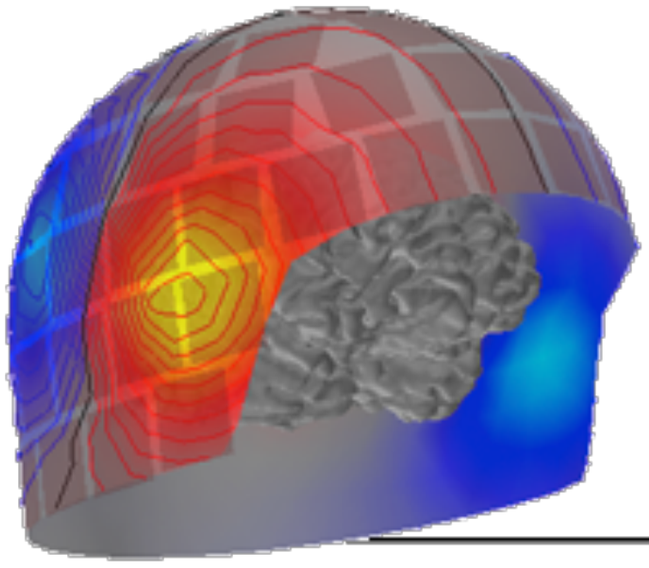

Paris-Saclay
Center for Data Science

MNE

Mining brain waves with MNE

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

Alexandre Gramfort

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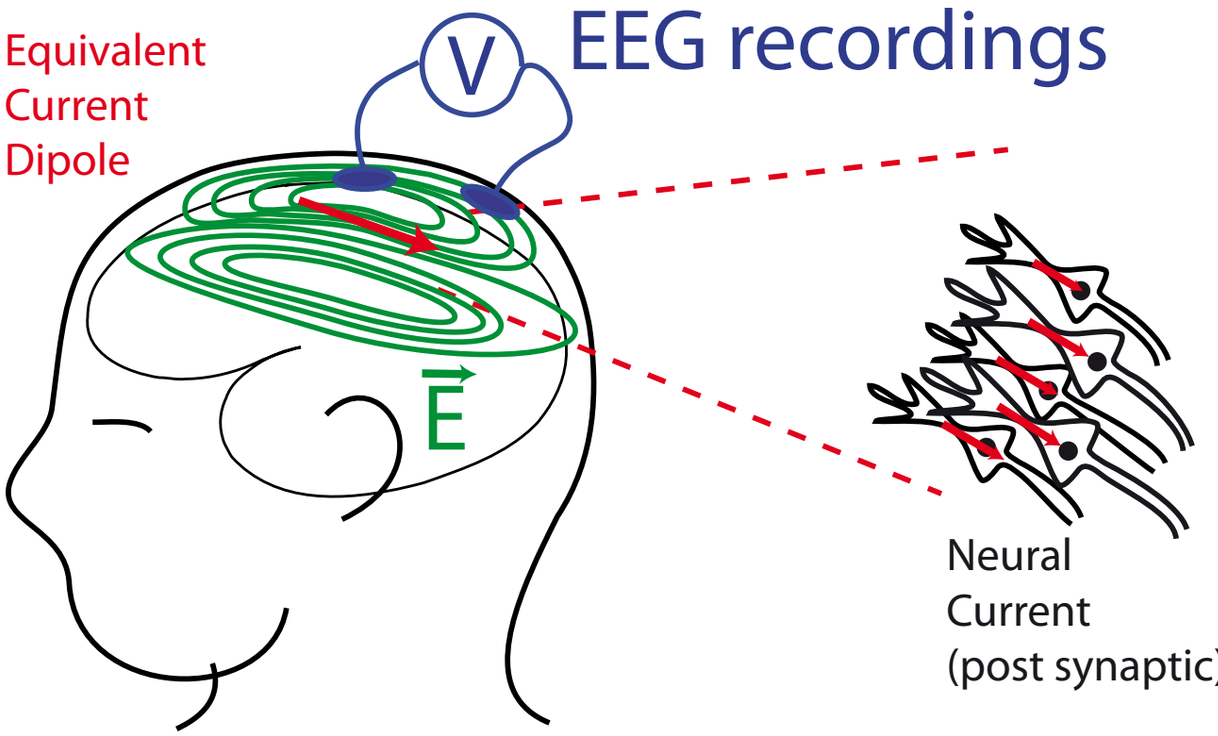
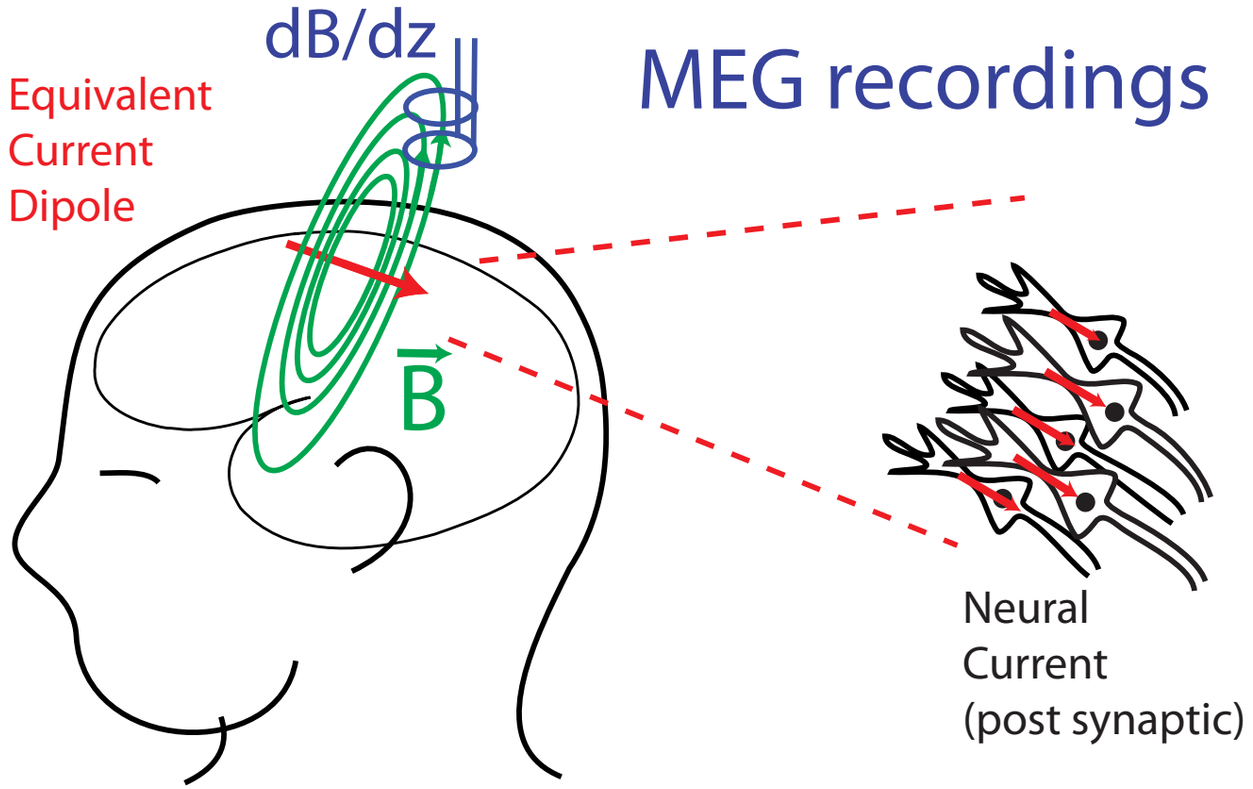
GitHub : @agramfort

