

# Emotiv versus Neurosity devices comparison

High gamma waves are 70-150 Hz x 4 = 280-600 Hz sampling frequency. The peaks P100, P300 ms of the ERP signal corresponded to 10 Hz. The somatosensory cortex starts at 30 Hz. Times 4 means the (theoretical) minimum sampling frequency the signal could be analysed.

The Bluetooth receiver should be checked to see if it jams timestamps. Sometimes during the transmission, it could join several consecutive samples, dropping the sample rate by 2-5 times. Also, if we set, say, 100 Hz sample rate, the IMU returns 60-90 Hz varying in time. The question is how to synchronize the timestamps from both devices, EEG and IMU, not to mention how to trust these timestamps. The ideal option is a single timestamp generator for both. Most likely, it does not exist.

ChatGPT: Compare the EMOTIV.com EEG recording devices; Append the Neurosity Crown

Feature	EMOTIV Insight	EMOTIV EPOC X	EMOTIV EPOC Flex	Neurosity Crown
Target User	Consumers, wellness, BCI	Researchers, advanced BCI	Clinical-grade research	Productivity seekers, developers, researchers
EEG Channels	5	14	Up to 32	8 (CP3, C3, F5, PO3, PO4, F6, C4, CP4)
Electrode Type	Dry	Saline-based wet	Gel/saline-based (wet or dry options)	Flexible dry sensors (Silver/Silver Chloride)
Connectivity	Bluetooth Smart	Bluetooth LE, USB	USB	Bluetooth 4.2 / BLE, Certified WiFi 802.11 ac/a/b/g/n
Battery Life	~6 hours	~12 hours	Tethered / external battery	3-hour rechargeable lithium-ion
Sampling Rate	128 SPS	128 or 256 SPS	128 or 2048 SPS (configurable)	256 Hz
Software Compatibility	EMOTIV App, Cortex	EMOTIV PRO, SDK	EMOTIV PRO, SDK	Neurosity OS, Music Shift™ app, SDK
Sensor Placement	Fixed (10–20 system subset)	Fixed (10–20 system)	Flexible (any 10–20 or custom montage)	Fixed (8 locations)
Intended Use Cases	Meditation, training, focus	Academic, neurofeedback, BCIs	Clinical EEG research, diagnostics	Focus enhancement, productivity, neurofeedback
Price (approx.)	\$300–400	\$800–1,200	\$2,000+ (depending on config)	\$1,499

## Emotiv API

The repository <https://github.com/Emotiv/cortex-example>

Most of the Emotiv API is devoted to the authorization process. Each time, the user must be authorized to access the data.

<https://emotiv.gitbook.io/cortex-api/data-subscription/data-sample-object>

<https://emotiv.gitbook.io/cortex-api/authentication>

A sample of a dataset from Kaggle

<https://www.kaggle.com/datasets/madyanomar/eeg-data-distance-learning-environment>

Overview of API flow <https://emotiv.gitbook.io/cortex-api/overview-of-api-flow>

### Authentication

[getCortexInfo](#)

[getUserLogin](#)

[requestAccess](#)

[hasAccessRight](#)

[authorize](#)

[generateNewToken](#)

[getUserInformation](#)

[getLicenseInfo](#)

### Headsets

[controlDevice](#)

[queryHeadsets](#)

[updateHeadset](#)

[updateHeadsetCustomInfo](#)

[syncWithHeadsetClock](#)

[Headset object](#)

### Sessions

[createSession](#)

[updateSession](#)

[querySessions](#)

[Session object](#)

### Data Subscription

[subscribe](#)

[unsubscribe](#)

[Data sample object](#)

### Records

[createRecord](#)

[stopRecord](#)

[updateRecord](#)

[deleteRecord](#)

[exportRecord](#)

[queryRecords](#)

[getRecordInfos](#)

[configOptOut](#)

[requestToDownloadRecordData](#)

[Record object](#)

### Markers

[injectMarker](#)

[updateMarker](#)

[Marker object](#)

### Subjects

[createSubject](#)

[updateSubject](#)

[deleteSubjects](#)

[querySubjects](#)

[getDemographicAttributes](#)

[Subject object](#)

### BCI

[queryProfile](#)

[getCurrentProfile](#)

[setupProfile](#)

[loadGuestProfile](#)

[getDetectionInfo](#)

[training](#)

[Readonly profile](#)

### Advanced BCI

[getTrainedSignatureActions](#)

[getTrainingTime](#)

[facialExpressionSignatureType](#)

[facialExpressionThreshold](#)

[mentalCommandActiveAction](#)

[mentalCommandBrainMap](#)

