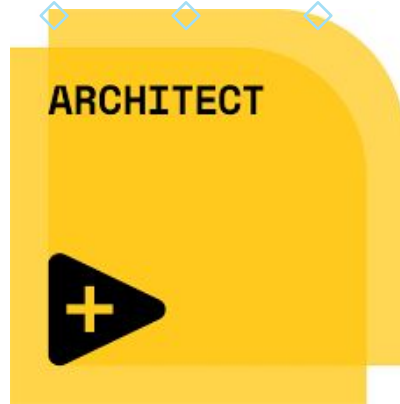




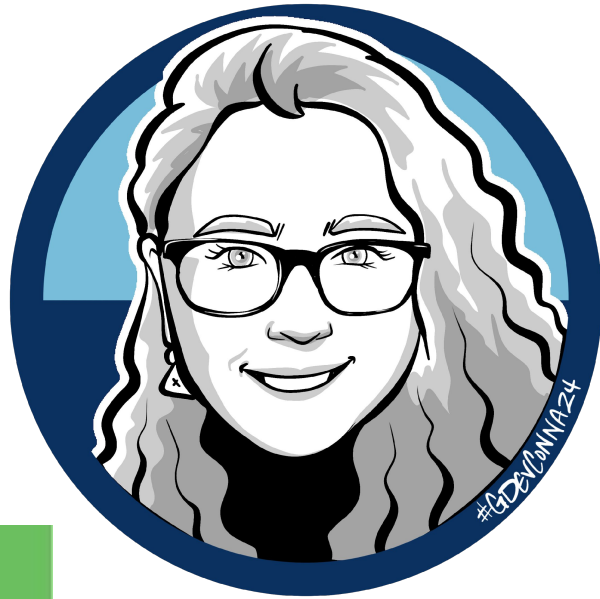
LABVIEW ON MY MIND

Experimenting with Brain-Computer Interfaces

Laura Miller



HITACHI
Inspire the Next



THE DREAM - TELEKENESIS

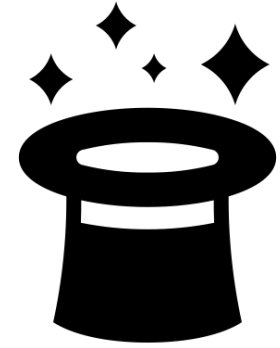


***“Any sufficiently advanced technology
is indistinguishable from magic”***

Arthur C. Clarke, science fiction writer



Anyone can do it!



1. Measure electrical signals from my brain (EEG and EMG)

2. Pull them into LabVIEW and *do stuff*

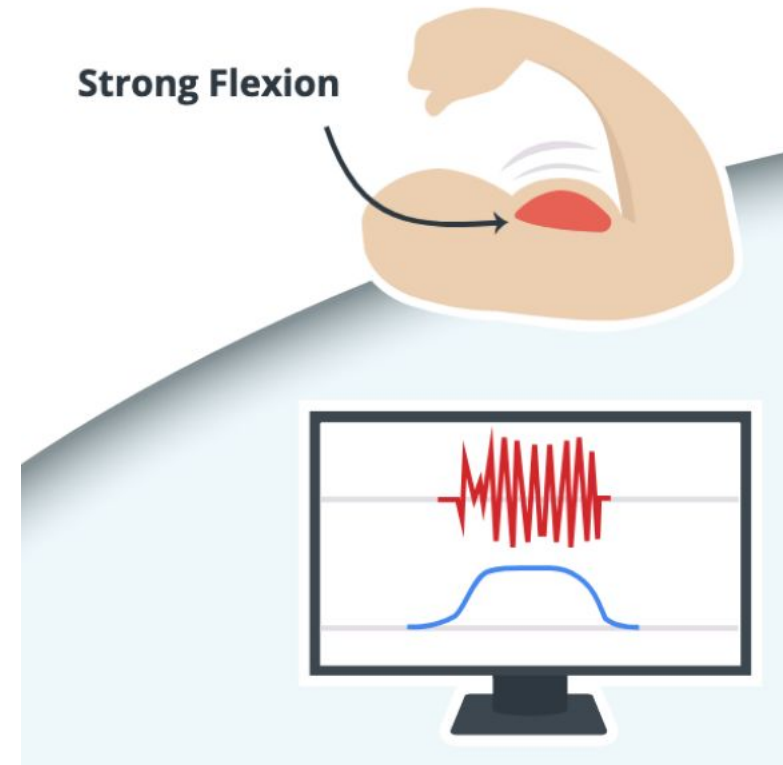
3. Focus on Open-Source and Affordable

MY THREE
STEP
MASTER
PLAN TO
FULFILL THE
DREAM

TERMINOLOGY (HIGH LEVEL)



