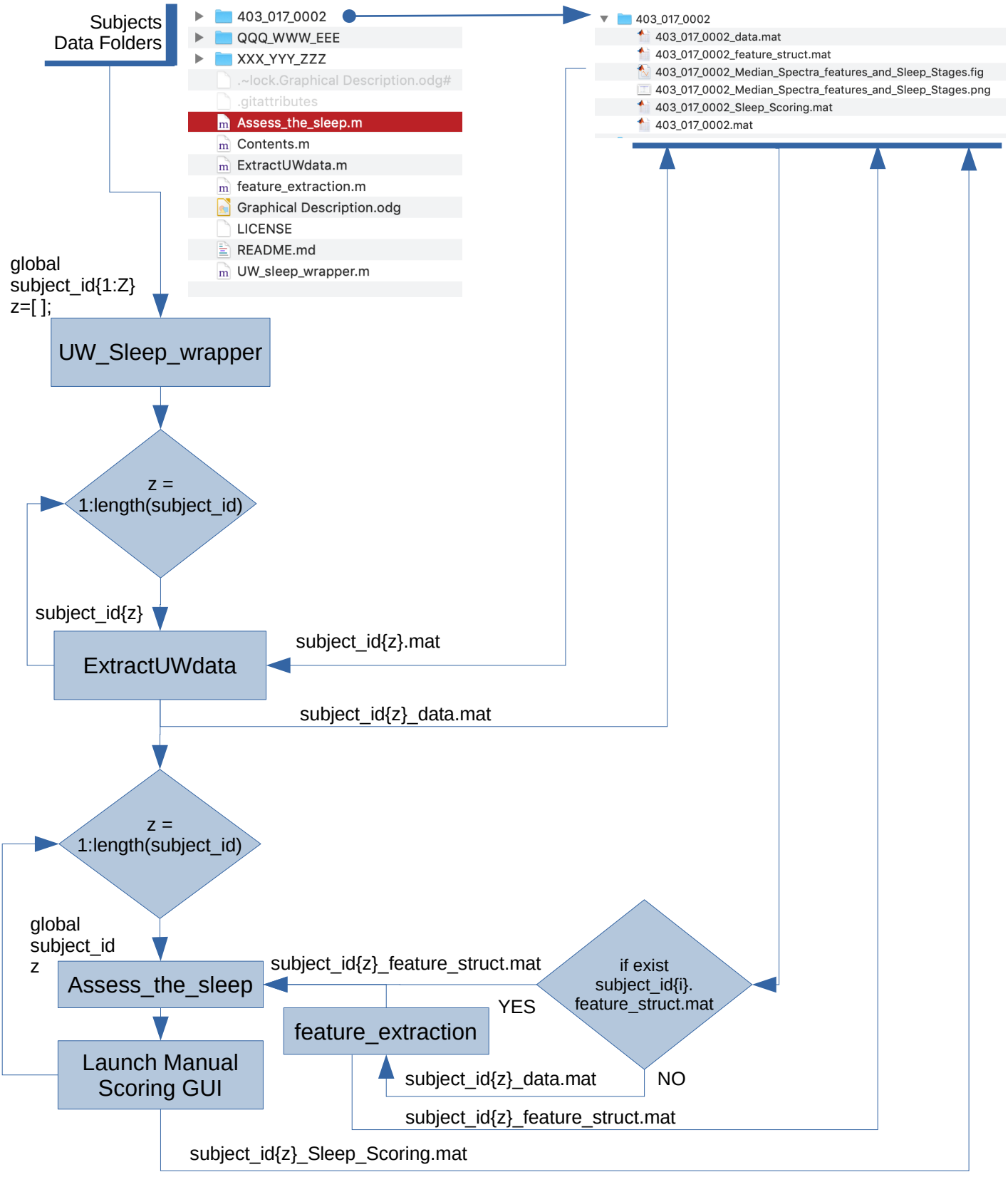
Semi-automated assessment of sleep based on feature analysis of EEG

Runs feature extraction and displays attributes of the time-domain data and launches UI for expert to enable to classify 30-second epochs of the data into AASM2012 sleep classes.
If all data are ready in structure described for subject_id_data.mat, then only Assess_the_sleep script can be run to score one patients. Otherwise processing of multiple patients can be done using UW_sleep_wrapper.m or its modification in case of other input formats. Assess_the_sleep script can be also called in loop to speed up processing. Function Assess_the_sleep can be run alone if data are prepared properly.