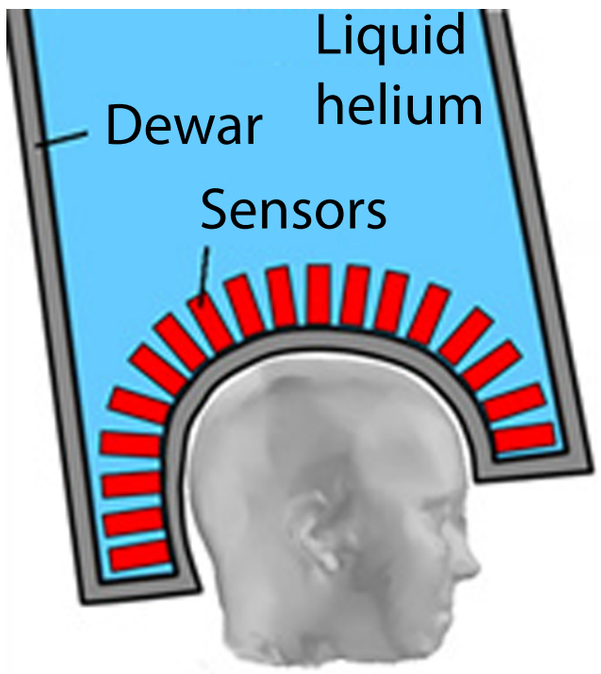
Twitter : @agramfort

EEG & MEG: non-invasive electrophy



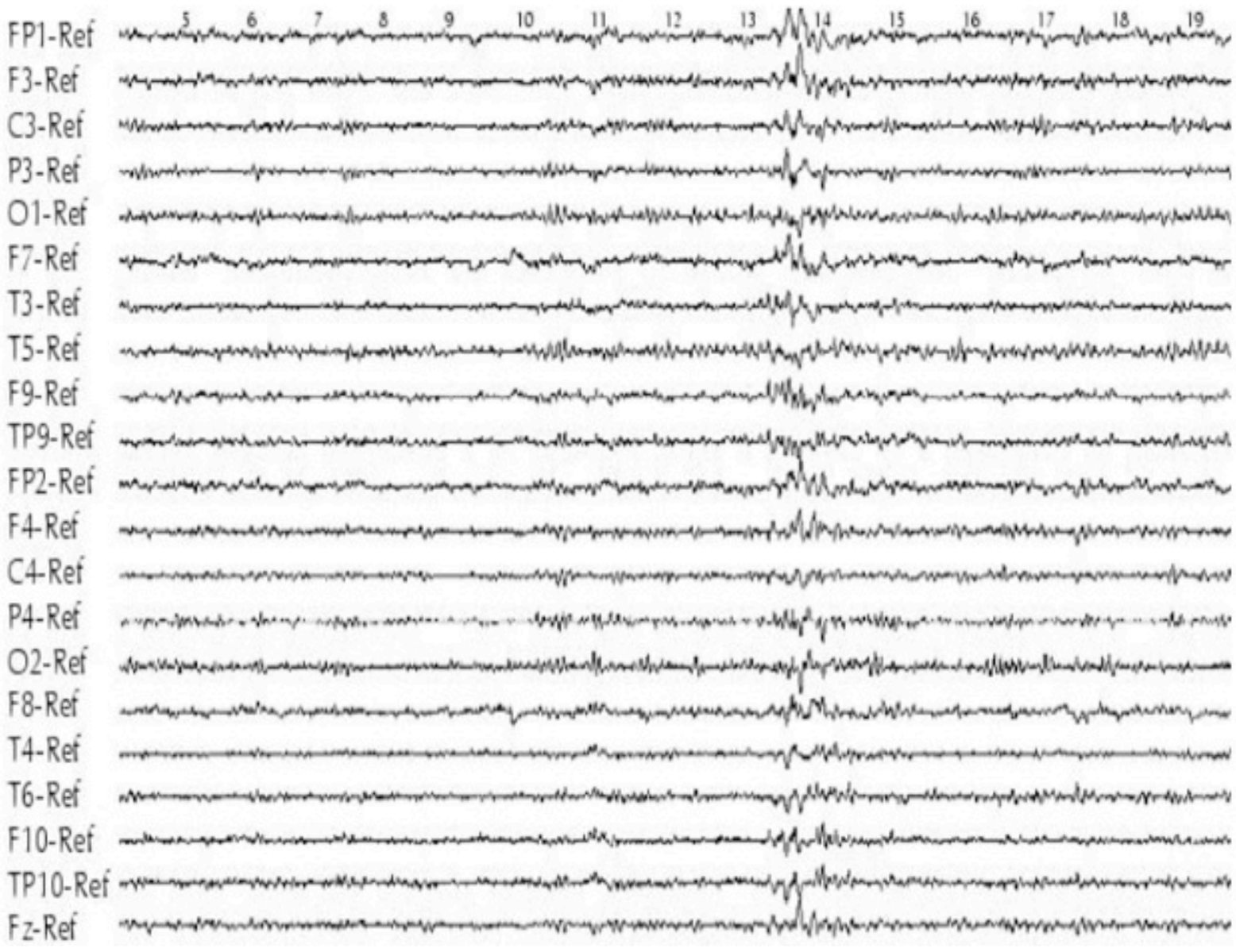


First EEG
recordings
in 1929
by H. Berger



First whole head MEG 1992

M/EEG Measurements



Sample EEG measurements

EEG :

