

# Statistical Analysis For FEM EEG Source Localization in Realistic Head Models

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UUCS-2000-003

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February 1, 2000

## ***Abstract***

Estimating the location and distribution of electric current sources within the brain from electroencephalographic (EEG) recordings is an ill-posed inverse problem. The ill-posed nature of the inverse EEG problem is due to the lack of a unique solution such that different configurations of sources can generate identical external electric fields.

In this paper we consider a spatio-temporal model, taking advantage of the entire EEG time series to reduce the extent of the configuration space we must evaluate. We apply the recently derived *infomax* algorithm for performing Independent Component Analysis (ICA) on the time-dependent EEG data. This algorithm separates multichannel EEG data into activation maps due to temporally independent stationary sources. For every activation map we perform a source localization procedure, looking only for a single dipole per map, thus dramatically reducing the search complexity. An added benefit of our ICA preprocessing step is that we obtain an *a priori* estimation of the number of independent sources producing the measured signal.