IDUN Technologies

IDUN Technologies - Ubiquitous Brain Computer Interfaces Based on Ear EEG Electrodes

Mark Melnykowycz
Oct. 20, 2021

Imagine a world with connected cognitive and emotional intelligence, fully controlled by each individual, to promote happiness and well being.

Everything gets better!

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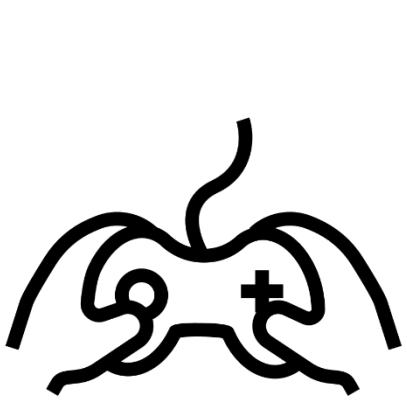
IDUN Technologies

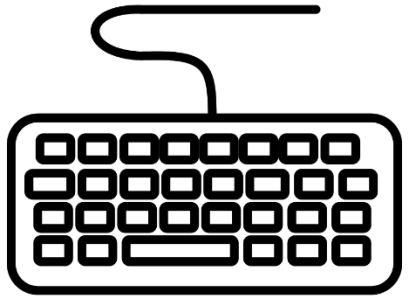
We are IDUN, and we create the Internet of Humans.

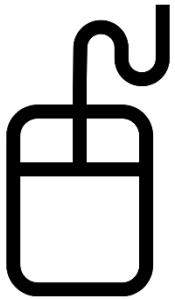
We will impact all products and services by providing intuitive access to human cognition and emotion in real time.

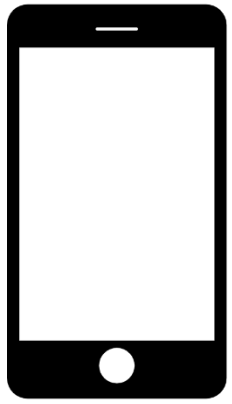
We unleash the potential of the brain for every living individual.

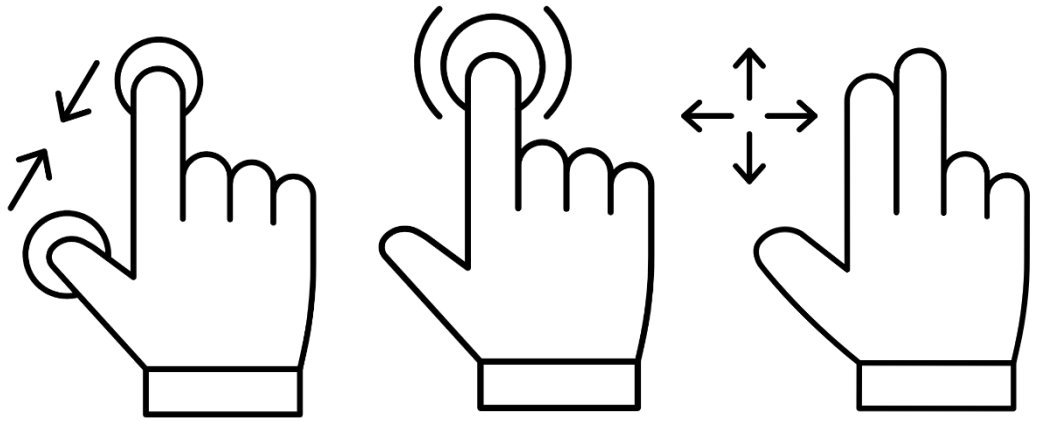
Interaction Computers and Humans Evolution



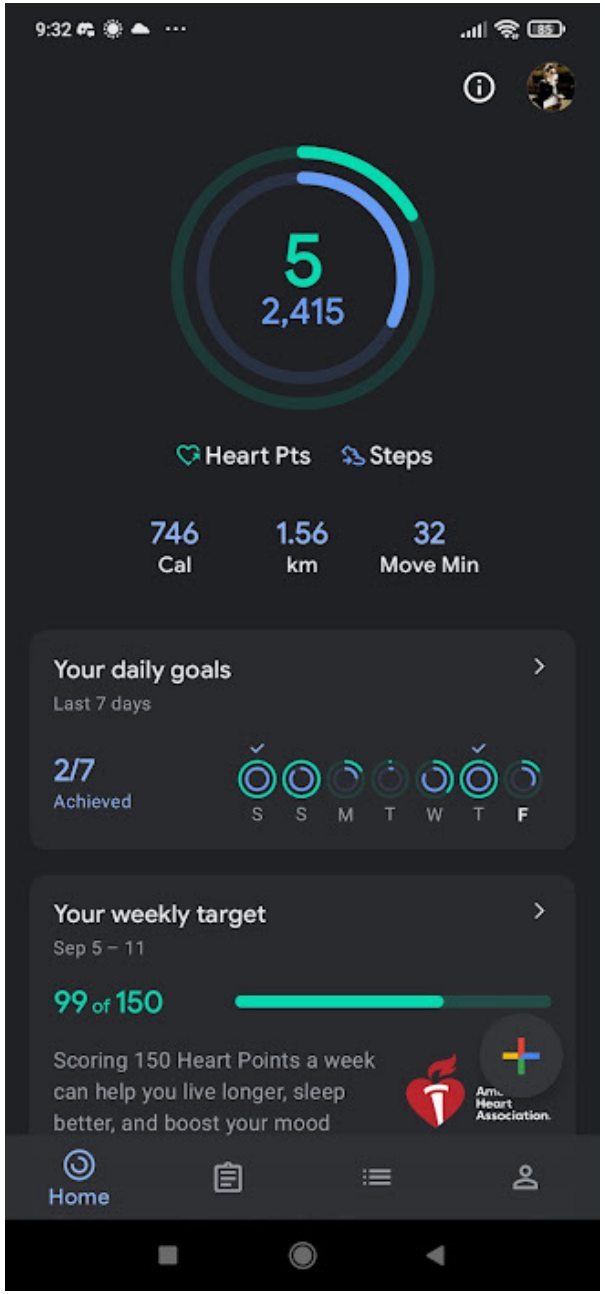


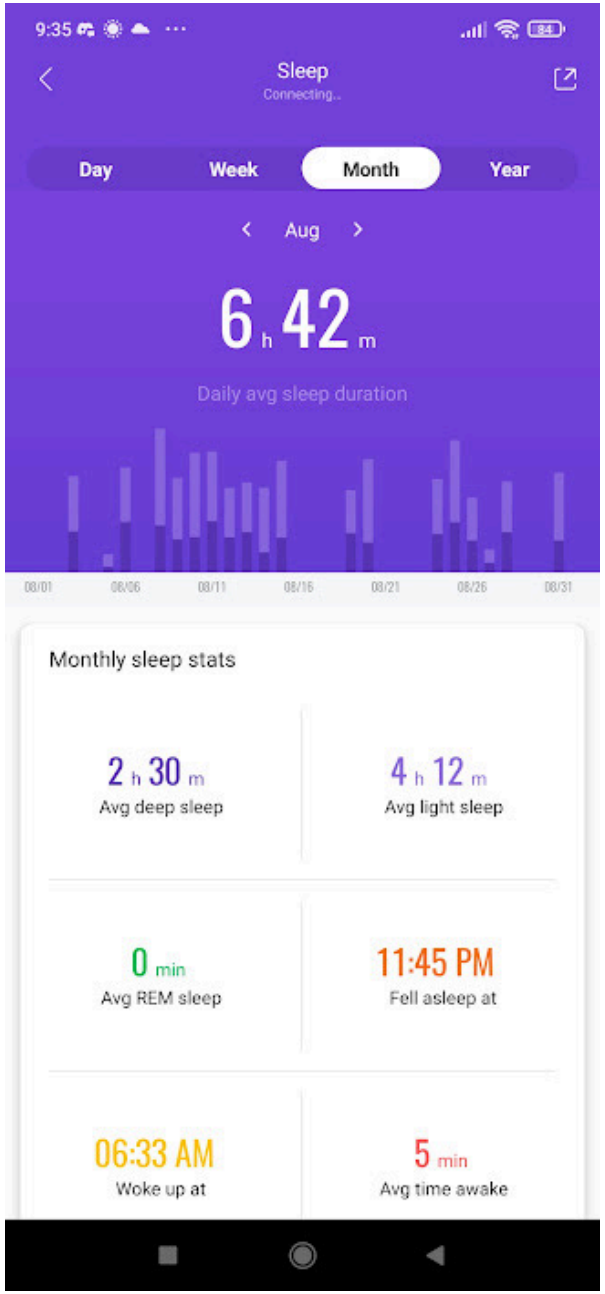






XR Computer Interaction





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The evolution of «Hearables»

