

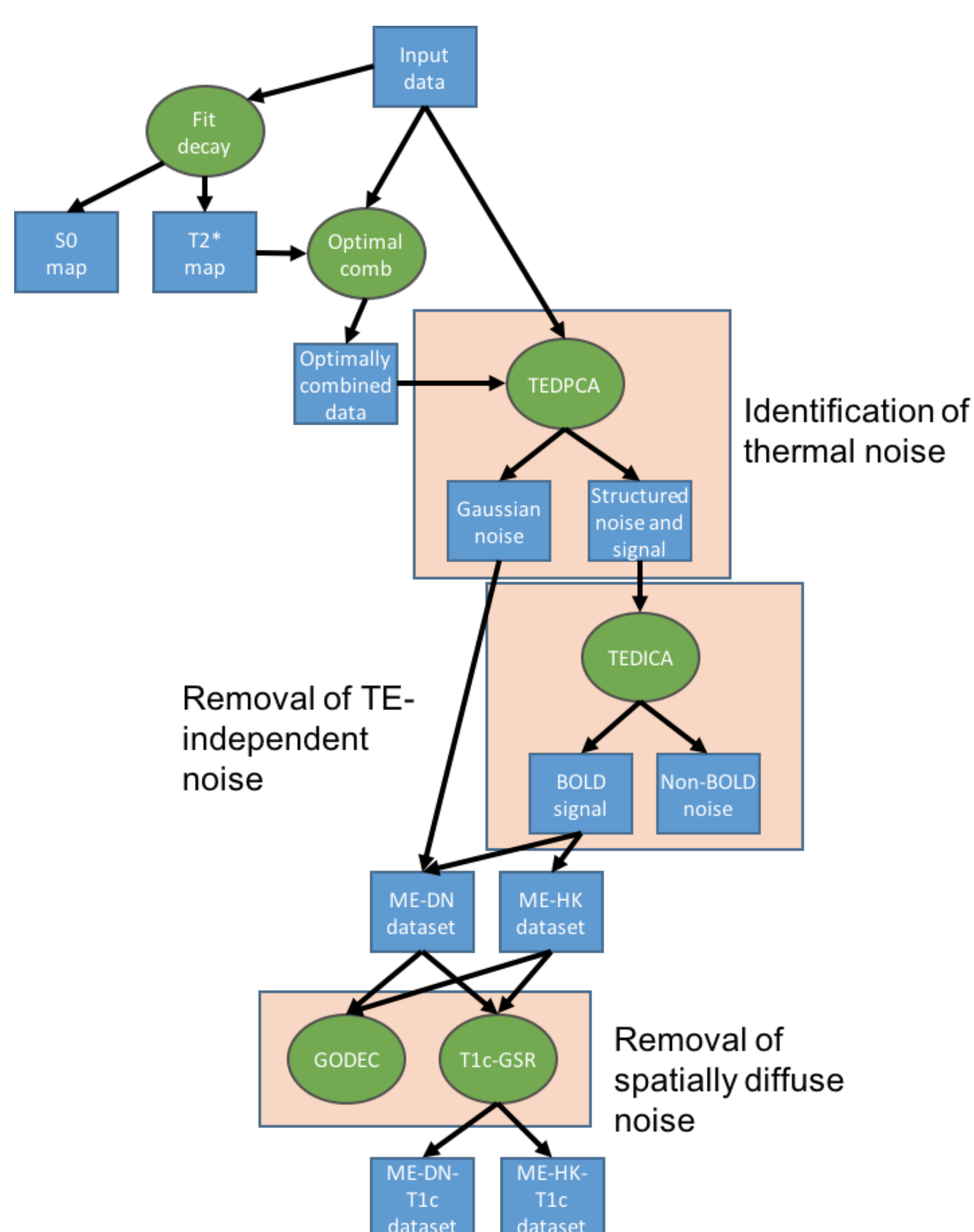
tedana: Robust and extensible software for multi-echo denoising

The tedana community, Logan Dowdle⁷, Elizabeth DuPre^{5,6}, Javier Gonzales-Castillo⁸, Dan Handwerker⁸, Taylor Salo^{3,4}, Joshua Teves⁷, Kirstie Whitaker^{1,2,4,6}

