



Load fMRIPrep confounds in Python

Project URL: https://github.com/htwangtw/2021_08_Wang_load-confounds

Hao-Ting Wang^{1,2*} and John J. Doe³

*Correspondence:

htwangtw@gmail.com

¹CRIUGM, Montreal, 4565 chemin Queen Mary, H3W 1W4, Quebec, Canada

Full list of author information is available at the end of the article

1 Introduction

fMRIPrep [1] is a popular minimal preprocessing software for functional MRI data. ‘Minimal preprocessing’ refers to motion correction, field unwarping, normalization, bias field correction, and brain extraction. Confound regression and smoothing are excluded from the workflow. Instead, fMRIPrep provides users with a large set of potential confound regressors that covers many denoising strategies. The users will have to select the confound regressors for denoising in the subsequent analysis. Loading a sensible subset of confounds is difficult and error prone for many strategies, such as ICA-AROMA and CompCor. `load_confounds` can access confound variables and provides preset strategies for confound selections. The loaded format is compatible with `nilearn` analysis functions such as `NiftiMasker` and the GLM modules. The aim is to provide a easy and foolproof API for users to perform subsequent denoising of `fMRIPrep` output.

2 Progress

At Brainhack Global Montreal 2020, the aim is to prepare the package ready for a potential Beta release. The related issues involves completing the strategies missing and improve the user experience with better examples and error messages. Several issues has been identified before Brainhack and the full discussion can be found under `load_confounds` [GitHub issue page](#).

During Brainhack the following issues have been discussed and/or resolved:

2.1 Strategies

We worked on three strategies:

- ICA-AROMA (contributed by Hao-Ting Wang)
- Scrubbing (contributed by Steven Meisler)
- Anatomical CompCor (contributed by Steven Meisler)

2.2 Demo

An executable demo using the `nilearn` developmental fMRI dataset ([OpenNeuro ds000228](#)) was added. (contributed by Michael W. Weiss)

2.3 Error message

Exception raised when failing to find params in the confounds. (Contributed by François Paugam)

2.4 Identify test dataset

[OpenNeuro ds003](#) is now the new test data. (Discussions amongs Pierre Bellec, Hao-Ting Wang, Elizabeth DuPre, and Chris Markiewicz) Pierre Bellec plans to preprocess [OpenNeuro ds000228](#) with all possible confounds.

2.5 All contributor bot

`allcontributors` bot is added to track community contributions (Contributed by Pierre Bellec).

2.6 Add `load_confounds` to `nixtract`

In addition to the main package, there was a collaborative project with the developers of `nixtract`. `nixtract` is a tool that extract and process timeseries data from neuroimaging files. Annabelle Harvey and Dan Gale added `load_confounds` as a dependency of `nixtract` for reading fMRIPrep confound variables.

3 Results

`load_confounds` can now the following strategies from Ciric et al. [2]. The following table highlights the relevant options:

Strategy	high_pass	motion	wm_csf	global	compcor	ica_aroma	scrub
Params2	x		basic				
Params6	x	basic					
Params9	x	basic	basic	basic			full
Params9scrub	x	basic	basic				
Params24	x	full					
Params36	x	full	full	full			full
Params36scrub	x	full	full				
AnatCompCor	x	full			anat		
TempCompCor	x				temp		
ICAAROMA	x		basic			full	
AROMAGSR	x		basic	basic		full	
AggrICAAROMA	x		basic	basic		basic	

The future direction is to integrate `load_confounds` as part of `nilearn` for better reach to wider range of users that can be benefited from the package. To facilitate the nilearn integration, we will add `sample_mask` to support volume-sensoring based scrubbing and improve the `nilearn` `NiftiMasker` related feature.

Availability of Supporting Data

Supplemental material has not been provided. More information about this project can be found at: https://github.com/htwangtw/2021_08_Wang_load-confounds. This report is generated at: https://github.com/htwangtw/2021_08_Wang_load-confounds.

Competing interests

None

Author's contributions

HTW wrote the software, HTW wrote the report.

Acknowledgements

The authors would like to thank the organizers and attendees of Brainhack Global Montreal 2020.

Reviewers

No reviewers has been added yet.

Author details

¹CRIUGM, Montreal, 4565 chemin Queen Mary, H3W 1W4, Quebec, Canada. ²Brighton & Sussex Medical School, Brighton, Trafford Centre, BN1 9RX, East Sussex, UK. ³name, city, street, code, state, country.

References

1. Esteban, O., Markiewicz, C.J., Blair, R.W., Moodie, C.A., Isik, A.I., Erramuzpe, A., Kent, J.D., Goncalves, M., DuPre, E., Snyder, M., et al.: fmripred: a robust preprocessing pipeline for functional mri. *Nature methods* **16**(1), 111–116 (2019)
2. Ciric, R., Wolf, D.H., Power, J.D., Roalf, D.R., Baum, G.L., Ruparel, K., Shinohara, R.T., Elliott, M.A., Eickhoff, S.B., Davatzikos, C., Gur, R.C., Gur, R.E., Bassett, D.S., Satterthwaite, T.D.: Benchmarking of participant-level confound regression strategies for the control of motion artifact in studies of functional connectivity. *Neuroimage* **154**, 174–187 (2017)