yieldReads,
```

```

##      outDir = demultiplexOutDir, summaryPrefix = demultiplexSummaryPrefix,
##      overwrite = overwrite, cores = cores, verbose = verbose,
##      logfilePrefix = logfilePrefix)

## Input sample information for FASTQ files:

##      project sample lane
## 1: example      1h1 L001
## 2: example      b1 L001
##
## 1: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_1h1_L001_R1_001.f
## 2: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_b1_L001_R1_001.f
##
## 1: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_1h1_L001_R2_001.f
## 2: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_b1_L001_R2_001.f
## automatically exporting the following variables from the local environment:
##      barcodeDt, bcEdit, bcStart, bcStop, fastqAnnotDt, keep, logfile, logfilePrefix, minQual, outDir, o
## numValues: 2, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 2, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 2, numResults: 2, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##      fun(result.1, result.2)
## returning status TRUE

## 2018-05-23 11:25:47 ... Write demultiplex summary for all samples to ./Demultiplex/20180523_112547_d

## ... Initialize SingleCellExperiment object.

## ... Add demultiplex summary to SCE colData.

## 2018-05-23 11:25:48 ... Demultiplex done!

## 2018-05-23 11:25:48 Start alignment ...

## alignRsubread(sce = de, index = index, unique = unique, nBestLocations = nBestLocations,
##      format = alignmentFileFormat, outDir = alignmentOutDir, cores = cores,
##      threads = threads, summaryPrefix = alignmentSummaryPrefix,
##      overwrite = overwrite, verbose = verbose, logfilePrefix = logfilePrefix)

## ... Input fastq paths:

##      [1] "./Demultiplex/1h1/example_1h1_cell_0001.fastq.gz"
##      [2] "./Demultiplex/1h1/example_1h1_cell_0002.fastq.gz"
##      [3] "./Demultiplex/1h1/example_1h1_cell_0003.fastq.gz"
##      [4] "./Demultiplex/1h1/example_1h1_cell_0004.fastq.gz"
##      [5] "./Demultiplex/1h1/example_1h1_cell_0005.fastq.gz"
##      [6] "./Demultiplex/1h1/example_1h1_cell_0006.fastq.gz"

```


[illegible]

[illegible]

```

## [169] "./Demultiplex/b1/example_b1_cell_0073.fastq.gz"
## [170] "./Demultiplex/b1/example_b1_cell_0074.fastq.gz"
## [171] "./Demultiplex/b1/example_b1_cell_0075.fastq.gz"
## [172] "./Demultiplex/b1/example_b1_cell_0076.fastq.gz"
## [173] "./Demultiplex/b1/example_b1_cell_0077.fastq.gz"
## [174] "./Demultiplex/b1/example_b1_cell_0078.fastq.gz"
## [175] "./Demultiplex/b1/example_b1_cell_0079.fastq.gz"
## [176] "./Demultiplex/b1/example_b1_cell_0080.fastq.gz"
## [177] "./Demultiplex/b1/example_b1_cell_0081.fastq.gz"
## [178] "./Demultiplex/b1/example_b1_cell_0082.fastq.gz"
## [179] "./Demultiplex/b1/example_b1_cell_0083.fastq.gz"
## [180] "./Demultiplex/b1/example_b1_cell_0084.fastq.gz"
## [181] "./Demultiplex/b1/example_b1_cell_0085.fastq.gz"
## [182] "./Demultiplex/b1/example_b1_cell_0086.fastq.gz"
## [183] "./Demultiplex/b1/example_b1_cell_0087.fastq.gz"
## [184] "./Demultiplex/b1/example_b1_cell_0088.fastq.gz"
## [185] "./Demultiplex/b1/example_b1_cell_0089.fastq.gz"
## [186] "./Demultiplex/b1/example_b1_cell_0090.fastq.gz"
## [187] "./Demultiplex/b1/example_b1_cell_0091.fastq.gz"
## [188] "./Demultiplex/b1/example_b1_cell_0092.fastq.gz"
## [189] "./Demultiplex/b1/example_b1_cell_0093.fastq.gz"
## [190] "./Demultiplex/b1/example_b1_cell_0094.fastq.gz"
## [191] "./Demultiplex/b1/example_b1_cell_0095.fastq.gz"
## [192] "./Demultiplex/b1/example_b1_cell_0096.fastq.gz"

## 2018-05-23 11:25:48 ... Creating output directory ./Alignment

## automatically exporting the following variables from the local environment:
##   format, index, logfile, nBestLocations, outDir, threads, unique, verbose
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE

```



```
## got results for task 9
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
```

```
## got results for task 27
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
```

```
## got results for task 45
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
```

```
## got results for task 63
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
```

```
## got results for task 81
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
```

```

## got results for task 99
## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##       result.7, result.8, result.9, result.10, result.11, result.12,
##       result.13, result.14, result.15, result.16, result.17, result.18,
##       result.19, result.20, result.21, result.22, result.23, result.24,
##       result.25, result.26, result.27, result.28, result.29, result.30,
##       result.31, result.32, result.33, result.34, result.35, result.36,
##       result.37, result.38, result.39, result.40, result.41, result.42,
##       result.43, result.44, result.45, result.46, result.47, result.48,
##       result.49, result.50, result.51, result.52, result.53, result.54,
##       result.55, result.56, result.57, result.58, result.59, result.60,
##       result.61, result.62, result.63, result.64, result.65, result.66,
##       result.67, result.68, result.69, result.70, result.71, result.72,
##       result.73, result.74, result.75, result.76, result.77, result.78,
##       result.79, result.80, result.81, result.82, result.83, result.84,
##       result.85, result.86, result.87, result.88, result.89, result.90,
##       result.91, result.92, result.93, result.94, result.95, result.96,
##       result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE

```

```
## returning status FALSE
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
```

```
## returning status FALSE
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
```



```
## returning status FALSE
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
```

```
## returning status FALSE
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
```

```

## returning status FALSE
## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##     result.106, result.107, result.108, result.109, result.110,
##     result.111, result.112, result.113, result.114, result.115,
##     result.116, result.117, result.118, result.119, result.120,
##     result.121, result.122, result.123, result.124, result.125,
##     result.126, result.127, result.128, result.129, result.130,
##     result.131, result.132, result.133, result.134, result.135,
##     result.136, result.137, result.138, result.139, result.140,
##     result.141, result.142, result.143, result.144, result.145,
##     result.146, result.147, result.148, result.149, result.150,
##     result.151, result.152, result.153, result.154, result.155,
##     result.156, result.157, result.158, result.159, result.160,
##     result.161, result.162, result.163, result.164, result.165,
##     result.166, result.167, result.168, result.169, result.170,
##     result.171, result.172, result.173, result.174, result.175,
##     result.176, result.177, result.178, result.179, result.180,
##     result.181, result.182, result.183, result.184, result.185,
##     result.186, result.187, result.188, result.189, result.190,
##     result.191, result.192)
## returning status TRUE
## automatically exporting the following variables from the local environment:
##   verbose

```

```
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE
## got results for task 9
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
```

```
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
## got results for task 27
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
```

```
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
## got results for task 45
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
```

```
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
## got results for task 63
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
```

```
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
## got results for task 81
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
```



```

## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
## got results for task 99
## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##     result.7, result.8, result.9, result.10, result.11, result.12,
##     result.13, result.14, result.15, result.16, result.17, result.18,
##     result.19, result.20, result.21, result.22, result.23, result.24,
##     result.25, result.26, result.27, result.28, result.29, result.30,
##     result.31, result.32, result.33, result.34, result.35, result.36,
##     result.37, result.38, result.39, result.40, result.41, result.42,
##     result.43, result.44, result.45, result.46, result.47, result.48,
##     result.49, result.50, result.51, result.52, result.53, result.54,
##     result.55, result.56, result.57, result.58, result.59, result.60,
##     result.61, result.62, result.63, result.64, result.65, result.66,
##     result.67, result.68, result.69, result.70, result.71, result.72,
##     result.73, result.74, result.75, result.76, result.77, result.78,
##     result.79, result.80, result.81, result.82, result.83, result.84,
##     result.85, result.86, result.87, result.88, result.89, result.90,
##     result.91, result.92, result.93, result.94, result.95, result.96,
##     result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102

```

```
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE
## returning status FALSE
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
```

```
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
## returning status FALSE
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
```

```
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
## returning status FALSE
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
```

```
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
## returning status FALSE
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
```

```
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
## returning status FALSE
## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
```

```

## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##       result.106, result.107, result.108, result.109, result.110,
##       result.111, result.112, result.113, result.114, result.115,
##       result.116, result.117, result.118, result.119, result.120,
##       result.121, result.122, result.123, result.124, result.125,
##       result.126, result.127, result.128, result.129, result.130,
##       result.131, result.132, result.133, result.134, result.135,
##       result.136, result.137, result.138, result.139, result.140,
##       result.141, result.142, result.143, result.144, result.145,
##       result.146, result.147, result.148, result.149, result.150,
##       result.151, result.152, result.153, result.154, result.155,
##       result.156, result.157, result.158, result.159, result.160,
##       result.161, result.162, result.163, result.164, result.165,
##       result.166, result.167, result.168, result.169, result.170,
##       result.171, result.172, result.173, result.174, result.175,
##       result.176, result.177, result.178, result.179, result.180,
##       result.181, result.182, result.183, result.184, result.185,
##       result.186, result.187, result.188, result.189, result.190,
##       result.191, result.192)
## returning status TRUE

## 2018-05-23 11:28:29 ... Write alignment summary to ./Alignment/20180523_112829_alignment.tab

## 2018-05-23 11:28:29 ... Add alignment information to SCE colData.

## 2018-05-23 11:28:29 ... Alignment done!

## 2018-05-23 11:28:29 Start UMI counting ...

## countUMI(sce = al, reference = reference, format = alignmentFileFormat,
##   outDir = countUmiOutDir, cellPerWell = cellPerWell, cores = cores,
##   outputPrefix = countPrefix, verbose = verbose, logfilePrefix = logfilePrefix)

## ... Input alignment files:

## [1] "./Alignment/example_1h1_cell_0001.BAM"
## [2] "./Alignment/example_1h1_cell_0002.BAM"
## [3] "./Alignment/example_1h1_cell_0003.BAM"
## [4] "./Alignment/example_1h1_cell_0004.BAM"
## [5] "./Alignment/example_1h1_cell_0005.BAM"
## [6] "./Alignment/example_1h1_cell_0006.BAM"
## [7] "./Alignment/example_1h1_cell_0007.BAM"
## [8] "./Alignment/example_1h1_cell_0008.BAM"
## [9] "./Alignment/example_1h1_cell_0009.BAM"
## [10] "./Alignment/example_1h1_cell_0010.BAM"
## [11] "./Alignment/example_1h1_cell_0011.BAM"
## [12] "./Alignment/example_1h1_cell_0012.BAM"
## [13] "./Alignment/example_1h1_cell_0013.BAM"
## [14] "./Alignment/example_1h1_cell_0014.BAM"

```

```
## [15] "./Alignment/example_1h1_cell_0015.BAM"
## [16] "./Alignment/example_1h1_cell_0016.BAM"
## [17] "./Alignment/example_1h1_cell_0017.BAM"
## [18] "./Alignment/example_1h1_cell_0018.BAM"
## [19] "./Alignment/example_1h1_cell_0019.BAM"
## [20] "./Alignment/example_1h1_cell_0020.BAM"
## [21] "./Alignment/example_1h1_cell_0021.BAM"
## [22] "./Alignment/example_1h1_cell_0022.BAM"
## [23] "./Alignment/example_1h1_cell_0023.BAM"
## [24] "./Alignment/example_1h1_cell_0024.BAM"
## [25] "./Alignment/example_1h1_cell_0025.BAM"
## [26] "./Alignment/example_1h1_cell_0026.BAM"
## [27] "./Alignment/example_1h1_cell_0027.BAM"
## [28] "./Alignment/example_1h1_cell_0028.BAM"
## [29] "./Alignment/example_1h1_cell_0029.BAM"
## [30] "./Alignment/example_1h1_cell_0030.BAM"
## [31] "./Alignment/example_1h1_cell_0031.BAM"
## [32] "./Alignment/example_1h1_cell_0032.BAM"
## [33] "./Alignment/example_1h1_cell_0033.BAM"
## [34] "./Alignment/example_1h1_cell_0034.BAM"
## [35] "./Alignment/example_1h1_cell_0035.BAM"
## [36] "./Alignment/example_1h1_cell_0036.BAM"
## [37] "./Alignment/example_1h1_cell_0037.BAM"
## [38] "./Alignment/example_1h1_cell_0038.BAM"
## [39] "./Alignment/example_1h1_cell_0039.BAM"
## [40] "./Alignment/example_1h1_cell_0040.BAM"
## [41] "./Alignment/example_1h1_cell_0041.BAM"
## [42] "./Alignment/example_1h1_cell_0042.BAM"
## [43] "./Alignment/example_1h1_cell_0043.BAM"
## [44] "./Alignment/example_1h1_cell_0044.BAM"
## [45] "./Alignment/example_1h1_cell_0045.BAM"
## [46] "./Alignment/example_1h1_cell_0046.BAM"
## [47] "./Alignment/example_1h1_cell_0047.BAM"
## [48] "./Alignment/example_1h1_cell_0048.BAM"
## [49] "./Alignment/example_1h1_cell_0049.BAM"
## [50] "./Alignment/example_1h1_cell_0050.BAM"
## [51] "./Alignment/example_1h1_cell_0051.BAM"
## [52] "./Alignment/example_1h1_cell_0052.BAM"
## [53] "./Alignment/example_1h1_cell_0053.BAM"
## [54] "./Alignment/example_1h1_cell_0054.BAM"
## [55] "./Alignment/example_1h1_cell_0055.BAM"
## [56] "./Alignment/example_1h1_cell_0056.BAM"
## [57] "./Alignment/example_1h1_cell_0057.BAM"
## [58] "./Alignment/example_1h1_cell_0058.BAM"
## [59] "./Alignment/example_1h1_cell_0059.BAM"
## [60] "./Alignment/example_1h1_cell_0060.BAM"
## [61] "./Alignment/example_1h1_cell_0061.BAM"
## [62] "./Alignment/example_1h1_cell_0062.BAM"
## [63] "./Alignment/example_1h1_cell_0063.BAM"
## [64] "./Alignment/example_1h1_cell_0064.BAM"
## [65] "./Alignment/example_1h1_cell_0065.BAM"
## [66] "./Alignment/example_1h1_cell_0066.BAM"
## [67] "./Alignment/example_1h1_cell_0067.BAM"
## [68] "./Alignment/example_1h1_cell_0068.BAM"
```