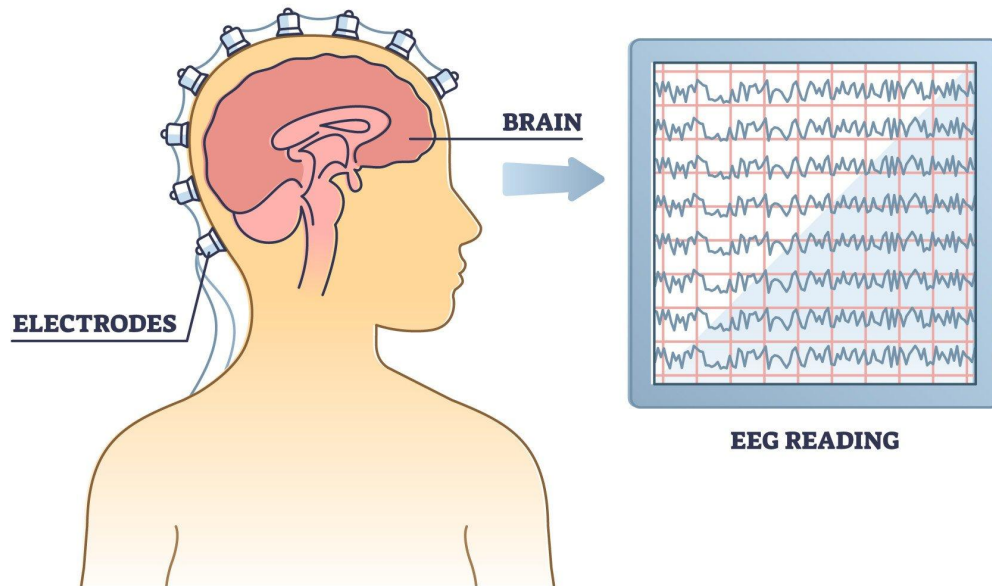
Brain-Computer Interface
BCI / EEG



Muscle Interface / EMG

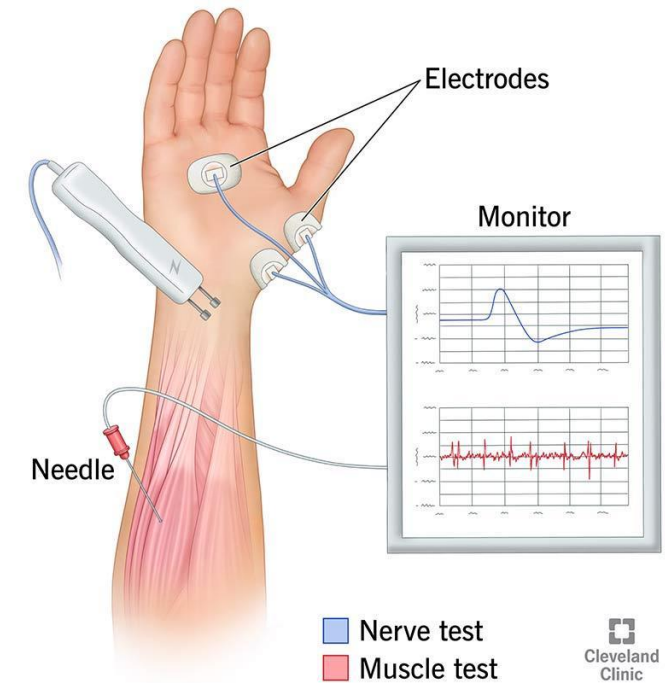
TERMINOLOGY – EEG AND EMG

ELECTROENCEPHALOGRAPHY



Signals measurable from scalp

EMG (Electromyography)



Brain telling muscles to move

ARE BRAIN COMPUTER INTERFACES (BCI) RELEVANT? **YES!**

BY EMILY MULLIN SCIENCE JUL 10, 2024 7:12 PM

Elon Musk's Neuralink Is Ready to Implant a Second Volunteer

In a livestreamed update on X, Elon Musk and Neuralink executives gave an update on the company's next study participant—and its next-generation brain implant.