GUI for semi-automated assessment of sleep based on feature analysis of EEG

When the Graphical User Interface (GUI) is started, it shows features and wavelet scalogram. If the manual gold standard data are available, it also shows hypnogram at the very bottom of the screen. Very last feature shown above hypnogram is Delta to Beta ratio. In Delta/Beta graph will appear all information about selected epochs and scoring (see image below). There is also automated classification of the awake (yellow dots in signal) and sleep phases (black dots in signal) made by clustering automata. This is for guiding the scoring person based on statistical quantification.

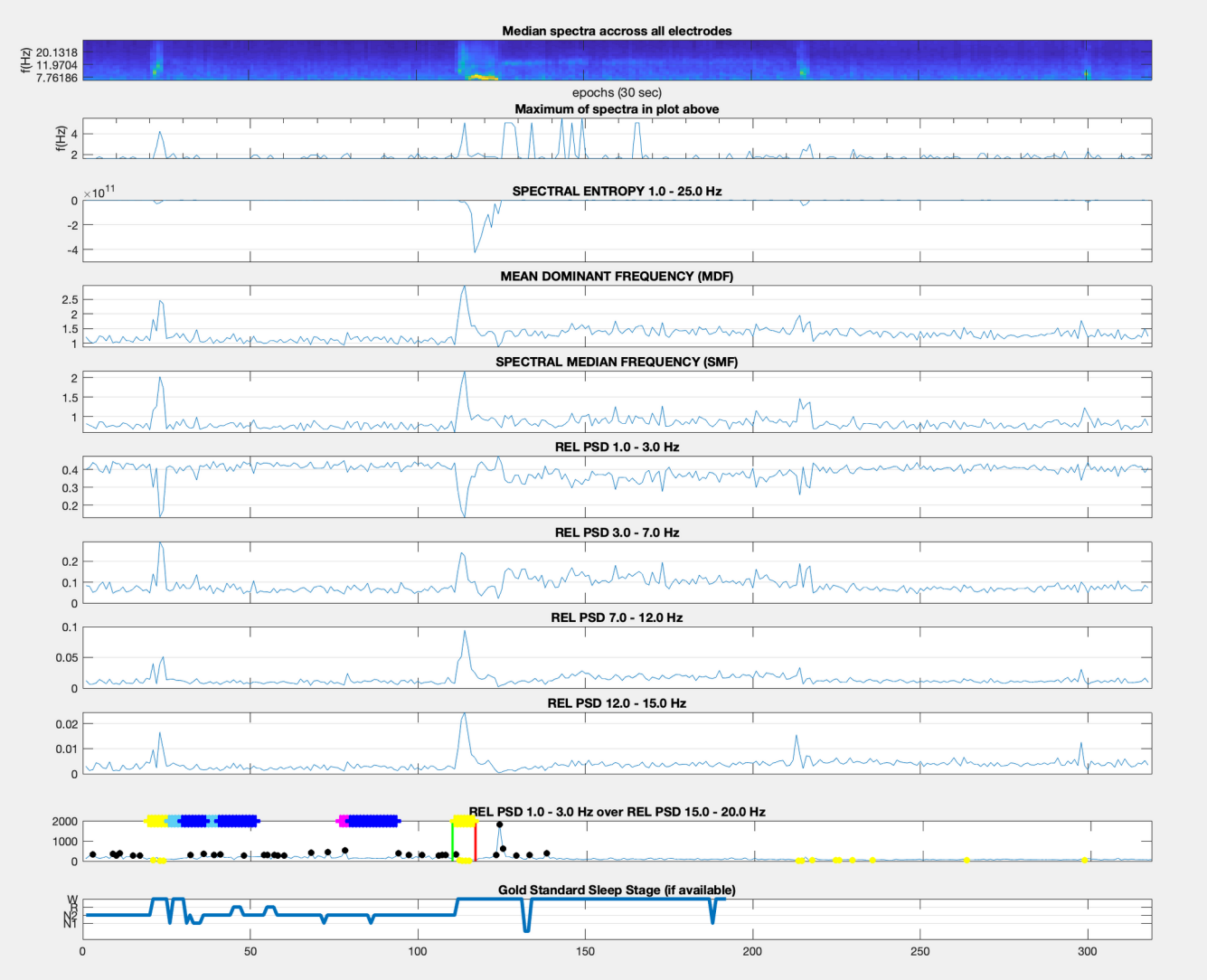
GUI can be only closed by hitting 'q' and selecting if saving or not saving score.
Score can be temporarily saved also by 's' and confirming the dialog.