```
## [69] "/Alignment/example_1h1_cell_0069.BAM"
## [70] "/Alignment/example_1h1_cell_0070.BAM"
## [71] "/Alignment/example_1h1_cell_0071.BAM"
## [72] "/Alignment/example_1h1_cell_0072.BAM"
## [73] "/Alignment/example_1h1_cell_0073.BAM"
## [74] "/Alignment/example_1h1_cell_0074.BAM"
## [75] "/Alignment/example_1h1_cell_0075.BAM"
## [76] "/Alignment/example_1h1_cell_0076.BAM"
## [77] "/Alignment/example_1h1_cell_0077.BAM"
## [78] "/Alignment/example_1h1_cell_0078.BAM"
## [79] "/Alignment/example_1h1_cell_0079.BAM"
## [80] "/Alignment/example_1h1_cell_0080.BAM"
## [81] "/Alignment/example_1h1_cell_0081.BAM"
## [82] "/Alignment/example_1h1_cell_0082.BAM"
## [83] "/Alignment/example_1h1_cell_0083.BAM"
## [84] "/Alignment/example_1h1_cell_0084.BAM"
## [85] "/Alignment/example_1h1_cell_0085.BAM"
## [86] "/Alignment/example_1h1_cell_0086.BAM"
## [87] "/Alignment/example_1h1_cell_0087.BAM"
## [88] "/Alignment/example_1h1_cell_0088.BAM"
## [89] "/Alignment/example_1h1_cell_0089.BAM"
## [90] "/Alignment/example_1h1_cell_0090.BAM"
## [91] "/Alignment/example_1h1_cell_0091.BAM"
## [92] "/Alignment/example_1h1_cell_0092.BAM"
## [93] "/Alignment/example_1h1_cell_0093.BAM"
## [94] "/Alignment/example_1h1_cell_0094.BAM"
## [95] "/Alignment/example_1h1_cell_0095.BAM"
## [96] "/Alignment/example_1h1_cell_0096.BAM"
## [97] "/Alignment/example_b1_cell_0001.BAM"
## [98] "/Alignment/example_b1_cell_0002.BAM"
## [99] "/Alignment/example_b1_cell_0003.BAM"
## [100] "/Alignment/example_b1_cell_0004.BAM"
## [101] "/Alignment/example_b1_cell_0005.BAM"
## [102] "/Alignment/example_b1_cell_0006.BAM"
## [103] "/Alignment/example_b1_cell_0007.BAM"
## [104] "/Alignment/example_b1_cell_0008.BAM"
## [105] "/Alignment/example_b1_cell_0009.BAM"
## [106] "/Alignment/example_b1_cell_0010.BAM"
## [107] "/Alignment/example_b1_cell_0011.BAM"
## [108] "/Alignment/example_b1_cell_0012.BAM"
## [109] "/Alignment/example_b1_cell_0013.BAM"
## [110] "/Alignment/example_b1_cell_0014.BAM"
## [111] "/Alignment/example_b1_cell_0015.BAM"
## [112] "/Alignment/example_b1_cell_0016.BAM"
## [113] "/Alignment/example_b1_cell_0017.BAM"
## [114] "/Alignment/example_b1_cell_0018.BAM"
## [115] "/Alignment/example_b1_cell_0019.BAM"
## [116] "/Alignment/example_b1_cell_0020.BAM"
## [117] "/Alignment/example_b1_cell_0021.BAM"
## [118] "/Alignment/example_b1_cell_0022.BAM"
## [119] "/Alignment/example_b1_cell_0023.BAM"
## [120] "/Alignment/example_b1_cell_0024.BAM"
## [121] "/Alignment/example_b1_cell_0025.BAM"
## [122] "/Alignment/example_b1_cell_0026.BAM"
```

```
## [123] "./Alignment/example_b1_cell_0027.BAM"
## [124] "./Alignment/example_b1_cell_0028.BAM"
## [125] "./Alignment/example_b1_cell_0029.BAM"
## [126] "./Alignment/example_b1_cell_0030.BAM"
## [127] "./Alignment/example_b1_cell_0031.BAM"
## [128] "./Alignment/example_b1_cell_0032.BAM"
## [129] "./Alignment/example_b1_cell_0033.BAM"
## [130] "./Alignment/example_b1_cell_0034.BAM"
## [131] "./Alignment/example_b1_cell_0035.BAM"
## [132] "./Alignment/example_b1_cell_0036.BAM"
## [133] "./Alignment/example_b1_cell_0037.BAM"
## [134] "./Alignment/example_b1_cell_0038.BAM"
## [135] "./Alignment/example_b1_cell_0039.BAM"
## [136] "./Alignment/example_b1_cell_0040.BAM"
## [137] "./Alignment/example_b1_cell_0041.BAM"
## [138] "./Alignment/example_b1_cell_0042.BAM"
## [139] "./Alignment/example_b1_cell_0043.BAM"
## [140] "./Alignment/example_b1_cell_0044.BAM"
## [141] "./Alignment/example_b1_cell_0045.BAM"
## [142] "./Alignment/example_b1_cell_0046.BAM"
## [143] "./Alignment/example_b1_cell_0047.BAM"
## [144] "./Alignment/example_b1_cell_0048.BAM"
## [145] "./Alignment/example_b1_cell_0049.BAM"
## [146] "./Alignment/example_b1_cell_0050.BAM"
## [147] "./Alignment/example_b1_cell_0051.BAM"
## [148] "./Alignment/example_b1_cell_0052.BAM"
## [149] "./Alignment/example_b1_cell_0053.BAM"
## [150] "./Alignment/example_b1_cell_0054.BAM"
## [151] "./Alignment/example_b1_cell_0055.BAM"
## [152] "./Alignment/example_b1_cell_0056.BAM"
## [153] "./Alignment/example_b1_cell_0057.BAM"
## [154] "./Alignment/example_b1_cell_0058.BAM"
## [155] "./Alignment/example_b1_cell_0059.BAM"
## [156] "./Alignment/example_b1_cell_0060.BAM"
## [157] "./Alignment/example_b1_cell_0061.BAM"
## [158] "./Alignment/example_b1_cell_0062.BAM"
## [159] "./Alignment/example_b1_cell_0063.BAM"
## [160] "./Alignment/example_b1_cell_0064.BAM"
## [161] "./Alignment/example_b1_cell_0065.BAM"
## [162] "./Alignment/example_b1_cell_0066.BAM"
## [163] "./Alignment/example_b1_cell_0067.BAM"
## [164] "./Alignment/example_b1_cell_0068.BAM"
## [165] "./Alignment/example_b1_cell_0069.BAM"
## [166] "./Alignment/example_b1_cell_0070.BAM"
## [167] "./Alignment/example_b1_cell_0071.BAM"
## [168] "./Alignment/example_b1_cell_0072.BAM"
## [169] "./Alignment/example_b1_cell_0073.BAM"
## [170] "./Alignment/example_b1_cell_0074.BAM"
## [171] "./Alignment/example_b1_cell_0075.BAM"
## [172] "./Alignment/example_b1_cell_0076.BAM"
## [173] "./Alignment/example_b1_cell_0077.BAM"
## [174] "./Alignment/example_b1_cell_0078.BAM"
## [175] "./Alignment/example_b1_cell_0079.BAM"
## [176] "./Alignment/example_b1_cell_0080.BAM"
```

```

## [177] "./Alignment/example_b1_cell_0081.BAM"
## [178] "./Alignment/example_b1_cell_0082.BAM"
## [179] "./Alignment/example_b1_cell_0083.BAM"
## [180] "./Alignment/example_b1_cell_0084.BAM"
## [181] "./Alignment/example_b1_cell_0085.BAM"
## [182] "./Alignment/example_b1_cell_0086.BAM"
## [183] "./Alignment/example_b1_cell_0087.BAM"
## [184] "./Alignment/example_b1_cell_0088.BAM"
## [185] "./Alignment/example_b1_cell_0089.BAM"
## [186] "./Alignment/example_b1_cell_0090.BAM"
## [187] "./Alignment/example_b1_cell_0091.BAM"
## [188] "./Alignment/example_b1_cell_0092.BAM"
## [189] "./Alignment/example_b1_cell_0093.BAM"
## [190] "./Alignment/example_b1_cell_0094.BAM"
## [191] "./Alignment/example_b1_cell_0095.BAM"
## [192] "./Alignment/example_b1_cell_0096.BAM"

## 2018-05-23 11:28:29 ... Creating output directory ./Count

## 2018-05-23 11:28:29 ... Loading TxDb file

## 2018-05-23 11:28:29 ... TxDb file GRCh38_MT.gtf.sqlite does not exist

## 2018-05-23 11:28:29 ... Creating TxDb object GRCh38_MT.gtf.sqlite

## Import genomic features from the file as a GRanges object ... OK
## Prepare the 'metadata' data frame ... OK
## Make the TxDb object ...

## Warning in .get_cds_IDX(type, phase): The "phase" metadata column contains non-NA values for features
## type stop_codon. This information was ignored.

## OK

## automatically exporting the following variables from the local environment:
## features, format, logfile, verbose
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE

```

```
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE
## got results for task 9
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
```

```
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
## got results for task 27
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
```

```
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
## got results for task 45
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
```

```
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
## got results for task 63
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
```

```
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
## got results for task 81
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
```



```

## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
## got results for task 99
## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##       result.7, result.8, result.9, result.10, result.11, result.12,
##       result.13, result.14, result.15, result.16, result.17, result.18,
##       result.19, result.20, result.21, result.22, result.23, result.24,
##       result.25, result.26, result.27, result.28, result.29, result.30,
##       result.31, result.32, result.33, result.34, result.35, result.36,
##       result.37, result.38, result.39, result.40, result.41, result.42,
##       result.43, result.44, result.45, result.46, result.47, result.48,
##       result.49, result.50, result.51, result.52, result.53, result.54,
##       result.55, result.56, result.57, result.58, result.59, result.60,
##       result.61, result.62, result.63, result.64, result.65, result.66,
##       result.67, result.68, result.69, result.70, result.71, result.72,
##       result.73, result.74, result.75, result.76, result.77, result.78,
##       result.79, result.80, result.81, result.82, result.83, result.84,
##       result.85, result.86, result.87, result.88, result.89, result.90,
##       result.91, result.92, result.93, result.94, result.95, result.96,
##       result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE

```

```
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE
## returning status FALSE
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
```

```
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
## returning status FALSE
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
```

```
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
## returning status FALSE
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
```

```
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
## returning status FALSE
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
```

```

## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
## returning status FALSE
## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##     result.106, result.107, result.108, result.109, result.110,
##     result.111, result.112, result.113, result.114, result.115,
##     result.116, result.117, result.118, result.119, result.120,
##     result.121, result.122, result.123, result.124, result.125,
##     result.126, result.127, result.128, result.129, result.130,
##     result.131, result.132, result.133, result.134, result.135,
##     result.136, result.137, result.138, result.139, result.140,
##     result.141, result.142, result.143, result.144, result.145,
##     result.146, result.147, result.148, result.149, result.150,
##     result.151, result.152, result.153, result.154, result.155,
##     result.156, result.157, result.158, result.159, result.160,
##     result.161, result.162, result.163, result.164, result.165,

```

```

##      result.166, result.167, result.168, result.169, result.170,
##      result.171, result.172, result.173, result.174, result.175,
##      result.176, result.177, result.178, result.179, result.180,
##      result.181, result.182, result.183, result.184, result.185,
##      result.186, result.187, result.188, result.189, result.190,
##      result.191, result.192)
## returning status TRUE

## 2018-05-23 11:28:52 ... Write UMI filtered count matrix to ./Count/20180523_112852_countUMI.tab
## 2018-05-23 11:28:52 ... Add count matrix and QC metrics to SCE object.

## [read.gtf.refGenome] Reading file 'GRCm38_MT.gtf'.
##
[GTF]      147 lines processed.
## [read.gtf.refGenome] Extracting genes table.
## [read.gtf.refGenome] Found 37 gene records.
## [read.gtf.refGenome] Finished.

## 2018-05-23 11:28:54 ... Save SingleCellExperiment object to ./Count/20180523_112854_countUMI_sce.rda
## 2018-05-23 11:28:54 ... UMI counting done!
## 2018-05-23 11:28:54 Finished running scruff ...

```

Visualize data quality.

```
qc <- qcplots(sce)
```

```

## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 25 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing missing values (geom_point).

