Package: stringi (via r-universe)

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Title Fast and Portable Character String Processing Facilities

Description A collection of character string/text/natural language processing tools for pattern searching (e.g., with 'Java'-like regular expressions or the 'Unicode' collation algorithm), random string generation, case mapping, string transliteration, concatenation, sorting, padding, wrapping, Unicode normalisation, date-time formatting and parsing, and many more. They are fast, consistent, convenient, and - thanks to 'ICU' (International Components for Unicode) - portable across all locales and platforms. Documentation about 'stringi' is provided via its website at <https://stringi.gagolewski.com/> and the paper by Gagolewski (2022, <doi:10.18637/jss.v103.i02>).

URL https://stringi.gagolewski.com/, https://github.com/gagolews/stringi, https://icu.unicode.org/

BugReports https://github.com/gagolews/stringi/issues

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Contents

stringi-package 4
%s+% 6
%s<% 7
%s$% 9
about_arguments 10
about_encoding 11
about_locale 15
about_search 17
about_search_boundaries 18
about_search_charclass 20
about_search_coll 25
about_search_fixed 26
about_search_regex 27
stri_compare 31
stri_count 33
stri_count_boundaries 35
stri_datetime_add 37
stri_datetime_create 38
stri_datetime_fields 40
stri_datetime_format 41
stri_datetime_fstr 46
stri_datetime_now 47
stri_datetime_symbols 47
stri_detect 49
stri_dup 51
stri_duplicated 52
stri_enc_detect 54
stri_enc_detect2 57
stri_enc_fromutf32 58
stri_enc_info 59
stri_enc_isascii 60
stri_enc_isutf16be 61
stri_enc_isutf8 62
stri_enc_list 63

stri_enc_mark . . . 64
stri_enc_set . . . 65
stri_enc_toascii . . . 66
stri_enc_tonative . . . 67
stri_enc_toutf32 . . . 68
stri_enc_toutf8 . . . 69
stri_encode . . . 70
stri_escape_unicode . . . 71
stri_extract_all . . . 72
stri_extract_all_boundaries . . . 76
stri_flatten . . . 78
stri_info . . . 79
stri_isempty . . . 80
stri_join . . . 81
stri_join_list . . . 82
stri_length . . . 83
stri_list2matrix . . . 85
stri_locale_info . . . 86
stri_locale_list . . . 87
stri_locale_set . . . 88
stri_locate_all . . . 89
stri_locate_all_boundaries . . . 93
stri_match_all . . . 95
stri_na2empty . . . 98
stri_numbytes . . . 99
stri_opts_brkiter . . . 100
stri_opts_collator . . . 102
stri_opts_fixed . . . 104
stri_opts_regex . . . 105
stri_order . . . 107
stri_pad_both . . . 108
stri_rand_lipsum . . . 110
stri_rand_shuffle . . . 111
stri_rand_strings . . . 112
stri_rank . . . 113
stri_read_lines . . . 115
stri_read_raw . . . 116
stri_remove_empty . . . 117
stri_replace_all . . . 118
stri_replace_na . . . 121
stri_replace_rstr . . . 122
stri_reverse . . . 123
stri_sort . . . 124
stri_sort_key . . . 125
stri_split . . . 126
stri_split_boundaries . . . 129
stri_split_lines . . . 131
stri_sprintf . . . 133

stri_startswith . . . 135
stri_stats_general . . . 138
stri_stats_latex . . . 139
stri_sub . . . 140
stri_sub_all . . . 143
stri_subset . . . 145
stri_timezone_get . . . 147
stri_timezone_info . . . 148
stri_timezone_list . . . 150
stri_trans_char . . . 151
stri_trans_general . . . 152
stri_trans_list . . . 154
stri_trans_nfc . . . 155
stri_trans_tolower . . . 157
stri_trim_both . . . 159
stri_unescape_unicode . . . 160
stri_unique . . . 161
stri_width . . . 162
stri_wrap . . . 164
stri_write_lines . . . 166

Index **168**

`stringi-package` *Fast and Portable Character String Processing in R*

Description

stringi is THE R package for fast, correct, consistent, and convenient string/text manipulation. It gives predictable results on every platform, in each locale, and under any native character encoding.

Keywords: R, text processing, character strings, internationalization, localization, ICU, ICU4C, i18n, l10n, Unicode.

Homepage: `https://stringi.gagolewski.com/`

License: The BSD-3-clause license for the package code, the ICU license for the accompanying ICU4C distribution, and the UCD license for the Unicode Character Database. See the COPYRIGHTS and LICENSE file for more details.

Details

Manual pages on general topics:

- about_encoding – character encoding issues, including information on encoding management in **stringi**, as well as on encoding detection and conversion.
- about_locale – locale issues, including locale management and specification in **stringi**, and the list of locale-sensitive operations. In particular, see `stri_opts_collator` for a description of the string collation algorithm, which is used for string comparing, ordering, ranking, sorting, case-folding, and searching.
- about_arguments – information on how **stringi** handles the arguments passed to its function.

Facilities available

Refer to the following:

- about_search for string searching facilities; these include pattern searching, matching, string splitting, and so on. The following independent search engines are provided:
  - about_search_regex – with ICU (Java-like) regular expressions,
  - about_search_fixed – fast, locale-independent, byte-wise pattern matching,
  - about_search_coll – locale-aware pattern matching for natural language processing tasks,
  - about_search_charclass – seeking elements of particular character classes, like "all whitespaces" or "all digits",
  - about_search_boundaries – text boundary analysis.
- `stri_datetime_format` for date/time formatting and parsing. Also refer to the links therein for other date/time/time zone- related operations.
- `stri_stats_general` and `stri_stats_latex` for gathering some fancy statistics on a character vector's contents.
- `stri_join`, `stri_dup`, `%s+%`, and `stri_flatten` for concatenation-based operations.
- `stri_sub` for extracting and replacing substrings, and `stri_reverse` for a joyful function to reverse all code points in a string.
- `stri_length` (among others) for determining the number of code points in a string. See also `stri_count_boundaries` for counting the number of Unicode characters and `stri_width` for approximating the width of a string.
- `stri_trim` (among others) for trimming characters from the beginning or/and end of a string, see also about_search_charclass, and `stri_pad` for padding strings so that they are of the same width. Additionally, `stri_wrap` wraps text into lines.
- `stri_trans_tolower` (among others) for case mapping, i.e., conversion to lower, UPPER, or Title Case, `stri_trans_nfc` (among others) for Unicode normalization, `stri_trans_char` for translating individual code points, and `stri_trans_general` for other universal text transforms, including transliteration.
- `stri_cmp`, `%s<%`, `stri_order`, `stri_sort`, `stri_rank`, `stri_unique`, and `stri_duplicated` for collation-based, locale-aware operations, see also about_locale.
- `stri_split_lines` (among others) to split a string into text lines.
- `stri_escape_unicode` (among others) for escaping some code points.
- `stri_rand_strings`, `stri_rand_shuffle`, and `stri_rand_lipsum` for generating (pseudo)random strings.
- `stri_read_raw`, `stri_read_lines`, and `stri_write_lines` for reading and writing text files.

Note that each man page provides many further links to other interesting facilities and topics.

Author(s)

Marek Gagolewski, with contributions from Bartek Tartanus and many others. ICU4C was developed by IBM, Unicode, Inc., and others.

References

stringi *Package Homepage*, https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

ICU – International Components for Unicode, https://icu.unicode.org/

ICU4C API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/

The Unicode Consortium, https://home.unicode.org/

UTF-8, A Transformation Format of ISO 10646 – RFC 3629, https://www.rfc-editor.org/rfc/rfc3629

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Useful links:

- https://stringi.gagolewski.com/
- https://github.com/gagolews/stringi
- https://icu.unicode.org/
- Report bugs at https://github.com/gagolews/stringi/issues

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search, about_search_boundaries, about_search_charclass, about_search_coll, about_search_fixed, about_search_regex

---

%s+% *Concatenate Two Character Vectors*

Description

Binary operators for joining (concatenating) two character vectors, with a typical R look-and-feel.

Usage

```
e1 %s+% e2

e1 %stri+% e2
```

Arguments

e1	a character vector or an object coercible to a character vector
e2	a character vector or an object coercible to a character vector

Details

Vectorized over `e1` and `e2`.

These operators act like a call to `stri_join(e1, e2, sep='')`. However, note that joining 3 vectors, e.g., `e1 %s+% e2 %s+% e3` is slower than `stri_join(e1, e2, e3, sep='')`, because it creates a new (temporary) result vector each time the operator is applied.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other join: `stri_dup()`, `stri_flatten()`, `stri_join()`, `stri_join_list()`

Examples

```
c('abc', '123', 'xy') %s+% letters[1:6]
'ID_' %s+% 1:5
```

`%s<%` *Compare Strings with or without Collation*

Description

Relational operators for comparing corresponding strings in two character vectors, with a typical R look-and-feel.

Usage

```
e1 %s<% e2

e1 %s<=% e2

e1 %s>% e2

e1 %s>=% e2

e1 %s==% e2
```

```
e1 %s!=% e2

e1 %s===% e2

e1 %s!==% e2

e1 %stri<% e2

e1 %stri<=% e2

e1 %stri>% e2

e1 %stri>=% e2

e1 %stri==% e2

e1 %stri!=% e2

e1 %stri===% e2

e1 %stri!==% e2
```

Arguments

e1, e2	character vectors or objects coercible to character vectors

Details

These functions call stri_cmp_le or its friends, using the default collator options. As a consequence, they are vectorized over e1 and e2.

%stri==% tests for canonical equivalence of strings (see stri_cmp_equiv) and is a locale-dependent operation.

%stri===% performs a locale-independent, code point-based comparison.

Value

All the functions return a logical vector indicating the result of a pairwise comparison. As usual, the elements of shorter vectors are recycled if necessary.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
'a' %stri<% 'b'
c('a', 'b', 'c') %stri>=% 'b'
```

%s$% *C-Style Formatting with* stri_sprintf *as a Binary Operator*

Description

Provides access to stri_sprintf in form of a binary operator in a way similar to Python's % overloaded for strings.

Missing values and empty vectors are propagated as usual.

Usage

```
e1 %s$% e2

e1 %stri$% e2
```

Arguments

e1	format strings, see stri_sprintf for syntax
e2	a list of atomic vectors to be passed to stri_sprintf or a single atomic vector

Details

Vectorized over e1 and e2.

e1 %s$% atomic_vector is equivalent to e1 %s$% list(atomic_vector).

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: stri_isempty(), stri_length(), stri_numbytes(), stri_pad_both(), stri_sprintf(), stri_width()

Examples

```
"value='%d'" %s$% 3
"value='%d'" %s$% 1:3
"%s='%d'" %s$% list("value", 3)
"%s='%d'" %s$% list("value", 1:3)
"%s='%d'" %s$% list(c("a", "b", "c"), 1)
"%s='%d'" %s$% list(c("a", "b", "c"), 1:3)

x <- c("abcd", "\u00DF\u00B5\U0001F970", "abcdef")
cat("[%6s]" %s$% x, sep="\n")  # width used, not the number of bytes
```

---

about_arguments *Passing Arguments to Functions in* **stringi**

Description

Below we explain how **stringi** deals with its functions' arguments.

If some function violates one of the following rules (for a very important reason), this is clearly indicated in its documentation (with discussion).

Coercion of Arguments

When a character vector argument is expected, factors and other vectors coercible to characters vectors are silently converted with as.character, otherwise an error is generated. Coercion from a list which does not consist of length-1 atomic vectors issues a warning.

When a logical, numeric, or integer vector argument is expected, factors are converted with as.*(as.character(...)), and other coercible vectors are converted with as.*, otherwise an error is generated.

Vectorization

Almost all functions are vectorized with respect to all their arguments and the recycling rule is applied whenever necessary. Due to this property you may, for instance, search for one pattern in each given string, search for each pattern in one given string, and search for the i-th pattern within the i-th string.

We of course took great care of performance issues: e.g., in regular expression searching, regex matchers are reused from iteration to iteration, as long as it is possible.

Functions with some non-vectorized arguments are rare: e.g., regular expression matcher's settings are established once per each call.

Some functions assume that a vector with one element is given as an argument (like `collapse` in `stri_join`). In such cases, if an empty vector is given you will get an error and for vectors with more than 1 elements - a warning will be generated (only the first element will be used).

You may find details on vectorization behavior in the man pages on each particular function of your interest.

Handling Missing Values (NAs)

stringi handles missing values consistently. For any vectorized operation, if at least one vector element is missing, then the corresponding resulting value is also set to `NA`.

Preserving Object Attributes

Generally, all our functions drop input objects' attributes (e.g., `names`, `dim`, etc.). This is due to deep vectorization as well as for efficiency reasons. If the preservation of attributes is needed, important attributes can be manually copied. Alternatively, the notation `x[] <- stri_...(x, ...)` can sometimes be used too.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other stringi_general_topics: `about_encoding`, `about_locale`, `about_search`, `about_search_boundaries`, `about_search_charclass`, `about_search_coll`, `about_search_fixed`, `about_search_regex`, `stringi-package`

---

about_encoding *Character Encodings and* **stringi**

Description

This manual page explains how **stringi** deals with character strings in various encodings.

In particular we should note that:

- R lets strings in ASCII, UTF-8, and your platform's native encoding coexist. A character vector printed on the console by calling `print` or `cat` is silently re-encoded to the native encoding.
- Functions in **stringi** process each string internally in Unicode, the most universal character encoding ever. Even if a string is given in the native encoding, i.e., your platform's default one, it will be converted to Unicode (precisely: UTF-8 or UTF-16).

- Most **stringi** functions always return UTF-8 encoded strings, regardless of the input encoding. What is more, the functions have been optimized for UTF-8/ASCII input (they have competitive, if not better performance, especially when performing more complex operations like string comparison, sorting, and even concatenation). Thus, it is best to rely on cascading calls to **stringi** operations solely.

Details

Quoting the ICU User Guide, 'Hundreds of encodings have been developed over the years, each for small groups of languages and for special purposes. As a result, the interpretation of text, input, sorting, display, and storage depends on the knowledge of all the different types of character sets and their encodings. Programs have been written to handle either one single encoding at a time and switch between them, or to convert between external and internal encodings.'

'Unicode provides a single character set that covers the major languages of the world, and a small number of machine-friendly encoding forms and schemes to fit the needs of existing applications and protocols. It is designed for best interoperability with both ASCII and ISO-8859-1 (the most widely used character sets) to make it easier for Unicode to be used in almost all applications and protocols' (see the ICU User Guide).

The Unicode Standard determines the way to map any possible character to a numeric value – a so-called code point. Such code points, however, have to be stored somehow in computer's memory. The Unicode Standard encodes characters in the range U+0000..U+10FFFF, which amounts to a 21-bit code space. Depending on the encoding form (UTF-8, UTF-16, or UTF-32), each character will then be represented either as a sequence of one to four 8-bit bytes, one or two 16-bit code units, or a single 32-bit integer (compare the ICU FAQ).

Unicode can be thought of as a superset of the spectrum of characters supported by any given code page.

UTF-8 and UTF-16

For portability reasons, the UTF-8 encoding is the most natural choice for representing Unicode character strings in R. UTF-8 has ASCII as its subset (code points 1–127 represent the same characters in both of them). Code points larger than 127 are represented by multi-byte sequences (from 2 to 4 bytes: Please note that not all sequences of bytes are valid UTF-8, compare `stri_enc_isutf8`).

Most of the computations in **stringi** are performed internally using either UTF-8 or UTF-16 encodings (this depends on type of service you request: some **ICU** services are designed only to work with UTF-16). Due to such a choice, with **stringi** you get the same result on each platform, which is – unfortunately – not the case of base R's functions (for instance, it is known that performing a regular expression search under Linux on some texts may give you a different result to those obtained under Windows). We really had portability in our minds while developing our package!

We have observed that R correctly handles UTF-8 strings regardless of your platform's native encoding (see below). Therefore, we decided that most functions in **stringi** will output its results in UTF-8 – this speeds ups computations on cascading calls to our functions: the strings does not have to be re-encoded each time.

Note that some Unicode characters may have an ambiguous representation. For example, "a with ogonek" (one character) and "a"+"ogonek" (two graphemes) are semantically the same. **stringi** provides functions to normalize character sequences, see `stri_trans_nfc` for discussion. However, it is observed that denormalized strings do appear very rarely in typical string processing activities.

Additionally, do note that **stringi** silently removes byte order marks (BOMs - they may incidentally appear in a string read from a text file) from UTF8-encoded strings, see `stri_enc_toutf8`.

Character Encodings in R

Data in memory are just bytes (small integer values) – an en*coding* is a way to represent characters with such numbers, it is a semantic 'key' to understand a given byte sequence. For example, in ISO-8859-2 (Central European), the value 177 represents Polish "a with ogonek", and in ISO-8859-1 (Western European), the same value denotes the "plus-minus" sign. Thus, a character encoding is a translation scheme: we need to communicate with R somehow, relying on how it represents strings.

Overall, R has a very simple encoding marking mechanism, see `stri_enc_mark`. There is an implicit assumption that your platform's default (native) encoding always extends ASCII – **stringi** checks that whenever your native encoding is being detected automatically on **ICU**'s initialization and each time when you change it manually by calling `stri_enc_set`.

Character strings in R (internally) can be declared to be in:

- `UTF-8`;
- `latin1`, i.e., either ISO-8859-1 (Western European on Linux, OS X, and other Unixes) or WINDOWS-1252 (Windows);
- `bytes` – for strings that should be manipulated as sequences of bytes.

Moreover, there are two other cases:

- ASCII – for strings consisting only of byte codes not greater than 127;
- `native` (a.k.a. `unknown` in `Encoding`; quite a misleading name: no explicit encoding mark) – for strings that are assumed to be in your platform's native (default) encoding. This can represent UTF-8 if you are an OS X user, or some 8-bit Windows code page, for example. The native encoding used by R may be determined by examining the LC_CTYPE category, see `Sys.getlocale`.

Intuitively, "native" strings result from reading a string from stdin (e.g., keyboard input). This makes sense: your operating system works in some encoding and provides R with some data.

Each time when a **stringi** function encounters a string declared in native encoding, it assumes that the input data should be translated from the default encoding, i.e., the one returned by `stri_enc_get` (unless you know what you are doing, the default encoding should only be changed if the automatic encoding detection process fails on **stringi** load).

Functions which allow `'bytes'` encoding markings are very rare in **stringi**, and were carefully selected. These are: `stri_enc_toutf8` (with argument `is_unknown_8bit=TRUE`), `stri_enc_toascii`, and `stri_encode`.

Finally, note that R lets strings in ASCII, UTF-8, and your platform's native encoding coexist. A character vector printed with `print`, `cat`, etc., is silently re-encoded so that it can be properly shown, e.g., on the console.

Encoding Conversion

Apart from automatic conversion from the native encoding, you may re-encode a string manually, for example when you read it from a file created on a different platform. Call `stri_enc_list` for the list of encodings supported by **ICU**. Note that converter names are case-insensitive and **ICU**

tries to normalize the encoding specifiers. Leading zeroes are ignored in sequences of digits (if further digits follow), and all non-alphanumeric characters are ignored. Thus the strings 'UTF-8', 'utf_8', 'u*Tf08' and 'Utf 8' are equivalent.

The `stri_encode` function allows you to convert between any given encodings (in some cases you will obtain `bytes`-marked strings, or even lists of raw vectors (i.e., for UTF-16). There are also some useful more specialized functions, like `stri_enc_toutf32` (converts a character vector to a list of integers, where one code point is exactly one numeric value) or `stri_enc_toascii` (substitutes all non-ASCII bytes with the SUBSTITUTE CHARACTER, which plays a similar role as R's `NA` value).

There are also some routines for automated encoding detection, see, e.g., `stri_enc_detect`.

Encoding Detection

Given a text file, one has to know how to interpret (encode) raw data in order to obtain meaningful information.

Encoding detection is always an imprecise operation and needs a considerable amount of data. However, in case of some encodings (like UTF-8, ASCII, or UTF-32) a "false positive" byte sequence is quite rare (statistically speaking).

Check out `stri_enc_detect` (among others) for a useful function in this category.

Author(s)

Marek Gagolewski and other contributors

References

Unicode Basics – ICU User Guide, https://unicode-org.github.io/icu/userguide/icu/unicode.html

Conversion – ICU User Guide, https://unicode-org.github.io/icu/userguide/conversion/

Converters – ICU User Guide, https://unicode-org.github.io/icu/userguide/conversion/converters.html (technical details)

UTF-8, UTF-16, UTF-32 & BOM – ICU FAQ, https://www.unicode.org/faq/utf_bom.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other stringi_general_topics: `about_arguments`, `about_locale`, `about_search`, `about_search_boundaries`, `about_search_charclass`, `about_search_coll`, `about_search_fixed`, `about_search_regex`, `stringi-package`

Other encoding_management: `stri_enc_info()`, `stri_enc_list()`, `stri_enc_mark()`, `stri_enc_set()`

Other encoding_detection: `stri_enc_detect()`, `stri_enc_detect2()`, `stri_enc_isascii()`, `stri_enc_isutf16be()`, `stri_enc_isutf8()`

Other encoding_conversion: `stri_enc_fromutf32()`, `stri_enc_toascii()`, `stri_enc_tonative()`, `stri_enc_toutf32()`, `stri_enc_toutf8()`, `stri_encode()`

about_locale *Locales and* **stringi**

Description

In this section we explain how we specify locales in **stringi**. Locale is a fundamental concept in **ICU**. It identifies a specific user community, i.e., a group of users who have similar culture and language expectations for human-computer interaction.

Details

Because a locale is just an identifier of a region, no validity check is performed when you specify a Locale. **ICU** is implemented as a set of services. If you want to verify whether particular resources are available in the locale you asked for, you must query those resources. Note: when you ask for a resource for a particular locale, you get back the best available match, not necessarily precisely the one you requested.

Locale Identifiers

ICU services are parametrized by locale, to deliver culturally correct results. Locales are identified by character strings of the form `Language` code, `Language_Country` code, or `Language_Country_Variant` code, e.g., 'en_US'.

The two-letter `Language` code uses the ISO-639-1 standard, e.g., 'en' stands for English, 'pl' – Polish, 'fr' – French, and 'de' for German.

`Country` is a two-letter code following the ISO-3166 standard. This is to reflect different language conventions within the same language, for example in US-English ('en_US') and Australian-English ('en_AU').

Differences may also appear in language conventions used within the same country. For example, the Euro currency may be used in several European countries while the individual country's currency is still in circulation. In such a case, **ICU** `Variant` '_EURO' could be used for selecting locales that support the Euro currency.

The final (optional) element of a locale is a list of keywords together with their values. Keywords must be unique. Their order is not significant. Unknown keywords are ignored. The handling of keywords depends on the specific services that utilize them. Currently, the following keywords are recognized: `calendar`, `collation`, `currency`, and `numbers`, e.g., `fr@collation=phonebook;calendar=islamic-civil` is a valid French locale specifier together with keyword arguments. For more information, refer to the ICU user guide.

For a list of locales that are recognized by **ICU**, call `stri_locale_list`.

Note that in **stringi**, 'C' is a synonym of 'en_US_POSIX'.

A Note on Default Locales

Each locale-sensitive function in **stringi** selects the current default locale if an empty string or `NULL` is provided as its `locale` argument. Default locales are available to all the functions; initially, the system locale on that platform is used, but it may be changed by calling `stri_locale_set`.

Your program should avoid changing the default locale. All locale-sensitive functions may request any desired locale per-call (by specifying the `locale` argument), i.e., without referencing to the default locale. During many tests, however, we did not observe any improper behavior of **stringi** while using a modified default locale.

Locale-Sensitive Functions in stringi

One of many examples of locale-dependent services is the Collator, which performs a locale-aware string comparison. It is used for string comparing, ordering, sorting, and searching. See `stri_opts_collator` for the description on how to tune its settings, and its `locale` argument in particular.

When choosing a resource bundle that is not available in the explicitly requested locale (but not when using the default locale) nor in its more general variants (e.g., 'es_ES' vs 'es'), a warning is emitted.

Other locale-sensitive functions include, e.g., `stri_trans_tolower` (that does character case mapping).

Author(s)

Marek Gagolewski and other contributors

References

Locale – ICU User Guide, https://unicode-org.github.io/icu/userguide/locale/

ISO 639: Language Codes, https://www.iso.org/iso-639-language-codes.html

ISO 3166: Country Codes, https://www.iso.org/iso-3166-country-codes.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_management: `stri_locale_info()`, `stri_locale_list()`, `stri_locale_set()`

Other locale_sensitive: `%s<%`, `about_search_boundaries`, `about_search_coll`, `stri_compare()`, `stri_count_boundaries()`, `stri_duplicated()`, `stri_enc_detect2()`, `stri_extract_all_boundaries()`, `stri_locate_all_boundaries()`, `stri_opts_collator()`, `stri_order()`, `stri_rank()`, `stri_sort()`, `stri_sort_key()`, `stri_split_boundaries()`, `stri_trans_tolower()`, `stri_unique()`, `stri_wrap()`

Other stringi_general_topics: `about_arguments`, `about_encoding`, `about_search`, `about_search_boundaries`, `about_search_charclass`, `about_search_coll`, `about_search_fixed`, `about_search_regex`, `stringi-package`

about_search *String Searching*

Description

This man page explains how to perform string search-based operations in **stringi**.

Details

The following independent string searching engines are available in **stringi**.

- `stri_*_regex` – **ICU**'s regular expressions (regexes), see about_search_regex,
- `stri_*_fixed` – locale-independent byte-wise pattern matching, see about_search_fixed,
- `stri_*_coll` – **ICU**'s `StringSearch`, locale-sensitive, Collator-based pattern search, useful for natural language processing tasks, see about_search_coll,
- `stri_*_charclass` – character classes search, e.g., Unicode General Categories or Binary Properties, see about_search_charclass,
- `stri_*_boundaries` – text boundary analysis, see about_search_boundaries

Each search engine is able to perform many search-based operations. These may include:

- `stri_detect_*` - detect if a pattern occurs in a string, see, e.g., `stri_detect`,
- `stri_count_*` - count the number of pattern occurrences, see, e.g., `stri_count`,
- `stri_locate_*` - locate all, first, or last occurrences of a pattern, see, e.g., `stri_locate`,
- `stri_extract_*` - extract all, first, or last occurrences of a pattern, see, e.g., `stri_extract` and, in case of regexes, `stri_match`,
- `stri_replace_*` - replace all, first, or last occurrences of a pattern, see, e.g., `stri_replace` and also `stri_trim`,
- `stri_split_*` - split a string into chunks indicated by occurrences of a pattern, see, e.g., `stri_split`,
- `stri_startswith_*` and `stri_endswith_*` detect if a string starts or ends with a pattern match, see, e.g., `stri_startswith`,
- `stri_subset_*` - return a subset of a character vector with strings that match a given pattern, see, e.g., `stri_subset`.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other text_boundaries: about_search_boundaries, stri_count_boundaries(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_split_lines(), stri_trans_tolower(), stri_wrap()

Other search_regex: about_search_regex, stri_opts_regex()

Other search_fixed: about_search_fixed, stri_opts_fixed()

Other search_coll: about_search_coll, stri_opts_collator()

Other search_charclass: about_search_charclass, stri_trim_both()

Other search_detect: stri_detect(), stri_startswith()

Other search_count: stri_count(), stri_count_boundaries()

Other search_locate: stri_locate_all(), stri_locate_all_boundaries()

Other search_replace: stri_replace_all(), stri_replace_rstr(), stri_trim_both()

Other search_split: stri_split(), stri_split_boundaries(), stri_split_lines()

Other search_subset: stri_subset()

Other search_extract: stri_extract_all(), stri_extract_all_boundaries(), stri_match_all()

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search_boundaries, about_search_charclass, about_search_coll, about_search_fixed, about_search_regex, stringi-package

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about_search_boundaries

Text Boundary Analysis in **stringi**

Description

Text boundary analysis is the process of locating linguistic boundaries while formatting and handling text.

Details

Examples of the boundary analysis process include:

- Locating positions to word-wrap text to fit within specific margins while displaying or printing, see stri_wrap and stri_split_boundaries.
- Counting characters, words, sentences, or paragraphs, see stri_count_boundaries.
- Making a list of the unique words in a document, see stri_extract_all_words and then stri_unique.
- Capitalizing the first letter of each word or sentence, see also stri_trans_totitle.

- Locating a particular unit of the text (for example, finding the third word in the document), see `stri_locate_all_boundaries`.

Generally, text boundary analysis is a locale-dependent operation. For example, in Japanese and Chinese one does not separate words with spaces - a line break can occur even in the middle of a word. These languages have punctuation and diacritical marks that cannot start or end a line, so this must also be taken into account.

stringi uses **ICU**'s `BreakIterator` to locate specific text boundaries. Note that the `BreakIterator`'s behavior may be controlled in come cases, see `stri_opts_brkiter`.

- The `character` boundary iterator tries to match what a user would think of as a "character" – a basic unit of a writing system for a language – which may be more than just a single Unicode code point.
- The `word` boundary iterator locates the boundaries of words, for purposes such as "Find whole words" operations.
- The `line_break` iterator locates positions that would be appropriate to wrap lines when displaying the text.
- The break iterator of type `sentence` locates sentence boundaries.

For technical details on different classes of text boundaries refer to the **ICU** User Guide, see below.

Author(s)

Marek Gagolewski and other contributors

References

Boundary Analysis – ICU User Guide, https://unicode-org.github.io/icu/userguide/boundaryanalysis/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: `%s<%`, `about_locale`, `about_search_coll`, `stri_compare()`, `stri_count_boundaries()`, `stri_duplicated()`, `stri_enc_detect2()`, `stri_extract_all_boundaries()`, `stri_locate_all_boundaries()`, `stri_opts_collator()`, `stri_order()`, `stri_rank()`, `stri_sort()`, `stri_sort_key()`, `stri_split_boundaries()`, `stri_trans_tolower()`, `stri_unique()`, `stri_wrap()`

Other text_boundaries: `about_search`, `stri_count_boundaries()`, `stri_extract_all_boundaries()`, `stri_locate_all_boundaries()`, `stri_opts_brkiter()`, `stri_split_boundaries()`, `stri_split_lines()`, `stri_trans_tolower()`, `stri_wrap()`

Other stringi_general_topics: `about_arguments`, `about_encoding`, `about_locale`, `about_search`, `about_search_charclass`, `about_search_coll`, `about_search_fixed`, `about_search_regex`, `stringi-package`

about_search_charclass

Character Classes in **stringi**

Description

Here we describe how character classes (sets) can be specified in the **stringi** package. These are useful for defining search patterns (note that the **ICU** regex engine uses the same scheme for denoting character classes) or, e.g., generating random code points with `stri_rand_strings`.

Details

All `stri_*_charclass` functions in **stringi** perform a single character (i.e., Unicode code point) search-based operations. You may obtain the same results using about_search_regex. However, these very functions aim to be faster.

Character classes are defined using **ICU**'s `UnicodeSet` patterns. Below we briefly summarize their syntax. For more details refer to the bibliographic References below.

`UnicodeSet` patterns

A `UnicodeSet` represents a subset of Unicode code points (recall that **stringi** converts strings in your native encoding to Unicode automatically). Legal code points are U+0000 to U+10FFFF, inclusive.

Patterns either consist of series of characters bounded by square brackets (such patterns follow a syntax similar to that employed by regular expression character classes) or of Perl-like Unicode property set specifiers.

`[]` denotes an empty set, `[a]` – a set consisting of character "a", `[\u0105]` – a set with character U+0105, and `[abc]` – a set with "a", "b", and "c".

`[a-z]` denotes a set consisting of characters "a" through "z" inclusively, in Unicode code point order.

Some set-theoretic operations are available. `^` denotes the complement, e.g., `[^a-z]` contains all characters but "a" through "z". Moreover, `[[pat1][pat2]]`, `[[pat1]\&[pat2]]`, and `[[pat1]-[pat2]]` denote union, intersection, and asymmetric difference of sets specified by `pat1` and `pat2`, respectively.

Note that all white-spaces are ignored unless they are quoted or back-slashed (white spaces can be freely used for clarity, as `[a c d-f m]` means the same as `[acd-fm]`). **stringi** does not allow including multi-character strings (see `UnicodeSet` API documentation). Also, empty string patterns are disallowed.

Any character may be preceded by a backslash in order to remove its special meaning.

A malformed pattern always results in an error.

Set expressions at a glance (according to https://unicode-org.github.io/icu/userguide/strings/regexp.html):

Some examples:

`[abc]` Match any of the characters a, b or c.

`[^abc]` Negation – match any character except a, b or c.

`[A-M]` Range – match any character from A to M. The characters to include are determined by Unicode code point ordering.

`[\u0000-\U0010ffff]` Range – match all characters.

`[\p{Letter}]` **or** `[\p{General_Category=Letter}]` **or** `[\p{L}]` Characters with Unicode Category = Letter. All forms shown are equivalent.

`[\P{Letter}]` Negated property (Note the upper case `\P`) – match everything except Letters.

`[\p{numeric_value=9}]` Match all numbers with a numeric value of 9. Any Unicode Property may be used in set expressions.

`[\p{Letter}&\p{script=cyrillic}]` Set intersection – match the set of all Cyrillic letters.

`[\p{Letter}-\p{script=latin}]` Set difference – match all non-Latin letters.

`[[a-z][A-Z][0-9]]` **or** `[a-zA-Z0-9]` Implicit union of sets – match ASCII letters and digits (the two forms are equivalent).

`[:script=Greek:]` Alternative POSIX-like syntax for properties – equivalent to `\p{script=Greek}`.

Unicode properties

Unicode property sets are specified with a POSIX-like syntax, e.g., `[:Letter:]`, or with a (extended) Perl-style syntax, e.g., `\p{L}`. The complements of the above sets are `[:^Letter:]` and `\P{L}`, respectively.

The names are normalized before matching (for example, the match is case-insensitive). Moreover, many names have short aliases.

Among predefined Unicode properties we find, e.g.:

- Unicode General Categories, e.g., `Lu` for uppercase letters,
- Unicode Binary Properties, e.g., `WHITE_SPACE`,

and many more (including Unicode scripts).

Each property provides access to the large and comprehensive Unicode Character Database. Generally, the list of properties available in **ICU** is not well-documented. Please refer to the References section for some links.

Please note that some classes might overlap. However, e.g., General Category `Z` (some space) and Binary Property `WHITE_SPACE` matches different character sets.

Unicode General Categories

The Unicode General Category property of a code point provides the most general classification of that code point. Each code point falls into one and only one Category.

`Cc` a C0 or C1 control code.

`Cf` a format control character.

`Cn` a reserved unassigned code point or a non-character.

`Co` a private-use character.

`Cs` a surrogate code point.

`Lc` the union of Lu, Ll, Lt.

`Ll` a lowercase letter.

`Lm` a modifier letter.

`Lo` other letters, including syllables and ideographs.

`Lt` a digraphic character, with the first part uppercase.

`Lu` an uppercase letter.

`Mc` a spacing combining mark (positive advance width).

`Me` an enclosing combining mark.

`Mn` a non-spacing combining mark (zero advance width).

`Nd` a decimal digit.

`Nl` a letter-like numeric character.

`No` a numeric character of other type.

`Pd` a dash or hyphen punctuation mark.

`Ps` an opening punctuation mark (of a pair).

`Pe` a closing punctuation mark (of a pair).

`Pc` a connecting punctuation mark, like a tie.

`Po` a punctuation mark of other type.

`Pi` an initial quotation mark.

`Pf` a final quotation mark.

`Sm` a symbol of mathematical use.

`Sc` a currency sign.

`Sk` a non-letter-like modifier symbol.

`So` a symbol of other type.

`Zs` a space character (of non-zero width).

`Zl` U+2028 LINE SEPARATOR only.

`Zp` U+2029 PARAGRAPH SEPARATOR only.

`C` the union of Cc, Cf, Cs, Co, Cn.

`L` the union of Lu, Ll, Lt, Lm, Lo.

`M` the union of Mn, Mc, Me.

`N` the union of Nd, Nl, No.

`P` the union of Pc, Pd, Ps, Pe, Pi, Pf, Po.

`S` the union of Sm, Sc, Sk, So.

`Z` the union of Zs, Zl, Zp

Unicode Binary Properties

Each character may follow many Binary Properties at a time.

Here is a comprehensive list of supported Binary Properties:

`ALPHABETIC` alphabetic character.

`ASCII_HEX_DIGIT` a character matching the `[0-9A-Fa-f]` charclass.

`BIDI_CONTROL` a format control which have specific functions in the Bidi (bidirectional text) Algorithm.

`BIDI_MIRRORED` a character that may change display in right-to-left text.

`DASH` a kind of a dash character.

`DEFAULT_IGNORABLE_CODE_POINT` characters that are ignorable in most text processing activities, e.g., <2060..206F, FFF0..FFFB, E0000..E0FFF>.

`DEPRECATED` a deprecated character according to the current Unicode standard (the usage of deprecated characters is strongly discouraged).

`DIACRITIC` a character that linguistically modifies the meaning of another character to which it applies.

`EXTENDER` a character that extends the value or shape of a preceding alphabetic character, e.g., a length and iteration mark.

`HEX_DIGIT` a character commonly used for hexadecimal numbers, see also `ASCII_HEX_DIGIT`.

`HYPHEN` a dash used to mark connections between pieces of words, plus the Katakana middle dot.

`ID_CONTINUE` a character that can continue an identifier, `ID_START+Mn+Mc+Nd+Pc`.

`ID_START` a character that can start an identifier, `Lu+Ll+Lt+Lm+Lo+Nl`.

`IDEOGRAPHIC` a CJKV (Chinese-Japanese-Korean-Vietnamese) ideograph.

`LOWERCASE` ...

`MATH` ...

`NONCHARACTER_CODE_POINT` ...

`QUOTATION_MARK` ...

`SOFT_DOTTED` a character with a "soft dot", like i or j, such that an accent placed on this character causes the dot to disappear.

`TERMINAL_PUNCTUATION` a punctuation character that generally marks the end of textual units.

`UPPERCASE` ...

`WHITE_SPACE` a space character or TAB or CR or LF or ZWSP or ZWNBSP.

`CASE_SENSITIVE` ...

`POSIX_ALNUM` ...

`POSIX_BLANK` ...

`POSIX_GRAPH` ...

`POSIX_PRINT` ...

`POSIX_XDIGIT` ...

`CASED` ...

`CASE_IGNORABLE` ...

`CHANGES_WHEN_LOWERCASED` ...

`CHANGES_WHEN_UPPERCASED` ...

`CHANGES_WHEN_TITLECASED` ...

`CHANGES_WHEN_CASEFOLDED` ...

`CHANGES_WHEN_CASEMAPPED` ...

`CHANGES_WHEN_NFKC_CASEFOLDED` ...

`EMOJI` Since ICU 57

`EMOJI_PRESENTATION` Since ICU 57

`EMOJI_MODIFIER` Since ICU 57

`EMOJI_MODIFIER_BASE` Since ICU 57

POSIX Character Classes

Avoid using POSIX character classes, e.g., `[:punct:]`. The ICU User Guide (see below) states that in general they are not well-defined, so you may end up with something different from you expect.

In particular, in POSIX-like regex engines, `[:punct:]` stands for the character class corresponding to the `ispunct()` classification function (check out `man 3 ispunct` on UNIX-like systems). According to ISO/IEC 9899:1990 (ISO C90), the `ispunct()` function tests for any printing character except for space or a character for which `isalnum()` is true. However, in a POSIX setting, the details of what characters belong into which class depend on the current locale. So the `[:punct:]` class does not lead to a portable code (again, in POSIX-like regex engines).

Therefore, a POSIX flavor of `[:punct:]` is more like `[\p{P}\p{S}]` in **ICU**. You have been warned.

Author(s)

Marek Gagolewski and other contributors

References

The Unicode Character Database – Unicode Standard Annex #44, https://www.unicode.org/reports/tr44/

UnicodeSet – ICU User Guide, https://unicode-org.github.io/icu/userguide/strings/unicodeset.html

Properties – ICU User Guide, https://unicode-org.github.io/icu/userguide/strings/properties.html

C/POSIX Migration – ICU User Guide, https://unicode-org.github.io/icu/userguide/icu/posix.html

Unicode Script Data, https://www.unicode.org/Public/UNIDATA/Scripts.txt

icu::Unicodeset Class Reference – ICU4C API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/classicu_1_1UnicodeSet.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_charclass: about_search, stri_trim_both()

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search, about_search_boundaries, about_search_coll, about_search_fixed, about_search_regex, stringi-package

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about_search_coll *Locale-Sensitive Text Searching in* **stringi**

Description

String searching facilities described here provide a way to locate a specific piece of text. Interestingly, locale-sensitive searching, especially on a non-English text, is a much more complex process than it seems at first glance.

Locale-Aware String Search Engine

All `stri_*_coll` functions in **stringi** use **ICU**'s `StringSearch` engine, which implements a locale-sensitive string search algorithm. The matches are defined by using the notion of "canonical equivalence" between strings.

Tuning the Collator's parameters allows you to perform correct matching that properly takes into account accented letters, conjoined letters, ignorable punctuation and letter case.

For more information on **ICU**'s Collator and the search engine and how to tune it up in **stringi**, refer to stri_opts_collator.

Please note that **ICU**'s `StringSearch`-based functions are often much slower that those to perform fixed pattern searches.

Author(s)

Marek Gagolewski and other contributors

References

ICU String Search Service – ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/string-search.html

L. Werner, *Efficient Text Searching in Java*, 1999, https://icu-project.org/docs/papers/efficient_text_searching_in_java.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_coll: about_search, stri_opts_collator()

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search, about_search_boundaries, about_search_charclass, about_search_fixed, about_search_regex, stringi-package

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about_search_fixed *Locale-Insensitive Fixed Pattern Matching in* **stringi**

Description

String searching facilities described here provide a way to locate a specific sequence of bytes in a string. The search engine's settings may be tuned up (for example to perform case-insensitive search) via a call to the stri_opts_fixed function.

Byte Compare

The fast Knuth-Morris-Pratt search algorithm, with worst time complexity of O(n+p) (n == length(str), p == length(pattern)) is implemented (with some tweaks for very short search patterns).

Be aware that, for natural language processing, fixed pattern searching might not be what you actually require. It is because a bitwise match will not give correct results in cases of:

1. accented letters;
2. conjoined letters;
3. ignorable punctuation;
4. ignorable case,

see also about_search_coll.

Note that the conversion of input data to Unicode is done as usual.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_fixed: about_search, stri_opts_fixed()

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search, about_search_boundaries, about_search_charclass, about_search_coll, about_search_regex, stringi-package

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about_search_regex *Regular Expressions in* **stringi**

Description

A regular expression is a pattern describing, possibly in a very abstract way, a text fragment. With so many regex functions in **stringi**, regular expressions may be a very powerful tool to perform string searching, substring extraction, string splitting, etc., tasks.

Details

All stri_*_regex functions in **stringi** use the **ICU** regex engine. Its settings may be tuned up (for example to perform case-insensitive search) via the stri_opts_regex function.

Regular expression patterns in **ICU** are quite similar in form and behavior to Perl's regexes. Their implementation is loosely inspired by JDK 1.4 java.util.regex. **ICU** Regular Expressions conform to the Unicode Technical Standard #18 (see References section) and its features are summarized in the ICU User Guide (see below). A good general introduction to regexes is (Friedl, 2002). Some general topics are also covered in the R manual, see regex.

ICU Regex Operators at a Glance

Here is a list of operators provided by the ICU User Guide on regexes.

| Alternation. A\|B matches either A or B.

* Match 0 or more times. Match as many times as possible.

+ Match 1 or more times. Match as many times as possible.

? Match zero or one times. Prefer one.

{n} Match exactly n times.

{n,} Match at least n times. Match as many times as possible.

{n,m} Match between n and m times. Match as many times as possible, but not more than m.

*? Match 0 or more times. Match as few times as possible.

+? Match 1 or more times. Match as few times as possible.

?? Match zero or one times. Prefer zero.

`{n}?` Match exactly n times.

`{n,}?` Match at least n times, but no more than required for an overall pattern match.

`{n,m}?` Match between n and m times. Match as few times as possible, but not less than n.

`*+` Match 0 or more times. Match as many times as possible when first encountered, do not retry with fewer even if overall match fails (Possessive Match).

`++` Match 1 or more times. Possessive match.

`?+` Match zero or one times. Possessive match.

`{n}+` Match exactly n times.

`{n,}+` Match at least n times. Possessive Match.

`{n,m}+` Match between n and m times. Possessive Match.

`(...)` Capturing parentheses. Range of input that matched the parenthesized sub-expression is available after the match, see `stri_match`.

`(?:...)` Non-capturing parentheses. Groups the included pattern, but does not provide capturing of matching text. Somewhat more efficient than capturing parentheses.

`(?>...)` Atomic-match parentheses. The first match of the parenthesized sub-expression is the only one tried; if it does not lead to an overall pattern match, back up the search for a match to a position before the `(?>`.

`(?#...)` Free-format comment `(?# comment )`.

`(?=...)` Look-ahead assertion. True if the parenthesized pattern matches at the current input position, but does not advance the input position.

`(?!...)` Negative look-ahead assertion. True if the parenthesized pattern does not match at the current input position. Does not advance the input position.

`(?<=...)` Look-behind assertion. True if the parenthesized pattern matches text preceding the current input position, with the last character of the match being the input character just before the current position. Does not alter the input position. The length of possible strings matched by the look-behind pattern must not be unbounded (no `*` or `+` operators.)

`(?<!...)` Negative Look-behind assertion. True if the parenthesized pattern does not match text preceding the current input position, with the last character of the match being the input character just before the current position. Does not alter the input position. The length of possible strings matched by the look-behind pattern must not be unbounded (no `*` or `+` operators.)

`(?<name>...)` Named capture group, where `name` (enclosed within the angle brackets) is a sequence like `[A-Za-z][A-Za-z0-9]*`

`(?ismwx-ismwx:...)` Flag settings. Evaluate the parenthesized expression with the specified flags enabled or `-`disabled, see also `stri_opts_regex`.

`(?ismwx-ismwx)` Flag settings. Change the flag settings. Changes apply to the portion of the pattern following the setting. For example, `(?i)` changes to a case insensitive match, see also `stri_opts_regex`.

ICU Regex Meta-characters at a Glance

Here is a list of meta-characters provided by the ICU User Guide on regexes.

`\a` Match a BELL, `\u0007`.

\A Match at the beginning of the input. Differs from ^. in that \A will not match after a new line within the input.

\b Match if the current position is a word boundary. Boundaries occur at the transitions between word (\w) and non-word (\W) characters, with combining marks ignored. For better word boundaries, see **ICU** Boundary Analysis, e.g., stri_extract_all_words.

\B Match if the current position is not a word boundary.

\cX Match a control-X character.

\d Match any character with the Unicode General Category of Nd (Number, Decimal Digit.).

\D Match any character that is not a decimal digit.

\e Match an ESCAPE, \u001B.

\E Terminates a \Q ... \E quoted sequence.

\f Match a FORM FEED, \u000C.

\G Match if the current position is at the end of the previous match.

\h Match a Horizontal White Space character. They are characters with Unicode General Category of Space_Separator plus the ASCII tab, \u0009. [Since ICU 55]

\H Match a non-Horizontal White Space character. [Since ICU 55]

\k<name> Named Capture Back Reference. [Since ICU 55]

\n Match a LINE FEED, \u000A.

\N{UNICODE CHARACTER NAME} Match the named character.

\p{UNICODE PROPERTY NAME} Match any character with the specified Unicode Property.

\P{UNICODE PROPERTY NAME} Match any character not having the specified Unicode Property.

\Q Quotes all following characters until \E.

\r Match a CARRIAGE RETURN, \u000D.

\s Match a white space character. White space is defined as [\t\n\f\r\p{Z}].

\S Match a non-white space character.

\t Match a HORIZONTAL TABULATION, \u0009.

\uhhhh Match the character with the hex value hhhh.

\Uhhhhhhhh Match the character with the hex value hhhhhhhh. Exactly eight hex digits must be provided, even though the largest Unicode code point is \U0010ffff.

\w Match a word character. Word characters are [\p{Alphabetic}\p{Mark}\p{Decimal_Number}\p{Connector_Punctua

\W Match a non-word character.

\x{hhhh} Match the character with hex value hhhh. From one to six hex digits may be supplied.

\xhh Match the character with two digit hex value hh

\X Match a Grapheme Cluster.

\Z Match if the current position is at the end of input, but before the final line terminator, if one exists.

\z Match if the current position is at the end of input.

\n Back Reference. Match whatever the nth capturing group matched. n must be a number > 1 and < total number of capture groups in the pattern.

`\0ooo` Match an Octal character. `'ooo'` is from one to three octal digits. 0377 is the largest allowed Octal character. The leading zero is required; it distinguishes Octal constants from back references.

`[pattern]` Match any one character from the set.

`.` Match any character except for - by default - newline, compare `stri_opts_regex`.

`^` Match at the beginning of a line.

`$` Match at the end of a line.

`\` [outside of sets] Quotes the following character. Characters that must be quoted to be treated as literals are `* ? + [ ( ) { } ^ $ | \ .`.

`\` [inside sets] Quotes the following character. Characters that must be quoted to be treated as literals are `[ ] \`; Characters that may need to be quoted, depending on the context are `- &`.

Character Classes

The syntax is similar, but not 100% compatible with the one described in about_search_charclass. In particular, whitespaces are not ignored and set-theoretic operations are denoted slightly differently. However, other than this about_search_charclass is a good reference on the capabilities offered.

The ICU User Guide on regexes lists what follows.

`[abc]` Match any of the characters a, b, or c

`[^abc]` Negation – match any character except a, b, or c

`[A-M]` Range – match any character from A to M (based on Unicode code point ordering)

`[\p{L}]`, `[\p{Letter}]`, `[\p{General_Category=Letter}]`, `[:letter:]` Characters with Unicode Category = Letter (4 equivalent forms)

`[\P{Letter}]` Negated property – natch everything except Letters

`[\p{numeric_value=9}]` Match all numbers with a numeric value of 9

`[\p{Letter}&&\p{script=cyrillic}]` Intersection; match the set of all Cyrillic letters

`[\p{Letter}-\p{script=latin}]` Set difference; match all non-Latin letters

`[[a-z][A-Z][0-9]]`, `[a-zA-Z0-9]` Union; match ASCII letters and digits (2 equivalent forms)

Regex Functions in stringi

Note that if a given regex `pattern` is empty, then all the functions in **stringi** give `NA` in result and generate a warning. On a syntax error, a quite informative failure message is shown.

If you wish to search for a fixed pattern, refer to about_search_coll or about_search_fixed. They allow to perform a locale-aware text lookup, or a very fast exact-byte search, respectively.

Author(s)

Marek Gagolewski and other contributors

References

Regular expressions – ICU User Guide, https://unicode-org.github.io/icu/userguide/strings/regexp.html

J.E.F. Friedl, *Mastering Regular Expressions*, O'Reilly, 2002

Unicode Regular Expressions – Unicode Technical Standard #18, https://www.unicode.org/reports/tr18/

Unicode Regular Expressions – Regex tutorial, https://www.regular-expressions.info/unicode.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_regex: about_search, stri_opts_regex()

Other stringi_general_topics: about_arguments, about_encoding, about_locale, about_search, about_search_boundaries, about_search_charclass, about_search_coll, about_search_fixed, stringi-package

---

stri_compare *Compare Strings with or without Collation*

Description

These functions may be used to determine if two strings are equal, canonically equivalent (this is performed in a much more clever fashion than when testing for equality), or to check whether they are in a specific lexicographic order.

Usage