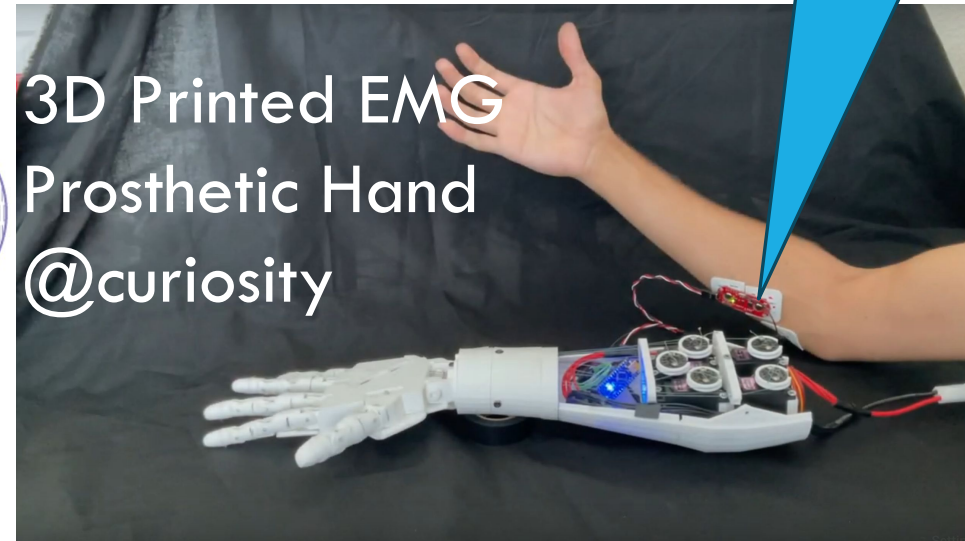
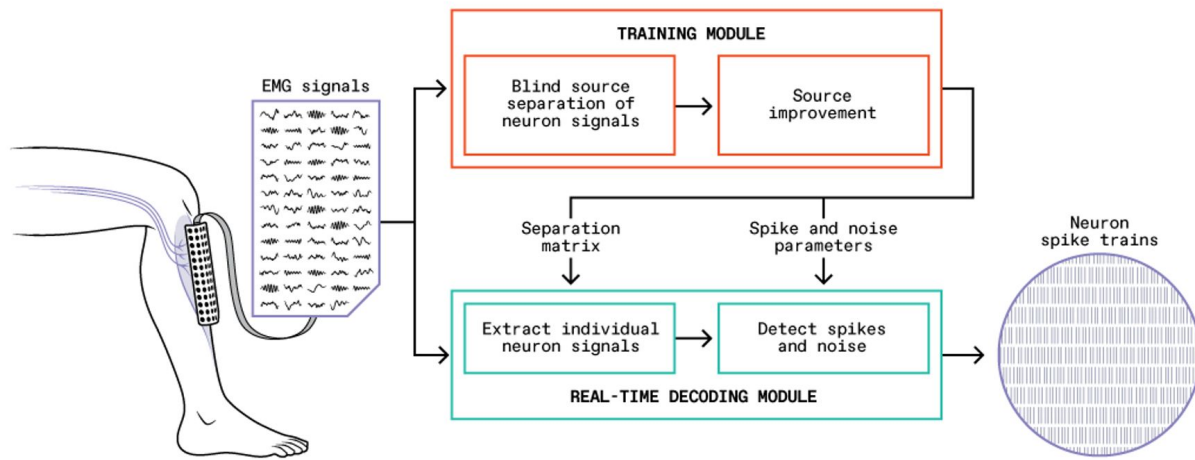
THESE ARE LIFE CHANGING TECHNOLOGIES

A powerful New Neurotech Tool
For Augmenting Your Mind

TED Talk
Conor Russomanno
Christian Bayerlein
June 29, 2023



OPEN-SOURCE PROSTHETICS



EMG Sensor

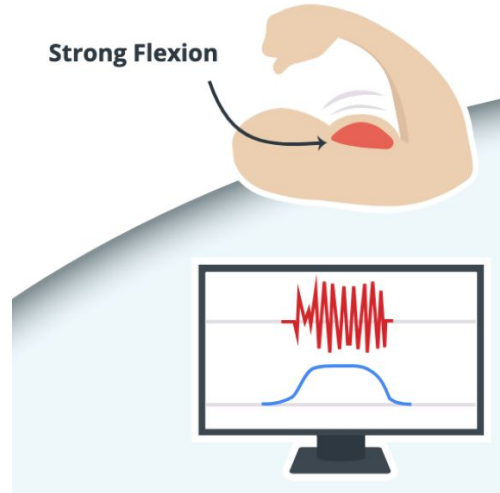
HARDWARE OPTION A: \$50+

(I'M VERY SORRY I

DON'T KNOW HOW MANY EUROS THAT IS)