IDUN
Integration of electrodes in earbuds to enable unobtrusive brain activity monitoring

2001

Speakers

2007

2012

Microphone

2016

True Wireless

2019

Noise Cancelling

2021

Biometrics

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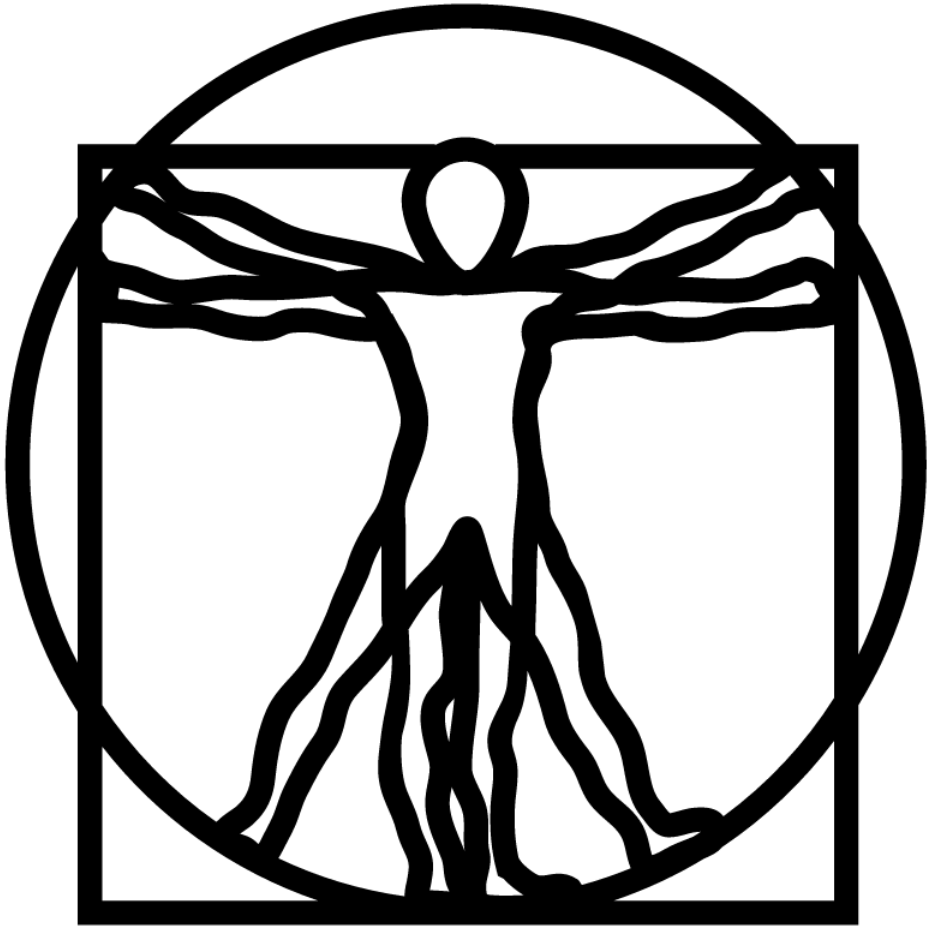
Quantified-Self

Interpretation

Data



Action

Sensors

Autonomy

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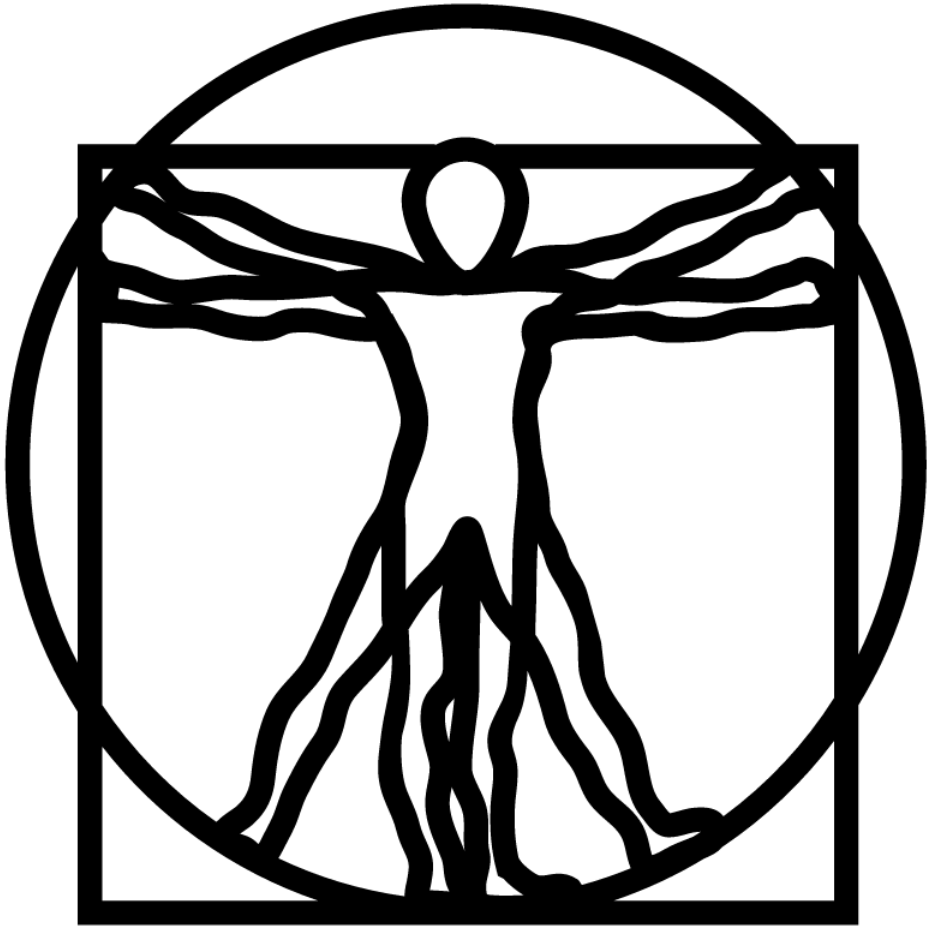
Quantified-Self

Interpretation

Data



Action

Sensors

Autonomy

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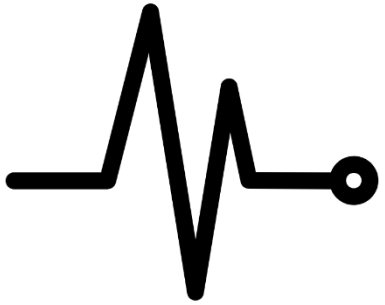
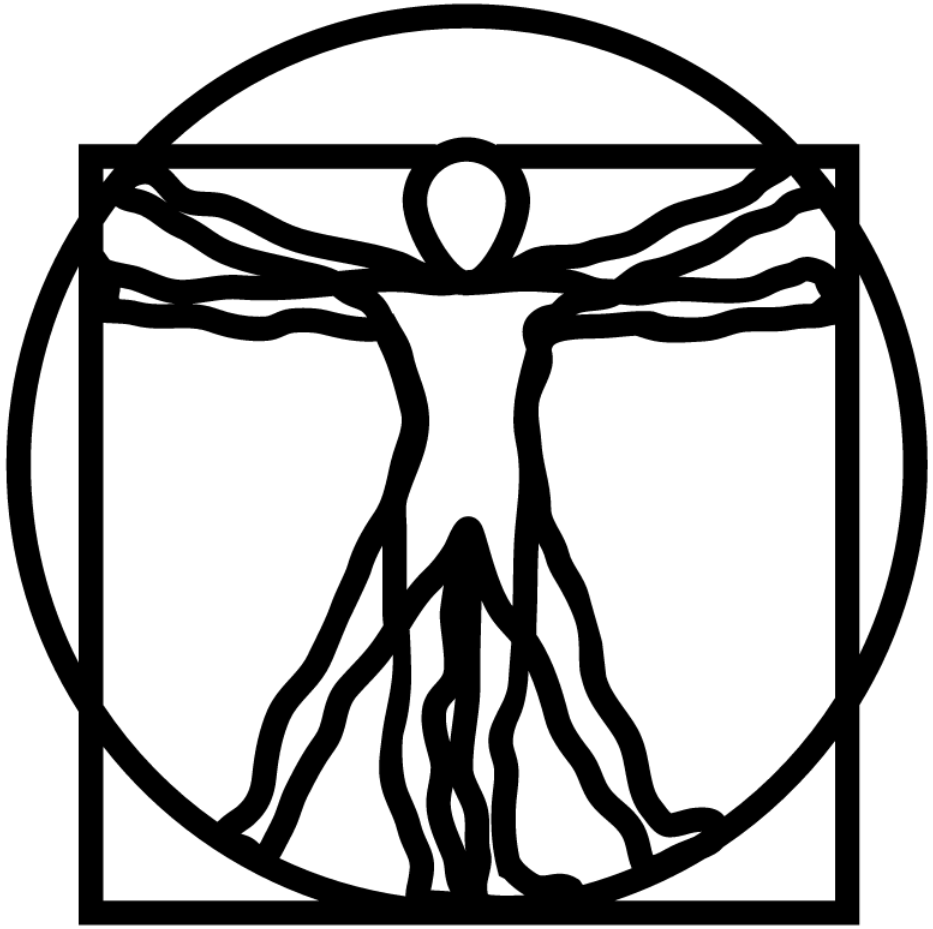
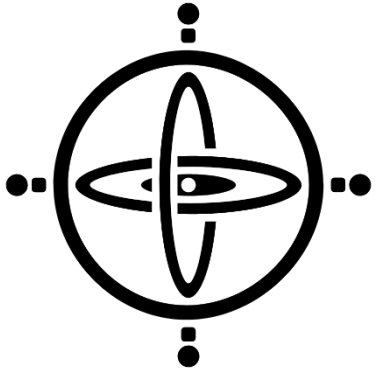
Sensors

