

Assumptions

- Neural imaging modalities reflect common underlying neural signal
- Neural activity can be localized in the regions where a significant proportion of fMRI signal can be reliably reconstructed from EEG

Challenges

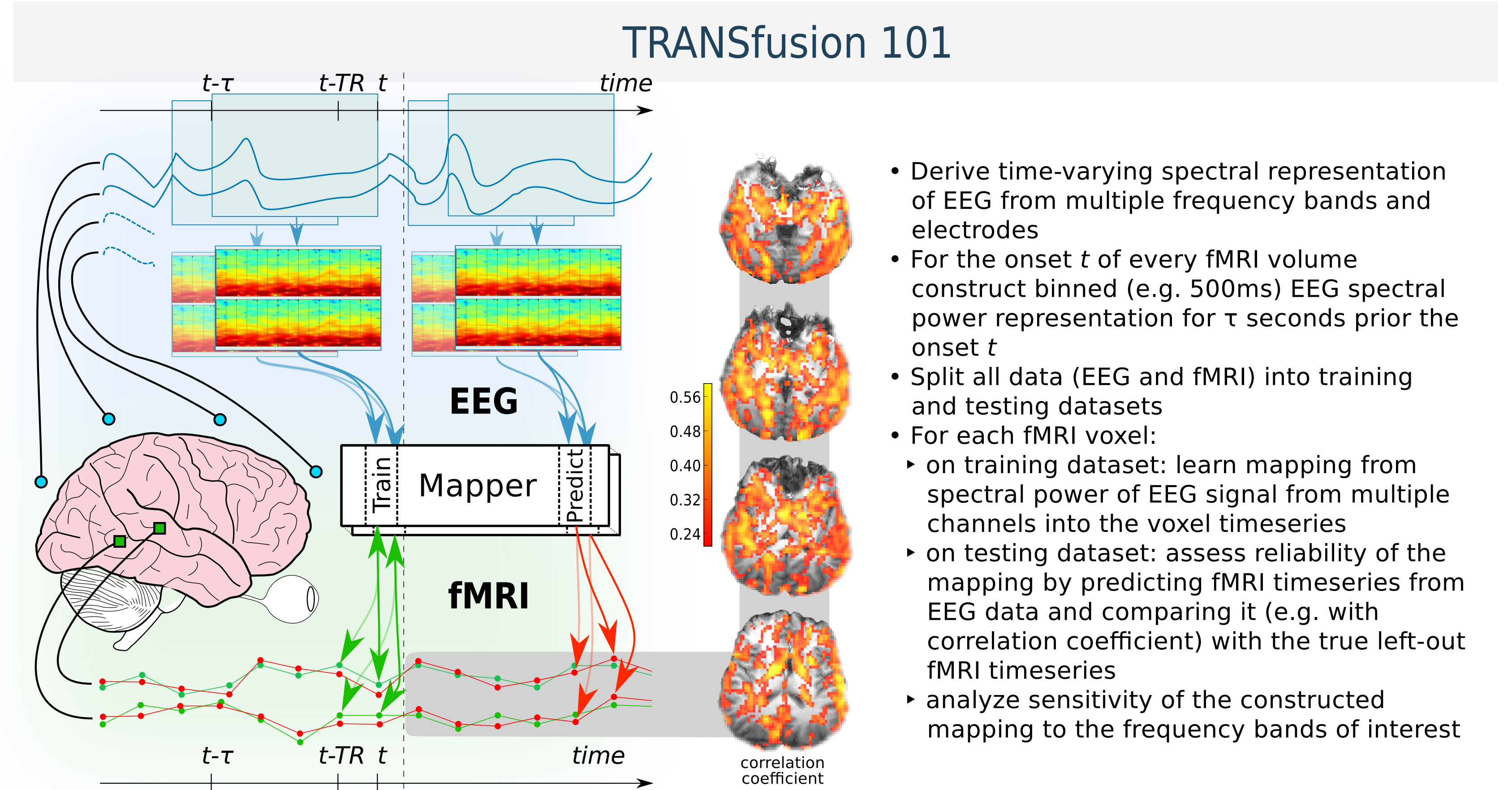
- There is no BOLD signal model with known parametrization –
estimate parameters under loose modeling assumptions
- BOLD signal is driven by a variety of neural generators –
construct multivariate model of BOLD accounting for all desired generators