```
stri_compare(e1, e2, ..., opts_collator = NULL)

stri_cmp(e1, e2, ..., opts_collator = NULL)

stri_cmp_eq(e1, e2)

stri_cmp_neq(e1, e2)

stri_cmp_equiv(e1, e2, ..., opts_collator = NULL)

stri_cmp_nequiv(e1, e2, ..., opts_collator = NULL)

stri_cmp_lt(e1, e2, ..., opts_collator = NULL)

stri_cmp_gt(e1, e2, ..., opts_collator = NULL)
```

```
stri_cmp_le(e1, e2, ..., opts_collator = NULL)

stri_cmp_ge(e1, e2, ..., opts_collator = NULL)
```

Arguments

e1, e2	character vectors or objects coercible to character vectors
...	additional settings for opts_collator
opts_collator	a named list with **ICU** Collator's options, see stri_opts_collator, NULL for the default collation options.

Details

All the functions listed here are vectorized over e1 and e2.

stri_cmp_eq tests whether two corresponding strings consist of exactly the same code points, while stri_cmp_neq allows to check whether there is any difference between them. These are locale-independent operations: for natural language processing, where the notion of canonical equivalence is more valid, this might not be exactly what you are looking for, see Examples. Please note that **stringi** always silently removes UTF-8 BOMs from input strings, therefore, e.g., stri_cmp_eq does not take BOMs into account while comparing strings.

stri_cmp_equiv tests for canonical equivalence of two strings and is locale-dependent. Additionally, the **ICU**'s Collator may be tuned up so that, e.g., the comparison is case-insensitive. To test whether two strings are not canonically equivalent, call stri_cmp_nequiv.

stri_cmp_le tests whether the elements in the first vector are less than or equal to the corresponding elements in the second vector, stri_cmp_ge tests whether they are greater or equal, stri_cmp_lt if less, and stri_cmp_gt if greater, see also, e.g., %s<%.

stri_compare is an alias to stri_cmp. They both perform exactly the same locale-dependent operation. Both functions provide a C library's strcmp() look-and-feel, see Value for details.

For more information on **ICU**'s Collator and how to tune its settings refer to stri_opts_collator. Note that different locale settings may lead to different results (see the examples below).

Value

The stri_cmp and stri_compare functions return an integer vector representing the comparison results: -1 if e1[...] < e2[...], 0 if they are canonically equivalent, and 1 if greater.

All the other functions return a logical vector that indicates whether a given relation holds between two corresponding elements in e1 and e2.

Author(s)

Marek Gagolewski and other contributors

References

Collation – ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
# in Polish, ch < h:
stri_cmp_lt('hladny', 'chladny', locale='pl_PL')

# in Slovak, ch > h:
stri_cmp_lt('hladny', 'chladny', locale='sk_SK')

# < or > (depends on locale):
stri_cmp('hladny', 'chladny')

# ignore case differences:
stri_cmp_equiv('hladny', 'HLADNY', strength=2)

# also ignore diacritical differences:
stri_cmp_equiv('hladn\u00FD', 'hladny', strength=1, locale='sk_SK')

marios <- c('Mario', 'mario', 'M\\u00e1rio', 'm\\u00e1rio')
stri_cmp_equiv(marios, 'mario', case_level=TRUE, strength=2L)
stri_cmp_equiv(marios, 'mario', case_level=TRUE, strength=1L)
stri_cmp_equiv(marios, 'mario', strength=1L)
stri_cmp_equiv(marios, 'mario', strength=2L)

# non-Unicode-normalized vs normalized string:
stri_cmp_equiv(stri_trans_nfkd('\u0105'), '\u105')

# note the difference:
stri_cmp_eq(stri_trans_nfkd('\u0105'), '\u105')

# ligatures:
stri_cmp_equiv('\ufb00', 'ff', strength=2)

# phonebook collation
stri_cmp_equiv('G\u00e4rtner', 'Gaertner', locale='de_DE@collation=phonebook', strength=1L)
stri_cmp_equiv('G\u00e4rtner', 'Gaertner', locale='de_DE', strength=1L)
```

---

stri_count *Count the Number of Pattern Occurrences*

Description

These functions count the number of occurrences of a pattern in a string.

Usage

```
stri_count(str, ..., regex, fixed, coll, charclass)

stri_count_charclass(str, pattern)

stri_count_coll(str, pattern, ..., opts_collator = NULL)

stri_count_fixed(str, pattern, ..., opts_fixed = NULL)

stri_count_regex(str, pattern, ..., opts_regex = NULL)
```

Arguments

`str`	character vector; strings to search in
`...`	supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, `opts_fixed`, and so on
`pattern`, `regex`, `fixed`, `coll`, `charclass`	character vector; search patterns; for more details refer to stringi-search
`opts_collator`, `opts_fixed`, `opts_regex`	a named list used to tune up the search engine's settings; see `stri_opts_collator`, `stri_opts_fixed`, and `stri_opts_regex`, respectively; `NULL` for the defaults

Details

Vectorized over `str` and `pattern` (with recycling of the elements in the shorter vector if necessary). This allows to, for instance, search for one pattern in each given string, search for each pattern in one given string, and search for the i-th pattern within the i-th string.

If `pattern` is empty, then the result is `NA` and a warning is generated.

`stri_count` is a convenience function. It calls either `stri_count_regex`, `stri_count_fixed`, `stri_count_coll`, or `stri_count_charclass`, depending on the argument used.

Value

All the functions return an integer vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_count: about_search, stri_count_boundaries()

Examples

```
s <- 'Lorem ipsum dolor sit amet, consectetur adipisicing elit.'
stri_count(s, fixed='dolor')
stri_count(s, regex='\\p{L}+')

stri_count_fixed(s, ' ')
stri_count_fixed(s, 'o')
stri_count_fixed(s, 'it')
stri_count_fixed(s, letters)
stri_count_fixed('babab', 'b')
stri_count_fixed(c('stringi', '123'), 'string')

stri_count_charclass(c('stRRRingi', 'STrrrINGI', '123'),
   c('\\p{Ll}', '\\p{Lu}', '\\p{Zs}'))
stri_count_charclass(' \t\n', '\\p{WHITE_SPACE}') # white space - binary property
stri_count_charclass(' \t\n', '\\p{Z}') # white-space - general category (note the difference)

stri_count_regex(s, '(s|el)it')
stri_count_regex(s, 'i.i')
stri_count_regex(s, '.it')
stri_count_regex('bab baab baaab', c('b.*?b', 'b.b'))
stri_count_regex(c('stringi', '123'), '^(s|1)')
```

---

stri_count_boundaries *Count the Number of Text Boundaries*

Description

These functions determine the number of text boundaries (like character, word, line, or sentence boundaries) in a string.

Usage

```
stri_count_boundaries(str, ..., opts_brkiter = NULL)

stri_count_words(str, locale = NULL)
```

Arguments

str	character vector or an object coercible to
...	additional settings for opts_brkiter
opts_brkiter	a named list with **ICU** BreakIterator's settings, see stri_opts_brkiter; NULL for the default break iterator, i.e., line_break
locale	NULL or '' for text boundary analysis following the conventions of the default locale, or a single string with locale identifier, see stringi-locale

Details

Vectorized over str.

For more information on text boundary analysis performed by **ICU**'s BreakIterator, see stringi-search-boundaries.

In case of stri_count_words, just like in stri_extract_all_words and stri_locate_all_words, **ICU**'s word BreakIterator iterator is used to locate the word boundaries, and all non-word characters (UBRK_WORD_NONE rule status) are ignored. This function is equivalent to a call to stri_count_boundaries(str, type='word', skip_word_none=TRUE, locale=locale).

Note that a BreakIterator of type character may be used to count the number of *Unicode characters* in a string. The stri_length function, which aims to count the number of *Unicode code points*, might report different results.

Moreover, a BreakIterator of type sentence may be used to count the number of sentences in a text piece.

Value

Both functions return an integer vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_count: about_search, stri_count()

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other text_boundaries: about_search, about_search_boundaries, stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_split_lines(), stri_trans_tolower(), stri_wrap()

Examples

```
test <- 'The\u00a0above-mentioned  features are very useful. Spam, spam, eggs, bacon, and spam.'
stri_count_boundaries(test, type='word')
stri_count_boundaries(test, type='sentence')
stri_count_boundaries(test, type='character')
stri_count_words(test)

test2 <- stri_trans_nfkd('\u03c0\u0153\u0119\u00a9\u00df\u2190\u2193\u2192')
stri_count_boundaries(test2, type='character')
stri_length(test2)
stri_numbytes(test2)
```

---

stri_datetime_add *Date and Time Arithmetic*

Description

Modifies a date-time object by adding a specific amount of time units.

Usage

```
stri_datetime_add(
  time,
  value = 1L,
  units = "seconds",
  tz = NULL,
  locale = NULL
)

stri_datetime_add(time, units = "seconds", tz = NULL, locale = NULL) <- value
```

Arguments

time	an object of class POSIXct (as.POSIXct will be called on character vectors and objects of class POSIXlt, Date, and factor)
value	integer vector; signed number of units to add to time
units	single string; one of 'years', 'months', 'weeks', 'days', 'hours', 'minutes', 'seconds', or 'milliseconds'
tz	NULL or '' for the default time zone or a single string with a timezone identifier,
locale	NULL or '' for default locale, or a single string with locale identifier; a non-Gregorian calendar may be specified by setting the @calendar=name keyword

Details

Vectorized over time and value.

Note that, e.g., January, 31 + 1 month = February, 28 or 29.

Value

Both functions return an object of class POSIXct.

The replacement version of stri_datetime_add modifies the state of the time object.

Author(s)

Marek Gagolewski and other contributors

References

Calendar Classes - ICU User Guide, https://unicode-org.github.io/icu/userguide/datetime/calendar/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_create(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_info(), stri_timezone_list()

Examples

```
x <- stri_datetime_now()
print(x)
stri_datetime_add(x, units='months') <- 2
print(x)

x <- stri_datetime_create(2025, 4, 20)
print(x)
stri_datetime_add(x, -2, units='months')
stri_datetime_add(x, 1, units='years')
stri_datetime_add(x, 1, units='years', locale='@calendar=hebrew')

stri_datetime_add(stri_datetime_create(2024, 1, 31), 1, units='months')
```

---

stri_datetime_create *Create a Date-Time Object*

Description

Constructs date-time objects from numeric representations.

Usage

```
stri_datetime_create(
  year = NULL,
  month = NULL,
  day = NULL,
  hour = 0L,
  minute = 0L,
  second = 0,
  lenient = FALSE,
  tz = NULL,
  locale = NULL
)
```

Arguments

year	integer vector; 0 is 1BCE, -1 is 2BCE, etc.; NULL for the current year
month	integer vector; months are 1-based; NULL for the current month
day	integer vector; NULL for the current day
hour	integer vector; NULL for the current hour
minute	integer vector; NULL for the current minute
second	numeric vector; fractional seconds are allowed; NULL for the current seconds (without milliseconds)
lenient	single logical value; should the operation be lenient?
tz	NULL or '' for the default time zone or a single string with time zone identifier, see stri_timezone_list
locale	NULL or '' for default locale, or a single string with locale identifier; a non-Gregorian calendar may be specified by setting @calendar=name keyword

Details

Vectorized over year, month, day, hour, hour, minute, and second.

Value

Returns an object of class POSIXct.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_info(), stri_timezone_list()

Examples

```
stri_datetime_create(2015, 12, 31, 23, 59, 59.999)
stri_datetime_create(5775, 8, 1, locale='@calendar=hebrew')  # 1 Nisan 5775 -> 2015-03-21
stri_datetime_create(2015, 02, 29)
stri_datetime_create(2015, 02, 29, lenient=TRUE)
stri_datetime_create(hour=15, minute=59)
```

---

stri_datetime_fields *Get Values for Date and Time Fields*

Description

Computes and returns values for all date and time fields.

Usage

```
stri_datetime_fields(time, tz = attr(time, "tzone"), locale = NULL)
```

Arguments

time	an object of class POSIXct (as.POSIXct will be called on character vectors and objects of class POSIXlt, Date, and factor)
tz	NULL or '' for the default time zone or a single string with time zone identifier, see stri_timezone_list
locale	NULL or '' for the current default locale, or a single string with a locale identifier; a non-Gregorian calendar may be specified by setting @calendar=name keyword

Details

Vectorized over time.

Value

Returns a data frame with the following columns:

1. Year (0 is 1BC, -1 is 2BC, etc.)
2. Month (1-based, i.e., 1 stands for the first month, e.g., January; note that the number of months depends on the selected calendar, see stri_datetime_symbols)
3. Day
4. Hour (24-h clock)
5. Minute

6. Second
7. Millisecond
8. WeekOfYear (this is locale-dependent)
9. WeekOfMonth (this is locale-dependent)
10. DayOfYear
11. DayOfWeek (1-based, 1 denotes Sunday; see stri_datetime_symbols)
12. Hour12 (12-h clock)
13. AmPm (see stri_datetime_symbols)
14. Era (see stri_datetime_symbols)

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_create(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_info(), stri_timezone_list()

Examples

```
stri_datetime_fields(stri_datetime_now())
stri_datetime_fields(stri_datetime_now(), locale='@calendar=hebrew')
stri_datetime_symbols(locale='@calendar=hebrew')$Month[
   stri_datetime_fields(stri_datetime_now(), locale='@calendar=hebrew')$Month
]
```

---

stri_datetime_format *Date and Time Formatting and Parsing*

Description

These functions convert a given date/time object to a character vector, or vice versa.

Usage

```
stri_datetime_format(
  time,
  format = "uuuu-MM-dd HH:mm:ss",
  tz = NULL,
  locale = NULL
)

stri_datetime_parse(
  str,
  format = "uuuu-MM-dd HH:mm:ss",
  lenient = FALSE,
  tz = NULL,
  locale = NULL
)
```

Arguments

time	an object of class POSIXct with date-time data to be formatted (as.POSIXct will be called on character vectors and objects of class POSIXlt, Date, and factor)
format	character vector, see Details; see also stri_datetime_fstr
tz	NULL or '' for the default time zone or a single string with a timezone identifier, see stri_timezone_get and stri_timezone_list
locale	NULL or '' for the default locale, or a single string with locale identifier; a non-Gregorian calendar may be specified by setting the @calendar=name keyword
str	character vector with strings to be parsed
lenient	single logical value; should date/time parsing be lenient?

Details

Vectorized over format and time or str.

