

Paris-Saclay
Center for Data Science

MNE



HIT

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Aalto University
School of Science



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FORSCHUNGSZENTRUM



TELECOM
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Mining brain waves with MNE

<http://martinos.org/mne/stable/index.html>

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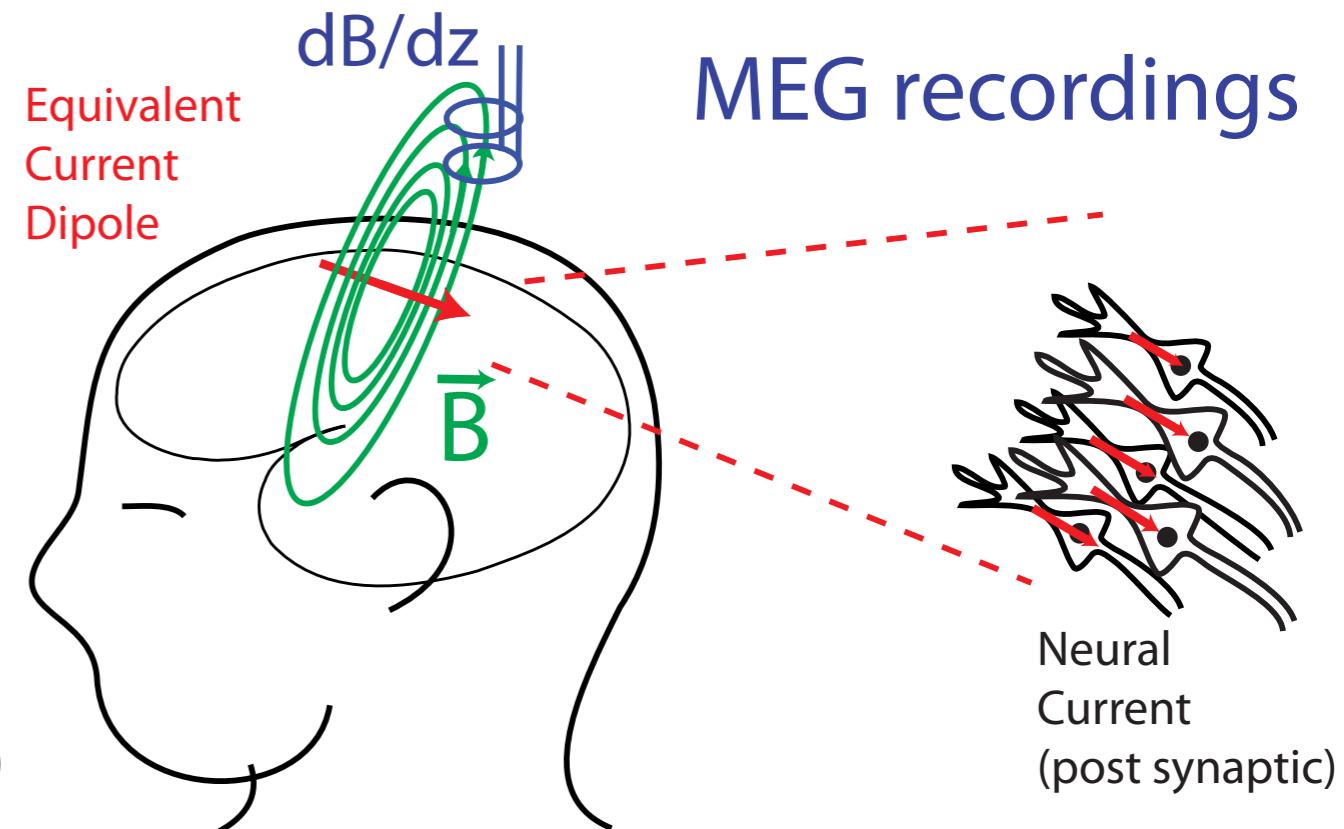
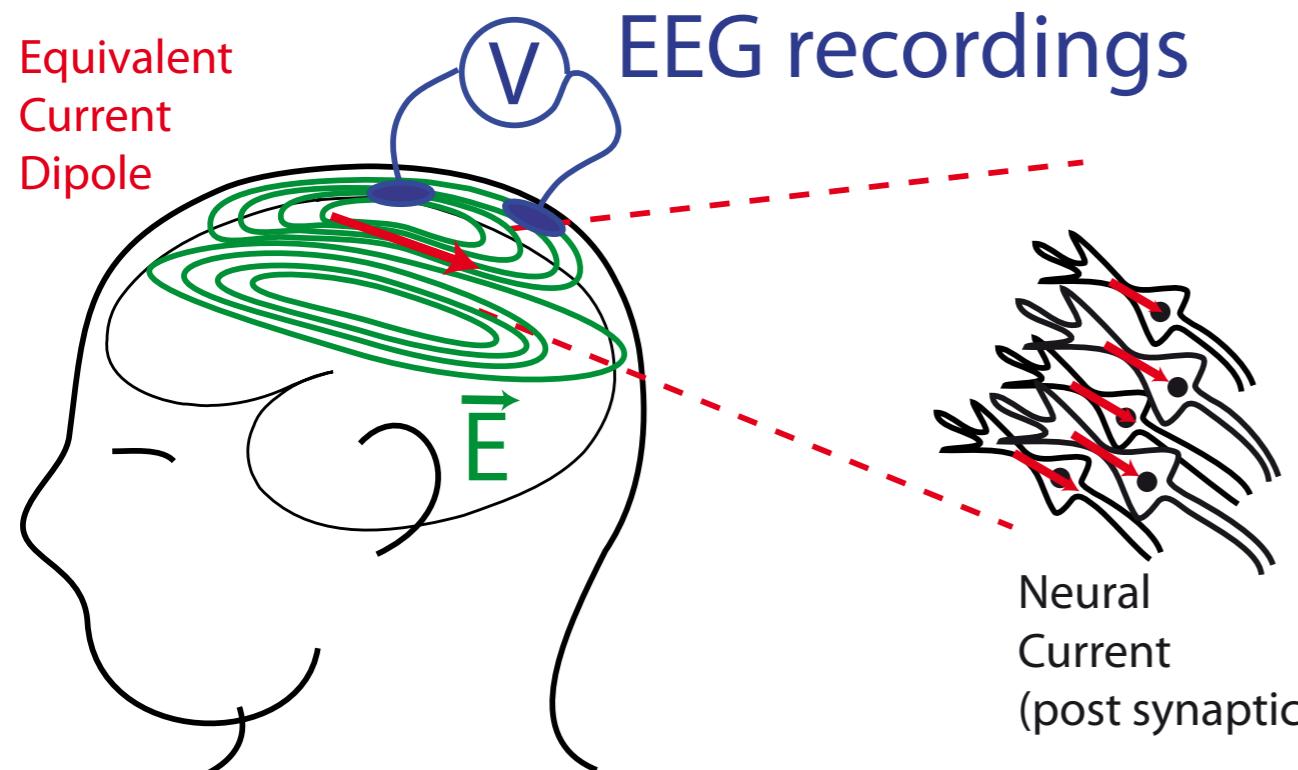
GitHub : @agramfort