Future extensions

- Non-linear modeling of fMRI
- Deriving contrasts across experimental conditions
- EEG-driven interpolation of fMRI (up to EEG sampling rate)
- Explore sensitivities to the components of ERP responses
- Quality assurance of EEG after MR artifacts removal

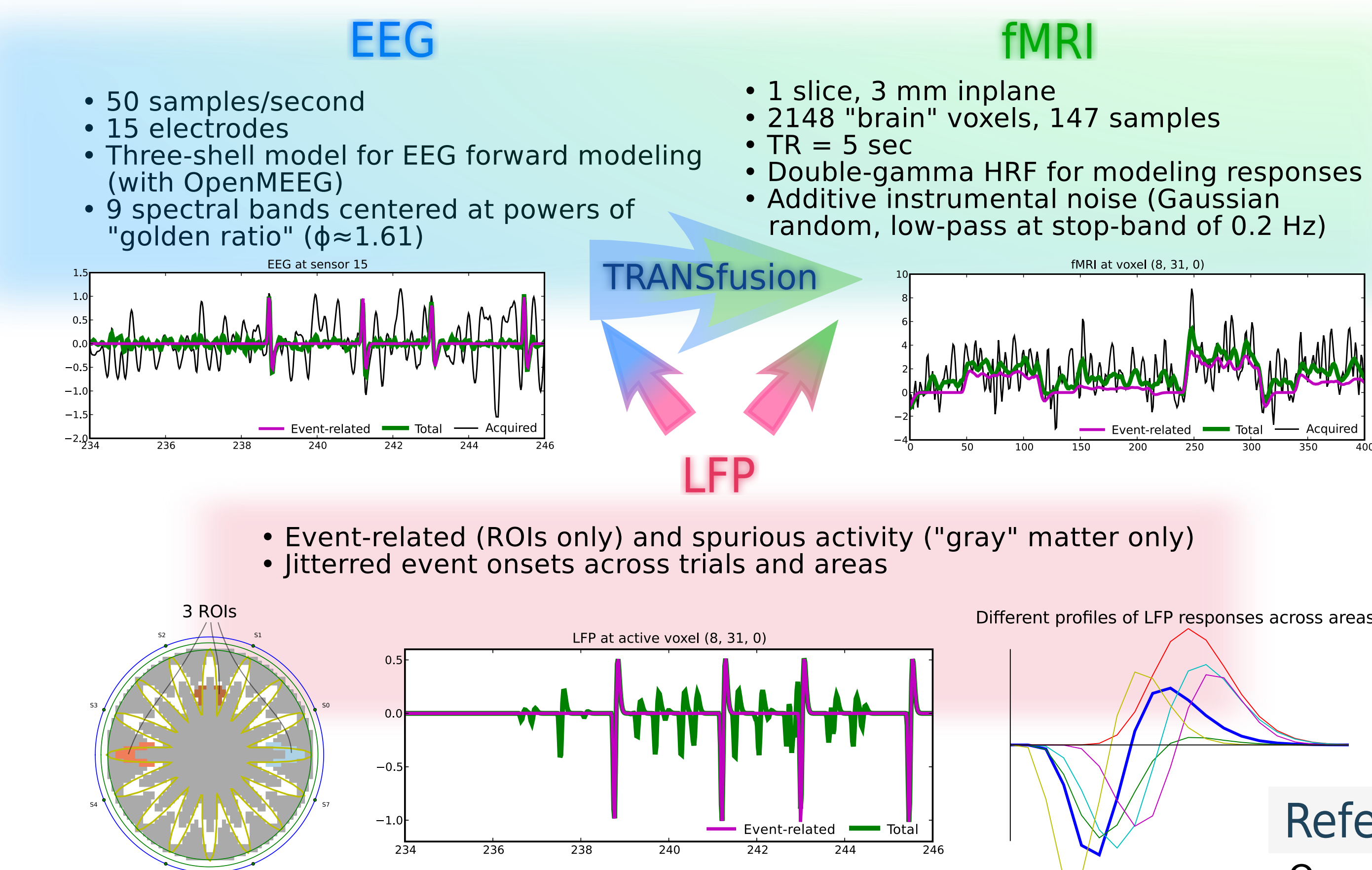
Summary

- TRANSfusion provides a multivariate EEG-based description of BOLD signal under loose modeling assumptions
- TRANSfusion localizes the brain regions activated during a task without explicit modeling of an experimental design
- Application to real data results in localization superior to design-driven approaches (e.g. GLM)
- Sensitivity analysis of constructed models allows to localize regions specific to the oscillatory generators of interest