## Warning: Removed 25 rows containing non-finite values (stat_boxplot).

## Warning: Removed 25 rows containing missing values (geom_point).

## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing missing values (geom_point).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

```

```
## Warning: Removed 32 rows containing missing values (geom_point).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing missing values (geom_point).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing missing values (geom_point).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing missing values (geom_point).
```

Stepwise Tutorial

Load Example Dataset

The `scruff` package contains 4 single cell RNA-seq FASTQ example files. Each file has 20,000 sequenced reads.

```
library(scruff)
v1h1R1 <- system.file("extdata",
                      "vandenBrink_1h1_L001_R1_001.fastq.gz",
                      package = "scruff")
v1h1R2 <- system.file("extdata",
                      "vandenBrink_1h1_L001_R2_001.fastq.gz",
                      package = "scruff")
vb1R1 <- system.file("extdata",
                    "vandenBrink_b1_L001_R1_001.fastq.gz",
                    package = "scruff")
vb1R2 <- system.file("extdata",
                    "vandenBrink_b1_L001_R2_001.fastq.gz",
                    package = "scruff")
```

Demultiplex and Assign Cell Specific Reads

Now the FASTQ files are ready to be demultiplexed. `scruff` package provides built-in predefined cell barcodes `barcodeExample` for demultiplexing the example dataset. In the example FASTQ files, read 1 contains cell barcode and UMI sequence information. Read 2 contains transcript sequences. The barcode sequence of each read starts at base 1 and ends at base 8. The UMI sequence starts at base 9 and ends at base 12. They can be set via `bcStart`, `bcStop`, and `umiStart`, `umiStop` arguments. By default, reads with any nucleotide in the barcode and UMI sequences with sequencing quality lower than 10 (Phred score) will be excluded. The following command demultiplexes the example FASTQ reads and trims reads longer than 75 nucleotides. The command returns a `SingleCellExperiment` object whose `colData` contains the cell index, barcode, reads, percentage of reads assigned, sample, and FASTQ file path information for each cell. By default, the cell specific demultiplexed `fastq.gz` files are stored in `./Demultiplex` folder.


```
print(barcodeExample)
```

```
## [1] "CATCACGC" "GTCGTCGC" "ACGACCGC" "TGATGCGC" "CATCAATC" "GTCGTATC"
## [7] "ACGACATC" "TGATGATC" "CATCATCC" "GTCGTTCC" "ACGACTCC" "TGATGTCC"
## [13] "CATCAGAA" "GTCGTGAA" "ACGACGAA" "TGATGGAA" "TCACACGC" "CGTGTGCG"
## [19] "GACACCGC" "ATGTGCGC" "TCACATCA" "CGTGTTC" "GACACTCA" "ATGTGTCA"
## [25] "TCACAGAG" "CGTGTGAG" "GACACGAG" "ATGTGGAG" "CTAACCGC" "GCTTGCGC"
## [31] "AGCCACGC" "TAGGTCGC" "CTAACTCA" "GCTTGTCA" "AGCCATCA" "TAGGTTCA"
## [37] "CTAACGAG" "GCTTGGAG" "AGCCAGAG" "TAGGTGAG" "GAATCCGA" "ATTCGCGA"
## [43] "TCCGACGA" "CGGATCGA" "GAATCATC" "ATTCGATC" "TCCGAATC" "CGGATATC"
## [49] "GAATCTCG" "ATTCGTCG" "TCCGATCG" "CGGATTCG" "GAATCGAT" "ATTCGGAT"
## [55] "TCCGAGAT" "CGGATGAT" "AGCGTCGA" "TAGACCGA" "CTATGCGA" "GCTCACGA"
## [61] "AGCGTATC" "TAGACATC" "CTATGATC" "GCTCAATC" "AGCGTTCG" "TAGACTCG"
## [67] "CTATGTCG" "GCTCATCG" "AGCGTGAT" "TAGACGAT" "CTATGGAT" "GCTCAGAT"
## [73] "ACTGACGA" "TGCATCGA" "CAGTCCGA" "GTACGCGA" "ACTGAATC" "TGCATATC"
## [79] "CAGTCATC" "GTACGATC" "ACTGATCG" "TGCATTTCG" "CAGTCTCG" "GTACGTCG"
## [85] "ACTGAGAT" "TGCATGAT" "CAGTCGAT" "GTACGGAT" "TGTACCGA" "CACTGCGA"
## [91] "GTGCACGA" "ACAGTCGA" "TGTACATC" "CACTGATC" "GTGCAATC" "ACAGTATC"
```

```
de <- demultiplex(project = "example",
                  sample = c("1h1", "b1"),
                  lane = c("L001", "L001"),
                  read1Path = c(v1h1R1, vb1R1),
                  read2Path = c(v1h1R2, vb1R2),
                  barcodeExample,
                  bcStart = 1,
                  bcStop = 8,
                  bcEdit = 0,
                  umiStart = 9,
                  umiStop = 12,
                  keep = 75,
                  minQual = 10,
                  yieldReads = 1e+06,
                  cores = 2,
                  verbose = TRUE,
                  overwrite = TRUE)
```

```
## 2018-05-23 11:28:59 Start demultiplexing ...
```

```
## demultiplex(project = "example", sample = c("1h1", "b1"), lane = c("L001",
## "L001"), read1Path = c(v1h1R1, vb1R1), read2Path = c(v1h1R2,
## vb1R2), bc = barcodeExample, bcStart = 1, bcStop = 8, bcEdit = 0,
## umiStart = 9, umiStop = 12, keep = 75, minQual = 10, yieldReads = 1e+06,
## overwrite = TRUE, cores = 2, verbose = TRUE)
```

```
## 2018-05-23 11:28:59 All files in ./Demultiplex will be deleted ...
```

```
## Input sample information for FASTQ files:
```

```
## project sample lane
## 1: example 1h1 L001
```

```
## 2: example      b1 L001
##
## 1: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_1h1_L001_R1_001.f
## 2: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_b1_L001_R1_001.f
##
## 1: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_1h1_L001_R2_001.f
## 2: /usr3/graduate/zhe/R/x86_64-pc-linux-gnu-library/3.4/scruff/extdata/vandenBrink_b1_L001_R2_001.f
## automatically exporting the following variables from the local environment:
##   barcodeDt, bcEdit, bcStart, bcStop, fastqAnnotDt, keep, logfile, logfilePrefix, minQual, outDir, o
## numValues: 2, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 2, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 2, numResults: 2, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2)
## returning status TRUE

## 2018-05-23 11:29:17 ... Write demultiplex summary for all samples to ./Demultiplex/20180523_112917_d

## ... Initialize SingleCellExperiment object.

## ... Add demultiplex summary to SCE colData.

## 2018-05-23 11:29:17 ... Demultiplex done!
```

Alignment

scruff provides an alignment function `alignRsubread` which is a wrapper function to `align` in `Rsubread` package. It aligns the reads to reference sequence index and outputs sequence alignment map files in “BAM” or “SAM” format. For demonstration purpose, the built-in mitochondrial DNA sequence from GRCm38 reference assembly `GRCm38MitochondrialFasta` will be used to map the reads. First, a `Rsubread` index for the reference sequence needs to be generated.

```
fasta <- system.file("extdata", "GRCm38_MT.fa", package = "scruff")
indexBase <- "GRCm38_MT"
# NOTE: Rsubread package does not support Windows environment.
library(Rsubread)
# Create index files for GRCm38_MT. For details, please refer to Rsubread user manual.
# Specify the basename for Rsubread index
indexBase <- "GRCm38_MT"
buildindex(basename = indexBase, reference = fasta, indexSplit = FALSE)
```

```
##
##      =====
##      ===== /  _ _ _ | | | | _ _ \ | _ _ _ | / \ | _ _ \
##      ===== | ( _ _ | | | | | ) | | ) | | _ _ / \ | | | |
##      ===== \ _ _ \ | | | | _ < | _ / | | _ / \ | | | |
##      ===== _ _ _ ) | | _ | | ) | | \ | | _ _ / _ _ \ | | | |
```

```

##          ===== |_____/ \_____/|_____/|_ | \_\_____/ _/ \_\_____/
##      Rsubread 1.28.0
##
## //===== indexBuilder setting =====\\
## ||
## ||          Index name : GRCm38_MT
## ||          Index space : base-space
## ||          Memory : 8000 Mbytes
## ||          Repeat threshold : 100 repeats
## ||          Distance to next subread : 3
## ||
## ||          Input files : 1 file in total
## ||                          o /usr3/graduate/zhe/R/x86_64-pc-linux-gnu ...
## ||
## \\===== http://subread.sourceforge.net/ =====//
##
## //===== Running =====\\
## ||
## || Check the integrity of provided reference sequences ...
## || No format issues were found
## || Scan uninformative subreads in reference sequences ...
## ||      8%, 0 mins elapsed, rate=2.3k bps/s, total=0m
## ||     16%, 0 mins elapsed, rate=4.6k bps/s, total=0m
## ||     24%, 0 mins elapsed, rate=6.9k bps/s, total=0m
## ||     33%, 0 mins elapsed, rate=9.2k bps/s, total=0m
## ||     41%, 0 mins elapsed, rate=11.5k bps/s, total=0m
## ||     49%, 0 mins elapsed, rate=13.8k bps/s, total=0m
## ||     58%, 0 mins elapsed, rate=16.1k bps/s, total=0m
## ||     66%, 0 mins elapsed, rate=18.4k bps/s, total=0m
## ||     74%, 0 mins elapsed, rate=20.7k bps/s, total=0m
## ||     83%, 0 mins elapsed, rate=23.0k bps/s, total=0m
## ||     91%, 0 mins elapsed, rate=25.3k bps/s, total=0m
## ||     99%, 0 mins elapsed, rate=27.5k bps/s, total=0m
## || Build the index...
## ||      8%, 0 mins elapsed, rate=671.5k bps/s, total=0m
## ||     16%, 0 mins elapsed, rate=895.3k bps/s, total=0m
## ||     24%, 0 mins elapsed, rate=805.8k bps/s, total=0m
## ||     33%, 0 mins elapsed, rate=767.4k bps/s, total=0m
## ||     41%, 0 mins elapsed, rate=746.1k bps/s, total=0m
## ||     49%, 0 mins elapsed, rate=732.6k bps/s, total=0m
## ||     58%, 0 mins elapsed, rate=723.2k bps/s, total=0m
## ||     66%, 0 mins elapsed, rate=716.3k bps/s, total=0m
## ||     74%, 0 mins elapsed, rate=711.0k bps/s, total=0m
## ||     83%, 0 mins elapsed, rate=746.1k bps/s, total=0m
## ||     91%, 0 mins elapsed, rate=738.7k bps/s, total=0m
## ||     99%, 0 mins elapsed, rate=732.6k bps/s, total=0m
## ||    108%, 0 mins elapsed, rate=727.5k bps/s, total=0m
## || Save current index block...
## || [ 0.0% finished ]
## || [ 10.0% finished ]
## || [ 20.0% finished ]
## || [ 30.0% finished ]
## || [ 40.0% finished ]
## || [ 50.0% finished ]

```

```
## || [ 60.0% finished ] ||
## || [ 70.0% finished ] ||
## || [ 80.0% finished ] ||
## || [ 90.0% finished ] ||
## || [ 100.0% finished ] ||
## || ||
## || Total running time: 0.0 minutes. ||
## || Index GRCm38_MT was successfully built! ||
## || ||
## \\===== http://subread.sourceforge.net/ =====//
```

The following command maps the FASTQ files to GRCm38 mitochondrial reference sequence GRCm38_MT.fa and returns a SingleCellExperiment object. By default, the files are stored in BAM format in ./Alignment folder.

