

# Package ‘Rbwa’

October 19, 2024

**Version** 1.9.0

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**Title** R wrapper for BWA-backtrack and BWA-MEM aligners

**Depends** R (>= 4.1)

**Suggests** testthat, BiocStyle, knitr, rmarkdown

**SystemRequirements** GNU make

**Description** Provides an R wrapper for BWA alignment algorithms.

Both BWA-backtrack and BWA-MEM are available.

Convenience function to build a BWA index from a reference genome is also provided. Currently not supported for Windows machines.

**License** MIT + file LICENSE

**URL** <https://github.com/Jfortin1/Rbwa>

**BugReports** <https://github.com/crisprVerse/Rbwa/issues>

**biocViews** Sequencing, Alignment

**VignetteBuilder** knitr

**RoxygenNote** 7.1.2

**OS\_type** unix

**git\_url** <https://git.bioconductor.org/packages/Rbwa>

**git\_branch** devel

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bwa_aln	<i>R wrapper to run BWA alignment tool BWA-backtrack</i>
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**Description**

R wrapper to run BWA alignment tool BWA-backtrack.

**Usage**

```
bwa_aln(
  type = c("single", "paired"),
  index_prefix,
  fastq_files,
  sai_files,
  ...
)
```

**Arguments**

type	String specifying type of reads: "single" for single-end reads (default) or "paired" for paired-end reads.
index_prefix	String specifying prefix of the BWA index.
fastq_files	Character vector specifying paths of fastq files. If type=="single", must be of length 1. If type=="paired", must be of length 2.
sai_files	Character vector specifying filenames of the BWA alignment output files. If type=="single", must be of length 1. If type=="paired", must be of length 2.
...	Other arguments to pass to the bwa aln alignment.

**Value**

No return value. Output files from bwa aln alignment are produced as side effect.

**Author(s)**

Jean-Philippe Fortin

**Examples**

```
dir <- tempdir()
fasta <- system.file(package="Rbwa",
  "fasta/chr12.fa")
fastq <- system.file(package="Rbwa",
  "fastq/sequences.fastq")
index_prefix <- file.path(dir, "chr12")
bwa_build_index(fasta, index_prefix=index_prefix)

bwa_aln(index_prefix=index_prefix,
  fastq_files=fastq,
  sai_files=file.path(dir, "output.sai"))
```

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bwa_build_index	<i>R wrapper to create BWA index files</i>
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**Description**

R wrapper to create BWA index files from a FASTA file.

**Usage**

```
bwa_build_index(fasta, index_prefix = NULL, ...)
```

**Arguments**

fasta	String specifying path to a FASTA file.
index_prefix	String specifying prefix of the output BWA index.
...	Other arguments to pass to bwa index.

**Value**

No return value. BWA index files are produced as a side-effect.

**Author(s)**

Jean-Philippe Fortin

**Examples**

```
dir <- tempdir()
fasta <- system.file(package="Rbwa",
                     "fasta/chr12.fa")
bwa_build_index(fasta,
                index_prefix=file.path(dir,"chr12"))
```

---

bwa_mem	<i>R wrapper to run BWA alignment tool BWA-MEM</i>
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**Description**

R wrapper to run BWA alignment tool BWA-MEM.

**Usage**

```
bwa_mem(type = c("single", "paired"), index_prefix, fastq_files, sam_file, ...)
```

**Arguments**

type	String specifying type of reads: "single" for single-end reads (default) or "paired" for paired-end reads.
index_prefix	String specifying prefix of the BWA index.
fastq_files	Character vector specifying paths of fastq files. If type=="single", must be of length 1. If type=="paired", must be of length 2.
sam_file	String specifying filename of the SAM alignment output.
...	Other arguments to pass to the bwa aln alignment.

**Value**

No return value. Output SAM file is produced as side effect.

