

Introduction

Challenge

- Increasingly large cohort sizes: ~10 (2005) \rightarrow hundreds (2020)
- Multimodality: a more integrated view of the brain
- Requires integration of different tools
- Difficult documentation and increased risk of error \rightarrow *Reproducibility*
- Harder to detect errors

Solution - Automatic analysis (aa)

- Flexible construction of complex workflows in MATLAB
- Convenient integration of tools
- Parallel execution



- Replicable high-level workflow description

?xml version="1.0" encoding="utf-8"?> aap = aarecipe('tutorial_2_SPM_CH30.xml'); <tasklist> aap.directory_conventions.analysisid = 'SPM_CH30_MoAEpilot'; <initialisation> ap.directory_conventions.reportname='report.htm'; <module><name>aamod_study_init</name></module> </initialisation> JLLDATAPATH = fullfile(aap.directory_conventions.rawdatadir, 'MoAEpilot'); aap.directory conventions.rawdatadir = FULLDATAPATH; <main> _downloaddemo(aap, 'MoAEpilot'); <!-- preprocessing --> <module><name>aamod structuralfromnifti</name></module> aamod reorienttomiddle structural p.options.autoidentifystructural_choosefirst = 1; aap.options.autoidentifystructural_chooselast = 0; amod epifromnifti**</name></module** amod reorienttomiddle epi**</name></module>** ap.options.NIFTI4D = 1; amod realign**</name></module** aap.acq details.numdummies = 0; module><name>aamod coreg extended</name></module> aap.acq_details.input.correctEVfordummies = 0; <module><name>aamod norm write epi</name></module> <module><name>aamod smooth</name></module> aap.tasksettings.aamod smooth.FWHM = 8; aap.tasksettings.aamod_firstlevel_model.xBF.UNITS = 'secs'; <!-- modeling -<module><name>aamod firstlevel model</name></module> aap = aas_processBIDS(aap); <module><name>aamod firstlevel contrasts</name></module> <module><name>aamod firstlevel threshold</name></module> p = aas_addcontrast(aap, 'aamod_firstlevel_contrasts',... '*', 'sameforallsessions', 1, 'L_G_R','T'); _doprocessing(aap); _report(fullfile(aas_getstudypath(aap),aap.directory_conventions.analysisid)

- Provenance information



Automatic analysis 5.8.0: demonstration of integrated and responsive open-source development

Tibor Auer¹, Michael Jones², Ethan Knights³, Jonathan E. Peelle²

1. School of Psychology, Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey, United Kingdom 2. Department of Otolaryngology, Washington University School of Medicine, St. Louis, Missouri, United States of America 3. MRC Cognition and Brain Sciences Unit, Cambridge, Cambridgeshire, United Kingdom

Methods New use-case - M/EEG - Integration of EEGLAB and FieldTrip toolboxes with a new sets of modules - Example workflow based on an openly available dataset \rightarrow Efficiency \rightarrow Transparency aamod coreg general 0000 e scalp/native skull/native grey / native air namod segment8 00001.structural native cs structural aamod_coreg_general_00001.structural aamod_coreg_general_00001.structural aamod meeg preparesourcemodel 0000 \rightarrow Efficiency headmodel \ segmentation aamod_meeg_timefrequencyanalysis_000 aamod_meeg_sourcereconstruction_00002 aamod_meeg_sourcereconstruction_00001 group #1: 000-000 m group #2: 000-000 m stat: 000-000 ms ⁷ F5 F3 F1 Fz F2 F4 FC5 FC3 FC1 FC2 FC4 FC6 F C5 C3 C1 Cz C2 C4 C6 CP5 CP3 CP1 CP2 CP2 CP4 C P7 P3 P3 P2 P2 P4 Delta \rightarrow *Reproducibility* Alpha (1-3 Hz) (14-32 Hz) (4-7 Hz) (8-13 Hz) **New environment - Windows** - MATLAB is a platform-dependent environment - Platform-dependen engine: iterative testing of components Results The implemented changes improve aa's robustness and offer its benefits for \rightarrow Transparency a more diverse community. The improved transparency in the development and the application allows more agile and responsive development while it

Highlights

- *aa* improves reproducibility and supports a wide range of use cases.
- GitHub provides a powerful collaborative coding environment.

References

- 1. Cusack, R., Vicente-Grabovetsky, A., Mitchell, D. J., Wild, C. J., Auer, T., et al. (2015). Frontiers in Neuroinformatics
- 2. Gorgolewski, K. J., Alfaro-Almagro, F., Auer, T., et al. (2017). PLoS Computational Biology
- 3. Auer T. (2020). F1000Research





- Multiplatform testing

also reduces the technical debt for contribution and application.

Track record

Mature platform

- 15 years old, under active development by an international team - 100+ researchers in 100s of studies, comprising 1000s of participants.

Well suited to the analysis of large, multimodal datasets, such as Cambridge Centre for Aging and Neuroscience

(www.cam-can.org)



Washington University in St.Louis

Q Filter cards Use your computer' terminal to talk to two repositories via two remotes to the • Remote submission GitHub servers. 🗊 4 tasks #243 opened by tiborauer automaticanalysis / automaticanalysis <> Code () Issues 28 11 Pull requests 6c667 3 days ago 🕚 2,815 commits 🔗 automaticanalysis.githul .github aa_engine FIX - DARTEL denorm XM aa_modules aa_parameterse aa_tools 💼 develope 214 examples external ll requests extrafunction 🗅 .gitignore 🗅 .zenodo.json iscussions Automatic Analysis 5.8.1 CODE_OF_CONDUC LICENSE 3 days ago Packages I months ago No packages published Contributors 11 6 🔞 🔞 🛞 🛞 🚳 🔇 - 🕒 🕕 🙆 🛃 Use case tests passing / docker bids/aa doi 10.33 github-pages (Activ VERSION Use case tests #44 Re-run all jobs ດ Summary Total duration 🕼 tiborauer 🔶 f76c667 🛛 master 5h 16m 23s Testing AROMA on fMR aa_use_case_test.yml Testing SPM DARTEL Testing Diffusion (with FSL) Testing fMRI Testing AROMA on fMRI 2h 25 Testing fMRI frame censoring Testing SPM DARTEL 29m 45 Testing (Freesurfer) Deface and Face Testing Diffusion (with F... 2h 43n Testing the M/EEG (with statistics) Testing fMRI Testing the M/EEG (with source rec. Testing fMRI frame cens... 3h 34n Testing (Freesurfer) Def... 44m 46s Testing the M/EEG (with... 5h 16m Testing the M/EEG (with... 3h 58m



