Cognitive Technology Group

OpenBCI

What it is, what we've done

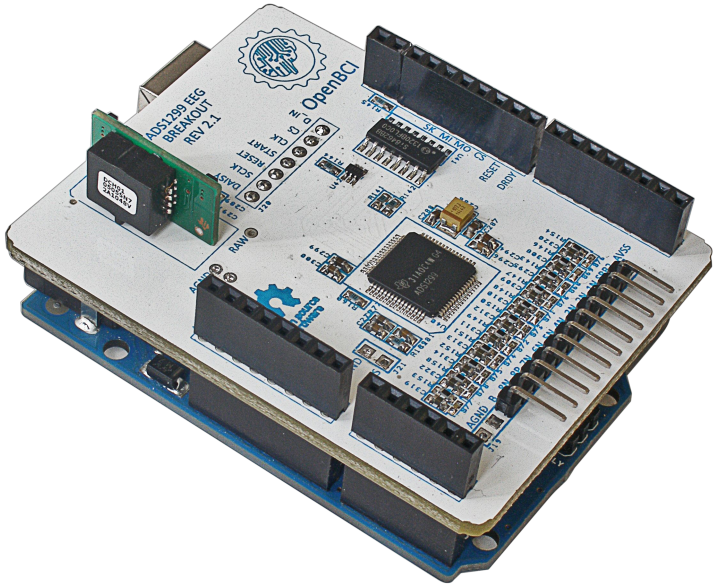
[CogTech + OpenBCI | 09/14/2014]

[Pierre Karashchuk | John Naulty | Derek Razo]

www.diy-neuro.com

OpenBCI

An open source brain computer interface



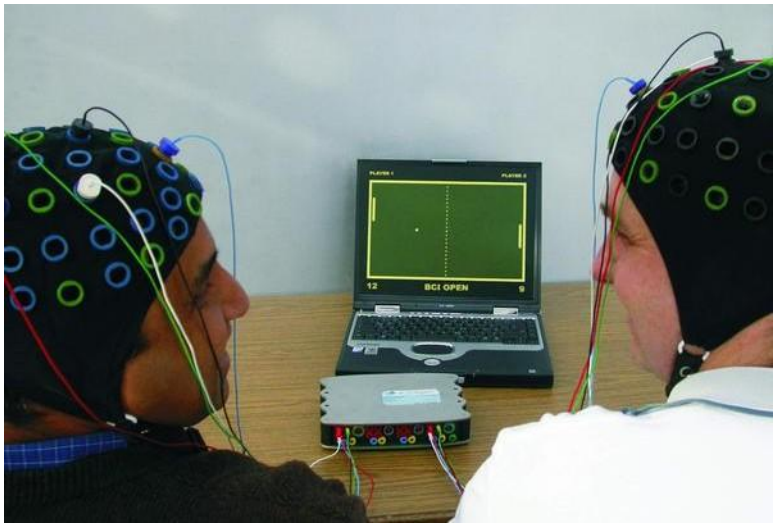
What is BCI?

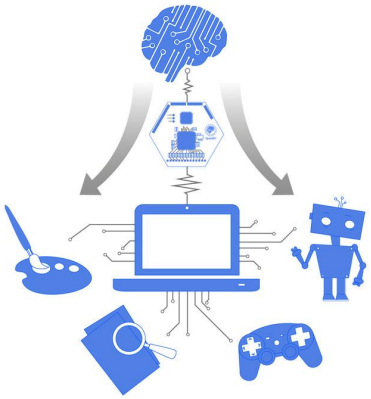
Brain-Computer Interface

“Direct communication pathway between the brain and an external device”
(Wikipedia)

