



Software Tools and Services for chrono and psycho physiology

PRANA Viewer

The PRANA® software for polysomnography and biosignal processing has powerful computing capabilities and modularity allowing multiple software plug-ins to be executed efficiently.

Various software plug-ins for general and specific purposes are already available:

- the spectral power analysis plug-in**
- the spectral coherency analysis plug-in**
- the feature extraction plug-in**
- the heart-rate variability analysis plug-in**
- the cardio-pulmonary cycle analysis plug-in**
- the event-related waveform analysis plug-in**
- the event-related neuro-autonomic analysis plug-in**
- the automatic stage scoring plug-in***

All the software plug-ins can be executed in a single run by using the [software plug-in launcher](#). Additional plug-ins can easily be implemented using the [software developer kit](#).

Spectral Power Analysis

The software power spectral analysis plug-in allows the study of human and animal brain functions by measuring EEG powers and frequencies using adjustable settings.

With its graphical interface, this user-friendly and flexible software plug-in features:

- single-run multiple channel processing,
- adjustable settings (window length, overlap, windowing type, maximal frequency, averaging type and length),
- automatic artifact removal using a quality threshold,
- selectable spectral parameter extraction (absolute powers, relative powers, mean frequency and peak frequency),
- default settings for quantitative human EEG,
- user-definable settings.



Spectral power analysis window

The software power spectral analysis plug-in of the PRANAi½ software features state-of-the-art quantitative biosignal time-frequency analysis. Quantitative analysis can be carried out easily and independently of the recording collection system, which allows ensure data from different studies to be compared.

Spectral Coherency Analysis

The software spectral coherency analysis plug-in allows studying brain functions by measuring EEG temporal-spectral coupling between different brain areas.

With its graphical interface, this user-friendly and flexible software plug-in features:

- single-run processing of multiple and selectable channel pairs,
- adjustable settings (window length, overlap, windowing type, maximal frequency, averaging type and length),



Spectral coherency analysis window

- automatic artifact removal using a quality threshold,
- selectable coherency parameter extraction (coherence and phase),
- default settings for quantitative human EEG,
- user-definable settings.

Thanks to the software spectral coherency analysis plug-in, the PRANAi½ software provides an analytical capability with an adjustable temporal resolution of the spectral coupling between biosignals.

Feature Extraction

The software feature extraction plug-in allows for biosignal time-varying analysis by extracting from the signals any mathematically defined features.

With its graphical interface, this user-friendly and flexible software plug-in features:

- single-run processing of selectable set of channels,
- multiple features extraction for each channel,
- adjustable analysis settings (feature selection, signal filtering, window length, averaging type and temporal resolution),
- user-programmable features using simple m-file functions,
- automatic artifact removal using quality threshold,
- saving and loading analysis settings,
- default settings for human EEG, EOG and EMG analysis,
- user-definable settings.



Feature extraction window

With the PRANAi½ software feature extraction plug-in, temporal analysis of any biosignals using any mathematical function can be performed. New signal processing features can thus be easily implemented and evaluated by the user.

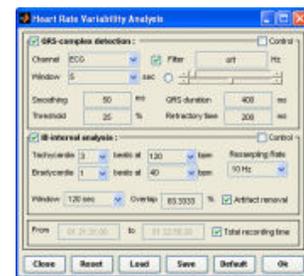
Software functions for biosignal feature extract: absolute and relative powers; mean and peak frequencies; correlation dimension, spectral, sample, approximate, Shannon and Tsallis entropies; Hjorth activity, complexity and motility; statistical descriptors such as minimum, maximum, sum, difference, mean, median, standard deviation, variance, skewness, kurtosis and slope; wave peak and root-mean-square amplitudes, inflexions and zero-crossings.

Heart-Rate Variability Analysis

The software heart rate variability analysis plug-in allows the study of human and animal autonomous nervous function by detecting heartbeats from any ECG signal and measuring heartbeat intervals variability using standard methods.

With its graphical interface, this user-friendly and flexible software plug-in features:

- ECG channel selection and filtering,
- QRS-complex detection using a validated algorithm,
- adjustable QRS-complex detection settings for any species,
- displaying and editing QRS-complex detection results directly from the ECG traces,
- ectopic heartbeat detection using adjustable settings,
- time-domain and frequency-domain analysis of NN-intervals using adjustable time window and overlap settings and artifact removal,
- default settings for human HRV analysis,
- user-definable settings,
- direct compatibility with various cardio-frequency meters.



HRV Analysis window

With the software heart rate variability analysis plug-in, the PRANAi½ software allows for high-quality HRV analysis independently of the recording system.

Cardio-Pulmonary Cycle Analysis

The software cardio-pulmonary cycle analysis plug-in allows the study of human and animal cardio-pulmonary and autonomic functions. It enables using adjustable settings the detection of cycles from any oscillatory signals such as respiratory flow, effort, pulse and arterial pressure captured from various sensors. After a detection of cyclic phases onset, offset, peak and throughs, the software plug-in extract time-varying averaged measures of cycles amplitude and frequency on a epoch per epoch basis.

With its graphical interface, this user-friendly and flexible software plug-in features:

- channel selection and filtering for respiratory, pulse, arterial pressure signals,
- cycle phases (onset, offset, peaks, throughs) detection using a validated algorithm,
- graphically adjustable algorithm detection settings,
- displaying and editing detection results directly from the corresponding traces,
- ectopic cycle detection using adjustable settings,
- time-domain cycle analysis (rate, amplitude and volume) using adjustable time window and artifact removal,
- default settings for human cardio-pulmonary cycle analysis,
- user-definable settings.



Cardio-Pulmonary Cycle Analysis window

The software cardio-pulmonary cycle analysis plug-in together with the PRANAi^{1/2} software allows for high-quality cardio-pulmonary analysis independently of the recording system.

Event-Related Waveform Analysis



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Plug-in available.

Event-Related Neuro-Autonomic Analysis



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Plug-in available.

Automatic Stage Scoring*



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*Compatible only with specific recording settings. Validity test required.