

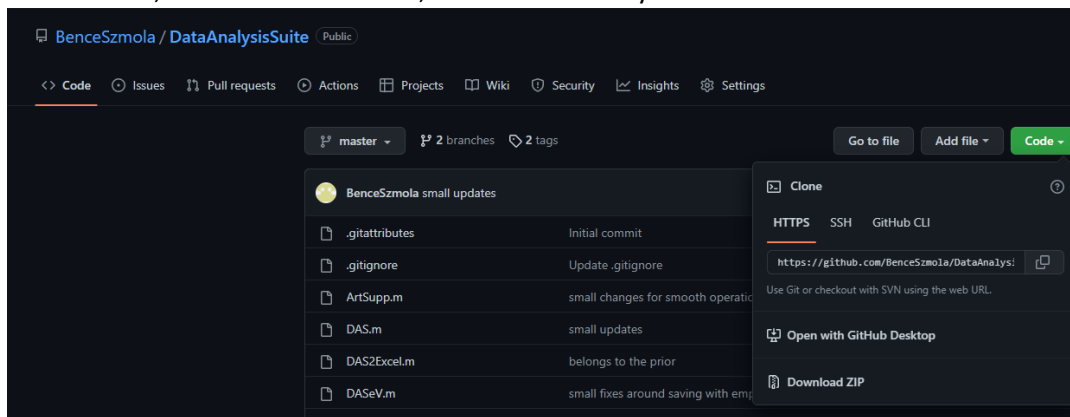
# Data Analysis Suite Package – Documentation

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## Installation

- Go to: <https://github.com/BenceSzmola/DataAnalysisSuite>
- Download the package from the master branch (usually it's the most stable but might not yet have all the latest features)
  - Click "Code", then "Download ZIP", save it wherever you wish



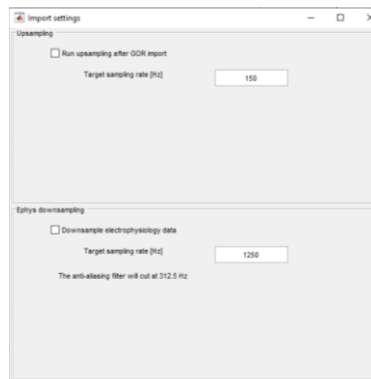
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- Open MATLAB, under Home tab select "Set Path" and using Add Folder, add the folder where you extracted the downloaded ZIP. Don't forget to save!
- Now you can start the GUIs by writing DAS, DASEV and DASEVDB respectively in the command line

## GUI #1: DAS

- Functions
  - Import raw data
    - Currently supported formats:
      - Intan's RHD (electrophysiology a.k.a. ephys)
      - MATLAB variables exported from MES Curve Analysis window (electrophysiology & imaging)
      - CSV (treadmill data)
  - Visualizing data
  - Processing tools for raw data
  - Event detection (ephys, imaging, simultaneous)
  - Saving detections
- Importing data

The screenshot displays the 'Data Analysis Suite' window. On the left, the 'Main Tab' is set to 'Electrophysiology data processing'. A red box labeled '1' highlights the 'Import data' section, which includes checkboxes for 'Electrophysiology' (checked), 'Imaging data (Ca2+)', and 'Running data'. Below this, a red box labeled '2' highlights the 'Data selection' area, which contains three buttons: 'Import RHD', 'Import gorobj', and 'Import run csv'. A red box labeled '3' highlights the 'Data selection' list, which shows a list of files with their paths and scales. On the right, a red box labeled '4' highlights the 'Data visualization' area, which contains four subplots: 'Voltage [uV]' (showing a large spike), 'ΔF/F' (showing a noisy signal), 'Running velocity' (showing a step-like signal), and 'Absolute position' (showing a linear increase over time).