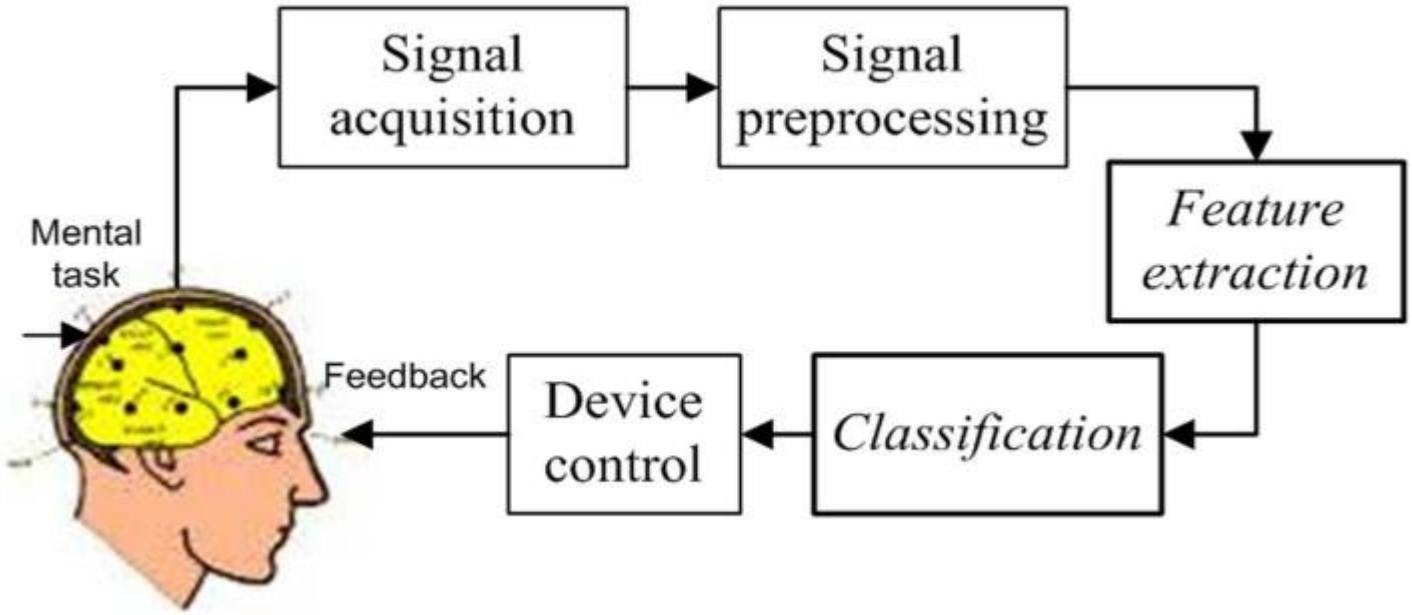
Applications of BCI :

1. Controlling a Wheelchair Indoors Using Thought. Rebsamen, B **Burdet**, **E** Guan, C Zhang, H Teo, CL Zeng, Q Laugier, C. *Intelligent Systems*. Abril de 2007





How does it work?



BCI Paradigms

SSVEP
Measure natural responses to visual stimulation at specific frequencies.

Motor Imagery
Measure mental rehearsals of movements.

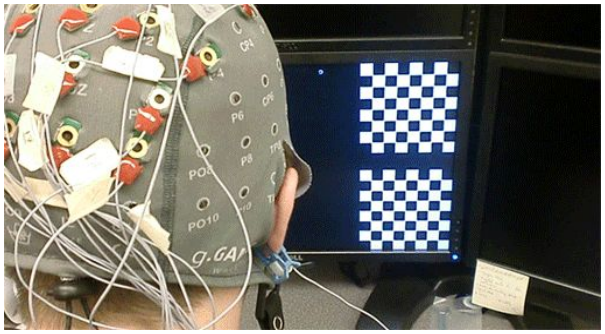
Event Related Potentials
measure response that is the direct result of a specific sensory or cognitive event.

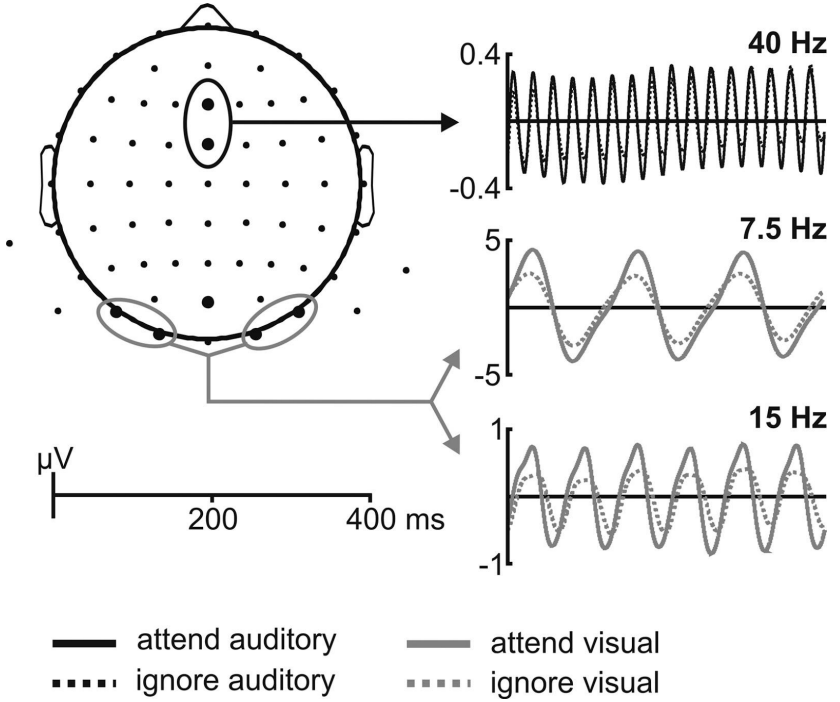
Slow Cortical Potentials
measure changes in the membrane potentials of cortical dendrites