When parsing strings, unspecified date-time fields (e.g., seconds where only hours and minutes are given) are based on today's midnight in the local time zone (for compatibility with strptime).

By default, stri_datetime_format (for compatibility with the strftime function) formats a date/time object using the current default time zone.

format may be one of DT_STYLE or DT_relative_STYLE, where DT is equal to date, time, or datetime, and STYLE is equal to full, long, medium, or short. This gives a locale-dependent date and/or time format. Note that currently **ICU** does not support relative time formats, thus this flag is currently ignored in such a context.

Otherwise, format is a pattern: a string where specific sequences of characters are replaced with date/time data from a calendar when formatting or used to generate data for a calendar when parsing. For example, y stands for 'year'. Characters may be used multiple times: yy might produce 99, whereas yyyy yields 1999. For most numerical fields, the number of characters specifies the field width. For example, if h is the hour, h might produce 5, but hh yields 05. For some characters, the count specifies whether an abbreviated or full form should be used.

Two single quotes represent a literal single quote, either inside or outside single quotes. Text within single quotes is not interpreted in any way (except for two adjacent single quotes). Otherwise, all ASCII letters from `a` to `z` and `A` to `Z` are reserved as syntax characters, and require quoting if they are to represent literal characters. In addition, certain ASCII punctuation characters may become available in the future (e.g., `:` being interpreted as the time separator and `/` as a date separator, and replaced by respective locale-sensitive characters in display).

Symbol	**Meaning**	**Example(s)**	**Output**
G	era designator	G, GG, or GGG	AD
		GGGG	Anno Domini
		GGGGG	A
y	year	yy	96
		y or yyyy	1996
u	extended year	u	4601
U	cyclic year name, as in Chinese lunar calendar	U	
r	related Gregorian year	r	1996
Q	quarter	Q or QQ	02
		QQQ	Q2
		QQQQ	2nd quarter
		QQQQQ	2
q	Stand Alone quarter	q or qq	02
		qqq	Q2
		qqqq	2nd quarter
		qqqqq	2
M	month in year	M or MM	09
		MMM	Sep
		MMMM	September
		MMMMM	S
L	Stand Alone month in year	L or LL	09
		LLL	Sep
		LLLL	September
		LLLLL	S
w	week of year	w or ww	27
W	week of month	W	2
d	day in month	d	2
		dd	02
D	day of year	D	189
F	day of week in month	F	2 (2nd Wed in July)
g	modified Julian day	g	2451334
E	day of week	E, EE, or EEE	Tue
		EEEE	Tuesday
		EEEEE	T
		EEEEEE	Tu
e	local day of week	e or ee	2
	example: if Monday is 1st day, Tuesday is 2nd)	eee	Tue
		eeee	Tuesday
		eeeee	T
		eeeeee	Tu

c	Stand Alone local day of week	c or cc	2
		ccc	Tue
		cccc	Tuesday
		ccccc	T
		cccccc	Tu
a	am/pm marker	a	pm
h	hour in am/pm (1~12)	h	7
		hh	07
H	hour in day (0~23)	H	0
		HH	00
k	hour in day (1~24)	k	24
		kk	24
K	hour in am/pm (0~11)	K	0
		KK	00
m	minute in hour	m	4
		mm	04
s	second in minute	s	5
		ss	05
S	fractional second - truncates (like other time fields)	S	2
	to the count of letters when formatting. Appends	SS	23
	zeros if more than 3 letters specified. Truncates at	SSS	235
	three significant digits when parsing.	SSSS	2350
A	milliseconds in day	A	61201235
z	Time Zone: specific non-location	z, zz, or zzz	PDT
		zzzz	Pacific Daylight Time
Z	Time Zone: ISO8601 basic hms? / RFC 822	Z, ZZ, or ZZZ	-0800
	Time Zone: long localized GMT (=OOOO)	ZZZZ	GMT-08:00
	Time Zone: ISO8601 extended hms? (=XXXXX)	ZZZZZ	-08:00, -07:52:58, Z
O	Time Zone: short localized GMT	O	GMT-8
	Time Zone: long localized GMT (=ZZZZ)	OOOO	GMT-08:00
v	Time Zone: generic non-location	v	PT
	(falls back first to VVVV)	vvvv	Pacific Time or Los Angeles Time
V	Time Zone: short time zone ID	V	uslax
	Time Zone: long time zone ID	VV	America/Los_Angeles
	Time Zone: time zone exemplar city	VVV	Los Angeles
	Time Zone: generic location (falls back to OOOO)	VVVV	Los Angeles Time
X	Time Zone: ISO8601 basic hm?, with Z for 0	X	-08, +0530, Z
	Time Zone: ISO8601 basic hm, with Z	XX	-0800, Z
	Time Zone: ISO8601 extended hm, with Z	XXX	-08:00, Z
	Time Zone: ISO8601 basic hms?, with Z	XXXX	-0800, -075258, Z
	Time Zone: ISO8601 extended hms?, with Z	XXXXX	-08:00, -07:52:58, Z
x	Time Zone: ISO8601 basic hm?, without Z for 0	x	-08, +0530
	Time Zone: ISO8601 basic hm, without Z	xx	-0800
	Time Zone: ISO8601 extended hm, without Z	xxx	-08:00
	Time Zone: ISO8601 basic hms?, without Z	xxxx	-0800, -075258
	Time Zone: ISO8601 extended hms?, without Z	xxxxx	-08:00, -07:52:58
’	escape for text	’	(nothing)
’ ’	two single quotes produce one	’ ’	’

Note that any characters in the pattern that are not in the ranges of `[a-z]` and `[A-Z]` will be treated as quoted text. For instance, characters like `:`, `.`, (a space), # and `@` will appear in the resulting time text even if they are not enclosed within single quotes. The single quote is used to "escape" the letters. Two single quotes in a row, inside or outside a quoted sequence, represent a "real" single quote.

A few examples:

Example Pattern	**Result**
yyyy.MM.dd 'at' HH:mm:ss zzz	2015.12.31 at 23:59:59 GMT+1
EEE, MMM d, "yy	czw., gru 31, '15
h:mm a	11:59 PM
hh 'o"clock' a, zzzz	11 o'clock PM, GMT+01:00
K:mm a, z	11:59 PM, GMT+1
yyyyy.MMMM.dd GGG hh:mm aaa	2015.grudnia.31 n.e. 11:59 PM
uuuu-MM-dd'T'HH:mm:ssZ	2015-12-31T23:59:59+0100 (the ISO 8601 guideline)

Value

`stri_datetime_format` returns a character vector.

`stri_datetime_parse` returns an object of class `POSIXct`.

Author(s)

Marek Gagolewski and other contributors

References

Formatting Dates and Times – ICU User Guide, https://unicode-org.github.io/icu/userguide/format_parse/datetime/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: `stri_datetime_add()`, `stri_datetime_create()`, `stri_datetime_fields()`, `stri_datetime_fstr()`, `stri_datetime_now()`, `stri_datetime_symbols()`, `stri_timezone_get()`, `stri_timezone_info()`, `stri_timezone_list()`

Examples

```
x <- '2015-02-28'
stri_datetime_parse(x, 'yyyy-MM-dd')  # try '2015-02-29'
stri_datetime_parse(x, 'yyyy-MM-dd', lenient=TRUE)  # try '2015-02-29'
stri_datetime_parse(x %s+% " 17:13", "yyyy-MM-dd HH:mm")
stri_datetime_parse('19 lipca 2015', 'date_long', locale='pl_PL')
stri_datetime_format(stri_datetime_now(), 'datetime_relative_medium')
```

stri_datetime_fstr *Convert* strptime*-Style Format Strings*

Description

This function converts strptime or strftime-style format strings to **ICU** format strings that may be used in stri_datetime_parse and stri_datetime_format functions.

Usage

```
stri_datetime_fstr(x, ignore_special = TRUE)
```

Arguments

x	character vector of date/time format strings
ignore_special	if FALSE, special identifiers like "datetime_full" or date_relative_short (see stri_datetime_format) are left as-is

Details

For more details on conversion specifiers please refer to the manual page of strptime. Most of the formatters of the form %x, where x is a letter, are supported. Moreover, each %% is replaced with %.

Warnings are given in the case of %x, %X, %u, %w, %g, %G, %c, %U, and %W as in such circumstances either **ICU** does not support the functionality requested using the string format API or there are some inconsistencies between base R and **ICU**.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_create(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_info(), stri_timezone_list()

Examples

```
stri_datetime_fstr('%Y-%m-%d %H:%M:%S')
```

stri_datetime_now *Get Current Date and Time*

Description

Returns the current date and time.

Usage

```
stri_datetime_now()
```

Details

The current date and time in **stringi** is represented as the (signed) number of seconds since 1970-01-01 00:00:00 UTC. UTC leap seconds are ignored.

Value

Returns an object of class `POSIXct`.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: `stri_datetime_add()`, `stri_datetime_create()`, `stri_datetime_fields()`, `stri_datetime_format()`, `stri_datetime_fstr()`, `stri_datetime_symbols()`, `stri_timezone_get()`, `stri_timezone_info()`, `stri_timezone_list()`

stri_datetime_symbols *List Localizable Date-Time Formatting Data*

Description

Returns a list of all localizable date-time formatting data, including month and weekday names, localized AM/PM strings, etc.

Usage

```
stri_datetime_symbols(locale = NULL, context = "standalone", width = "wide")
```

Arguments

locale	NULL or '' for default locale, or a single string with locale identifier
context	single string; one of: 'format', 'standalone'
width	single string; one of: 'abbreviated', 'wide', 'narrow'

Details

context stands for a selector for date formatting context and width - for date formatting width.

Value

Returns a list with the following named components:

1. Month - month names,
2. Weekday - weekday names,
3. Quarter - quarter names,
4. AmPm - AM/PM names,
5. Era - era names.

Author(s)

Marek Gagolewski and other contributors

References

Calendar - ICU User Guide, https://unicode-org.github.io/icu/userguide/datetime/calendar/

DateFormatSymbols class – ICU API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/classicu_1_1DateFormatSymbols.html

Formatting Dates and Times – ICU User Guide, https://unicode-org.github.io/icu/userguide/format_parse/datetime/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_create(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_timezone_get(), stri_timezone_info(), stri_timezone_list()

Examples

```
stri_datetime_symbols() # uses the Gregorian calendar in most locales
stri_datetime_symbols('@calendar=hebrew')
stri_datetime_symbols('he_IL@calendar=hebrew')
stri_datetime_symbols('@calendar=islamic')
stri_datetime_symbols('@calendar=persian')
stri_datetime_symbols('@calendar=indian')
stri_datetime_symbols('@calendar=coptic')
stri_datetime_symbols('@calendar=japanese')

stri_datetime_symbols('ja_JP_TRADITIONAL') # uses the Japanese calendar by default
stri_datetime_symbols('th_TH_TRADITIONAL') # uses the Buddhist calendar

stri_datetime_symbols('pl_PL', context='format')
stri_datetime_symbols('pl_PL', context='standalone')

stri_datetime_symbols(width='wide')
stri_datetime_symbols(width='abbreviated')
stri_datetime_symbols(width='narrow')
```

---

stri_detect *Detect Pattern Occurrences*

Description

These functions determine, for each string in `str`, if there is at least one match to a corresponding `pattern`.

Usage

```
stri_detect(str, ..., regex, fixed, coll, charclass)

stri_detect_fixed(
  str,
  pattern,
  negate = FALSE,
  max_count = -1,
  ...,
  opts_fixed = NULL
)

stri_detect_charclass(str, pattern, negate = FALSE, max_count = -1)

stri_detect_coll(
  str,
  pattern,
  negate = FALSE,
```

```
  max_count = -1,
  ...,
  opts_collator = NULL
)

stri_detect_regex(
  str,
  pattern,
  negate = FALSE,
  max_count = -1,
  ...,
  opts_regex = NULL
)
```

Arguments

`str`	character vector; strings to search in
`...`	supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, `opts_fixed`, and so on
`pattern`, `regex`, `fixed`, `coll`, `charclass`	character vector; search patterns; for more details refer to stringi-search
`negate`	single logical value; whether a no-match to a pattern is rather of interest
`max_count`	single integer; allows to stop searching once a given number of occurrences is detected; `-1` (the default) inspects all elements
`opts_collator`, `opts_fixed`, `opts_regex`	a named list used to tune up the search engine's settings; see `stri_opts_collator`, `stri_opts_fixed`, and `stri_opts_regex`, respectively; `NULL` for the defaults

Details

Vectorized over `str` and `pattern` (with recycling of the elements in the shorter vector if necessary). This allows to, for instance, search for one pattern in each given string, search for each pattern in one given string, and search for the i-th pattern within the i-th string.

If `pattern` is empty, then the result is `NA` and a warning is generated.

`stri_detect` is a convenience function. It calls either `stri_detect_regex`, `stri_detect_fixed`, `stri_detect_coll`, or `stri_detect_charclass`, depending on the argument used.

See also `stri_startswith` and `stri_endswith` for testing whether a string starts or ends with a match to a given pattern. Moreover, see `stri_subset` for a character vector subsetting.

If `max_count` is negative, then all stings are examined. Otherwise, searching terminates once `max_count` matches (or, if `negate` is `TRUE`, no-matches) are detected. The uninspected cases are marked as missing in the return vector. Be aware that, unless `pattern` is a singleton, the elements in `str` might be inspected in a non-consecutive order.

Value

Each function returns a logical vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_detect: about_search, stri_startswith()

Examples

```
stri_detect_fixed(c('stringi R', 'R STRINGI', '123'), c('i', 'R', '0'))
stri_detect_fixed(c('stringi R', 'R STRINGI', '123'), 'R')

stri_detect_charclass(c('stRRRingi','R STRINGI', '123'),
   c('\\p{Ll}', '\\p{Lu}', '\\p{Zs}'))

stri_detect_regex(c('stringi R', 'R STRINGI', '123'), 'R.')
stri_detect_regex(c('stringi R', 'R STRINGI', '123'), '[[:alpha:]]*?')
stri_detect_regex(c('stringi R', 'R STRINGI', '123'), '[a-zC1]')
stri_detect_regex(c('stringi R', 'R STRINGI', '123'), '( R|RE)')
stri_detect_regex('stringi', 'STRING.', case_insensitive=TRUE)

stri_detect_regex(c('abc', 'def', '123', 'ghi', '456', '789', 'jkl'),
   '^[0-9]+$', max_count=1)
stri_detect_regex(c('abc', 'def', '123', 'ghi', '456', '789', 'jkl'),
   '^[0-9]+$', max_count=2)
stri_detect_regex(c('abc', 'def', '123', 'ghi', '456', '789', 'jkl'),
   '^[0-9]+$', negate=TRUE, max_count=3)
```

---

stri_dup *Duplicate Strings*

Description

Duplicates each str(e1) string times(e2) times and concatenates the results.

Usage

```
stri_dup(str, times)

e1 %s*% e2

e1 %stri*% e2
```

Arguments

str, e1	a character vector of strings to be duplicated
times, e2	an integer vector with the numbers of times to duplicate each string

Details

Vectorized over all arguments.

e1 %s*% e2 and e1 %stri*% e2 are synonyms for stri_dup(e1, e2)

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other join: %s+%, stri_flatten(), stri_join(), stri_join_list()

Examples

```
stri_dup('a', 1:5)
stri_dup(c('a', NA, 'ba'), 4)
stri_dup(c('abc', 'pqrst'), c(4, 2))
"a" %s*% 5
```

---

stri_duplicated *Determine Duplicated Elements*

Description

stri_duplicated() determines which strings in a character vector are duplicates of other elements.

stri_duplicated_any() determines if there are any duplicated strings in a character vector.

Usage

```
stri_duplicated(
  str,
  from_last = FALSE,
  fromLast = from_last,
  ...,
  opts_collator = NULL
)

stri_duplicated_any(
  str,
  from_last = FALSE,
  fromLast = from_last,
  ...,
  opts_collator = NULL
)
```

Arguments

str	a character vector
from_last	a single logical value; indicates whether search should be performed from the last to the first string
fromLast	[DEPRECATED] alias of from_last
...	additional settings for opts_collator
opts_collator	a named list with **ICU** Collator's options, see stri_opts_collator, NULL for default collation options

Details

Missing values are regarded as equal.

Unlike duplicated and anyDuplicated, these functions test for canonical equivalence of strings (and not whether the strings are just bytewise equal) Such operations are locale-dependent. Hence, stri_duplicated and stri_duplicated_any are significantly slower (but much better suited for natural language processing) than their base R counterparts.

See also stri_unique for extracting unique elements.

Value

stri_duplicated() returns a logical vector of the same length as str. Each of its elements indicates whether a canonically equivalent string was already found in str.

stri_duplicated_any() returns a single non-negative integer. Value of 0 indicates that all the elements in str are unique. Otherwise, it gives the index of the first non-unique element.

Author(s)

Marek Gagolewski and other contributors

References

Collation - ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_enc_detect2(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
# In the following examples, we have 3 duplicated values,
# 'a' - 2 times, NA - 1 time
stri_duplicated(c('a', 'b', 'a', NA, 'a', NA))
stri_duplicated(c('a', 'b', 'a', NA, 'a', NA), from_last=TRUE)
stri_duplicated_any(c('a', 'b', 'a', NA, 'a', NA))

# compare the results:
stri_duplicated(c('\u0105', stri_trans_nfkd('\u0105')))
duplicated(c('\u0105', stri_trans_nfkd('\u0105')))

stri_duplicated(c('gro\u00df', 'GROSS', 'Gro\u00df', 'Gross'), strength=1)
duplicated(c('gro\u00df', 'GROSS', 'Gro\u00df', 'Gross'))
```

---

stri_enc_detect *Detect Character Set and Language*

Description

This function uses the **ICU** engine to determine the character set, or encoding, of character data in an unknown format.

Usage

```
stri_enc_detect(str, filter_angle_brackets = FALSE)
```

Arguments

str	character vector, a raw vector, or a list of raw vectors
filter_angle_brackets	logical; If filtering is enabled, text within angle brackets ('<' and '>') will be removed before detection, which will remove most HTML or XML markup.

Details

Vectorized over `str` and `filter_angle_brackets`.

For a character vector input, merging all text lines via `stri_flatten(str, collapse='\n')` might be needed if `str` has been obtained via a call to `readLines` and in fact represents an image of a single text file.

This is, at best, an imprecise operation using statistics and heuristics. Because of this, detection works best if you supply at least a few hundred bytes of character data that is mostly in a single language. However, because the detection only looks at a limited amount of the input data, some of the returned character sets may fail to handle all of the input data. Note that in some cases, the language can be determined along with the encoding.

Several different techniques are used for character set detection. For multi-byte encodings, the sequence of bytes is checked for legible patterns. The detected characters are also checked against a list of frequently used characters in that encoding. For single byte encodings, the data is checked against a list of the most commonly occurring three letter groups for each language that can be written using that encoding.

The detection process can be configured to optionally ignore HTML or XML style markup (using **ICU**'s internal facilities), which can interfere with the detection process by changing the statistics.

This function should most often be used for byte-marked input strings, especially after loading them from text files and before the main conversion with `stri_encode`. The input encoding is of course not taken into account here, even if marked.

The following table shows all the encodings that can be detected:

Character_Set	Languages
UTF-8	–
UTF-16BE	–
UTF-16LE	–
UTF-32BE	–
UTF-32LE	–
Shift_JIS	Japanese
ISO-2022-JP	Japanese
ISO-2022-CN	Simplified Chinese
ISO-2022-KR	Korean
GB18030	Chinese
Big5	Traditional Chinese
EUC-JP	Japanese
EUC-KR	Korean
ISO-8859-1	Danish, Dutch, English, French, German, Italian, Norwegian, Portuguese, Swedish
ISO-8859-2	Czech, Hungarian, Polish, Romanian
ISO-8859-5	Russian
ISO-8859-6	Arabic
ISO-8859-7	Greek
ISO-8859-8	Hebrew
ISO-8859-9	Turkish
windows-1250	Czech, Hungarian, Polish, Romanian
windows-1251	Russian
windows-1252	Danish, Dutch, English, French, German, Italian, Norwegian, Portuguese, Swedish

windows-1253	Greek
windows-1254	Turkish
windows-1255	Hebrew
windows-1256	Arabic
KOI8-R	Russian
IBM420	Arabic
IBM424	Hebrew

Value

Returns a list of length equal to the length of `str`. Each list element is a data frame with the following three named vectors representing all the guesses:

- `Encoding` – string; guessed encodings; `NA` on failure,
- `Language` – string; guessed languages; `NA` if the language could not be determined (e.g., in case of UTF-8),
- `Confidence` – numeric in [0,1]; the higher the value, the more confidence there is in the match; `NA` on failure.

The guesses are ordered by decreasing confidence.

Author(s)

Marek Gagolewski and other contributors

References

Character Set Detection – ICU User Guide, https://unicode-org.github.io/icu/userguide/conversion/detection.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_detection: `about_encoding`, `stri_enc_detect2()`, `stri_enc_isascii()`, `stri_enc_isutf16be()`, `stri_enc_isutf8()`

Examples

```
## Not run:
## f <- rawToChar(readBin('test.txt', 'raw', 100000))
## stri_enc_detect(f)
```

stri_enc_detect2 *[DEPRECATED] Detect Locale-Sensitive Character Encoding*

Description

This function tries to detect character encoding in case the language of text is known.

Usage

```
stri_enc_detect2(str, locale = NULL)
```

Arguments

str	character vector, a raw vector, or a list of raw vectors
locale	NULL or '' for the default locale, or a single string with locale identifier.

Details

Vectorized over str.

First, the text is checked whether it is valid UTF-32BE, UTF-32LE, UTF-16BE, UTF-16LE, UTF-8 (as in stri_enc_detect, this is roughly inspired by **ICU**'s i18n/csrucode.cpp) or ASCII.

If locale is not NA and the above fails, the text is checked for the number of occurrences of language-specific code points (data provided by the **ICU** library) converted to all possible 8-bit encodings that fully cover the indicated language. The encoding is selected based on the greatest number of total byte hits.

The guess is of course imprecise, as it is obtained using statistics and heuristics. Because of this, detection works best if you supply at least a few hundred bytes of character data that is in a single language.

If you have no initial guess on the language and encoding, try with stri_enc_detect (uses **ICU** facilities).

Value

Just like stri_enc_detect, this function returns a list of length equal to the length of str. Each list element is a data frame with the following three named components:

- Encoding – string; guessed encodings; NA on failure (if and only if encodings is empty),
- Language – always NA,
- Confidence – numeric in [0,1]; the higher the value, the more confidence there is in the match; NA on failure.

The guesses are ordered by decreasing confidence.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other encoding_detection: about_encoding, stri_enc_detect(), stri_enc_isascii(), stri_enc_isutf16be(), stri_enc_isutf8()

---

stri_enc_fromutf32 *Convert From UTF-32*

Description

This function converts integer vectors, representing sequences of UTF-32 code points, to UTF-8 strings.

Usage

```
stri_enc_fromutf32(vec)
```

Arguments

vec	a list of integer vectors (or objects coercible to such vectors) or NULLs. For convenience, a single integer vector can also be given.

Details

UTF-32 is a 32-bit encoding where each Unicode code point corresponds to exactly one integer value.

This function is a vectorized version of intToUtf8. As usual in **stringi**, it returns character strings in UTF-8. See stri_enc_toutf32 for a dual operation.

If an ill-defined code point is given, a warning is generated and the corresponding string is set to NA. Note that 0s are not allowed in vec, as they are used internally to mark the end of a string (in the C API).

See also stri_encode for decoding arbitrary byte sequences from any given encoding.

Value

Returns a character vector (in UTF-8). NULLs in the input list are converted to NA_character_.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: about_encoding, stri_enc_toascii(), stri_enc_tonative(), stri_enc_toutf32(), stri_enc_toutf8(), stri_encode()

`stri_enc_info` *Query a Character Encoding*

Description

Gets basic information on a character encoding.

Usage

```
stri_enc_info(enc = NULL)
```

Arguments

`enc`	`NULL` or `''` for the default encoding, or a single string with encoding name

Details

An error is raised if the provided encoding is unknown to **ICU** (see `stri_enc_list` for more details).

Value

Returns a list with the following components:

- `Name.friendly` – friendly encoding name: MIME Name or JAVA Name or **ICU** Canonical Name (the first of provided ones is selected, see below);
- `Name.ICU` – encoding name as identified by **ICU**;
- `Name.*` – other standardized encoding names, e.g., `Name.UTR22`, `Name.IBM`, `Name.WINDOWS`, `Name.JAVA`, `Name.IANA`, `Name.MIME` (some of them may be unavailable for all the encodings);
- `ASCII.subset` – is ASCII a subset of the given encoding?;
- `Unicode.1to1` – for 8-bit encodings only: are all characters translated to exactly one Unicode code point and is the translation scheme reversible?;
- `CharSize.8bit` – is this an 8-bit encoding, i.e., do we have `CharSize.min` == `CharSize.max` and `CharSize.min` == 1?;
- `CharSize.min` – minimal number of bytes used to represent a UChar (in UTF-16, this is not the same as UChar32)
- `CharSize.max` – maximal number of bytes used to represent a UChar (in UTF-16, this is not the same as UChar32, i.e., does not reflect the maximal code point representation size)

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_management: about_encoding, stri_enc_list(), stri_enc_mark(), stri_enc_set()

---

stri_enc_isascii *Check If a Data Stream Is Possibly in ASCII*

Description

The function checks whether all bytes in a string are <= 127.

Usage

```
stri_enc_isascii(str)
```

Arguments

str	character vector, a raw vector, or a list of raw vectors

Details

This function is independent of the way R marks encodings in character strings (see Encoding and stringi-encoding).

Value

Returns a logical vector. The i-th element indicates whether the i-th string corresponds to a valid ASCII byte sequence.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_detection: about_encoding, stri_enc_detect(), stri_enc_detect2(), stri_enc_isutf16be(), stri_enc_isutf8()

Examples

```
stri_enc_isascii(letters[1:3])
stri_enc_isascii('\u0105\u0104')
```

`stri_enc_isutf16be` *Check If a Data Stream Is Possibly in UTF-16 or UTF-32*

Description

These functions detect whether a given byte stream is valid UTF-16LE, UTF-16BE, UTF-32LE, or UTF-32BE.

Usage

```
stri_enc_isutf16be(str)

stri_enc_isutf16le(str)

stri_enc_isutf32be(str)

stri_enc_isutf32le(str)
```

Arguments

`str`	character vector, a raw vector, or a list of `raw` vectors

Details

These functions are independent of the way R marks encodings in character strings (see Encoding and stringi-encoding). Most often, these functions act on raw vectors.

A result of `FALSE` means that a string is surely not valid UTF-16 or UTF-32. However, false positives are possible.

Also note that a data stream may be sometimes classified as both valid UTF-16LE and UTF-16BE.

Value

Returns a logical vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_detection: about_encoding, stri_enc_detect(), stri_enc_detect2(), stri_enc_isascii(), stri_enc_isutf8()

`stri_enc_isutf8` *Check If a Data Stream Is Possibly in UTF-8*

Description

The function checks whether given sequences of bytes forms a proper UTF-8 string.

Usage

```
stri_enc_isutf8(str)
```

Arguments

`str`	character vector, a raw vector, or a list of `raw` vectors

Details

`FALSE` means that a string is certainly not valid UTF-8. However, false positives are possible. For instance, `(c4,85)` represents ('a with ogonek') in UTF-8 as well as ('A umlaut', 'Ellipsis') in WINDOWS-1250. Also note that UTF-8, as well as most 8-bit encodings, extend ASCII (note that `stri_enc_isascii` implies that `stri_enc_isutf8`).

However, the longer the sequence, the greater the possibility that the result is indeed in UTF-8 – this is because not all sequences of bytes are valid UTF-8.

This function is independent of the way R marks encodings in character strings (see Encoding and stringi-encoding).

Value

Returns a logical vector. Its i-th element indicates whether the i-th string corresponds to a valid UTF-8 byte sequence.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_detection: about_encoding, stri_enc_detect(), stri_enc_detect2(), stri_enc_isascii(), stri_enc_isutf16be()

Examples

```
stri_enc_isutf8(letters[1:3])
stri_enc_isutf8('\u0105\u0104')
stri_enc_isutf8('\u1234\u0222')
```

---

stri_enc_list *List Known Character Encodings*

Description

Gives the list of encodings that are supported by **ICU**.

Usage

```
stri_enc_list(simplify = TRUE)
```

Arguments

simplify	single logical value; return a character vector or a list of character vectors?

Details

Apart from given encoding identifiers and their aliases, some other specifiers might additionally be available. This is due to the fact that **ICU** tries to normalize converter names. For instance, 'UTF8' is also valid, see stringi-encoding for more information.

Value

If simplify is FALSE, a list of character vectors is returned. Each list element represents a unique character encoding. The name attribute gives the **ICU** Canonical Name of an encoding family. The elements (character vectors) are its aliases.

If simplify is TRUE (the default), then the resulting list is coerced to a character vector and sorted, and returned with removed duplicated entries.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_management: about_encoding, stri_enc_info(), stri_enc_mark(), stri_enc_set()

Examples

```
stri_enc_list()
stri_enc_list(FALSE)
```

---

stri_enc_mark *Get Declared Encodings of Each String*

Description

Reads declared encodings for each string in a character vector as seen by **stringi**.

Usage

```
stri_enc_mark(str)
```

Arguments

str	character vector or an object coercible to a character vector

Details

According to Encoding, R has a simple encoding marking mechanism: strings can be declared to be in latin1, UTF-8 or bytes.

Moreover, we may check (via the R/C API) whether a string is in ASCII (R assumes that this holds if and only if all bytes in a string are not greater than 127, so there is an implicit assumption that your platform uses an encoding that extends ASCII) or in the system's default (a.k.a. unknown in Encoding) encoding.

Intuitively, the default encoding should be equivalent to the one you use on stdin (e.g., your 'keyboard'). In **stringi** we assume that such an encoding is equivalent to the one returned by stri_enc_get. It is automatically detected by **ICU** to match – by default – the encoding part of the LC_CTYPE category as given by Sys.getlocale.

Value

Returns a character vector of the same length as str. Unlike in the Encoding function, here the possible encodings are: ASCII, latin1, bytes, native, and UTF-8. Additionally, missing values are handled properly.

This gives exactly the same data that is used by all the functions in **stringi** to re-encode their inputs.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_management: about_encoding, stri_enc_info(), stri_enc_list(), stri_enc_set()

---

stri_enc_set *Set or Get Default Character Encoding in* **stringi**

Description

stri_enc_set sets the encoding used to re-encode strings internally (i.e., by R) declared to be in native encoding, see stringi-encoding and stri_enc_mark. stri_enc_get returns the currently used default encoding.

Usage

```
stri_enc_set(enc)

stri_enc_get()
```

Arguments

enc	single string; character encoding name, see stri_enc_list for the list of supported encodings.

Details

stri_enc_get is the same as stri_enc_info(NULL)$Name.friendly.

Note that changing the default encoding may have undesired consequences. Unless you are an expert user and you know what you are doing, stri_enc_set should only be used if **ICU** fails to detect your system's encoding correctly (while testing **stringi** we only encountered such a situation on a very old Solaris machine). Note that **ICU** tries to match the encoding part of the LC_CTYPE category as given by Sys.getlocale.

If you set a default encoding that is neither a superset of ASCII, nor an 8-bit encoding, a warning will be generated, see stringi-encoding for discussion.

stri_enc_set has no effect if the system ICU assumes that the default charset is always UTF-8 (i.e., where the internal U_CHARSET_IS_UTF8 is defined and set to 1), see stri_info.

Value

`stri_enc_set` returns a string with previously used character encoding, invisibly.

`stri_enc_get` returns a string with current default character encoding.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_management: `about_encoding`, `stri_enc_info()`, `stri_enc_list()`, `stri_enc_mark()`

`stri_enc_toascii` *Convert To ASCII*

Description

This function converts input strings to ASCII, i.e., to character strings consisting of bytes not greater than 127.

Usage

```
stri_enc_toascii(str)
```

Arguments

`str`	a character vector to be converted

Details

All code points greater than 127 are replaced with the ASCII SUBSTITUTE CHARACTER (0x1A). R encoding declarations are always used to determine which encoding is assumed for each input, see `stri_enc_mark`. If ill-formed byte sequences are found in UTF-8 byte streams, a warning is generated.

A `bytes`-marked string is assumed to be in an 8-bit encoding extending the ASCII map (a common assumption in R itself).

Note that the SUBSTITUTE CHARACTER (`\x1a == \032`) may be interpreted as the ASCII missing value for single characters.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: about_encoding, stri_enc_fromutf32(), stri_enc_tonative(), stri_enc_toutf32(), stri_enc_toutf8(), stri_encode()

---

stri_enc_tonative *Convert Strings To Native Encoding*

Description

Converts character strings with declared encodings to the current native encoding.

Usage

