# Package 'Epoch'

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**Title** IEEG (Intracranial Electroencephalography) Epoch Data Tools

**Version** 1.0.3

**Description** Provides tools for working with iEEG matrix data, including downloading curated iEEG data from OSF (The Open Science Framework <https://osf.io/>) (EpochDownloader()), making new objects (Epoch()), processing (crop() and resample()), and visualizing the data (plot()).

**License** GPL (>= 3)

**Encoding** UTF-8

**RoxygenNote** 7.3.2

**Biarch** true

**Depends** R (>= 4.1)

**Imports** ggplot2, methods, ramify, TableContainer, glue, osfr, jsonlite, rlang, ggtext, gsignal

**SystemRequirements** GNU make

**Suggests** knitr, rmarkdown, testthat (>= 3.0.0)

**Config/testthat/edition** 3

**VignetteBuilder** knitr

**NeedsCompilation** no

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**Repository** CRAN

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`.checkIndex` *Check and keep valid index only*

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## Description

Check and keep valid index only

## Usage

```
.checkIndex(indices, names)
```

## Arguments

| | |
|---|---|
| `indices` | Numeric or character index to check |
| `names` | Character. All names corresponding to the indices |

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`.standardizeIEEG` *Standardize iEEG row data for plotting*

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## Description

Standardize iEEG row data for plotting

## Usage

```
.standardizeIEEG(data)
```

## Arguments

| | |
|---|---|
| `data` | Matrix or data frame of iEEG data |

## Value

Standardized data matrix

## coltimes *Obtain the time points for the Epoch matrix*

### Description

Obtain the time points for the Epoch matrix

### Usage

```
coltimes(x)

## S4 method for signature 'Epoch'
coltimes(x)
```

### Arguments

| | |
|---|---|
| x | An Epoch object |

### Value

A numeric vector of time points, or column indices if time points are not defined

### See Also

Other Epoch methods: `crop()`, `plot,Epoch,missing-method`, `resample()`, `show,Epoch-method`

### Examples

```
# Create an Epoch object
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)

# get the time points of an Epoch object
coltimes(epoch)
```

## crop *Methods for Epoch class*

### Description

Truncating iEEG data to a specific time range.

## Usage

```
crop(x, start, end, ...)

## S4 method for signature 'Epoch'
crop(x, start, end, checkTimeRange = TRUE)
```

## Arguments

| | |
|---|---|
| x | An Epoch object |
| start | Numeric value specifying start of new time range |
| end | Numeric value specifying end of new time range |
| ... | Not used |
| checkTimeRange | Logical, whether to check the validity of the time range. This includes checking if the time range is empty, if start is greater than end, and if start or end are out of bounds. Default is TRUE. |

## Value

clip the time range of the Epoch object

## See Also

Other Epoch methods: coltimes(), plot,Epoch,missing-method, resample(), show,Epoch-method

## Examples

```
# Create an Epoch object
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)

# crop the epoch
crop(epoch, start = 0.5, end = 1.5)
```

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# dim,Epoch-method *Wrapper functions for calling TableContainer methods*

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## Description

Wrapper functions for calling TableContainer methods

## Usage

```
## S4 method for signature 'Epoch'
dim(x)

## S4 method for signature 'Epoch'
dimnames(x)

## S4 method for signature 'Epoch'
x[i, j, ..., drop = TRUE]
```

## Arguments

| | |
|---|---|
| x | An Epoch object |
| i | Row indices for subsetting. If only i is provided, it will return the entire row(s). |
| j | Column indices for subsetting. |
| ... | Additional arguments. |
| drop | Not used. |

## Value

[: A new Epoch object with the selected data.

## Examples

```
# Create an Epoch object
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)

# wrappers
dim(epoch)
dimnames(epoch)
epoch[1]
```

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# Epoch *Constructor for Epoch class*

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## Description

Constructor for Epoch class

## Usage

```
Epoch(
  table,
  electrodes = NULL,
  times = NULL,
  startTime = NULL,
  samplingRate = NULL,
  rowData = NULL,
  colData = NULL,
  metaData = NULL
)
```

## Arguments

| | |
|---|---|
| table | Matrix containing epoch data (rows=electrodes, columns=time points) |
| electrodes | Optional character vector for electrode names, if not provided, row names of data are used. If row names are also not available, there will be no electrode names. |
| times | Optional numeric vector of time points. |
| startTime | Optional numeric value for start time, if provided, times will be calculated based on this and samplingRate. |
| samplingRate | Optional numeric value for sampling rate, if provided, times will be calculated based on this and startTime. |
| rowData | Optional data frame containing metadata for rows (electrodes). |
| colData | Optional data frame containing metadata for columns (time points). |
| metaData | Optional list containing metadata for the Epoch object. Element name "SamplingRate" is reserved by the Epoch class. |

## Value

An Epoch object

## Examples

```
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)
```

## Epoch-class *Epoch Class*

### Description

S4 class to handle epoch data with electrodes and time points

### Slots

`table` a matrix containing iEEG data (columns=time points, rows=electrodes)

`colData` a data frame containing metadata for columns (time points)

`rowData` a data frame containing metadata for rows (electrodes)

`metaData` a list containing metadata for the Epoch object

## EpochDownloader *EpochDownloader constructor*

### Description

Manually update the project list from the remote repository. This function will attempt to download the latest configuration from the GitHub repository. If it fails, the current configuration will remain unchanged.

This function returns the list of available projects. If the configuration has not been fetched yet, it will automatically update the project list from the remote repository.