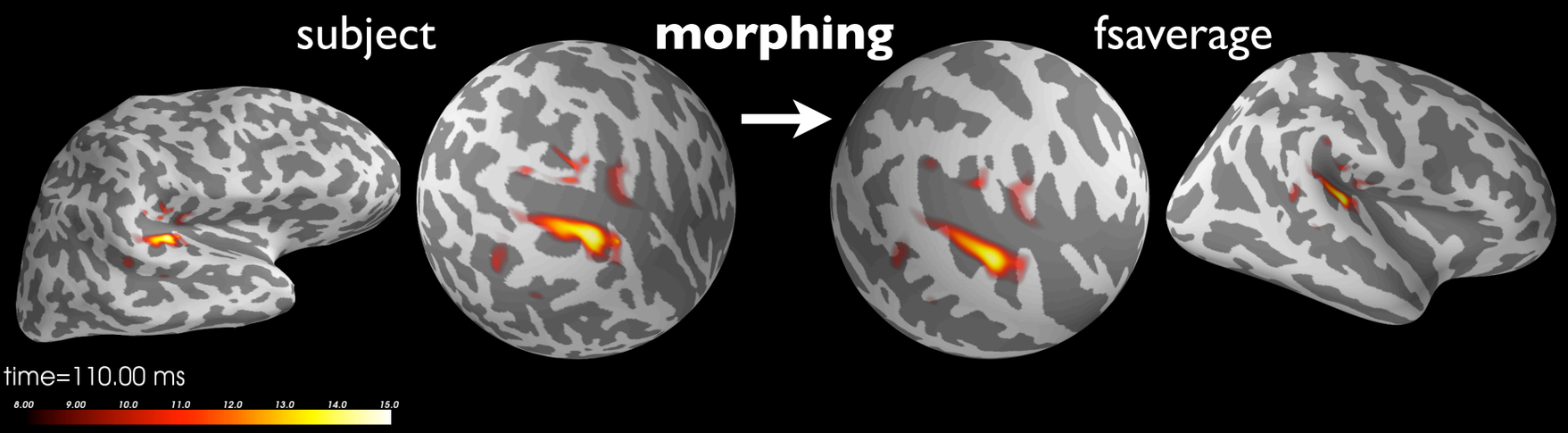
- ≈ 100 sensors

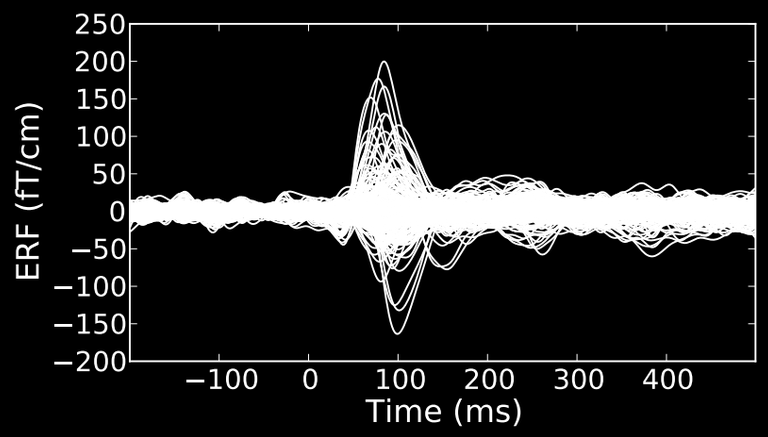
MEG :