MyoWare Muscle Sensors



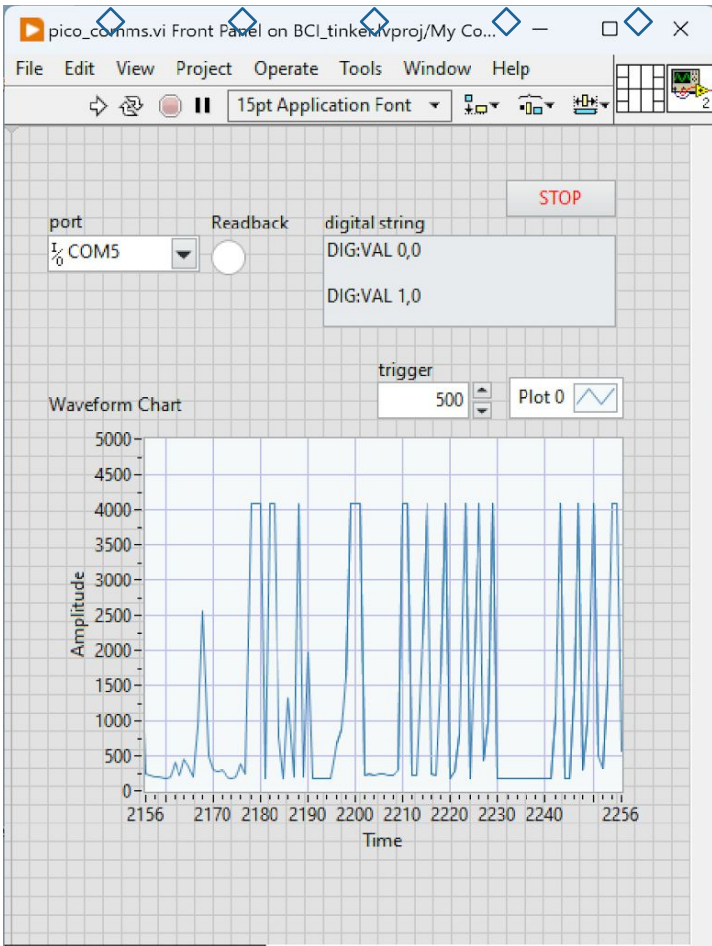
UART

Digital Out, PWM, U dream it you can do it



Pico ADC





Context Help

stop

No description available.

stop (boolean (TRUE or FALSE))

[Detailed help](#)

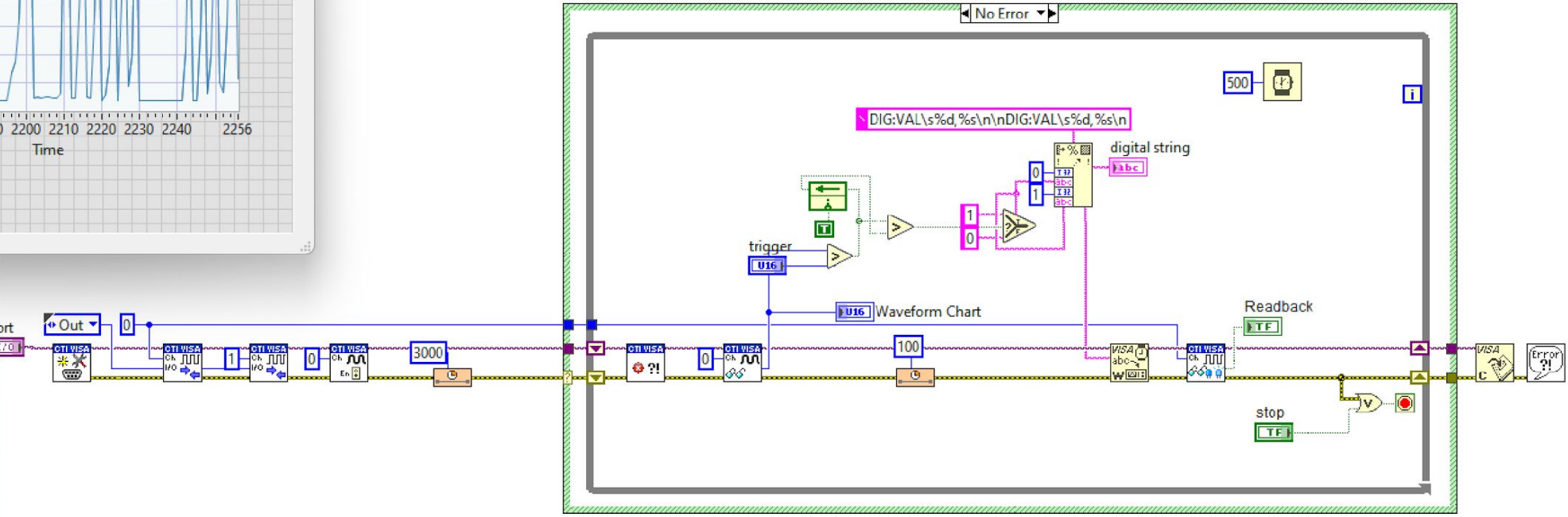
lvproj/My Computer

Window Help

15pt Application Font

BCI_tinker.lvproj/My Computer

VI Package Manager...