```
stri_enc_tonative(str)
```

Arguments

str	a character vector to be converted

Details

This function just calls stri_encode(str, NULL, NULL). The current native encoding can be read with stri_enc_get. Character strings declared to be in bytes encoding will fail here.

Note that if working in a UTF-8 environment, resulting strings will be marked with UTF-8 and not native, see stri_enc_mark.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: about_encoding, stri_enc_fromutf32(), stri_enc_toascii(), stri_enc_toutf32(), stri_enc_toutf8(), stri_encode()

stri_enc_toutf32 *Convert Strings To UTF-32*

Description

UTF-32 is a 32-bit encoding where each Unicode code point corresponds to exactly one integer value. This function converts a character vector to a list of integer vectors so that, e.g., individual code points may be easily accessed, changed, etc.

Usage

```
stri_enc_toutf32(str)
```

Arguments

str	a character vector (or an object coercible to) to be converted

Details

See stri_enc_fromutf32 for a dual operation.

This function is roughly equivalent to a vectorized call to utf8ToInt(enc2utf8(str)). If you want a list of raw vectors on output, use stri_encode.

Unlike utf8ToInt, if ill-formed UTF-8 byte sequences are detected, a corresponding element is set to NULL and a warning is generated. To deal with such issues, use, e.g., stri_enc_toutf8.

Value

Returns a list of integer vectors. Missing values are converted to NULLs.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: about_encoding, stri_enc_fromutf32(), stri_enc_toascii(), stri_enc_tonative(), stri_enc_toutf8(), stri_encode()

stri_enc_toutf8 *Convert Strings To UTF-8*

Description

Converts character strings with declared marked encodings to UTF-8 strings.

Usage

```
stri_enc_toutf8(str, is_unknown_8bit = FALSE, validate = FALSE)
```

Arguments

str	a character vector to be converted
is_unknown_8bit	a single logical value, see Details
validate	a single logical value (can be NA), see Details

Details

If is_unknown_8bit is set to FALSE (the default), then R encoding marks are used, see stri_enc_mark. Bytes-marked strings will cause the function to fail.

If a string is in UTF-8 and has a byte order mark (BOM), then the BOM will be silently removed from the output string.

If the default encoding is UTF-8, see stri_enc_get, then strings marked with native are – for efficiency reasons – returned as-is, i.e., with unchanged markings. A similar behavior is observed when calling enc2utf8.

For is_unknown_8bit=TRUE, if a string is declared to be neither in ASCII nor in UTF-8, then all byte codes > 127 are replaced with the Unicode REPLACEMENT CHARACTER (\Ufffd). Note that the REPLACEMENT CHARACTER may be interpreted as Unicode missing value for single characters. Here a bytes-marked string is assumed to use an 8-bit encoding that extends the ASCII map.

What is more, setting validate to TRUE or NA in both cases validates the resulting UTF-8 byte stream. If validate=TRUE, then in case of any incorrect byte sequences, they will be replaced with the REPLACEMENT CHARACTER. This option may be used in a case where you want to fix an invalid UTF-8 byte sequence. For NA, a bogus string will be replaced with a missing value.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: about_encoding, stri_enc_fromutf32(), stri_enc_toascii(), stri_enc_tonative(), stri_enc_toutf32(), stri_encode()

---

stri_encode *Convert Strings Between Given Encodings*

Description

These functions convert strings between encodings. They aim to serve as a more portable and faster replacement for R's own iconv.

Usage

```
stri_encode(str, from = NULL, to = NULL, to_raw = FALSE)

stri_conv(str, from = NULL, to = NULL, to_raw = FALSE)
```

Arguments

str	a character vector, a raw vector, or a list of raw vectors to be converted
from	input encoding: NULL or '' for the default encoding or internal encoding marks' usage (see Details); otherwise, a single string with encoding name, see stri_enc_list
to	target encoding: NULL or '' for default encoding (see stri_enc_get), or a single string with encoding name
to_raw	a single logical value; indicates whether a list of raw vectors rather than a character vector should be returned

Details

stri_conv is an alias for stri_encode.

Refer to stri_enc_list for the list of supported encodings and stringi-encoding for a general discussion.

If from is either missing, '', or NULL, and if str is a character vector then the marked encodings are used (see stri_enc_mark) – in such a case bytes-declared strings are disallowed. Otherwise, i.e., if str is a raw-type vector or a list of raw vectors, we assume that the input encoding is the current default encoding as given by stri_enc_get.

However, if from is given explicitly, the internal encoding declarations are always ignored.

For to_raw=FALSE, the output strings always have the encodings marked according to the target converter used (as specified by to) and the current default Encoding (ASCII, latin1, UTF-8, native, or bytes in all other cases).

Note that some issues might occur if `to` indicates, e.g., UTF-16 or UTF-32, as the output strings may have embedded NULs. In such cases, please use `to_raw=TRUE` and consider specifying a byte order marker (BOM) for portability reasons (e.g., set `UTF-16` or `UTF-32` which automatically adds the BOMs).

Note that `stri_encode(as.raw(data), 'encodingname')` is a clever substitute for `rawToChar`.

In the current version of **stringi**, if an incorrect code point is found on input, it is replaced with the default (for that target encoding) 'missing/erroneous' character (with a warning), e.g., the SUBSTITUTE character (U+001A) or the REPLACEMENT one (U+FFFD). Occurrences thereof can be located in the output string to diagnose the problematic sequences, e.g., by calling: `stri_locate_all_regex(converted_str`
`'[\ufffd\u001a]'`.

Because of the way this function is currently implemented, maximal size of a single string to be converted cannot exceed ~0.67 GB.

Value

If `to_raw` is `FALSE`, then a character vector with encoded strings (and appropriate encoding marks) is returned. Otherwise, a list of vectors of type raw is produced.

Author(s)

Marek Gagolewski and other contributors

References

Conversion – ICU User Guide, https://unicode-org.github.io/icu/userguide/conversion/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other encoding_conversion: `about_encoding`, `stri_enc_fromutf32()`, `stri_enc_toascii()`, `stri_enc_tonative()`, `stri_enc_toutf32()`, `stri_enc_toutf8()`

`stri_escape_unicode` *Escape Unicode Code Points*

Description

Generates an ASCII string where all non-printable characters and non-ASCII characters are converted to escape sequences.

Usage

```
stri_escape_unicode(str)
```

Arguments

str	character vector

Details

For non-printable and certain special (well-known, see also the R man page Quotes) ASCII characters, the following (also recognized in R) convention is used. We get \a, \b, \t, \n, \v, \f, \r, \", \', \\ or either \uXXXX (4 hex digits) or \UXXXXXXXX (8 hex digits) otherwise.

As usual in stringi, any input string is converted to Unicode before executing the escape process.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other escape: stri_unescape_unicode()

Examples

```
stri_escape_unicode('a\u0105!')
```

---

stri_extract_all *Extract Pattern Occurrences*

Description

These functions extract all substrings matching a given pattern.

stri_extract_all_* extracts all the matches. stri_extract_first_* and stri_extract_last_* yield the first or the last matches, respectively.

Usage

```
stri_extract_all(str, ..., regex, fixed, coll, charclass)

stri_extract_first(str, ..., regex, fixed, coll, charclass)

stri_extract_last(str, ..., regex, fixed, coll, charclass)

stri_extract(
  str,
  ...,
  regex,
  fixed,
  coll,
  charclass,
  mode = c("first", "all", "last")
)

stri_extract_all_charclass(
  str,
  pattern,
  merge = TRUE,
  simplify = FALSE,
  omit_no_match = FALSE
)

stri_extract_first_charclass(str, pattern)

stri_extract_last_charclass(str, pattern)

stri_extract_all_coll(
  str,
  pattern,
  simplify = FALSE,
  omit_no_match = FALSE,
  ...,
  opts_collator = NULL
)

stri_extract_first_coll(str, pattern, ..., opts_collator = NULL)

stri_extract_last_coll(str, pattern, ..., opts_collator = NULL)

stri_extract_all_regex(
  str,
  pattern,
  simplify = FALSE,
  omit_no_match = FALSE,
  ...,
```

```
  opts_regex = NULL
)

stri_extract_first_regex(str, pattern, ..., opts_regex = NULL)

stri_extract_last_regex(str, pattern, ..., opts_regex = NULL)

stri_extract_all_fixed(
  str,
  pattern,
  simplify = FALSE,
  omit_no_match = FALSE,
  ...,
  opts_fixed = NULL
)

stri_extract_first_fixed(str, pattern, ..., opts_fixed = NULL)

stri_extract_last_fixed(str, pattern, ..., opts_fixed = NULL)
```

Arguments

`str`	character vector; strings to search in
`...`	supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, and so on
`mode`	single string; one of: `'first'` (the default), `'all'`, `'last'`
`pattern`, `regex`, `fixed`, `coll`, `charclass`	character vector; search patterns; for more details refer to stringi-search
`merge`	single logical value; indicates whether consecutive pattern matches will be merged into one string; `stri_extract_all_charclass` only
`simplify`	single logical value; if `TRUE` or `NA`, then a character matrix is returned; otherwise (the default), a list of character vectors is given, see Value; `stri_extract_all_*` only
`omit_no_match`	single logical value; if `FALSE`, then a missing value will indicate that there was no match; `stri_extract_all_*` only
`opts_collator`, `opts_fixed`, `opts_regex`	a named list to tune up the search engine's settings; see `stri_opts_collator`, `stri_opts_fixed`, and `stri_opts_regex`, respectively; `NULL` for the defaults

Details

Vectorized over `str` and `pattern` (with recycling of the elements in the shorter vector if necessary). This allows to, for instance, search for one pattern in each given string, search for each pattern in one given string, and search for the i-th pattern within the i-th string.

Check out `stri_match` for the extraction of matches to individual regex capture groups.

`stri_extract`, `stri_extract_all`, `stri_extract_first`, and `stri_extract_last` are convenience functions. They merely call `stri_extract_*_*`, depending on the arguments used.

Value

For stri_extract_all*, if simplify=FALSE (the default), then a list of character vectors is returned. Each list element represents the results of a different search scenario. If a pattern is not found and omit_no_match=FALSE, then a character vector of length 1 with single NA value will be generated.

Otherwise, i.e., if simplify is not FALSE, then stri_list2matrix with byrow=TRUE argument is called on the resulting object. In such a case, the function yields a character matrix with an appropriate number of rows (according to the length of str, pattern, etc.). Note that stri_list2matrix's fill argument is set either to an empty string or NA, depending on whether simplify is TRUE or NA, respectively.

stri_extract_first* and stri_extract_last* return a character vector. A NA element indicates a no-match.

Note that stri_extract_last_regex searches from start to end, but skips overlapping matches, see the example below.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_extract: about_search, stri_extract_all_boundaries(), stri_match_all()

Examples

```
stri_extract_all('XaaaaX', regex=c('\\p{Ll}', '\\p{Ll}+', '\\p{Ll}{2,3}', '\\p{Ll}{2,3}?'))
stri_extract_all('Bartolini', coll='i')
stri_extract_all('stringi is so good!', charclass='\\p{Zs}') # all white-spaces

stri_extract_all_charclass(c('AbcdeFgHijK', 'abc', 'ABC'), '\\p{Ll}')
stri_extract_all_charclass(c('AbcdeFgHijK', 'abc', 'ABC'), '\\p{Ll}', merge=FALSE)
stri_extract_first_charclass('AaBbCc', '\\p{Ll}')
stri_extract_last_charclass('AaBbCc', '\\p{Ll}')

## Not run:
# emoji support available since ICU 57
stri_extract_all_charclass(stri_enc_fromutf32(32:55200), '\\p{EMOJI}')

## End(Not run)

stri_extract_all_coll(c('AaaaaaaA', 'AAAA'), 'a')
stri_extract_first_coll(c('Yy\u00FD', 'AAA'), 'y', strength=2, locale='sk_SK')
stri_extract_last_coll(c('Yy\u00FD', 'AAA'), 'y',  strength=1, locale='sk_SK')

stri_extract_all_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+', '\\p{Ll}{2,3}', '\\p{Ll}{2,3}?'))
stri_extract_first_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+', '\\p{Ll}{2,3}', '\\p{Ll}{2,3}?'))
```

```
stri_extract_last_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+', '\\p{Ll}{2,3}', '\\p{Ll}{2,3}?'))

stri_list2matrix(stri_extract_all_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+')))
stri_extract_all_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+'), simplify=TRUE)
stri_extract_all_regex('XaaaaX', c('\\p{Ll}', '\\p{Ll}+'), simplify=NA)

stri_extract_all_fixed('abaBAba', 'Aba', case_insensitive=TRUE)
stri_extract_all_fixed('abaBAba', 'Aba', case_insensitive=TRUE, overlap=TRUE)

# Searching for the last occurrence:
# Note the difference - regex searches left to right, with no overlaps.
stri_extract_last_fixed("agAGA", "aga", case_insensitive=TRUE)
stri_extract_last_regex("agAGA", "aga", case_insensitive=TRUE)
```

---

stri_extract_all_boundaries

Extract Data Between Text Boundaries

Description

These functions extract data between text boundaries.

Usage

```
stri_extract_all_boundaries(
  str,
  simplify = FALSE,
  omit_no_match = FALSE,
  ...,
  opts_brkiter = NULL
)

stri_extract_last_boundaries(str, ..., opts_brkiter = NULL)

stri_extract_first_boundaries(str, ..., opts_brkiter = NULL)

stri_extract_all_words(
  str,
  simplify = FALSE,
  omit_no_match = FALSE,
  locale = NULL
)

stri_extract_first_words(str, locale = NULL)

stri_extract_last_words(str, locale = NULL)
```

Arguments

str	character vector or an object coercible to
simplify	single logical value; if TRUE or NA, then a character matrix is returned; otherwise (the default), a list of character vectors is given, see Value
omit_no_match	single logical value; if FALSE, then a missing value will indicate that there are no words
...	additional settings for opts_brkiter
opts_brkiter	a named list with **ICU** BreakIterator's settings, see stri_opts_brkiter; NULL for the default break iterator, i.e., line_break
locale	NULL or '' for text boundary analysis following the conventions of the default locale, or a single string with locale identifier, see stringi-locale

Details

Vectorized over str.

For more information on text boundary analysis performed by **ICU**'s BreakIterator, see stringi-search-boundaries.

In case of stri_extract_*_words, just like in stri_count_words, **ICU**'s word BreakIterator iterator is used to locate the word boundaries, and all non-word characters (UBRK_WORD_NONE rule status) are ignored.

Value

For stri_extract_all_*, if simplify=FALSE (the default), then a list of character vectors is returned. Each string consists of a separate word. In case of omit_no_match=FALSE and if there are no words or if a string is missing, a single NA is provided on output.

Otherwise, stri_list2matrix with byrow=TRUE argument is called on the resulting object. In such a case, a character matrix with length(str) rows is returned. Note that stri_list2matrix's fill argument is set to an empty string and NA, for simplify TRUE and NA, respectively.

For stri_extract_first_* and stri_extract_last_*, a character vector is returned. A NA element indicates a no-match.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_extract: about_search, stri_extract_all(), stri_match_all()

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_locate_all_boundari

stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other text_boundaries: about_search, about_search_boundaries, stri_count_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_split_lines(), stri_trans_tolower(), stri_wrap()

Examples

```
stri_extract_all_words('stringi: THE string processing package 123.48...')
```

---

stri_flatten *Flatten a String*

Description

Joins the elements of a character vector into one string.

Usage

```
stri_flatten(str, collapse = "", na_empty = FALSE, omit_empty = FALSE)
```

Arguments

str	a vector of strings to be coerced to character
collapse	a single string denoting the separator
na_empty	single logical value; should missing values in str be treated as empty strings (TRUE) or be omitted whatsoever (NA)?
omit_empty	single logical value; should empty strings in str be omitted?

Details

The stri_flatten(str, collapse='XXX') call is equivalent to paste(str, collapse='XXX', sep='').

If you wish to use some more fancy (e.g., differing) separators between flattened strings, call stri_join(str, separators, collapse='').

If str is not empty, then a single string is returned. If collapse has length > 1, then only the first string will be used.

Value

Returns a single string, i.e., a character vector of length 1.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other join: %s+%, stri_dup(), stri_join(), stri_join_list()

Examples

```
stri_flatten(LETTERS)
stri_flatten(LETTERS, collapse=',')
stri_flatten(stri_dup(letters[1:6], 1:3))
stri_flatten(c(NA, '', 'A', '', 'B', NA, 'C'), collapse=',', na_empty=TRUE, omit_empty=TRUE)
stri_flatten(c(NA, '', 'A', '', 'B', NA, 'C'), collapse=',', na_empty=NA)
```

---

stri_info *Query Default Settings for* **stringi**

Description

Gives the current default settings used by the **ICU** library.

Usage

```
stri_info(short = FALSE)
```

Arguments

short	logical; whether or not the results should be given in a concise form; defaults to TRUE

Value

If short is TRUE, then a single string providing information on the default character encoding, locale, and Unicode as well as **ICU** version is returned.

Otherwise, a list with the following components is returned:

- Unicode.version – version of Unicode supported by the **ICU** library;
- ICU.version – **ICU** library version used;
- Locale – contains information on default locale, as returned by stri_locale_info;
- Charset.internal – fixed at c('UTF-8', 'UTF-16');
- Charset.native – information on the default encoding, as returned by stri_enc_info;
- ICU.system – logical; TRUE indicates that the system **ICU** libs are used, otherwise **ICU** was built together with **stringi**;
- ICU.UTF8 – logical; TRUE if the internal U_CHARSET_IS_UTF8 flag is defined and set.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

---

stri_isempty *Determine if a String is of Length Zero*

Description

This is the fastest way to find out whether the elements of a character vector are empty strings.

Usage

```
stri_isempty(str)
```

Arguments

str	character vector or an object coercible to

Details

Missing values are handled properly.

Value

Returns a logical vector of the same length as str.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: %s$%, stri_length(), stri_numbytes(), stri_pad_both(), stri_sprintf(), stri_width()

Examples

```
stri_isempty(letters[1:3])
stri_isempty(c(',', '', 'abc', '123', '\u0105\u0104'))
stri_isempty(character(1))
```

`stri_join` *Concatenate Character Vectors*

Description

These are the **stringi**'s equivalents of the built-in `paste` function. `stri_c` and `stri_paste` are aliases for `stri_join`.

Usage

```
stri_join(..., sep = "", collapse = NULL, ignore_null = FALSE)

stri_c(..., sep = "", collapse = NULL, ignore_null = FALSE)

stri_paste(..., sep = "", collapse = NULL, ignore_null = FALSE)
```

Arguments

`...`	character vectors (or objects coercible to character vectors) whose corresponding elements are to be concatenated
`sep`	a single string; separates terms
`collapse`	a single string or `NULL`; an optional results separator
`ignore_null`	a single logical value; if `TRUE`, then empty vectors provided via `...` are silently ignored

Details

Vectorized over each atomic vector in '`...`'.

Unless `collapse` is `NULL`, the result will be a single string. Otherwise, you get a character vector of length equal to the length of the longest argument.

If any of the arguments in '`...`' is a vector of length 0 (not to be confused with vectors of empty strings) and `ignore_null` is `FALSE`, then you will get a 0-length character vector in result.

If `collapse` or `sep` has length greater than 1, then only the first string will be used.

In case where there are missing values in any of the input vectors, `NA` is set to the corresponding element. Note that this behavior is different from `paste`, which treats missing values as ordinary strings like `'NA'`. Moreover, as usual in **stringi**, the resulting strings are always in UTF-8.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other join: `%s+%`, `stri_dup()`, `stri_flatten()`, `stri_join_list()`

Examples

```
stri_join(1:13, letters)
stri_join(1:13, letters, sep=',')
stri_join(1:13, letters, collapse='; ')
stri_join(1:13, letters, sep=',', collapse='; ')
stri_join(c('abc', '123', 'xyz'),'###', 1:6, sep=',')
stri_join(c('abc', '123', 'xyz'),'###', 1:6, sep=',', collapse='; ')
```

---

stri_join_list *Concatenate Strings in a List*

Description

These functions concatenate all the strings in each character vector in a given list. `stri_c_list` and `stri_paste_list` are aliases for `stri_join_list`.

Usage

```
stri_join_list(x, sep = "", collapse = NULL)

stri_c_list(x, sep = "", collapse = NULL)

stri_paste_list(x, sep = "", collapse = NULL)
```

Arguments

`x`	a list consisting of character vectors
`sep`	a single string; separates strings in each of the character vectors in `x`
`collapse`	a single string or `NULL`; an optional results separator

Details

Unless `collapse` is `NULL`, the result will be a single string. Otherwise, you get a character vector of length equal to the length of `x`.

Vectors in `x` of length 0 are silently ignored.

If `collapse` or `sep` has length greater than 1, then only the first string will be used.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other join: `%s+%`, `stri_dup()`, `stri_flatten()`, `stri_join()`

Examples

```
stri_join_list(
   stri_extract_all_words(c('Lorem ipsum dolor sit amet.',
   'Spam spam bacon sausage and spam.')),
sep=', ')

stri_join_list(
   stri_extract_all_words(c('Lorem ipsum dolor sit amet.',
   'Spam spam bacon sausage and spam.')),
sep=', ', collapse='. ')

stri_join_list(
   stri_extract_all_regex(
      c('spam spam bacon', '123 456', 'spam 789 sausage'), '\\p{L}+'
   ),
sep=',')

stri_join_list(
   stri_extract_all_regex(
      c('spam spam bacon', '123 456', 'spam 789 sausage'), '\\p{L}+',
      omit_no_match=TRUE
   ),
sep=',', collapse='; ')
```

---

stri_length *Count the Number of Code Points*

Description

This function returns the number of code points in each string.

Usage

```
stri_length(str)
```

Arguments

str	character vector or an object coercible to

Details

Note that the number of code points is not the same as the 'width' of the string when printed on the console.

If a given string is in UTF-8 and has not been properly normalized (e.g., by stri_trans_nfc), the returned counts may sometimes be misleading. See stri_count_boundaries for a method to count *Unicode characters*. Moreover, if an incorrect UTF-8 byte sequence is detected, then a warning is generated and the corresponding output element is set to NA, see also stri_enc_toutf8 for a method to deal with such cases.

Missing values are handled properly. For 'byte' encodings we get, as usual, an error.

Value

Returns an integer vector of the same length as str.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: %s$%, stri_isempty(), stri_numbytes(), stri_pad_both(), stri_sprintf(), stri_width()

Examples

```
stri_length(LETTERS)
stri_length(c('abc', '123', '\u0105\u0104'))
stri_length('\u0105') # length is one, but...
stri_numbytes('\u0105') # 2 bytes are used
stri_numbytes(stri_trans_nfkd('\u0105')) # 3 bytes here but...
stri_length(stri_trans_nfkd('\u0105')) # ...two code points (!)
stri_count_boundaries(stri_trans_nfkd('\u0105'), type='character') # ...and one Unicode character
```

stri_list2matrix *Convert a List to a Character Matrix*

Description

This function converts a given list of atomic vectors to a character matrix.

Usage

```
stri_list2matrix(
  x,
  byrow = FALSE,
  fill = NA_character_,
  n_min = 0,
  by_row = byrow
)
```

Arguments

x	a list of atomic vectors
byrow	a single logical value; should the resulting matrix be transposed?
fill	a single string, see Details
n_min	a single integer value; minimal number of rows (byrow==FALSE) or columns (otherwise) in the resulting matrix
by_row	alias of byrow

Details

This function is similar to the built-in simplify2array function. However, it always returns a character matrix, even if each element in x is of length 1 or if elements in x are not of the same lengths. Moreover, the elements in x are always coerced to character vectors.

If byrow is FALSE, then a matrix with length(x) columns is returned. The number of rows is the length of the longest vector in x, but no less than n_min. Basically, we have result[i,j] == x[[j]][i] if i <= length(x[[j]]) and result[i,j] == fill otherwise, see Examples.

If byrow is TRUE, then the resulting matrix is a transposition of the above-described one.

This function may be useful, e.g., in connection with stri_split and stri_extract_all.

Value

Returns a character matrix.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other utils: `stri_na2empty()`, `stri_remove_empty()`, `stri_replace_na()`

Examples

```
simplify2array(list(c('a', 'b'), c('c', 'd'), c('e', 'f')))
stri_list2matrix(list(c('a', 'b'), c('c', 'd'), c('e', 'f')))
stri_list2matrix(list(c('a', 'b'), c('c', 'd'), c('e', 'f')), byrow=TRUE)

simplify2array(list('a', c('b', 'c')))
stri_list2matrix(list('a', c('b', 'c')))
stri_list2matrix(list('a', c('b', 'c')), fill='')
stri_list2matrix(list('a', c('b', 'c')), fill='', n_min=5)
```

---

stri_locale_info *Query Given Locale*

Description

Provides some basic information on a given locale identifier.

Usage

```
stri_locale_info(locale = NULL)
```

Arguments

`locale`	`NULL` or `''` for default locale, or a single string with locale identifier.

Details

With this function you may obtain some basic information on any provided locale identifier, even if it is unsupported by **ICU** or if you pass a malformed locale identifier (the one that is not, e.g., of the form Language_Country). See stringi-locale for discussion.

This function does not do anything really complicated. In many cases it is similar to a call to `as.list(stri_split_fixed(locale, '_', 3L)[[1]])`, with `locale` case mapped. It may be used, however, to get insight on how ICU understands a given locale identifier.

Value

Returns a list with the following named character strings: `Language`, `Country`, `Variant`, and `Name`, being their underscore separated combination.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_management: about_locale, stri_locale_list(), stri_locale_set()

Examples

```
stri_locale_info('pl_PL')
stri_locale_info('Pl_pL') # the same result
```

---

stri_locale_list *List Available Locales*

Description

Creates a character vector with all available locale identifies.

Usage

```
stri_locale_list()
```

Details

Note that some of the services may be unavailable in some locales. Querying for locale-specific services is always performed during the resource request.

See stringi-locale for more information.

Value

Returns a character vector with locale identifiers that are known to **ICU**.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_management: about_locale, stri_locale_info(), stri_locale_set()

Examples

```
stri_locale_list()
```

`stri_locale_set` *Set or Get Default Locale in* **stringi**

Description

`stri_locale_set` changes the default locale for all the functions in the **stringi** package, i.e., establishes the meaning of the "`NULL` locale" argument of locale-sensitive functions. `stri_locale_get` gives the current default locale.

Usage

```
stri_locale_set(locale)

stri_locale_get()
```

Arguments

`locale`	single string of the form `Language`, `Language_Country`, or `Language_Country_Variant`, e.g., `'en_US'`, see `stri_locale_list`.

Details

See stringi-locale for more information on the effect of changing the default locale.

`stri_locale_get` is the same as `stri_locale_info(NULL)$Name`.

Value

`stri_locale_set` returns a string with previously used locale, invisibly.

`stri_locale_get` returns a string of the form `Language`, `Language_Country`, or `Language_Country_Variant`, e.g., `'en_US'`.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_management: `about_locale`, `stri_locale_info()`, `stri_locale_list()`

Examples

```
## Not run:
oldloc <- stri_locale_set('pt_BR')
# ... some locale-dependent operations
# ... note that you may always modify a locale per-call
# ... changing the default locale is convenient if you perform
# ... many operations
stri_locale_set(oldloc) # restore the previous default locale

## End(Not run)
```

---

stri_locate_all *Locate Pattern Occurrences*

Description

These functions find the indexes (positions) where there is a match to some pattern. The functions `stri_locate_all_*` locate all the matches. `stri_locate_first_*` and `stri_locate_last_*` give the first and the last matches, respectively.

Usage

```
stri_locate_all(str, ..., regex, fixed, coll, charclass)

stri_locate_first(str, ..., regex, fixed, coll, charclass)

stri_locate_last(str, ..., regex, fixed, coll, charclass)

stri_locate(
  str,
  ...,
  regex,
  fixed,
  coll,
  charclass,
  mode = c("first", "all", "last")
)

stri_locate_all_charclass(
  str,
  pattern,
  merge = TRUE,
  omit_no_match = FALSE,
  get_length = FALSE
)

stri_locate_first_charclass(str, pattern, get_length = FALSE)
```

```
stri_locate_last_charclass(str, pattern, get_length = FALSE)

stri_locate_all_coll(
  str,
  pattern,
  omit_no_match = FALSE,
  get_length = FALSE,
  ...,
  opts_collator = NULL
)

stri_locate_first_coll(
  str,
  pattern,
  get_length = FALSE,
  ...,
  opts_collator = NULL
)

stri_locate_last_coll(
  str,
  pattern,
  get_length = FALSE,
  ...,
  opts_collator = NULL
)

stri_locate_all_regex(
  str,
  pattern,
  omit_no_match = FALSE,
  capture_groups = FALSE,
  get_length = FALSE,
  ...,
  opts_regex = NULL
)

stri_locate_first_regex(
  str,
  pattern,
  capture_groups = FALSE,
  get_length = FALSE,
  ...,
  opts_regex = NULL
)

stri_locate_last_regex(
```

```
  str,
  pattern,
  capture_groups = FALSE,
  get_length = FALSE,
  ...,
  opts_regex = NULL
)

stri_locate_all_fixed(
  str,
  pattern,
  omit_no_match = FALSE,
  get_length = FALSE,
  ...,
  opts_fixed = NULL
)

stri_locate_first_fixed(
  str,
  pattern,
  get_length = FALSE,
  ...,
  opts_fixed = NULL
)

stri_locate_last_fixed(
  str,
  pattern,
  get_length = FALSE,
  ...,
  opts_fixed = NULL
)
```

Arguments

`str`	character vector; strings to search in
`...`	supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, `opts_fixed`, and so on
`mode`	single string; one of: `'first'` (the default), `'all'`, `'last'`
`pattern`, `regex`, `fixed`, `coll`, `charclass`	character vector; search patterns; for more details refer to stringi-search
`merge`	single logical value; indicates whether consecutive sequences of indexes in the resulting matrix should be merged; `stri_locate_all_charclass` only
`omit_no_match`	single logical value; if `TRUE`, a no-match will be indicated by a matrix with 0 rows `stri_locate_all_*` only
`get_length`	single logical value; if `FALSE` (default), generate *from-to* matrices; otherwise, output *from-length* ones

opts_collator, opts_fixed, opts_regex
: named list used to tune up the selected search engine's settings; see stri_opts_collator, stri_opts_fixed, and stri_opts_regex, respectively; NULL for the defaults

capture_groups
: single logical value; whether positions of matches to parenthesized subexpressions should be returned too (as capture_groups attribute); stri_locate_*_regex only

Details

Vectorized over str and pattern (with recycling of the elements in the shorter vector if necessary). This allows to, for instance, search for one pattern in each string, search for each pattern in one string, and search for the i-th pattern within the i-th string.

The matches may be extracted by calling stri_sub or stri_sub_all. Alternatively, you may call stri_extract directly.

stri_locate, stri_locate_all, stri_locate_first, and stri_locate_last are convenience functions. They just call stri_locate_*_*, depending on the arguments used.

Value

For stri_locate_all_*, a list of integer matrices is returned. Each list element represents the results of a separate search scenario. The first column gives the start positions of the matches, and the second column gives the end positions. Moreover, two NAs in a row denote NA arguments or a no-match (the latter only if omit_no_match is FALSE).

stri_locate_first_* and stri_locate_last_* return an integer matrix with two columns, giving the start and end positions of the first or the last matches, respectively, and two NAs if and only if they are not found.

For stri_locate_*_regex, if the match is of zero length, end will be one character less than start. Note that stri_locate_last_regex searches from start to end, but skips overlapping matches, see the example below.

Setting get_length=TRUE results in the 2nd column representing the length of the match instead of the end position. In this case, negative length denotes a no-match.

If capture_groups=TRUE, then the outputs are equipped with the capture_groups attribute, which is a list of matrices giving the start-end positions of matches to parenthesized subexpressions. Similarly to stri_match_regex, capture group names are extracted unless looking for first/last occurrences of many different patterns.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_locate: about_search, stri_locate_all_boundaries()

Other indexing: stri_locate_all_boundaries(), stri_sub(), stri_sub_all()

Examples

```
stri_locate_all('stringi', fixed='i')

stri_locate_first_coll('hladn\u00FD', 'HLADNY', strength=1, locale='sk_SK')

stri_locate_all_regex(
    c('breakfast=eggs;lunch=pizza', 'breakfast=spam', 'no food here'),
   '(?<when>\\w+)=(?<what>\\w+)',
   capture_groups=TRUE
)  # named capture groups

stri_locate_all_fixed("abababa", "ABA", case_insensitive=TRUE, overlap=TRUE)
stri_locate_first_fixed("ababa", "aba")
stri_locate_last_fixed("ababa", "aba")  # starts from end
stri_locate_last_regex("ababa", "aba")  # no overlaps, from left to right

x <- c("yes yes", "no", NA)
stri_locate_all_fixed(x, "yes")
stri_locate_all_fixed(x, "yes", omit_no_match=TRUE)
stri_locate_all_fixed(x, "yes", get_length=TRUE)
stri_locate_all_fixed(x, "yes", get_length=TRUE, omit_no_match=TRUE)
stri_locate_first_fixed(x, "yes")
stri_locate_first_fixed(x, "yes", get_length=TRUE)