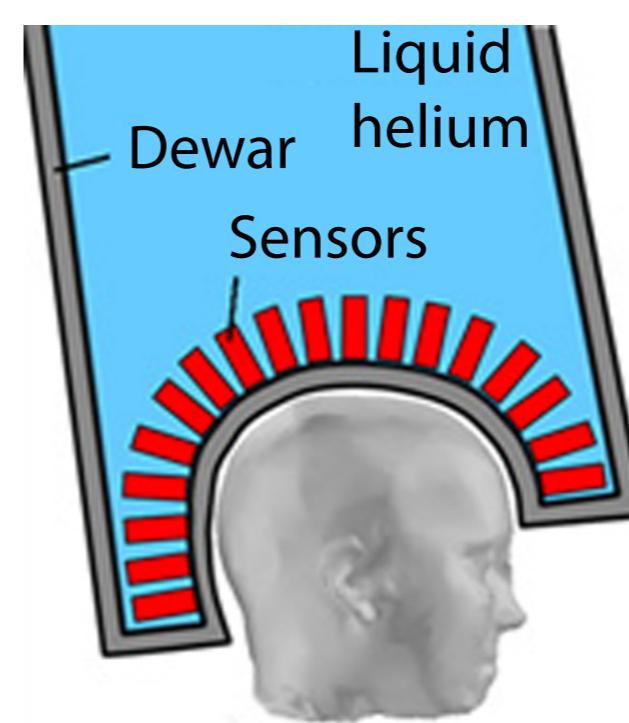
Twitter : @agramfort



EEG & MEG: non-invasive electrophysiology

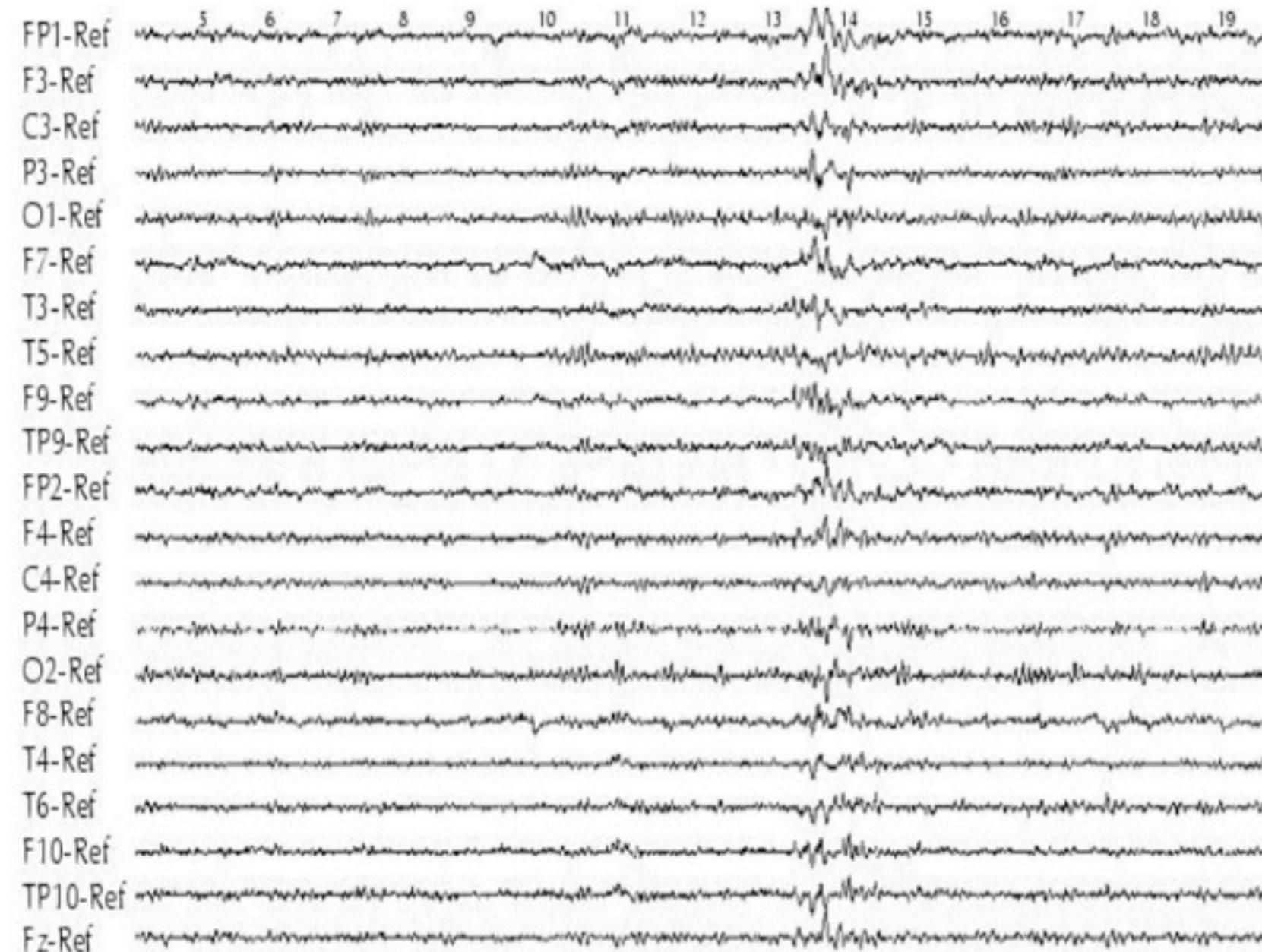


First EEG recordings in 1929 by H. Berger



First whole head MEG 1992

M/EEG Measurements



Sample EEG measurements

EEG :

- \approx 100 sensors

MEG :

