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Inverse source estimation problem in EEG

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► **To cite this version:**

Maureen Clerc, Juliette Leblond, Jean-Paul Marmorat, Théo Papadopoulos. Inverse source estimation problem in EEG. BaCI 2017 - Basic and Clinical Multimodal Imaging, Aug 2017, Bern, Switzerland. hal-03472757v1

HAL Id: hal-03472757

<https://hal.science/hal-03472757v1>

Submitted on 9 Dec 2021 (v1), last revised 10 Dec 2021 (v2)

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Abstract

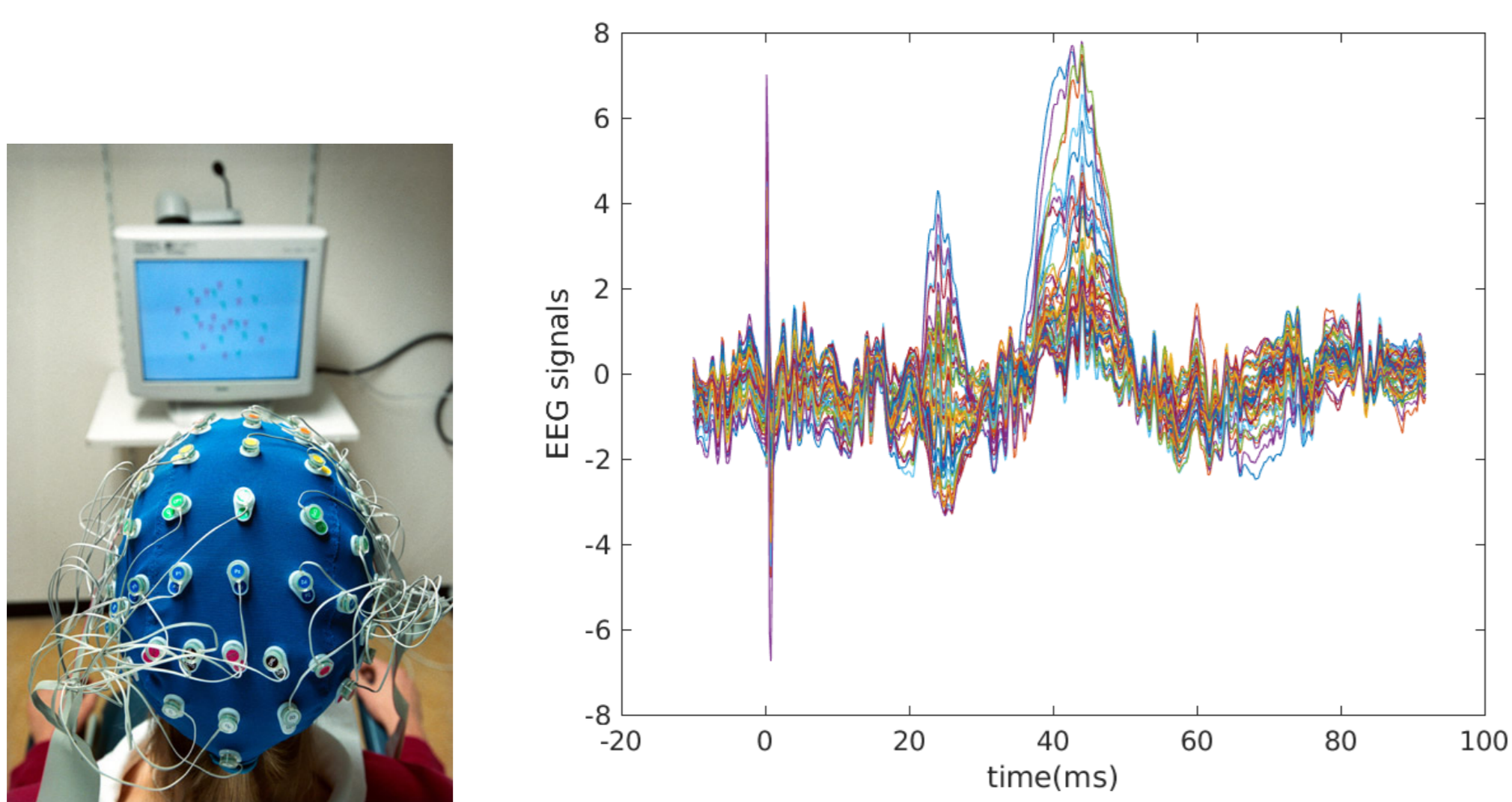
Being given pointwise measurements of the electric potential taken by electrodes on part of the scalp, the EEG (electroencephalography) inverse problem consists in estimating current sources within the brain that account for this activity. A model for the behaviour of the potential rests on Maxwell equation in the quasi-static case, under the form of a Poisson-Laplace equation. We describe our approach for solving the inverse problem in spherical geometry, for piecewise constant electric conductivity values, and pointwise dipolar source terms.