# Use regex positive-lookahead to locate overlapping pattern matches:
stri_locate_all_regex('ACAGAGACTTTAGATAGAGAAGA', '(?=AGA)')
# note that start > end here (match of length zero)
```

---

stri_locate_all_boundaries

Locate Text Boundaries

Description

These functions locate text boundaries (like character, word, line, or sentence boundaries). Use `stri_locate_all_*` to locate all the matches. `stri_locate_first_*` and `stri_locate_last_*` give the first or the last matches, respectively.

Usage

```
stri_locate_all_boundaries(
  str,
  omit_no_match = FALSE,
  get_length = FALSE,
  ...,
  opts_brkiter = NULL
)
```

```
stri_locate_last_boundaries(str, get_length = FALSE, ..., opts_brkiter = NULL)

stri_locate_first_boundaries(str, get_length = FALSE, ..., opts_brkiter = NULL)

stri_locate_all_words(
  str,
  omit_no_match = FALSE,
  locale = NULL,
  get_length = FALSE
)

stri_locate_last_words(str, locale = NULL, get_length = FALSE)

stri_locate_first_words(str, locale = NULL, get_length = FALSE)
```

Arguments

str	character vector or an object coercible to
omit_no_match	single logical value; if TRUE, a no-match will be indicated by a matrix with 0 rows stri_locate_all_* only
get_length	single logical value; if FALSE (default), generate *from-to* matrices; otherwise, output *from-length* ones
...	additional settings for opts_brkiter
opts_brkiter	named list with **ICU** BreakIterator's settings, see stri_opts_brkiter; NULL for default break iterator, i.e., line_break
locale	NULL or '' for text boundary analysis following the conventions of the default locale, or a single string with locale identifier, see stringi-locale

Details

Vectorized over str.

For more information on text boundary analysis performed by **ICU**'s BreakIterator, see stringi-search-boundaries.

For stri_locate_*_words, just like in stri_extract_all_words and stri_count_words, **ICU**'s word BreakIterator iterator is used to locate the word boundaries, and all non-word characters (UBRK_WORD_NONE rule status) are ignored. This function is equivalent to a call to stri_locate_*_boundaries(str, type='word', skip_word_none=TRUE, locale=locale)

Value

stri_locate_all_* yields a list of length(str) integer matrices. stri_locate_first_* and stri_locate_last_* generate return an integer matrix. See stri_locate for more details.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_locate: about_search, stri_locate_all()

Other indexing: stri_locate_all(), stri_sub(), stri_sub_all()

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other text_boundaries: about_search, about_search_boundaries, stri_count_boundaries(), stri_extract_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_split_lines(), stri_trans_tolower(), stri_wrap()

Examples

```
test <- 'The\u00a0above-mentioned  features are very useful. Spam, spam, eggs, bacon, and spam.'
stri_locate_all_words(test)
stri_locate_all_boundaries(
    'Mr. Jones and Mrs. Brown are very happy. So am I, Prof. Smith.',
    type='sentence',
    locale='en_US@ss=standard' # ICU >= 56 only
)
```

---

stri_match_all *Extract Regex Pattern Matches, Together with Capture Groups*

Description

These functions extract substrings in `str` that match a given regex `pattern`. Additionally, they extract matches to every *capture group*, i.e., to all the sub-patterns given in round parentheses.

Usage

```
stri_match_all(str, ..., regex)

stri_match_first(str, ..., regex)

stri_match_last(str, ..., regex)

stri_match(str, ..., regex, mode = c("first", "all", "last"))

stri_match_all_regex(
```

```
  str,
  pattern,
  omit_no_match = FALSE,
  cg_missing = NA_character_,
  ...,
  opts_regex = NULL
)

stri_match_first_regex(
  str,
  pattern,
  cg_missing = NA_character_,
  ...,
  opts_regex = NULL
)

stri_match_last_regex(
  str,
  pattern,
  cg_missing = NA_character_,
  ...,
  opts_regex = NULL
)
```

Arguments

str	character vector; strings to search in
...	supplementary arguments passed to the underlying functions, including additional settings for opts_regex
mode	single string; one of: 'first' (the default), 'all', 'last'
pattern, regex	character vector; search patterns; for more details refer to stringi-search
omit_no_match	single logical value; if FALSE, then a row with missing values will indicate that there was no match; stri_match_all_* only
cg_missing	single string to be used if a capture group match is unavailable
opts_regex	a named list with **ICU** Regex settings, see stri_opts_regex; NULL for default settings

Details

Vectorized over str and pattern (with recycling of the elements in the shorter vector if necessary). This allows to, for instance, search for one pattern in each given string, search for each pattern in one given string, and search for the i-th pattern within the i-th string.

If no pattern match is detected and omit_no_match=FALSE, then NAs are included in the resulting matrix (matrices), see Examples.

stri_match, stri_match_all, stri_match_first, and stri_match_last are convenience functions. They merely call stri_match_*_regex and are provided for consistency with other string searching functions' wrappers, see, among others, stri_extract.

Value

For `stri_match_all*`, a list of character matrices is returned. Each list element represents the results of a different search scenario.

For `stri_match_first*` and `stri_match_last*` a character matrix is returned. Each row corresponds to a different search result.

The first matrix column gives the whole match. The second one corresponds to the first capture group, the third – the second capture group, and so on.

If regular expressions feature a named capture group, the matrix columns will be named accordingly. However, for `stri_match_first*` and `stri_match_last*` this will only be the case if there is a single pattern.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_extract: about_search, stri_extract_all(), stri_extract_all_boundaries()

Examples

```
stri_match_all_regex('breakfast=eggs, lunch=pizza, dessert=icecream',
   '(\\w+)=(\\w+)')
stri_match_all_regex(c('breakfast=eggs', 'lunch=pizza', 'no food here'),
   '(\\w+)=(\\w+)')
stri_match_all_regex(c('breakfast=eggs;lunch=pizza',
   'breakfast=bacon;lunch=spaghetti', 'no food here'),
   '(\\w+)=(\\w+)')
stri_match_all_regex(c('breakfast=eggs;lunch=pizza',
   'breakfast=bacon;lunch=spaghetti', 'no food here'),
   '(?<when>\\w+)=(?<what>\\w+)')  # named capture groups
stri_match_first_regex(c('breakfast=eggs;lunch=pizza',
   'breakfast=bacon;lunch=spaghetti', 'no food here'),
   '(\\w+)=(\\w+)')
stri_match_last_regex(c('breakfast=eggs;lunch=pizza',
   'breakfast=bacon;lunch=spaghetti', 'no food here'),
   '(\\w+)=(\\w+)')

stri_match_first_regex(c('abcd', ':abcd', ':abcd:'), '^(:)?([^:]*)(:)?$')
stri_match_first_regex(c('abcd', ':abcd', ':abcd:'), '^(:)?([^:]*)(:)?$', cg_missing='')

# Match all the pattern of the form XYX, including overlapping matches:
stri_match_all_regex('ACAGAGACTTTAGATAGAGAAGA', '(?=(([ACGT])[ACGT]\\2))')[[1]][,2]
# Compare the above to:
stri_extract_all_regex('ACAGAGACTTTAGATAGAGAAGA', '([ACGT])[ACGT]\\1')
```

`stri_na2empty` *Replace NAs with Empty Strings*

Description

This function replaces all missing values with empty strings. See `stri_replace_na` for a generalization.

Usage

```
stri_na2empty(x)
```

Arguments

`x`	a character vector

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other utils: `stri_list2matrix()`, `stri_remove_empty()`, `stri_replace_na()`

Examples

```
stri_na2empty(c('a', NA, '', 'b'))
```

stri_numbytes *Count the Number of Bytes*

Description

Counts the number of bytes needed to store each string in the computer's memory.

Usage

```
stri_numbytes(str)
```

Arguments

str	character vector or an object coercible to

Details

Often, this is not the function you would normally use in your string processing activities. See stri_length instead.

For 8-bit encoded strings, this is the same as stri_length. For UTF-8 strings, the returned values may be greater than the number of code points, as UTF-8 is not a fixed-byte encoding: one code point may be encoded by 1-4 bytes (according to the current Unicode standard).

Missing values are handled properly.

The strings do not need to be re-encoded to perform this operation.

The returned values do not include the trailing NUL bytes, which are used internally to mark the end of string data (in C).

Value

Returns an integer vector of the same length as str.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: %s$%, stri_isempty(), stri_length(), stri_pad_both(), stri_sprintf(), stri_width()

Examples

```
stri_numbytes(letters)
stri_numbytes(c('abc', '123', '\u0105\u0104'))

## Not run:
# this used to fail on Windows, where there were no native support
# for 4-bytes Unicode characters; see, however, stri_unescape_unicode():
stri_numbytes('\U001F600') # compare stri_length('\U001F600')

## End(Not run)
```

`stri_opts_brkiter` *Generate a List with BreakIterator Settings*

Description

A convenience function to tune the **ICU** `BreakIterator`'s behavior in some text boundary analysis functions, see stringi-search-boundaries.

Usage

```
stri_opts_brkiter(
  type,
  locale,
  skip_word_none,
  skip_word_number,
  skip_word_letter,
  skip_word_kana,
  skip_word_ideo,
  skip_line_soft,
  skip_line_hard,
  skip_sentence_term,
  skip_sentence_sep
)
```

Arguments

`type`	single string; either the break iterator type, one of `character`, `line_break`, `sentence`, `word`, or a custom set of ICU break iteration rules; see stringi-search-boundaries
`locale`	single string, `NULL` or `''` for default locale
`skip_word_none`	logical; perform no action for 'words' that do not fit into any other categories
`skip_word_number`	logical; perform no action for words that appear to be numbers

`skip_word_letter`
: logical; perform no action for words that contain letters, excluding hiragana, katakana, or ideographic characters

`skip_word_kana`
: logical; perform no action for words containing kana characters

`skip_word_ideo`
: logical; perform no action for words containing ideographic characters

`skip_line_soft`
: logical; perform no action for soft line breaks, i.e., positions where a line break is acceptable but not required

`skip_line_hard`
: logical; perform no action for hard, or mandatory line breaks

`skip_sentence_term`
: logical; perform no action for sentences ending with a sentence terminator ('.', '¡', '?', '!'), possibly followed by a hard separator (`CR`, `LF`, `PS`, etc.)

`skip_sentence_sep`
: logical; perform no action for sentences that do not contain an ending sentence terminator, but are ended by a hard separator or end of input

Details

The `skip_*` family of settings may be used to prevent performing any special actions on particular types of text boundaries, e.g., in case of the `stri_locate_all_boundaries` and `stri_split_boundaries` functions.

Note that custom break iterator rules (advanced users only) should be specified as a single string. For a detailed description of the syntax of RBBI rules, please refer to the ICU User Guide on Boundary Analysis.

Value

Returns a named list object. Omitted `skip_*` values act as they have been set to `FALSE`.

Author(s)

Marek Gagolewski and other contributors

References

`ubrk.h` *File Reference* – ICU4C API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/ubrk_8h.html

Boundary Analysis – ICU User Guide, https://unicode-org.github.io/icu/userguide/boundaryanalysis/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other text_boundaries: `about_search`, `about_search_boundaries`, `stri_count_boundaries()`, `stri_extract_all_boundaries()`, `stri_locate_all_boundaries()`, `stri_split_boundaries()`, `stri_split_lines()`, `stri_trans_tolower()`, `stri_wrap()`

stri_opts_collator *Generate a List with Collator Settings*

Description

A convenience function to tune the **ICU** Collator's behavior, e.g., in stri_compare, stri_order, stri_unique, stri_duplicated, as well as stri_detect_coll and other stringi-search-coll functions.

Usage

```
stri_opts_collator(
  locale = NULL,
  strength = 3L,
  alternate_shifted = FALSE,
  french = FALSE,
  uppercase_first = NA,
  case_level = FALSE,
  normalization = FALSE,
  normalisation = normalization,
  numeric = FALSE
)

stri_coll(
  locale = NULL,
  strength = 3L,
  alternate_shifted = FALSE,
  french = FALSE,
  uppercase_first = NA,
  case_level = FALSE,
  normalization = FALSE,
  normalisation = normalization,
  numeric = FALSE
)
```

Arguments

locale	single string, NULL or '' for default locale
strength	single integer in {1,2,3,4}, which defines collation strength; 1 for the most permissive collation rules, 4 for the strictest ones
alternate_shifted	single logical value; FALSE treats all the code points with non-ignorable primary weights in the same way, TRUE causes code points with primary weights that are equal or below the variable top value to be ignored on primary level and moved to the quaternary level
french	single logical value; used in Canadian French; TRUE results in secondary weights being considered backwards

`uppercase_first`
: single logical value; `NA` orders upper and lower case letters in accordance to their tertiary weights, `TRUE` forces upper case letters to sort before lower case letters, `FALSE` does the opposite

`case_level`
: single logical value; controls whether an extra case level (positioned before the third level) is generated or not

`normalization`
: single logical value; if `TRUE`, then incremental check is performed to see whether the input data is in the FCD form. If the data is not in the FCD form, incremental NFD normalization is performed

`normalisation`
: alias of `normalization`

`numeric`
: single logical value; when turned on, this attribute generates a collation key for the numeric value of substrings of digits; this is a way to get '100' to sort AFTER '2'; note that negative or non-integer numbers will not be ordered properly

Details

ICU's *collator* performs a locale-aware, natural-language alike string comparison. This is a more reliable way of establishing relationships between strings than the one provided by base R, and definitely one that is more complex and appropriate than ordinary bytewise comparison.

Value

Returns a named list object; missing settings are left with default values.

Author(s)

Marek Gagolewski and other contributors

References

Collation – ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

ICU Collation Service Architecture – ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/architecture.html

`icu::Collator` *Class Reference* – ICU4C API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/classicu_1_1Collator.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: `%s<%`, `about_locale`, `about_search_boundaries`, `about_search_coll`, `stri_compare()`, `stri_count_boundaries()`, `stri_duplicated()`, `stri_enc_detect2()`, `stri_extract_all_boundar`
`stri_locate_all_boundaries()`, `stri_order()`, `stri_rank()`, `stri_sort()`, `stri_sort_key()`, `stri_split_boundaries()`, `stri_trans_tolower()`, `stri_unique()`, `stri_wrap()`

Other search_coll: `about_search`, `about_search_coll`

Examples

```
stri_cmp('number100', 'number2')
stri_cmp('number100', 'number2', opts_collator=stri_opts_collator(numeric=TRUE))
stri_cmp('number100', 'number2', numeric=TRUE) # equivalent
stri_cmp('above mentioned', 'above-mentioned')
stri_cmp('above mentioned', 'above-mentioned', alternate_shifted=TRUE)
```

---

stri_opts_fixed *Generate a List with Fixed Pattern Search Engine's Settings*

Description

A convenience function used to tune up the behavior of `stri_*_fixed` functions, see stringi-search-fixed.

Usage

```
stri_opts_fixed(case_insensitive = FALSE, overlap = FALSE)
```

Arguments

`case_insensitive`	logical; enable simple case insensitive matching
`overlap`	logical; enable overlapping matches' detection

Details

Case-insensitive matching uses a simple, single-code point case mapping (via ICU's `u_toupper()` function). Full case mappings should be used whenever possible because they produce better results by working on whole strings. They also take into account the string context and the language, see stringi-search-coll.

Searching for overlapping pattern matches is available in `stri_extract_all_fixed`, `stri_locate_all_fixed`, and `stri_count_fixed` functions.

Value

Returns a named list object.

Author(s)

Marek Gagolewski and other contributors

References

C/POSIX Migration – ICU User Guide, https://unicode-org.github.io/icu/userguide/icu/posix.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_fixed: about_search, about_search_fixed

Examples

```
stri_detect_fixed('ala', 'ALA') # case-sensitive by default
stri_detect_fixed('ala', 'ALA', opts_fixed=stri_opts_fixed(case_insensitive=TRUE))
stri_detect_fixed('ala', 'ALA', case_insensitive=TRUE) # equivalent
```

---

stri_opts_regex *Generate a List with Regex Matcher Settings*

Description

A convenience function to tune the **ICU** regular expressions matcher's behavior, e.g., in stri_count_regex and other stringi-search-regex functions.

Usage

```
stri_opts_regex(
  case_insensitive,
  comments,
  dotall,
  dot_all = dotall,
  literal,
  multiline,
  multi_line = multiline,
  unix_lines,
  uword,
  error_on_unknown_escapes,
  time_limit = 0L,
  stack_limit = 0L
)
```

Arguments

case_insensitive	logical; enables case insensitive matching [regex flag (?i)]
comments	logical; allows white space and comments within patterns [regex flag (?x)]
dotall	logical; if set, '.' matches line terminators, otherwise matching of '.' stops at a line end [regex flag (?s)]
dot_all	alias of dotall

`literal` logical; if set, treat the entire pattern as a literal string: metacharacters or escape sequences in the input sequence will be given no special meaning; note that in most cases you would rather use the stringi-search-fixed facilities in this case

`multiline` logical; controls the behavior of '`$`' and '`^`'. If set, recognize line terminators within a string, otherwise, match only at start and end of input string [regex flag `(?m)`]

`multi_line` alias of `multiline`

`unix_lines` logical; Unix-only line endings; when enabled, only `U+000a` is recognized as a line ending by '`.`', '`$`', and '`^`'.

`uword` logical; Unicode word boundaries; if set, uses the Unicode TR 29 definition of word boundaries; warning: Unicode word boundaries are quite different from traditional regex word boundaries. [regex flag `(?w)`] See https://unicode.org/reports/tr29/#Word_Boundaries

`error_on_unknown_escapes` logical; whether to generate an error on unrecognized backslash escapes; if set, fail with an error on patterns that contain backslash-escaped ASCII letters without a known special meaning; otherwise, these escaped letters represent themselves

`time_limit` integer; processing time limit, in ~milliseconds (but not precisely so, depends on the CPU speed), for match operations; setting a limit is desirable if poorly written regexes are expected on input; 0 for no limit

`stack_limit` integer; maximal size, in bytes, of the heap storage available for the match backtracking stack; setting a limit is desirable if poorly written regexes are expected on input; 0 for no limit

Details

Note that some regex settings may be changed using ICU regex flags inside regexes. For example, `'(?i)pattern'` performs a case-insensitive match of a given pattern, see the **ICU** User Guide entry on Regular Expressions in the References section or stringi-search-regex.

Value

Returns a named list object; missing settings are left with default values.

Author(s)

Marek Gagolewski and other contributors

References

`enum URegexpFlag`: *Constants for Regular Expression Match Modes* – ICU4C API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/uregex_8h.html

Regular Expressions – ICU User Guide, https://unicode-org.github.io/icu/userguide/strings/regexp.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_regex: about_search, about_search_regex

Examples

```
stri_detect_regex('ala', 'ALA') # case-sensitive by default
stri_detect_regex('ala', 'ALA', opts_regex=stri_opts_regex(case_insensitive=TRUE))
stri_detect_regex('ala', 'ALA', case_insensitive=TRUE) # equivalent
stri_detect_regex('ala', '(?i)ALA') # equivalent
```

---

stri_order *Ordering Permutation*

Description

This function finds a permutation which rearranges the strings in a given character vector into the ascending or descending locale-dependent lexicographic order.

Usage

```
stri_order(str, decreasing = FALSE, na_last = TRUE, ..., opts_collator = NULL)
```

Arguments

str	a character vector
decreasing	a single logical value; should the sort order be nondecreasing (FALSE, default) or nonincreasing (TRUE)?
na_last	a single logical value; controls the treatment of NAs in str. If TRUE, then missing values in str are put at the end; if FALSE, they are put at the beginning; if NA, then they are removed from the output
...	additional settings for opts_collator
opts_collator	a named list with **ICU** Collator's options, see stri_opts_collator, NULL for default collation options

Details

For more information on **ICU**'s Collator and how to tune it up in **stringi**, refer to stri_opts_collator.

As usual in **stringi**, non-character inputs are coerced to strings, see an example below for a somewhat non-intuitive behavior of lexicographic sorting on numeric inputs.

This function uses a stable sort algorithm (**STL**'s stable_sort), which performs up to $N * log^2(N)$ element comparisons, where N is the length of str.

For ordering with regards to multiple criteria (such as sorting data frames by more than 1 column), see stri_rank.

Value

The function yields an integer vector that gives the sort order.

Author(s)

Marek Gagolewski and other contributors

References

Collation - ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
stri_order(c('hladny', 'chladny'), locale='pl_PL')
stri_order(c('hladny', 'chladny'), locale='sk_SK')

stri_order(c(1, 100, 2, 101, 11, 10))  # lexicographic order
stri_order(c(1, 100, 2, 101, 11, 10), numeric=TRUE)  # OK for integers
stri_order(c(0.25, 0.5, 1, -1, -2, -3), numeric=TRUE)  # incorrect
```

---

stri_pad_both *Pad (Center/Left/Right Align) a String*

Description

Add multiple pad characters at the given side(s) of each string so that each output string is of total width of at least width. These functions may be used to center or left/right-align each string.

Usage

```
stri_pad_both(
  str,
  width = floor(0.9 * getOption("width")),
  pad = " ",
  use_length = FALSE
)
```

```
stri_pad_left(
  str,
  width = floor(0.9 * getOption("width")),
  pad = " ",
  use_length = FALSE
)

stri_pad_right(
  str,
  width = floor(0.9 * getOption("width")),
  pad = " ",
  use_length = FALSE
)

stri_pad(
  str,
  width = floor(0.9 * getOption("width")),
  side = c("left", "right", "both"),
  pad = " ",
  use_length = FALSE
)
```

Arguments

str	character vector
width	integer vector giving minimal output string lengths
pad	character vector giving padding code points
use_length	single logical value; should the number of code points be used instead of the total code point width (see stri_width)?
side	[stri_pad only] single character string; sides on which padding character is added (left (default), right, or both)

Details

Vectorized over str, width, and pad. Each string in pad should consist of a code points of total width equal to 1 or, if use_length is TRUE, exactly one code point.

stri_pad is a convenience function, which dispatches to stri_pad_*.

Note that Unicode code points may have various widths when printed on the console and that, by default, the function takes that into account. By changing the state of the use_length argument, this function starts acting like each code point was of width 1. This feature should rather be used with text in Latin script.

See stri_trim_left (among others) for reverse operation. Also check out stri_wrap for line wrapping.

Value

These functions return a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: %s$%, stri_isempty(), stri_length(), stri_numbytes(), stri_sprintf(), stri_width()

Examples

```
stri_pad_left('stringi', 10, pad='#')
stri_pad_both('stringi', 8:12, pad='*')
# center on screen:
cat(stri_pad_both(c('the', 'string', 'processing', 'package'),
   getOption('width')*0.9), sep='\n')
cat(stri_pad_both(c('\ud6c8\ubbfc\uc815\uc74c', # takes width into account
   stri_trans_nfkd('\ud6c8\ubbfc\uc815\uc74c'), 'abcd'),
   width=10), sep='\n')
```

---

stri_rand_lipsum *A Lorem Ipsum Generator*

Description

Generates (pseudo)random *lorem ipsum* text consisting of a given number of text paragraphs.

Usage

```
stri_rand_lipsum(n_paragraphs, start_lipsum = TRUE, nparagraphs = n_paragraphs)
```

Arguments

n_paragraphs	single integer, number of paragraphs to generate
start_lipsum	single logical value; should the resulting text start with *Lorem ipsum dolor sit amet*?
nparagraphs	[DEPRECATED] alias of n_paragraphs

Details

Lorem ipsum is a dummy text often used as a source of data for string processing and displaying/laying-outing exercises.

The current implementation is very simple: words are selected randomly from a Zipf distribution (based on a set of ca. 190 predefined Latin words). The number of words per sentence and sentences per paragraph follows a discretized, truncated normal distribution. No Markov chain modeling, just i.i.d. word selection.

Value

Returns a character vector of length `n_paragraphs`.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other random: `stri_rand_shuffle()`, `stri_rand_strings()`

Examples

```
cat(sapply(
   stri_wrap(stri_rand_lipsum(10), 80, simplify=FALSE),
   stri_flatten, collapse='\n'), sep='\n\n')
cat(stri_rand_lipsum(10), sep='\n\n')
```

---

stri_rand_shuffle *Randomly Shuffle Code Points in Each String*

Description

Generates a (pseudo)random permutation of the code points in each string.

Usage

```
stri_rand_shuffle(str)
```

Arguments

`str`	character vector

Details

This operation may result in non-Unicode-normalized strings and may give peculiar outputs in case of bidirectional strings.

See also `stri_reverse` for reversing the order of code points.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other random: `stri_rand_lipsum()`, `stri_rand_strings()`

Examples

```
stri_rand_shuffle(c('abcdefghi', '0123456789'))
# you can do better than this with stri_rand_strings:
stri_rand_shuffle(rep(stri_paste(letters, collapse=''), 10))
```

---

stri_rand_strings *Generate Random Strings*

Description

Generates (pseudo)random strings of desired lengths.

Usage

```
stri_rand_strings(n, length, pattern = "[A-Za-z0-9]")
```

Arguments

`n`	single integer, number of observations
`length`	integer vector, desired string lengths
`pattern`	character vector specifying character classes to draw elements from, see stringi-search-charclass

Details

Vectorized over `length` and `pattern`. If length of `length` or `pattern` is greater than `n`, then redundant elements are ignored. Otherwise, these vectors are recycled if necessary.

This operation may result in non-Unicode-normalized strings and may give peculiar outputs for bidirectional strings.

Sampling of code points from the set specified by `pattern` is always done with replacement and each code point appears with equal probability.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other random: `stri_rand_lipsum()`, `stri_rand_shuffle()`

Examples

```
stri_rand_strings(5, 10) # 5 strings of length 10
stri_rand_strings(5, sample(1:10, 5, replace=TRUE)) # 5 strings of random lengths
stri_rand_strings(10, 5, '[\\p{script=latin}&\\p{Ll}]') # small letters from the Latin script

# generate n random passwords of length in [8, 14]
# consisting of at least one digit, small and big ASCII letter:
n <- 10
stri_rand_shuffle(stri_paste(
   stri_rand_strings(n, 1, '[0-9]'),
   stri_rand_strings(n, 1, '[a-z]'),
   stri_rand_strings(n, 1, '[A-Z]'),
   stri_rand_strings(n, sample(5:11, 5, replace=TRUE), '[a-zA-Z0-9]')
))
```

---

stri_rank *Ranking*

Description

This function ranks each string in a character vector according to a locale-dependent lexicographic order. It is a portable replacement for the base `xtfrm` function.

Usage

```
stri_rank(str, ..., opts_collator = NULL)
```

Arguments

`str`	a character vector
`...`	additional settings for `opts_collator`
`opts_collator`	a named list with **ICU** Collator's options, see `stri_opts_collator`, `NULL` for default collation options

Details

Missing values result in missing ranks and tied observations receive the same ranks (based on min).

For more information on **ICU**'s Collator and how to tune it up in **stringi**, refer to stri_opts_collator.

Value

The result is a vector of ranks corresponding to each string in str.

Author(s)

Marek Gagolewski and other contributors

References

Collation – ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
stri_rank(c('hladny', 'chladny'), locale='pl_PL')
stri_rank(c('hladny', 'chladny'), locale='sk_SK')

stri_rank("a" %s+% c(1, 100, 2, 101, 11, 10))  # lexicographic order
stri_rank("a" %s+% c(1, 100, 2, 101, 11, 10), numeric=TRUE)  # OK
stri_rank("a" %s+% c(0.25, 0.5, 1, -1, -2, -3), numeric=TRUE)  # incorrect

# Ordering a data frame with respect to two criteria:
X <- data.frame(a=c("b", NA, "b", "b", NA, "a", "a", "c"), b=runif(8))
X[order(stri_rank(X$a), X$b), ]
```

`stri_read_lines` *Read Text Lines from a Text File*

Description

Reads a text file in ins entirety, re-encodes it, and splits it into text lines.

Usage

```
stri_read_lines(con, encoding = NULL, fname = con)
```

Arguments

`con`	name of the output file or a connection object (opened in the binary mode)
`encoding`	single string; input encoding; `NULL` or `''` for the current default encoding.
`fname`	[DEPRECATED] alias of `con`

Details

This aims to be a substitute for the `readLines` function, with the ability to re-encode the input file in a much more robust way, and split the text into lines with `stri_split_lines1` (which conforms with the Unicode guidelines for newline markers).

The function calls `stri_read_raw`, `stri_encode`, and `stri_split_lines1`, in this order.

Because of the way this function is currently implemented, maximal file size cannot exceed ~0.67 GB.

Value

Returns a character vector, each text line is a separate string. The output is always marked as UTF-8.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other files: `stri_read_raw()`, `stri_write_lines()`

`stri_read_raw` *Read Text File as Raw*

Description

Reads a text file as-is, with no conversion or text line splitting.

Usage

```
stri_read_raw(con, fname = con)
```

Arguments

`con`	name of the output file or a connection object (opened in the binary mode)
`fname`	[DEPRECATED] alias of `con`

Details

Once a text file is read into memory, encoding detection (see `stri_enc_detect`), conversion (see `stri_encode`), and/or splitting of text into lines (see `stri_split_lines1`) can be performed.

Value

Returns a vector of type `raw`.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other files: `stri_read_lines()`, `stri_write_lines()`

stri_remove_empty *Remove All Empty Strings from a Character Vector*

Description

`stri_remove_empty` (alias `stri_omit_empty`) removes all empty strings from a character vector, and, if `na_empty` is `TRUE`, also gets rid of all missing values.

`stri_remove_empty_na` (alias `stri_omit_empty_na`) removes both empty strings and missing values.

`stri_remove_na` (alias `stri_omit_na`) returns a version of `x` with missing values removed.

Usage

```
stri_remove_empty(x, na_empty = FALSE)

stri_omit_empty(x, na_empty = FALSE)

stri_remove_empty_na(x)

stri_omit_empty_na(x)

stri_remove_na(x)

stri_omit_na(x)
```

Arguments

`x`	a character vector
`na_empty`	should missing values be treated as empty strings?

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other utils: `stri_list2matrix()`, `stri_na2empty()`, `stri_replace_na()`

Examples

```
stri_remove_empty(stri_na2empty(c('a', NA, '', 'b')))
stri_remove_empty(c('a', NA, '', 'b'))
stri_remove_empty(c('a', NA, '', 'b'), TRUE)

stri_omit_empty_na(c('a', NA, '', 'b'))
```

---

stri_replace_all *Replace Pattern Occurrences*

Description

These functions replace, with the given replacement string, every/first/last substring of the input that matches the specified `pattern`.

Usage

```
stri_replace_all(str, replacement, ..., regex, fixed, coll, charclass)

stri_replace_first(str, replacement, ..., regex, fixed, coll, charclass)

stri_replace_last(str, replacement, ..., regex, fixed, coll, charclass)

stri_replace(
  str,
  replacement,
  ...,
  regex,
  fixed,
  coll,
  charclass,
  mode = c("first", "all", "last")
)

stri_replace_all_charclass(
  str,
  pattern,
  replacement,
  merge = FALSE,
  vectorize_all = TRUE,
  vectorise_all = vectorize_all
)

stri_replace_first_charclass(str, pattern, replacement)

stri_replace_last_charclass(str, pattern, replacement)
```

```
stri_replace_all_coll(
  str,
  pattern,
  replacement,
  vectorize_all = TRUE,
  vectorise_all = vectorize_all,
  ...,
  opts_collator = NULL
)

stri_replace_first_coll(str, pattern, replacement, ..., opts_collator = NULL)

stri_replace_last_coll(str, pattern, replacement, ..., opts_collator = NULL)

stri_replace_all_fixed(
  str,
  pattern,
  replacement,
  vectorize_all = TRUE,
  vectorise_all = vectorize_all,
  ...,
  opts_fixed = NULL
)

stri_replace_first_fixed(str, pattern, replacement, ..., opts_fixed = NULL)

stri_replace_last_fixed(str, pattern, replacement, ..., opts_fixed = NULL)

stri_replace_all_regex(
  str,
  pattern,
  replacement,
  vectorize_all = TRUE,
  vectorise_all = vectorize_all,
  ...,
  opts_regex = NULL
)

stri_replace_first_regex(str, pattern, replacement, ..., opts_regex = NULL)

stri_replace_last_regex(str, pattern, replacement, ..., opts_regex = NULL)
```

Arguments

str	character vector; strings to search in
replacement	character vector with replacements for matched patterns
...	supplementary arguments passed to the underlying functions, including addi-

tional settings for opts_collator, opts_regex, opts_fixed, and so on

mode — single string; one of: 'first' (the default), 'all', 'last'

pattern, regex, fixed, coll, charclass — character vector; search patterns; for more details refer to stringi-search

merge — single logical value; should consecutive matches be merged into one string; stri_replace_all_charclass only

vectorize_all — single logical value; should each occurrence of a pattern in every string be replaced by a corresponding replacement string?; stri_replace_all_* only

vectorise_all — alias of vectorize_all

opts_collator, opts_fixed, opts_regex — a named list used to tune up the search engine's settings; see stri_opts_collator, stri_opts_fixed, and stri_opts_regex, respectively; NULL for the defaults

Details

By default, all the functions are vectorized over str, pattern, replacement (with recycling of the elements in the shorter vector if necessary). Input that is not part of any match is left unchanged; each match is replaced in the result by the replacement string.

However, for stri_replace_all*, if vectorize_all is FALSE, then each substring matching any of the supplied patterns is replaced by a corresponding replacement string. In such a case, the vectorization is over str, and - independently - over pattern and replacement. In other words, this is equivalent to something like for (i in 1:npatterns) str <- stri_replace_all(str, pattern[i], replacement[i]. Note that you must set length(pattern) >= length(replacement).

In case of stri_replace_*_regex, the replacement string may contain references to capture groups (in round parentheses). References are of the form $n, where n is the number of the capture group ($1 denotes the first group). For the literal $, escape it with a backslash. Moreover, ${name} are used for named capture groups.

Note that stri_replace_last_regex searches from start to end, but skips overlapping matches, see the example below.

stri_replace, stri_replace_all, stri_replace_first, and stri_replace_last are convenience functions; they just call stri_replace_*_* variants, depending on the arguments used.

If you wish to remove white-spaces from the start or end of a string, see stri_trim.

Value

All the functions return a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_replace: about_search, stri_replace_rstr(), stri_trim_both()

Examples

```
stri_replace_all_charclass('aaaa', '[a]', 'b', merge=c(TRUE, FALSE))

stri_replace_all_charclass('a\nb\tc   d', '\\p{WHITE_SPACE}', ' ')
stri_replace_all_charclass('a\nb\tc   d', '\\p{WHITE_SPACE}', ' ', merge=TRUE)

s <- 'Lorem ipsum dolor sit amet, consectetur adipisicing elit.'
stri_replace_all_fixed(s, ' ', '#')
stri_replace_all_fixed(s, 'o', '0')

stri_replace_all_fixed(c('1', 'NULL', '3'), 'NULL', NA)

stri_replace_all_regex(s, ' .*? ', '#')
stri_replace_all_regex(s, '(el|s)it', '1234')
stri_replace_all_regex('abaca', 'a', c('!', '*'))
stri_replace_all_regex('123|456|789', '(\\p{N}).(\\p{N})', '$2-$1')
stri_replace_all_regex(c('stringi R', 'REXAMINE', '123'), '( R|R.)', ' r ')

# named capture groups are available since ICU 55
## Not run:
stri_replace_all_regex('words 123 and numbers 456',
   '(?<numbers>[0-9]+)', '!${numbers}!')

