Package 'radtools'

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Title Utilities for Smooth Navigation of Medical Image Data

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Description
A collection of utilities for navigating medical image data. The DICOM and NIfTI formats are supported. Functions provide simple interfaces to the data and metadata contained in these formats.
A particular emphasis on metadata allows simple conversion of image metadata to familiar R data structures
such as lists and data frames. Where possible, generic functions can silently process either DICOM or
NIfTI data. Additionally, image data can be extracted and viewed.

Depends R (>= 3.4.0)

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Encoding UTF-8

LazyData true

Imports oro.dicom, dplyr, Hmisc, oro.nifti, magrittr, methods

RoxygenNote 6.1.0

Suggests testthat, covr, knitr, rmarkdown, rvest, hashmap, stringr, xml2

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

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R topics documented:

`dicom_all_valid_header_keywords`
Get all valid DICOM header keywords

Description

Get all valid DICOM header keywords

Usage

```
dicom_all_valid_header_keywords()
```

Value

Vector of all possible header keywords (e.g. "PatientName") from the DICOM standard

`dicom_all_valid_header_names` *Get all valid DICOM header names*

Description

Get all valid DICOM header names

Usage

```
dicom_all_valid_header_names()
```

Value

Vector of all possible header keywords (e.g. "Patient's Name") from the DICOM standard

`dicom_all_valid_header_tags` *Get all valid DICOM header tags*

Description

Get all valid DICOM header tags

Usage

```
dicom_all_valid_header_tags()
```

Value

Vector of all possible header tags (e.g. "(0008,0020)") from the DICOM standard

dicom_constant_header_values

Get the values of header attributes that are constant across slices

Description

Get the values of header attributes that are constant across slices

Usage

```
dicom_constant_header_values(dicom_data, numeric = TRUE)
```

Arguments

dicom_data	DICOM data returned by read_dicom
numeric	Convert number values to numeric instead of strings

Value

List of field values that are constant across all slices. List identifiers are field names and values are the common attribute values. Fields that are included more than once in the header are excluded from the return list.

Examples

```
dicom_constant_header_values(radtools::sample_dicom_img)
```

dicom_header_as_matrix

Get the header information as a matrix

Description

Get the header information as a matrix

Usage

```
dicom_header_as_matrix(dicom_data, slice_idx = NA)
```

Arguments

dicom_data	DICOM data returned by read_dicom
slice_idx	1-based slice index. If NA, all slices will be included. Won't work if multiple slices are included in only one image file.

Value

Data frame containing one record for each header attribute. Note that if all slices are included, fields that appear more than once (including tag and name) in a given slice header will be excluded from the values reported for that slice. Each column contains all header attributes for one slice, therefore, values are represented as strings even if they are conceptually numeric.

Examples

```
dicom_header_as_matrix(radtools::sample_dicom_img)
```

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dicom_header_tag *Get DICOM header tag string corresponding to a group and element*

Description

Get DICOM header tag string corresponding to a group and element

Usage

```
dicom_header_tag(group, element)
```

Arguments

group	Group e.g. "0008"
element	Element e.g. "0020"

Value

The tag e.g. "(0008,0020)"

Examples

```
dicom_header_tag("0008", "0020")
```

dicom_search_header_keywords

Search header keywords in the DICOM standard for matches to a string

Description

Search header keywords in the DICOM standard for matches to a string

Usage

```
dicom_search_header_keywords(str)
```

Arguments

str	String to search for (case insensitive)

Value

Vector of header keywords (e.g. "PatientName") matching the string

Examples

```
dicom_search_header_keywords("manufacturer")
```

dicom_search_header_names

Search header names in the DICOM standard for matches to a string

Description

Search header names in the DICOM standard for matches to a string

Usage

```
dicom_search_header_names(str)
```

Arguments

str	String to search for (case insensitive)

Value

Vector of header names (e.g. "Patient's Name") matching the string

Examples

```
dicom_search_header_names("manufacturer")
```

`dicom_standard_timestamp` *Get the time at which the DICOM standard was loaded from the web for this package*

Description

Get the time at which the DICOM standard was loaded from the web for this package

Usage

```
dicom_standard_timestamp()
```

Value

Timestamp

`dicom_standard_version` *Get the version of the DICOM standard assumed by validation functions*

Description

Get the version of the DICOM standard assumed by validation functions

Usage

```
dicom_standard_version()
```

Value

DICOM standard version

dicom_standard_web *Get the website used to load the DICOM standard for this package*

Description

Get the website used to load the DICOM standard for this package

Usage

```
dicom_standard_web()
```

Value

Web URL for DICOM standard

header_fields *Get the names of metadata fields from an image dataset's header(s)*

Description

Get the names of metadata fields from an image dataset's header(s)

Usage

```
header_fields(img_data)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1

Value

Vector of header field names

Examples

```
header_fields(radtools::sample_dicom_img)
header_fields(radtools::sample_nifti_img)
```

`header_fields.dicomdata`

Get the names of DICOM header fields for an image series.

Description

If field names are repeated within a single header, these duplicate fields are omitted from the return value. If slices have different header fields, this function returns the union across slices of all field names.

Usage

```
## S3 method for class 'dicomdata'
header_fields(img_data)
```

Arguments

`img_data`	DICOM data returned by `read_dicom`

Value

Vector of header field names

`header_fields.nifti1data`

Get the fields in a NIfTI-1 header.

Description

See the official definition of the NIfTI-1 header.

Usage

```
## S3 method for class 'nifti1data'
header_fields(img_data)
```

Arguments

`img_data`	NIfTI-1 data returned by `read_nifti1`

Value

Vector of header field names

header_value *Get metadata contained in a header field*

Description

Get metadata contained in a header field

Usage