Neuro-Markers



Heart Rate





Motion

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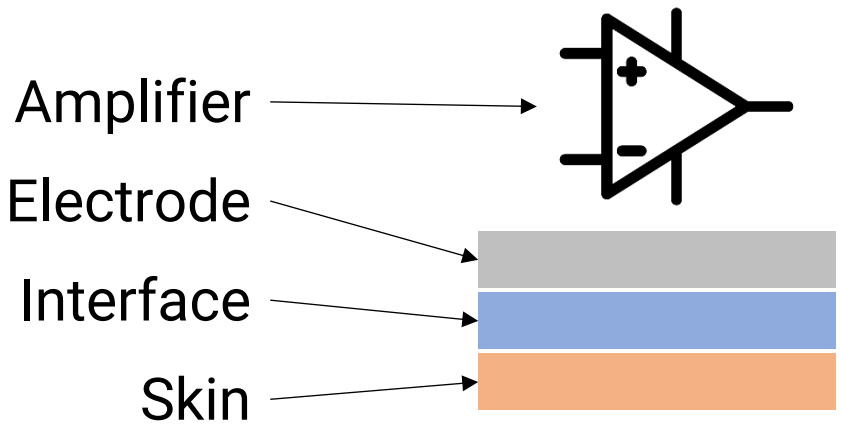
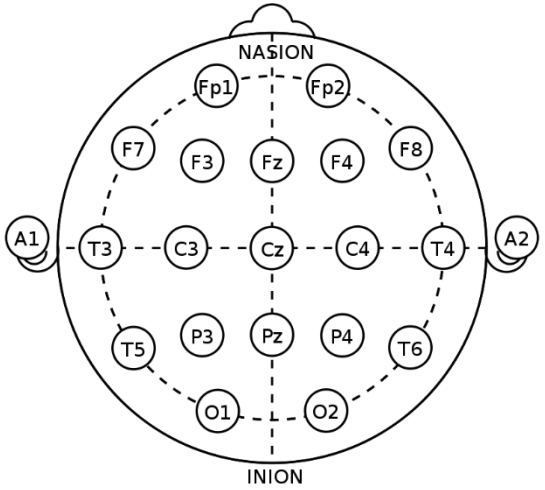
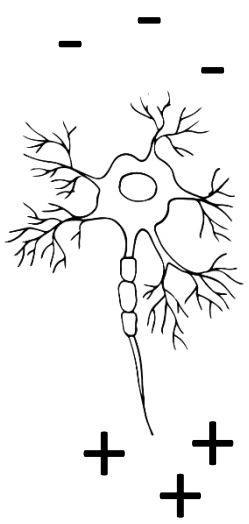
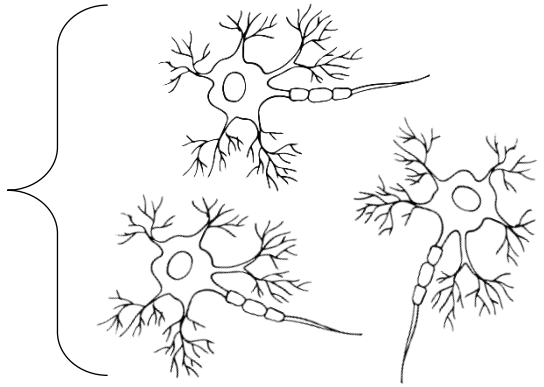
Brain Activity Setup and Operation







Neuron activity



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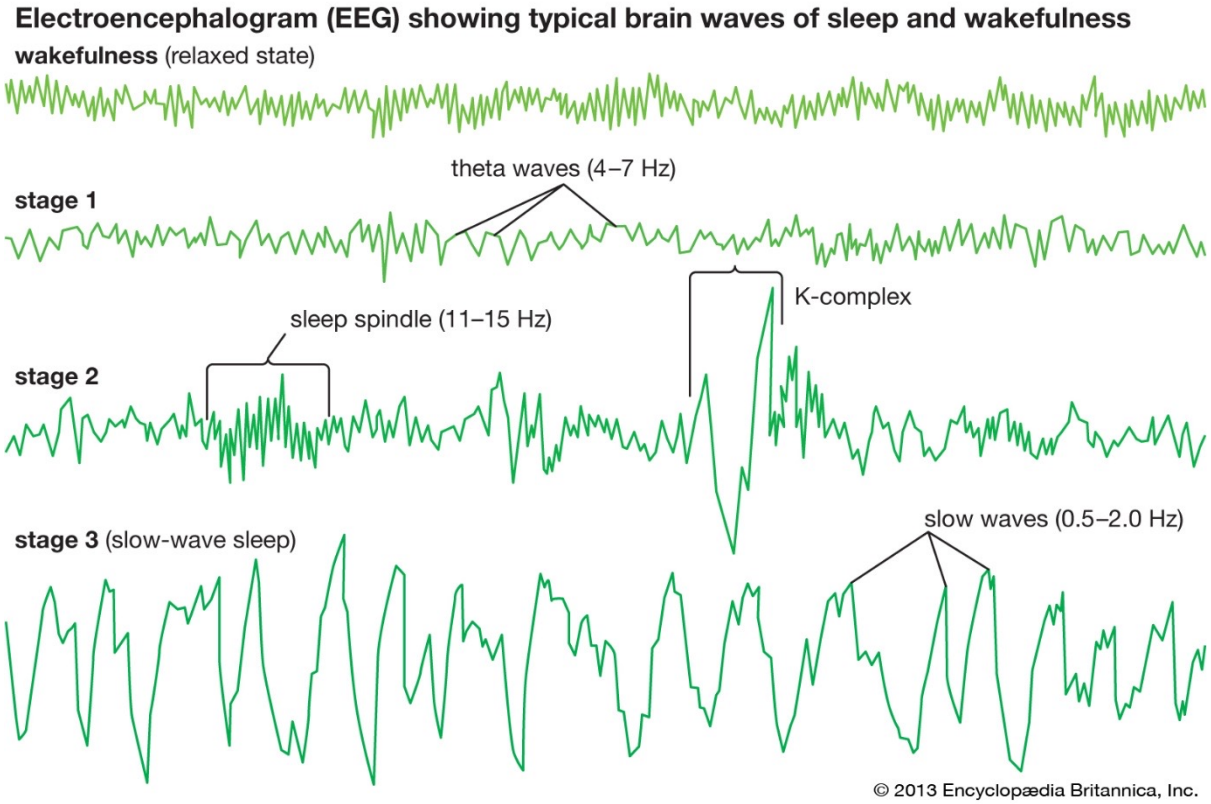
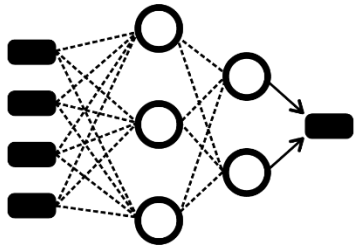
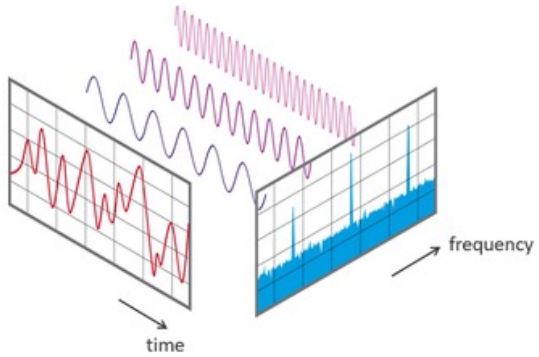
Brain Activity Data and Interpretation