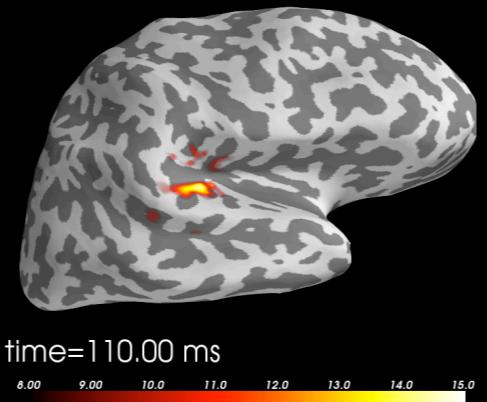
- \approx 150 to 300 sensors

Sampling between 250
and 1000 Hz

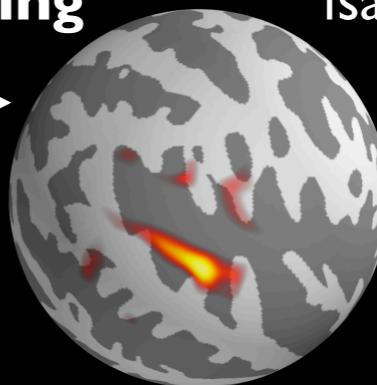
**High temporal
resolution**



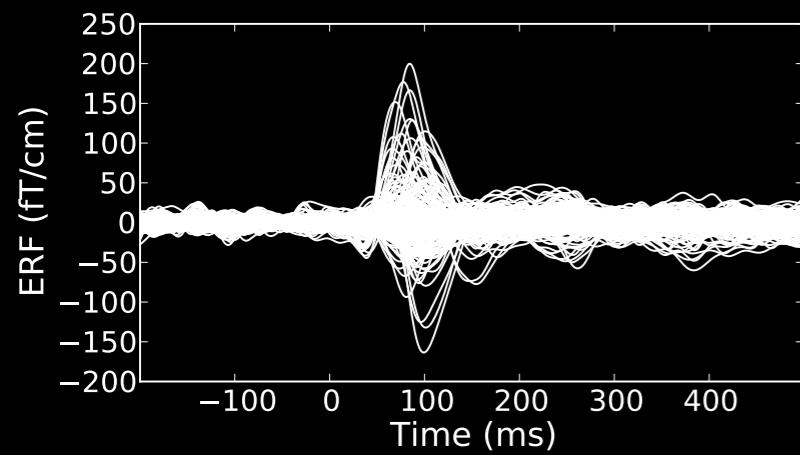
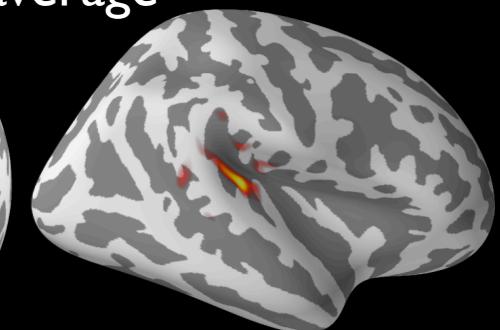
subject



morphing

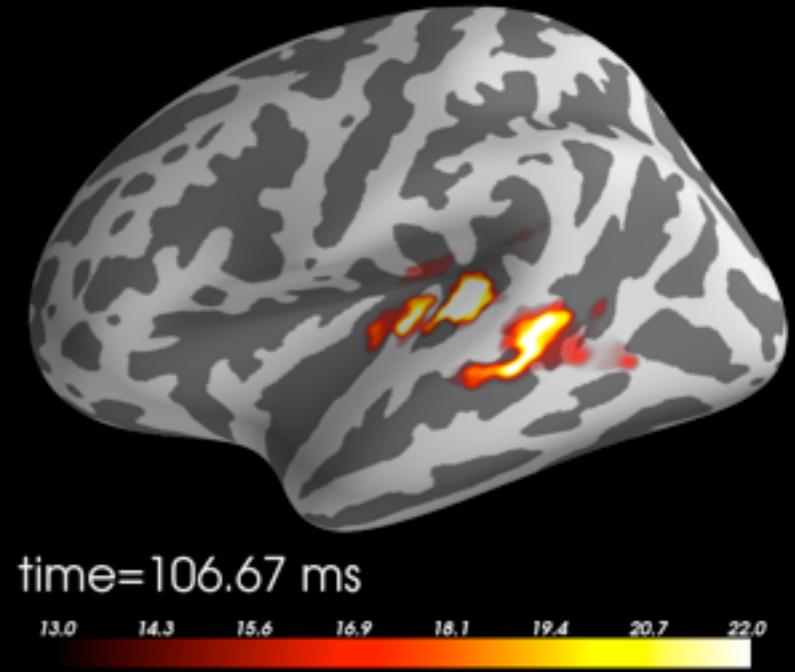
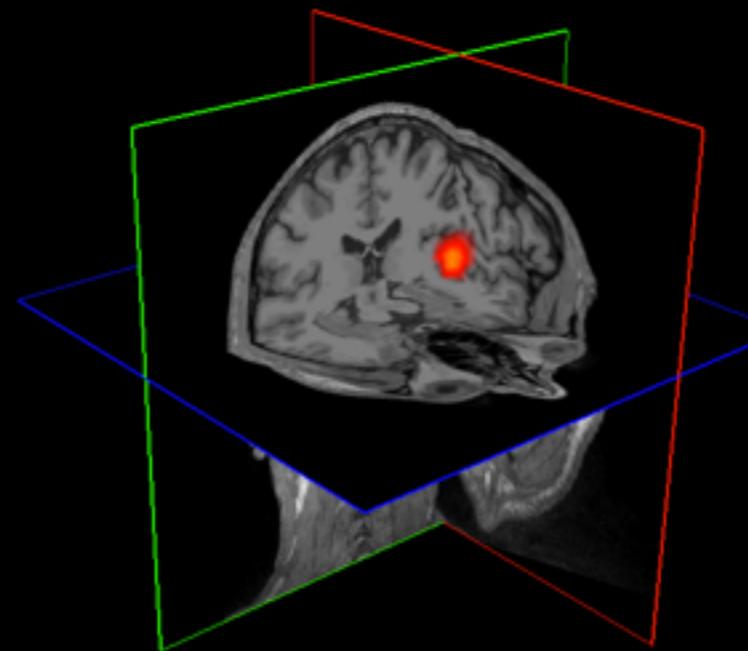
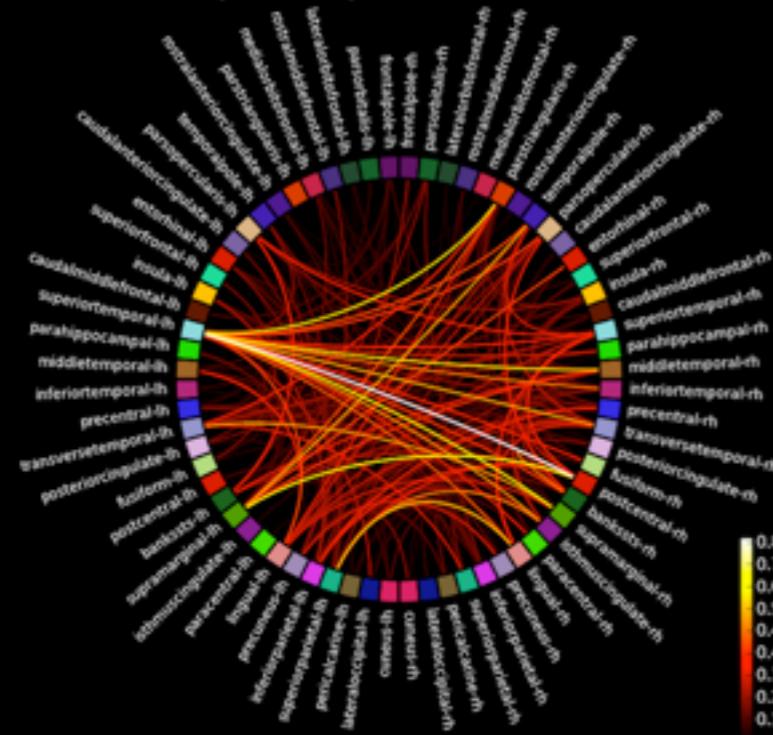
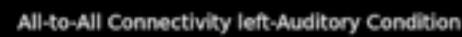