BCI_tinker.lvproj/My Computer

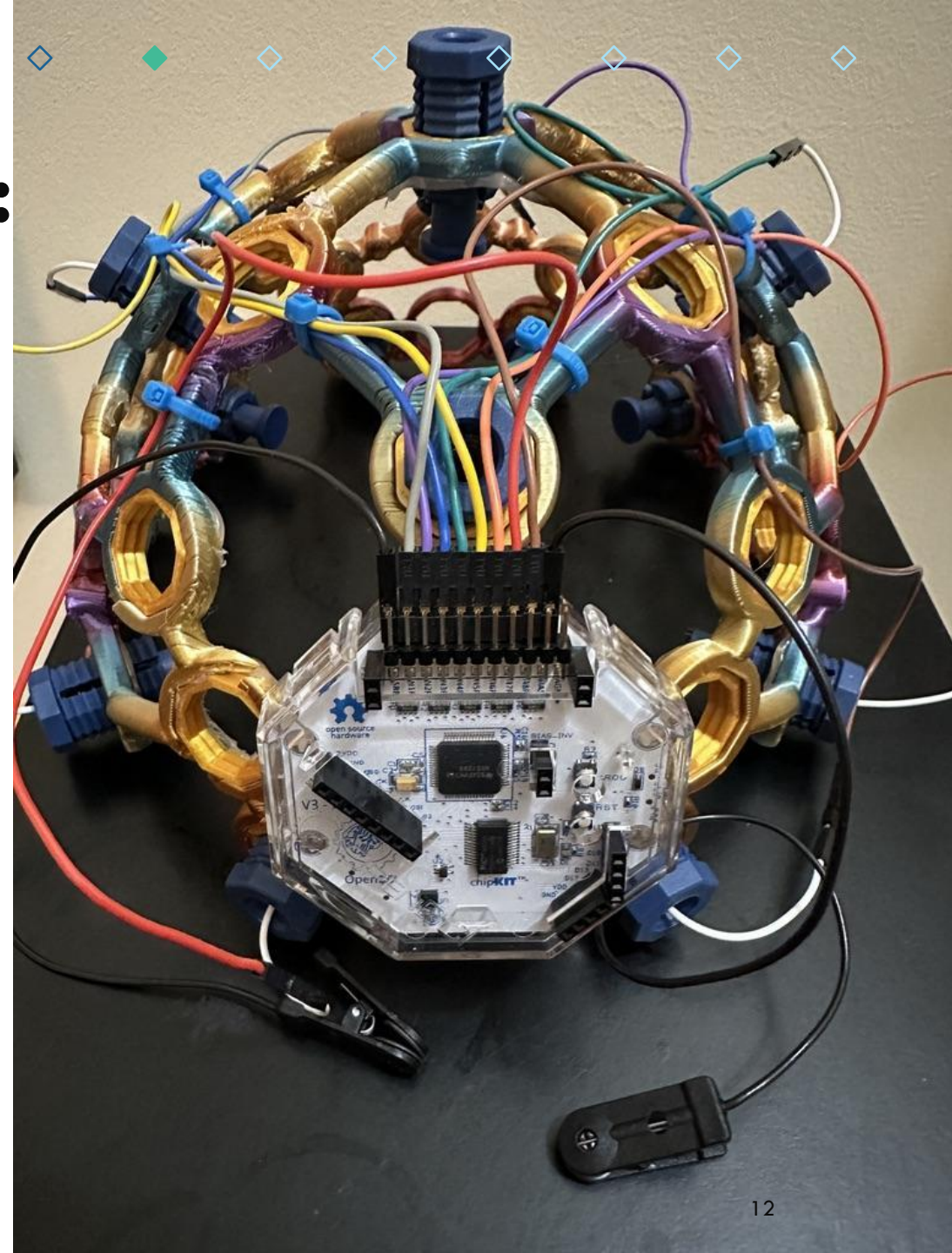
HARDWARE OPTION B: \$500+

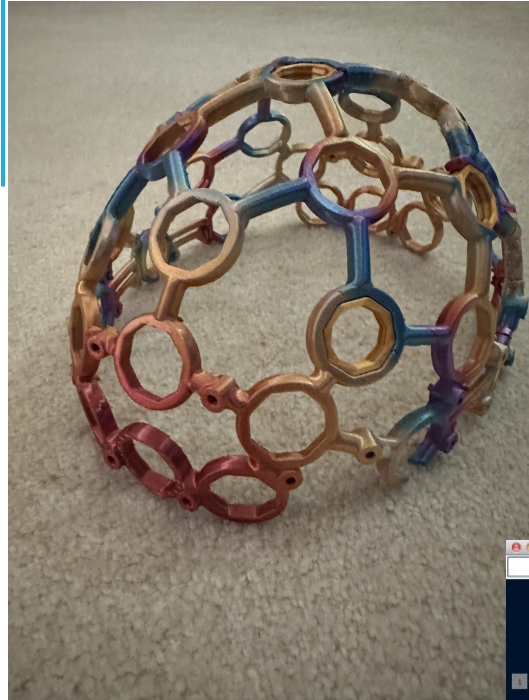
(unfortunately, I still
haven't googled the
conversion rate)



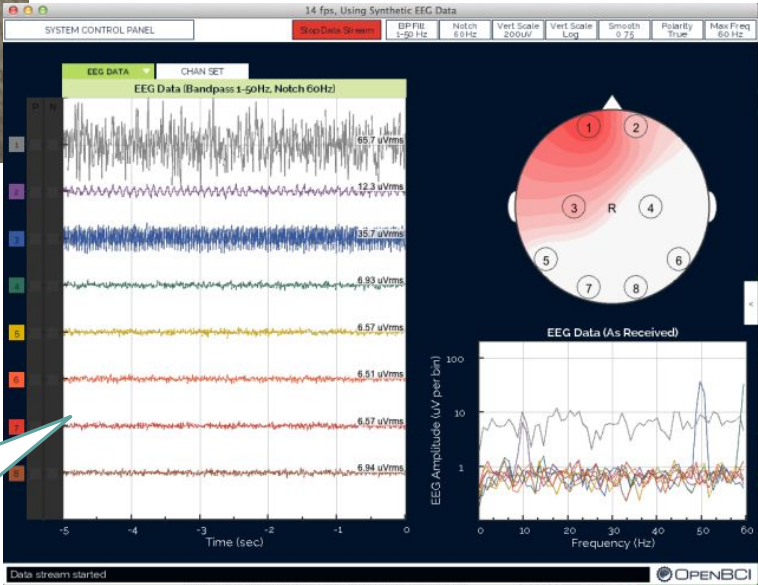
OUR MISSION

OpenBCI creates open-source tools for biosensing and neuroscience. OpenBCI's mission is to lower the barrier to entry for brain-computer interfacing, while ensuring that these technologies are adopted into the consumer landscape in an ethical way that protects user agency and mental health.