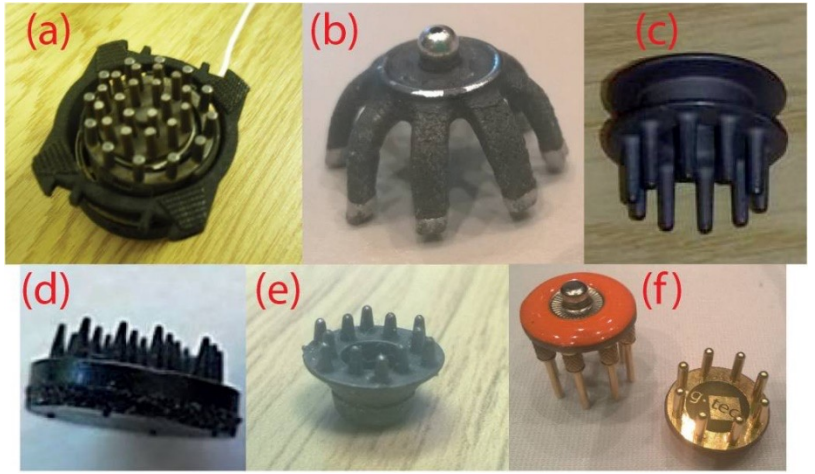
Recurrent networks
Time domain
Anomaly detection



Frequency domain
Feature extraction
State characterization

https://www.britannica.com/science/electroencephalography
https://en.wikipedia.org/wiki/Fast_Fourier_transform

Dry Electroencephalography (EEG) Sensors



Dry fingered EEG electrodes. (**a**) Wearable sensing; (**b**) Cognionics; (**c**) Neuroelectrics; (**d**) IMEC; (**e**) Florida Research Instruments; (**f**) g.tec g.SAHARA.

https://www.wevolver.com/wevolver.staff/dry.eeg.electrodes/master/blob/EEG.md
https://www.gtec.at/product/gsaharasys/

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EEG Mobile Devices

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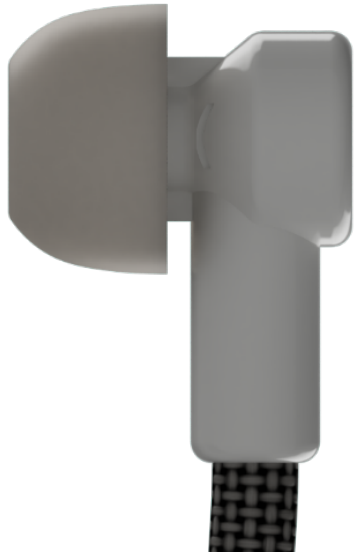
Bring brain imaging from the lab into everyday life

Hearables - the optimal form-factor for ubiquitous brain imaging

The IDUN Neuro-Intelligence Platform enables a complete neurofeedback loop

Ear EEG

Brain Computer Interface



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The DRYODE™ Guardian Development Kit

Guardian is the first unobtrusive in-ear EEG platform able to generate actionable insights for the user.

IDUN Guardian records, processes and interprets brain signals in real-time through comfortable earpieces that feature:

EEG:
- 2-channel in-ear
- real-time stream
- unobtrusive and comfortable

Cloud platform:
- Data levels: raw, processed, classified
- Experiment setup and results presentation

Wireless Connectivity:
BLE

Audio:
Existing earbuds can plug in (diameters 6-7 mm)

Bridge Connectivity:
WiFi/Ethernet

Long Battery Life:
4+ h

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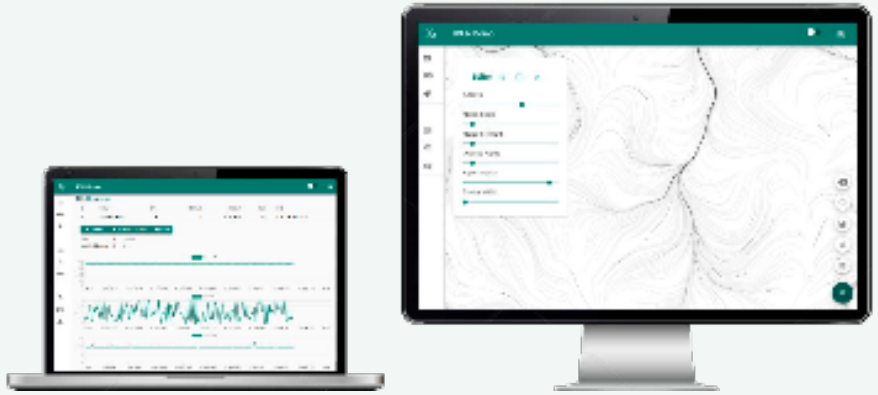
DRYODE™ Guardian

HARDWARE

Brainbox

Bridge

SOFTWARE



Neuro-Intelligence Platform

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Enabling the Internet of Humans

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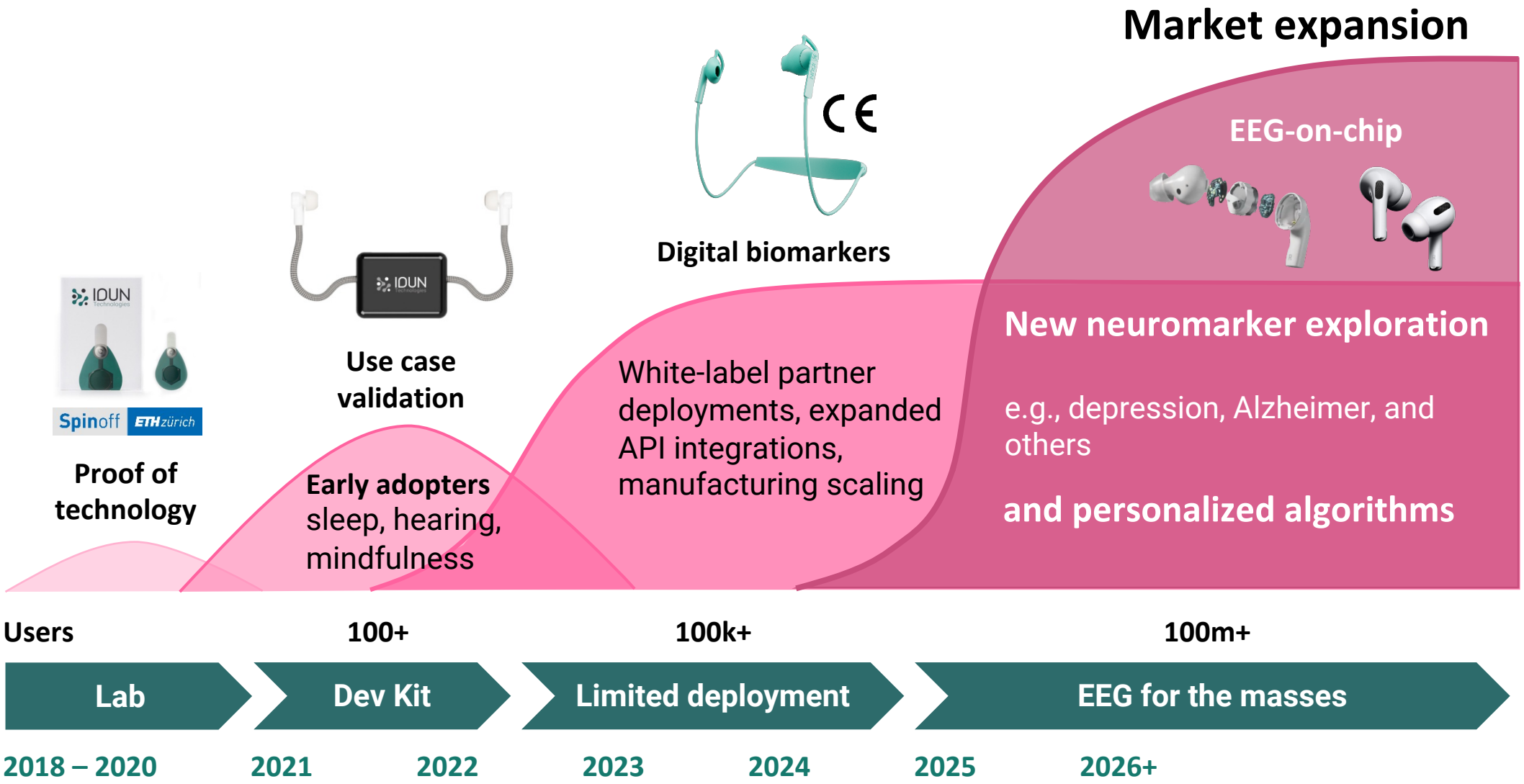
Dr. Moritz Thielen
CTO