[mentalCommandGetSkillRating](#)

[mentalCommandTrainingThresh](#)

[old](#)

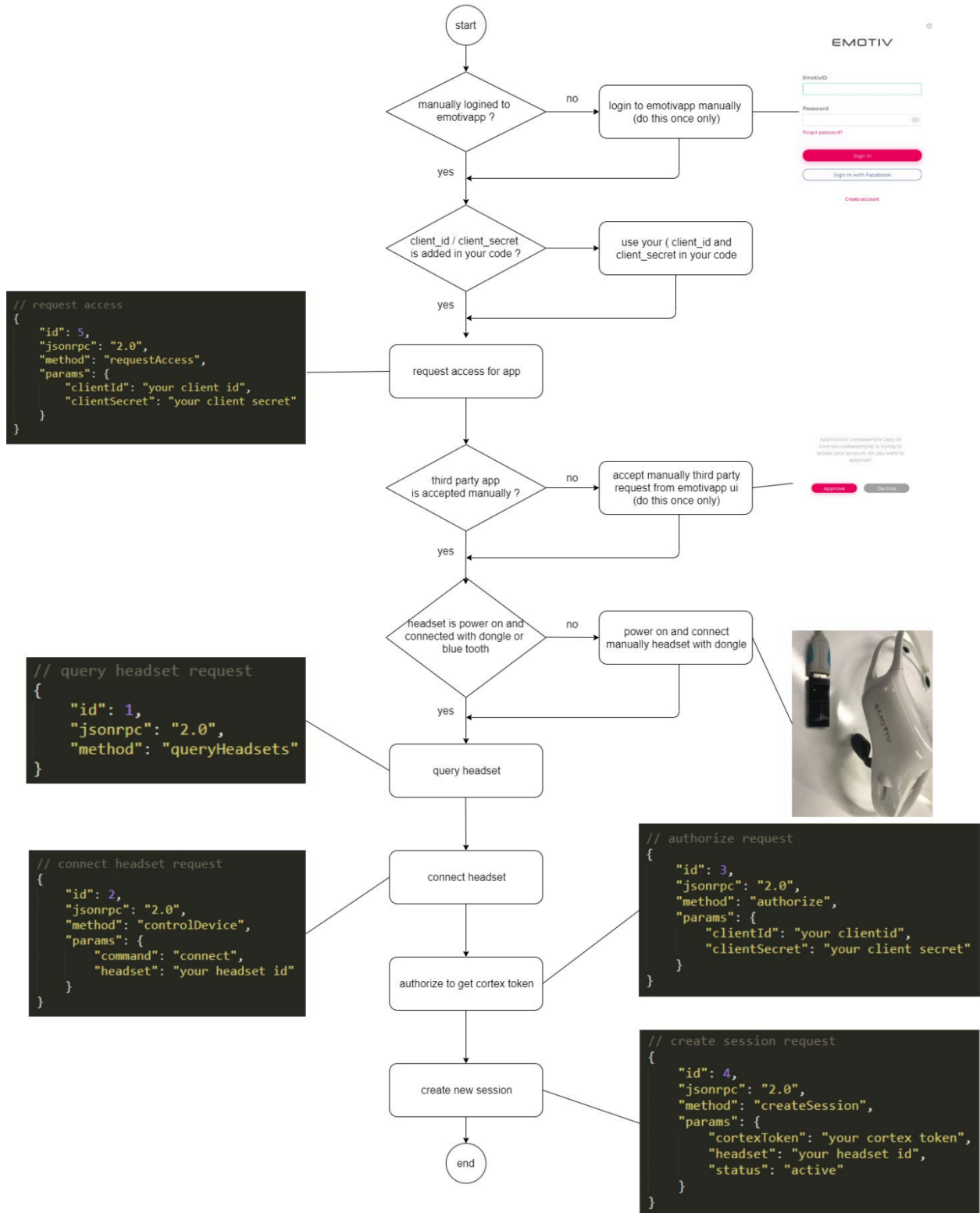
[mentalCommandActionSensitivity](#)

[y](#)

### Note

Before user could do record or mental command following steps should be done

- login to emotivapp manually once
- use client\_id / client\_secret in third party app
- request access for third party app with code
- accept third party app manually on emotivapp
- connect with headset
- authorize to get cortex token
- create a new session



<https://forum.emotiv.com/search/Gyroscope/>

February 6, 2023 at 7:18 pm

#1381

**Topic: Node-red motion sensor ONLY outputs Gyroscope X axis**

in forum [Connecting and Troubleshooting](#)



