BESA
Statistics 2.1

BESA Statistics Update History

Version 2.1 November 2020

General

BESA Statistics was re-classified according to guidelines of the European Medical Device Directive (MDR). BESA Statistics 2.1 is not a medical device and can be used for research purposes only.

New features

- In all workflows, the data type *Connectivity* can now be used. This enables direct import of results obtained by BESA Connectivity for group statistics on connectivity results in sensor space or source space.

- For *Image* data, a configurable slice view is available that displays sequences in one of three available orthogonal orientation.

Improvements

Themes and user interaction:

- The colour theme can be adjusted between *BESA White* and the previous *BESA Standard*.

- Several new colour maps are available:

  - For diverging data types (e.g. two-tailed t-tests): *Standard*, and *Blue to Red.*

  - For sequential data types (e.g. F-tests): *Standard*, *Rainbow*, *Viridis*, and *White to Red.*

- High DPI displays are supported, and the overall look and feel was modernized.

- The data values are displayed on mouse-over in the detail windows.

- In 2D data displays (time-frequency), the cursor can now be set by clicking into the detail windows or into the Top Viewer widgets.

Data import:

- Time-frequency data stored by BESA Connectivity with wavelet analysis can now be read with the correct (logarithmic) frequency spacing.

- Single-trial time-frequency data can now be read in the t-test workflow (*.tfcs data format). Note that the information about time interval and frequency interval used needs to be supplied by the user if it deviates from BESA Connectivity's defaults.

- There is no upper limit on the number of data files imported into the workflow.

Data export:

- Cluster summary results now also include:

  - Project settings information

  - The cluster threshold values to reach significance

  - t-, F-, or r-value for each cluster

- o channel, latency, frequency or coordinate of the cluster maximum as applicable for the data type
- A new image export format is available (svg).
- Screenshots and cluster summary results can now be copied to the clipboard using the right mouse popup menu.

Calculation:

- The random number generator was improved.

Bugfixes

Data import:

- When loading an ANOVA project, a program crash could occur. This is fixed (#365, 660).
- An error message occurred when total size of files to load exceeded approximately 650 Mbyte. This is fixed (#348).
- Specifying identical image data for two conditions lead to a program crash. This is fixed (#241).

Workflows:

- If an ANOVA workflow did not find a statistically significant cluster, it was not possible to finish the project. This is now possible (#665).
- Re-scaling of the topographic plot did not work if a different project had previously been active. This is now fixed (#254).
- The head scheme was shown for polygraphic or intracranial channels, insinuating that coordinates for these channels were in use. This is fixed (#246).

Data export:

- Exported times for cluster start and end could be wrong if the time range was restricted. This is fixed (#261, #640).
- Image export in time-frequency mode did not work correctly if the Time-frequency map was shown (#272).

Known issues

The following known issues could not be fixed for this release, and remain in the software:
- When starting an ANOVA workflow, proceeding to the Load Data workstep, and moving back to the previous workstep, the selection of number of conditions cannot be changed. Workaround: Start a new workflow, then the number of conditions can be modified again (#271).
- When starting an ANCOVA workflow between subjects with covariate of no interest, the data order in covariates can currently not be changed. Workaround: Ensure that data order of covariates matches the subjects for this scenario (#259).

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Previous Versions

BESA Statistics 2.0 July 2015

New features

- Cluster permutation testing now extended to Analysis of Variance or Covariance (ANOVA / ANCOVA) and Correlation.

- Post-Hoc testing based on cluster permutation Scheffe's test.

- TF-mapping: clusters in the sensor-space time-frequency domain can now be visualized with topographic maps

- OpenMP support results in massive improvement in calculation times due to use of parallel computing

Data Readers

- Data reader for BESA's generic file format (ERP / ERF)

- Data reader for BrainVision Analyzer 2 data format for time and time-frequency data

Miscellaneous

- In TFC-ERF (MEG) data, averaging over channels now works as expected.

- Scaling issues in Image data showing (de-)synchronization were fixed.

BESA Statistics 1.0 February 2014

64 bit

- BESA Statistics is now also available as a 64 bit version. This should prevent memory issues stemming from the 32 bit restriction when running statistics on larger datasets. Please check if your Windows system supports 64 bit.

Exporting options

- Pressing Export / Statistical Results / Summary of Cluster Statistics for ERP/ERF or TFC data now additionally outputs the channel labels belonging to a cluster.

Data Readers

- Minor bugfixes related to re-referenced EEG data. BESA Statistics now accepts channel labels of all kinds of re-referenced EEG data.

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Scaling

- Fixed display bug with time frequency scale bar in the detail window. The scale bar now changes when rescaling.

BESA Statistics 1.0 July 2012

Exporting options

1. Images of all data windows can now be exported as vector graphics (eps) or bitmap-based images (png).

2. Statistical results (only cluster permutation statistics) can be exported as comma-separated text-files. The summary export will output group means per cluster, as well as cluster boundaries and significance levels. The detailed export will output mean values per person and cluster for further statistical analysis.

BESA Statistics 1.0 May 2012

Data readers

1. The TFC SWF data reader for now supports all exporting options from BESA Research ("all traces", "radial orientation", "first orientation" and "all traces").

2. SWF data that were exported in columns can now be read.

3. Data readers are no longer case-sensitive, so that deviations in electrode label naming no longer cause problems.

4. The TFC ERP data reader now correctly interprets labels of re-referenced EEG data.

5. The TFC SWF reader now automatically detects if data stem from source coherence analysis and accepts that the source position file (*.bsa) contains one more source (the reference source) than the individual coherence files.

6. The data readers can now handle one or more empty lines in ascii files.

7. Project names can now contain full stops.

8. If a user attempts to load minimum norm data that were calculated on a cortical surface, BESA Statistics now displays an error message explaining that cortical solutions are not yet supported.

Scaling

1. Scaling in the TFC workflow is now improved.

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2. Full scaling of SWF and Image data is now possible.

Miscellaneous

1. When saving extremely large datasets, BESA Statistics no longer crashes but displays the error message "memory allocation error".

2. Neighborhood distance values can now contain two digits after the comma for more precision.