Abigail Holland
Neurotech Engineer

Andrea Fümm
Hardware Lead

Helge Meichssner
CFO

Technology and Product Growth Path



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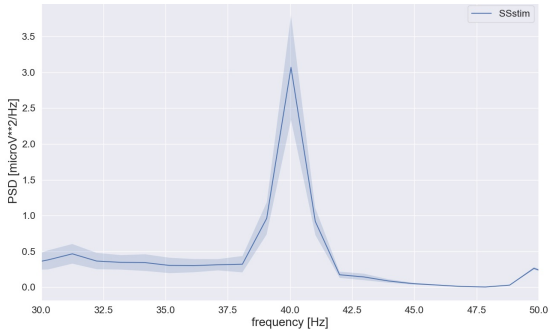
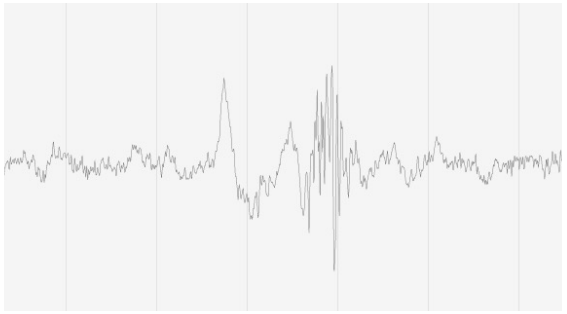
Brain Activity Performance / Validation



Hearing

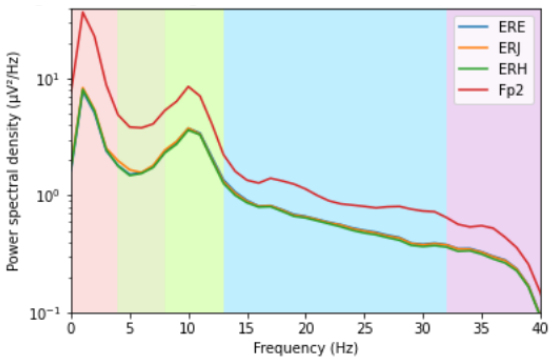
Acoustic attention and hearing training



Sleep Tech

Characterizing digital biomarkers for sleep

The Guardian Brain Computer Interface is being validated for use-cases in Hearing, Sleep Tech and Wellness.



Wellness

Enhancing meditation journey through music

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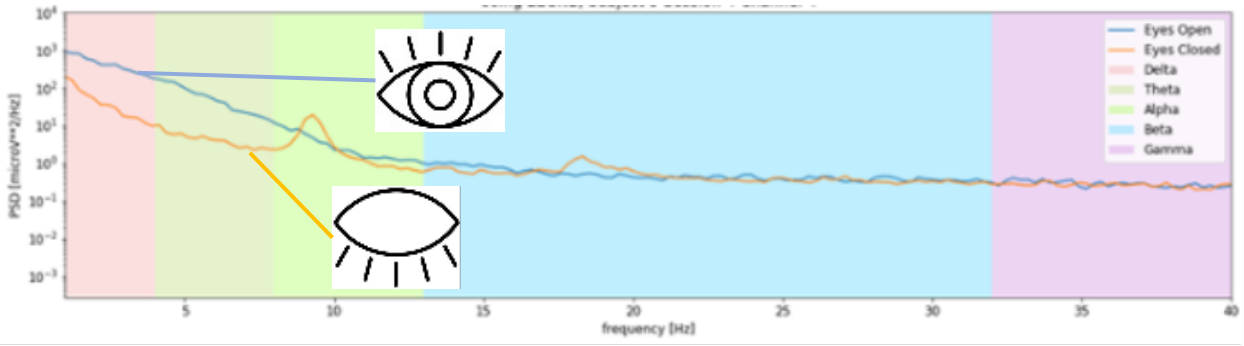
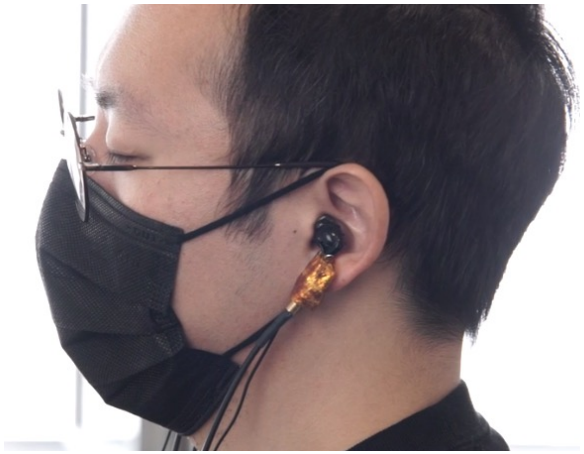
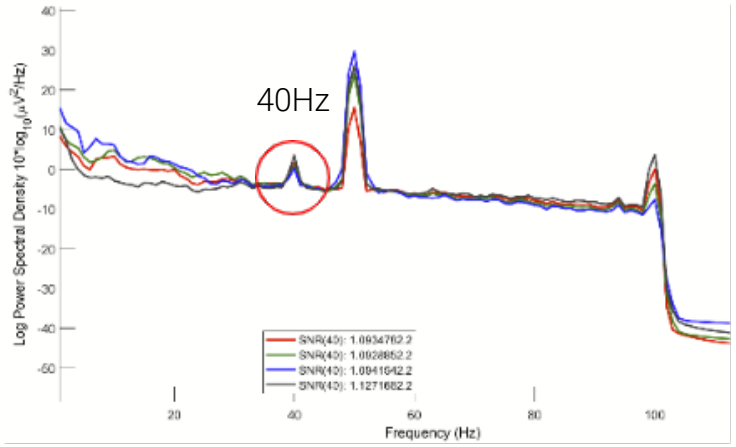
Electrodes IDUN Ear EEG – Paradigm Results

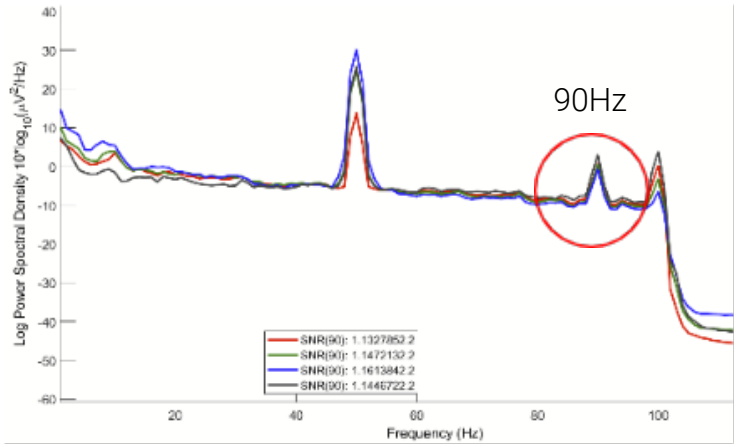
Eyes open / Eyes closed (Alpha)