MOTIVATION

- Functional magnetic resonance imaging (fMRI) data is prone to artifacts and noise
- Multi-echo fMRI acquisition and preprocessing is poised to ameliorate some of these artifacts [1, 2] through data-driven denoising procedures
- ME-ICA [3] was developed as one of the first preprocessing pipelines for multi-echo data; however, it is no longer maintained
- tedana is a growing open-source, community-developed python package designed to facilitate multi-echo fMRI analysis

PIPELINE OVERVIEW



RECENT DEVELOPMENTS

Component selection

- Refactored the selection tree in TED-ICA to allow for new decision metrics
- Added provenance on individual components; i.e., why they were kept or rejected in the decision tree
- Optionally generate visualization of each component to aid in quality control

Performance

- Added support for AFNI-style BRIK/HEAD files
- Reduced memory usage by automatically generating regions of interest if a mask is not provided
- Automatically restart ICA on convergence failure for user-specified number of attempts

Documentation

- Added documentation on acquiring multi-echo datasets
- Started a monthly developer call series and newsletter



DEMO THE TOOL

For OHBM, we have created a brief demo to showcase tedana processing. You can access the relevant notebooks using the QR code below, or by navigating to <https://github.com/ME-ICA/tedana-ohbm-2019>

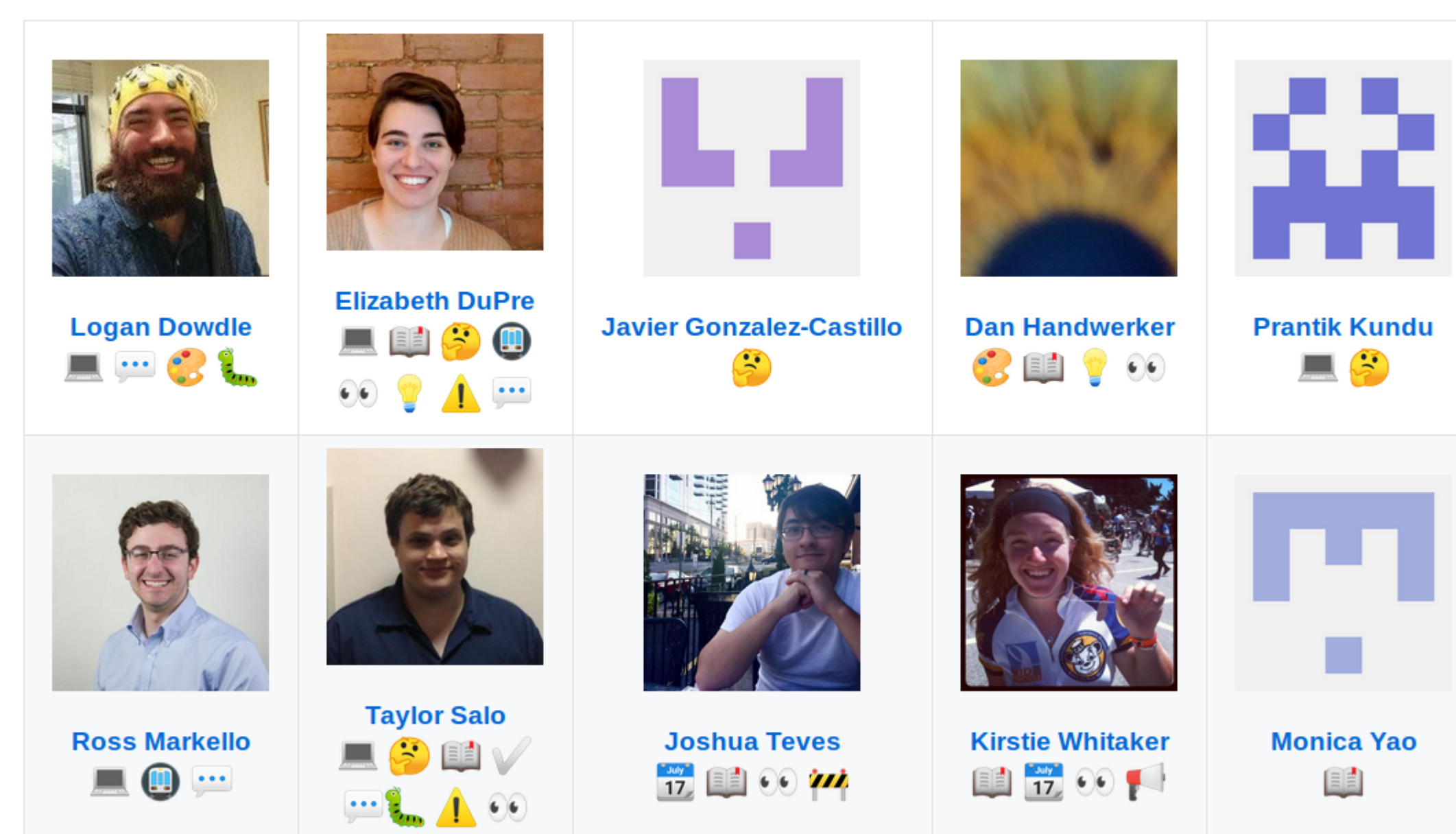


There, we show processing on two publicly available multi-echo data sets with three and five echos.

We encourage you to check out the demo yourself or to stop by our software demonstration on Thursday afternoon!