**Author(s)**

Jean-Philippe Fortin

**Examples**

```
dir <- tempdir()
fasta <- system.file(package="Rbwa",
                     "fasta/chr12.fa")
fastq <- system.file(package="Rbwa",
                     "fastq/sequences.fastq")
index_prefix <- file.path(dir, "chr12")
bwa_build_index(fasta, index_prefix=index_prefix)

bwa_mem(index_prefix=index_prefix,
        fastq_files=fastq,
        sam_file=file.path(dir, "output.sam"))
```

---

bwa\_sam

*R wrapper to convert bwa aln output to SAM format*

---

**Description**

R wrapper to convert bwa aln output to SAM format.

**Usage**

```
bwa_sam(
  type = c("single", "paired"),
  index_prefix,
  fastq_files,
  sai_files,
  sam_file,
  ...
)
```

**Arguments**

type	String specifying type of reads: "single" for single-end reads (default) or "paired" for paired-end reads.
index_prefix	String specifying prefix of the BWA index.
fastq_files	Character vector specifying paths of fastq files. If type=="single", must be of length 1. If type=="paired", must be of length 2.
sai_files	Character vector specifying filenames of the bwa aln alignment output files. If type=="single", must be of length 1. If type=="paired", must be of length 2.
sam_file	String specifying paths of the SAM output file.
...	Other arguments to pass to bwa_sam.

**Value**

No return value. Output SAM files are produced as side effect.

**Author(s)**

Jean-Philippe Fortin

**Examples**

```
# Creating index:
dir <- tempdir()
fasta <- system.file(package="Rbwa",
                     "fasta/chr12.fa")
fastq <- system.file(package="Rbwa",
                     "fastq/sequences.fastq")
index_prefix <- file.path(dir, "chr12")
bwa_build_index(fasta, index_prefix=index_prefix)

# Creating alignments:
bwa_aln(index_prefix=index_prefix,
        fastq_files=fastq,
        sai_files=file.path(dir, "output.sai"))

# Generating SAM file:
bwa_sam(index_prefix=index_prefix,
        fastq_files=fastq,
        sai_files=file.path(dir, "output.sai"),
        sam_file=file.path(dir, "output.sam"))

# Reading in alignments from SAM file:
aln <- readLines(file.path(dir, "output.sam"))
aln
```

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`xa2multi`*Unpack multiple alignments stored in BWA output*

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## Description

Unpack multiple alignments stored in BWA output

## Usage

```
xa2multi(input_sam_file, output_sam_file)
```

## Arguments

`input_sam_file` String specifying path of the input SAM file.  
`output_sam_file`  
String specifying path of the output SAM file.

## Details

Each row in the SAM file produced by `bwaaln` corresponds to the best alignment hit for a given input query sequence. Other alignments (secondary alignments, or other loci in case of multiple alignments) are stored in the XA tag.

`xa2multi` conveniently extracts the alignments from the XA tags and represent them as additional rows in the SAM format.

## Value

Returns NULL invisibly. SAM file with multiple alignments is produced as a side effect.

## Author(s)

Jean-Philippe Fortin

## Examples

```
# Creating index:
dir <- tempdir()
fasta <- system.file(package="Rbwa",
                     "fasta/chr12.fa")
fastq <- system.file(package="Rbwa",
                     "fastq/sequences.fastq")
index_prefix <- file.path(dir, "chr12")
bwa_build_index(fasta, index_prefix=index_prefix)

# Creating alignments:
bwaaln(index_prefix=index_prefix,
       fastq_files=fastq,
       sai_files=file.path(dir, "output.sai"))

# Generating SAM file:
bwa_sam(index_prefix=index_prefix,
       fastq_files=fastq,
       sai_files=file.path(dir, "output.sai"),
```

```
    sam_file=file.path(dir, "output.sam"))

# Generating multiple alignments:
xa2multi(input_sam_file=file.path(dir, "output.sam"),
         output_sam_file=file.path(dir, "output.multi.sam"))

#' Reading in:
aln <- readLines(file.path(dir, "output.multi.sam"))
aln
```

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