```
# Align the reads using Rsubread
```

```
al <- alignRsubread(de,
                    indexBase,
                    unique = FALSE,
                    nBestLocations = 1,
                    format = "BAM",
                    cores = 2,
                    overwrite = TRUE,
                    verbose = TRUE)
```

```
## 2018-05-23 11:29:18 Start alignment ...
```

```
## alignRsubread(sce = de, index = indexBase, unique = FALSE, nBestLocations = 1,
## format = "BAM", cores = 2, overwrite = TRUE, verbose = TRUE)
```

```
## ... Input fastq paths:
```

```
## [1] "./Demultiplex/1h1/example_1h1_cell_0001.fastq.gz"
## [2] "./Demultiplex/1h1/example_1h1_cell_0002.fastq.gz"
## [3] "./Demultiplex/1h1/example_1h1_cell_0003.fastq.gz"
## [4] "./Demultiplex/1h1/example_1h1_cell_0004.fastq.gz"
## [5] "./Demultiplex/1h1/example_1h1_cell_0005.fastq.gz"
## [6] "./Demultiplex/1h1/example_1h1_cell_0006.fastq.gz"
## [7] "./Demultiplex/1h1/example_1h1_cell_0007.fastq.gz"
## [8] "./Demultiplex/1h1/example_1h1_cell_0008.fastq.gz"
## [9] "./Demultiplex/1h1/example_1h1_cell_0009.fastq.gz"
## [10] "./Demultiplex/1h1/example_1h1_cell_0010.fastq.gz"
## [11] "./Demultiplex/1h1/example_1h1_cell_0011.fastq.gz"
## [12] "./Demultiplex/1h1/example_1h1_cell_0012.fastq.gz"
## [13] "./Demultiplex/1h1/example_1h1_cell_0013.fastq.gz"
## [14] "./Demultiplex/1h1/example_1h1_cell_0014.fastq.gz"
## [15] "./Demultiplex/1h1/example_1h1_cell_0015.fastq.gz"
## [16] "./Demultiplex/1h1/example_1h1_cell_0016.fastq.gz"
## [17] "./Demultiplex/1h1/example_1h1_cell_0017.fastq.gz"
## [18] "./Demultiplex/1h1/example_1h1_cell_0018.fastq.gz"
## [19] "./Demultiplex/1h1/example_1h1_cell_0019.fastq.gz"
## [20] "./Demultiplex/1h1/example_1h1_cell_0020.fastq.gz"
## [21] "./Demultiplex/1h1/example_1h1_cell_0021.fastq.gz"
```

[illegible]

```

## [76] "/Demultiplex/1h1/example_1h1_cell_0076.fastq.gz"
## [77] "/Demultiplex/1h1/example_1h1_cell_0077.fastq.gz"
## [78] "/Demultiplex/1h1/example_1h1_cell_0078.fastq.gz"
## [79] "/Demultiplex/1h1/example_1h1_cell_0079.fastq.gz"
## [80] "/Demultiplex/1h1/example_1h1_cell_0080.fastq.gz"
## [81] "/Demultiplex/1h1/example_1h1_cell_0081.fastq.gz"
## [82] "/Demultiplex/1h1/example_1h1_cell_0082.fastq.gz"
## [83] "/Demultiplex/1h1/example_1h1_cell_0083.fastq.gz"
## [84] "/Demultiplex/1h1/example_1h1_cell_0084.fastq.gz"
## [85] "/Demultiplex/1h1/example_1h1_cell_0085.fastq.gz"
## [86] "/Demultiplex/1h1/example_1h1_cell_0086.fastq.gz"
## [87] "/Demultiplex/1h1/example_1h1_cell_0087.fastq.gz"
## [88] "/Demultiplex/1h1/example_1h1_cell_0088.fastq.gz"
## [89] "/Demultiplex/1h1/example_1h1_cell_0089.fastq.gz"
## [90] "/Demultiplex/1h1/example_1h1_cell_0090.fastq.gz"
## [91] "/Demultiplex/1h1/example_1h1_cell_0091.fastq.gz"
## [92] "/Demultiplex/1h1/example_1h1_cell_0092.fastq.gz"
## [93] "/Demultiplex/1h1/example_1h1_cell_0093.fastq.gz"
## [94] "/Demultiplex/1h1/example_1h1_cell_0094.fastq.gz"
## [95] "/Demultiplex/1h1/example_1h1_cell_0095.fastq.gz"
## [96] "/Demultiplex/1h1/example_1h1_cell_0096.fastq.gz"
## [97] "/Demultiplex/b1/example_b1_cell_0001.fastq.gz"
## [98] "/Demultiplex/b1/example_b1_cell_0002.fastq.gz"
## [99] "/Demultiplex/b1/example_b1_cell_0003.fastq.gz"
## [100] "/Demultiplex/b1/example_b1_cell_0004.fastq.gz"
## [101] "/Demultiplex/b1/example_b1_cell_0005.fastq.gz"
## [102] "/Demultiplex/b1/example_b1_cell_0006.fastq.gz"
## [103] "/Demultiplex/b1/example_b1_cell_0007.fastq.gz"
## [104] "/Demultiplex/b1/example_b1_cell_0008.fastq.gz"
## [105] "/Demultiplex/b1/example_b1_cell_0009.fastq.gz"
## [106] "/Demultiplex/b1/example_b1_cell_0010.fastq.gz"
## [107] "/Demultiplex/b1/example_b1_cell_0011.fastq.gz"
## [108] "/Demultiplex/b1/example_b1_cell_0012.fastq.gz"
## [109] "/Demultiplex/b1/example_b1_cell_0013.fastq.gz"
## [110] "/Demultiplex/b1/example_b1_cell_0014.fastq.gz"
## [111] "/Demultiplex/b1/example_b1_cell_0015.fastq.gz"
## [112] "/Demultiplex/b1/example_b1_cell_0016.fastq.gz"
## [113] "/Demultiplex/b1/example_b1_cell_0017.fastq.gz"
## [114] "/Demultiplex/b1/example_b1_cell_0018.fastq.gz"
## [115] "/Demultiplex/b1/example_b1_cell_0019.fastq.gz"
## [116] "/Demultiplex/b1/example_b1_cell_0020.fastq.gz"
## [117] "/Demultiplex/b1/example_b1_cell_0021.fastq.gz"
## [118] "/Demultiplex/b1/example_b1_cell_0022.fastq.gz"
## [119] "/Demultiplex/b1/example_b1_cell_0023.fastq.gz"
## [120] "/Demultiplex/b1/example_b1_cell_0024.fastq.gz"
## [121] "/Demultiplex/b1/example_b1_cell_0025.fastq.gz"
## [122] "/Demultiplex/b1/example_b1_cell_0026.fastq.gz"
## [123] "/Demultiplex/b1/example_b1_cell_0027.fastq.gz"
## [124] "/Demultiplex/b1/example_b1_cell_0028.fastq.gz"
## [125] "/Demultiplex/b1/example_b1_cell_0029.fastq.gz"
## [126] "/Demultiplex/b1/example_b1_cell_0030.fastq.gz"
## [127] "/Demultiplex/b1/example_b1_cell_0031.fastq.gz"
## [128] "/Demultiplex/b1/example_b1_cell_0032.fastq.gz"
## [129] "/Demultiplex/b1/example_b1_cell_0033.fastq.gz"

```

[illegible]

```

## [184] "./Demultiplex/b1/example_b1_cell_0088.fastq.gz"
## [185] "./Demultiplex/b1/example_b1_cell_0089.fastq.gz"
## [186] "./Demultiplex/b1/example_b1_cell_0090.fastq.gz"
## [187] "./Demultiplex/b1/example_b1_cell_0091.fastq.gz"
## [188] "./Demultiplex/b1/example_b1_cell_0092.fastq.gz"
## [189] "./Demultiplex/b1/example_b1_cell_0093.fastq.gz"
## [190] "./Demultiplex/b1/example_b1_cell_0094.fastq.gz"
## [191] "./Demultiplex/b1/example_b1_cell_0095.fastq.gz"
## [192] "./Demultiplex/b1/example_b1_cell_0096.fastq.gz"

## 2018-05-23 11:29:18 ... Delete (if any) existing alignment results

## 2018-05-23 11:29:18 ... Creating output directory ./Alignment

## automatically exporting the following variables from the local environment:
##   format, index, logfile, nBestLocations, outDir, threads, unique, verbose
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE
## got results for task 9
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE

```



```
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
## got results for task 27
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
```

```
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
## got results for task 45
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
```

```
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
## got results for task 63
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
```

```
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
## got results for task 81
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
```

```

## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
## got results for task 99
## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##       result.7, result.8, result.9, result.10, result.11, result.12,
##       result.13, result.14, result.15, result.16, result.17, result.18,
##       result.19, result.20, result.21, result.22, result.23, result.24,
##       result.25, result.26, result.27, result.28, result.29, result.30,

```

```

##      result.31, result.32, result.33, result.34, result.35, result.36,
##      result.37, result.38, result.39, result.40, result.41, result.42,
##      result.43, result.44, result.45, result.46, result.47, result.48,
##      result.49, result.50, result.51, result.52, result.53, result.54,
##      result.55, result.56, result.57, result.58, result.59, result.60,
##      result.61, result.62, result.63, result.64, result.65, result.66,
##      result.67, result.68, result.69, result.70, result.71, result.72,
##      result.73, result.74, result.75, result.76, result.77, result.78,
##      result.79, result.80, result.81, result.82, result.83, result.84,
##      result.85, result.86, result.87, result.88, result.89, result.90,
##      result.91, result.92, result.93, result.94, result.95, result.96,
##      result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE
## returning status FALSE
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE

```

```
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
## returning status FALSE
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
```

```
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
## returning status FALSE
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
```



```
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
## returning status FALSE
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
```

```
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
## returning status FALSE
## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
```

```

## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##       result.106, result.107, result.108, result.109, result.110,
##       result.111, result.112, result.113, result.114, result.115,
##       result.116, result.117, result.118, result.119, result.120,
##       result.121, result.122, result.123, result.124, result.125,
##       result.126, result.127, result.128, result.129, result.130,
##       result.131, result.132, result.133, result.134, result.135,
##       result.136, result.137, result.138, result.139, result.140,
##       result.141, result.142, result.143, result.144, result.145,
##       result.146, result.147, result.148, result.149, result.150,
##       result.151, result.152, result.153, result.154, result.155,
##       result.156, result.157, result.158, result.159, result.160,
##       result.161, result.162, result.163, result.164, result.165,
##       result.166, result.167, result.168, result.169, result.170,
##       result.171, result.172, result.173, result.174, result.175,
##       result.176, result.177, result.178, result.179, result.180,
##       result.181, result.182, result.183, result.184, result.185,
##       result.186, result.187, result.188, result.189, result.190,
##       result.191, result.192)
## returning status TRUE
## automatically exporting the following variables from the local environment:
##   verbose
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE

```

```
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE
## got results for task 9
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
```

```
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
## got results for task 27
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
```

```
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
## got results for task 45
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
```

```
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
## got results for task 63
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
```

```
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
## got results for task 81
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
```



```

## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
## got results for task 99
## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##       result.7, result.8, result.9, result.10, result.11, result.12,
##       result.13, result.14, result.15, result.16, result.17, result.18,
##       result.19, result.20, result.21, result.22, result.23, result.24,
##       result.25, result.26, result.27, result.28, result.29, result.30,
##       result.31, result.32, result.33, result.34, result.35, result.36,
##       result.37, result.38, result.39, result.40, result.41, result.42,
##       result.43, result.44, result.45, result.46, result.47, result.48,
##       result.49, result.50, result.51, result.52, result.53, result.54,
##       result.55, result.56, result.57, result.58, result.59, result.60,
##       result.61, result.62, result.63, result.64, result.65, result.66,
##       result.67, result.68, result.69, result.70, result.71, result.72,
##       result.73, result.74, result.75, result.76, result.77, result.78,
##       result.79, result.80, result.81, result.82, result.83, result.84,
##       result.85, result.86, result.87, result.88, result.89, result.90,
##       result.91, result.92, result.93, result.94, result.95, result.96,
##       result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106

```

```
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE
## returning status FALSE
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
```

```
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
## returning status FALSE
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
```

```
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
## returning status FALSE
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
```

```
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
## returning status FALSE
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
```

```

## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
## returning status FALSE
## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##     result.106, result.107, result.108, result.109, result.110,
##     result.111, result.112, result.113, result.114, result.115,
##     result.116, result.117, result.118, result.119, result.120,
##     result.121, result.122, result.123, result.124, result.125,
##     result.126, result.127, result.128, result.129, result.130,
##     result.131, result.132, result.133, result.134, result.135,
##     result.136, result.137, result.138, result.139, result.140,
##     result.141, result.142, result.143, result.144, result.145,

```

```
##      result.146, result.147, result.148, result.149, result.150,
##      result.151, result.152, result.153, result.154, result.155,
##      result.156, result.157, result.158, result.159, result.160,
##      result.161, result.162, result.163, result.164, result.165,
##      result.166, result.167, result.168, result.169, result.170,
##      result.171, result.172, result.173, result.174, result.175,
##      result.176, result.177, result.178, result.179, result.180,
##      result.181, result.182, result.183, result.184, result.185,
##      result.186, result.187, result.188, result.189, result.190,
##      result.191, result.192)
## returning status TRUE

## 2018-05-23 11:31:52 ... Write alignment summary to ./Alignment/20180523_113152_alignment.tab

## 2018-05-23 11:31:52 ... Add alignment information to SCE colData.

## 2018-05-23 11:31:52 ... Alignment done!
```

UMI correction and Generation of Count Matrix

Example GTF file `GRCm38_MT.gtf` will be used for feature counting. Currently, `scruff` applies the union counting mode of the HTSeq Python package. The following command generates the UMI filtered count matrix for the example dataset.