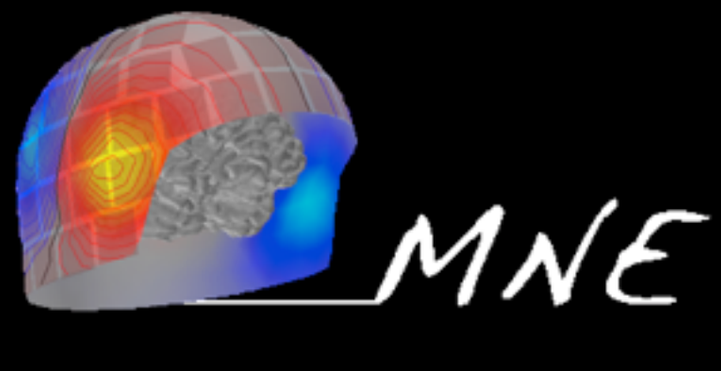
- ≈ 150 to 300 sensors

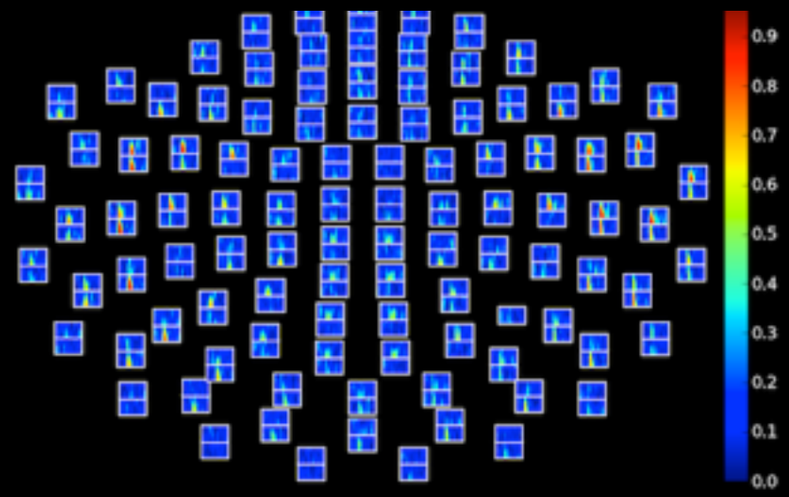
Sampling between 250 and1000 Hz

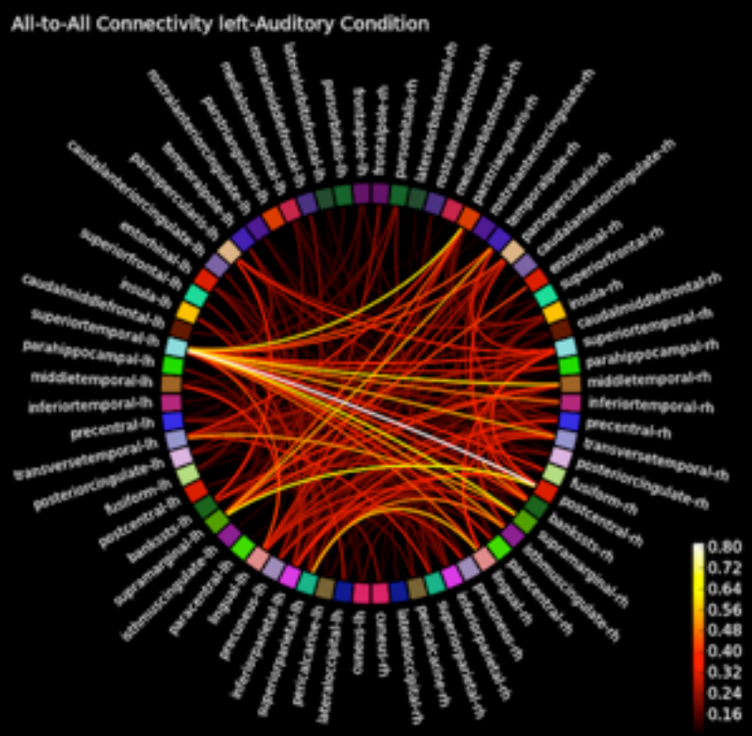
High temporal resolution

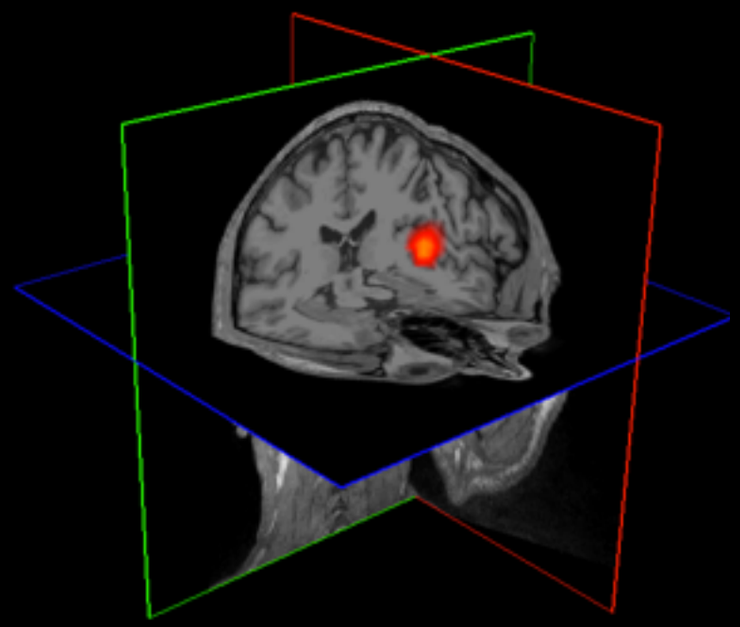

subject
morphing
fsaverage
time=110.00 ms
8.00 9.00 10.0 11.0 12.0 13.0 14.0 15.0

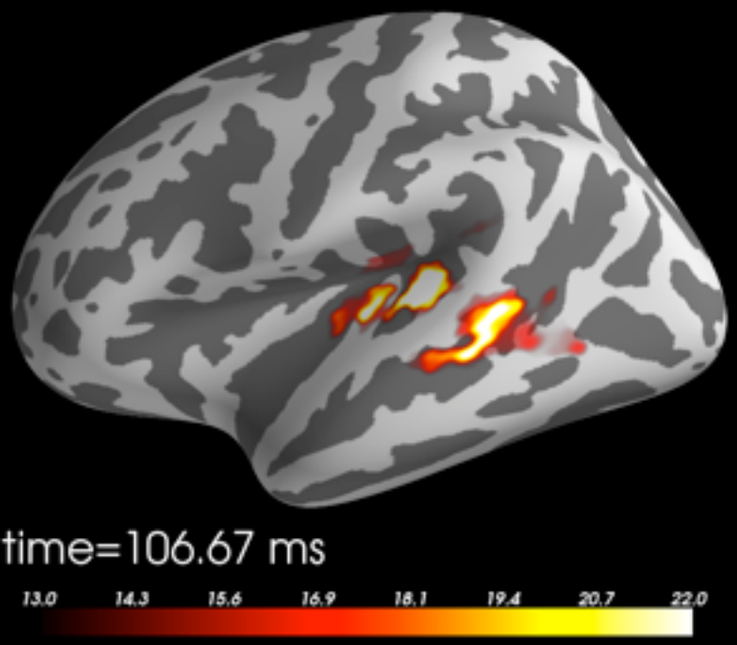

ERF (fT/cm)
250
200
150
100
50
0
−50
−100
−150
−200
−100 0 100 200 300 400
Time (ms)


