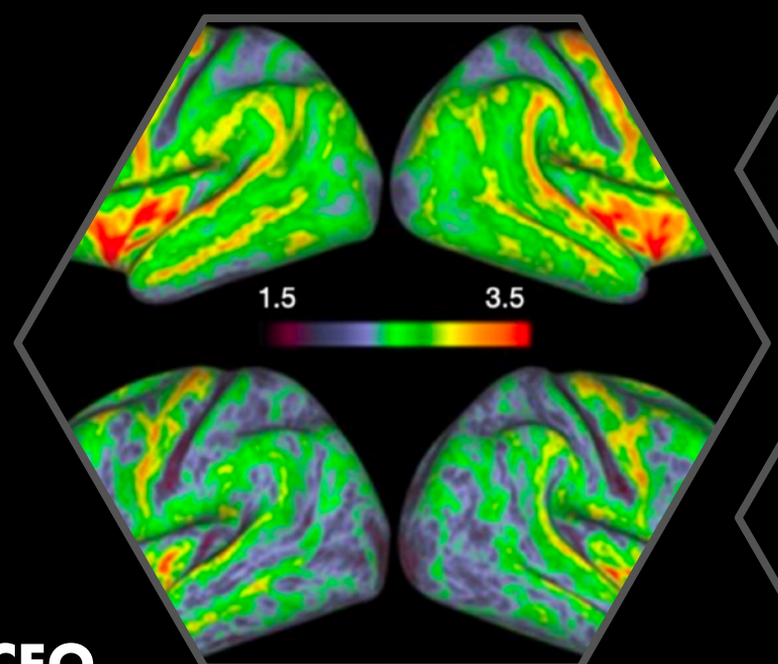
REBIS LLC

brain-computer interfaces with artificial intelligence for mental gaming, wellness, and neurorehabilitation.

TRL 9

IRR 332%



Alexandra Bernadotte, CEO,
MD, PhD in Medicine, PhD in Mathematics,
Professor in Computer Science.

Problems

1. Mental control of remote robotic devices.
    1.1. Cyber environment (instead of a mouse, joystick);
    1.2. Robotic devices: robotic arms, cars, exoskeletons and others.

- for people with special needs,
- for special tasks (restrict movement, for example, in space),
- for gaming.

2. Reaction speed in eSports and other sports.
    2.1. For professional eSports players, the norm is 200-300 movements per minute and about 4 movements per second. In healthy people, it does not exceed 2 movements per second.

Motion recognition technologies, such as speech command recognition, motion recognition, recognize one movement command in 1-2 seconds. The speed of recognition is limiting the use of technology in the following industries: control of machines, robots, construction cranes.

NeuroGaming
is a software (**CortexGame**)
and hardware (**Hermes & Nero**)
for mental control and navigation in
(1) gaming,
(2) virtual reality,
(3) remote robotic devices.

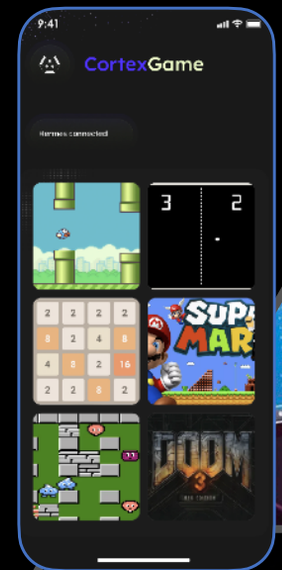
You can play video games via brain-computer interface Hermes & Nero also with a traditional normal input device (joystick).

Solution I: NeuroGaming for new-gen gaming control

The user learns to control machine, robotic arm or other device mentally via brain-computer interfaces Hermes with Mobile App CortexGame.

The brain-computer interface Hermes is used as an input device instead of a steering wheel, joystick, keyboard, voice, mouse.

AI server associated with the application CortexGame recognises up to 30 mental commands with the highest speed possible for a human.