```
gtf <- system.file("extdata", "GRCm38_MT.gtf", package = "scruff")
# get the molecular counts of transcripts for each cell
# In sample 1h1, cell barcodes 95 and 96 are empty well controls. In sample b1, cell barcode 95 is bulk
sce = countUMI(al,
               gtf,
               format = "BAM",
               cellPerWell = c(rep(1, 94), 0, 0, rep(1, 94), 300, 1),
               cores = 2,
               verbose = TRUE)

## 2018-05-23 11:31:52 Start UMI counting ...

## countUMI(sce = al, reference = gtf, format = "BAM", cellPerWell = c(rep(1,
##      94), 0, 0, rep(1, 94), 300, 1), cores = 2, verbose = TRUE)

## ... Input alignment files:

## [1] "./Alignment/example_1h1_cell_0001.BAM"
## [2] "./Alignment/example_1h1_cell_0002.BAM"
## [3] "./Alignment/example_1h1_cell_0003.BAM"
## [4] "./Alignment/example_1h1_cell_0004.BAM"
## [5] "./Alignment/example_1h1_cell_0005.BAM"
## [6] "./Alignment/example_1h1_cell_0006.BAM"
## [7] "./Alignment/example_1h1_cell_0007.BAM"
## [8] "./Alignment/example_1h1_cell_0008.BAM"
## [9] "./Alignment/example_1h1_cell_0009.BAM"
## [10] "./Alignment/example_1h1_cell_0010.BAM"
```

```
## [11] "./Alignment/example_1h1_cell_0011.BAM"
## [12] "./Alignment/example_1h1_cell_0012.BAM"
## [13] "./Alignment/example_1h1_cell_0013.BAM"
## [14] "./Alignment/example_1h1_cell_0014.BAM"
## [15] "./Alignment/example_1h1_cell_0015.BAM"
## [16] "./Alignment/example_1h1_cell_0016.BAM"
## [17] "./Alignment/example_1h1_cell_0017.BAM"
## [18] "./Alignment/example_1h1_cell_0018.BAM"
## [19] "./Alignment/example_1h1_cell_0019.BAM"
## [20] "./Alignment/example_1h1_cell_0020.BAM"
## [21] "./Alignment/example_1h1_cell_0021.BAM"
## [22] "./Alignment/example_1h1_cell_0022.BAM"
## [23] "./Alignment/example_1h1_cell_0023.BAM"
## [24] "./Alignment/example_1h1_cell_0024.BAM"
## [25] "./Alignment/example_1h1_cell_0025.BAM"
## [26] "./Alignment/example_1h1_cell_0026.BAM"
## [27] "./Alignment/example_1h1_cell_0027.BAM"
## [28] "./Alignment/example_1h1_cell_0028.BAM"
## [29] "./Alignment/example_1h1_cell_0029.BAM"
## [30] "./Alignment/example_1h1_cell_0030.BAM"
## [31] "./Alignment/example_1h1_cell_0031.BAM"
## [32] "./Alignment/example_1h1_cell_0032.BAM"
## [33] "./Alignment/example_1h1_cell_0033.BAM"
## [34] "./Alignment/example_1h1_cell_0034.BAM"
## [35] "./Alignment/example_1h1_cell_0035.BAM"
## [36] "./Alignment/example_1h1_cell_0036.BAM"
## [37] "./Alignment/example_1h1_cell_0037.BAM"
## [38] "./Alignment/example_1h1_cell_0038.BAM"
## [39] "./Alignment/example_1h1_cell_0039.BAM"
## [40] "./Alignment/example_1h1_cell_0040.BAM"
## [41] "./Alignment/example_1h1_cell_0041.BAM"
## [42] "./Alignment/example_1h1_cell_0042.BAM"
## [43] "./Alignment/example_1h1_cell_0043.BAM"
## [44] "./Alignment/example_1h1_cell_0044.BAM"
## [45] "./Alignment/example_1h1_cell_0045.BAM"
## [46] "./Alignment/example_1h1_cell_0046.BAM"
## [47] "./Alignment/example_1h1_cell_0047.BAM"
## [48] "./Alignment/example_1h1_cell_0048.BAM"
## [49] "./Alignment/example_1h1_cell_0049.BAM"
## [50] "./Alignment/example_1h1_cell_0050.BAM"
## [51] "./Alignment/example_1h1_cell_0051.BAM"
## [52] "./Alignment/example_1h1_cell_0052.BAM"
## [53] "./Alignment/example_1h1_cell_0053.BAM"
## [54] "./Alignment/example_1h1_cell_0054.BAM"
## [55] "./Alignment/example_1h1_cell_0055.BAM"
## [56] "./Alignment/example_1h1_cell_0056.BAM"
## [57] "./Alignment/example_1h1_cell_0057.BAM"
## [58] "./Alignment/example_1h1_cell_0058.BAM"
## [59] "./Alignment/example_1h1_cell_0059.BAM"
## [60] "./Alignment/example_1h1_cell_0060.BAM"
## [61] "./Alignment/example_1h1_cell_0061.BAM"
## [62] "./Alignment/example_1h1_cell_0062.BAM"
## [63] "./Alignment/example_1h1_cell_0063.BAM"
## [64] "./Alignment/example_1h1_cell_0064.BAM"
```



```
## [65] "/Alignment/example_1h1_cell_0065.BAM"
## [66] "/Alignment/example_1h1_cell_0066.BAM"
## [67] "/Alignment/example_1h1_cell_0067.BAM"
## [68] "/Alignment/example_1h1_cell_0068.BAM"
## [69] "/Alignment/example_1h1_cell_0069.BAM"
## [70] "/Alignment/example_1h1_cell_0070.BAM"
## [71] "/Alignment/example_1h1_cell_0071.BAM"
## [72] "/Alignment/example_1h1_cell_0072.BAM"
## [73] "/Alignment/example_1h1_cell_0073.BAM"
## [74] "/Alignment/example_1h1_cell_0074.BAM"
## [75] "/Alignment/example_1h1_cell_0075.BAM"
## [76] "/Alignment/example_1h1_cell_0076.BAM"
## [77] "/Alignment/example_1h1_cell_0077.BAM"
## [78] "/Alignment/example_1h1_cell_0078.BAM"
## [79] "/Alignment/example_1h1_cell_0079.BAM"
## [80] "/Alignment/example_1h1_cell_0080.BAM"
## [81] "/Alignment/example_1h1_cell_0081.BAM"
## [82] "/Alignment/example_1h1_cell_0082.BAM"
## [83] "/Alignment/example_1h1_cell_0083.BAM"
## [84] "/Alignment/example_1h1_cell_0084.BAM"
## [85] "/Alignment/example_1h1_cell_0085.BAM"
## [86] "/Alignment/example_1h1_cell_0086.BAM"
## [87] "/Alignment/example_1h1_cell_0087.BAM"
## [88] "/Alignment/example_1h1_cell_0088.BAM"
## [89] "/Alignment/example_1h1_cell_0089.BAM"
## [90] "/Alignment/example_1h1_cell_0090.BAM"
## [91] "/Alignment/example_1h1_cell_0091.BAM"
## [92] "/Alignment/example_1h1_cell_0092.BAM"
## [93] "/Alignment/example_1h1_cell_0093.BAM"
## [94] "/Alignment/example_1h1_cell_0094.BAM"
## [95] "/Alignment/example_1h1_cell_0095.BAM"
## [96] "/Alignment/example_1h1_cell_0096.BAM"
## [97] "/Alignment/example_b1_cell_0001.BAM"
## [98] "/Alignment/example_b1_cell_0002.BAM"
## [99] "/Alignment/example_b1_cell_0003.BAM"
## [100] "/Alignment/example_b1_cell_0004.BAM"
## [101] "/Alignment/example_b1_cell_0005.BAM"
## [102] "/Alignment/example_b1_cell_0006.BAM"
## [103] "/Alignment/example_b1_cell_0007.BAM"
## [104] "/Alignment/example_b1_cell_0008.BAM"
## [105] "/Alignment/example_b1_cell_0009.BAM"
## [106] "/Alignment/example_b1_cell_0010.BAM"
## [107] "/Alignment/example_b1_cell_0011.BAM"
## [108] "/Alignment/example_b1_cell_0012.BAM"
## [109] "/Alignment/example_b1_cell_0013.BAM"
## [110] "/Alignment/example_b1_cell_0014.BAM"
## [111] "/Alignment/example_b1_cell_0015.BAM"
## [112] "/Alignment/example_b1_cell_0016.BAM"
## [113] "/Alignment/example_b1_cell_0017.BAM"
## [114] "/Alignment/example_b1_cell_0018.BAM"
## [115] "/Alignment/example_b1_cell_0019.BAM"
## [116] "/Alignment/example_b1_cell_0020.BAM"
## [117] "/Alignment/example_b1_cell_0021.BAM"
## [118] "/Alignment/example_b1_cell_0022.BAM"
```

```
## [119] "./Alignment/example_b1_cell_0023.BAM"
## [120] "./Alignment/example_b1_cell_0024.BAM"
## [121] "./Alignment/example_b1_cell_0025.BAM"
## [122] "./Alignment/example_b1_cell_0026.BAM"
## [123] "./Alignment/example_b1_cell_0027.BAM"
## [124] "./Alignment/example_b1_cell_0028.BAM"
## [125] "./Alignment/example_b1_cell_0029.BAM"
## [126] "./Alignment/example_b1_cell_0030.BAM"
## [127] "./Alignment/example_b1_cell_0031.BAM"
## [128] "./Alignment/example_b1_cell_0032.BAM"
## [129] "./Alignment/example_b1_cell_0033.BAM"
## [130] "./Alignment/example_b1_cell_0034.BAM"
## [131] "./Alignment/example_b1_cell_0035.BAM"
## [132] "./Alignment/example_b1_cell_0036.BAM"
## [133] "./Alignment/example_b1_cell_0037.BAM"
## [134] "./Alignment/example_b1_cell_0038.BAM"
## [135] "./Alignment/example_b1_cell_0039.BAM"
## [136] "./Alignment/example_b1_cell_0040.BAM"
## [137] "./Alignment/example_b1_cell_0041.BAM"
## [138] "./Alignment/example_b1_cell_0042.BAM"
## [139] "./Alignment/example_b1_cell_0043.BAM"
## [140] "./Alignment/example_b1_cell_0044.BAM"
## [141] "./Alignment/example_b1_cell_0045.BAM"
## [142] "./Alignment/example_b1_cell_0046.BAM"
## [143] "./Alignment/example_b1_cell_0047.BAM"
## [144] "./Alignment/example_b1_cell_0048.BAM"
## [145] "./Alignment/example_b1_cell_0049.BAM"
## [146] "./Alignment/example_b1_cell_0050.BAM"
## [147] "./Alignment/example_b1_cell_0051.BAM"
## [148] "./Alignment/example_b1_cell_0052.BAM"
## [149] "./Alignment/example_b1_cell_0053.BAM"
## [150] "./Alignment/example_b1_cell_0054.BAM"
## [151] "./Alignment/example_b1_cell_0055.BAM"
## [152] "./Alignment/example_b1_cell_0056.BAM"
## [153] "./Alignment/example_b1_cell_0057.BAM"
## [154] "./Alignment/example_b1_cell_0058.BAM"
## [155] "./Alignment/example_b1_cell_0059.BAM"
## [156] "./Alignment/example_b1_cell_0060.BAM"
## [157] "./Alignment/example_b1_cell_0061.BAM"
## [158] "./Alignment/example_b1_cell_0062.BAM"
## [159] "./Alignment/example_b1_cell_0063.BAM"
## [160] "./Alignment/example_b1_cell_0064.BAM"
## [161] "./Alignment/example_b1_cell_0065.BAM"
## [162] "./Alignment/example_b1_cell_0066.BAM"
## [163] "./Alignment/example_b1_cell_0067.BAM"
## [164] "./Alignment/example_b1_cell_0068.BAM"
## [165] "./Alignment/example_b1_cell_0069.BAM"
## [166] "./Alignment/example_b1_cell_0070.BAM"
## [167] "./Alignment/example_b1_cell_0071.BAM"
## [168] "./Alignment/example_b1_cell_0072.BAM"
## [169] "./Alignment/example_b1_cell_0073.BAM"
## [170] "./Alignment/example_b1_cell_0074.BAM"
## [171] "./Alignment/example_b1_cell_0075.BAM"
## [172] "./Alignment/example_b1_cell_0076.BAM"
```

```

## [173] "./Alignment/example_b1_cell_0077.BAM"
## [174] "./Alignment/example_b1_cell_0078.BAM"
## [175] "./Alignment/example_b1_cell_0079.BAM"
## [176] "./Alignment/example_b1_cell_0080.BAM"
## [177] "./Alignment/example_b1_cell_0081.BAM"
## [178] "./Alignment/example_b1_cell_0082.BAM"
## [179] "./Alignment/example_b1_cell_0083.BAM"
## [180] "./Alignment/example_b1_cell_0084.BAM"
## [181] "./Alignment/example_b1_cell_0085.BAM"
## [182] "./Alignment/example_b1_cell_0086.BAM"
## [183] "./Alignment/example_b1_cell_0087.BAM"
## [184] "./Alignment/example_b1_cell_0088.BAM"
## [185] "./Alignment/example_b1_cell_0089.BAM"
## [186] "./Alignment/example_b1_cell_0090.BAM"
## [187] "./Alignment/example_b1_cell_0091.BAM"
## [188] "./Alignment/example_b1_cell_0092.BAM"
## [189] "./Alignment/example_b1_cell_0093.BAM"
## [190] "./Alignment/example_b1_cell_0094.BAM"
## [191] "./Alignment/example_b1_cell_0095.BAM"
## [192] "./Alignment/example_b1_cell_0096.BAM"

## 2018-05-23 11:31:52 ... Creating output directory ./Count

## 2018-05-23 11:31:52 ... Loading TxDb file

## automatically exporting the following variables from the local environment:
##   features, format, logfile, verbose
## numValues: 192, numResults: 0, stopped: TRUE
## got results for task 1
## numValues: 192, numResults: 1, stopped: TRUE
## returning status FALSE
## got results for task 2
## numValues: 192, numResults: 2, stopped: TRUE
## returning status FALSE
## got results for task 3
## numValues: 192, numResults: 3, stopped: TRUE
## returning status FALSE
## got results for task 4
## numValues: 192, numResults: 4, stopped: TRUE
## returning status FALSE
## got results for task 5
## numValues: 192, numResults: 5, stopped: TRUE
## returning status FALSE
## got results for task 6
## numValues: 192, numResults: 6, stopped: TRUE
## returning status FALSE
## got results for task 7
## numValues: 192, numResults: 7, stopped: TRUE
## returning status FALSE
## got results for task 8
## numValues: 192, numResults: 8, stopped: TRUE
## returning status FALSE
## got results for task 9

```

