

# Package ‘Epoch’

November 22, 2025

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

**Version** 1.0.7

**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** 7.3.3

**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

**Author** Jiefei Wang [aut, cre]

**Maintainer** Jiefei Wang <szwjf08@gmail.com>

**Repository** CRAN

**Date/Publication** 2025-11-22 17:30:02 UTC

## Contents

|                            |   |
|----------------------------|---|
| .checkIndex . . . . .      | 2 |
| .standardizeIEEG . . . . . | 2 |
| coltimes . . . . .         | 3 |
| crop . . . . .             | 3 |
| dim,Epoch-method . . . . . | 4 |

|                                     |    |
|-------------------------------------|----|
| Epoch . . . . .                     | 5  |
| Epoch-class . . . . .               | 7  |
| EpochDownloader . . . . .           | 7  |
| EpochDownloader-class . . . . .     | 9  |
| get_config_data . . . . .           | 10 |
| plot,Epoch,missing-method . . . . . | 10 |
| resample . . . . .                  | 12 |
| show,Epoch-method . . . . .         | 13 |

## **Index** **14**

---

|                          |  |
|--------------------------|--|
| <code>.checkIndex</code> | <i>Check and keep valid index only</i> |
|--------------------------|--|

---

### **Description**

Check and keep valid index only

### **Usage**

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

### **Arguments**

|                      |   |
|----------------------|---|
| <code>indices</code> | Numeric or character index to check               |
| <code>names</code>   | Character. All names corresponding to the indices |

---

|                               |   |
|-------------------------------|---|
| <code>.standardizeIEEG</code> | <i>Standardize iEEG row data for plotting</i> |
|-------------------------------|---|

---

### **Description**

Standardize iEEG row data for plotting

### **Usage**

```
.standardizeIEEG(data, standardize = TRUE, gap = 2)
```

### **Arguments**

|                          |  |
|--------------------------|--|
| <code>data</code>        | Matrix or data frame of iEEG data  |
| <code>standardize</code> | Logical or numeric vector. If logical, indicates whether to standardize each row. If numeric, indicates the scaling factor for each row. |
| <code>gap</code>         | Numeric. The gap to separate different electrodes in the plot.   |

### **Value**

Standardized data matrix

---

|          |  |
|----------|--|
| coltimes | <i>Obtain the time points for the Epoch matrix</i> |
|----------|--|

---

**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 | <i>Methods for Epoch class</i> |
|------|--------------------------------|

---

**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)
```

---

dim,Epoch-method

*Wrapper functions for calling TableContainer methods*

---

**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]
```

---

Epoch

*Constructor for Epoch class*

---

**Description**

Constructor for Epoch class

**Usage**

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

**Arguments**

|                           |  |
|---------------------------|--|
| <code>table</code>        | Matrix containing epoch data (rows=electrodes, columns=time points)  |
| <code>electrodes</code>   | 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. |
| <code>times</code>        | Optional numeric vector of time points.  |
| <code>startTime</code>    | Optional numeric value for start time, if provided, times will be calculated based on this and <code>samplingRate</code> .   |
| <code>samplingRate</code> | Optional numeric value for sampling rate, if provided, times will be calculated based on this and <code>startTime</code> .   |
| <code>rowData</code>      | Optional data frame containing metadata for rows (electrodes).   |
| <code>colData</code>      | Optional data frame containing metadata for columns (time points).   |
| <code>metaData</code>     | 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 | <i>Epoch Class</i> |
|-------------|--------------------|

---

**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 | <i>EpochDownloader constructor</i> |
|-----------------|------------------------------------|