Solution I: NeuroGaming for new-gen gaming control

CortexGame (software)
+ Hermes/Nero (hardware)

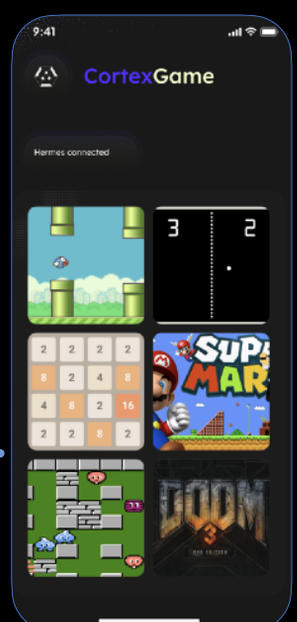
is a bidirectional brain-computer interface that

(1) recognises 30 mental commands 20 times faster than any other technology;

(2) transmits to video game with VR and AR.

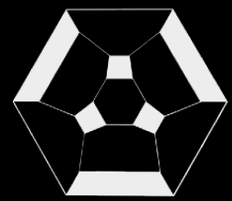
The user plays the video games: Flappy Bird, Mario, 2048, Bomberman, Doom3, and Atomic Heart using the brain-computer interface.

Hermes is an Intelligent Brain-Computer Interface with 16 gold-plated gentle electrodes.



CortexGame is an Intelligent App for gaming via brain.

Problems



3. Wellness and Neurorehabilitation
    - 3.1. ADHD, stress, sleep problems, and burnout.
    - 3.2. Cognitive abilities.
    - 3.3. Negative brain changes after COVID, PTSD, trauma.
4. Neurorehabilitation
    - 4.1. Head injuries.
    - 4.2. Stroke and cerebral infarction.
    - 4.3. PTSD.

HyperCortex is a software and hardware complex for enhancing cognitive abilities, improving mental well-being, concentration and meditation.

Solution II: HyperCortex for neuroplasticity & neurorehabilitation

The Bernadotte's technique of directed neuroplasticity pumps up the brain in a playful way.
The user, with plays the usual video games mentally: 2048, bomberman, Mario, Doom3, racing and Atomic Heart using the Hermes and Neuron neural interfaces.

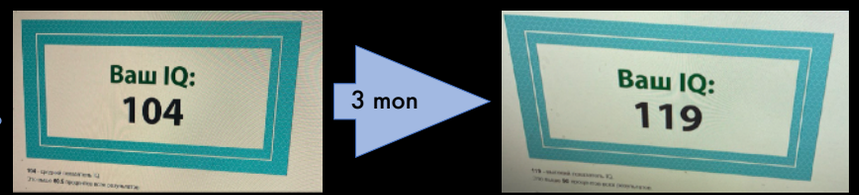
Author's technique of directed neuroplasticity: during the game, adapted to activate certain electromagnetic patterns, the user learns to play games, while the cognitive abilities increases.

As a result:

1) increases performance on functional tests: IQ, spatial orientation, counting, musical ear, visual recognition, memory capacity;

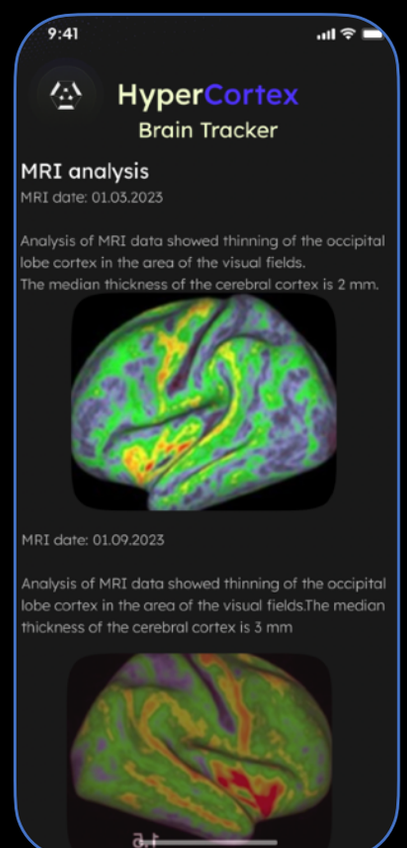
2) increases the thickness of the cortex in selected areas;

3) reduces signs of post-COVID syndrome on morphofunctional tests.



On server
According to the technique of directed neuroplasticity, the server modifies the weights of the neural network, according to the chosen tactics for pumping the brain.