```
## numValues: 192, numResults: 9, stopped: TRUE
## returning status FALSE
## got results for task 10
## numValues: 192, numResults: 10, stopped: TRUE
## returning status FALSE
## got results for task 11
## numValues: 192, numResults: 11, stopped: TRUE
## returning status FALSE
## got results for task 12
## numValues: 192, numResults: 12, stopped: TRUE
## returning status FALSE
## got results for task 13
## numValues: 192, numResults: 13, stopped: TRUE
## returning status FALSE
## got results for task 14
## numValues: 192, numResults: 14, stopped: TRUE
## returning status FALSE
## got results for task 15
## numValues: 192, numResults: 15, stopped: TRUE
## returning status FALSE
## got results for task 16
## numValues: 192, numResults: 16, stopped: TRUE
## returning status FALSE
## got results for task 17
## numValues: 192, numResults: 17, stopped: TRUE
## returning status FALSE
## got results for task 18
## numValues: 192, numResults: 18, stopped: TRUE
## returning status FALSE
## got results for task 19
## numValues: 192, numResults: 19, stopped: TRUE
## returning status FALSE
## got results for task 20
## numValues: 192, numResults: 20, stopped: TRUE
## returning status FALSE
## got results for task 21
## numValues: 192, numResults: 21, stopped: TRUE
## returning status FALSE
## got results for task 22
## numValues: 192, numResults: 22, stopped: TRUE
## returning status FALSE
## got results for task 23
## numValues: 192, numResults: 23, stopped: TRUE
## returning status FALSE
## got results for task 24
## numValues: 192, numResults: 24, stopped: TRUE
## returning status FALSE
## got results for task 25
## numValues: 192, numResults: 25, stopped: TRUE
## returning status FALSE
## got results for task 26
## numValues: 192, numResults: 26, stopped: TRUE
## returning status FALSE
## got results for task 27
```

```
## numValues: 192, numResults: 27, stopped: TRUE
## returning status FALSE
## got results for task 28
## numValues: 192, numResults: 28, stopped: TRUE
## returning status FALSE
## got results for task 29
## numValues: 192, numResults: 29, stopped: TRUE
## returning status FALSE
## got results for task 30
## numValues: 192, numResults: 30, stopped: TRUE
## returning status FALSE
## got results for task 31
## numValues: 192, numResults: 31, stopped: TRUE
## returning status FALSE
## got results for task 32
## numValues: 192, numResults: 32, stopped: TRUE
## returning status FALSE
## got results for task 33
## numValues: 192, numResults: 33, stopped: TRUE
## returning status FALSE
## got results for task 34
## numValues: 192, numResults: 34, stopped: TRUE
## returning status FALSE
## got results for task 35
## numValues: 192, numResults: 35, stopped: TRUE
## returning status FALSE
## got results for task 36
## numValues: 192, numResults: 36, stopped: TRUE
## returning status FALSE
## got results for task 37
## numValues: 192, numResults: 37, stopped: TRUE
## returning status FALSE
## got results for task 38
## numValues: 192, numResults: 38, stopped: TRUE
## returning status FALSE
## got results for task 39
## numValues: 192, numResults: 39, stopped: TRUE
## returning status FALSE
## got results for task 40
## numValues: 192, numResults: 40, stopped: TRUE
## returning status FALSE
## got results for task 41
## numValues: 192, numResults: 41, stopped: TRUE
## returning status FALSE
## got results for task 42
## numValues: 192, numResults: 42, stopped: TRUE
## returning status FALSE
## got results for task 43
## numValues: 192, numResults: 43, stopped: TRUE
## returning status FALSE
## got results for task 44
## numValues: 192, numResults: 44, stopped: TRUE
## returning status FALSE
## got results for task 45
```

```
## numValues: 192, numResults: 45, stopped: TRUE
## returning status FALSE
## got results for task 46
## numValues: 192, numResults: 46, stopped: TRUE
## returning status FALSE
## got results for task 47
## numValues: 192, numResults: 47, stopped: TRUE
## returning status FALSE
## got results for task 48
## numValues: 192, numResults: 48, stopped: TRUE
## returning status FALSE
## got results for task 49
## numValues: 192, numResults: 49, stopped: TRUE
## returning status FALSE
## got results for task 50
## numValues: 192, numResults: 50, stopped: TRUE
## returning status FALSE
## got results for task 51
## numValues: 192, numResults: 51, stopped: TRUE
## returning status FALSE
## got results for task 52
## numValues: 192, numResults: 52, stopped: TRUE
## returning status FALSE
## got results for task 53
## numValues: 192, numResults: 53, stopped: TRUE
## returning status FALSE
## got results for task 54
## numValues: 192, numResults: 54, stopped: TRUE
## returning status FALSE
## got results for task 55
## numValues: 192, numResults: 55, stopped: TRUE
## returning status FALSE
## got results for task 56
## numValues: 192, numResults: 56, stopped: TRUE
## returning status FALSE
## got results for task 57
## numValues: 192, numResults: 57, stopped: TRUE
## returning status FALSE
## got results for task 58
## numValues: 192, numResults: 58, stopped: TRUE
## returning status FALSE
## got results for task 59
## numValues: 192, numResults: 59, stopped: TRUE
## returning status FALSE
## got results for task 60
## numValues: 192, numResults: 60, stopped: TRUE
## returning status FALSE
## got results for task 61
## numValues: 192, numResults: 61, stopped: TRUE
## returning status FALSE
## got results for task 62
## numValues: 192, numResults: 62, stopped: TRUE
## returning status FALSE
## got results for task 63
```

```
## numValues: 192, numResults: 63, stopped: TRUE
## returning status FALSE
## got results for task 64
## numValues: 192, numResults: 64, stopped: TRUE
## returning status FALSE
## got results for task 65
## numValues: 192, numResults: 65, stopped: TRUE
## returning status FALSE
## got results for task 66
## numValues: 192, numResults: 66, stopped: TRUE
## returning status FALSE
## got results for task 67
## numValues: 192, numResults: 67, stopped: TRUE
## returning status FALSE
## got results for task 68
## numValues: 192, numResults: 68, stopped: TRUE
## returning status FALSE
## got results for task 69
## numValues: 192, numResults: 69, stopped: TRUE
## returning status FALSE
## got results for task 70
## numValues: 192, numResults: 70, stopped: TRUE
## returning status FALSE
## got results for task 71
## numValues: 192, numResults: 71, stopped: TRUE
## returning status FALSE
## got results for task 72
## numValues: 192, numResults: 72, stopped: TRUE
## returning status FALSE
## got results for task 73
## numValues: 192, numResults: 73, stopped: TRUE
## returning status FALSE
## got results for task 74
## numValues: 192, numResults: 74, stopped: TRUE
## returning status FALSE
## got results for task 75
## numValues: 192, numResults: 75, stopped: TRUE
## returning status FALSE
## got results for task 76
## numValues: 192, numResults: 76, stopped: TRUE
## returning status FALSE
## got results for task 77
## numValues: 192, numResults: 77, stopped: TRUE
## returning status FALSE
## got results for task 78
## numValues: 192, numResults: 78, stopped: TRUE
## returning status FALSE
## got results for task 79
## numValues: 192, numResults: 79, stopped: TRUE
## returning status FALSE
## got results for task 80
## numValues: 192, numResults: 80, stopped: TRUE
## returning status FALSE
## got results for task 81
```

```
## numValues: 192, numResults: 81, stopped: TRUE
## returning status FALSE
## got results for task 82
## numValues: 192, numResults: 82, stopped: TRUE
## returning status FALSE
## got results for task 83
## numValues: 192, numResults: 83, stopped: TRUE
## returning status FALSE
## got results for task 84
## numValues: 192, numResults: 84, stopped: TRUE
## returning status FALSE
## got results for task 85
## numValues: 192, numResults: 85, stopped: TRUE
## returning status FALSE
## got results for task 86
## numValues: 192, numResults: 86, stopped: TRUE
## returning status FALSE
## got results for task 87
## numValues: 192, numResults: 87, stopped: TRUE
## returning status FALSE
## got results for task 88
## numValues: 192, numResults: 88, stopped: TRUE
## returning status FALSE
## got results for task 89
## numValues: 192, numResults: 89, stopped: TRUE
## returning status FALSE
## got results for task 90
## numValues: 192, numResults: 90, stopped: TRUE
## returning status FALSE
## got results for task 91
## numValues: 192, numResults: 91, stopped: TRUE
## returning status FALSE
## got results for task 92
## numValues: 192, numResults: 92, stopped: TRUE
## returning status FALSE
## got results for task 93
## numValues: 192, numResults: 93, stopped: TRUE
## returning status FALSE
## got results for task 94
## numValues: 192, numResults: 94, stopped: TRUE
## returning status FALSE
## got results for task 95
## numValues: 192, numResults: 95, stopped: TRUE
## returning status FALSE
## got results for task 96
## numValues: 192, numResults: 96, stopped: TRUE
## returning status FALSE
## got results for task 97
## numValues: 192, numResults: 97, stopped: TRUE
## returning status FALSE
## got results for task 98
## numValues: 192, numResults: 98, stopped: TRUE
## returning status FALSE
## got results for task 99
```



```

## numValues: 192, numResults: 99, stopped: TRUE
## returning status FALSE
## got results for task 100
## numValues: 192, numResults: 100, stopped: TRUE
## first call to combine function
## evaluating call object to combine results:
##   fun(result.1, result.2, result.3, result.4, result.5, result.6,
##       result.7, result.8, result.9, result.10, result.11, result.12,
##       result.13, result.14, result.15, result.16, result.17, result.18,
##       result.19, result.20, result.21, result.22, result.23, result.24,
##       result.25, result.26, result.27, result.28, result.29, result.30,
##       result.31, result.32, result.33, result.34, result.35, result.36,
##       result.37, result.38, result.39, result.40, result.41, result.42,
##       result.43, result.44, result.45, result.46, result.47, result.48,
##       result.49, result.50, result.51, result.52, result.53, result.54,
##       result.55, result.56, result.57, result.58, result.59, result.60,
##       result.61, result.62, result.63, result.64, result.65, result.66,
##       result.67, result.68, result.69, result.70, result.71, result.72,
##       result.73, result.74, result.75, result.76, result.77, result.78,
##       result.79, result.80, result.81, result.82, result.83, result.84,
##       result.85, result.86, result.87, result.88, result.89, result.90,
##       result.91, result.92, result.93, result.94, result.95, result.96,
##       result.97, result.98, result.99, result.100)
## returning status FALSE
## got results for task 101
## numValues: 192, numResults: 101, stopped: TRUE
## returning status FALSE
## got results for task 102
## numValues: 192, numResults: 102, stopped: TRUE
## returning status FALSE
## got results for task 103
## numValues: 192, numResults: 103, stopped: TRUE
## returning status FALSE
## got results for task 104
## numValues: 192, numResults: 104, stopped: TRUE
## returning status FALSE
## got results for task 105
## numValues: 192, numResults: 105, stopped: TRUE
## returning status FALSE
## got results for task 106
## numValues: 192, numResults: 106, stopped: TRUE
## returning status FALSE
## got results for task 107
## numValues: 192, numResults: 107, stopped: TRUE
## returning status FALSE
## got results for task 108
## numValues: 192, numResults: 108, stopped: TRUE
## returning status FALSE
## got results for task 109
## numValues: 192, numResults: 109, stopped: TRUE
## returning status FALSE
## got results for task 110
## numValues: 192, numResults: 110, stopped: TRUE
## returning status FALSE

```

```
## got results for task 111
## numValues: 192, numResults: 111, stopped: TRUE
## returning status FALSE
## got results for task 112
## numValues: 192, numResults: 112, stopped: TRUE
## returning status FALSE
## got results for task 113
## numValues: 192, numResults: 113, stopped: TRUE
## returning status FALSE
## got results for task 114
## numValues: 192, numResults: 114, stopped: TRUE
## returning status FALSE
## got results for task 115
## numValues: 192, numResults: 115, stopped: TRUE
## returning status FALSE
## got results for task 116
## numValues: 192, numResults: 116, stopped: TRUE
## returning status FALSE
## got results for task 117
## numValues: 192, numResults: 117, stopped: TRUE
## returning status FALSE
## got results for task 118
## numValues: 192, numResults: 118, stopped: TRUE
## returning status FALSE
## got results for task 119
## numValues: 192, numResults: 119, stopped: TRUE
## returning status FALSE
## got results for task 120
## numValues: 192, numResults: 120, stopped: TRUE
## returning status FALSE
## got results for task 121
## numValues: 192, numResults: 121, stopped: TRUE
## returning status FALSE
## got results for task 122
## numValues: 192, numResults: 122, stopped: TRUE
## returning status FALSE
## got results for task 123
## numValues: 192, numResults: 123, stopped: TRUE
## returning status FALSE
## got results for task 124
## numValues: 192, numResults: 124, stopped: TRUE
## returning status FALSE
## got results for task 125
## numValues: 192, numResults: 125, stopped: TRUE
## returning status FALSE
## got results for task 126
## numValues: 192, numResults: 126, stopped: TRUE
## returning status FALSE
## got results for task 127
## numValues: 192, numResults: 127, stopped: TRUE
## returning status FALSE
## got results for task 128
## numValues: 192, numResults: 128, stopped: TRUE
## returning status FALSE
```