Neurofeedback
Use real-time displays of brain activity

SSVEP Steady State Visually Evoked Potentials

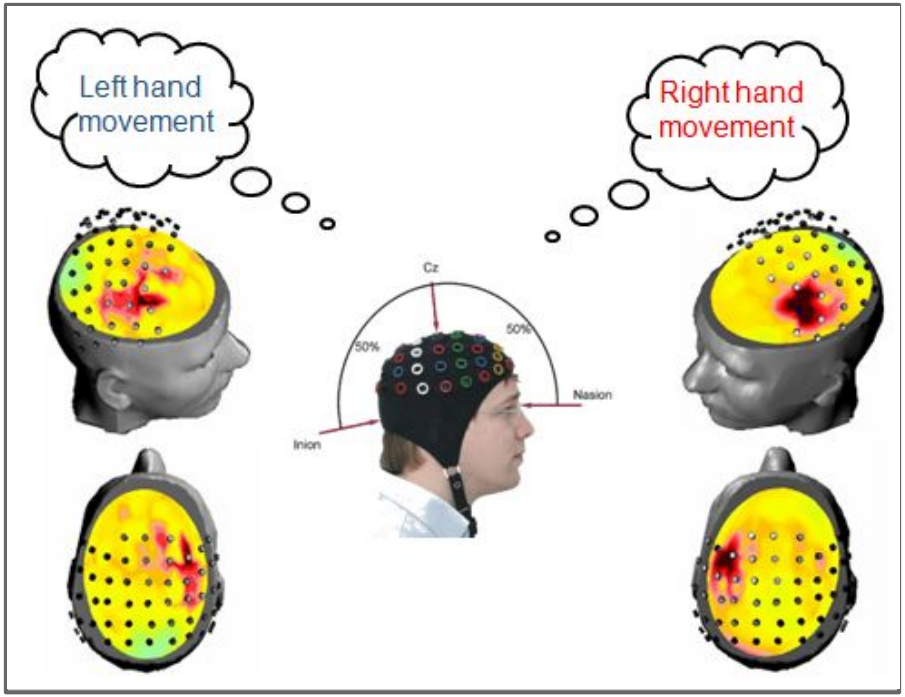
Measure natural responses to visual stimulation at specific frequencies.





Motor Imagery

Measure mental rehearsals of movements.



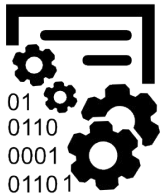
Wang, Y., Gao, S., & Gao, X. (2006, January). Common spatial pattern method for channel selection in motor imagery based brain-computer interface.

Achieved **> 90% accuracy** classifying right hand vs right foot imagery with just 4 electrodes!