Blabla

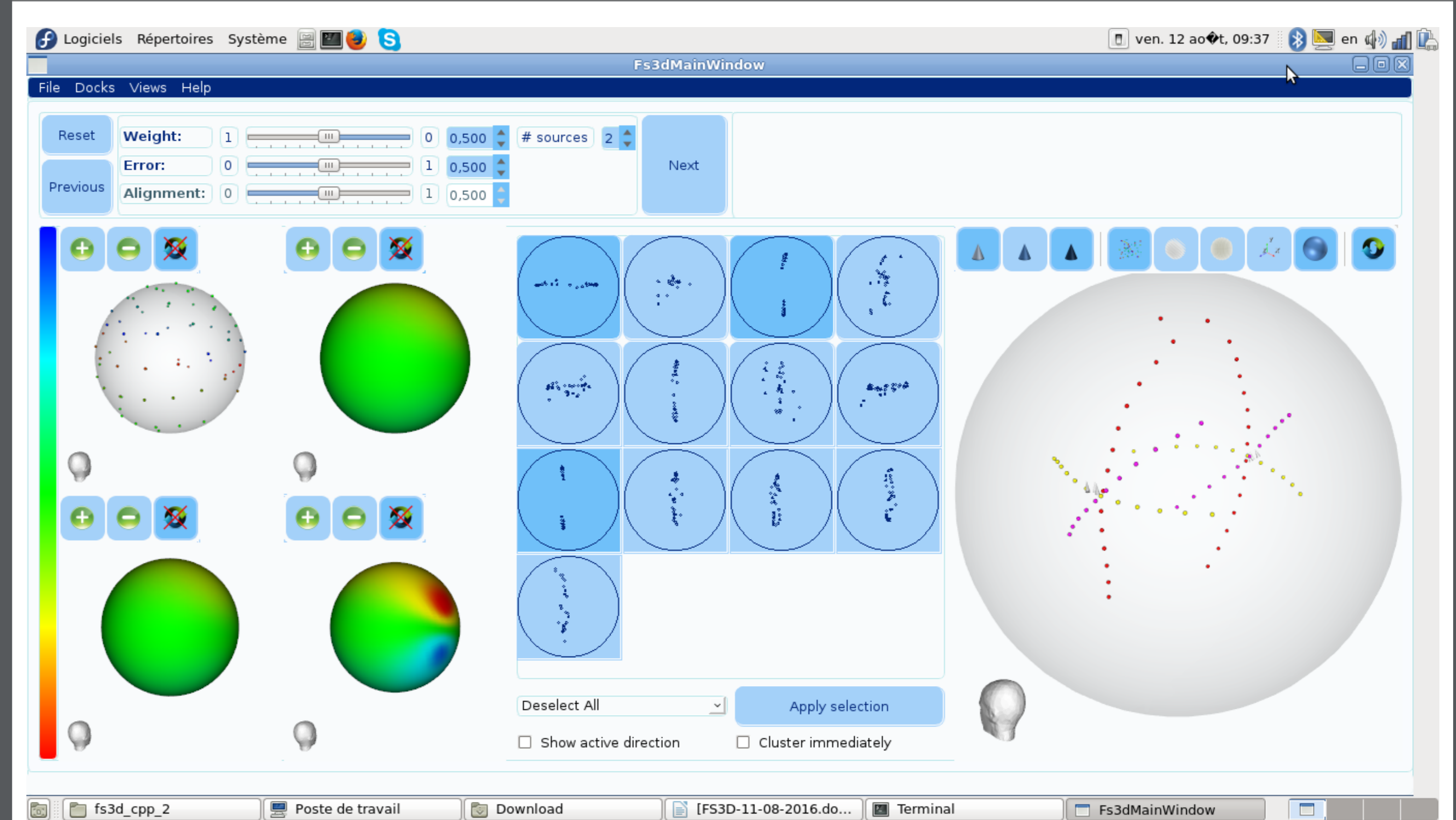
The algorithm relies on consecutive steps, and has been encoded in the software FindSources3D (see [CLMP], [FS3D]):