```
## got results for task 129
## numValues: 192, numResults: 129, stopped: TRUE
## returning status FALSE
## got results for task 130
## numValues: 192, numResults: 130, stopped: TRUE
## returning status FALSE
## got results for task 131
## numValues: 192, numResults: 131, stopped: TRUE
## returning status FALSE
## got results for task 132
## numValues: 192, numResults: 132, stopped: TRUE
## returning status FALSE
## got results for task 133
## numValues: 192, numResults: 133, stopped: TRUE
## returning status FALSE
## got results for task 134
## numValues: 192, numResults: 134, stopped: TRUE
## returning status FALSE
## got results for task 135
## numValues: 192, numResults: 135, stopped: TRUE
## returning status FALSE
## got results for task 136
## numValues: 192, numResults: 136, stopped: TRUE
## returning status FALSE
## got results for task 137
## numValues: 192, numResults: 137, stopped: TRUE
## returning status FALSE
## got results for task 138
## numValues: 192, numResults: 138, stopped: TRUE
## returning status FALSE
## got results for task 139
## numValues: 192, numResults: 139, stopped: TRUE
## returning status FALSE
## got results for task 140
## numValues: 192, numResults: 140, stopped: TRUE
## returning status FALSE
## got results for task 141
## numValues: 192, numResults: 141, stopped: TRUE
## returning status FALSE
## got results for task 142
## numValues: 192, numResults: 142, stopped: TRUE
## returning status FALSE
## got results for task 143
## numValues: 192, numResults: 143, stopped: TRUE
## returning status FALSE
## got results for task 144
## numValues: 192, numResults: 144, stopped: TRUE
## returning status FALSE
## got results for task 145
## numValues: 192, numResults: 145, stopped: TRUE
## returning status FALSE
## got results for task 146
## numValues: 192, numResults: 146, stopped: TRUE
## returning status FALSE
```

```
## got results for task 147
## numValues: 192, numResults: 147, stopped: TRUE
## returning status FALSE
## got results for task 148
## numValues: 192, numResults: 148, stopped: TRUE
## returning status FALSE
## got results for task 149
## numValues: 192, numResults: 149, stopped: TRUE
## returning status FALSE
## got results for task 150
## numValues: 192, numResults: 150, stopped: TRUE
## returning status FALSE
## got results for task 151
## numValues: 192, numResults: 151, stopped: TRUE
## returning status FALSE
## got results for task 152
## numValues: 192, numResults: 152, stopped: TRUE
## returning status FALSE
## got results for task 153
## numValues: 192, numResults: 153, stopped: TRUE
## returning status FALSE
## got results for task 154
## numValues: 192, numResults: 154, stopped: TRUE
## returning status FALSE
## got results for task 155
## numValues: 192, numResults: 155, stopped: TRUE
## returning status FALSE
## got results for task 156
## numValues: 192, numResults: 156, stopped: TRUE
## returning status FALSE
## got results for task 157
## numValues: 192, numResults: 157, stopped: TRUE
## returning status FALSE
## got results for task 158
## numValues: 192, numResults: 158, stopped: TRUE
## returning status FALSE
## got results for task 159
## numValues: 192, numResults: 159, stopped: TRUE
## returning status FALSE
## got results for task 160
## numValues: 192, numResults: 160, stopped: TRUE
## returning status FALSE
## got results for task 161
## numValues: 192, numResults: 161, stopped: TRUE
## returning status FALSE
## got results for task 162
## numValues: 192, numResults: 162, stopped: TRUE
## returning status FALSE
## got results for task 163
## numValues: 192, numResults: 163, stopped: TRUE
## returning status FALSE
## got results for task 164
## numValues: 192, numResults: 164, stopped: TRUE
## returning status FALSE
```

```
## got results for task 165
## numValues: 192, numResults: 165, stopped: TRUE
## returning status FALSE
## got results for task 166
## numValues: 192, numResults: 166, stopped: TRUE
## returning status FALSE
## got results for task 167
## numValues: 192, numResults: 167, stopped: TRUE
## returning status FALSE
## got results for task 168
## numValues: 192, numResults: 168, stopped: TRUE
## returning status FALSE
## got results for task 169
## numValues: 192, numResults: 169, stopped: TRUE
## returning status FALSE
## got results for task 170
## numValues: 192, numResults: 170, stopped: TRUE
## returning status FALSE
## got results for task 171
## numValues: 192, numResults: 171, stopped: TRUE
## returning status FALSE
## got results for task 172
## numValues: 192, numResults: 172, stopped: TRUE
## returning status FALSE
## got results for task 173
## numValues: 192, numResults: 173, stopped: TRUE
## returning status FALSE
## got results for task 174
## numValues: 192, numResults: 174, stopped: TRUE
## returning status FALSE
## got results for task 175
## numValues: 192, numResults: 175, stopped: TRUE
## returning status FALSE
## got results for task 176
## numValues: 192, numResults: 176, stopped: TRUE
## returning status FALSE
## got results for task 177
## numValues: 192, numResults: 177, stopped: TRUE
## returning status FALSE
## got results for task 178
## numValues: 192, numResults: 178, stopped: TRUE
## returning status FALSE
## got results for task 179
## numValues: 192, numResults: 179, stopped: TRUE
## returning status FALSE
## got results for task 180
## numValues: 192, numResults: 180, stopped: TRUE
## returning status FALSE
## got results for task 181
## numValues: 192, numResults: 181, stopped: TRUE
## returning status FALSE
## got results for task 182
## numValues: 192, numResults: 182, stopped: TRUE
## returning status FALSE
```

```

## got results for task 183
## numValues: 192, numResults: 183, stopped: TRUE
## returning status FALSE
## got results for task 184
## numValues: 192, numResults: 184, stopped: TRUE
## returning status FALSE
## got results for task 185
## numValues: 192, numResults: 185, stopped: TRUE
## returning status FALSE
## got results for task 186
## numValues: 192, numResults: 186, stopped: TRUE
## returning status FALSE
## got results for task 187
## numValues: 192, numResults: 187, stopped: TRUE
## returning status FALSE
## got results for task 188
## numValues: 192, numResults: 188, stopped: TRUE
## returning status FALSE
## got results for task 189
## numValues: 192, numResults: 189, stopped: TRUE
## returning status FALSE
## got results for task 190
## numValues: 192, numResults: 190, stopped: TRUE
## returning status FALSE
## got results for task 191
## numValues: 192, numResults: 191, stopped: TRUE
## returning status FALSE
## got results for task 192
## numValues: 192, numResults: 192, stopped: TRUE
## calling combine function
## evaluating call object to combine results:
##   fun(accum, result.101, result.102, result.103, result.104, result.105,
##     result.106, result.107, result.108, result.109, result.110,
##     result.111, result.112, result.113, result.114, result.115,
##     result.116, result.117, result.118, result.119, result.120,
##     result.121, result.122, result.123, result.124, result.125,
##     result.126, result.127, result.128, result.129, result.130,
##     result.131, result.132, result.133, result.134, result.135,
##     result.136, result.137, result.138, result.139, result.140,
##     result.141, result.142, result.143, result.144, result.145,
##     result.146, result.147, result.148, result.149, result.150,
##     result.151, result.152, result.153, result.154, result.155,
##     result.156, result.157, result.158, result.159, result.160,
##     result.161, result.162, result.163, result.164, result.165,
##     result.166, result.167, result.168, result.169, result.170,
##     result.171, result.172, result.173, result.174, result.175,
##     result.176, result.177, result.178, result.179, result.180,
##     result.181, result.182, result.183, result.184, result.185,
##     result.186, result.187, result.188, result.189, result.190,
##     result.191, result.192)
## returning status TRUE

## 2018-05-23 11:32:14 ... Write UMI filtered count matrix to ./Count/20180523_113214_countUMI.tab

```

```
## 2018-05-23 11:32:14 ... Add count matrix and QC metrics to SCE object.

## [read.gtf.refGenome] Reading file 'GRCm38_MT.gtf'.
##
[GTF]      147 lines processed.
## [read.gtf.refGenome] Extracting genes table.
## [read.gtf.refGenome] Found 37 gene records.
## [read.gtf.refGenome] Finished.

## 2018-05-23 11:32:16 ... Save SingleCellExperiment object to ./Count/20180523_113216_countUMI_sce.rda

## 2018-05-23 11:32:16 ... UMI counting done!
```

Visualization of QC metrics

The data quality diagnostic information are contained in the `colData` of the returned `SingleCellExperiment` object `sce`. They can be visualized using the `qcplots` function.

```
qc <- qcplots(sce)
```

```
## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 25 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing missing values (geom_point).

## Warning: Removed 25 rows containing non-finite values (stat_boxplot).

## Warning: Removed 25 rows containing missing values (geom_point).

## Warning: Removed 3 rows containing non-finite values (stat_boxplot).

## Warning: Removed 3 rows containing missing values (geom_point).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

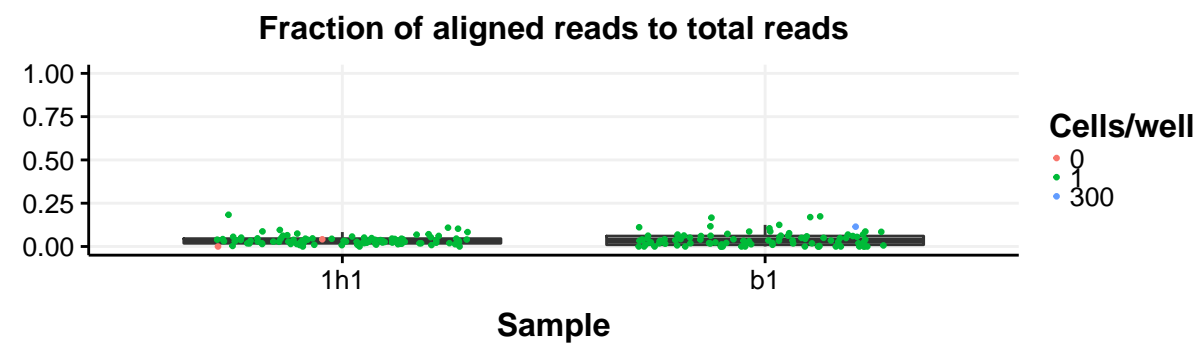
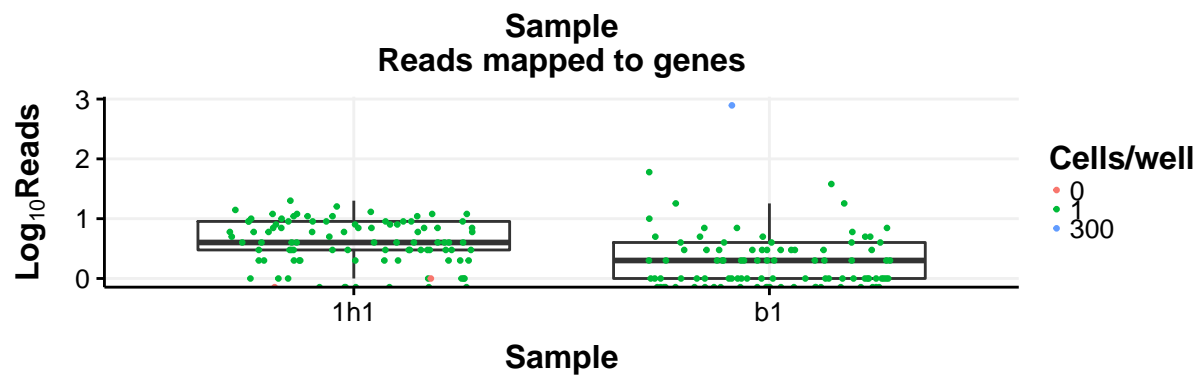
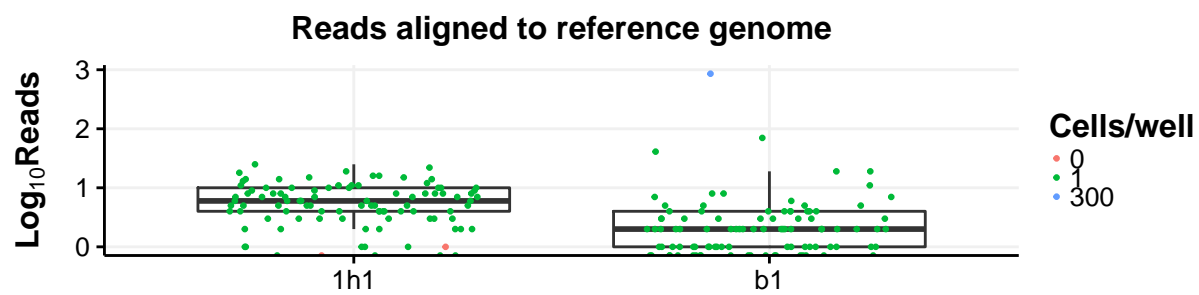
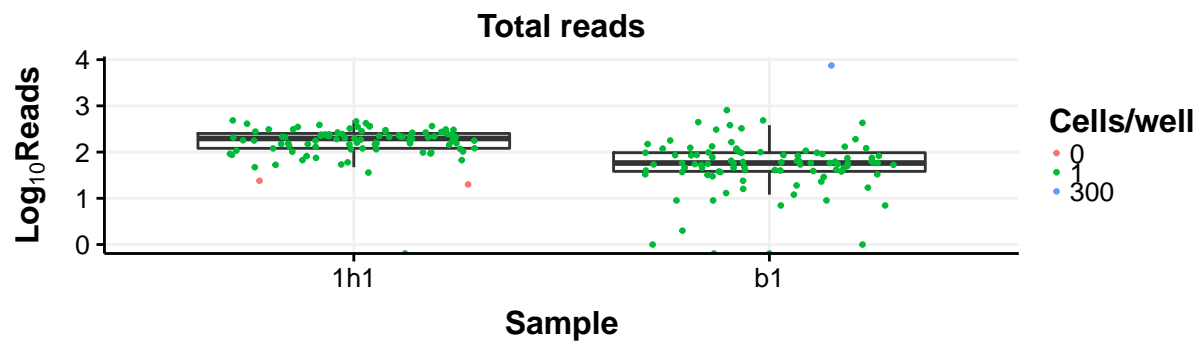
## Warning: Removed 32 rows containing missing values (geom_point).