On a mobile device
The progress can be seen through MRI analysis, which is performed on the server and stored on the mobile.



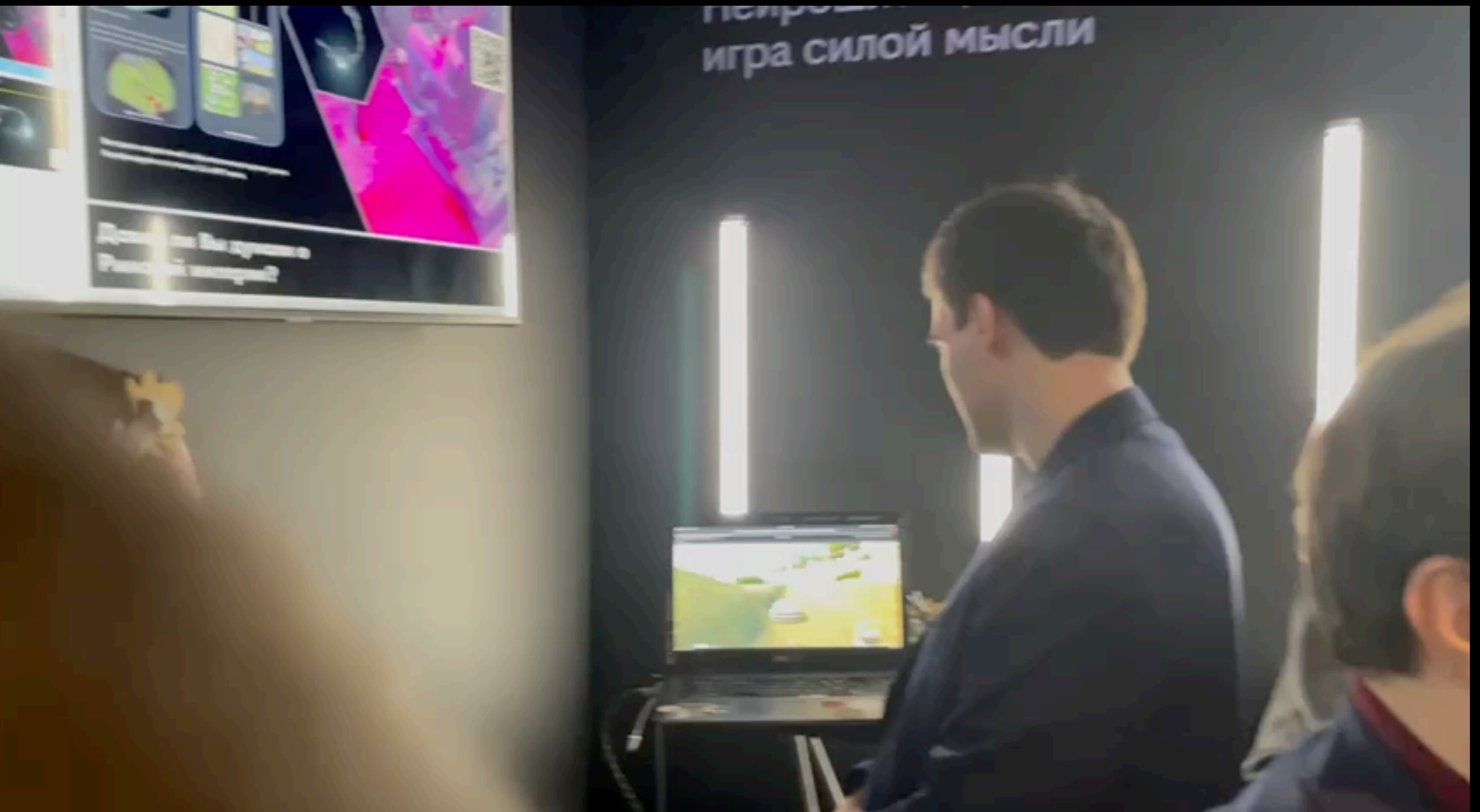
Hardware: Hermes

Hermes is an Intelligent Brain-Computer Interface based on EEG, accelerometer and eye tracker with16 gold-plated gentle electrodes and removable battery. Hermes integrates with AI server and recognizes up to 30 mental movement commands and up to 8 brain states.