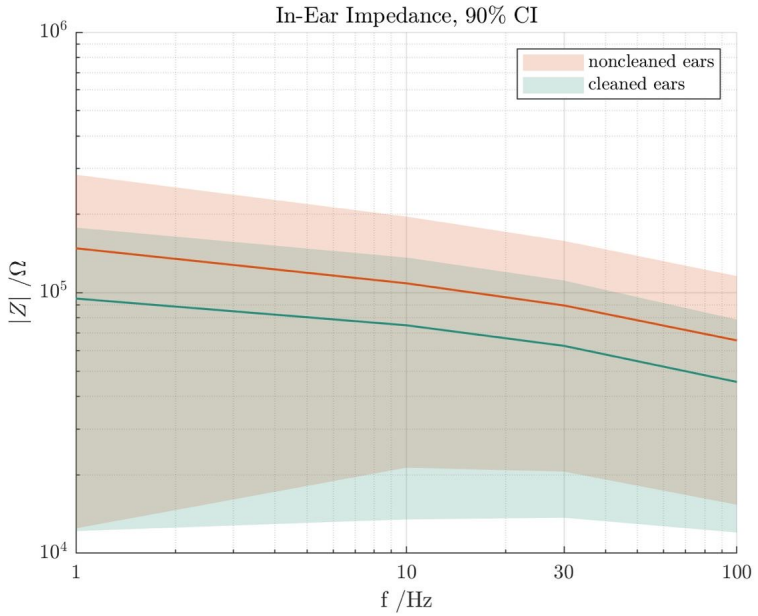




Auditory Steady-State Response (ASSR)







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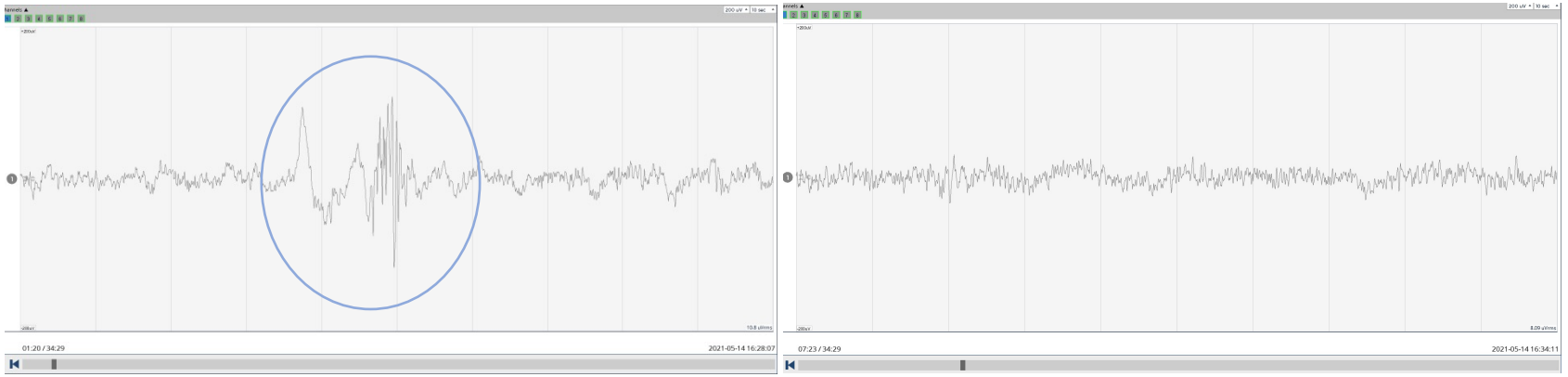
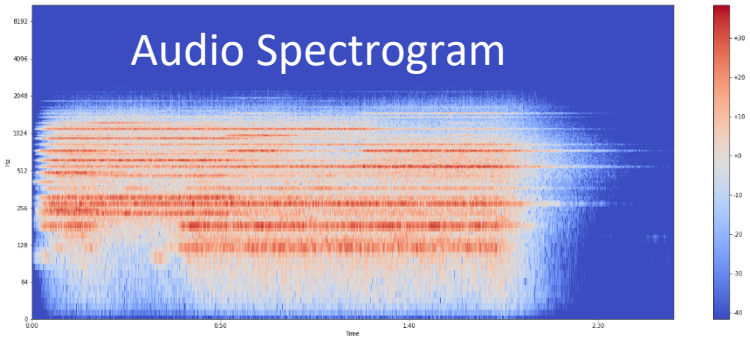
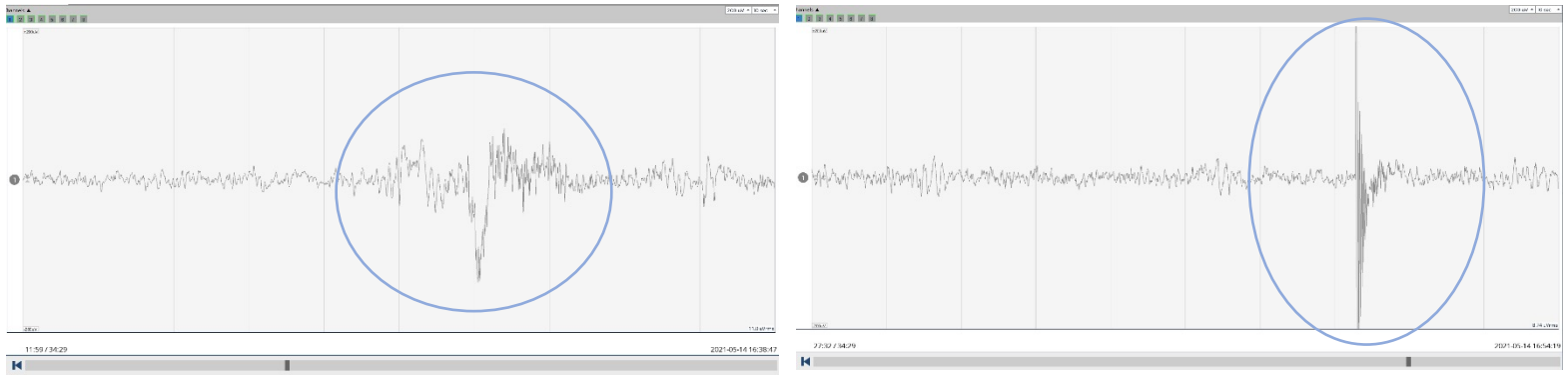
Sleep Test – Guardian Electrodes

- Ear EEG recorded over 30 min session
- LAIFE music played during the entire session, 250 sec loop
- Subject experienced sleep onset in conjunction with music features







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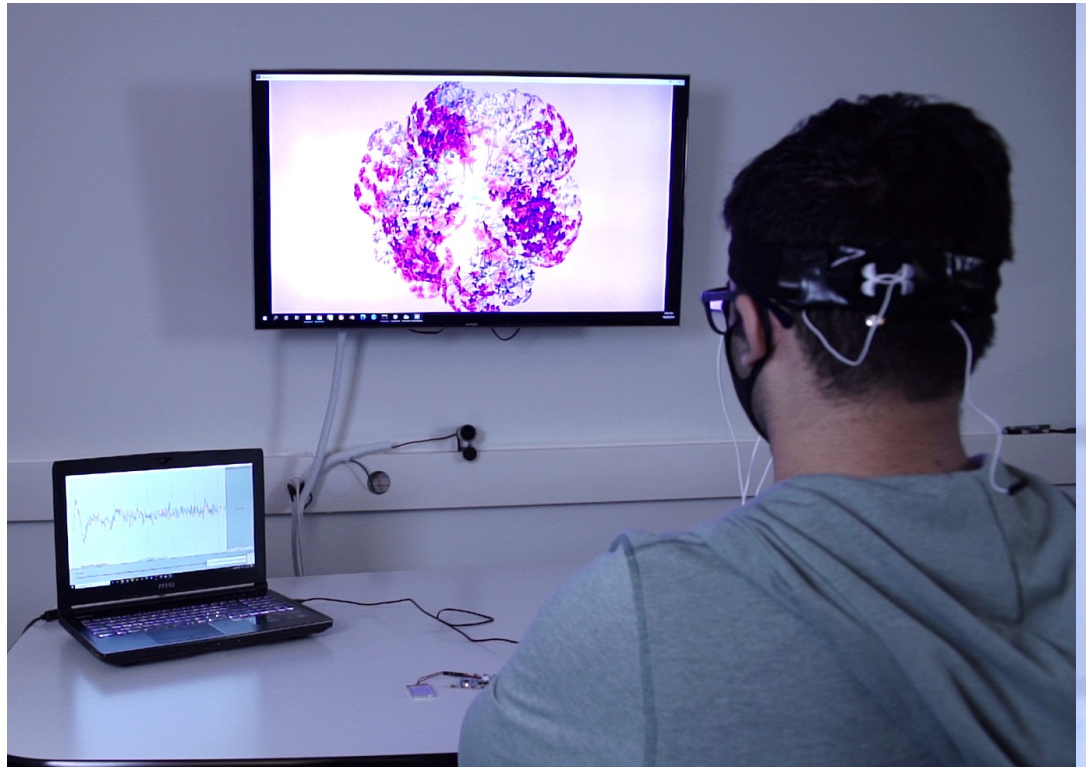
Application Generative/Interactive Art