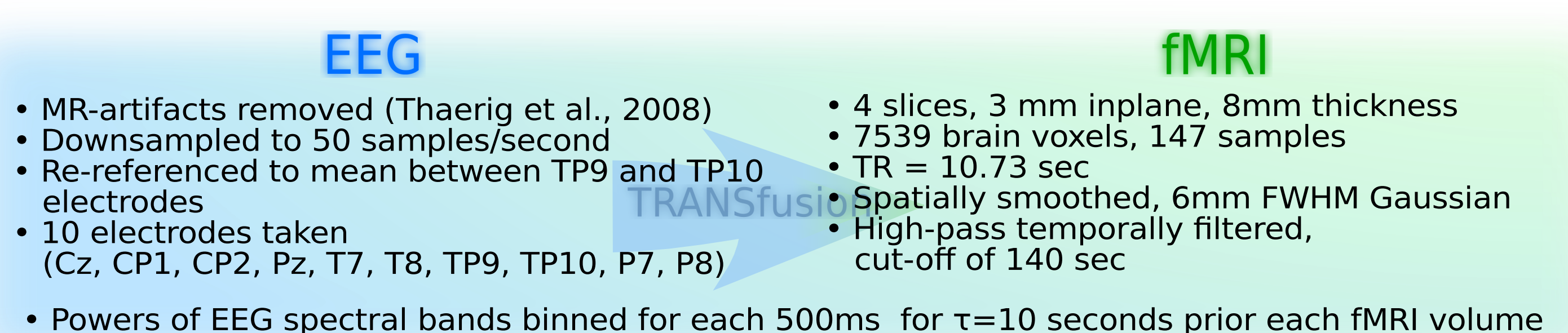
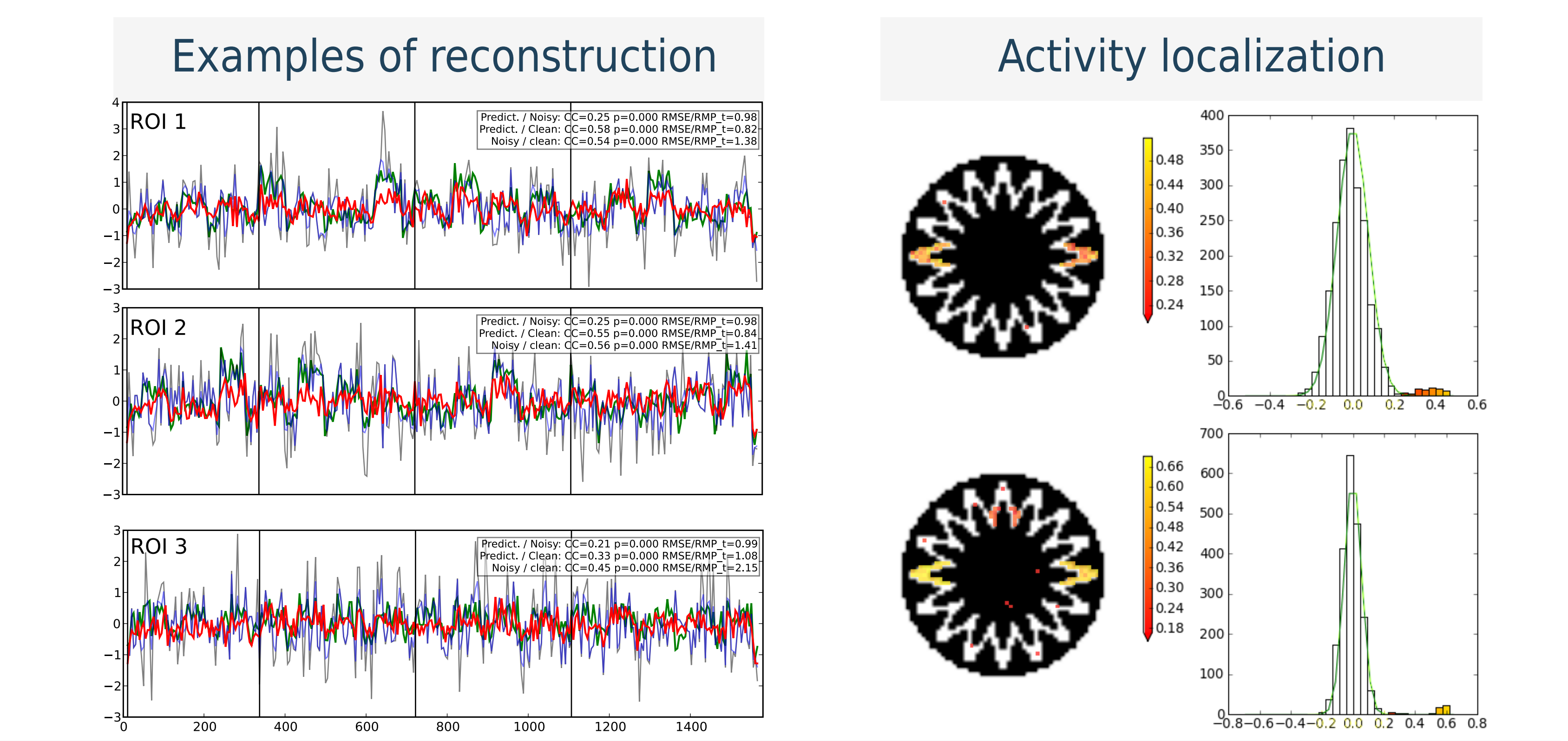
Implementation details