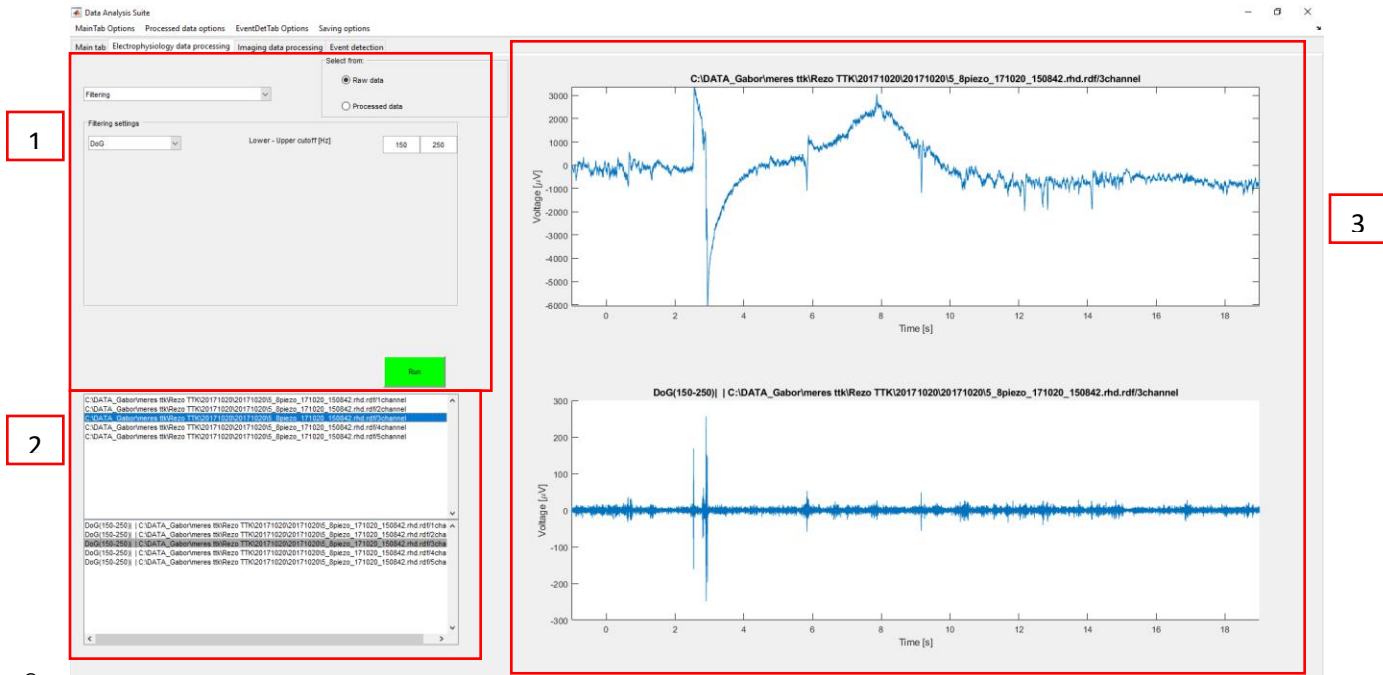
- 1: Checkboxes to select which datatype(s) you want to work with
  - By selecting one, the corresponding import options become available
- 2: Data import options
  - Import RHD: import .rhd files using the Intan import script
  - Import gorobj: import variables which were exported from MES curve analysis window
    - Might extend this to also import from .gor files
  - Import run csv: imports data from the treadmill .csv files
  - Import settings



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- Enable upsampling (meant for imaging data) and/or downsampling (meant for ephys data) of imported data

- 3: Listboxes containing the imported data
- 4: Data display section

## • Data processing



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- 1: Processing setup: here you can choose what type of processing you want to do and set the required parameters
  - Using the toggle buttons you can set whether the processing will work on the raw data or data that was already processed in some way
- 2: Listboxes containing the raw and processed data
  - The upper box contains the raw data
  - The lower contains the processed data
    - Right click in the lower listbox to delete processed data from memory
- 3: Data visualization
  - Upper graph shows the selected raw data
  - Lower graph shows the selected processed data

## Event detection

The screenshot shows the 'Event detection' window of the Data Analysis Suite. It is divided into three main sections:

- 1: Setup of event detection:** This section contains various settings for detection. It includes a 'Reference channel' dropdown, 'Settings for DoD-based detection' (with 'Lower-upper cutoff [Hz]' set to 150-250, 'SD multiplier' set to 4, and 'Min event length [ms]' set to 20), 'Settings for mean-based detection' (with 'Sd multiplier' set to 3 and 'WinSize [samples]' set to 10), and 'Settings for simultaneous detection' (with 'Delay interval between LFP and imaging event [ms]' set to 200-300). There are buttons for 'Run ephys detection', 'Run imaging detection', and 'Run simultan detection'.
- 2: Parameters of detected events:** This section displays the parameters for the detected event. It includes a table of 'Event parameters' with columns for 'Parameter' and 'Value'. The parameters listed are: RawAmplitudeP, RawAmplitudeP2P, RawAmplitudePeakT, RawAmplitudeP2P, Length, Frequency, NumCycles, AUC, RiseTime, RiseTime2000, DecayTime, DecayTime2000, DecayTau, and RiseTime. The values are: 11.2819, 377.3250, 11.2818, 56.6095, 0.0360, 116.6291, 7, 6.5646e+03, 0.0235, 0.0373, 0.0125, 0.0785, -3.7928e-04, and 0.0363.
- 3: Display of events and buttons for browsing through them and deleting them if needed:** This section shows two plots. The top plot is 'Channel #1 Simultan Detection #1/2 (nonSimult #5)' showing Voltage [V] vs Time [s]. The bottom plot is 'ROI #3 Simultan Detection #1/1 (nonSimult #2)' showing ΔF/F vs Time [s]. Both plots have buttons for 'Def', 'Del', 'Chart', 'Chan', and 'Del'.