fsaverage

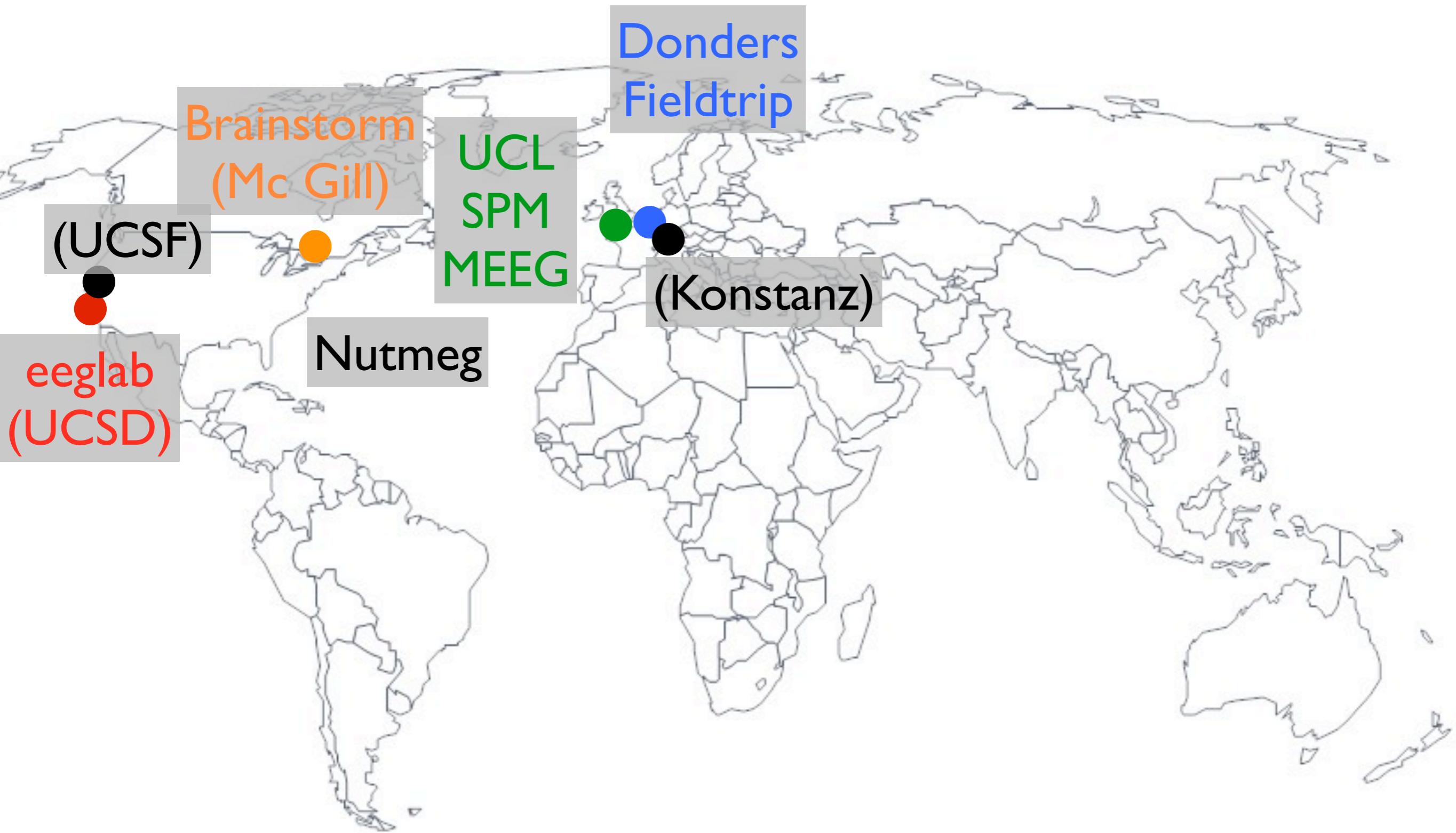


A 3D rendering of a human head showing a brain scan with red and yellow colors indicating activity or signal strength.