For selecting the epoch to score, one needs to select start and end of period of time to be scored. This is done by two single left click of mouse. If selection needs to be canceled, then just click the mouse button for the third time. Before selecting another epoch, one must click the mouse button third time to clear previous selection and then select new epoch by one and then second mouse click.

To score the selected epoch, hitting the numbers will set appropriate sleep score:

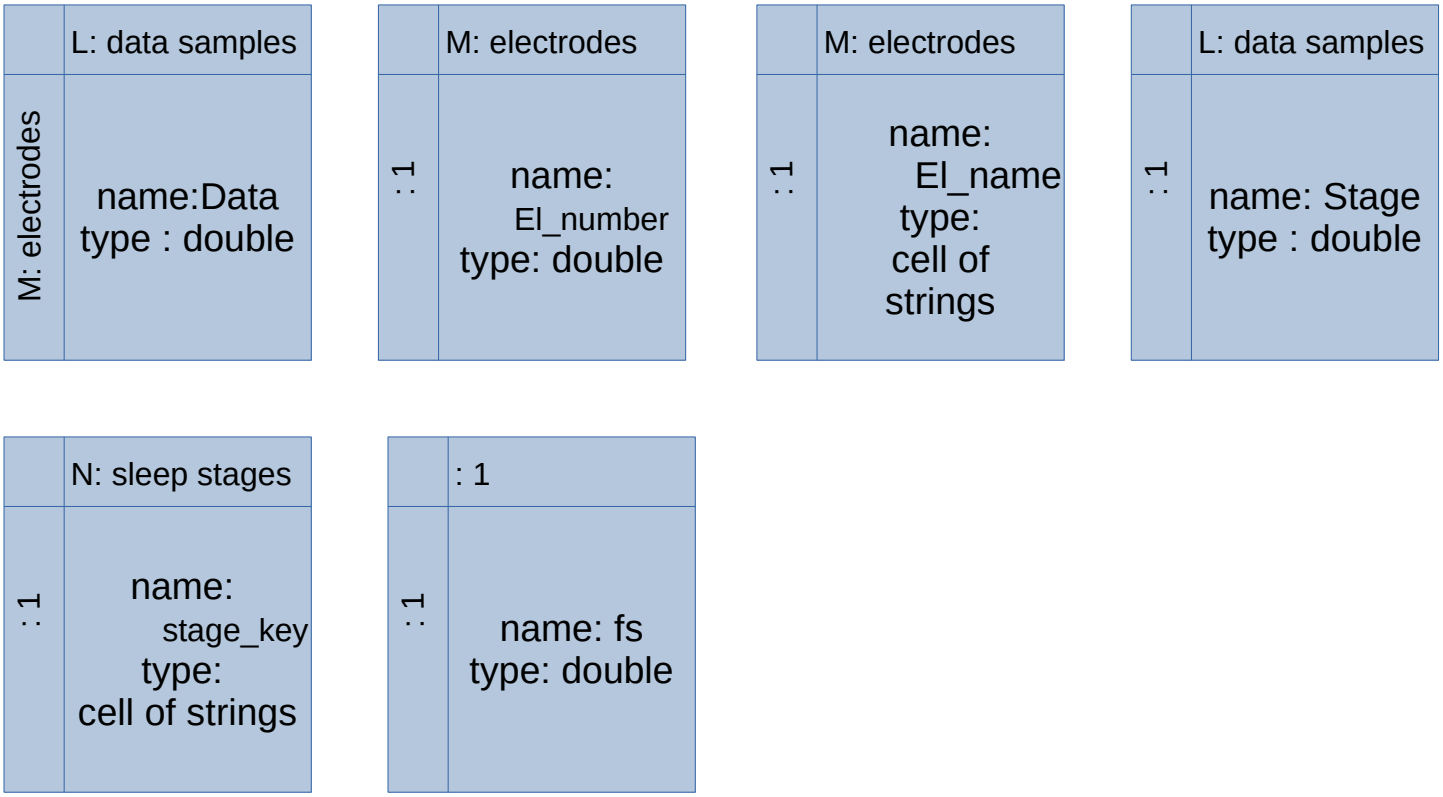
- '0' - awake (marked by yellow at top when selected)
- '1' - N1 (marked by light blue at top when selected)
- '2' - N2 (marked by dark blue at top when selected)
- '3' - N3 (marked by black at top when selected)
- '5' - REM (marked by magenta at top when selected)
- '7' - Unknown (marked by gray at top when selected)