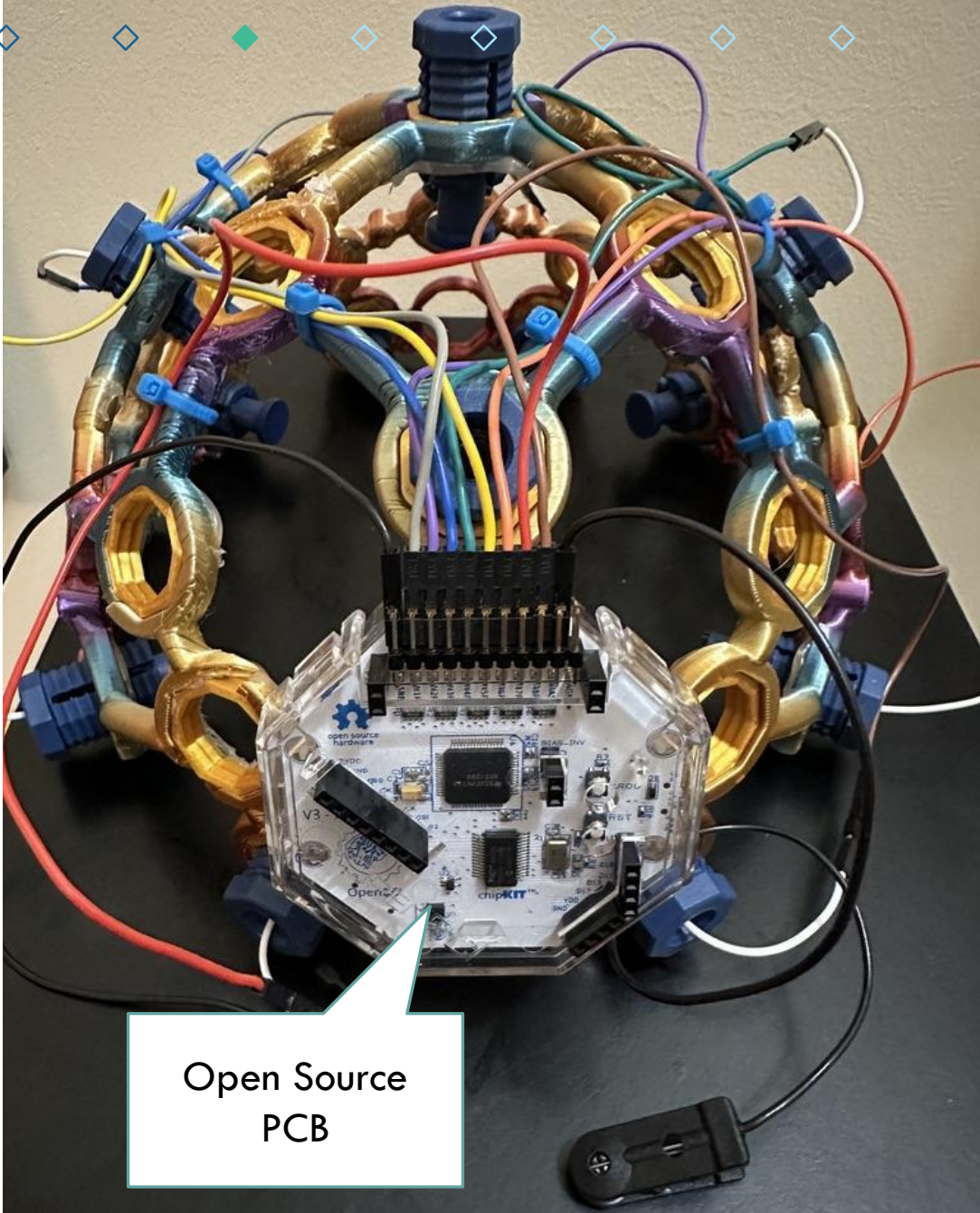




3D Printed Frame



Open Source GUI



Open Source PCB

DEMO

OpenBCI GUI v5.2.2 - 2023/08/21 16:14:34 - 41 fps

System Control Panel Update Shop Issues Help

Stop Data Stream Filters Smoothing On Settings Layout

Focus Widget Metric Classifier Threshold Window Channels

Metric	Classifier	Threshold	Window
Metric Value		0.8	10 sec
Delta (1.5-4Hz)	Relaxation	Regression	
Theta (4-8Hz)			
Alpha (7.5-13Hz)			
Beta (13-30Hz)			
Gamma (30-45Hz)			

Relaxing

Turn Audio On Use Band Powers

UDP successfully connected

Band Power Channels Smooth Filters?

Networking Protocol

Networking Guide Data Outputs UDP

UDP

	Stream 1	Stream 2	Stream 3
Data Type	AvgBandPower	Focus	None
IP	127.0.0.1	127.0.0.1	127.0.0.1
Port	12346	12345	12347