```
header_value(img_data, field)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1
field	Field name

Value

Metadata for the field in an appropriate format for the data type

Examples

```
header_value(radtools::sample_dicom_img, "SliceLocation")
header_value(radtools::sample_nifti_img, "dim_")
```

header_value.dicomdata *Get vector of header values for each DICOM slice for a header field*

Description

Get vector of header values for each DICOM slice for a header field

Usage

```
## S3 method for class 'dicomdata'
header_value(img_data, field)
```

Arguments

img_data	DICOM data returned by read_dicom
field	Header field keyword e.g. "PatientName"

Value

Vector of header values. Numeric values are converted to numbers.

header_value.nifti1data *Get header value for a field in a NIfTI-1 header*

Description

Get header value for a field in a NIfTI-1 header

Usage

```
## S3 method for class 'nifti1data'
header_value(img_data, field)
```

Arguments

img_data	NIfTI-1 data returned by read_nifti1
field	Header field name e.g. "sizeof_hdr". Get header field names with header_fields.

Value

Metadata field value

img_data_to_3D_mat *Convert image data to 3D matrix of intensities*

Description

Convert image data to 3D matrix of intensities

Usage

```
img_data_to_3D_mat(img_data, coord_extra_dim)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1
coord_extra_dim	Coordinates in extra dimensions (beyond 3) that define the particular 3D image of interest. Not applicable for DICOM; pass NULL in that case.

Value

3D array of intensities where third dimension is slice

Examples

```
img_data_to_3D_mat(radtools::sample_nifti_img)
## Not run: img_data_to_3D_mat(nifti_data_4D, coord_extra_dim = 10)
```

img_data_to_mat *Convert image data to matrix of intensities*

Description

Convert image data to matrix of intensities

Usage

```
img_data_to_mat(img_data)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1

Value

Multidimensional array of intensities where third dimension is slice

Examples

```
img_data_to_mat(radtools::sample_dicom_img)
```

img_dimensions *Get the dimensions of an image*

Description

Get the dimensions of an image

Usage

```
img_dimensions(img_data)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1

Value

Image dimensions

Examples

```
img_dimensions(radtools::sample_dicom_img)
img_dimensions(radtools::sample_nifti_img)
```

nifti1_header_values *Get named list of header attributes for a NIfTI-1 file*

Description

Get named list of header attributes for a NIfTI-1 file

Usage

```
nifti1_header_values(img_data)
```

Arguments

img_data	NIfTI-1 data returned by read_nifti1

Value

List of header attribute values

Examples

```
nifti1_header_values(radtools::sample_nifti_img)
```

nifti1_num_dim *Get the number of dimensions in a NIfTI-1 image*

Description

Get the number of dimensions in a NIfTI-1 image

Usage

```
nifti1_num_dim(nifti1_data)
```

Arguments

nifti1_data	NIfTI-1 data returned by read_nifti1

Examples

```
nifti1_num_dim(radtools::sample_nifti_img)
```

num_slices *Get the number of image slices in an image series*

Description

Get the number of image slices in an image series

Usage

```
num_slices(img_data)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1

Value

Number of slices

Examples

```
num_slices(radtools::sample_dicom_img)
num_slices(radtools::sample_nifti_img)
```

read_dicom *Read a DICOM image or series of images*

Description

Read a DICOM image or series of images

Usage

```
read_dicom(path, ...)
```

Arguments

path	Directory containing DICOM images, or single image file
...	Additional arguments to readDICOM

Value

List with elements hdr and img, each with an element for each slice

Examples

```
## Not run: read_dicom(dicom_directory)
## Not run: read_dicom(dicom_file.dcm)
```

read_nifti1 *Read a NIfTI-1 image*

Description

Read a NIfTI-1 image

Usage

```
read_nifti1(file, ...)
```

Arguments

file	.nii file, gzipped or not, or base of .hdr and .img files without extension
...	Additional arguments to readNIfTI

Value

List containing object of class nifti

Examples

```
## Not run: read_nifti1(nifti_file.nii)
## Not run: read_nifti1(nifti_file_basename)
```

sample_dicom_img *A sample DICOM image*

Description

A sample DICOM image

Usage

```
sample_dicom_img
```

Format

A ‘dicomdata‘ object; list with elements ‘hdr‘ and ‘img‘

hdr DICOM header

img DICOM image data

Source

http://www.pcir.org/researchers/downloads_available.html

sample_nifti_img *A sample NIfTI-1 image*

Description

A sample NIfTI-1 image

Usage

```
sample_nifti_img
```

Format

List with one element 'data'

data Object of class 'nifti'

Source

https://nifti.nimh.nih.gov/nifti-1/data

view_slice *Display a visual of one slice of an image*

Description

Display a visual of one slice of an image

Usage

```
view_slice(img_data, slice = NULL, col = grDevices::grey(0:64/64), ...)
```

Arguments

img_data	Image data returned by e.g. read_dicom or read_nifti1
slice	Slice number, or NULL if image is already 2D
col	Color scheme
...	Additional arguments to view_slice_mat

Examples

```
view_slice(radtools::sample_dicom_img, slice = 2)
```

`view_slice_mat` *Display a visual of one slice of an image matrix*

Description

Display a visual of one slice of an image matrix

Usage

```
view_slice_mat(mat, slice = NULL, col = grDevices::grey(0:64/64), ...)
```

Arguments

`mat`	2D or 3D intensity matrix, e.g. the return value from `img_data_to_mat` or `img_data_to_3D_mat`
`slice`	Slice number, or NULL if matrix is 2D
`col`	Color scheme
`...`	Additional arguments to `image`

Examples

```
## Not run: view_slice_mat(img_data_to_3D_mat(nifti_data_4d, coord_extra_dim = 10), slice = 20)
```

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