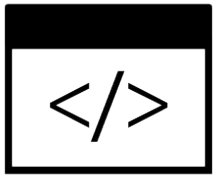
Our Work with OpenBCI

EEG Toolbox

BCI Applications for Researchers & Makers

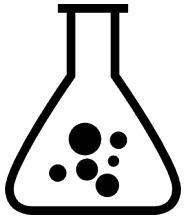


Data Collection & Tagging



Simple User Interface

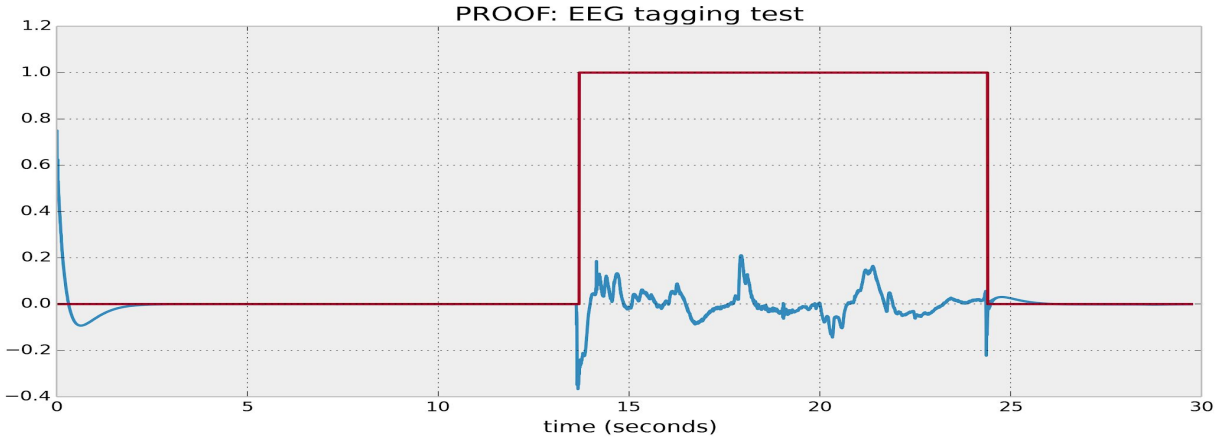
Plots + Graphs



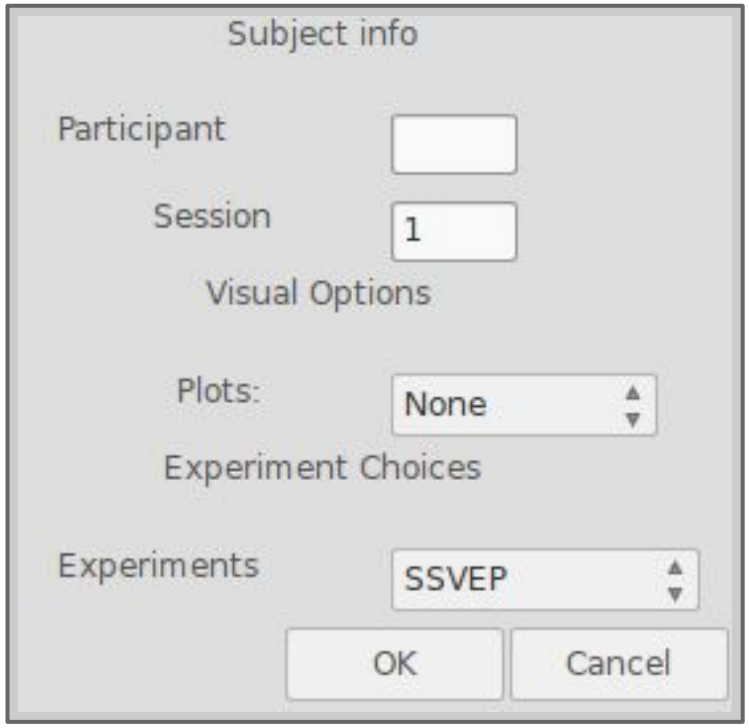
Built in experiment paradigms

Data Logging & Tagging

Easily collect raw data with accurate labeling.