## End(Not run)

# Compare the results:
stri_replace_all_fixed('The quick brown fox jumped over the lazy dog.',
     c('quick', 'brown', 'fox'), c('slow',  'black', 'bear'), vectorize_all=TRUE)
stri_replace_all_fixed('The quick brown fox jumped over the lazy dog.',
     c('quick', 'brown', 'fox'), c('slow',  'black', 'bear'), vectorize_all=FALSE)

# Compare the results:
stri_replace_all_fixed('The quicker brown fox jumped over the lazy dog.',
     c('quick', 'brown', 'fox'), c('slow',  'black', 'bear'), vectorize_all=FALSE)
stri_replace_all_regex('The quicker brown fox jumped over the lazy dog.',
    '\\b'%s+%c('quick', 'brown', 'fox')%s+%'\\b', c('slow', 'black', 'bear'), vectorize_all=FALSE)

# Searching for the last occurrence:
# Note the difference - regex searches left to right, with no overlaps.
stri_replace_last_fixed("agAGA", "aga", "*", case_insensitive=TRUE)
stri_replace_last_regex("agAGA", "aga", "*", case_insensitive=TRUE)
```

`stri_replace_na` *Replace Missing Values in a Character Vector*

Description

This function gives a convenient way to replace each missing (NA) value with a given string.

Usage

```
stri_replace_na(str, replacement = "NA")
```

Arguments

str	character vector or an object coercible to
replacement	single string

Details

This function is roughly equivalent to `str2 <- stri_enc_toutf8(str); str2[is.na(str2)] <- stri_enc_toutf8(replacement); str2`. It may be used, e.g., wherever the 'plain R' `NA` handling is desired, see Examples.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other utils: `stri_list2matrix()`, `stri_na2empty()`, `stri_remove_empty()`

Examples

```
x <- c('test', NA)
stri_paste(x, 1:2)                          # 'test1' NA
paste(x, 1:2)                               # 'test 1' 'NA 2'
stri_paste(stri_replace_na(x), 1:2, sep=' ') # 'test 1' 'NA 2'
```

---

stri_replace_rstr *Convert gsub-Style Replacement Strings*

Description

Converts a `gsub`-style replacement strings to those which can be used in `stri_replace`. In particular, `$` becomes `\$` and `\1` becomes `$1`.

Usage

```
stri_replace_rstr(x)
```

Arguments

x	character vector

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_replace: about_search, stri_replace_all(), stri_trim_both()

---

stri_reverse *Reverse Each String*

Description

Reverses the order of the code points in every string.

Usage

```
stri_reverse(str)
```

Arguments

str	character vector

Details

Note that this operation may result in non-Unicode-normalized strings and may give peculiar outputs for bidirectional strings.

See also stri_rand_shuffle for a random permutation of code points.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Examples

```
stri_reverse(c('123', 'abc d e f'))
stri_reverse('ZXY (\u0105\u0104123$^).')
stri_reverse(stri_trans_nfd('\u0105')) == stri_trans_nfd('\u0105') # A, ogonek -> agonek, A
```

---

stri_sort *String Sorting*

Description

This function sorts a character vector according to a locale-dependent lexicographic order.

Usage

```
stri_sort(str, decreasing = FALSE, na_last = NA, ..., opts_collator = NULL)
```

Arguments

str	a character vector
decreasing	a single logical value; should the sort order be nondecreasing (FALSE, default, i.e., weakly increasing) or nonincreasing (TRUE)?
na_last	a single logical value; controls the treatment of NAs in str. If TRUE, then missing values in str are put at the end; if FALSE, they are put at the beginning; if NA, then they are removed from the output
...	additional settings for opts_collator
opts_collator	a named list with **ICU** Collator's options, see stri_opts_collator, NULL for default collation options

Details

For more information on **ICU**'s Collator and how to tune it up in **stringi**, refer to stri_opts_collator.

As usual in **stringi**, non-character inputs are coerced to strings, see an example below for a somewhat non-intuitive behavior of lexicographic sorting on numeric inputs.

This function uses a stable sort algorithm (**STL**'s stable_sort), which performs up to $N * log^2(N)$ element comparisons, where N is the length of str.

Value

The result is a sorted version of str, i.e., a character vector.

Author(s)

Marek Gagolewski and other contributors

References

Collation - ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique(), stri_wrap()

Examples

```
stri_sort(c('hladny', 'chladny'), locale='pl_PL')
stri_sort(c('hladny', 'chladny'), locale='sk_SK')
stri_sort(sample(LETTERS))
stri_sort(c(1, 100, 2, 101, 11, 10))  # lexicographic order
stri_sort(c(1, 100, 2, 101, 11, 10), numeric=TRUE)  # OK for integers
stri_sort(c(0.25, 0.5, 1, -1, -2, -3), numeric=TRUE)  # incorrect
```

---

stri_sort_key *Sort Keys*

Description

This function computes a locale-dependent sort key, which is an alternative character representation of the string that, when ordered in the C locale (which orders using the underlying bytes directly), will give an equivalent ordering to the original string. It is useful for enhancing algorithms that sort only in the C locale (e.g., the strcmp function in libc) with the ability to be locale-aware.

Usage

```
stri_sort_key(str, ..., opts_collator = NULL)
```

Arguments

str	a character vector
...	additional settings for opts_collator
opts_collator	a named list with **ICU** Collator's options, see stri_opts_collator, NULL for default collation options

Details

For more information on **ICU**'s Collator and how to tune it up in **stringi**, refer to `stri_opts_collator`.

See also `stri_rank` for ranking strings with a single character vector, i.e., generating relative sort keys.

Value

The result is a character vector with the same length as `str` that contains the sort keys. The output is marked as `bytes`-encoded.

Author(s)

Marek Gagolewski and other contributors

References

Collation - ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: `%s<%`, `about_locale`, `about_search_boundaries`, `about_search_coll`, `stri_compare()`, `stri_count_boundaries()`, `stri_duplicated()`, `stri_enc_detect2()`, `stri_extract_all_boundar`
`stri_locate_all_boundaries()`, `stri_opts_collator()`, `stri_order()`, `stri_rank()`, `stri_sort()`, `stri_split_boundaries()`, `stri_trans_tolower()`, `stri_unique()`, `stri_wrap()`

Examples

```
stri_sort_key(c('hladny', 'chladny'), locale='pl_PL')
stri_sort_key(c('hladny', 'chladny'), locale='sk_SK')
```

---

stri_split *Split a String By Pattern Matches*

Description

These functions split each element in `str` into substrings. `pattern` defines the delimiters that separate the inputs into tokens. The input data between the matches become the fields themselves.

Usage

```
stri_split(str, ..., regex, fixed, coll, charclass)

stri_split_fixed(
  str,
  pattern,
  n = -1L,
  omit_empty = FALSE,
  tokens_only = FALSE,
  simplify = FALSE,
  ...,
  opts_fixed = NULL
)

stri_split_regex(
  str,
  pattern,
  n = -1L,
  omit_empty = FALSE,
  tokens_only = FALSE,
  simplify = FALSE,
  ...,
  opts_regex = NULL
)

stri_split_coll(
  str,
  pattern,
  n = -1L,
  omit_empty = FALSE,
  tokens_only = FALSE,
  simplify = FALSE,
  ...,
  opts_collator = NULL
)

stri_split_charclass(
  str,
  pattern,
  n = -1L,
  omit_empty = FALSE,
  tokens_only = FALSE,
  simplify = FALSE
)
```

Arguments

str	character vector; strings to search in

`...` supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, `opts_fixed`, and so on

`pattern`, `regex`, `fixed`, `coll`, `charclass`
character vector; search patterns; for more details refer to stringi-search

`n` integer vector, maximal number of strings to return, and, at the same time, maximal number of text boundaries to look for

`omit_empty` logical vector; determines whether empty tokens should be removed from the result (`TRUE` or `FALSE`) or replaced with `NA`s (`NA`)

`tokens_only` single logical value; may affect the result if `n` is positive, see Details

`simplify` single logical value; if `TRUE` or `NA`, then a character matrix is returned; otherwise (the default), a list of character vectors is given, see Value

`opts_collator`, `opts_fixed`, `opts_regex`
a named list used to tune up the search engine's settings; see `stri_opts_collator`, `stri_opts_fixed`, and `stri_opts_regex`, respectively; `NULL` for the defaults

Details

Vectorized over `str`, `pattern`, `n`, and `omit_empty` (with recycling of the elements in the shorter vector if necessary).

If `n` is negative, then all pieces are extracted. Otherwise, if `tokens_only` is `FALSE` (which is the default), then `n-1` tokens are extracted (if possible) and the `n`-th string gives the remainder (see Examples). On the other hand, if `tokens_only` is `TRUE`, then only full tokens (up to `n` pieces) are extracted.

`omit_empty` is applied during the split process: if it is set to `TRUE`, then tokens of zero length are ignored. Thus, empty strings will never appear in the resulting vector. On the other hand, if `omit_empty` is `NA`, then empty tokens are substituted with missing strings.

Empty search patterns are not supported. If you wish to split a string into individual characters, use, e.g., `stri_split_boundaries(str, type='character')` for THE Unicode way.

`stri_split` is a convenience function. It calls either `stri_split_regex`, `stri_split_fixed`, `stri_split_coll`, or `stri_split_charclass`, depending on the argument used.

Value

If `simplify=FALSE` (the default), then the functions return a list of character vectors.

Otherwise, `stri_list2matrix` with `byrow=TRUE` and `n_min=n` arguments is called on the resulting object. In such a case, a character matrix with an appropriate number of rows (according to the length of `str`, `pattern`, etc.) is returned. Note that `stri_list2matrix`'s `fill` argument is set to an empty string and `NA`, for `simplify` equal to `TRUE` and `NA`, respectively.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_split: about_search, stri_split_boundaries(), stri_split_lines()

Examples

```
stri_split_fixed('a_b_c_d', '_')
stri_split_fixed('a_b_c__d', '_')
stri_split_fixed('a_b_c__d', '_', omit_empty=TRUE)
stri_split_fixed('a_b_c__d', '_', n=2, tokens_only=FALSE) # 'a' & remainder
stri_split_fixed('a_b_c__d', '_', n=2, tokens_only=TRUE) # 'a' & 'b' only
stri_split_fixed('a_b_c__d', '_', n=4, omit_empty=TRUE, tokens_only=TRUE)
stri_split_fixed('a_b_c__d', '_', n=4, omit_empty=FALSE, tokens_only=TRUE)
stri_split_fixed('a_b_c__d', '_', omit_empty=NA)
stri_split_fixed(c('ab_c', 'd_ef_g', 'h', ''), '_', n=1, tokens_only=TRUE, omit_empty=TRUE)
stri_split_fixed(c('ab_c', 'd_ef_g', 'h', ''), '_', n=2, tokens_only=TRUE, omit_empty=TRUE)
stri_split_fixed(c('ab_c', 'd_ef_g', 'h', ''), '_', n=3, tokens_only=TRUE, omit_empty=TRUE)

stri_list2matrix(stri_split_fixed(c('ab,c', 'd,ef,g', ',h', ''), ',', omit_empty=TRUE))
stri_split_fixed(c('ab,c', 'd,ef,g', ',h', ''), ',', omit_empty=FALSE, simplify=TRUE)
stri_split_fixed(c('ab,c', 'd,ef,g', ',h', ''), ',', omit_empty=NA, simplify=TRUE)
stri_split_fixed(c('ab,c', 'd,ef,g', ',h', ''), ',', omit_empty=TRUE, simplify=TRUE)
stri_split_fixed(c('ab,c', 'd,ef,g', ',h', ''), ',', omit_empty=NA, simplify=NA)

stri_split_regex(c('ab,c', 'd,ef  ,  g', ',  h', ''),
   '\\p{WHITE_SPACE}*,\\p{WHITE_SPACE}*', omit_empty=NA, simplify=TRUE)

stri_split_charclass('Lorem ipsum dolor sit amet', '\\p{WHITE_SPACE}')
stri_split_charclass(' Lorem  ipsum dolor', '\\p{WHITE_SPACE}', n=3,
   omit_empty=c(FALSE, TRUE))

stri_split_regex('Lorem ipsum dolor sit amet',
   '\\p{Z}+') # see also stri_split_charclass
```

---

stri_split_boundaries *Split a String at Text Boundaries*

Description

This function locates text boundaries (like character, word, line, or sentence boundaries) and splits strings at the indicated positions.

Usage

```
stri_split_boundaries(
  str,
  n = -1L,
  tokens_only = FALSE,
  simplify = FALSE,
  ...,
  opts_brkiter = NULL
)
```

Arguments

str	character vector or an object coercible to
n	integer vector, maximal number of strings to return
tokens_only	single logical value; may affect the result if n is positive, see Details
simplify	single logical value; if TRUE or NA, then a character matrix is returned; otherwise (the default), a list of character vectors is given, see Value
...	additional settings for opts_brkiter
opts_brkiter	a named list with **ICU** BreakIterator's settings, see stri_opts_brkiter; NULL for the default break iterator, i.e., line_break

Details

Vectorized over str and n.

If n is negative (the default), then all text pieces are extracted.

Otherwise, if tokens_only is FALSE (which is the default), then n-1 tokens are extracted (if possible) and the n-th string gives the (non-split) remainder (see Examples). On the other hand, if tokens_only is TRUE, then only full tokens (up to n pieces) are extracted.

For more information on text boundary analysis performed by **ICU**'s BreakIterator, see stringi-search-boundaries.

Value

If simplify=FALSE (the default), then the functions return a list of character vectors.

Otherwise, stri_list2matrix with byrow=TRUE and n_min=n arguments is called on the resulting object. In such a case, a character matrix with length(str) rows is returned. Note that stri_list2matrix's fill argument is set to an empty string and NA, for simplify equal to TRUE and NA, respectively.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_split: about_search, stri_split(), stri_split_lines()

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_trans_tolower(), stri_unique(), stri_wrap()

Other text_boundaries: about_search, about_search_boundaries, stri_count_boundaries(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_lines(), stri_trans_tolower(), stri_wrap()

Examples

```
test <- 'The\u00a0above-mentioned    features are very useful. ' %s+%
   'Spam, spam, eggs, bacon, and spam. 123 456 789'
stri_split_boundaries(test, type='line')
stri_split_boundaries(test, type='word')
stri_split_boundaries(test, type='word', skip_word_none=TRUE)
stri_split_boundaries(test, type='word', skip_word_none=TRUE, skip_word_letter=TRUE)
stri_split_boundaries(test, type='word', skip_word_none=TRUE, skip_word_number=TRUE)
stri_split_boundaries(test, type='sentence')
stri_split_boundaries(test, type='sentence', skip_sentence_sep=TRUE)
stri_split_boundaries(test, type='character')

# a filtered break iterator with the new ICU:
stri_split_boundaries('Mr. Jones and Mrs. Brown are very happy.
So am I, Prof. Smith.', type='sentence', locale='en_US@ss=standard') # ICU >= 56 only
```

---

stri_split_lines *Split a String Into Text Lines*

Description

These functions split each character string in a given vector into text lines.

Usage

```
stri_split_lines(str, omit_empty = FALSE)

stri_split_lines1(str)
```

Arguments

str	character vector (stri_split_lines) or a single string (stri_split_lines1)
omit_empty	logical vector; determines whether empty strings should be removed from the result [stri_split_lines only]

Details

Vectorized over str and omit_empty.

omit_empty is applied when splitting. If set to TRUE, then empty strings will never appear in the resulting vector.

Newlines are represented with the Carriage Return (CR, 0x0D), Line Feed (LF, 0x0A), CRLF, or Next Line (NEL, 0x85) characters, depending on the platform. Moreover, the Unicode Standard defines two unambiguous separator characters, the Paragraph Separator (PS, 0x2029) and the Line Separator (LS, 0x2028). Sometimes also the Vertical Tab (VT, 0x0B) and the Form Feed (FF, 0x0C) are used for this purpose.

These **stringi** functions follow UTR#18 rules, where a newline sequence corresponds to the following regular expression: `(?:\u{D A}|(?!\u{D A})[\u{A}-\u{D}\u{85}\u{2028}\u{2029}]`. Each match serves as a text line separator.

Value

stri_split_lines returns a list of character vectors. If any input string is NA, then the corresponding list element is a single NA string.

stri_split_lines1(str) is equivalent to stri_split_lines(str[1])[[1]] (with default parameters), therefore it returns a character vector. Moreover, if the input string ends with a newline sequence, the last empty string is omitted from the file's contents into text lines.

Author(s)

Marek Gagolewski and other contributors

References

Unicode Newline Guidelines – Unicode Technical Report #13, https://www.unicode.org/standard/reports/tr13/tr13-5.html

Unicode Regular Expressions – Unicode Technical Standard #18, https://www.unicode.org/reports/tr18/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_split: about_search, stri_split(), stri_split_boundaries()

Other text_boundaries: about_search, about_search_boundaries, stri_count_boundaries(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_trans_tolower(), stri_wrap()

stri_sprintf *Format Strings*

Description

stri_sprintf (synonym: stri_string_format) is a Unicode-aware replacement for and enhancement of the built-in sprintf function. Moreover, stri_printf prints formatted strings.

Usage

```
stri_sprintf(
  format,
  ...,
  na_string = NA_character_,
  inf_string = "Inf",
  nan_string = "NaN",
  use_length = FALSE
)

stri_string_format(
  format,
  ...,
  na_string = NA_character_,
  inf_string = "Inf",
  nan_string = "NaN",
  use_length = FALSE
)

stri_printf(
  format,
  ...,
  file = "",
  sep = "\n",
  append = FALSE,
  na_string = "NA",
  inf_string = "Inf",
  nan_string = "NaN",
  use_length = FALSE
)
```

Arguments

format	character vector of format strings
...	vectors (coercible to integer, real, or character)
na_string	single string to represent missing values; if NA, missing values in ... result in the corresponding outputs be missing too; use "NA" for compatibility with base R

inf_string	single string to represent the (unsigned) infinity (NA allowed)
nan_string	single string to represent the not-a-number (NA allowed)
use_length	single logical value; should the number of code points be used when applying modifiers such as %20s instead of the total code point width?
file	see cat
sep	see cat
append	see cat

Details

Vectorized over format and all vectors passed via ....

Unicode code points may have various widths when printed on the console (compare stri_width). These functions, by default (see the use_length argument), take this into account.

These functions are not locale sensitive. For instance, numbers are always formatted in the "POSIX" style, e.g., -123456.789 (no thousands separator, dot as a fractional separator). Such a feature might be added at a later date, though.

All arguments passed via ... are evaluated. If some of them are unused, a warning is generated. Too few arguments result in an error.

Note that stri_printf treats missing values in ... as "NA" strings by default.

All format specifiers supported sprintf are also available here. For the formatting of integers and floating-point values, currently the system std::snprintf() is called, but this may change in the future. Format specifiers are normalized and necessary sanity checks are performed.

Supported conversion specifiers: dioxX (integers) feEgGaA (floats) and s (character strings). Supported flags: - (left-align), + (force output sign or blank when NaN or NA; numeric only), <space> (output minus or space for a sign; numeric only) 0 (pad with 0s; numeric only), # (alternative output of some numerics).

Value

stri_printf is used for its side effect, which is printing text on the standard output or other connection/file. Hence, it returns invisible(NULL).

The other functions return a character vector.

Author(s)

Marek Gagolewski and other contributors

References

printf in glibc, https://man.archlinux.org/man/printf.3

printf format strings – Wikipedia, https://en.wikipedia.org/wiki/Printf_format_string

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: `%s$%`, `stri_isempty()`, `stri_length()`, `stri_numbytes()`, `stri_pad_both()`, `stri_width()`

Examples

```
stri_printf("%4s=%.3f", c("e", "e\u00b2", "\u03c0", "\u03c0\u00b2"),
    c(exp(1), exp(2), pi, pi^2))

x <- c(
  "xxabcd",
  "xx\u0105\u0106\u0107\u0108",
  stri_paste(
    "\u200b\u200b\u200b\u200b",
    "\U0001F3F4\U000E0067\U000E0062\U000E0073\U000E0063\U000E0074\U000E007F",
    "abcd"
  ))
stri_printf("[%10s]", x)  # minimum width = 10
stri_printf("[%-10.3s]", x)  # output of max width = 3, but pad to width of 10
stri_printf("[%10s]", x, use_length=TRUE)  # minimum number of Unicode code points = 10

# vectorization wrt all arguments:
p <- runif(10)
stri_sprintf(ifelse(p > 0.5, "P(Y=1)=%1$.2f", "P(Y=0)=%2$.2f"), p, 1-p)

# using a "preformatted" logical vector:
x <- c(TRUE, FALSE, FALSE, NA, TRUE, FALSE)
stri_sprintf("%s) %s", letters[seq_along(x)], c("\u2718", "\u2713")[x+1])

# custom NA/Inf/NaN strings:
stri_printf("%+10.3f", c(-Inf, -0, 0, Inf, NaN, NA_real_),
    na_string="<NA>", nan_string="\U0001F4A9", inf_string="\u221E")

stri_sprintf("UNIX time %1$f is %1$s.", Sys.time())

# the following do not work in sprintf()
stri_sprintf("%1$#- *2$.*3$f", 1.23456, 10, 3)  # two asterisks
stri_sprintf(c("%s", "%f"), pi)  # re-coercion needed
stri_sprintf("%1$s is %1$f UNIX time.", Sys.time())  # re-coercion needed
stri_sprintf(c("%d", "%s"), factor(11:12))  # re-coercion needed
stri_sprintf(c("%s", "%d"), factor(11:12))  # re-coercion needed
```

`stri_startswith` *Determine if the Start or End of a String Matches a Pattern*

Description

These functions check if a string starts or ends with a match to a given pattern. Also, it is possible to check if there is a match at a specific position.

Usage

```
stri_startswith(str, ..., fixed, coll, charclass)

stri_endswith(str, ..., fixed, coll, charclass)

stri_startswith_fixed(
  str,
  pattern,
  from = 1L,
  negate = FALSE,
  ...,
  opts_fixed = NULL
)

stri_endswith_fixed(
  str,
  pattern,
  to = -1L,
  negate = FALSE,
  ...,
  opts_fixed = NULL
)

stri_startswith_charclass(str, pattern, from = 1L, negate = FALSE)

stri_endswith_charclass(str, pattern, to = -1L, negate = FALSE)

stri_startswith_coll(
  str,
  pattern,
  from = 1L,
  negate = FALSE,
  ...,
  opts_collator = NULL
)

stri_endswith_coll(
  str,
  pattern,
  to = -1L,
  negate = FALSE,
  ...,
  opts_collator = NULL
```

)

Arguments

str	character vector
...	supplementary arguments passed to the underlying functions, including additional settings for opts_collator, opts_fixed, and so on.
pattern, fixed, coll, charclass	character vector defining search patterns; for more details refer to stringi-search
from	integer vector
negate	single logical value; whether a no-match to a pattern is rather of interest
to	integer vector
opts_collator, opts_fixed	a named list used to tune up the search engine's settings; see stri_opts_collator and stri_opts_fixed, respectively; NULL for the defaults

Details

Vectorized over str, pattern, and from or to (with recycling of the elements in the shorter vector if necessary).

If pattern is empty, then the result is NA and a warning is generated.

Argument start controls the start position in str where there is a match to a pattern. to gives the end position.

Indexes given by from or to are of course 1-based, i.e., an index 1 denotes the first character in a string. This gives a typical R look-and-feel.

For negative indexes in from or to, counting starts at the end of the string. For instance, index -1 denotes the last code point in the string.

If you wish to test for a pattern match at an arbitrary position in str, use stri_detect.

stri_startswith and stri_endswith are convenience functions. They call either stri_*_fixed, stri_*_coll, or stri_*_charclass, depending on the argument used. Relying on these underlying functions directly will make your code run slightly faster.

Note that testing for a pattern match at the start or end of a string has not been implemented separately for regex patterns. For that you may use the '^' and '$' meta-characters, see stringi-search-regex.

Value

Each function returns a logical vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_detect: about_search, stri_detect()

Examples

```
stri_startswith_charclass(' trim me! ', '\\p{WSpace}')
stri_startswith_fixed(c('a1', 'a2', 'b3', 'a4', 'c5'), 'a')
stri_detect_regex(c('a1', 'a2', 'b3', 'a4', 'c5'), '^a')
stri_startswith_fixed('ababa', 'ba')
stri_startswith_fixed('ababa', 'ba', from=2)
stri_startswith_coll(c('a1', 'A2', 'b3', 'A4', 'C5'), 'a', strength=1)
pat <- stri_paste('\u0635\u0644\u0649 \u0627\u0644\u0644\u0647 ',
                  '\u0639\u0644\u064a\u0647 \u0648\u0633\u0644\u0645XYZ')
stri_endswith_coll('\ufdfa\ufdfa\ufdfaXYZ', pat, strength=1)
```

---

stri_stats_general *General Statistics for a Character Vector*

Description

This function gives general statistics for a character vector, e.g., obtained by loading a text file with the readLines or stri_read_lines function, where each text line' is represented by a separate string.

Usage

```
stri_stats_general(str)
```

Arguments

str	character vector to be aggregated

Details

None of the strings may contain \r or \n characters, otherwise you will get at error.

Below by 'white space' we mean the Unicode binary property WHITE_SPACE, see stringi-search-charclass.

Value

Returns an integer vector with the following named elements:

1. `Lines` - number of lines (number of non-missing strings in the vector);
2. `LinesNEmpty` - number of lines with at least one non-`WHITE_SPACE` character;
3. `Chars` - total number of Unicode code points detected;
4. `CharsNWhite` - number of Unicode code points that are not `WHITE_SPACE`s;
5. ... (Other stuff that may appear in future releases of **stringi**).

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other stats: `stri_stats_latex()`

Examples

```
s <- c('Lorem ipsum dolor sit amet, consectetur adipisicing elit.',
       'nibh augue, suscipit a, scelerisque sed, lacinia in, mi.',
       'Cras vel lorem. Etiam pellentesque aliquet tellus.',
       '')
stri_stats_general(s)
```

`stri_stats_latex` *Statistics for a Character Vector Containing LaTeX Commands*

Description

This function gives LaTeX-oriented statistics for a character vector, e.g., obtained by loading a text file with the `readLines` function, where each text line is represented by a separate string.

Usage

```
stri_stats_latex(str)
```

Arguments

`str`	character vector to be aggregated

Details

We use a slightly modified LaTeX Word Count algorithm implemented in Kile 2.1.3, see https://kile.sourceforge.io/team.php for the original contributors.

Value

Returns an integer vector with the following named elements:

1. `CharsWord` - number of word characters;
2. `CharsCmdEnvir` - command and words characters;
3. `CharsWhite` - LaTeX white spaces, including { and } in some contexts;
4. `Words` - number of words;
5. `Cmds` - number of commands;
6. `Envirs` - number of environments;
7. ... (Other stuff that may appear in future releases of **stringi**).

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other stats: `stri_stats_general()`

Examples

```
s <- c('Lorem \\textbf{ipsum} dolor sit \\textit{amet}, consectetur adipisicing elit.',
    '\\begin{small}Proin nibh augue,\\end{small} suscipit a, scelerisque sed, lacinia in, mi.',
      '')
stri_stats_latex(s)
```

`stri_sub` *Extract a Substring From or Replace a Substring In a Character Vector*

Description

`stri_sub` extracts particular substrings at code point-based index ranges provided. Its replacement version allows to substitute (in-place) parts of a string with given replacement strings. `stri_sub_replace` is its forward pipe operator-friendly variant that returns a copy of the input vector.

For extracting/replacing multiple substrings from/within each string, see `stri_sub_all`.

Usage

```
stri_sub(
  str,
  from = 1L,
  to = -1L,
  length,
  use_matrix = TRUE,
  ignore_negative_length = FALSE
)

stri_sub(str, from = 1L, to = -1L, length, omit_na = FALSE, use_matrix = TRUE) <- value

stri_sub_replace(..., replacement, value = replacement)
```

Arguments

str	character vector
from	integer vector giving the start indexes; alternatively, if use_matrix=TRUE, a two-column matrix of type cbind(from, to) (unnamed columns or the 2nd column named other than length) or cbind(from, length=length) (2nd column named length)
to	integer vector giving the end indexes; mutually exclusive with length and from being a matrix
length	integer vector giving the substring lengths; mutually exclusive with to and from being a matrix
use_matrix	single logical value; see from
ignore_negative_length	single logical value; whether negative lengths should be ignored or result in missing values
omit_na	single logical value; indicates whether missing values in any of the indexes or in value leave the corresponding input string unchanged [replacement function only]
value	a character vector defining the replacement strings [replacement function only]
...	arguments to be passed to stri_sub<-
replacement	alias of value [wherever applicable]

Details

Vectorized over str, [value], from and (to or length). Parameters to and length are mutually exclusive.

Indexes are 1-based, i.e., the start of a string is at index 1. For negative indexes in from or to, counting starts at the end of the string. For instance, index -1 denotes the last code point in the string. Non-positive length gives an empty string.

Argument from gives the start of a substring to extract. Argument to defines the last index of a substring, inclusive. Alternatively, its length may be provided.

If from is a two-column matrix, then these two columns are used as from and to, respectively, unless the second column is named length. In such a case anything passed explicitly as to or length is ignored. Such types of index matrices are generated by stri_locate_first and stri_locate_last. If extraction based on stri_locate_all is needed, see stri_sub_all.

In stri_sub, out-of-bound indexes are silently corrected. If from > to, then an empty string is returned. By default, negative length results in the corresponding output being NA, see ignore_negative_length, though.

In stri_sub<-, some configurations of indexes may work as substring 'injection' at the front, back, or in middle. Negative length does not alter the corresponding input string.

If both to and length are provided, length has priority over to.

Note that for some Unicode strings, the extracted substrings might not be well-formed, especially if input strings are not normalized (see stri_trans_nfc), include byte order marks, Bidirectional text marks, and so on. Handle with care.

Value

stri_sub and stri_sub_replace return a character vector. stri_sub<- changes the str object 'in-place'.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other indexing: stri_locate_all(), stri_locate_all_boundaries(), stri_sub_all()

Examples

```
s <- c("spam, spam, bacon, and spam", "eggs and spam")
stri_sub(s, from=-4)
stri_sub(s, from=1, length=c(10, 4))
(stri_sub(s, 1, 4) <- 'stringi')

x <- c('12 3456 789', 'abc', '', NA, '667')
stri_sub(x, stri_locate_first_regex(x, '[0-9]+')) # see stri_extract_first
stri_sub(x, stri_locate_last_regex(x, '[0-9]+'))  # see stri_extract_last

stri_sub_replace(x, stri_locate_first_regex(x, '[0-9]+'),
    omit_na=TRUE, replacement='***') # see stri_replace_first
stri_sub_replace(x, stri_locate_last_regex(x, '[0-9]+'),
    omit_na=TRUE, replacement='***') # see stri_replace_last