EEG signal sent wirelessly to Touch Designer software

Compliant electrodes placed on forehead in headband form-factor

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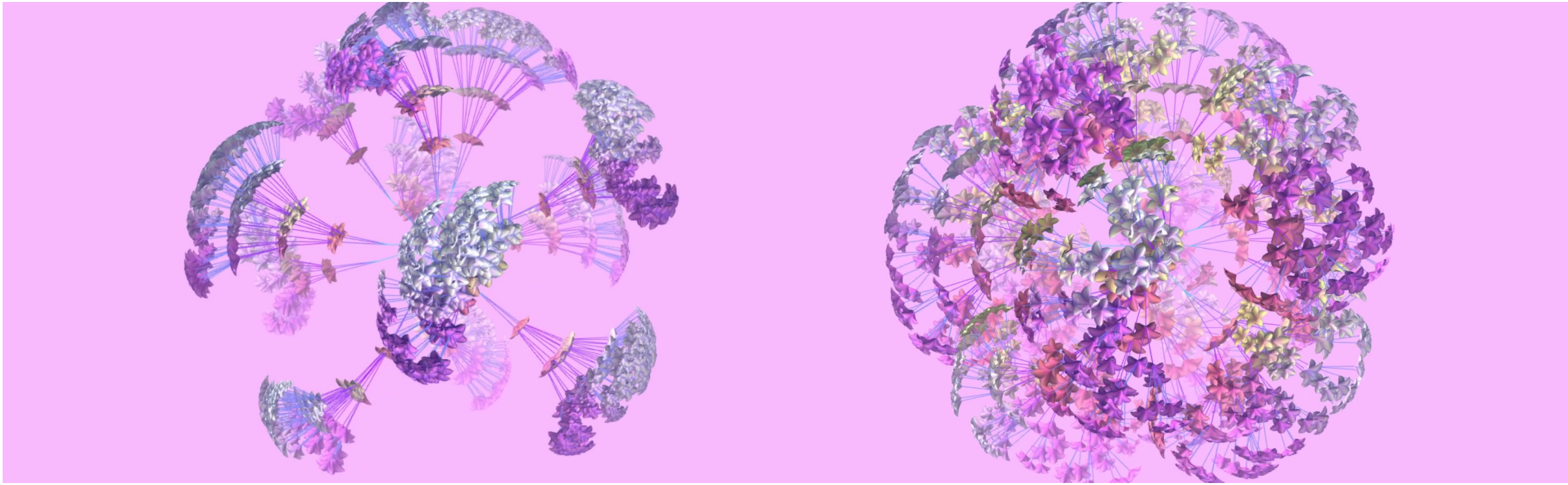
Application Generative/Interactive Art



Low Alpha activity

High Alpha activity

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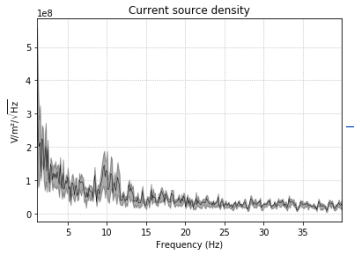
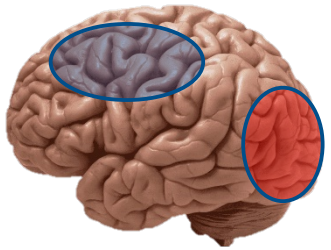
Neurofeedback Music – Sleep Journey Enhancement