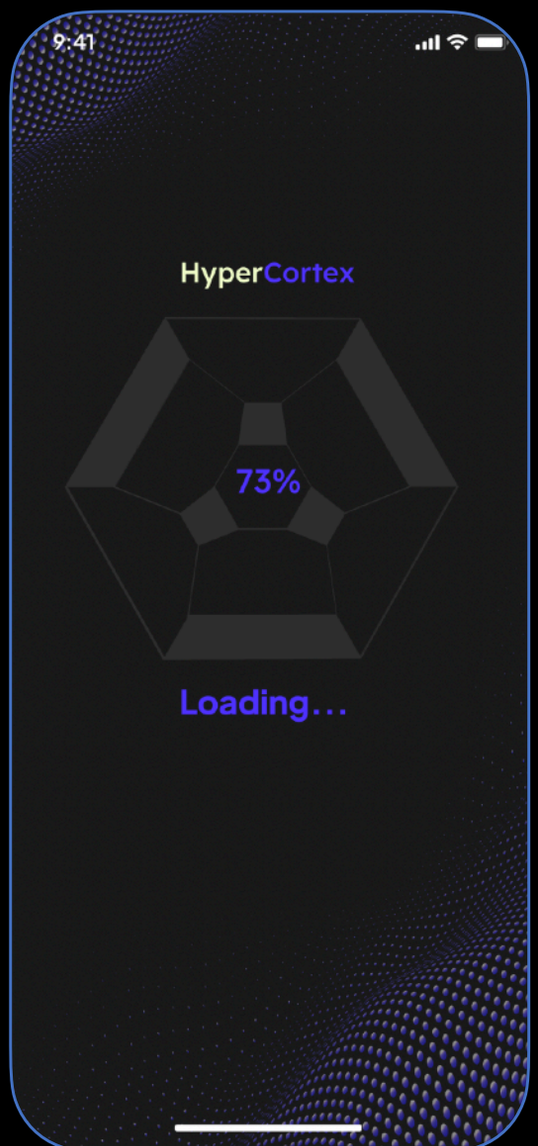
Hardware: Nero

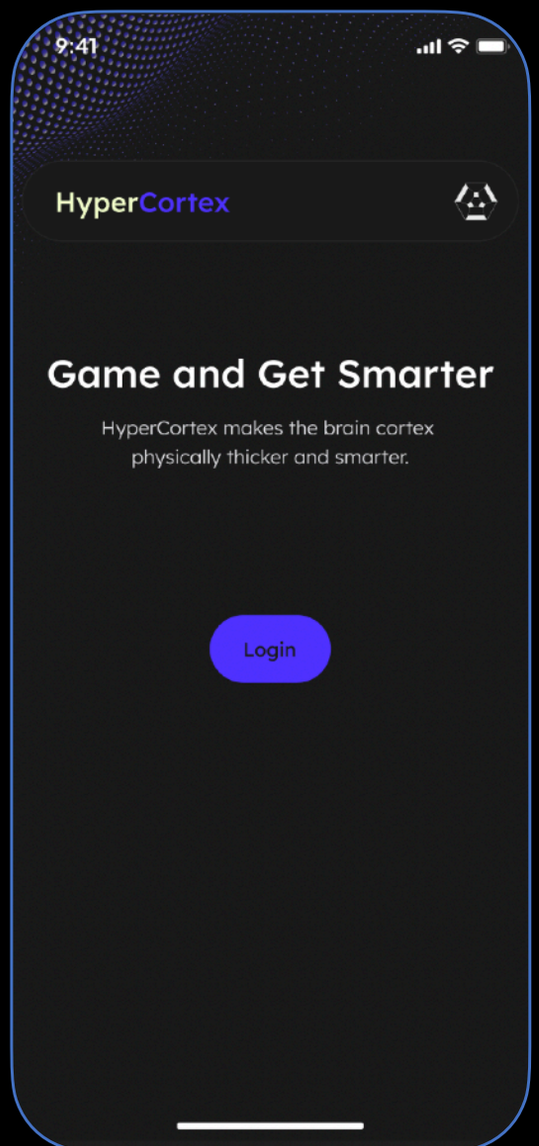
Nero is a Brain-computer interface with artificial intelligence on board and 8 gold-plated gentle active electrodes.