## Not run: x |> stri_sub_replace(1, 5, replacement='new_substring')
```

stri_sub_all *Extract or Replace Multiple Substrings*

Description

stri_sub_all extracts multiple substrings from each string. Its replacement version substitutes (in-place) multiple substrings with the corresponding replacement strings. stri_sub_replace_all (alias stri_sub_all_replace) is its forward pipe operator-friendly variant, returning a copy of the input vector.

For extracting/replacing single substrings from/within each string, see stri_sub.

Usage

```
stri_sub_all(
  str,
  from = list(1L),
  to = list(-1L),
  length,
  use_matrix = TRUE,
  ignore_negative_length = TRUE
)

stri_sub_all(
  str,
  from = list(1L),
  to = list(-1L),
  length,
  omit_na = FALSE,
  use_matrix = TRUE
) <- value

stri_sub_replace_all(..., replacement, value = replacement)

stri_sub_all_replace(..., replacement, value = replacement)
```

Arguments

str	character vector
from	list of integer vector giving the start indexes; alternatively, if use_matrix=TRUE, a list of two-column matrices of type cbind(from, to) (unnamed columns or the 2nd column named other than length) or cbind(from, length=length) (2nd column named length)
to	list of integer vectors giving the end indexes
length	list of integer vectors giving the substring lengths
use_matrix	single logical value; see from

ignore_negative_length
: single logical value; whether negative lengths should be ignored or result in missing values

omit_na
: single logical value; indicates whether missing values in any of the indexes or in value leave the part of the corresponding input string unchanged [replacement function only]

value
: a list of character vectors defining the replacement strings [replacement function only]

...
: arguments to be passed to stri_sub_all<-

replacement
: alias of value [wherever applicable]

Details

Vectorized over str, [value], from and (to or length). Just like in stri_sub, parameters to and length are mutually exclusive.

In one of the simplest scenarios, stri_sub_all(str, from, to), the i-th element of the resulting list generated like stri_sub(str[i], from[[i]], to[[i]]). As usual, if one of the inputs is shorter than the others, recycling rule is applied.

If any of from, to, length, or value is not a list, it is wrapped into a list.

If from consists of a two-column matrix, then these two columns are used as from and to, respectively, unless the second column is named length. Such types of index matrices are generated by stri_locate_all. If extraction or replacement based on stri_locate_first or stri_locate_last is needed, see stri_sub.

In the replacement function, the index ranges must be sorted with respect to from and must be mutually disjoint. Negative length does not result in any altering of the corresponding input string. On the other hand, in stri_sub_all, this make the corresponding chunk be ignored, see ignore_negative_length, though.

Value

stri_sub_all returns a list of character vectors. Its replacement versions modify the input 'in-place'.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other indexing: stri_locate_all(), stri_locate_all_boundaries(), stri_sub()

Examples

```
x <- c('12 3456 789', 'abc', '', NA, '667')
stri_sub_all(x, stri_locate_all_regex(x, '[0-9]+')) # see stri_extract_all
stri_sub_all(x, stri_locate_all_regex(x, '[0-9]+', omit_no_match=TRUE))

stri_sub_all(x, stri_locate_all_regex(x, '[0-9]+', omit_no_match=TRUE)) <- '***'
print(x)

stri_sub_replace_all('a b c', c(1, 3, 5), c(1, 3, 5), replacement=c('A', 'B', 'C'))
```

---

stri_subset *Select Elements that Match a Given Pattern*

Description

These functions return or modify a sub-vector where there is a match to a given pattern. In other words, they are roughly equivalent (but faster and easier to use) to a call to `str[stri_detect(str, ...)]` or `str[stri_detect(str, ...)] <- value`.

Usage

```
stri_subset(str, ..., regex, fixed, coll, charclass)

stri_subset(str, ..., regex, fixed, coll, charclass) <- value

stri_subset_fixed(
  str,
  pattern,
  omit_na = FALSE,
  negate = FALSE,
  ...,
  opts_fixed = NULL
)

stri_subset_fixed(str, pattern, negate=FALSE, ..., opts_fixed=NULL) <- value

stri_subset_charclass(str, pattern, omit_na = FALSE, negate = FALSE)

stri_subset_charclass(str, pattern, negate=FALSE) <- value

stri_subset_coll(
  str,
  pattern,
  omit_na = FALSE,
  negate = FALSE,
```

```
  ...,
  opts_collator = NULL
)

stri_subset_coll(str, pattern, negate=FALSE, ..., opts_collator=NULL) <- value

stri_subset_regex(
  str,
  pattern,
  omit_na = FALSE,
  negate = FALSE,
  ...,
  opts_regex = NULL
)

stri_subset_regex(str, pattern, negate=FALSE, ..., opts_regex=NULL) <- value
```

Arguments

`str`	character vector; strings to search within
`...`	supplementary arguments passed to the underlying functions, including additional settings for `opts_collator`, `opts_regex`, `opts_fixed`, and so on
`value`	non-empty character vector of replacement strings; replacement function only
`pattern`, `regex`, `fixed`, `coll`, `charclass`	character vector; search patterns (no more than the length of `str`); for more details refer to stringi-search
`omit_na`	single logical value; should missing values be excluded from the result?
`negate`	single logical value; whether a no-match is rather of interest
`opts_collator`, `opts_fixed`, `opts_regex`	a named list used to tune up the search engine's settings; see `stri_opts_collator`, `stri_opts_fixed`, and `stri_opts_regex`, respectively; `NULL` for the defaults

Details

Vectorized over `str` as well as partially over `pattern` and `value`, with recycling of the elements in the shorter vector if necessary. As the aim here is to subset `str`, `pattern` cannot be longer than the former. Moreover, if the number of items to replace is not a multiple of length of `value`, a warning is emitted and the unused elements are ignored. Hence, the length of the output will be the same as length of `str`.

`stri_subset` and `stri_subset<-` are convenience functions. They call either `stri_subset_regex`, `stri_subset_fixed`, `stri_subset_coll`, or `stri_subset_charclass`, depending on the argument used.

Value

The `stri_subset_*` functions return a character vector. As usual, the output encoding is UTF-8.

The `stri_subset_*<-` functions modifies `str` 'in-place'.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_subset: about_search

Examples

```
stri_subset_regex(c('stringi R', '123', 'ID456', ''), '^[0-9]+$')

x <- c('stringi R', '123', 'ID456', '')
`stri_subset_regex<-`(x, '[0-9]+$', negate=TRUE, value=NA)  # returns a copy
stri_subset_regex(x, '[0-9]+$') <- NA  # modifies `x` in-place
print(x)
```

---

stri_timezone_get *Set or Get Default Time Zone in* **stringi**

Description

`stri_timezone_set` changes the current default time zone for all functions in the **stringi** package, i.e., establishes the meaning of the "`NULL` time zone" argument to date/time processing functions.

`stri_timezone_get` gets the current default time zone.

For more information on time zone representation in **ICU** and **stringi**, refer to `stri_timezone_list`.

Usage

```
stri_timezone_get()

stri_timezone_set(tz)
```

Arguments

`tz`	single string; time zone identifier

Details

Unless the default time zone has already been set using `stri_timezone_set`, the default time zone is determined by querying the OS with methods in **ICU**'s internal platform utilities.

Value

`stri_timezone_set` returns a string with previously used timezone, invisibly.

`stri_timezone_get` returns a single string with the current default time zone.

Author(s)

Marek Gagolewski and other contributors

References

TimeZone class – ICU API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/classicu_1_1TimeZone.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: `stri_datetime_add()`, `stri_datetime_create()`, `stri_datetime_fields()`, `stri_datetime_format()`, `stri_datetime_fstr()`, `stri_datetime_now()`, `stri_datetime_symbols()`, `stri_timezone_info()`, `stri_timezone_list()`

Other timezone: `stri_timezone_info()`, `stri_timezone_list()`

Examples

```
## Not run:
oldtz <- stri_timezone_set('Europe/Warsaw')
# ... many time zone-dependent operations
stri_timezone_set(oldtz) # restore previous default time zone

## End(Not run)
```

---

stri_timezone_info *Query a Given Time Zone*

Description

Provides some basic information on a given time zone identifier.

Usage

```
stri_timezone_info(tz = NULL, locale = NULL, display_type = "long")
```

Arguments

tz	NULL or '' for default time zone, or a single string with time zone ID otherwise
locale	NULL or '' for default locale, or a single string with locale identifier
display_type	single string; one of 'short', 'long', 'generic_short', 'generic_long', 'gmt_short', 'gmt_long', 'common', 'generic_location'

Details

Used to fetch basic information on any supported time zone.

For more information on time zone representation in **ICU**, see stri_timezone_list.

Value

Returns a list with the following named components:

1. ID (time zone identifier),
2. Name (localized human-readable time zone name),
3. Name.Daylight (localized human-readable time zone name when DST is used, if available),
4. Name.Windows (Windows time zone ID, if available),
5. RawOffset (raw GMT offset, in hours, before taking daylight savings into account), and
6. UsesDaylightTime (states whether a time zone uses daylight savings time in the current Gregorian calendar year).

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_create(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_list()

Other timezone: stri_timezone_get(), stri_timezone_list()

Examples

```
stri_timezone_info()
stri_timezone_info(locale='sk_SK')
sapply(c('short', 'long', 'generic_short', 'generic_long',
         'gmt_short', 'gmt_long', 'common', 'generic_location'),
  function(e) stri_timezone_info('Europe/London', display_type=e))
```

`stri_timezone_list` *List Available Time Zone Identifiers*

Description

Returns a list of available time zone identifiers.

Usage

```
stri_timezone_list(region = NA_character_, offset = NA_integer_)
```

Arguments

`region`	single string; a ISO 3166 two-letter country code or UN M.49 three-digit area code; `NA` for all regions
`offset`	single numeric value; a given raw offset from GMT, in hours; `NA` for all offsets

Details

If `offset` and `region` are `NA` (the default), then all time zones are returned. Otherwise, only time zone identifiers with a given raw offset from GMT and/or time zones corresponding to a given region are provided. Note that the effect of daylight savings time is ignored.

A time zone represents an offset applied to the Greenwich Mean Time (GMT) to obtain local time (Universal Coordinated Time, or UTC, is similar, but not precisely identical, to GMT; in **ICU** the two terms are used interchangeably since **ICU** does not concern itself with either leap seconds or historical behavior). The offset might vary throughout the year, if daylight savings time (DST) is used, or might be the same all year long. Typically, regions closer to the equator do not use DST. If DST is in use, then specific rules define the point where the offset changes and the amount by which it changes.

If DST is observed, then three additional bits of information are needed:

1. The precise date and time during the year when DST begins. In the first half of the year it is in the northern hemisphere, and in the second half of the year it is in the southern hemisphere.
2. The precise date and time during the year when DST ends. In the first half of the year it is in the southern hemisphere, and in the second half of the year it is in the northern hemisphere.
3. The amount by which the GMT offset changes when DST is in effect. This is almost always one hour.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

References

TimeZone class – ICU API Documentation, https://unicode-org.github.io/icu-docs/apidoc/dev/icu4c/classicu_1_1TimeZone.html

ICU TimeZone classes – ICU User Guide, https://unicode-org.github.io/icu/userguide/datetime/timezone/

Date/Time Services – ICU User Guide, https://unicode-org.github.io/icu/userguide/datetime/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other datetime: stri_datetime_add(), stri_datetime_create(), stri_datetime_fields(), stri_datetime_format(), stri_datetime_fstr(), stri_datetime_now(), stri_datetime_symbols(), stri_timezone_get(), stri_timezone_info()

Other timezone: stri_timezone_get(), stri_timezone_info()

Examples

```
stri_timezone_list()
stri_timezone_list(offset=1)
stri_timezone_list(offset=5.5)
stri_timezone_list(offset=5.75)
stri_timezone_list(region='PL')
stri_timezone_list(region='US', offset=-10)

# Fetch information on all time zones
do.call(rbind.data.frame,
   lapply(stri_timezone_list(), function(tz) stri_timezone_info(tz)))
```

---

stri_trans_char *Translate Characters*

Description

Translates Unicode code points in each input string.

Usage

```
stri_trans_char(str, pattern, replacement)
```

Arguments

str	character vector
pattern	a single character string providing code points to be translated
replacement	a single character string giving translated code points

Details

Vectorized over `str` and with respect to each code point in `pattern` and `replacement`.

If `pattern` and `replacement` consist of a different number of code points, then the extra code points in the longer of the two are ignored, with a warning.

If code points in a given `pattern` are not unique, the last corresponding replacement code point is used.

Time complexity for each string in `str` is O(`stri_length(str)*stri_length(pattern)`).

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other transform: `stri_trans_general()`, `stri_trans_list()`, `stri_trans_nfc()`, `stri_trans_tolower()`

Examples

```
stri_trans_char('id.123', '.', '_')
stri_trans_char('babaab', 'ab', '01')
stri_trans_char('GCUACGGAGCUUCGGAGCUAG', 'ACGT', 'TGCA')
```

---

stri_trans_general *General Text Transforms, Including Transliteration*

Description

ICU General transforms provide different ways for processing Unicode text. They are useful in handling a variety of different tasks, including:

- locale-independent upper case, lower case, title case, full/halfwidth conversions,
- normalization,
- hex and character name conversions,
- script to script conversion/transliteration.

Usage

```
stri_trans_general(str, id, rules = FALSE, forward = TRUE)
```

Arguments

str	character vector
id	a single string with transform identifier, see stri_trans_list, or custom transliteration rules
rules	if TRUE, treat id as a string with semicolon-separated transliteration rules (see the **ICU** manual);
forward	transliteration direction (TRUE for forward, FALSE for reverse)

Details

ICU Transforms were mainly designed to transliterate characters from one script to another (for example, from Greek to Latin, or Japanese Katakana to Latin). However, these services are also capable of handling a much broader range of tasks. In particular, the Transforms include prebuilt transformations for case conversions, for normalization conversions, for the removal of given characters, and also for a variety of language and script transliterations. Transforms can be chained together to perform a series of operations and each step of the process can use a UnicodeSet to restrict the characters that are affected.

To get the list of available transforms, call stri_trans_list.

Note that transliterators are often combined in sequence to achieve a desired transformation. This is analogous to the composition of mathematical functions. For example, given a script that converts lowercase ASCII characters from Latin script to Katakana script, it is convenient to first (1) separate input base characters and accents, and then (2) convert uppercase to lowercase. To achieve this, a compound transform can be specified as follows: NFKD; Lower; Latin-Katakana; (with the default rules=FALSE).

Custom rule-based transliteration is also supported, see the **ICU** manual and below for some examples.

Transliteration is not dependent on the current locale.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

References

General Transforms – ICU User Guide, https://unicode-org.github.io/icu/userguide/transforms/general/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other transform: stri_trans_char(), stri_trans_list(), stri_trans_nfc(), stri_trans_tolower()

Examples

```
stri_trans_general('gro\u00df', 'latin-ascii')
stri_trans_general('stringi', 'latin-greek')
stri_trans_general('stringi', 'latin-cyrillic')
stri_trans_general('stringi', 'upper') # see stri_trans_toupper
stri_trans_general('\u0104', 'nfd; lower') # compound id; see stri_trans_nfd
stri_trans_general('Marek G\u0105golewski', 'pl-pl_FONIPA')
stri_trans_general('\u2620', 'any-name') # character name
stri_trans_general('\\N{latin small letter a}', 'name-any') # decode name
stri_trans_general('\u2620', 'hex/c') # to hex
stri_trans_general("\u201C\u2026\u201D \u0105\u015B\u0107\u017C",
    "NFKD; NFC; [^\\p{L}] latin-ascii")

x <- "\uC885\uB85C\uAD6C \uC0AC\uC9C1\uB3D9"
stringi::stri_trans_general(x, "Hangul-Latin")
# Deviate from the ICU rules of romanisation of Korean,
# see https://en.wikipedia.org/wiki/Romanization_of_Korean
id <- "
    :: NFD;
    \u11A8 > k;
    \u11AE > t;
    \u11B8 > p;
    \u1105 > r;
    :: Hangul-Latin;
"
stringi::stri_trans_general(x, id, rules=TRUE)
```

---

stri_trans_list *List Available Text Transforms and Transliterators*

Description

Returns a list of available text transform identifiers. Each of them may be used in `stri_trans_general` tasks.

Usage

```
stri_trans_list()
```

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

References

General Transforms – ICU User Guide, https://unicode-org.github.io/icu/userguide/transforms/general/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other transform: stri_trans_char(), stri_trans_general(), stri_trans_nfc(), stri_trans_tolower()

Examples

```
stri_trans_list()
```

---

stri_trans_nfc *Perform or Check For Unicode Normalization*

Description

These functions convert strings to NFC, NFKC, NFD, NFKD, or NFKC_Casefold Unicode Normalization Form or check whether strings are normalized.

Usage

```
stri_trans_nfc(str)

stri_trans_nfd(str)

stri_trans_nfkd(str)

stri_trans_nfkc(str)

stri_trans_nfkc_casefold(str)

stri_trans_isnfc(str)

stri_trans_isnfd(str)

stri_trans_isnfkd(str)

stri_trans_isnfkc(str)

stri_trans_isnfkc_casefold(str)
```

Arguments

`str`	character vector to be encoded

Details

Unicode Normalization Forms are formally defined normalizations of Unicode strings which, e.g., make possible to determine whether any two strings are equivalent. Essentially, the Unicode Normalization Algorithm puts all combining marks in a specified order, and uses rules for decomposition and composition to transform each string into one of the Unicode Normalization Forms.

The following Normalization Forms (NFs) are supported:

- NFC (Canonical Decomposition, followed by Canonical Composition),
- NFD (Canonical Decomposition),
- NFKC (Compatibility Decomposition, followed by Canonical Composition),
- NFKD (Compatibility Decomposition),
- NFKC_Casefold (combination of NFKC, case folding, and removing ignorable characters which was introduced with Unicode 5.2).

Note that many W3C Specifications recommend using NFC for all content, because this form avoids potential interoperability problems arising from the use of canonically equivalent, yet different, character sequences in document formats on the Web. Thus, you will rather not use these functions in typical string processing activities. Most often you may assume that a string is in NFC, see RFC5198.

As usual in **stringi**, if the input character vector is in the native encoding, it will be automatically converted to UTF-8.

For more general text transforms refer to `stri_trans_general`.

Value

The `stri_trans_nf*` functions return a character vector of the same length as input (the output is always in UTF-8).

`stri_trans_isnf*` return a logical vector.

Author(s)

Marek Gagolewski and other contributors

References

Unicode Normalization Forms – Unicode Standard Annex #15, https://unicode.org/reports/tr15/

Unicode Format for Network Interchange – RFC5198, https://www.rfc-editor.org/rfc/rfc5198

Character Model for the World Wide Web 1.0: Normalization – W3C Working Draft, https://www.w3.org/TR/charmod-norm/

Normalization – ICU User Guide, https://unicode-org.github.io/icu/userguide/transforms/normalization/ (technical details)

Unicode Equivalence – Wikipedia, https://en.wikipedia.org/wiki/Unicode_equivalence

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other transform: stri_trans_char(), stri_trans_general(), stri_trans_list(), stri_trans_tolower()

Examples

```
stri_trans_nfd('\u0105') # a with ogonek -> a, ogonek
stri_trans_nfkc('\ufdfa') # 1 codepoint -> 18 codepoints
```

---

stri_trans_tolower *Transform Strings with Case Mapping or Folding*

Description

These functions transform strings either to lower case, UPPER CASE, or Title Case or perform case folding.

Usage

```
stri_trans_tolower(str, locale = NULL)

stri_trans_toupper(str, locale = NULL)

stri_trans_casefold(str)

stri_trans_totitle(str, ..., opts_brkiter = NULL)
```

Arguments

str	character vector
locale	NULL or '' for case mapping following the conventions of the default locale, or a single string with locale identifier, see stringi-locale.
...	additional settings for opts_brkiter
opts_brkiter	a named list with **ICU** BreakIterator's settings, see stri_opts_brkiter; NULL for default break iterator, i.e., word; stri_trans_totitle only

Details

Vectorized over str.

ICU implements full Unicode string case mappings. It is worth noting that, generally, case mapping:

- can change the number of code points and/or code units of a string,

- is language-sensitive (results may differ depending on the locale), and
- is context-sensitive (a character in the input string may map differently depending on surrounding characters).

With `stri_trans_totitle`, if `word BreakIterator` is used (the default), then the first letter of each word will be capitalized and the rest will be transformed to lower case. With the break iterator of type `sentence`, the first letter of each sentence will be capitalized only. Note that according the **ICU** User Guide, the string `'one. two. three.'` consists of one sentence.

Case folding, on the other hand, is locale-independent. Its purpose is to make two pieces of text that differ only in case identical. This may come in handy when comparing strings.

For more general (but not locale dependent) text transforms refer to `stri_trans_general`.

Value

Each function returns a character vector.

Author(s)

Marek Gagolewski and other contributors

References

Case Mappings – ICU User Guide, https://unicode-org.github.io/icu/userguide/transforms/casemappings.html

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: `%s<%`, `about_locale`, `about_search_boundaries`, `about_search_coll`, `stri_compare()`, `stri_count_boundaries()`, `stri_duplicated()`, `stri_enc_detect2()`, `stri_extract_all_boundar`
`stri_locate_all_boundaries()`, `stri_opts_collator()`, `stri_order()`, `stri_rank()`, `stri_sort()`, `stri_sort_key()`, `stri_split_boundaries()`, `stri_unique()`, `stri_wrap()`

Other transform: `stri_trans_char()`, `stri_trans_general()`, `stri_trans_list()`, `stri_trans_nfc()`

Other text_boundaries: `about_search`, `about_search_boundaries`, `stri_count_boundaries()`, `stri_extract_all_boundaries()`, `stri_locate_all_boundaries()`, `stri_opts_brkiter()`, `stri_split_boundaries()`, `stri_split_lines()`, `stri_wrap()`

Examples

```
stri_trans_toupper('\u00DF', 'de_DE') # small German Eszett / scharfes S
stri_cmp_eq(stri_trans_toupper('i', 'en_US'), stri_trans_toupper('i', 'tr_TR'))
stri_trans_toupper(c('abc', '123', '\u0105\u0104'))
stri_trans_tolower(c('AbC', '123', '\u0105\u0104'))
stri_trans_totitle(c('AbC', '123', '\u0105\u0104'))
stri_trans_casefold(c('AbC', '123', '\u0105\u0104'))
stri_trans_totitle('stringi is a FREE R pAcKaGe. WItH NO StrinGS attached.') # word boundary
stri_trans_totitle('stringi is a FREE R pAcKaGe. WItH NO StrinGS attached.', type='sentence')
```

stri_trim_both *Trim Characters from the Left and/or Right Side of a String*

Description

These functions may be used, e.g., to remove unnecessary white-spaces from strings. Trimming ends at the first or starts at the last `pattern` match.

Usage

```
stri_trim_both(str, pattern = "\\P{Wspace}", negate = FALSE)

stri_trim_left(str, pattern = "\\P{Wspace}", negate = FALSE)

stri_trim_right(str, pattern = "\\P{Wspace}", negate = FALSE)

stri_trim(
  str,
  side = c("both", "left", "right"),
  pattern = "\\P{Wspace}",
  negate = FALSE
)
```

Arguments

`str`	a character vector of strings to be trimmed
`pattern`	a single pattern, specifying the class of characters (see stringi-search-charclass) to to be preserved (if `negate` is `FALSE`; default) or trimmed (otherwise)
`negate`	either `TRUE` or `FALSE`; see `pattern`
`side`	character [`stri_trim` only]; defaults to `'both'`

Details

Vectorized over `str` and `pattern`.

`stri_trim` is a convenience wrapper over `stri_trim_left` and `stri_trim_right`.

Contrary to many other string processing libraries, our trimming functions are universal. The class of characters to be retained or trimmed can be adjusted.

For replacing pattern matches with an arbitrary replacement string, see `stri_replace`.

Trimming can also be used where you would normally rely on regular expressions. For instance, you may get `'23.5'` out of `'total of 23.5 bitcoins'`.

For trimming white-spaces, please note the difference between Unicode binary property '`\p{Wspace}`' (more universal) and general character category '`\p{Z}`', see stringi-search-charclass.

Value

All functions return a character vector.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other search_replace: about_search, stri_replace_all(), stri_replace_rstr()

Other search_charclass: about_search, about_search_charclass

Examples

```
stri_trim_left('              aaa')
stri_trim_right('r-project.org/', '\\P{P}')
stri_trim_both(' Total of 23.5 bitcoins. ', '\\p{N}')
stri_trim_both(' Total of 23.5 bitcoins. ', '\\P{N}', negate=TRUE)
```

---

stri_unescape_unicode *Un-escape All Escape Sequences*

Description

Un-escapes all known escape sequences.

Usage

```
stri_unescape_unicode(str)
```

Arguments

str	character vector

Details

Uses **ICU**'s facilities to un-escape Unicode character sequences.

The following escape sequences are recognized: \a, \b, \t, \n, \v, \?, \e, \f, \r, \", \', \\, \uXXXX (4 hex digits), \UXXXXXXXX (8 hex digits), \xXX (1-2 hex digits), \ooo (1-3 octal digits), \cX (control-X; X is masked with 0x1F). For \xXX and \ooo, beware of non-valid UTF-8 byte sequences.

Note that some versions of R on Windows cannot handle characters defined with \UXXXXXXXX.

Value

Returns a character vector. If an escape sequence is ill-formed, the result will be NA and a warning will be given.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other escape: `stri_escape_unicode()`

Examples

```
stri_unescape_unicode('a\\u0105!\\u0032\\n')
```

---

stri_unique *Extract Unique Elements*

Description

This function returns a character vector like `str`, but with duplicate elements removed.

Usage

```
stri_unique(str, ..., opts_collator = NULL)
```

Arguments

`str`	a character vector
`...`	additional settings for `opts_collator`
`opts_collator`	a named list with **ICU** Collator's options, see `stri_opts_collator`, `NULL` for default collation options

Details

As usual in **stringi**, no attributes are copied. Unlike `unique`, this function tests for canonical equivalence of strings (and not whether the strings are just bytewise equal). Such an operation is locale-dependent. Hence, `stri_unique` is significantly slower (but much better suited for natural language processing) than its base R counterpart.

See also `stri_duplicated` for indicating non-unique elements.

Value

Returns a character vector.

Author(s)

Marek Gagolewski and other contributors

References

Collation - ICU User Guide, https://unicode-org.github.io/icu/userguide/collation/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_wrap()

Examples

```
# normalized and non-Unicode-normalized version of the same code point:
stri_unique(c('\u0105', stri_trans_nfkd('\u0105')))
unique(c('\u0105', stri_trans_nfkd('\u0105')))

stri_unique(c('gro\u00df', 'GROSS', 'Gro\u00df', 'Gross'), strength=1)
```

---

stri_width *Determine the Width of Code Points*

Description

Approximates the number of text columns the ‘cat()‘ function might use to print a string using a mono-spaced font.

Usage

```
stri_width(str)
```

Arguments

str	character vector or an object coercible to

Details

The Unicode standard does not formalize the notion of a character width. Roughly based on http://www.cl.cam.ac.uk/~mgk25/ucs/wcwidth.c, https://github.com/nodejs/node/blob/master/src/node_i18n.cc, and UAX #11 we proceed as follows. The following code points are of width 0:

- code points with general category (see stringi-search-charclass) Me, Mn, and Cf),
- C0 and C1 control codes (general category Cc) - for compatibility with the nchar function,
- Hangul Jamo medial vowels and final consonants (code points with enumerable property UCHAR_HANGUL_SYLLABLE_TYPE equal to U_HST_VOWEL_JAMO or U_HST_TRAILING_JAMO; note that applying the NFC normalization with stri_trans_nfc is encouraged),
- ZERO WIDTH SPACE (U+200B),

Characters with the UCHAR_EAST_ASIAN_WIDTH enumerable property equal to U_EA_FULLWIDTH or U_EA_WIDE are of width 2.

Most emojis and characters with general category So (other symbols) are of width 2.

SOFT HYPHEN (U+00AD) (for compatibility with nchar) as well as any other characters have width 1.

Value

Returns an integer vector of the same length as str.

Author(s)

Marek Gagolewski and other contributors

References

East Asian Width – Unicode Standard Annex #11, https://www.unicode.org/reports/tr11/

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other length: %s$%, stri_isempty(), stri_length(), stri_numbytes(), stri_pad_both(), stri_sprintf()

Examples

```
stri_width(LETTERS[1:5])
stri_width(stri_trans_nfkd('\u0105'))
stri_width(stri_trans_nfkd('\U0001F606'))
stri_width( # Full-width equivalents of ASCII characters:
   stri_enc_fromutf32(as.list(c(0x3000, 0xFF01:0xFF5E)))
)
stri_width(stri_trans_nfkd('\ubc1f')) # includes Hangul Jamo medial vowels and final consonants
```

stri_wrap *Word Wrap Text to Format Paragraphs*

Description

This function breaks text paragraphs into lines, of total width (if it is possible) at most given `width`.

Usage

```
stri_wrap(
  str,
  width = floor(0.9 * getOption("width")),
  cost_exponent = 2,
  simplify = TRUE,
  normalize = TRUE,
  normalise = normalize,
  indent = 0,
  exdent = 0,
  prefix = "",
  initial = prefix,
  whitespace_only = FALSE,
  use_length = FALSE,
  locale = NULL
)
```

Arguments

`str`	character vector of strings to reformat
`width`	single integer giving the suggested maximal total width/number of code points per line
`cost_exponent`	single numeric value, values not greater than zero will select a greedy word-wrapping algorithm; otherwise this value denotes the exponent in the cost function of a (more aesthetic) dynamic programming-based algorithm (values in [2, 3] are recommended)
`simplify`	single logical value, see Value
`normalize`	single logical value, see Details
`normalise`	alias of `normalize`
`indent`	single non-negative integer; gives the indentation of the first line in each paragraph
`exdent`	single non-negative integer; specifies the indentation of subsequent lines in paragraphs
`prefix`, `initial`	single strings; `prefix` is used as prefix for each line except the first, for which `initial` is utilized

whitespace_only
: single logical value; allow breaks only at white-spaces? if FALSE, **ICU**'s line break iterator is used to split text into words, which is suitable for natural language processing

use_length
: single logical value; should the number of code points be used instead of the total code point width (see stri_width)?

locale
: NULL or '' for text boundary analysis following the conventions of the default locale, or a single string with locale identifier, see stringi-locale

Details

Vectorized over str.

If whitespace_only is FALSE, then **ICU**'s line-BreakIterator is used to determine text boundaries where a line break is possible. This is a locale-dependent operation. Otherwise, the breaks are only at white-spaces.

Note that Unicode code points may have various widths when printed on the console and that this function, by default, takes that into account. By changing the state of the use_length argument, this function starts to act as if each code point was of width 1.

If normalize is FALSE, then multiple white spaces between the word boundaries are preserved within each wrapped line. In such a case, none of the strings can contain \r, \n, or other new line characters, otherwise you will get an error. You should split the input text into lines or, for example, substitute line breaks with spaces before applying this function.

If normalize is TRUE, then all consecutive white space (ASCII space, horizontal TAB, CR, LF) sequences are replaced with single ASCII spaces before actual string wrapping. Moreover, stri_split_lines and stri_trans_nfc is called on the input character vector. This is for compatibility with strwrap.

The greedy algorithm (for cost_exponent being non-positive) provides a very simple way for word wrapping. It always puts as many words in each line as possible. This method – contrary to the dynamic algorithm – does not minimize the number of space left at the end of every line. The dynamic algorithm (a.k.a. Knuth's word wrapping algorithm) is more complex, but it returns text wrapped in a more aesthetic way. This method minimizes the squared (by default, see cost_exponent) number of spaces (raggedness) at the end of each line, so the text is mode arranged evenly. Note that the cost of printing the last line is always zero.

Value

If simplify is TRUE, then a character vector is returned. Otherwise, you will get a list of length(str) character vectors.

Author(s)

Marek Gagolewski and other contributors

References

D.E. Knuth, M.F. Plass, Breaking paragraphs into lines, *Software: Practice and Experience* 11(11), 1981, pp. 1119–1184.

See Also

The official online manual of **stringi** at https://stringi.gagolewski.com/

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other locale_sensitive: %s<%, about_locale, about_search_boundaries, about_search_coll, stri_compare(), stri_count_boundaries(), stri_duplicated(), stri_enc_detect2(), stri_extract_all_boundar stri_locate_all_boundaries(), stri_opts_collator(), stri_order(), stri_rank(), stri_sort(), stri_sort_key(), stri_split_boundaries(), stri_trans_tolower(), stri_unique()

Other text_boundaries: about_search, about_search_boundaries, stri_count_boundaries(), stri_extract_all_boundaries(), stri_locate_all_boundaries(), stri_opts_brkiter(), stri_split_boundaries(), stri_split_lines(), stri_trans_tolower()

Examples

