

Package ‘LeadSense’

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Title Medtronic Brain Sense Local Field Potencial Analysis

Version 0.0.2.0

Description Extracts and creates an analysis pipeline for the JSON data files from Brain Sense sessions using Medtronic's Deep Brain Stimulation surgery electrode implants.

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Encoding UTF-8

RoxygenNote 7.3.2

Imports dplyr, ggplot2, ggpubr, seewave, tidyr, reshape2, signal

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

Depends R (>= 3.5)

LazyData true

NeedsCompilation no

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brain_sense_spectrogram

Plot BrainSense Spectrograms and Return Data (with Optional Band Filtering)

Description

This function generates spectrograms for Medtronic BrainSense time-domain signals across one or more data passes. Optionally, the user can select specific passes to plot, filter by frequency band, save the plots, and extract the underlying spectrogram data.

Usage

```
brain_sense_spectrogram(
  dataset = NULL,
  wl = 512,
  ovlp = 75,
  collevels = seq(-80, 0, by = 0.2),
  save_as = NULL,
  output_dir = getwd(),
  passes = NULL,
  band = NULL
)
```

Arguments

dataset	A JSON-like object (e.g., parsed with <code>jsonlite::fromJSON()</code>) containing Medtronic BrainSense data. If NULL, attempts to load the default dataset from the LeadSense package.
wl	Integer. Window length for FFT. Default is 512.
ovlp	Numeric. Overlap percentage between successive windows. Default is 75.
collevels	Numeric. A sequence of color levels for the spectrogram image (in dB). Default is <code>seq(-80, 0, by = 0.2)</code> .
save_as	Character. File format to save plots ("png", "pdf", or "jpeg"). If NULL (default), plots are not saved.
output_dir	Character. Path to the directory where plots will be saved. Default is current working directory.
passes	Integer vector. Indices of passes to plot (e.g., <code>c(1, 3)</code>). Default is NULL, which plots all available passes.
band	Character. One of "Delta", "Theta", "Alpha", "Beta", "Gamma". If provided, filters signal to this frequency band before generating the spectrogram.

Details

WARNING: This function may be computationally intensive and take significant time to execute. Please wait until all plots are rendered.

Value

A list of data frames (invisible). Each data frame corresponds to one spectrogram and contains:

- time** Time in seconds
- frequency** Frequency in Hz
- magnitude** Spectral power in dB
- channel** Channel label
- pass** Pass index (i)

Examples

```
brain_sense_spectrogram(dataset, passes = c(2), band = "Beta")
```

dataset	<i>JSON list sample session file</i>
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Description

JSON list sample session file

Usage

dataset

Format

A Large list obtained using jsonlite::JSON("myJSON_sessionFile.json")

- AbnormalEnd** AbnormalEnd name
- FullyReadForSession** FullyReadForSession
- FeatureInformationCode** FeatureInformationCode
- SessionDate** SessionDate
- SessionEndDate** SessionEndDate
- ProgrammerTimezone** ProgrammerTimezone
- ProgrammerUtcOffset** ProgrammerUtcOffset
- ProgrammerLocale** ProgrammerLocale
- ProgrammerVersion** ProgrammerVersion
- PatientInformation** PatientInformation
- DeviceInformation** DeviceInformation
- BatteryInformation** BatteryInformation
- GroupUsagePercentage** GroupUsagePercentage
- LeadConfiguration** LeadConfiguration

Stimulation Stimulation
Groups Groups
BatteryReminder BatteryReminder
MostRecentInSessionSignalCheck MostRecentInSessionSignalCheck
Impedance Impedance
GroupHistory GroupHistory
SenseChannelTests SenseChannelTests
CalibrationTests CalibrationTests
LfpMontageTimeDomain LfpMontageTimeDomain
BrainSenseTimeDomain BrainSenseTimeDomain
BrainSenseLfp BrainSenseLfp
LFPMontage LFPMontage
DiagnosticData DiagnosticData

Source

In-house created

Examples

```
data(dataset) # Lazy loading (!)
```

impedance_summary	<i>Extract and summarize Impedance data if available</i>
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Description

This function extracts impedance data from a JSON-like dataset and computes summary statistics.

Usage

```
impedance_summary(dataset = NULL)
```

Arguments

dataset	A JSON object/list loaded into the work environment. If NULL, attempts to load the default dataset from the LeadSense package.
---------	--

Value

A list containing:

- combined_impedance_df - The full impedance dataset (if available).
- impedance_summary - Summary of mean impedance values by Hemisphere and Type.

If no valid impedance data is found, a message is printed instead.

Examples

```
impedance_results <- impedance_summary(dataset)
print(impedance_results$impedance_summary)
print(impedance_results$combined_impedance_df)
```

lfp_data

Extract and summarize LFP data

Description

This function extracts and summarizes LFP (Local Field Potential) data from a JSON-like dataset.

Usage

```
lfp_data(dataset = NULL)
```

Arguments

dataset	A JSON object/list loaded into the work environment. If NULL, attempts to load the default dataset from the LeadSense package.
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Value

A structured LFP dataset including:

- Power in each frequency band
- LFP Frequency vs Magnitude for each electrode
- Time-domain signals for all sequences in the LFP montage

Examples

```
lfp_dataset <- lfp_data(dataset)
print(lfp_dataset$band_power_results)
print(lfp_dataset$structured_lfp_dataset)
```

summary_long	<i>Extract basic session summary information in long format</i>
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Description

Extract basic session summary information in long format

Usage

```
summary_long(dataset = NULL)
```

Arguments

dataset A JSON object/list loaded into the work environment

Value

Long format table with summary session information

Examples

```
summary_long()
```

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