### 1: Setup of event detection:

#### Select channel(s) for detection (only ephys)

- There is the option to select channel(s) from the processed data in memory or to run processing before detection
- If there are intervals in the recording which shouldn't be taken into consideration when running the detection check the "Select interval" box

#### Select detection method, and specify settings for that method

### 2: Parameters of detected events

#### Here you can see the automatically extracted parameters for the displayed event

### 3: Display of events and buttons for browsing through them and deleting them if needed

## Saving detection

The screenshot shows the 'Event detection' window with the 'Saving options' tab selected. The 'Save detection' button is highlighted in blue. The interface is divided into three main sections:

- 1: Setup of event detection:** This section contains various settings for detection. It includes a 'Reference channel' dropdown, 'Settings for DoD-based detection' (with 'Lower-upper cutoff [Hz]' set to 150-250, 'SD multiplier' set to 4, and 'Min event length [ms]' set to 20), 'Settings for mean-based detection' (with 'Sd multiplier' set to 3 and 'WinSize [samples]' set to 10), and 'Settings for simultaneous detection' (with 'Delay interval between LFP and imaging event [ms]' set to 200-300). There are buttons for 'Run ephys detection', 'Run imaging detection', and 'Run simultan detection'.
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- 3: Display of events and buttons for browsing through them and deleting them if needed:** This section shows two plots. The top plot is 'Channel #1 Simultan Detection #1/2 (nonSimult #5)' showing Voltage [V] vs Time [s]. The bottom plot is 'ROI #3 Simultan Detection #1/1 (nonSimult #2)' showing ΔF/F vs Time [s]. Both plots have buttons for 'Def', 'Del', 'Chart', 'Chan', and 'Del'.

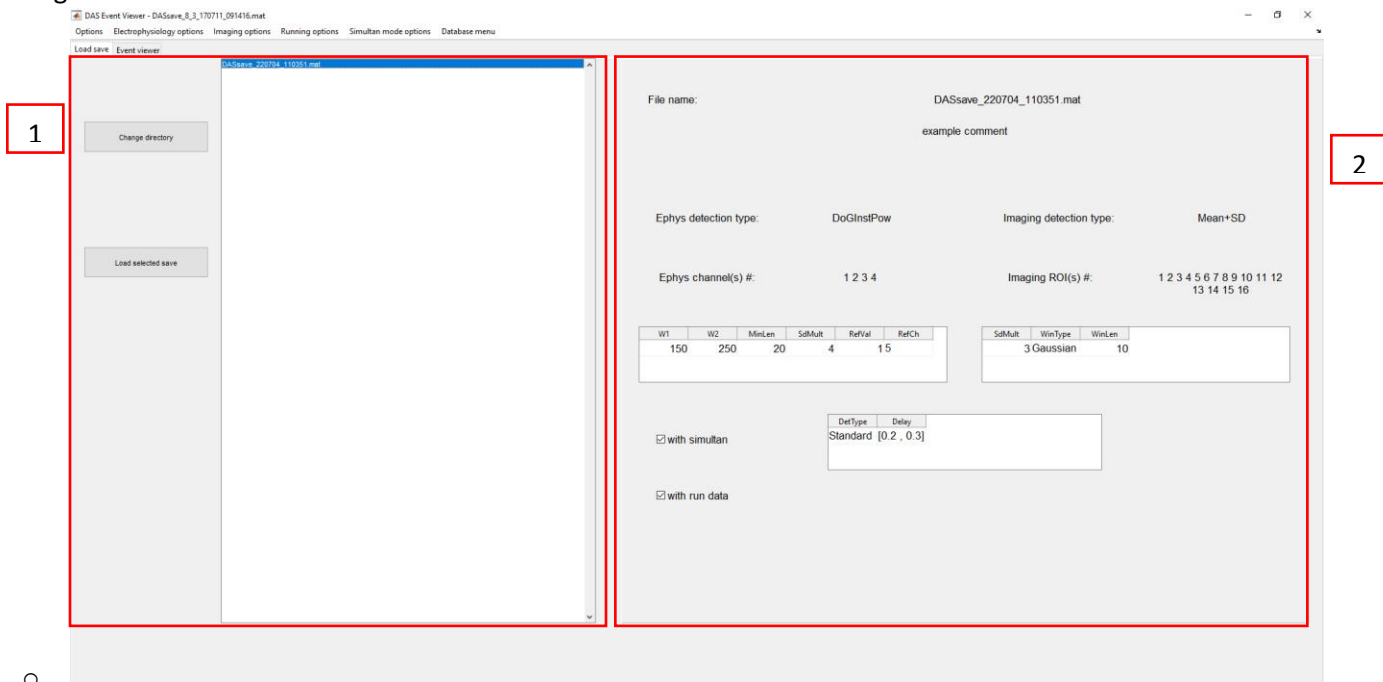
### There are some options depending on what was loaded and what was used for detection