MNE



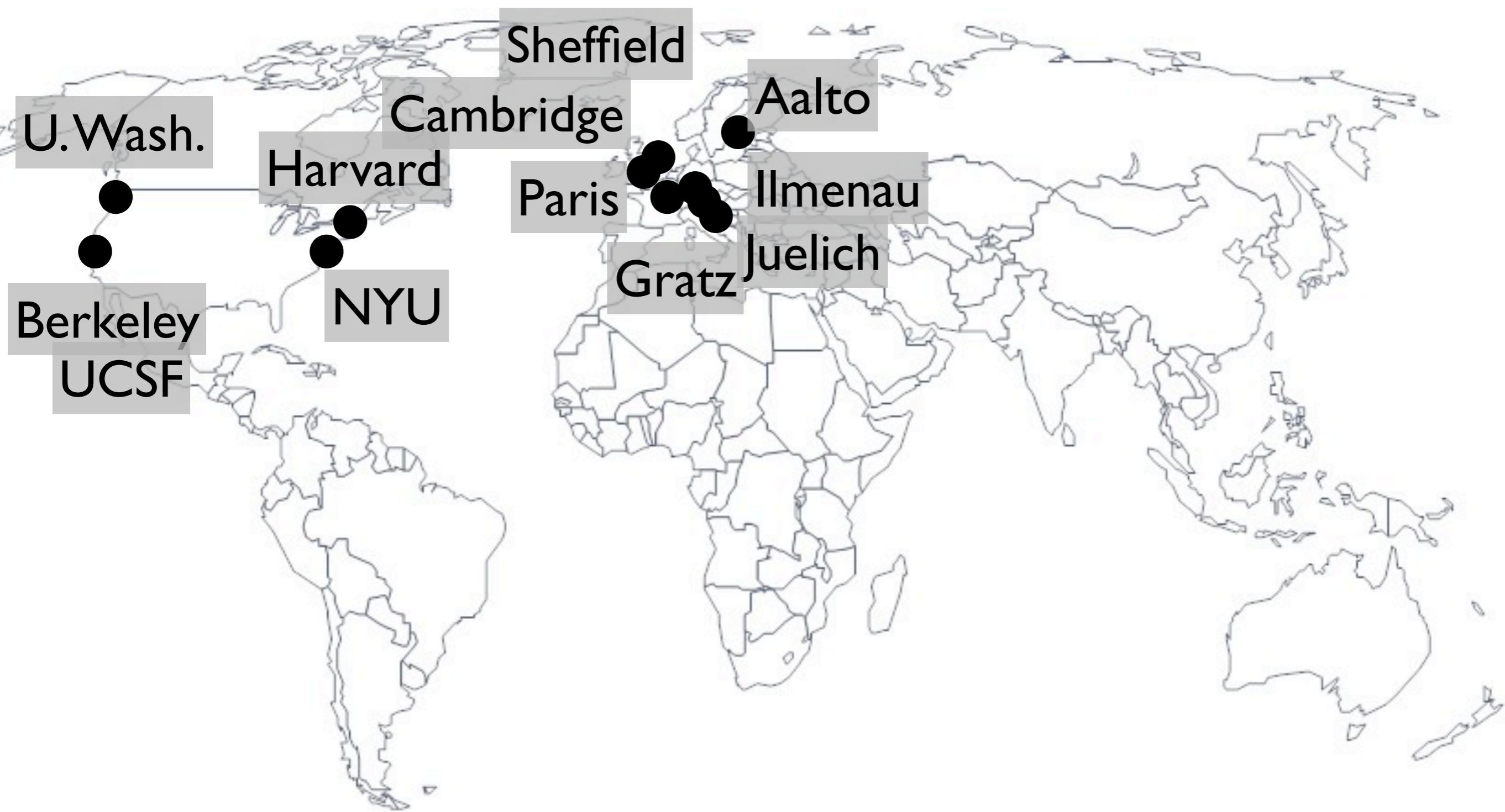
The landscape of M/EEG software development



Development of the MNE software before 2010



Development of the MNE software in 2014



About the project

- MNE based on C code developed for ~15 years by MSH
- MNE-Python started in Dec. 2010 at MGH, Boston

In a Nutshell, MNE-Python...

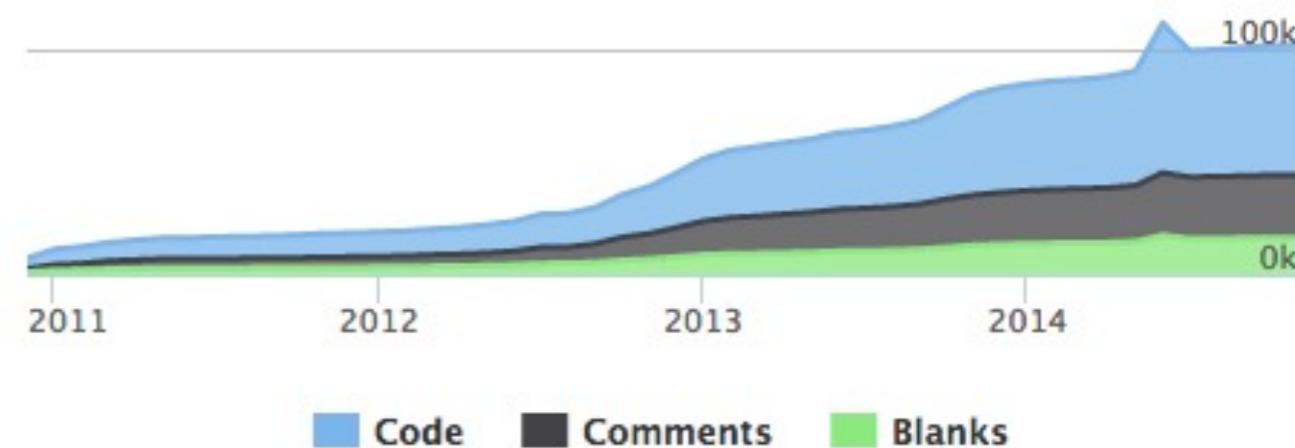
... has had 6,386 commits made by 68 contributors representing 57,785 lines of code

... is mostly written in Python with a well-commented source code

... has a codebase with a long source history maintained by a very large development team with stable Y-O-Y commits

... took an estimated 15 years of effort (COCOMO model) starting with its first commit in December, 2010 ending with its most recent commit 7 days ago

Lines of Code



Activity

12 Month Summary

Nov 10 2013 — Nov 10 2014

2399 Commits

Down -376 (13%) from previous 12 months

47 Contributors

Up +14 (42%) from previous 12 months

[ARCHIVE](#)
[WHAT IF?](#)
[BLAG](#)
[STORE](#)
[ABOUT](#)



A WEBCOMIC OF ROMANCE,
SARCASM, MATH, AND LANGUAGE.