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hello dear helpers,

I am experienced user with the node-red and Insight (v.1) headset, everything works fine until now i want to retrieve the motion sensor data. Only Gyroscope X axis is working, and I have noticed that the green light follow by "getting Gyroscope, X.Y.Z. axis data" messages are not corresponding to the correct node settings, as show here in the screen shot: <https://ibb.co/Qn8tdY6>

I have checked with the BCI app, all axis works fine there. And i had also trouble shoot with my data routing, changing node axis setting, restarted node-red, reconnected headset, all does not help.

seems pretty sure for me something there is something wrong with the motion sensor node ?

thanks in advance for your time

An 2015 user manual

[https://perso.ensta-paris.fr/~jing-rebecca.li/ecole\\_dete\\_france\\_excellence\\_files\\_2017/Emotiv%20Xavier%20Pure.EEG%20Manual.pdf](https://perso.ensta-paris.fr/~jing-rebecca.li/ecole_dete_france_excellence_files_2017/Emotiv%20Xavier%20Pure.EEG%20Manual.pdf)

## Neurocity Crown

<https://neurocity.co/crown>

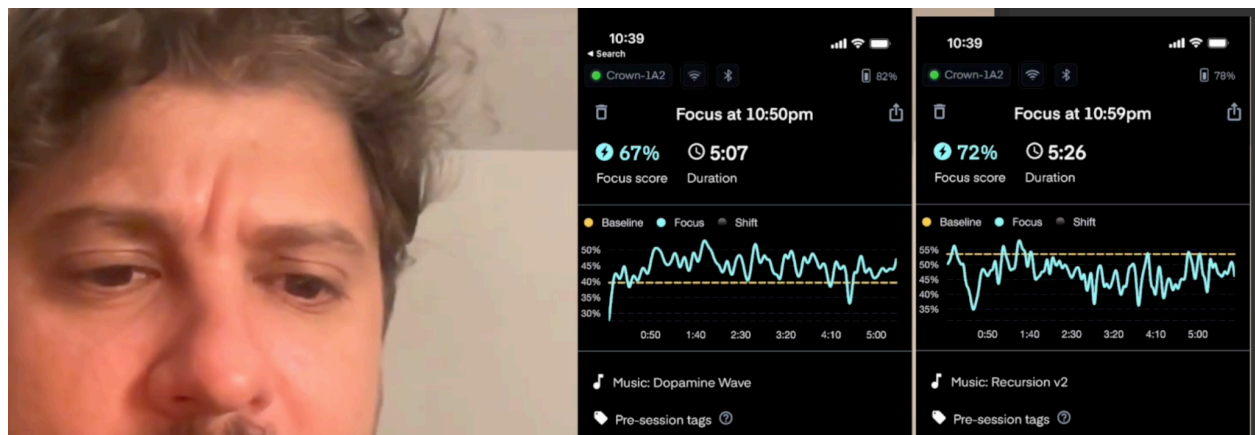
<https://docs.neurocity.co/docs/overview>

```
console.log("Imagine a baseball with your left arm")
```

<https://docs.neurocity.co/docs/guides/training>

The unboxing video shifts the baseline, but the Focus line remains the same with a big variance.

<https://www.youtube.com/watch?v=ITkOVnJw-28>



## The Neurocity SDK

Overview

Neurocity SDK

### Get Started

Your First Node App

Your First Web App

Resources

### Working with the SDK

Ethics

Importing

Signal

Training

### API Guides

Device Selection

Device Information

Device Status

Authentication

OAuth

Device Settings

Signal Quality

Brainwaves

Focus

Calm

Kinesis

Predictions

Wi-Fi & Bluetooth

OSC

Haptics

Disconnect

Bluetooth for Web

Bluetooth for React Native

Migrating from v5 to v6

## GitHub

<https://github.com/neurocity/neurocity-sdk-js>

<https://github.com/JeremyNixon/neurocity/>

Jeremy's transformer to split the channels (no IMU)

[https://github.com/JeremyNixon/neurocity/blob/main/training/train\\_transformer.py](https://github.com/JeremyNixon/neurocity/blob/main/training/train_transformer.py)

## **Resume:**

Emotiv is an old project, but there are not many commercial applications, mainly academic research. The business model is subscription, and the main part of the API is about how to access the device securely.

Neuroosity is a new project intended to develop commercial applications. The API includes templates for mobile/web apps. Although there is a big part about the authentication, too.

Emotiv: dry-5, wet-8, 32, sample at: 128, 128-256, up to 2048 Hz

Neuroosity: dry-8, sample at: 256 Hz

Note on the sample rate: movements start at 70 Hz. For the low sampling frequency devices, the information obtained from their signal vanishes at  $256/4 = 64$  Hz.