```
s <- stri_paste(
   'Lorem ipsum dolor sit amet, consectetur adipisicing elit. Proin ',
   'nibh augue, suscipit a, scelerisque sed, lacinia in, mi. Cras vel ',
   'lorem. Etiam pellentesque aliquet tellus.')
cat(stri_wrap(s, 20, 0.0), sep='\n') # greedy
cat(stri_wrap(s, 20, 2.0), sep='\n') # dynamic
cat(stri_pad(stri_wrap(s), side='both'), sep='\n')
```

---

stri_write_lines *Write Text Lines to a Text File*

Description

Writes a text file is such a way that each element of a given character vector becomes a separate text line.

Usage

```
stri_write_lines(
  str,
  con,
  encoding = "UTF-8",
  sep = ifelse(.Platform$OS.type == "windows", "\r\n", "\n"),
  fname = con
)
```

Arguments

str	character vector with data to write
con	name of the output file or a connection object (opened in the binary mode)
encoding	output encoding, NULL or '' for the current default one
sep	newline separator
fname	[DEPRECATED] alias of con

Details

It is a substitute for the R `writeLines` function, with the ability to easily re-encode the output.

We suggest using the UTF-8 encoding for all text files: thus, it is the default one for the output.

Value

This function returns nothing noteworthy.

Author(s)

Marek Gagolewski and other contributors

See Also

The official online manual of **stringi** at `https://stringi.gagolewski.com/`

Gagolewski M., **stringi**: Fast and portable character string processing in R, *Journal of Statistical Software* 103(2), 2022, 1-59, doi:10.18637/jss.v103.i02

Other files: `stri_read_lines()`, `stri_read_raw()`

Index

∗ **datetime**
stri_datetime_add, 37
stri_datetime_create, 38
stri_datetime_fields, 40
stri_datetime_format, 41
stri_datetime_fstr, 46
stri_datetime_now, 47
stri_datetime_symbols, 47
stri_timezone_get, 147
stri_timezone_info, 148
stri_timezone_list, 150
∗ **encoding_conversion**
about_encoding, 11
stri_enc_fromutf32, 58
stri_enc_toascii, 66
stri_enc_tonative, 67
stri_enc_toutf32, 68
stri_enc_toutf8, 69
stri_encode, 70
∗ **encoding_detection**
about_encoding, 11
stri_enc_detect, 54
stri_enc_detect2, 57
stri_enc_isascii, 60
stri_enc_isutf16be, 61
stri_enc_isutf8, 62
∗ **encoding_management**
about_encoding, 11
stri_enc_info, 59
stri_enc_list, 63
stri_enc_mark, 64
stri_enc_set, 65
∗ **encoding**
stri_info, 79
∗ **escape**
stri_escape_unicode, 71
stri_unescape_unicode, 160
∗ **files**
stri_read_lines, 115
stri_read_raw, 116
stri_write_lines, 166
∗ **indexing**
stri_locate_all, 89
stri_locate_all_boundaries, 93
stri_sub, 140
stri_sub_all, 143
∗ **join**
%s+%, 6
stri_dup, 51
stri_flatten, 78
stri_join, 81
stri_join_list, 82
∗ **length**
%s$%, 9
stri_isempty, 80
stri_length, 83
stri_numbytes, 99
stri_pad_both, 108
stri_sprintf, 133
stri_width, 162
∗ **locale_management**
about_locale, 15
stri_locale_info, 86
stri_locale_list, 87
stri_locale_set, 88
∗ **locale_sensitive**
%s<%, 7
about_locale, 15
about_search_boundaries, 18
about_search_coll, 25
stri_compare, 31
stri_count_boundaries, 35
stri_duplicated, 52
stri_enc_detect2, 57
stri_extract_all_boundaries, 76
stri_locate_all_boundaries, 93
stri_opts_collator, 102
stri_order, 107

stri_rank, 113
stri_sort, 124
stri_sort_key, 125
stri_split_boundaries, 129
stri_trans_tolower, 157
stri_unique, 161
stri_wrap, 164
∗ **locale**
stri_info, 79
∗ **prepare_arg**
about_arguments, 10
∗ **random**
stri_rand_lipsum, 110
stri_rand_shuffle, 111
stri_rand_strings, 112
∗ **search_charclass**
about_search, 17
about_search_charclass, 20
stri_trim_both, 159
∗ **search_coll**
about_search, 17
about_search_coll, 25
stri_opts_collator, 102
∗ **search_count**
about_search, 17
stri_count, 33
stri_count_boundaries, 35
∗ **search_detect**
about_search, 17
stri_detect, 49
stri_startswith, 135
∗ **search_extract**
about_search, 17
stri_extract_all, 72
stri_extract_all_boundaries, 76
stri_match_all, 95
∗ **search_fixed**
about_search, 17
about_search_fixed, 26
stri_opts_fixed, 104
∗ **search_in**
about_search, 17
∗ **search_locate**
about_search, 17
stri_locate_all, 89
stri_locate_all_boundaries, 93
∗ **search_regex**
about_search, 17
about_search_regex, 27
stri_opts_regex, 105
∗ **search_replace**
about_search, 17
stri_replace_all, 118
stri_replace_rstr, 122
stri_trim_both, 159
∗ **search_split**
about_search, 17
stri_split, 126
stri_split_boundaries, 129
stri_split_lines, 131
∗ **search_subset**
about_search, 17
stri_subset, 145
∗ **stats**
stri_stats_general, 138
stri_stats_latex, 139
∗ **stringi_general_topics**
about_arguments, 10
about_encoding, 11
about_locale, 15
about_search, 17
about_search_boundaries, 18
about_search_charclass, 20
about_search_coll, 25
about_search_fixed, 26
about_search_regex, 27
stringi-package, 4
∗ **text_boundaries**
about_search, 17
about_search_boundaries, 18
stri_count_boundaries, 35
stri_extract_all_boundaries, 76
stri_locate_all_boundaries, 93
stri_opts_brkiter, 100
stri_split_boundaries, 129
stri_split_lines, 131
stri_trans_tolower, 157
stri_wrap, 164
∗ **timezone**
stri_timezone_get, 147
stri_timezone_info, 148
stri_timezone_list, 150
∗ **transform**
stri_trans_char, 151
stri_trans_general, 152
stri_trans_list, 154

stri_trans_nfc, 155
stri_trans_tolower, 157
∗ **utils**
stri_list2matrix, 85
stri_na2empty, 98
stri_remove_empty, 117
stri_replace_na, 121
%s!==% *(%s<%)*, 7
%s!=% *(%s<%)*, 7
%s*% *(*stri_dup*)*, 51
%s<=% *(%s<%)*, 7
%s===% *(%s<%)*, 7
%s==% *(%s<%)*, 7
%s>=% *(%s<%)*, 7
%s>% *(%s<%)*, 7
%stri!==% *(%s<%)*, 7
%stri!=% *(%s<%)*, 7
%stri*% *(*stri_dup*)*, 51
%stri+% *(%s+%)*, 6
%stri<=% *(%s<%)*, 7
%stri<% *(%s<%)*, 7
%stri===% *(%s<%)*, 7
%stri==% *(%s<%)*, 7
%stri>=% *(%s<%)*, 7
%stri>% *(%s<%)*, 7
%stri$% *(%s$%)*, 9
%s+%, *5*, 6, *52*, *79*, *82, 83*
%s<%, *5*, 7, *16*, *19*, *26*, *32, 33*, *36*, *54*, *58*, *77*, *95*, *103*, *108*, *114*, *125, 126*, *131*, *158*, *162*, *166*
%s$%, 9, *80*, *84*, *99*, *110*, *135*, *163*

about_arguments, *4*, *6*, 10, *14*, *16*, *18, 19*, *25–27*, *31*
about_encoding, *4*, *6*, 11, *11*, *16*, *18, 19*, *25–27*, *31*, *56*, *58–60*, *62–68*, *70, 71*
about_locale, *4–6*, *9*, *11*, *14*, 15, *18, 19*, *25–27*, *31*, *33*, *36*, *54*, *58*, *77*, *87, 88*, *95*, *103*, *108*, *114*, *125, 126*, *131*, *158*, *162*, *166*
about_search, *5, 6*, *11*, *14*, *16*, 17, *19*, *25–27*, *31*, *35, 36*, *51*, *75*, *77, 78*, *92*, *95*, *97*, *101*, *103*, *105*, *107*, *120*, *123*, *129*, *131, 132*, *138*, *147*, *158*, *160*, *166*
about_search_boundaries, *5, 6*, *9*, *11*, *14*, *16, 17*, 18, *18*, *25–27*, *31*, *33*, *36*, *54*, *58*, *77, 78*, *95*, *101*, *103*, *108*, *114*, *125, 126*, *131, 132*, *158*, *162*, *166*
about_search_charclass, *5, 6*, *11*, *14*, *16–19*, 20, *26, 27*, *30, 31*, *160*
about_search_coll, *5, 6*, *9*, *11*, *14*, *16–19*, *25*, *25–27*, *30, 31*, *33*, *36*, *54*, *58*, *77*, *95*, *103*, *108*, *114*, *125, 126*, *131*, *158*, *162*, *166*
about_search_fixed, *5, 6*, *11*, *14*, *16–19*, *25*, 26, *26*, *30, 31*, *105*
about_search_regex, *5, 6*, *11*, *14*, *16–20*, *25, 26*, 27, *27*, *107*
anyDuplicated, *53*
arguments *(*about_arguments*)*, 10
as.character, *10*
as.list, *86*

cat, *11*, *13*, *134*

dim, *11*
duplicated, *53*

enc2utf8, *69*
Encoding, *13*, *60–62*, *64*
encoding *(*about_encoding*)*, 11

gsub, *122*

iconv, *70*
intToUtf8, *58*

locale *(*about_locale*)*, 15

names, *11*
nchar, *163*

oper_compare *(%s<%)*, 7
oper_comparison *(%s<%)*, 7
oper_dollar *(%s$%)*, 9
oper_multiply *(*stri_dup*)*, 51
oper_plus *(%s+%)*, 6
operator_add *(%s+%)*, 6
operator_compare *(%s<%)*, 7
operator_dollar *(%s$%)*, 9
operator_multiply *(*stri_dup*)*, 51
operator_plus *(%s+%)*, 6

paste, *78*, *81*
POSIXct, *37–40*, *42*, *45*, *47*
print, *11*, *13*

Quotes, *72*

rawToChar, *71*
readLines, *115*, *138*, *139*
regex, *27*

search *(*about_search*)*, 17
search_boundaries
*(*about_search_boundaries*)*, 18
search_charclass
*(*about_search_charclass*)*, 20
search_coll *(*about_search_coll*)*, 25
search_fixed *(*about_search_fixed*)*, 26
search_regex *(*about_search_regex*)*, 27
simplify2array, *85*
sprintf, *133*, *134*
strftime, *42*, *46*
stri_c *(*stri_join*)*, 81
stri_c_list *(*stri_join_list*)*, 82
stri_cmp, *5*
stri_cmp *(*stri_compare*)*, 31
stri_cmp_eq *(*stri_compare*)*, 31
stri_cmp_equiv, *8*
stri_cmp_equiv *(*stri_compare*)*, 31
stri_cmp_ge *(*stri_compare*)*, 31
stri_cmp_gt *(*stri_compare*)*, 31
stri_cmp_le, *8*
stri_cmp_le *(*stri_compare*)*, 31
stri_cmp_lt *(*stri_compare*)*, 31
stri_cmp_neq *(*stri_compare*)*, 31
stri_cmp_nequiv *(*stri_compare*)*, 31
stri_coll *(*stri_opts_collator*)*, 102
stri_compare, 31, *102*
stri_compare(), *9*, *16*, *19*, *26*, *36*, *54*, *58*, *77*, *95*, *103*, *108*, *114*, *125*, *126*, *131*, *158*, *162*, *166*
stri_conv *(*stri_encode*)*, 70
stri_count, *17*, 33
stri_count(), *18*, *36*
stri_count_boundaries, *5*, *18*, 35, *36*, *84*
stri_count_boundaries(), *9*, *16*, *18*, *19*, *26*, *33*, *35*, *54*, *58*, *77*, *78*, *95*, *101*, *103*, *108*, *114*, *125*, *126*, *131*, *132*, *158*, *162*, *166*
stri_count_charclass *(*stri_count*)*, 33
stri_count_coll *(*stri_count*)*, 33
stri_count_fixed, *104*
stri_count_fixed *(*stri_count*)*, 33
stri_count_regex, *105*
stri_count_regex *(*stri_count*)*, 33
stri_count_words, *77*, *94*
stri_count_words
*(*stri_count_boundaries*)*, 35
stri_datetime_add, 37
stri_datetime_add(), *40*, *41*, *45–48*, *148*, *149*, *151*
stri_datetime_add<-
*(*stri_datetime_add*)*, 37
stri_datetime_create, 38
stri_datetime_create(), *38*, *41*, *45–48*, *148*, *149*, *151*
stri_datetime_fields, 40
stri_datetime_fields(), *38*, *40*, *45–48*, *148*, *149*, *151*
stri_datetime_format, *5*, 41, *46*
stri_datetime_format(), *38*, *40*, *41*, *46–48*, *148*, *149*, *151*
stri_datetime_fstr, *42*, 46
stri_datetime_fstr(), *38*, *40*, *41*, *45*, *47*, *48*, *148*, *149*, *151*
stri_datetime_now, 47
stri_datetime_now(), *38*, *40*, *41*, *45*, *46*, *48*, *148*, *149*, *151*
stri_datetime_parse, *46*
stri_datetime_parse
*(*stri_datetime_format*)*, 41
stri_datetime_symbols, *40*, *41*, 47
stri_datetime_symbols(), *38*, *40*, *41*, *45–47*, *148*, *149*, *151*
stri_detect, *17*, 49, *137*, *145*
stri_detect(), *18*, *138*
stri_detect_charclass *(*stri_detect*)*, 49
stri_detect_coll, *102*
stri_detect_coll *(*stri_detect*)*, 49
stri_detect_fixed *(*stri_detect*)*, 49
stri_detect_regex *(*stri_detect*)*, 49
stri_dup, *5*, 51
stri_dup(), *7*, *79*, *82*, *83*
stri_duplicated, *5*, 52, *102*, *161*
stri_duplicated(), *9*, *16*, *19*, *26*, *33*, *36*, *58*, *77*, *95*, *103*, *108*, *114*, *125*, *126*, *131*, *158*, *162*, *166*
stri_duplicated_any *(*stri_duplicated*)*, 52
stri_enc_detect, *14*, 54, *57*, *116*
stri_enc_detect(), *14*, *58*, *60*, *62*, *63*
stri_enc_detect2, 57
stri_enc_detect2(), *9*, *14*, *16*, *19*, *26*, *33*, *36*, *54*, *56*, *60*, *62*, *63*, *77*, *95*, *103*,

108, *114*, *125*, *126*, *131*, *158*, *162*, *166*
stri_enc_fromutf32, 58, *68*
stri_enc_fromutf32(), *14*, *67*, *68*, *70*, *71*
stri_enc_get, *13*, *64*, *67*, *69*, *70*
stri_enc_get *(*stri_enc_set*)*, 65
stri_enc_info, 59, *65*, *79*
stri_enc_info(), *14*, *64–66*
stri_enc_isascii, 60, *62*
stri_enc_isascii(), *14*, *56*, *58*, *62*, *63*
stri_enc_isutf16be, 61
stri_enc_isutf16be(), *14*, *56*, *58*, *60*, *63*
stri_enc_isutf16le *(*stri_enc_isutf16be*)*, 61
stri_enc_isutf32be *(*stri_enc_isutf16be*)*, 61
stri_enc_isutf32le *(*stri_enc_isutf16be*)*, 61
stri_enc_isutf8, *12*, 62, *62*
stri_enc_isutf8(), *14*, *56*, *58*, *60*, *62*
stri_enc_list, *13*, *59*, 63, *65*, *70*
stri_enc_list(), *14*, *60*, *65*, *66*
stri_enc_mark, *13*, 64, *65–67*, *69*, *70*
stri_enc_mark(), *14*, *60*, *64*, *66*
stri_enc_set, *13*, 65
stri_enc_set(), *14*, *60*, *64*, *65*
stri_enc_toascii, *13*, *14*, 66
stri_enc_toascii(), *14*, *59*, *67*, *68*, *70*, *71*
stri_enc_tonative, 67
stri_enc_tonative(), *14*, *59*, *67*, *68*, *70*, *71*
stri_enc_toutf32, *14*, *58*, 68
stri_enc_toutf32(), *14*, *59*, *67*, *70*, *71*
stri_enc_toutf8, *13*, *68*, 69, *84*
stri_enc_toutf8(), *14*, *59*, *67*, *68*, *71*
stri_encode, *13*, *14*, *55*, *58*, *67*, *68*, 70, *115*, *116*
stri_encode(), *14*, *59*, *67*, *68*, *70*
stri_endswith, *50*
stri_endswith *(*stri_startswith*)*, 135
stri_endswith_charclass *(*stri_startswith*)*, 135
stri_endswith_coll *(*stri_startswith*)*, 135
stri_endswith_fixed *(*stri_startswith*)*, 135
stri_escape_unicode, *5*, 71
stri_escape_unicode(), *161*
stri_extract, *17*, *92*, *96*
stri_extract *(*stri_extract_all*)*, 72
stri_extract_all, 72, *85*
stri_extract_all(), *18*, *77*, *97*
stri_extract_all_boundaries, 76
stri_extract_all_boundaries(), *9*, *16*, *18*, *19*, *26*, *33*, *36*, *54*, *58*, *75*, *95*, *97*, *101*, *103*, *108*, *114*, *125*, *126*, *131*, *132*, *158*, *162*, *166*
stri_extract_all_charclass *(*stri_extract_all*)*, 72
stri_extract_all_coll *(*stri_extract_all*)*, 72
stri_extract_all_fixed, *104*
stri_extract_all_fixed *(*stri_extract_all*)*, 72
stri_extract_all_regex *(*stri_extract_all*)*, 72
stri_extract_all_words, *18*, *29*, *36*, *94*
stri_extract_all_words *(*stri_extract_all_boundaries*)*, 76
stri_extract_first *(*stri_extract_all*)*, 72
stri_extract_first_boundaries *(*stri_extract_all_boundaries*)*, 76
stri_extract_first_charclass *(*stri_extract_all*)*, 72
stri_extract_first_coll *(*stri_extract_all*)*, 72
stri_extract_first_fixed *(*stri_extract_all*)*, 72
stri_extract_first_regex *(*stri_extract_all*)*, 72
stri_extract_first_words *(*stri_extract_all_boundaries*)*, 76
stri_extract_last *(*stri_extract_all*)*, 72
stri_extract_last_boundaries *(*stri_extract_all_boundaries*)*, 76
stri_extract_last_charclass *(*stri_extract_all*)*, 72
stri_extract_last_coll *(*stri_extract_all*)*, 72
stri_extract_last_fixed *(*stri_extract_all*)*, 72
stri_extract_last_regex

(stri_extract_all), 72
stri_extract_last_words
(stri_extract_all_boundaries), 76
stri_flatten, 5, 55, 78
stri_flatten(), 7, 52, 82, 83
stri_info, 65, 79
stri_isempty, 80
stri_isempty(), 10, 84, 99, 110, 135, 163
stri_join, 5, 7, 11, 78, 81
stri_join(), 7, 52, 79, 83
stri_join_list, 82
stri_join_list(), 7, 52, 79, 82
stri_length, 5, 36, 83, 99
stri_length(), 10, 80, 99, 110, 135, 163
stri_list2matrix, 75, 77, 85, 128, 130
stri_list2matrix(), 98, 117, 122
stri_locale_get (stri_locale_set), 88
stri_locale_info, 79, 86, 88
stri_locale_info(), 16, 87, 88
stri_locale_list, 15, 87, 88
stri_locale_list(), 16, 87, 88
stri_locale_set, 15, 88
stri_locale_set(), 16, 87
stri_locate, 17, 94
stri_locate (stri_locate_all), 89
stri_locate_all, 89, 142, 144
stri_locate_all(), 18, 95, 142, 144
stri_locate_all_boundaries, 19, 93, 101
stri_locate_all_boundaries(), 9, 16, 18, 19, 26, 33, 36, 54, 58, 77, 78, 92, 101, 103, 108, 114, 125, 126, 131, 132, 142, 144, 158, 162, 166
stri_locate_all_charclass
(stri_locate_all), 89
stri_locate_all_coll (stri_locate_all), 89
stri_locate_all_fixed, 104
stri_locate_all_fixed
(stri_locate_all), 89
stri_locate_all_regex
(stri_locate_all), 89
stri_locate_all_words, 36
stri_locate_all_words
(stri_locate_all_boundaries), 93
stri_locate_first, 142, 144
stri_locate_first (stri_locate_all), 89
stri_locate_first_boundaries
(stri_locate_all_boundaries), 93
stri_locate_first_charclass
(stri_locate_all), 89
stri_locate_first_coll
(stri_locate_all), 89
stri_locate_first_fixed
(stri_locate_all), 89
stri_locate_first_regex
(stri_locate_all), 89
stri_locate_first_words
(stri_locate_all_boundaries), 93
stri_locate_last, 142, 144
stri_locate_last (stri_locate_all), 89
stri_locate_last_boundaries
(stri_locate_all_boundaries), 93
stri_locate_last_charclass
(stri_locate_all), 89
stri_locate_last_coll
(stri_locate_all), 89
stri_locate_last_fixed
(stri_locate_all), 89
stri_locate_last_regex
(stri_locate_all), 89
stri_locate_last_words
(stri_locate_all_boundaries), 93
stri_match, 17, 28, 74
stri_match (stri_match_all), 95
stri_match_all, 95
stri_match_all(), 18, 75, 77
stri_match_all_regex (stri_match_all), 95
stri_match_first (stri_match_all), 95
stri_match_first_regex
(stri_match_all), 95
stri_match_last (stri_match_all), 95
stri_match_last_regex (stri_match_all), 95
stri_na2empty, 98
stri_na2empty(), 86, 117, 122
stri_numbytes, 99
stri_numbytes(), 10, 80, 84, 110, 135, 163
stri_omit_empty (stri_remove_empty), 117
stri_omit_empty_na (stri_remove_empty),

117
stri_omit_na *(*stri_remove_empty*)*, 117
stri_opts_brkiter, *19*, *36*, *77*, *94*, 100, *130*, *157*
stri_opts_brkiter(), *18, 19*, *36*, *78*, *95*, *131, 132*, *158*, *166*
stri_opts_collator, *4*, *16*, *25*, *32*, *34*, *50*, *53*, *74*, *92*, 102, *107*, *113, 114*, *120*, *124–126*, *128*, *137*, *146*, *161*
stri_opts_collator(), *9*, *16*, *18, 19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *108*, *114*, *125, 126*, *131*, *158*, *162*, *166*
stri_opts_fixed, *26*, *34*, *50*, *74*, *92*, 104, *120*, *128*, *137*, *146*
stri_opts_fixed(), *18*, *27*
stri_opts_regex, *27, 28*, *30*, *34*, *50*, *74*, *92*, *96*, 105, *120*, *128*, *146*
stri_opts_regex(), *18*, *31*
stri_order, *5*, *102*, 107
stri_order(), *9*, *16*, *19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *103*, *114*, *125, 126*, *131*, *158*, *162*, *166*
stri_pad, *5*
stri_pad *(*stri_pad_both*)*, 108
stri_pad_both, 108
stri_pad_both(), *10*, *80*, *84*, *99*, *135*, *163*
stri_pad_left *(*stri_pad_both*)*, 108
stri_pad_right *(*stri_pad_both*)*, 108
stri_paste *(*stri_join*)*, 81
stri_paste_list *(*stri_join_list*)*, 82
stri_printf *(*stri_sprintf*)*, 133
stri_rand_lipsum, *5*, 110
stri_rand_lipsum(), *112, 113*
stri_rand_shuffle, *5*, 111, *123*
stri_rand_shuffle(), *111*, *113*
stri_rand_strings, *5*, *20*, 112
stri_rand_strings(), *111, 112*
stri_rank, *5*, *107*, 113, *126*
stri_rank(), *9*, *16*, *19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *103*, *108*, *125, 126*, *131*, *158*, *162*, *166*
stri_read_lines, *5*, 115, *138*
stri_read_lines(), *116*, *167*
stri_read_raw, *5*, *115*, 116
stri_read_raw(), *115*, *167*
stri_remove_empty, 117
stri_remove_empty(), *86*, *98*, *122*
stri_remove_empty_na
*(*stri_remove_empty*)*, 117
stri_remove_na *(*stri_remove_empty*)*, 117
stri_replace, *17*, *122*, *159*
stri_replace *(*stri_replace_all*)*, 118
stri_replace_all, 118
stri_replace_all(), *18*, *123*, *160*
stri_replace_all_charclass *(*stri_replace_all*)*, 118
stri_replace_all_coll *(*stri_replace_all*)*, 118
stri_replace_all_fixed *(*stri_replace_all*)*, 118
stri_replace_all_regex *(*stri_replace_all*)*, 118
stri_replace_first *(*stri_replace_all*)*, 118
stri_replace_first_charclass *(*stri_replace_all*)*, 118
stri_replace_first_coll *(*stri_replace_all*)*, 118
stri_replace_first_fixed *(*stri_replace_all*)*, 118
stri_replace_first_regex *(*stri_replace_all*)*, 118
stri_replace_last *(*stri_replace_all*)*, 118
stri_replace_last_charclass *(*stri_replace_all*)*, 118
stri_replace_last_coll *(*stri_replace_all*)*, 118
stri_replace_last_fixed *(*stri_replace_all*)*, 118
stri_replace_last_regex *(*stri_replace_all*)*, 118
stri_replace_na, *98*, 121
stri_replace_na(), *86*, *98*, *117*
stri_replace_rstr, 122
stri_replace_rstr(), *18*, *120*, *160*
stri_reverse, *5*, *111*, 123
stri_sort, *5*, 124
stri_sort(), *9*, *16*, *19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *103*, *108*, *114*, *126*, *131*, *158*, *162*, *166*
stri_sort_key, 125
stri_sort_key(), *9*, *16*, *19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *103*, *108*, *114*, *125*, *131*, *158*, *162*, *166*
stri_split, *17*, *85*, 126

stri_split(), *18*, *131, 132*
stri_split_boundaries, *18*, *101*, *128*, 129
stri_split_boundaries(), *9*, *16*, *18, 19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *101*, *103*, *108*, *114*, *125, 126*, *129*, *132*, *158*, *162*, *166*
stri_split_charclass *(*stri_split*)*, 126
stri_split_coll *(*stri_split*)*, 126
stri_split_fixed, *86*
stri_split_fixed *(*stri_split*)*, 126
stri_split_lines, *5*, 131, *165*
stri_split_lines(), *18, 19*, *36*, *78*, *95*, *101*, *129*, *131*, *158*, *166*
stri_split_lines1, *115, 116*
stri_split_lines1 *(*stri_split_lines*)*, 131
stri_split_regex *(*stri_split*)*, 126
stri_sprintf, *9*, 133
stri_sprintf(), *10*, *80*, *84*, *99*, *110*, *163*
stri_startswith, *17*, *50*, 135
stri_startswith(), *18*, *51*
stri_startswith_charclass *(*stri_startswith*)*, 135
stri_startswith_coll *(*stri_startswith*)*, 135
stri_startswith_fixed *(*stri_startswith*)*, 135
stri_stats_general, *5*, 138
stri_stats_general(), *140*
stri_stats_latex, *5*, 139
stri_stats_latex(), *139*
stri_string_format *(*stri_sprintf*)*, 133
stri_sub, *5*, *92*, 140, *143, 144*
stri_sub(), *92*, *95*, *144*
stri_sub<- *(*stri_sub*)*, 140
stri_sub_all, *92*, *140*, *142*, 143
stri_sub_all(), *92*, *95*, *142*
stri_sub_all<- *(*stri_sub_all*)*, 143
stri_sub_all_replace *(*stri_sub_all*)*, 143
stri_sub_replace *(*stri_sub*)*, 140
stri_sub_replace_all *(*stri_sub_all*)*, 143
stri_subset, *17*, *50*, 145
stri_subset(), *18*
stri_subset<- *(*stri_subset*)*, 145
stri_subset_charclass *(*stri_subset*)*, 145
stri_subset_charclass<- *(*stri_subset*)*, 145
stri_subset_coll *(*stri_subset*)*, 145
stri_subset_coll<- *(*stri_subset*)*, 145
stri_subset_fixed *(*stri_subset*)*, 145
stri_subset_fixed<- *(*stri_subset*)*, 145
stri_subset_regex *(*stri_subset*)*, 145
stri_subset_regex<- *(*stri_subset*)*, 145
stri_timezone_get, *42*, 147
stri_timezone_get(), *38*, *40, 41*, *45–48*, *149*, *151*
stri_timezone_info, 148
stri_timezone_info(), *38*, *40, 41*, *45–48*, *148*, *151*
stri_timezone_list, *39, 40*, *42*, *147*, *149*, 150
stri_timezone_list(), *38*, *40, 41*, *45–48*, *148, 149*
stri_timezone_set *(*stri_timezone_get*)*, 147
stri_trans_casefold *(*stri_trans_tolower*)*, 157
stri_trans_char, *5*, 151
stri_trans_char(), *153*, *155*, *157, 158*
stri_trans_general, *5*, 152, *154*, *156*, *158*
stri_trans_general(), *152*, *155*, *157, 158*
stri_trans_isnfc *(*stri_trans_nfc*)*, 155
stri_trans_isnfd *(*stri_trans_nfc*)*, 155
stri_trans_isnfkc *(*stri_trans_nfc*)*, 155
stri_trans_isnfkc_casefold *(*stri_trans_nfc*)*, 155
stri_trans_isnfkd *(*stri_trans_nfc*)*, 155
stri_trans_list, *153*, 154
stri_trans_list(), *152, 153*, *157, 158*
stri_trans_nfc, *5*, *12*, *84*, *142*, 155, *163*, *165*
stri_trans_nfc(), *152, 153*, *155*, *158*
stri_trans_nfd *(*stri_trans_nfc*)*, 155
stri_trans_nfkc *(*stri_trans_nfc*)*, 155
stri_trans_nfkc_casefold *(*stri_trans_nfc*)*, 155
stri_trans_nfkd *(*stri_trans_nfc*)*, 155
stri_trans_tolower, *5*, *16*, 157
stri_trans_tolower(), *9*, *16*, *18, 19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *101*, *103*, *108*, *114*, *125, 126*, *131, 132*, *152, 153*, *155*, *157*, *162*, *166*
stri_trans_totitle, *18*
stri_trans_totitle *(*stri_trans_tolower*)*, 157
stri_trans_toupper *(*stri_trans_tolower*)*, 157

stri_trim, *5*, *17*, *120*
stri_trim *(*stri_trim_both*)*, 159
stri_trim_both, 159
stri_trim_both(), *18*, *25*, *120*, *123*
stri_trim_left, *109*
stri_trim_left *(*stri_trim_both*)*, 159
stri_trim_right *(*stri_trim_both*)*, 159
stri_unescape_unicode, 160
stri_unescape_unicode(), *72*
stri_unique, *5*, *18*, *53*, *102*, 161
stri_unique(), *9*, *16*, *19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *103*, *108*, *114*, *125, 126*, *131*, *158*, *166*
stri_width, *5*, *109*, *134*, 162, *165*
stri_width(), *10*, *80*, *84*, *99*, *110*, *135*
stri_wrap, *5*, *18*, *109*, 164
stri_wrap(), *9*, *16*, *18, 19*, *26*, *33*, *36*, *54*, *58*, *78*, *95*, *101*, *103*, *108*, *114*, *125, 126*, *131, 132*, *158*, *162*
stri_write_lines, *5*, 166
stri_write_lines(), *115, 116*
stringi *(*stringi-package*)*, 4
stringi-arguments *(*about_arguments*)*, 10
stringi-encoding, *60–63*, *65*, *70*
stringi-encoding *(*about_encoding*)*, 11
stringi-locale, *36*, *77*, *86–88*, *94*, *157*, *165*
stringi-locale *(*about_locale*)*, 15
stringi-package, 4
stringi-search, *34*, *50*, *74*, *91*, *96*, *120*, *128*, *137*, *146*
stringi-search *(*about_search*)*, 17
stringi-search-boundaries, *36*, *77*, *94*, *100*, *130*
stringi-search-boundaries *(*about_search_boundaries*)*, 18
stringi-search-charclass, *112*, *159*, *163*
stringi-search-charclass *(*about_search_charclass*)*, 20
stringi-search-coll, *102*, *104*
stringi-search-coll *(*about_search_coll*)*, 25
stringi-search-fixed, *104*, *106*
stringi-search-fixed *(*about_search_fixed*)*, 26
stringi-search-regex, *105, 106*, *137*
stringi-search-regex *(*about_search_regex*)*, 27
strptime, *42*, *46*
strwrap, *165*
Sys.getlocale, *13*, *64, 65*

unique, *161*
utf8ToInt, *68*

writeLines, *167*