MNE

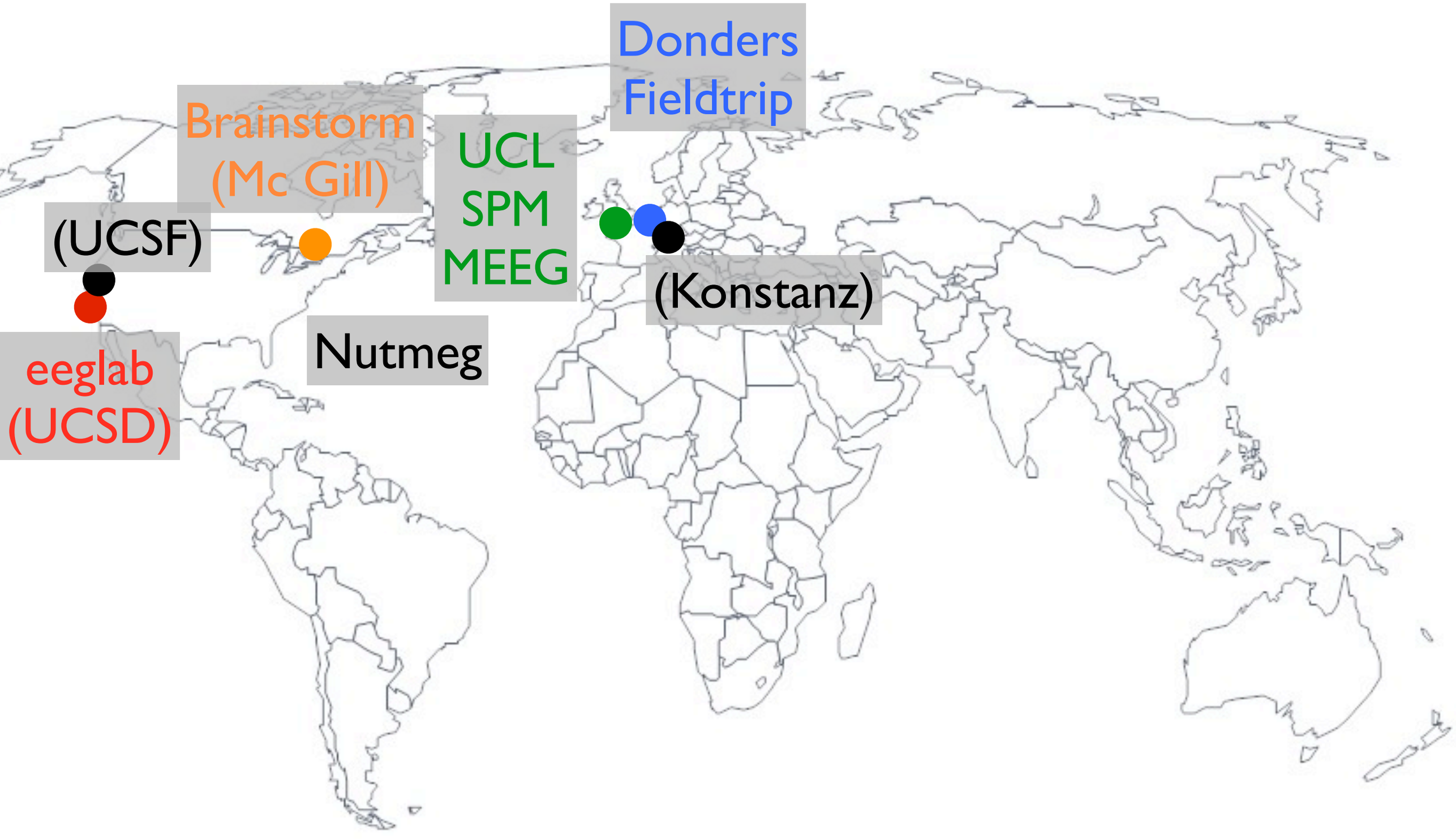

0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0


All-to-All Connectivity left-Auditory Condition
0.80
0.72
0.64
0.56
0.48
0.40
0.32
0.24
0.16