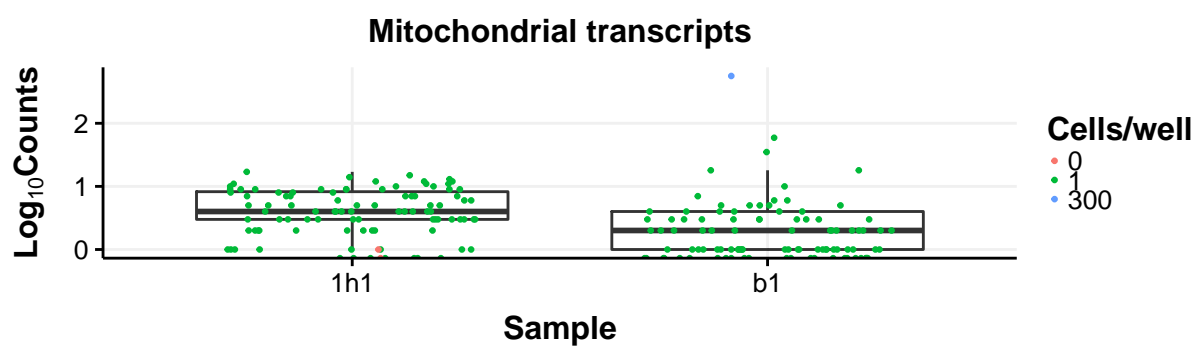
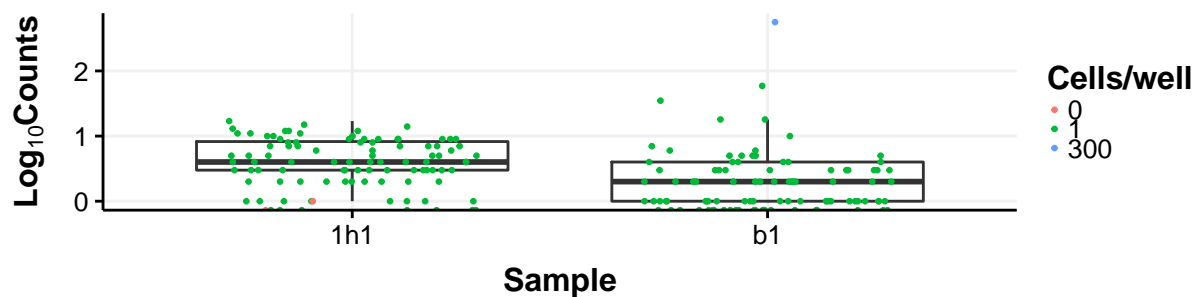
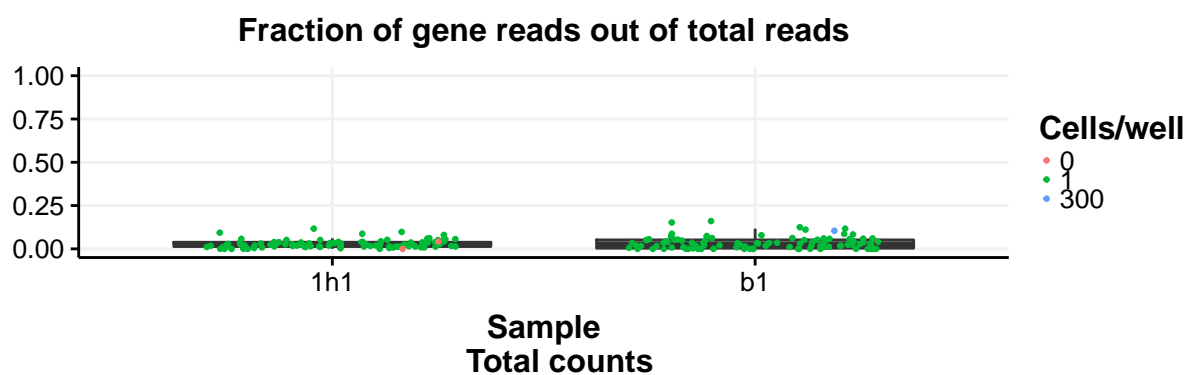
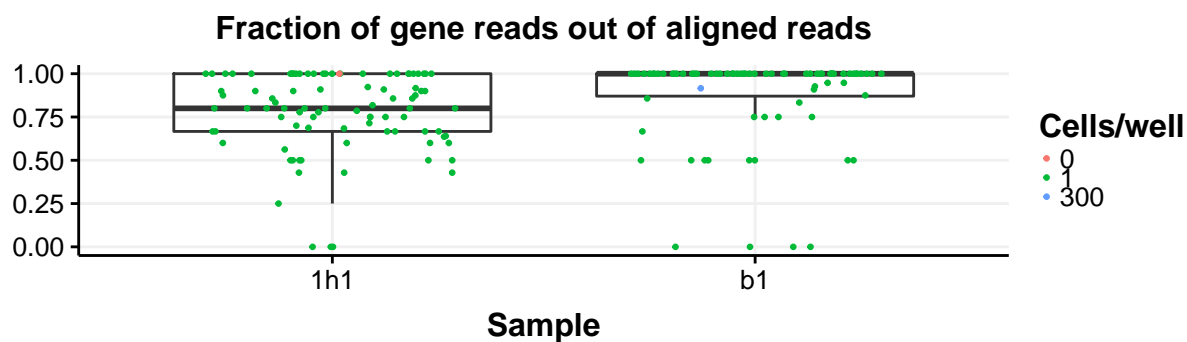
## Warning: Removed 32 rows containing non-finite values (stat_boxplot).

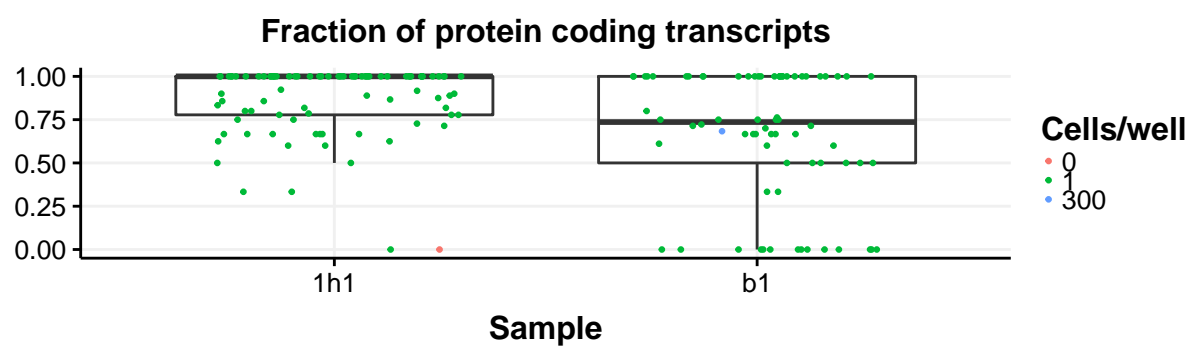
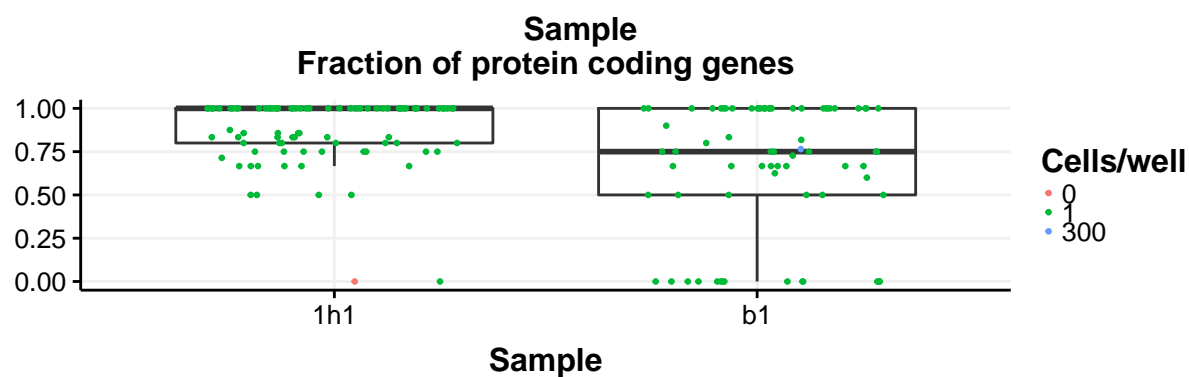
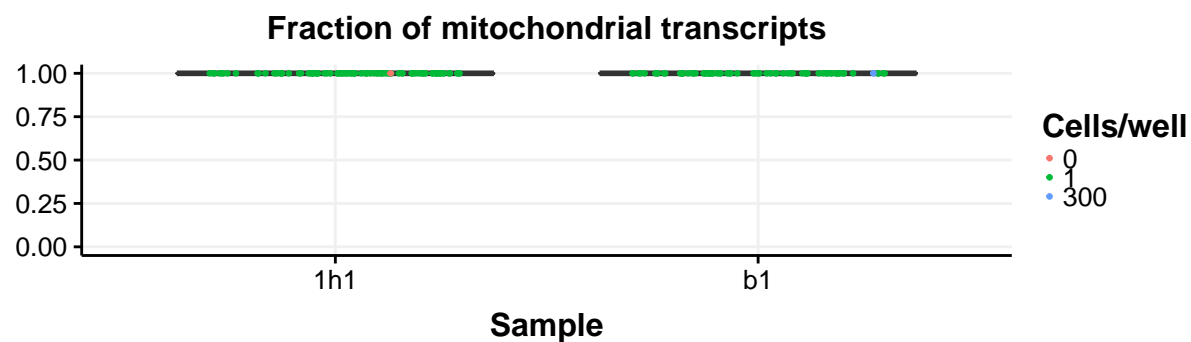
## Warning: Removed 32 rows containing non-finite values (stat_boxplot).
```

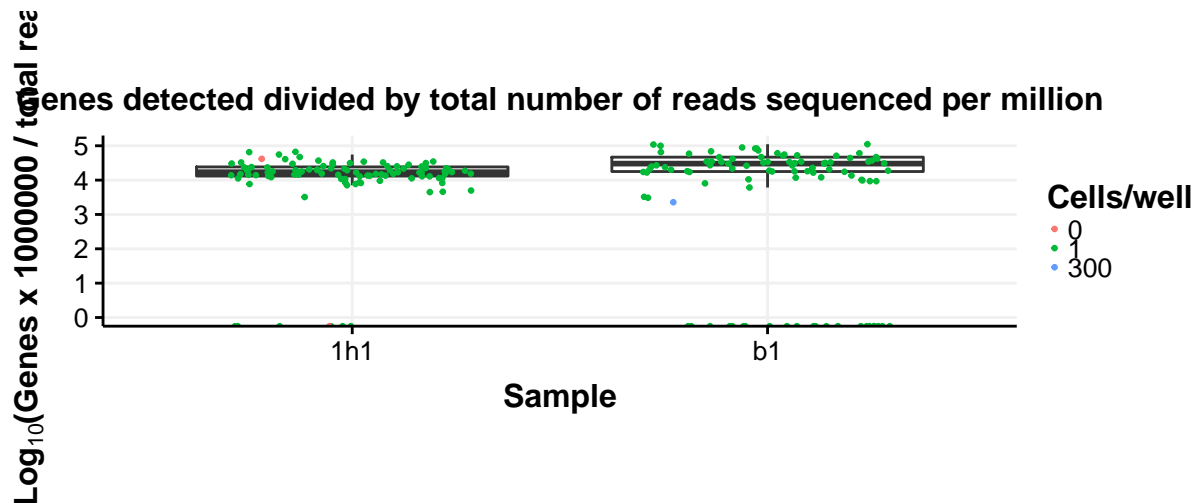
```
## Warning: Removed 32 rows containing missing values (geom_point).  
## Warning: Removed 32 rows containing non-finite values (stat_boxplot).  
## Warning: Removed 32 rows containing missing values (geom_point).  
## Warning: Removed 32 rows containing non-finite values (stat_boxplot).  
## Warning: Removed 3 rows containing missing values (geom_point).
```

```
qc
```







Visualization of Read alignments

scruff package provides functions to visualize read alignments on the reference genome. Reads are colored by their UMI. The following command visualize the reads mapped to gene mt-Rnr2 for the bulk sample “vandenBrink_b1_cell_0095”.

```
# Visualize the reads mapped to gene "mt-Rnr2" in cell "vandenBrink_b1_cell_0095".
```

```
bam <- GenomicAlignments::readGAlignments(
  Rsamtools::BamFile(SummarizedExperiment::colData(sce)[
    which(SummarizedExperiment::colData(sce)$number_of_cells == 300),
    "alignment_path"]),
  use.names = T)
```

```
gtfEG = refGenome::ensemblGenome(dirname(gtf))
refGenome::read.gtf(gtfEG, filename = basename(gtf))
```

```
## [read.gtf.refGenome] Reading file 'GRCm38_MT.gtf'.
##
[GTf]      147 lines processed.
## [read.gtf.refGenome] Extracting genes table.
## [read.gtf.refGenome] Found 37 gene records.
## [read.gtf.refGenome] Finished.
```

```
# gene mt-Rnr2 starts at 1094 and ends at 2675
```

```
start <- 1094
end <- 2675
```

```
g1 <- rview(bam, chr = "MT", start = start, end = end)
g2 <- gview(gtfEG, chr = "MT", start = start, end = end)
g <- ggbio::tracks(g1, g2, heights = c(5,1), xlab = "chr MT")
g
```