### Usage

```
EpochDownloader(id = NULL, progress = TRUE, verbose = FALSE, path = NULL)

## S4 method for signature 'EpochDownloader'
names(x)

## S4 method for signature 'EpochDownloader'
x[i]

## S4 method for signature 'EpochDownloader'
x$name

## S4 method for signature 'EpochDownloader'
x[[i]]

## S4 method for signature 'EpochDownloader'
show(object)
```

```
## S4 method for signature 'EpochDownloader'
length(x)

wiki(x, ...)

## S4 method for signature 'EpochDownloader'
wiki(x)

updateRepos(verbose = FALSE)

EpochRepos(verbose = TRUE)
```

## Arguments

| | |
|---|---|
| id | Either the ID of an OSF project or the name of an iEEG projects (case insensitive). Check the available projects using `EpochRepos()`. The default points to the fragility data from the Fragility multi-center retrospective study. |
| progress | Logical indicating whether to show progress during download. |
| verbose | Logical indicating whether to show messages |
| path | The path to the temporary folder where the files will be downloaded. |
| x | An `EpochDownloader` object. |
| i | Index or name of the files to be accessed. |
| name | The name of the file to be accessed. |
| object | An `EpochDownloader` object. |
| ... | Not used, for future extensibility |

## Value

`EpochDownloader`: An `EpochDownloader` object.

`names`: A character vector of file names.

`[`: A named list of `Epoch` objects. The names are the dataset names.

`$`: A single `Epoch` object.

`[[`: A single `Epoch` object.

`show`: Prints a summary of the `EpochDownloader` object.

`length`: Returns the number of files in the `EpochDownloader` object.

`wiki`: Opens the wiki page in the default browser

`updateRepos`: No return value, called for side effects.

`EpochRepos`: A list of project names and their corresponding OSF project IDs.

## Examples

```
# list all available projects
EpochRepos()

# downloader for the fragility data
dl <- EpochDownloader(id = "fragility")

# list all Epoch objects in the downloader
names(dl)

# download the first Epoch object

 dl[1]
 # equivalent to (index by name)
 dl[names(dl)[1]]


# download the multiple Epoch objects

 dl[c(1, 2)]
 # equivalent to (index by name)
 dl[names(dl)[c(1, 2)]]


EpochRepos()
```

---

`EpochDownloader-class` *EpochDownloader*

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## Description

`EpochDownloader` is a class that allows downloading and accessing files from a OSF project.

## Slots

`id` The ID of the OSF project.

`files` The files in the OSF project.

`dataNames` The names of the files in the OSF project.

`tmp_folder` The temporary folder where the files are downloaded.

`progress` Logical indicating whether to show progress during download.

## get_config_data *Get configuration data from remote URL*

### Description

Get configuration data from remote URL

### Usage

```
get_config_data()
```

### Value

A list of project configurations

## plot,Epoch,missing-method *Plot method for Epoch objects*

### Description

Plot method for Epoch objects

### Usage

```
## S4 method for signature 'Epoch,missing'
plot(
  x,
  y,
  gap = 2,
  groupIndex = NULL,
  timeResolution = 2048,
  maxLabels = 50,
  x.lab.size = 2,
  ...
)
```

### Arguments

| | |
|---|---|
| x | An Epoch object |
| y | Not used (for S4 method compatibility) |
| gap | Numeric value specifying the gap between electrode traces (default: 2) |
| groupIndex | Integer or string. A group of electrodes to show together in a different color. If NULL(default), all electrodes are shown in the same color. |

| | |
|---|---|
| timeResolution | Maximum number of time points to keep for each electrode (default: 2048) |
| maxLabels | Maximum number of electrode labels to display on the y-axis (default: 50) |
| x.lab.size | Size of the x-axis label text (default: 2) |
| ... | Additional arguments (not currently used) |

## Value

plot: A ggplot object showing iEEG electrode traces

## See Also

Other Epoch methods: coltimes(), crop(), resample(), show,Epoch-method

## Examples

```
# Create an Epoch object
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)

# Plot the epoch
plot(epoch)
```

---

# resample *Generic function for resampling objects*

---

## Description

This function allows you to resample an object to a different sampling frequency.

This function allows you to resample an Epoch object to a different sampling frequency.

## Usage

```
resample(x, ...)

## S4 method for signature 'Epoch'
resample(x, samplingRate, ...)
```

## Arguments

| | |
|---|---|
| x | An Epoch object to be resampled. |
| ... | Additional arguments passed to gsignal::resample |
| samplingRate | The new sampling frequency (unit: Hertz). |

## Value

An Epoch object with the resampled data.

## See Also

Other Epoch methods: coltimes(), crop(), plot,Epoch,missing-method, show,Epoch-method

## Examples

```
# Create an Epoch object
epoch_data <- matrix(rnorm(1000), nrow = 10)
rownames(epoch_data) <- paste0("Electrode_", 1:10)
epoch <- Epoch(epoch_data, startTime = 0, samplingRate = 100)

# downsample the epoch to 50 Hz
resample(epoch, samplingRate = 50)

# upsample the epoch to 200 Hz
resample(epoch, samplingRate = 200)
```

---

# show,Epoch-method *Print the Epoch Object*

---

## Description

Print the Epoch Object

## Usage

```
## S4 method for signature 'Epoch'
show(object)
```

## Arguments

| | |
|---|---|
| object | Epoch object |

## Value

returns an invisible NULL

## See Also

Other Epoch methods: coltimes(), crop(), plot,Epoch,missing-method, resample()

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