#### Which detection to save (ephsys, imaging, simultaneous)

- If simultaneous is selected both the ephys and imaging individual detections are also saved
- Should the running data be saved
- Should all loaded channels be saved or only those which were used in the detection
- Choosing the name of the save file
  - There is always a tag attached to the name for easy identification later
  - If RHD was loaded, the RHD filename is used as default, otherwise the current date is the default

## GUI #2: DAsE v

- Functions
  - Examining detections saved by DAS in more detail
  - Saving individual events to database
- Loading from the DAS save files



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- 1: File selection part
  - Select the directory with “Change directory” → select the save file you want to load from the list → load it using the “Load selected save” button
- 2: Information panel
  - Here you get a preview of what is in the highlighted save file

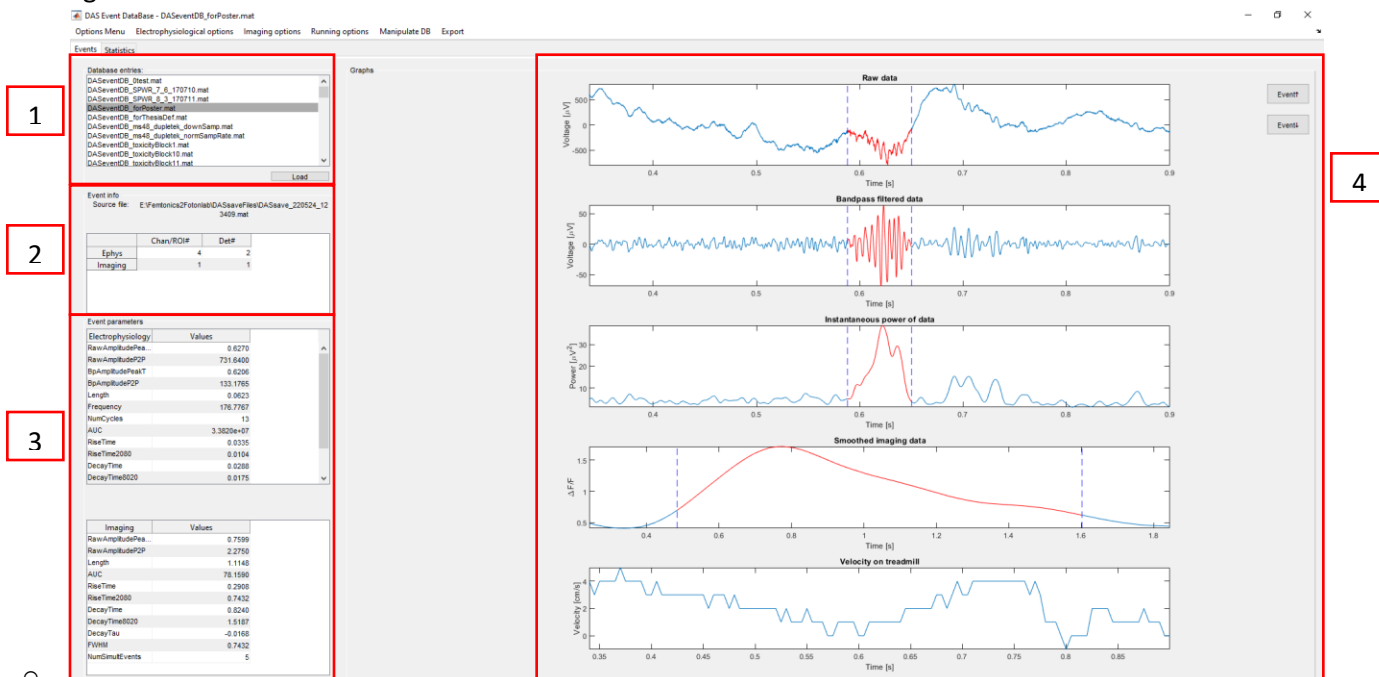
## Examining & saving events



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- 1: Event parameters