---

**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

|                       |  |
|-----------------------|--|
| <code>id</code>       | Either the ID of an OSF project or the name of an iEEG projects (case insensitive). Check the available projects using <code>EpochRepos()</code> . The default points to the fragility data from the Fragility multi-center retrospective study. |
| <code>progress</code> | Logical indicating whether to show progress during download.   |
| <code>verbose</code>  | Logical indicating whether to show messages  |
| <code>path</code>     | The path to the temporary folder where the files will be downloaded.   |
| <code>x</code>        | An <code>EpochDownloader</code> object.  |
| <code>i</code>        | Index or name of the files to be accessed.   |
| <code>name</code>     | The name of the file to be accessed.   |
| <code>object</code>   | An <code>EpochDownloader</code> object.  |
| <code>...</code>      | 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*

---

**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 | <i>Get configuration data from remote URL</i> |
|-----------------|---|

---

**Description**

Get configuration data from remote URL

**Usage**

```
get_config_data()
```

**Value**

A list of project configurations

---

|                           |                                      |
|---------------------------|--------------------------------------|
| plot,Epoch,missing-method | <i>Plot method for Epoch objects</i> |
|---------------------------|--------------------------------------|

---

**Description**

Plot method for Epoch objects

**Usage**

```
## S4 method for signature 'Epoch,missing'  
plot(  
  x,  
  y,  
  gap = 2,  
  groupIndex = NULL,  
  timeResolution = 2048,  
  maxLabels = 50,  
  linewidth = 0.2,  
  x.lab.size = 10,  
  y.lab.size = 10,  
  standardize = TRUE,  
  ...  
)
```

**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)   |
| linewidth      | Line width for the electrode traces (default: 0.2)  |
| x.lab.size     | Size of the x-axis label text (default: 10)   |
| y.lab.size     | Size of the y-axis label text (default: 10)   |
| standardize    | If the parameter is a logical value, it indicates whether to standardize the iEEG data across time for each electrode. If it is a logical vector with length equal to the number of electrodes, it indicates whether to standardize each electrode individually. If it is a numeric vector with length equal to the number of electrodes, it indicates the standard deviation to use for standardization for each electrode. (default: TRUE). |
| ...            | 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

|                           |   |
|---------------------------|---|
| <code>x</code>            | An Epoch object to be resampled.                              |
| <code>...</code>          | Additional arguments passed to <code>gsignal::resample</code> |
| <code>samplingRate</code> | 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\(\)](#)

# Index

- \* **Epoch downloader**
  - EpochDownloader-class, 9
- \* **Epoch methods**
  - coltimes, 3
  - crop, 3
  - plot, Epoch, missing-method, 10
  - resample, 12
  - show, Epoch-method, 13
- .Epoch (Epoch-class), 7
- .EpochDownloader
  - (EpochDownloader-class), 9
- .checkIndex, 2
- .standardizeIEEG, 2
- [, Epoch-method (dim, Epoch-method), 4
- [, EpochDownloader-method
  - (EpochDownloader), 7
- [[, EpochDownloader-method
  - (EpochDownloader), 7
- \$, EpochDownloader-method
  - (EpochDownloader), 7
  
- coltimes, 3, 4, 11–13
- coltimes, Epoch-method (coltimes), 3
- crop, 3, 3, 11–13
- crop, Epoch-method (crop), 3
  
- dim, Epoch-method, 4
- dimnames, Epoch-method
  - (dim, Epoch-method), 4
  
- Epoch, 5
- Epoch-class, 7
- EpochDownloader, 7
- EpochDownloader-class, 9
- EpochRepos (EpochDownloader), 7
  
- get\_config\_data, 10
  
- length, EpochDownloader-method
  - (EpochDownloader), 7
  
- names, EpochDownloader-method
  - (EpochDownloader), 7
  
- plot, Epoch, missing-method, 10
  
- resample, 3, 4, 11, 12, 13
- resample, Epoch-method (resample), 12
  
- show, Epoch-method, 13
- show, EpochDownloader-method
  - (EpochDownloader), 7
  
- updateRepos (EpochDownloader), 7
  
- wiki (EpochDownloader), 7
- wiki, EpochDownloader-method
  - (EpochDownloader), 7