If there is a serious medical research on the connection between brain signals and body motions, then it is recommended to use both devices. Neuroosity with dry electrodes to make an easy-to-wear and friendly prototype, and Emotiv Flex with a maximum number of saline electrodes and maximum frequency to train the models, and check Neuroosity Crown correctness.

If there is a limit to only one device, it worth to take risk and chose a dry electrodes with fixed positions due to lesser variations on measurements.

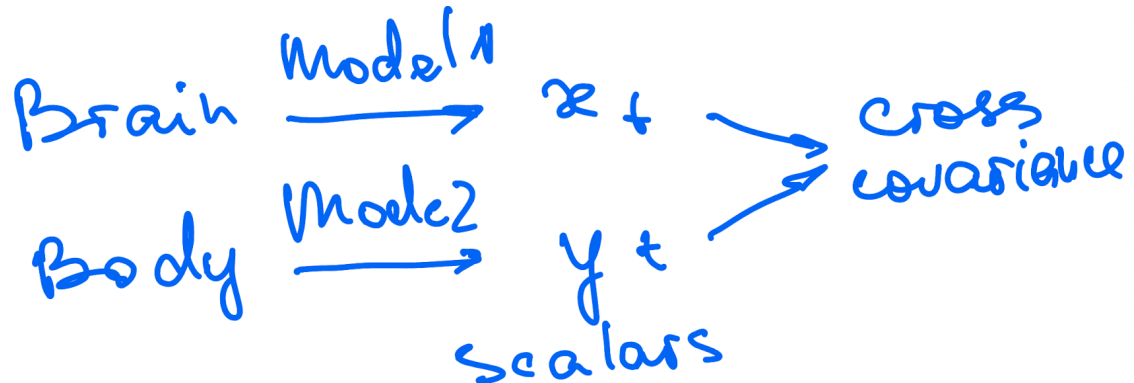
Still under question: is there EEG+IMU synchronous data for both devices?

# Modeling synchronous signals: EEG and IMU

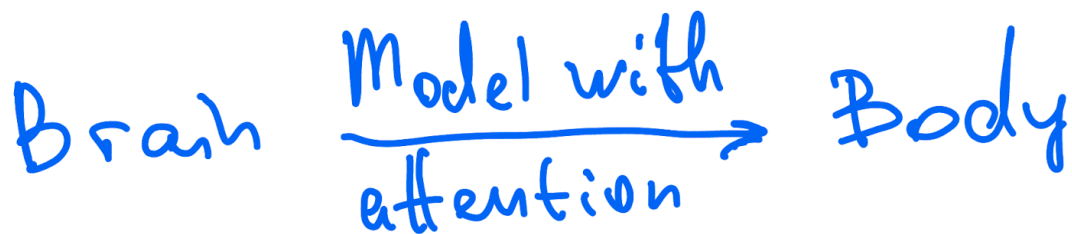
To prove the concept "Mind state controls body sway" there are several variants of modeling

## 1. Without a medical expert assessment

Average brain wave frequency to Energy of body movements



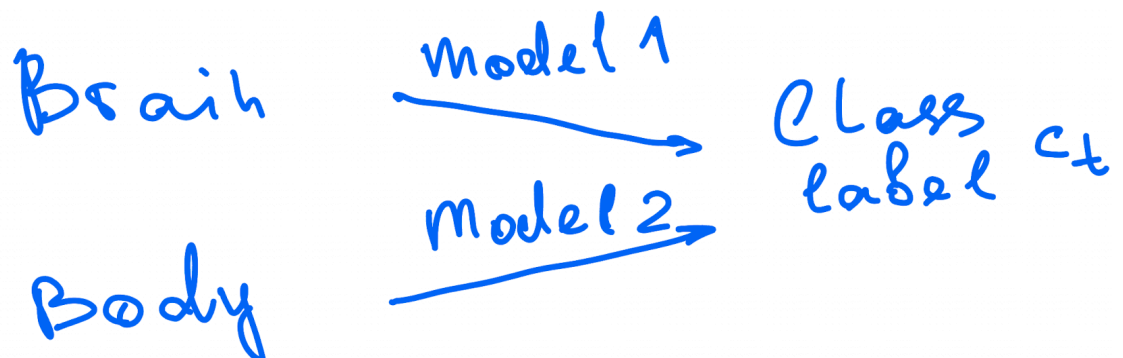
Raw brain signal (Brain state) to Body state



## 2. With labelling by an expert assessment

Both Brain state and Body State corresponds to the same Expert label

There are two statistically significant difference between distributions of two sample sets



## 3. Note. The project JeremyNixon/neurocity/ makes an embedding only.