XKCD UPDATES EVERY MONDAY, WEDNESDAY, AND FRIDAY.

PYTHON

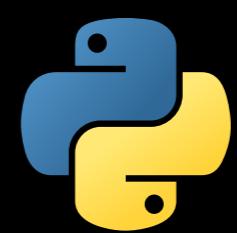
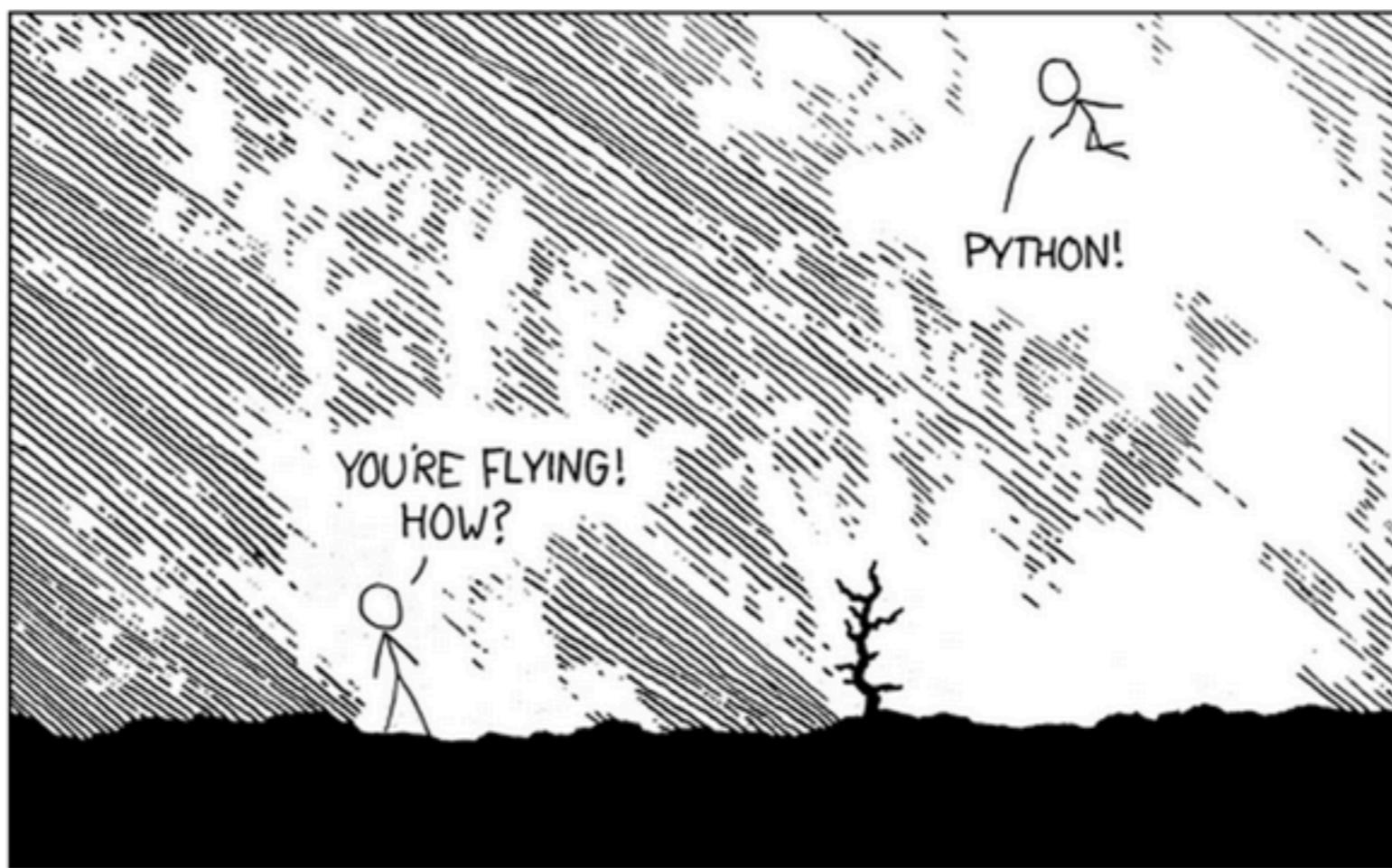
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RANDOM

