Package ‘radtools’

April 28, 2019

Title Utilities for Convenient Extraction of Medical Image Metadata
Version 1.0.6
Author Pamela Russell [aut, cre]
Maintainer Pamela Russell <pamela.russell@gmail.com>
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)
License MIT + file LICENSE
Encoding UTF-8
LazyData true
Imports oro.dicom, dplyr, Hmisc, oro.nifti, magrittr, methods, TCIApthfinder, R.utils, xfun
RoxygenNote 6.1.1
Suggests testthat, covr, knitr, rmarkdown, rvest, hashmap, stringr, xml2
VignetteBuilder knitr
NeedsCompilation no
Repository CRAN
Date/Publication 2019-04-28 20:50:06 UTC

R topics documented:

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**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**

\[ \text{dicom\_all\_valid\_header\_names}() \]

**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**

\[ \text{dicom\_all\_valid\_header\_tags}() \]

**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**
```
data(sample_dicom_img)
dicom_constant_header_values(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

data(sample_dicom_img)
dicom_header_as_matrix(sample_dicom_img)

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

<table>
<thead>
<tr>
<th>argument</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>group</td>
<td>Group e.g. &quot;0008&quot;</td>
</tr>
<tr>
<td>element</td>
<td>Element e.g. &quot;0020&quot;</td>
</tr>
</tbody>
</table>

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**

```python
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**

```python
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**

```r
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**

```r
header_fields(img_data)
```

**Arguments**

| img_data | Image data returned by e.g. `read_dicom` or `read_nifti` |

**Value**

Vector of header field names

**Examples**

```r
data(sample_dicom_img)
data(sample_nifti_img)
header_fields(sample_dicom_img)
header_fields(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**

```r
def 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**

```r
def S3 method for class 'nifti1data'
header_fields(img_data)
```

**Arguments**

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

**Value**

Vector of header field names
header_value.
dicomdata

---

**header_value**

*Get metadata contained in a header field*

**Description**

Get metadata contained in a header field

**Usage**

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

**Arguments**

- **img_data**: Image data returned by e.g. `read_dicom` or `read_nifti`
- **field**: Field name

**Value**

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

**Examples**

```python
data(sample_dicom_img)
data(sample_nifti_img)
header_value(sample_dicom_img, "SliceLocation")
header_value(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**

```python
# 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

data(sample_nifti_img)
img_data_to_mat(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_nifti`

Value

Multidimensional array of intensities where third dimension is slice

Examples

`data(sample_dicom_img)`
`img_data_to_mat(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_nifti`

Value

Image dimensions, or NA if image has no slices
nifti1_header_values

Examples

```r
data(sample_dicom_img)
data(sample_nifti_img)
img_dimensions(sample_dicom_img)
img_dimensions(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

```r
nifti1_header_values(img_data)
```

Arguments

- **img_data**: NIfTI-1 data returned by `read_nifti`

Value

List of header attribute values

Examples

```r
data(sample_nifti_img)
nifti1_header_values(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

```r
nifti1_num_dim(nifti1_data)
```

Arguments

- **nifti1_data**: NIfTI-1 data returned by `read_nifti`

Examples

```r
data(sample_nifti_img)
nifti1_num_dim(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**

```python
num_slices(img_data)
```

**Arguments**

- `img_data` Image data returned by e.g. `read_dicom` or `read_nifti`

**Value**

Number of slices

**Examples**

```python
data(sample_dicom_img)
data(sample_nifti_img)
num_slices(sample_dicom_img)
num_slices(sample_nifti_img)
```

---

**read_dicom**

*Read a DICOM image or series of images*

**Description**

Read a DICOM image or series of images

**Usage**

```python
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. `img` is empty if the DICOM file contains no pixel data.
**read_nifti**

*Read a NIfTI-1 image*

## Description
Read a NIfTI-1 image

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

---

**sample_dicom_img**

*A sample DICOM image*

## Description
A sample DICOM image

## Usage
```r
sample_dicom_img
```

## Format
A `dicomdata` object; list with elements `hdr` and `img`

- `hdr`: DICOM header
- `img`: DICOM image data
Source

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

---

table

<table>
<thead>
<tr>
<th>Sample NIfTI-1 Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>A sample NIfTI-1 image</td>
</tr>
</tbody>
</table>

Description

A sample NIfTI-1 image

Usage

```r
tsample_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

```r
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_nifti`
- `slice` Slice number, or NULL if image is already 2D
- `col` Color scheme
- `...` Additional arguments to `view_slice_mat`

Examples

```r
data(sample_dicom_img)
view_slice(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

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