Simple User Interface



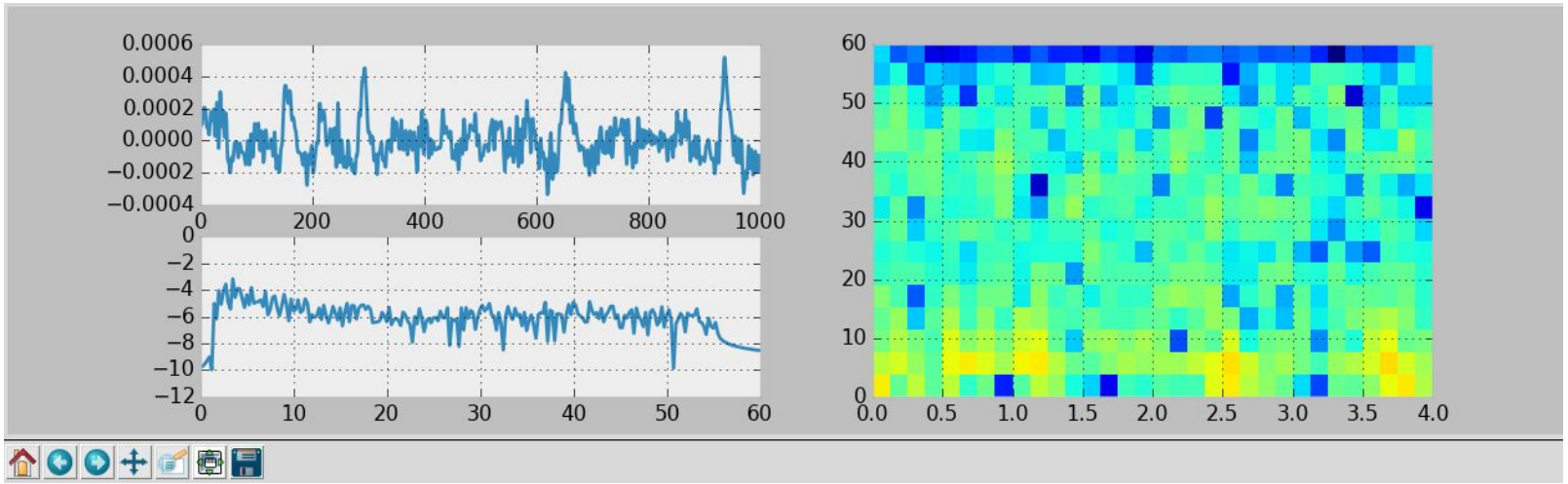
Capture data from sessions,

Plot data automatically

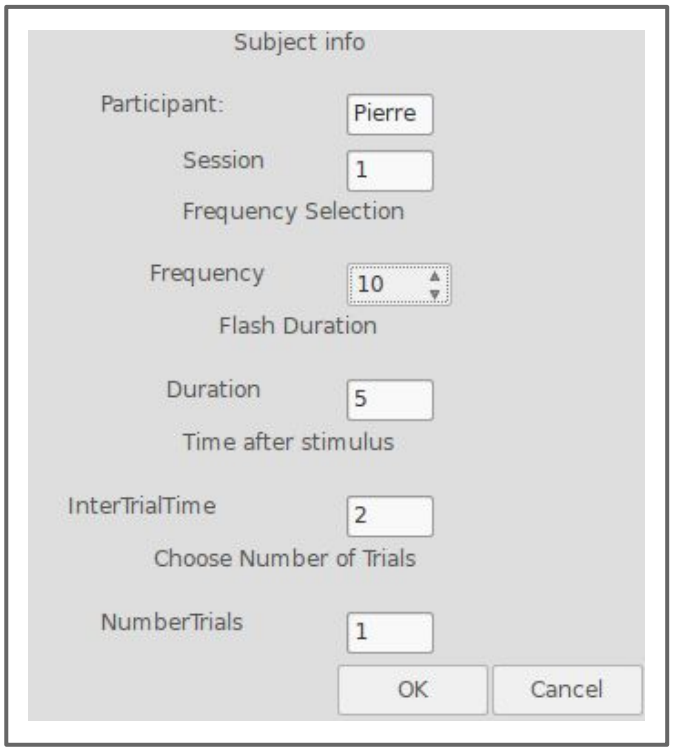
Use pre-programed experiment paradigms.