1. Singular value decomposition (SVD), in order to separate the time independent activities.
2. Spherical harmonics expansion, for data transmission from scalp to cortex ("cortical mapping") using best constrained approximation.
3. Best quadratic rational approximation on families of 2D slices in order to compute singularities in circular sections.
4. Clustering of these singularities in order to localize the sources, dipole fitting, moment computation.

EEG dataset

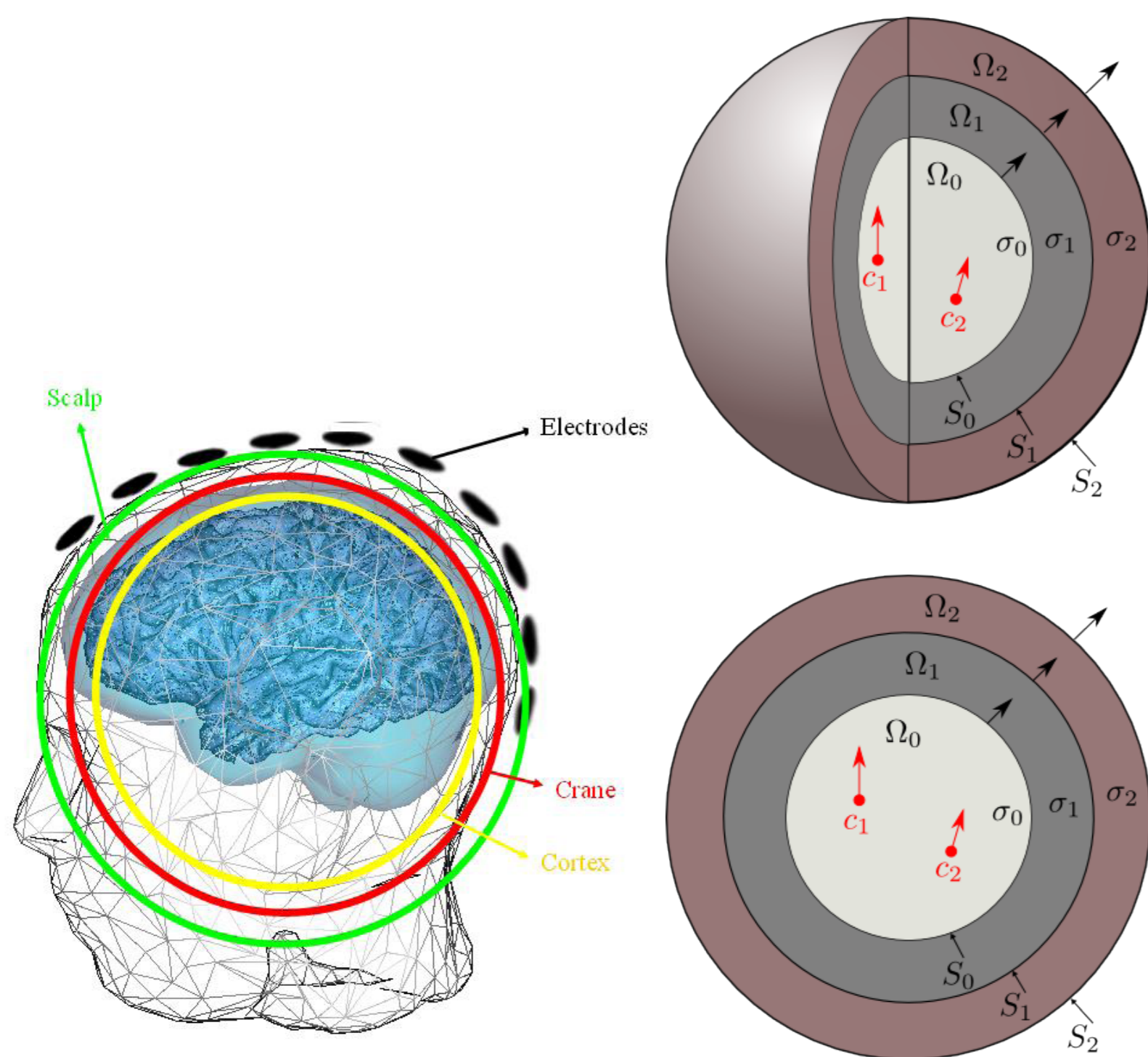


Steps 2, 3, 4



blabla blabla blabla

Modelling assumptions

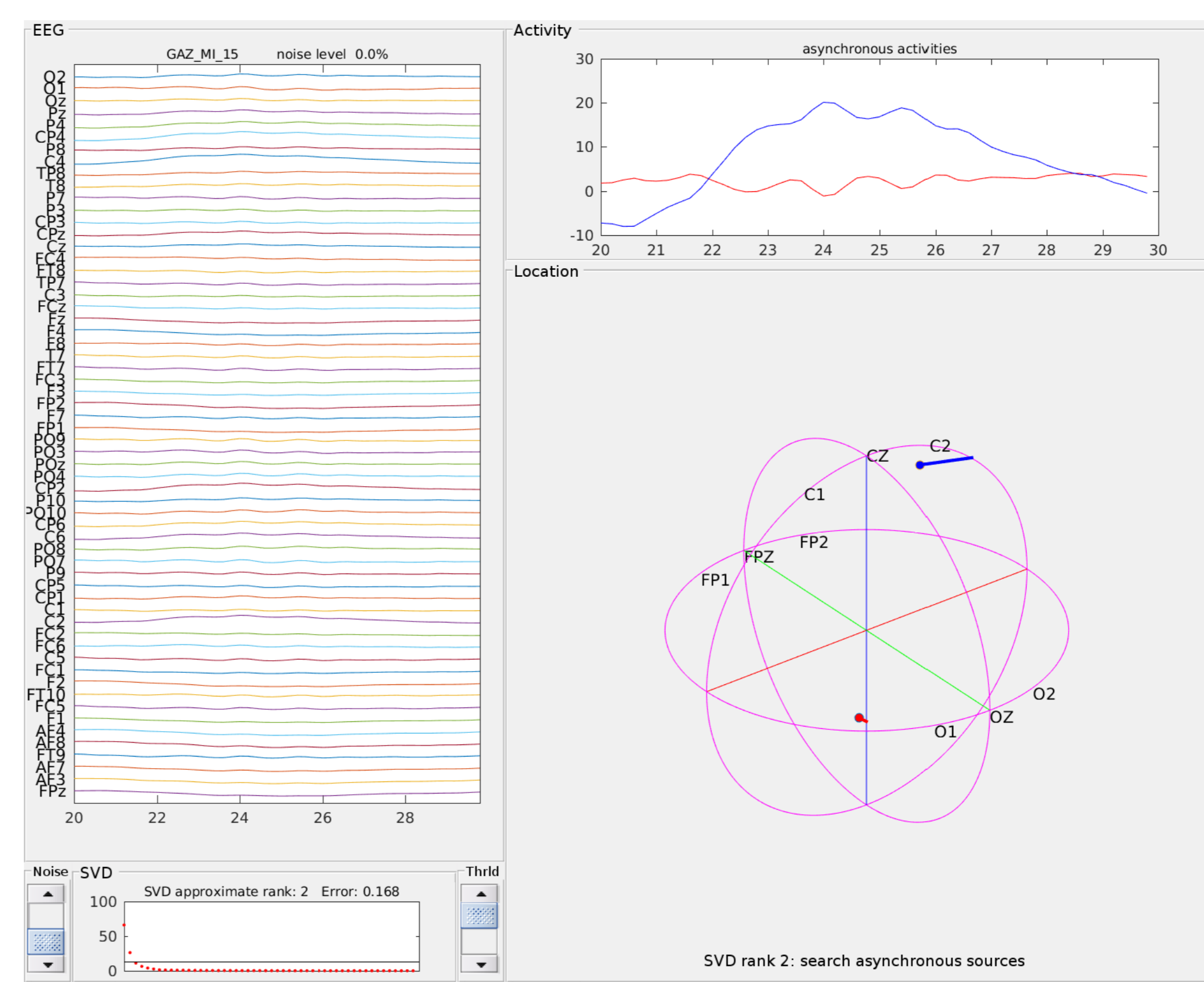


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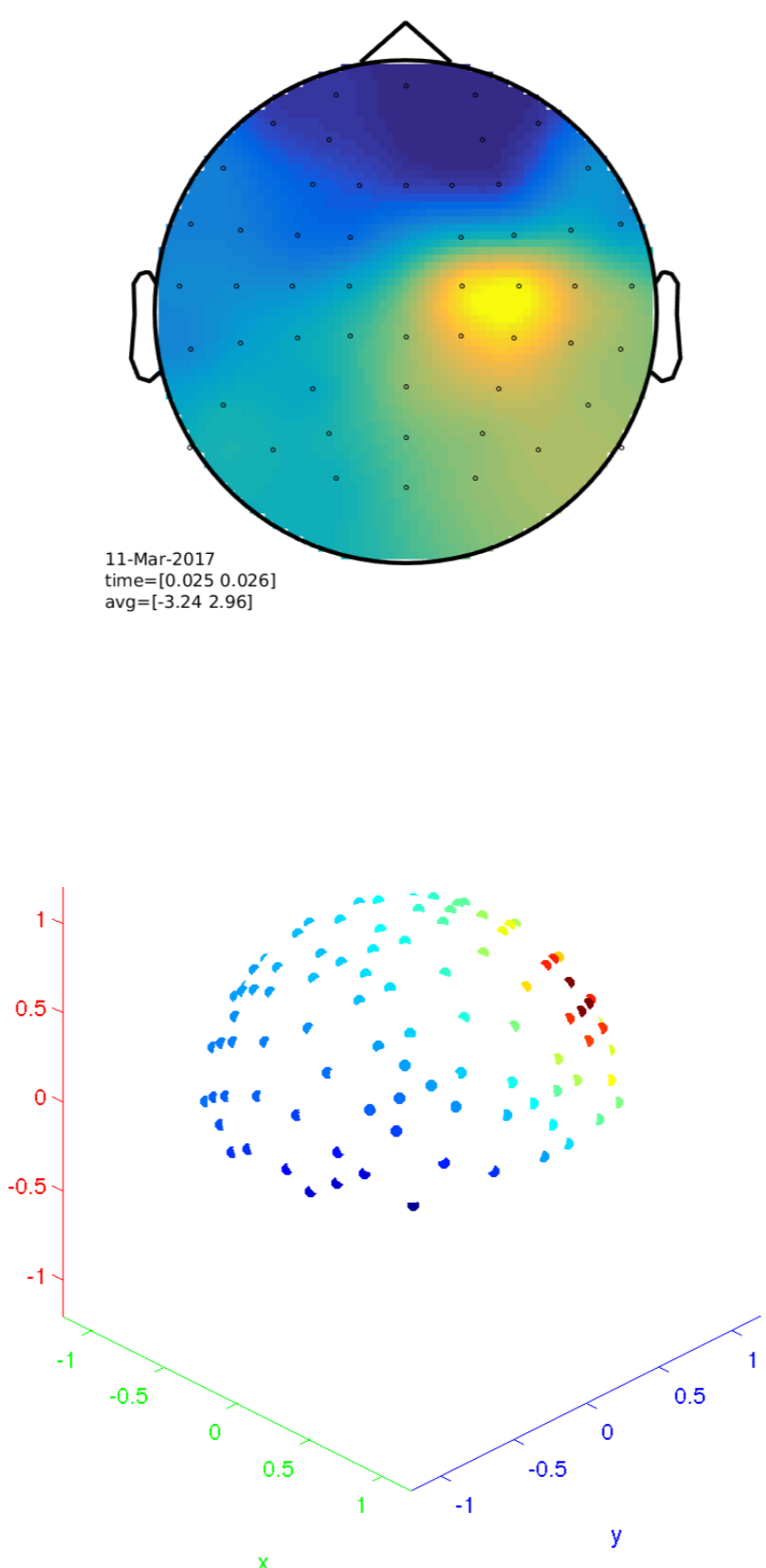
Result



blabla
blabla
blabla

Step 1 ~> static activities

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Conclusion

- ▶ done up to now
- ▶ limitations
- ▶ still to be done

References

- [CLMP] M. Clerc, J. Leblond, J.-P. Marmorat, T. Papadopoulo, Source localization in EEG using rational approximation on plane sections, *Inverse Problems*, 28, 2012.
 [FS3D] <http://www-sop.inria.fr/apics/FindSources3D/>