- 2: Panel for selecting events to be saved to database
- 3: Graphs showing the events + buttons to step through them
  - Ephys data can be displayed in up to three different forms at once (wideband/raw, bandpassed, power)

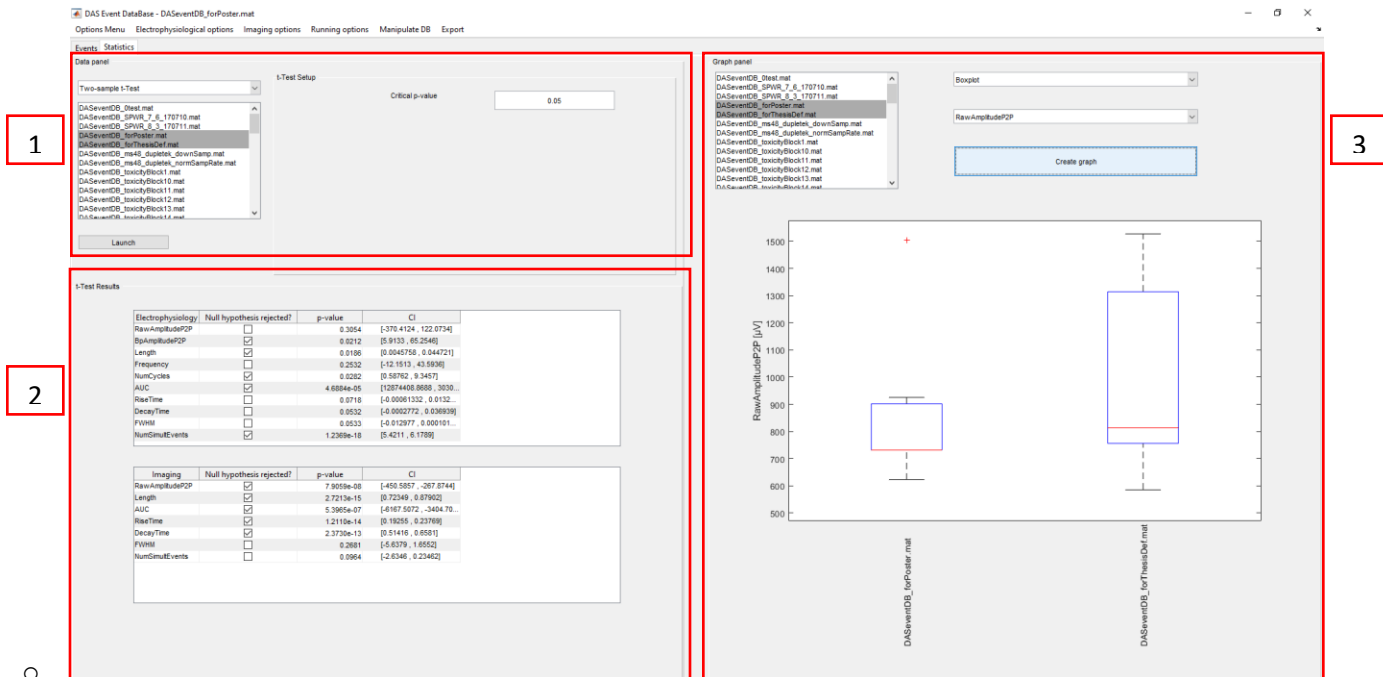
## GUI #3: DASEvDB

- Functions
  - Examining the event database
  - Computing statistics from the database
- Examining database



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- 1: Select which group of events to load
- 2: Information on the source of the event

- Which DAS save file it is from
- Channel and event number in the original detection from where it was taken
- 3: Event parameters
- 4: Display of events
- Statistics



- 1: Setup for statistics computations (basic stats, t-tests)
- 2: Results of the statistics computation
  - If the selected event group contains both ephys and imaging data then the upper table shows the stats for ephys and lower the results for imaging
- 3: Statistically relevant plot generation
  - Select which group(s) you want to use
  - Select the type of plot
  - Select parameter to plot
  - Click "Create graph"