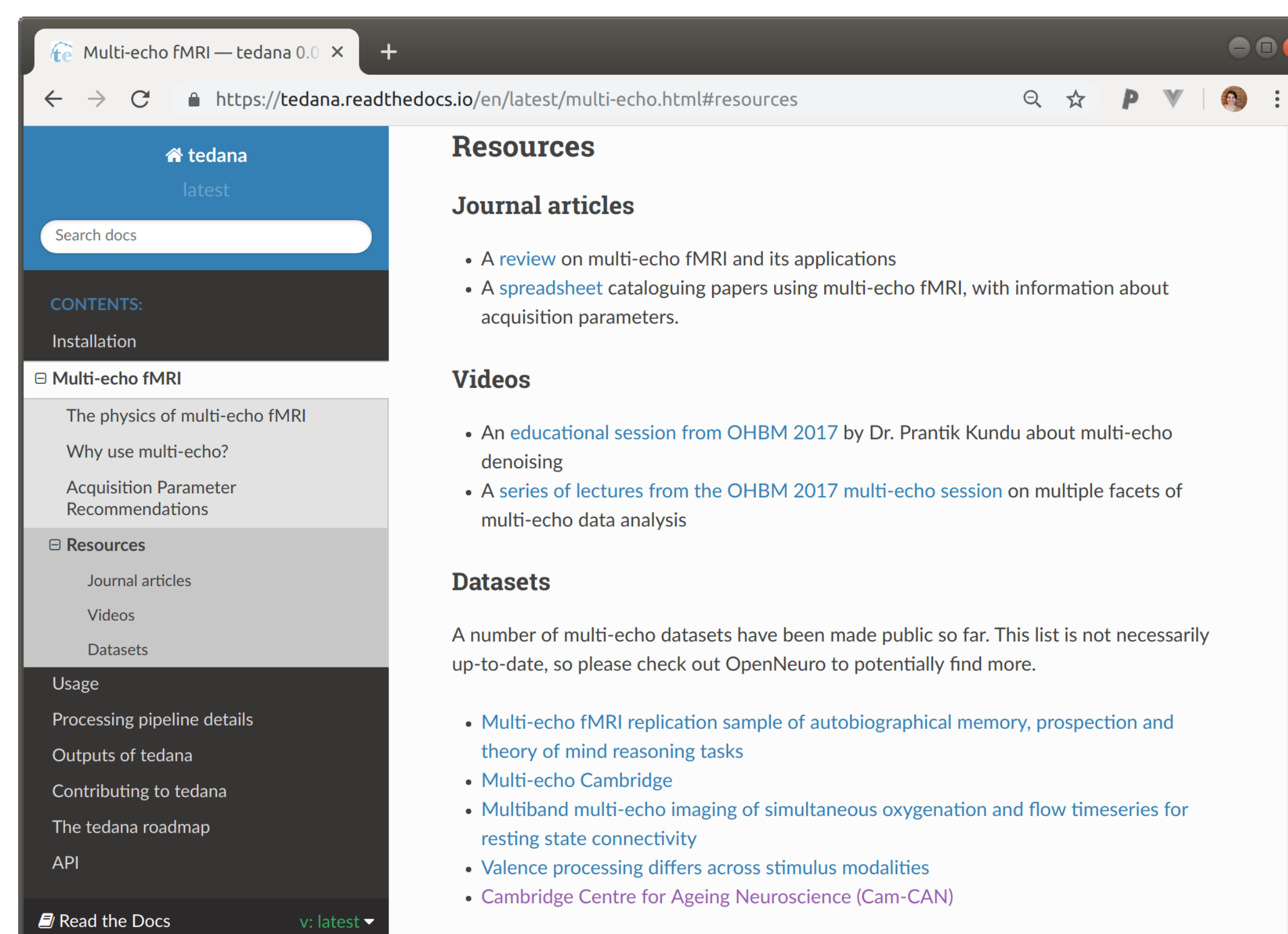
JOIN THE TEAM

Thanks goes to these wonderful people (emoji key):

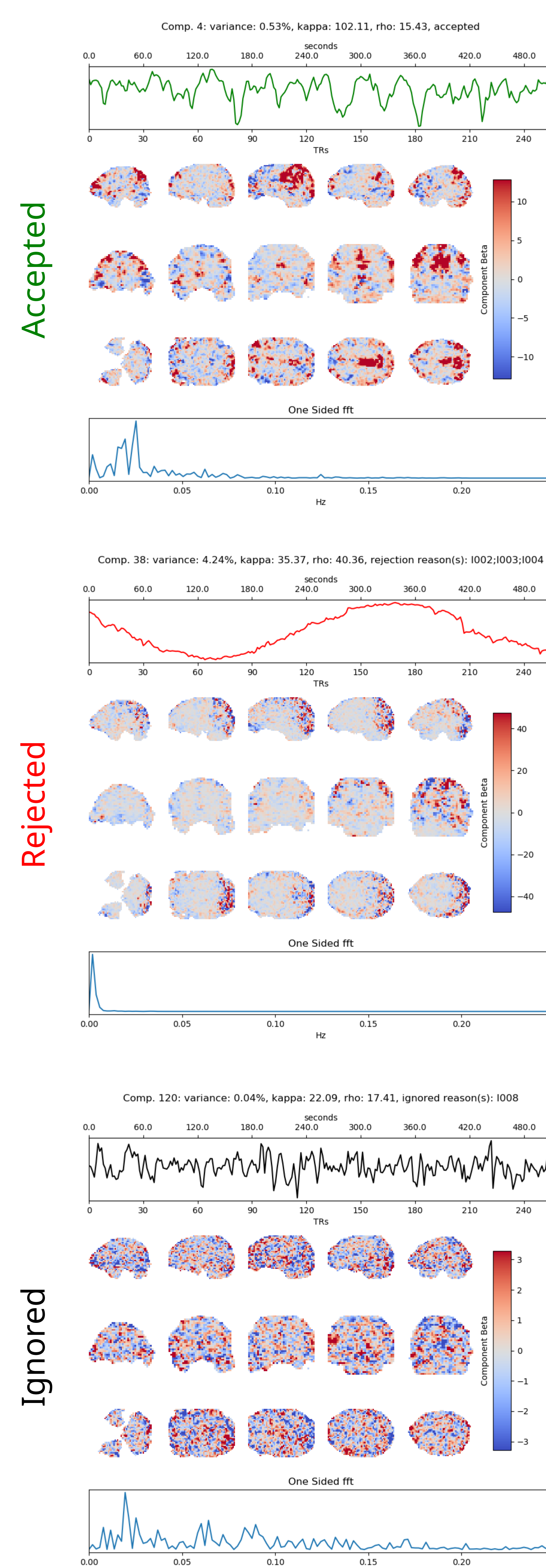


This project follows the [all-contributors](#) specification. Contributions of any kind welcome!

CHECK OUT OUR RESOURCES



VISUAL REPORTS



INSTALLATION

To install tedana you will need Python ≥ 3.5 and the following packages:

```
numpy, scipy, scikit-learn, Nilearn, nibabel
```

You can then run:

```
$ pip install tedana
```

REFERENCES

- Kundu, P., et al. (2017). Multi-echo fMRI: A review of applications in fMRI denoising and analysis of BOLD signals. *NeuroImage*.
- Power, J. D., et al. (2018). Ridding fMRI data of motion-related influences: Removal of signals with distinct spatial and physical bases in multi-echo data. *PNAS*.
- Kundu, P., et al. (2012). Differentiating BOLD and non-BOLD signals in fMRI time series using multi-echo EPI. *NeuroImage*.