Stop UDP Stream

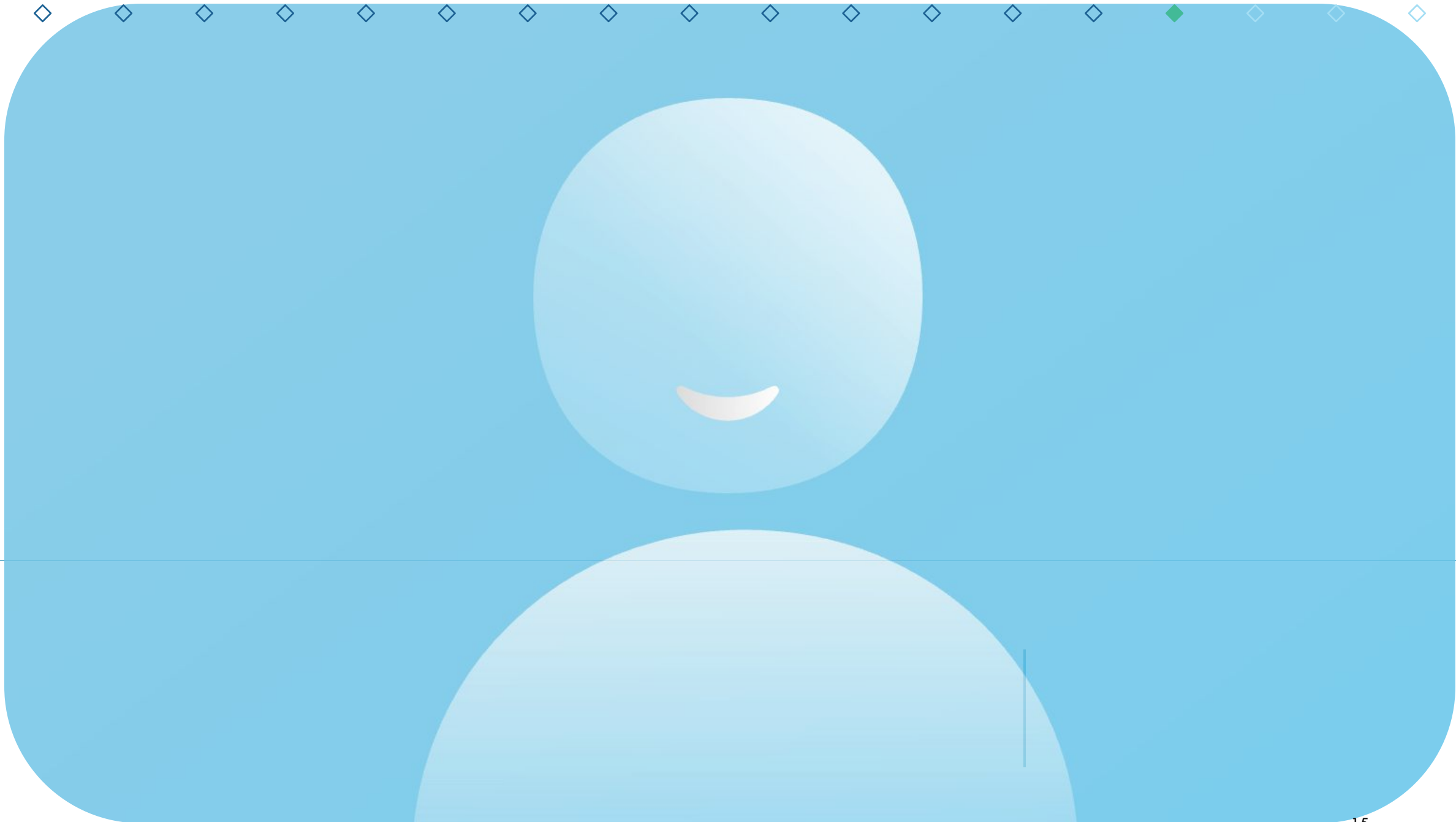
Control_RC_Focus_BandPwr.vi

File Edit View Project Operate Tools Window Help

COM5 Enable Pico Test IO Stop

Delta Theta Alpha Beta Gamma

BCI_tinker.lvproj/My Computer



Band Power

The band power widget shows the relative voltages of the various brain wave categories. Each type of brain wave represents a subset of frequencies, which represent different states of activity. The widget is a great "at-a-glance" look into your brain's activity.

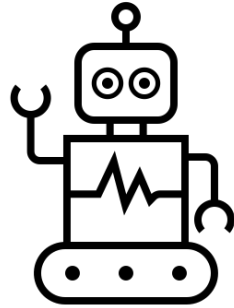
Types of Waves

Wave	Frequency (Hz)	Description
Gamma	32-100	Signifies heightened perception, learning and problem solving tasks, as well as alertness. It occurs when there is simultaneous information processing from multiple parts of the brain.
Beta	13-32	Signifies normal alert consciousness and active thinking. It occurs when one is focusing on work, solving a problem, learning a new concept, or engaging in active conversation.
Alpha	8-13	Signifies physical and mental relaxation. They occur when your eyes are closed, when one is being artistic, and during yoga.
Theta	4-8	Signifies deep relaxation, creativity, insight, reduced consciousness. They are picked up during day dreaming and deep meditation.
Delta	0.5-4	Signifies sleep, dreaming. Occurs when we enjoy restorative, deep, dreamless sleep.

Problem Solving

Relaxation

CAN WE TAKE IT A STEP FURTHER?



- Use the Python node in LabVIEW and an open source tool like TensorFlow
- Utilize the EEG data to train a model

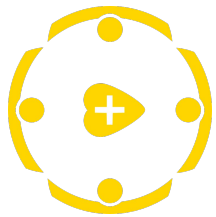
TensorFlow: Democratizing Machine Learning

Google's TensorFlow has had a profound impact on the machine learning landscape. By providing a comprehensive platform for building and training machine learning models, TensorFlow has made advanced AI technologies accessible to a broader audience, driving innovation across industries.



DIVE IN!

...THEN REACH OUT AND SHARE
WHAT YOU'VE MADE !



LabVIEW CTI

Community Training Initiative