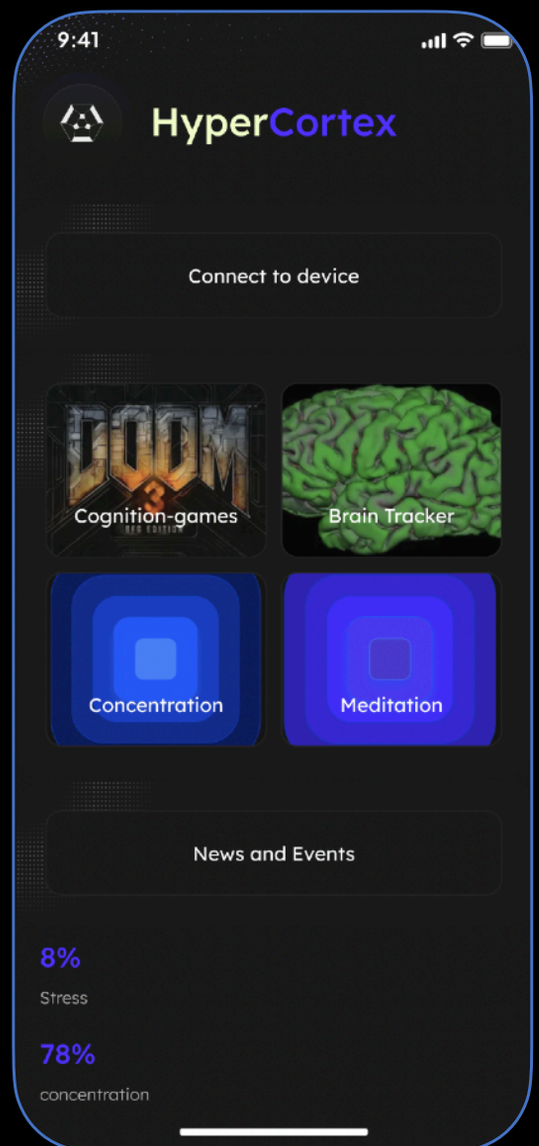
NeuroGaming

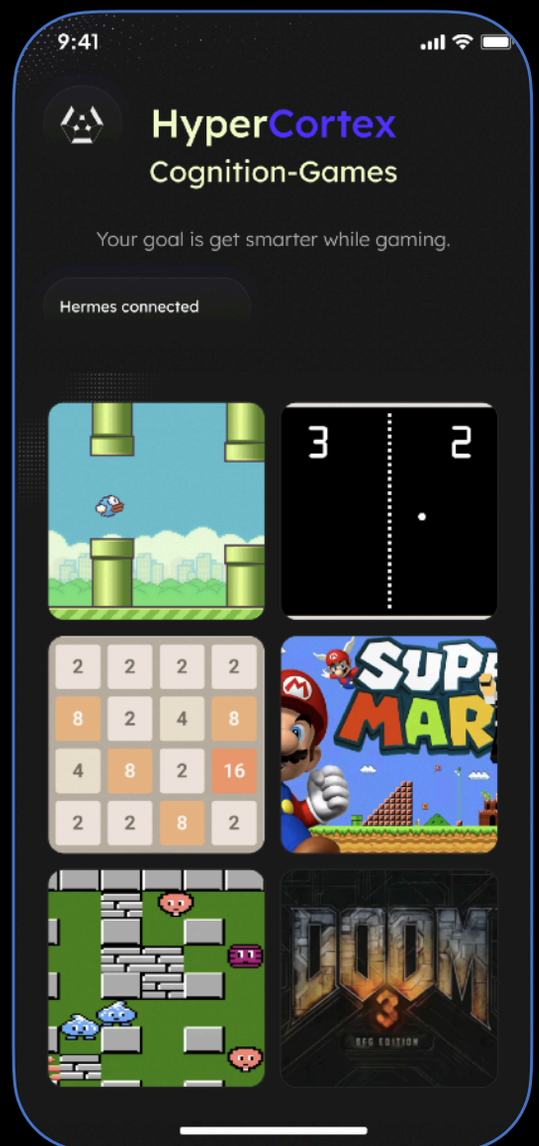


Software: CortexGame App









Architecture

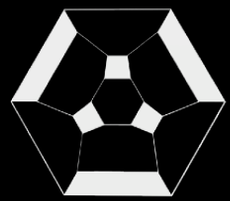
The brain-computer interface digitizes the brain signal and connects via Bluetooth/BLE with a mobile application.