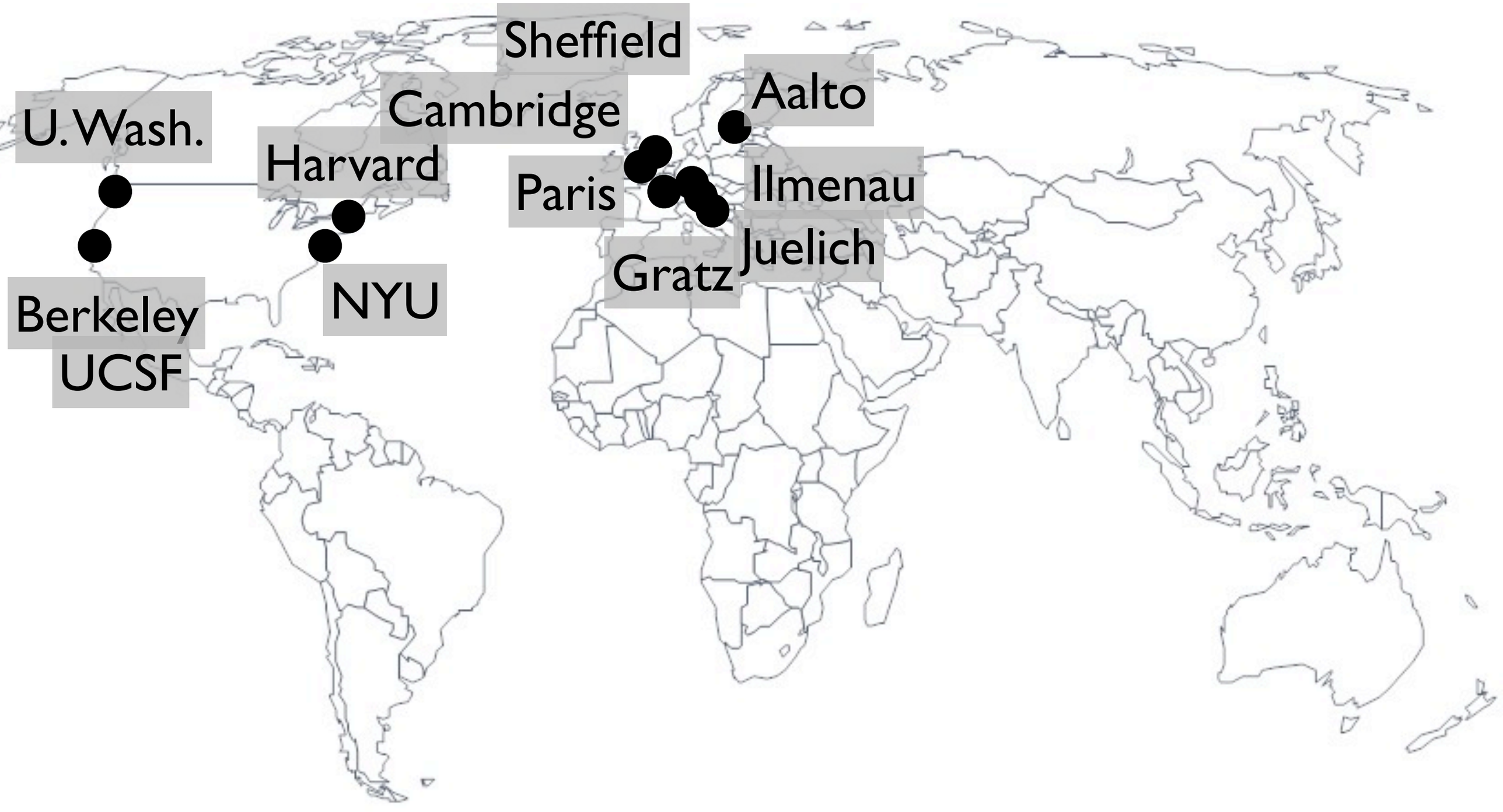

time=106.67 ms
13.0 14.3 15.6 16.9 18.1 19.4 20.7 22.0

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

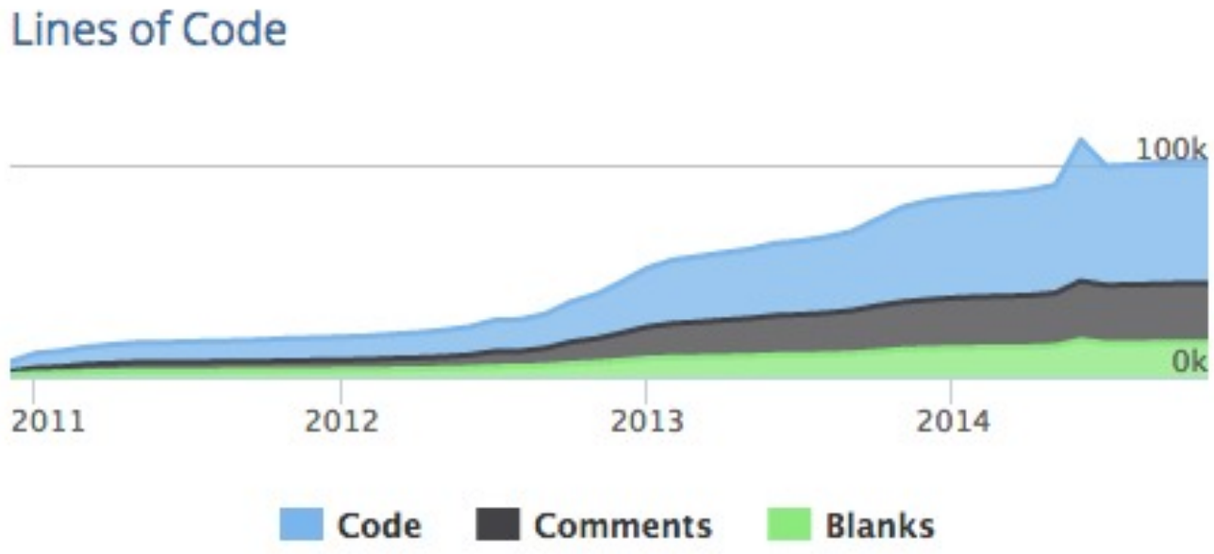
In a Nutshell, MNE-Python...