NEXT >

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python™

Demo

Objective

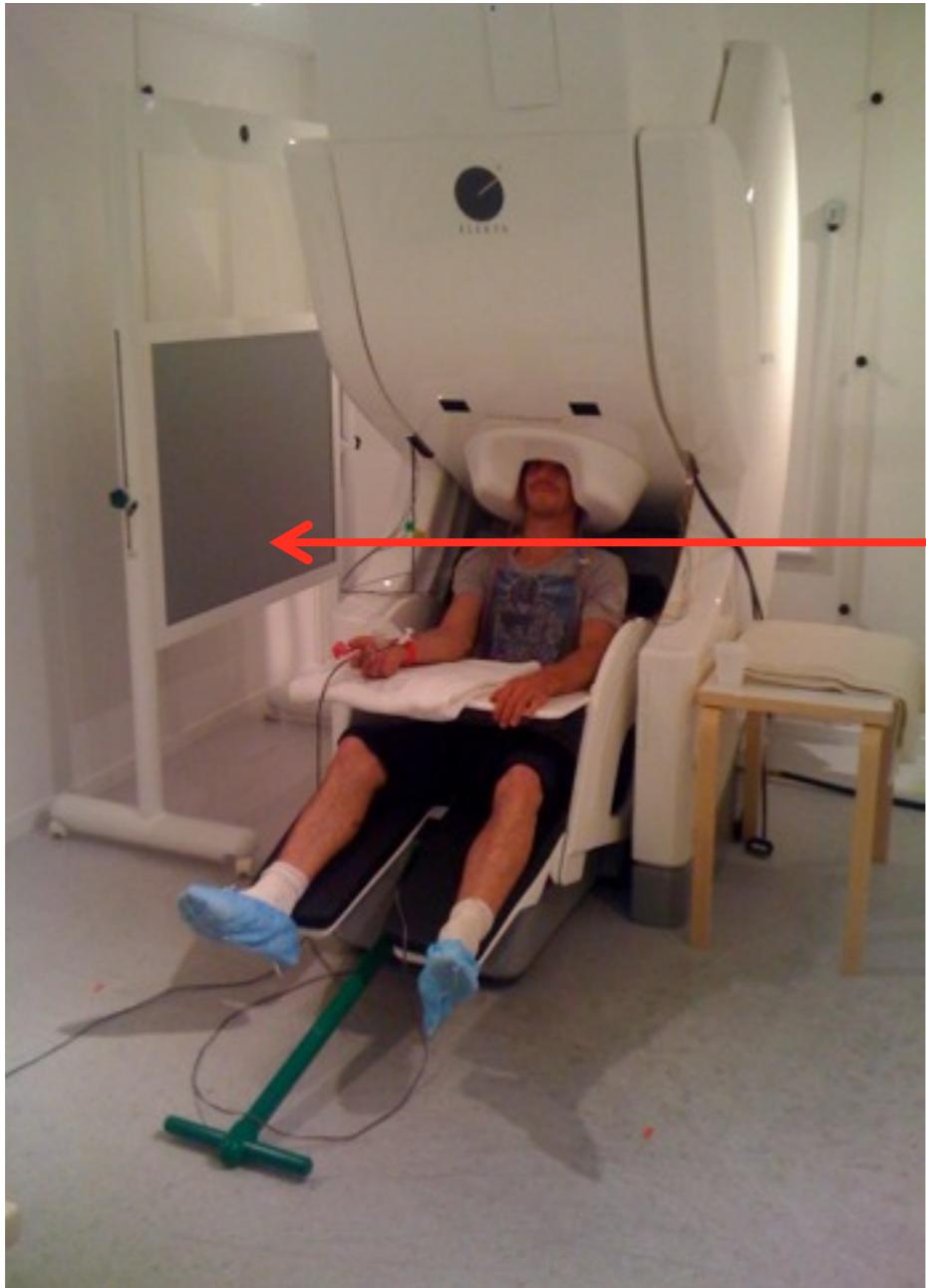
The image shows the top navigation bar of the Kaggle website. It features the 'kaggle' logo on the left, followed by four main tabs: 'Customer Solutions', 'Competitions', and 'Community' (with a dropdown arrow), and two buttons on the right: 'Sign up' and 'Login'. The background is dark grey.

The image shows the 'DecMeg2014 - Decoding the Human Brain' competition page on Kaggle. On the left, there's a sidebar with a 'DecMeg2014' banner at the top, followed by navigation links: 'Dashboard' (highlighted in blue), 'Home', 'Data', 'Make a submission', 'Information', and 'Description'. To the right of the sidebar, the main content area displays the competition details: 'Completed • \$5,000 • 267 teams', the competition title in large bold letters, and the date range 'Mon 21 Apr 2014 – Sun 27 Jul 2014 (3 months ago)'. Below this, there are links to 'Competition Details', 'Get the Data', and 'Make a submission'. The main description text reads: 'Predict visual stimuli from MEG recordings of human brain activity'.

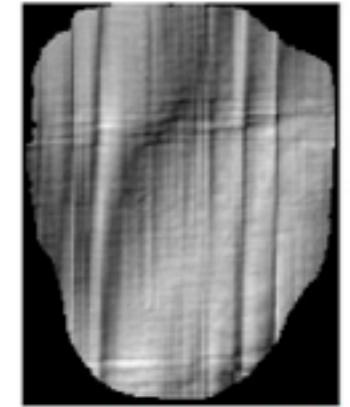
<https://www.kaggle.com/c/decoding-the-human-brain>

Organized by: E. Olivetti, M. Kia, P. Avesani, N. Weisz (Univ. of Trento, IT),
D. Wakeman (Harvard, USA), R. Henson (MRC/CBU, Cambridge, UK),
O. Jensen (Donders Institute, NL), and A. Gramfort (Telecom ParisTech, CEA)