The GUI is shown on the image below, when sleep score is set for some epochs (color horizontal bars at the top of Delta/Beta graph) and, currently selected epoch is marked by green (onset) and red (offset) vertical bars.



Data Formats

Variables in file “subject_id_data.mat”



Data Formats

Variables in file “subject_id_features.mat”

feature_struct
: structure

	E: epochs
65: frequencies	WT : double

	E: epochs
: 1	wavelet_maximas : double

	65: frequencies [Hz]
: 1	f_cwt :double

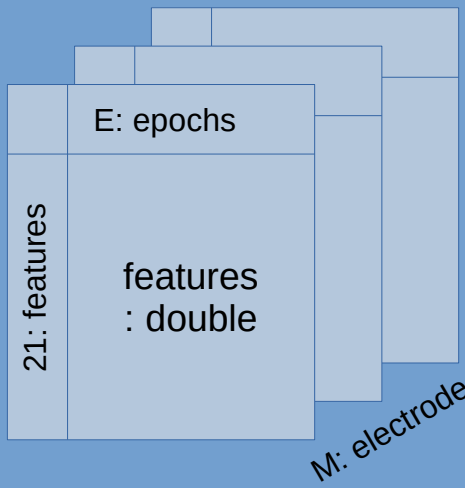
	M: electrodes
: 1	El_name : cell of strings

	M: numbers
: 1	El_number : double

	: 1
: 1	fs : double

	L: sleep scores
: 1	stage : double

	21: names of features
: 1	features_key : cell of strings



	N: sleep stages
: 1	stage_key : cell of strings

To run the Assess_the_sleep script alone for one subject/trial

1. One needs to have **directory structure** setup as described above.

2. Data file "subject_id_data.mat":
must be in "subject_id" folder and the content of the file should be as described above. If gold standard scoring is not available, variables "stage_key" and "Stage" can be omitted and don't have to be saved in "subject_id_data.mat" file.

3. Before running the "Assess_the_sleep" script:
Make sure subject_id variable is cell of strings and made as global in Matlab workspace.
Variable "z" is made as global and contains valid index that is selecting proper subject from "subject_id" cell variable.

Example of commands running the script Assess_the_sleep.m for subject MSEL_0606 in Matlab workspace, while there are two subjects data ready and two subjects names in "subject_id" variable:

```
>> global subject_id z
>> subject_id = {'MSEL_0606', 'MSEL_0001'};
>> z = 1;
>> Assess_the_sleep
```