... 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



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

Source: https://www.ohloh.net/p/MNE

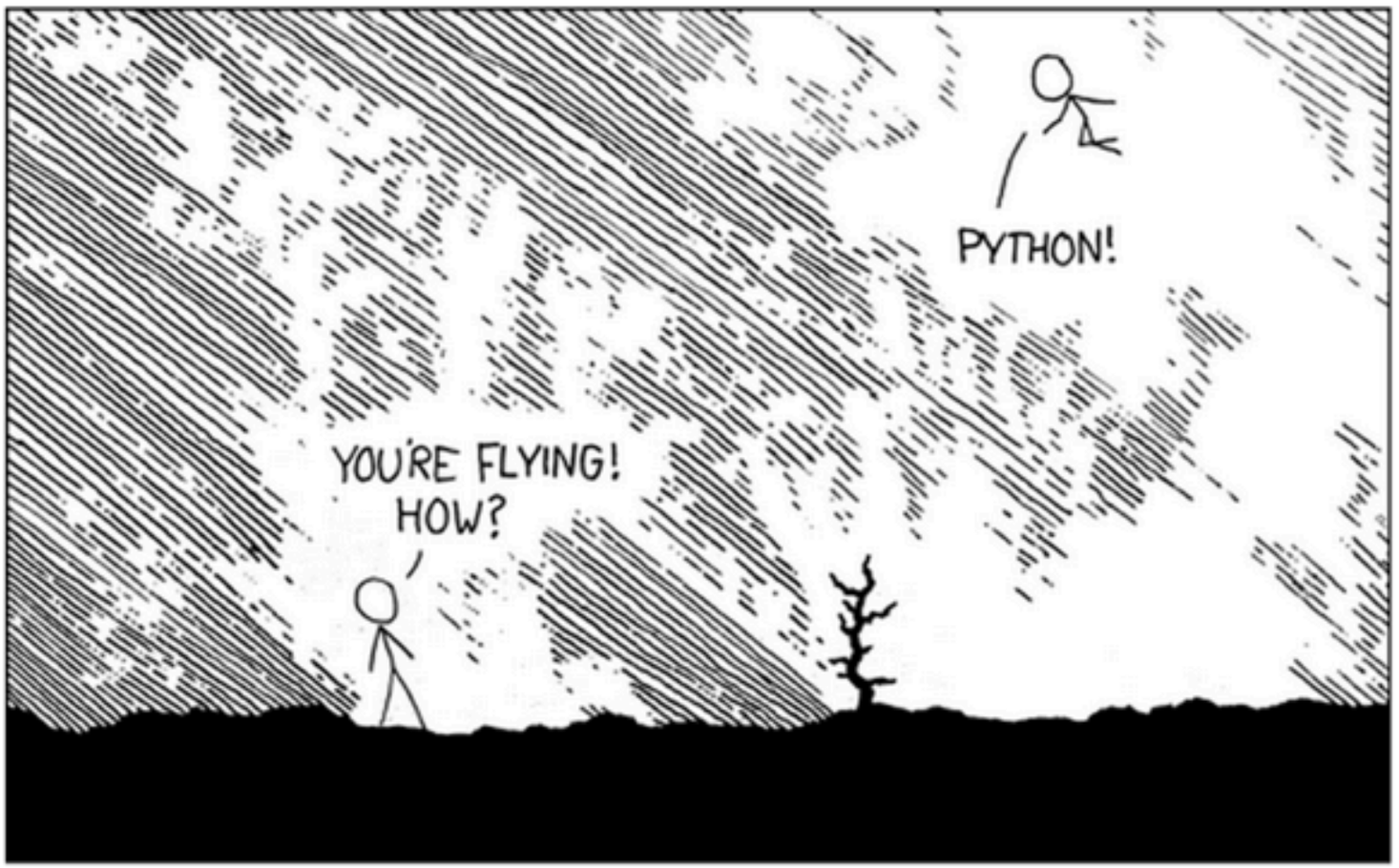
xkcd

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

XKCD UPDATES EVERY MONDAY, WEDNESDAY, AND FRIDAY.

PYTHON

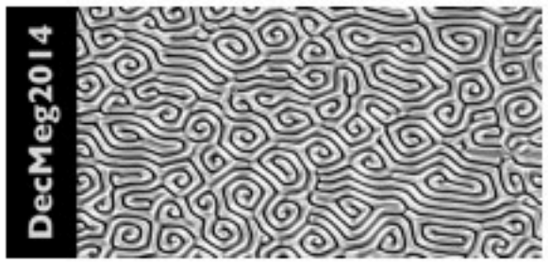
|< < PREV RANDOM NEXT > >|



Demo

Objective

kaggle | Customer Solutions | Competitions | Community | Sign up | Login



Completed • $5,000 • 267 teams

DecMeg2014 - Decoding the Human Brain

Mon 21 Apr 2014 – Sun 27 Jul 2014 (3 months ago)

Dashboard

Home
Data
Make a submission

Information
Description

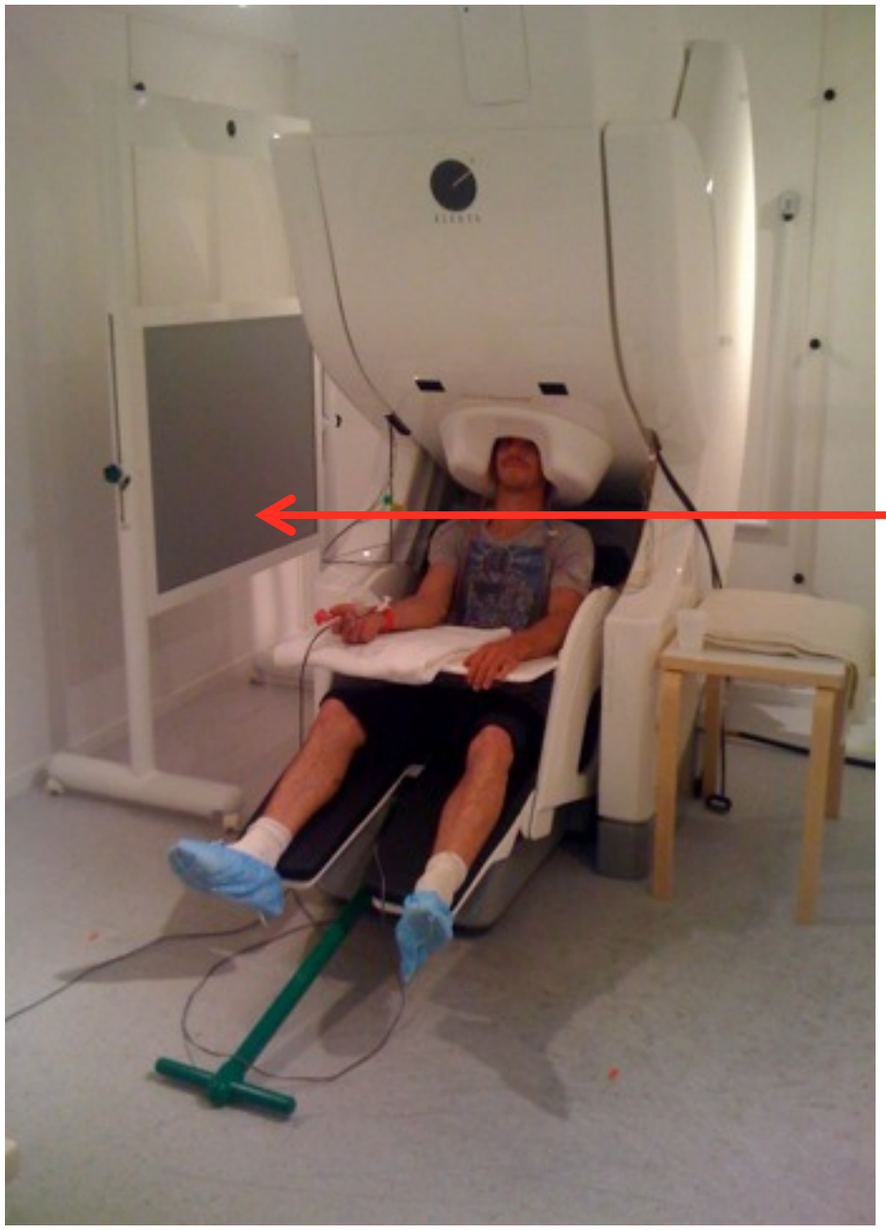
Competition Details » Get the Data » Make a submission

Predict visual stimuli from MEG recordings of human brain activity

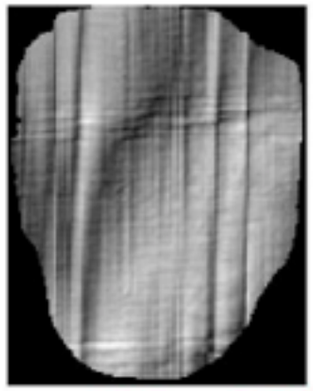
https://www.kaggle.com/c/decoding-the-human-brain