Complete analysis pipeline was implemented in Python using PyMVPA 0.4.3 with Linear SVR to construct the mapping. Source code and auditory dataset will be provided from <http://www.pymvpa.org>.

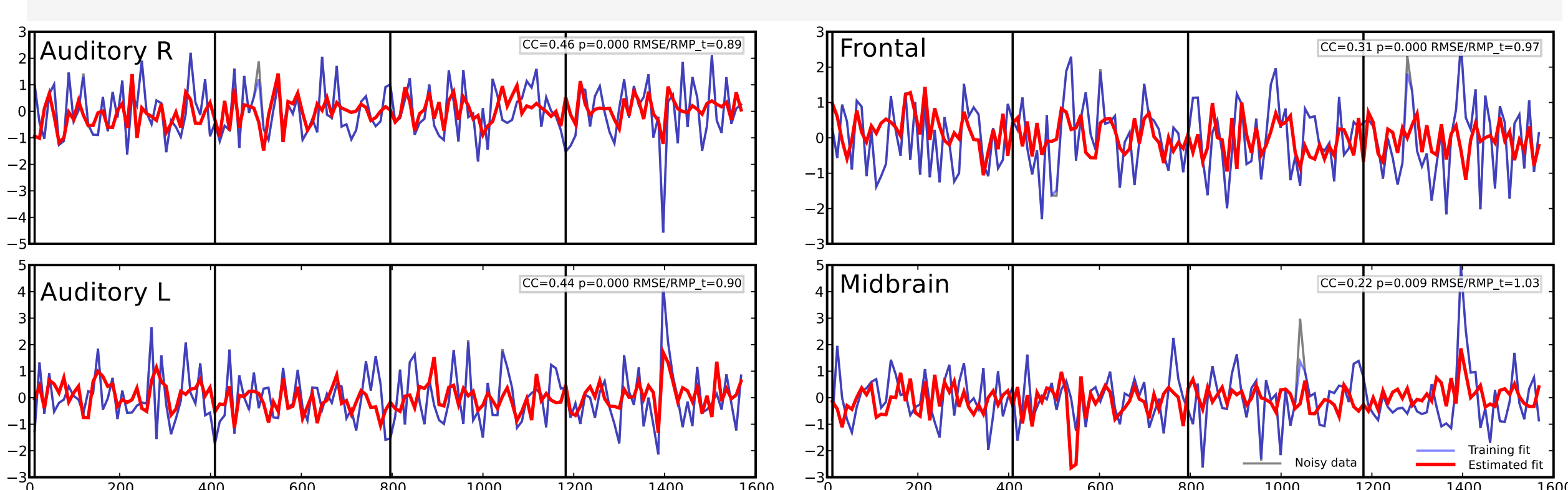


References

OpenMEEG: <http://openmeeeg.gforge.inria.fr>
A C++ package for low-frequency bio-electromagnetism including the EEG/MEG forward and inverse problems



Examples of reconstruction



References

Thaerig, S., Behne, N., Schadow, J., Lenz, D., Scheich, H., Brechmann, A., Herrmann, C. S., Mar. 2008. Sound level dependence of auditory evoked potentials: simultaneous EEG recording and low-noise fMRI. *International Journal of Psychophysiology* 67 (3), 235–41.