Objective



Every 1s or 2s



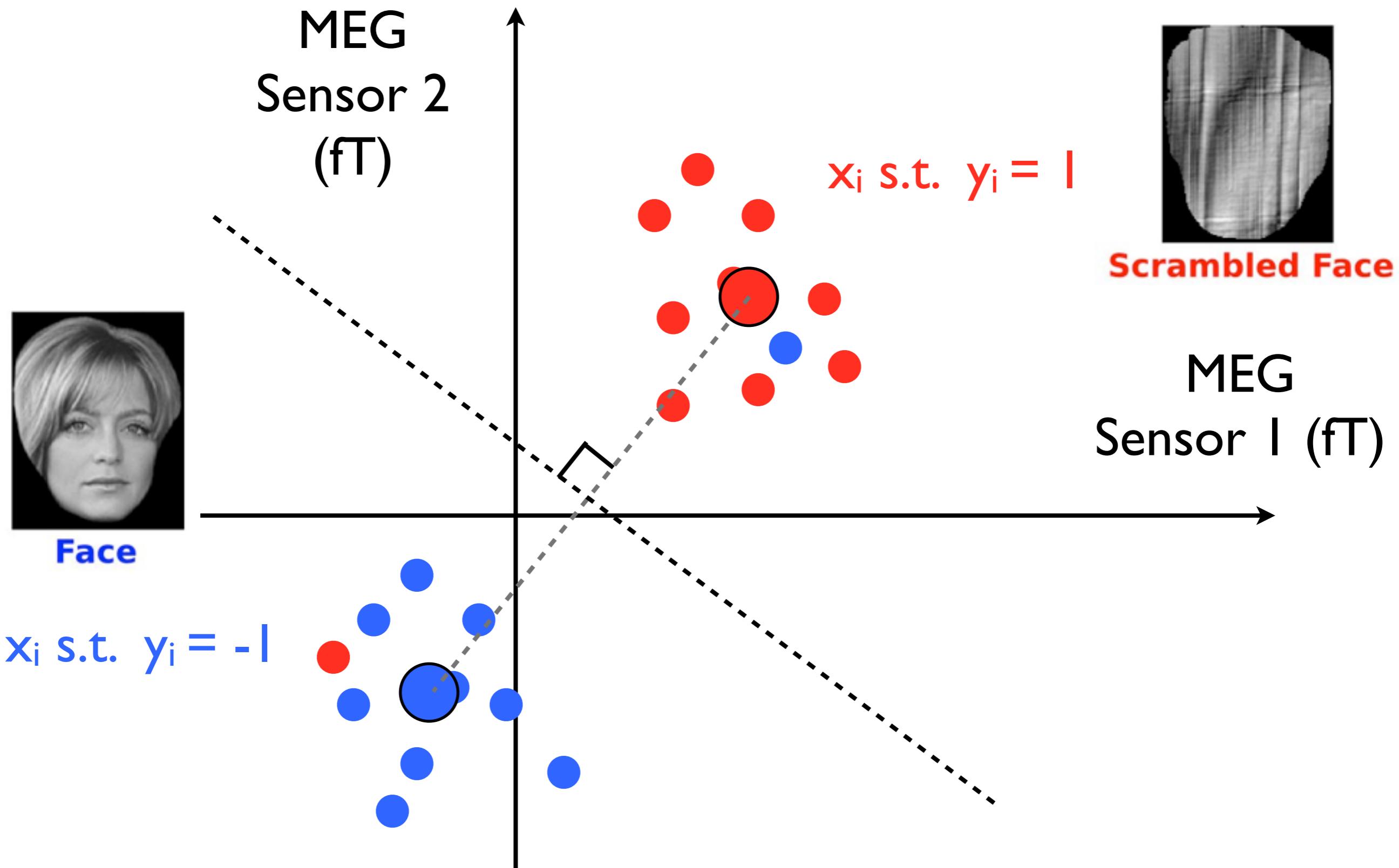
Scrambled Face



Face

Can we classify if subject saw a face or scrambled face?

Objective



Hacking
time...

Get inspired ...

http://martinos.org/mne/auto_examples/index.html

Home | Manual | Python | MNE with Python » previous | next | modules

Examples

General examples

General-purpose and introductory examples to MNE.

Visualize channel over epochs as an image

Define target events based on time lag, plot evoked response

Estimate covariance matrix from Epochs baseline

Estimate covariance matrix from a raw FIF file

Create evoked objects in delayed SSP mode

Plotting topographic maps of evoked data

Table Of Contents

- Examples
 - General examples
 - Connectivity Analysis Examples
 - Decoding / MVPA
 - Export of MNE data for use in other packages
 - Inverse problem and source analysis
 - Preprocessing
 - Statistics Examples
 - Time-Frequency Examples

Previous topic

Tutorial: MEG and EEG data processing with MNE and Python

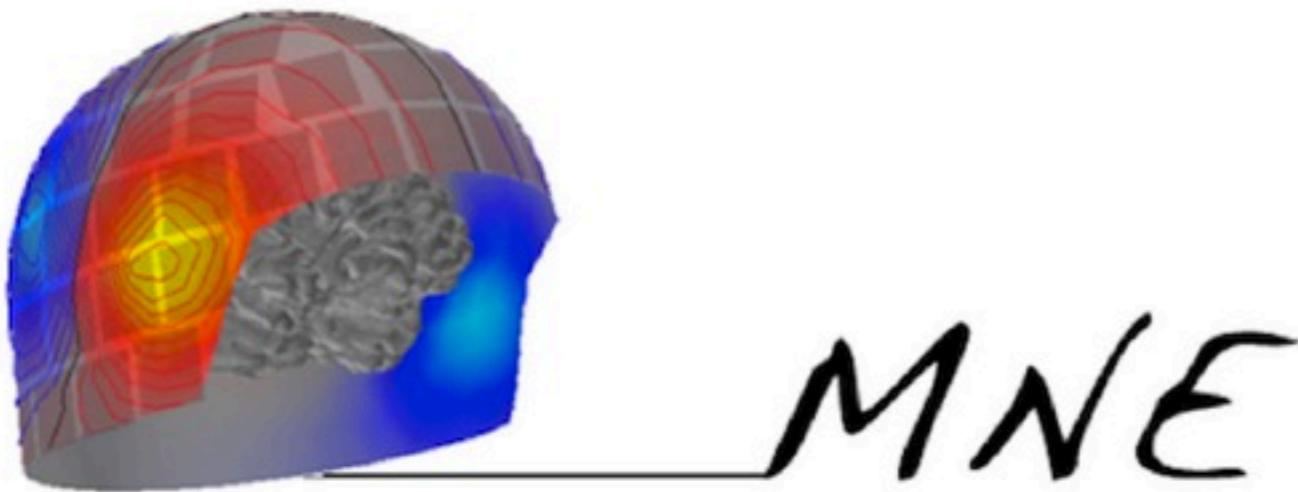
Next topic

Visualize channel over epochs as an image

Quick search

Ask for help

<http://martinos.org/mne/>



The MNE logo consists of a 3D rendering of a human brain with a grid of colored activity patterns (red, yellow, blue) overlaid. To the right of the brain, the letters "MNE" are written in a large, black, cursive-style font.

MGH 1811 Aalto University School of Science A! ns JÜLICH FORSCHUNGSZENTRUM ILMENAU UNIVERSITY OF TECHNOLOGY NYU TELECOM ParisTech

Home | Manual | Python | Cite MNE | next | modules

MNE Home

MNE is a software package for processing magnetoencephalography (MEG) and electroencephalography (EEG) data.

Next topic
Manual
Quick search

Mailing list:

http://mail.nmr.mgh.harvard.edu/mailman/listinfo/mne_analysis

People



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@rgoj



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@lauriparkkonen



@TaLinzen



@adykstra



@dgwakeman



@leggitta



@mshamalainen



@kazemakase



@you?

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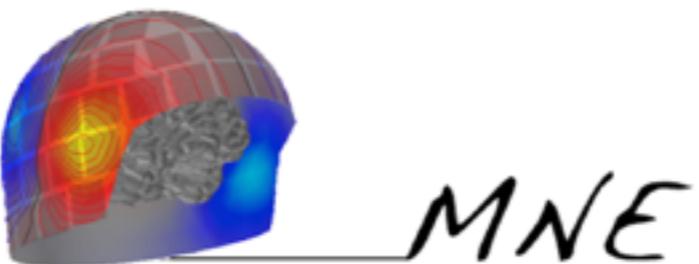
GitHub : @agramfort



Twitter : @agramfort



References



MNE software for processing MEG and EEG data, A. Gramfort, M. Luessi, E. Larson, D. Engemann, D. Strohmeier, C. Brodbeck, L. Parkkonen, M. Hämäläinen, Neuroimage, 2014

MEG and EEG data analysis with MNE-Python, A. Gramfort, M. Luessi, E. Larson, D. Engemann, D. Strohmeier, C. Brodbeck, R. Goj, M. Jas, T. Brooks, L. Parkkonen, M. Hämäläinen, Frontiers in Neuroscience, 2013

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