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



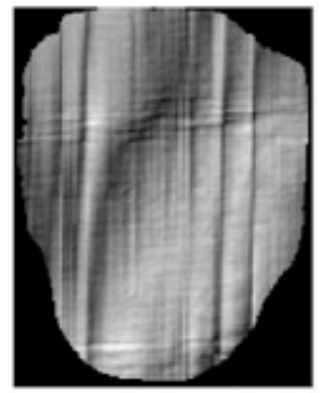
Scrambled Face

Face

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

Objective

Face



Scrambled Face

MEG
Sensor 2
(fT)

x_i s.t. $y_i = 1$

x_i s.t. $y_i = -1$

MEG
Sensor 1 (fT)

Hacking time…

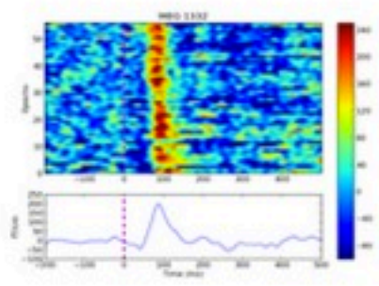
Get inspired ...

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

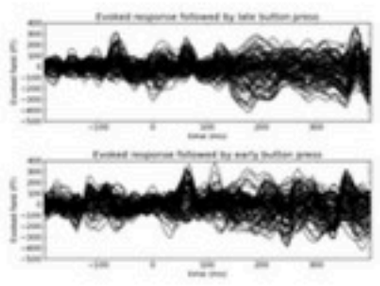
Examples

General examples

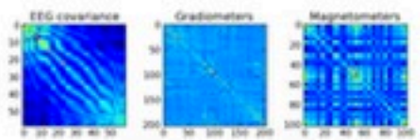
General-purpose and introductory examples to MNE.



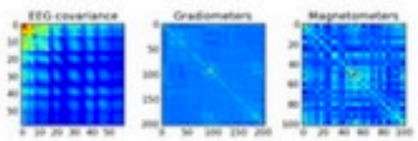
Visualize channel over epochs as an image



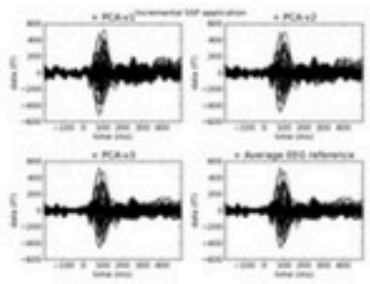
Define target events based on time lag, plot evoked response



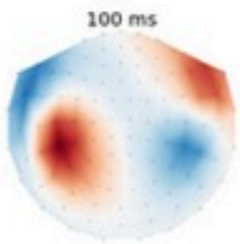
Estimate covariance matrix from Epochs baseline



Estimate covariance matrix from a raw FIF file



Create evoked objects in delayed SSP mode



Plotting topographic maps of evoked data

Previous topic

Tutorial: MEG and EEG data processing with MNE and Python

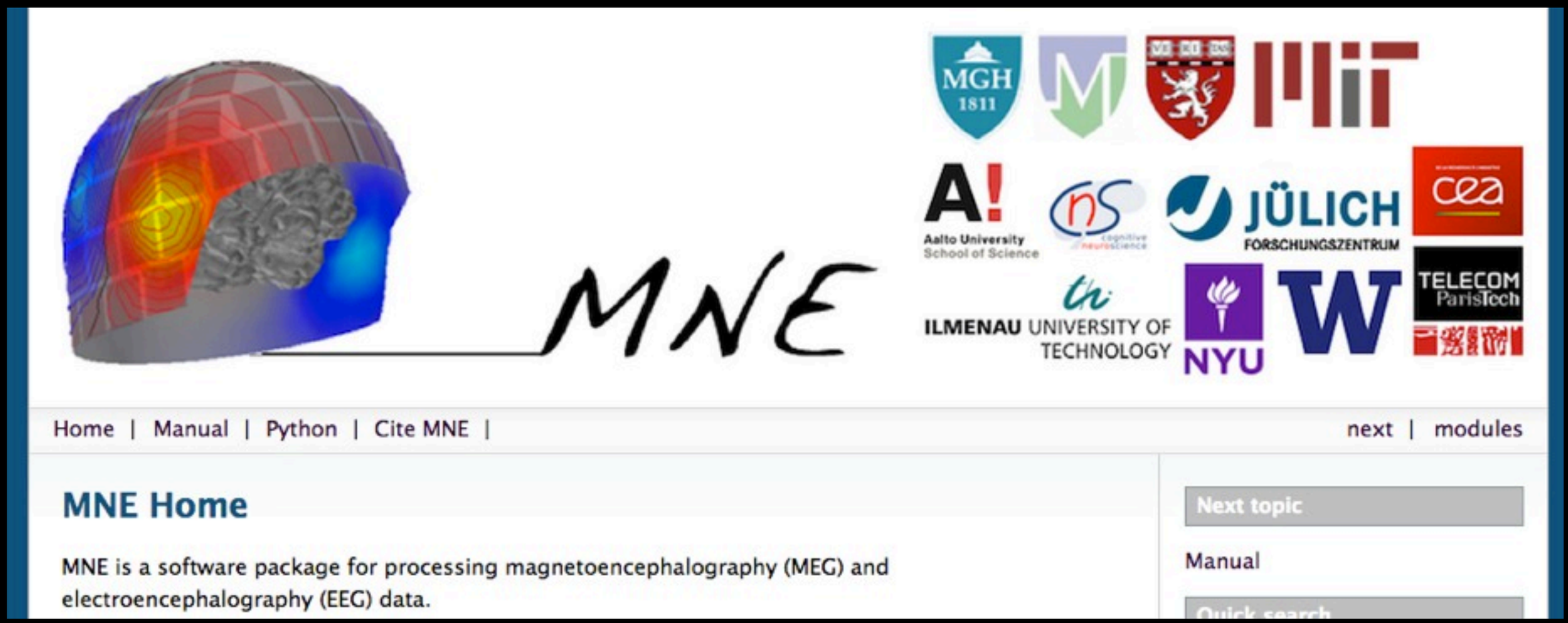
Next topic

Visualize channel over epochs as an image

Quick search

Ask for help

http://martinos.org/mne/



Mailing list:

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

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@dgwakeman


@leggitta


@mshamalainen


@kazemakase


@you?

http://martinos.org/mne/stable/whats_new.html

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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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