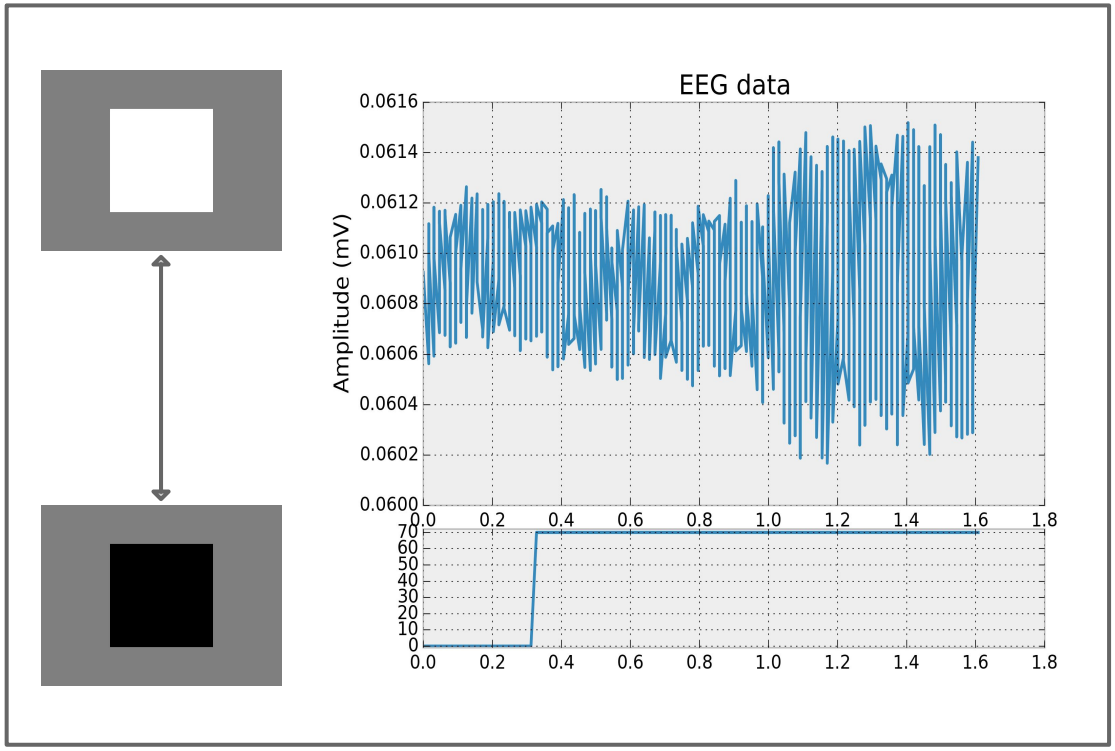
Plots & Graphs

Plot and graph data in real time.



SSVP Steady State Visually Evoked Potentials

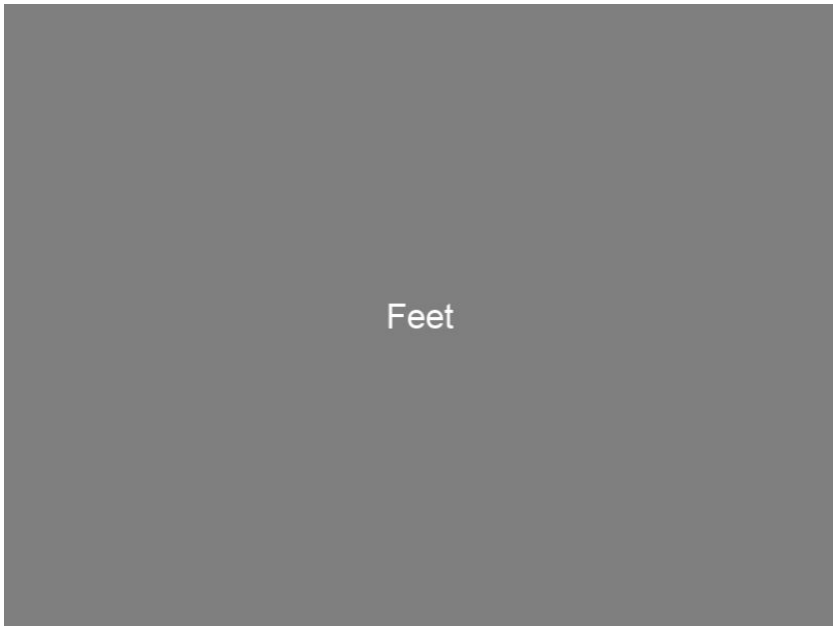




Motor Imagery

Choose movements to rehearse.

Feet
Tounge
Left Hand
Right Hand
+ more soon!



Education with OpenBCI

Intro to BCI with OpenBCI

Open Source educational materials for the BCI Community

Learn about brain computer interfacing for research and making.

Next Steps with OpenBCI

Stuff we want to make

Clean, simple documentation for developers and researchers.

More advanced UI

Classification algorithms

Web apps and services

Integration with other toolboxes like OpenVibe, BCI2000, MNE

Community ways to get involved

Come make with us! ww.diy-neuro.com

Anyone can join
We love learning with and teaching others.

Got an idea?
Come try it out at a meeting, or borrow equipment through the equipment collective.

We would <3 help from
UI / UX Designers, Signal processing sages, Machine learning masters, and Neuroscience nerds.

Community ways to get involved

Become a collaborator

Hackers
Help us develop this further!

Bloggers
Help us tell our story!

Organizers
We want you!

Artists
Let's collaborate!

Neuroscientists
We have so many subjects...

Curious
You know you want to.

Community our friends