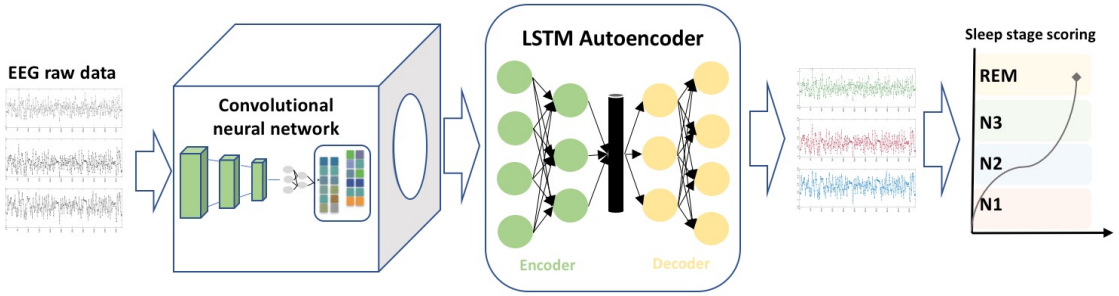


Raw EEG Data

Extracted Features

IDUN API

Sleep Features

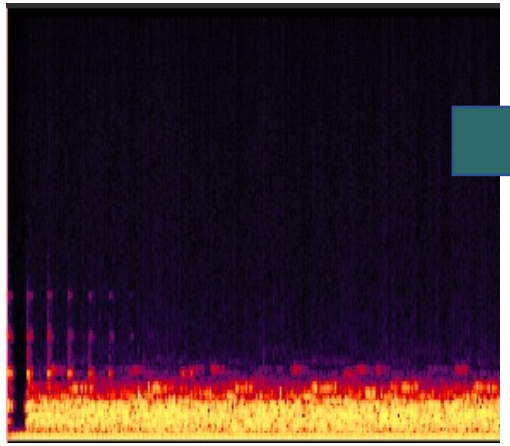


Music Model

Optimal sleep music is generated based on the trained model and brain inputs

Sleep Music Model

Sleep Music



LAIFE Music

Optimal sleep music is played to the user to induce sleep

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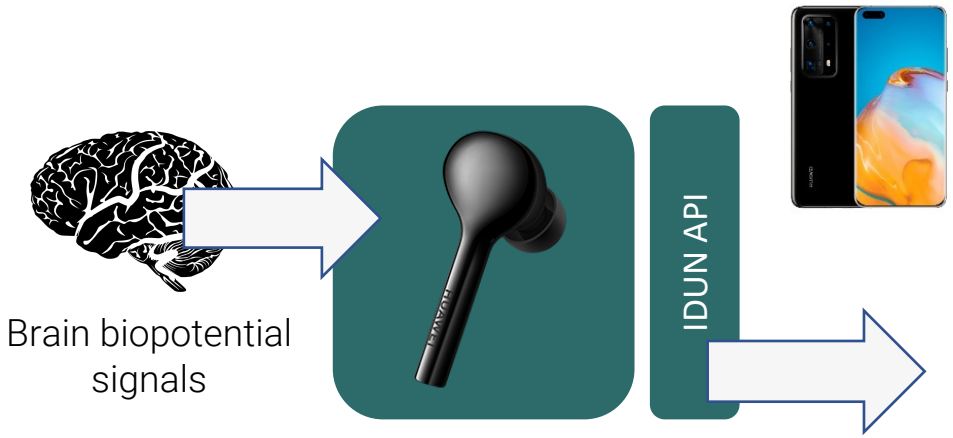
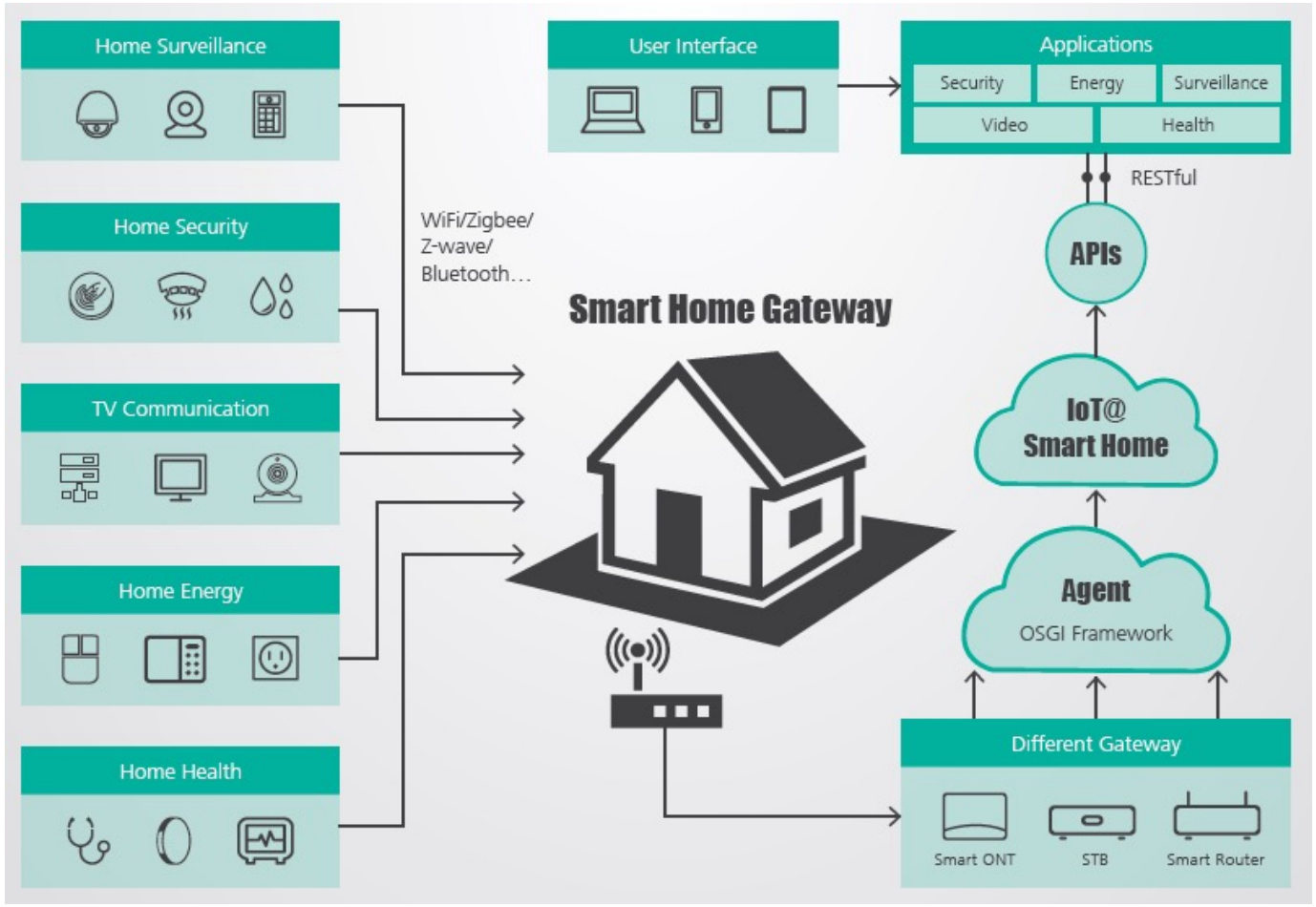
Product Concept: Smart home ecosystem

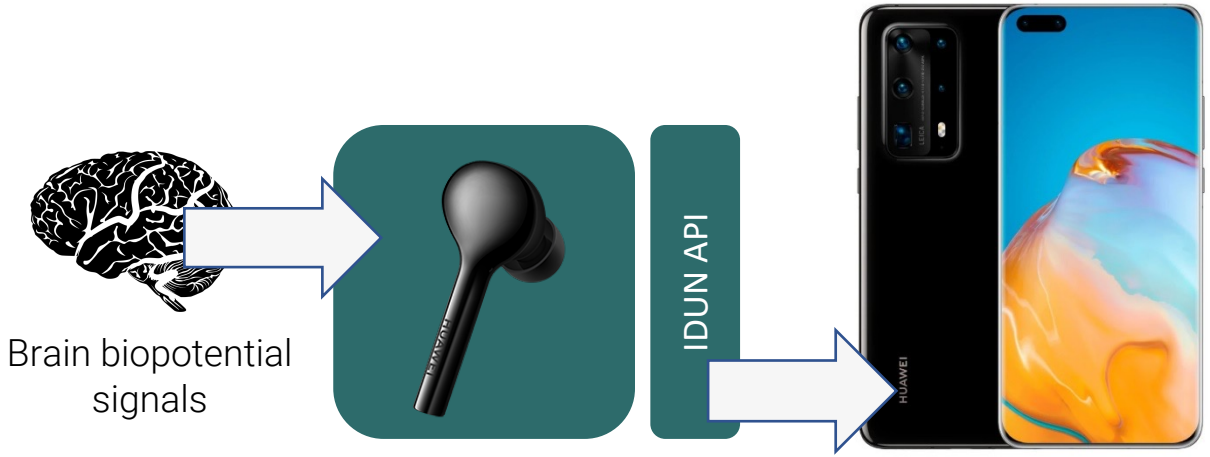
Smart Home Integration

Neurofeedback integrated through smart home gateway can open many applications in health and wellness





Smart Home Demo: Synchronizing room lighting to emotional needs



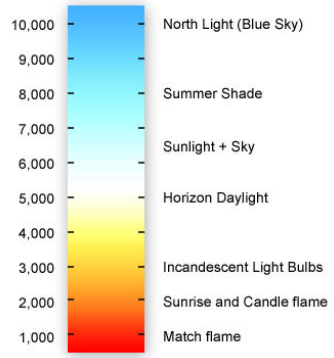
Brain biopotential signals

IDUN BCI

IDUN technology integrated into headphone products designed to monitor Brain Flow

Philips Hue Bridge

Lights change based on the emotional needs of people to produce calming effects in the smart home



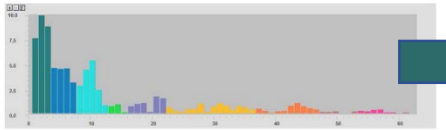
Meditation: Environment and neurofeedback

Meditation Environment

Control light and audio to assist in meditation immersion

Brain biopotential signals

- Raw Data
- Extracted Features
- IDUN API



Media Integration

Learn which media and environment parameters are needed to improve mediation experience of users

- Music
- Generative Audio
- Room Lighting
- Guided Meditation

Enabling the Internet of Humans

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Product / Application Lead

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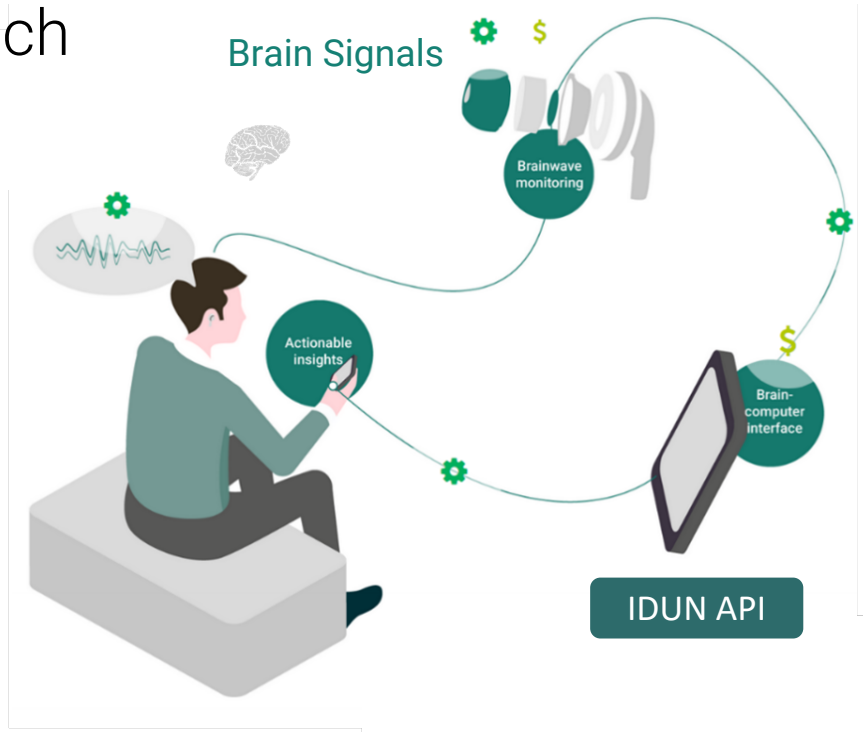

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THANK YOU FOR YOUR TIME, AND INTEREST IN

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