The mobile AI server in inference mode recognizes mental states, converts them into control commands, and sends commands to the gaming application/ control application, etc.

In training mode, the AI server trains the neural network of this user and transmits the resulting weights to the mobile device via Wi-Fi.

The mobile device connects via Wi-Fi to the AI server and transmits current data to further train the neural network of a given user to increase the accuracy of classification of mental states and movements.

Technology



(1) Preprocessing.
The brain-computer interface (Nero and Hermes) processes the brain signal (EEG, accelerometer, eye tracker) using proprietary and publicly available algorithms integrated into the device microcontroller (see below).

(2) Embedded systems.
The Rebis team has developed microcontrollers with an ESP32 chip for data preprocessing on the device with 8, 16 and 32 channels. The embedded system allows to transform data: frequency filtering, fast Fourier transform, data window shift, filter based on the Hessian matrix, encryption, packaging with service information, and more.

(3) Communication.
The brain-computer interface communicates with smartphone/PC via BLE 5.2 or WiFi/ZigBee.

(4) Mobile applications.
The Rebis team developed gaming mobile applications for iOS and Android that process the signal on a smartphone and transmit the signal to a video games: Flappy Bird, Mario, 2048, Bomberman, Doom3, and Atomic Heart.

Technology

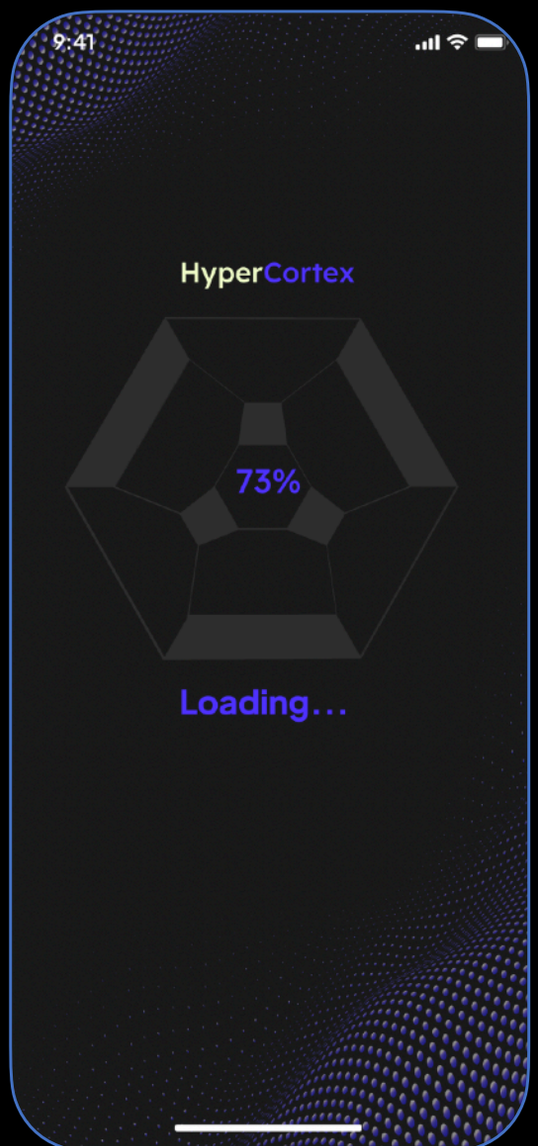
(5) Drivers.
Connected devices have Rebis universal driver, imported onto all platforms (iOS, Android, Windows, Linux), supported by all popular languages (Python, Java, C++, C#). The signal processing driver for the Hermes and Nero series devices is compatible with open solutions in the field of neurotechnology: OpenBCI GUI, OpenVibe, BrainFlow, CyKit. Our devices make it possible to use existing applications that neurotechnology researchers are accustomed to. The best user experience is achieved with our native, device-optimized apps.

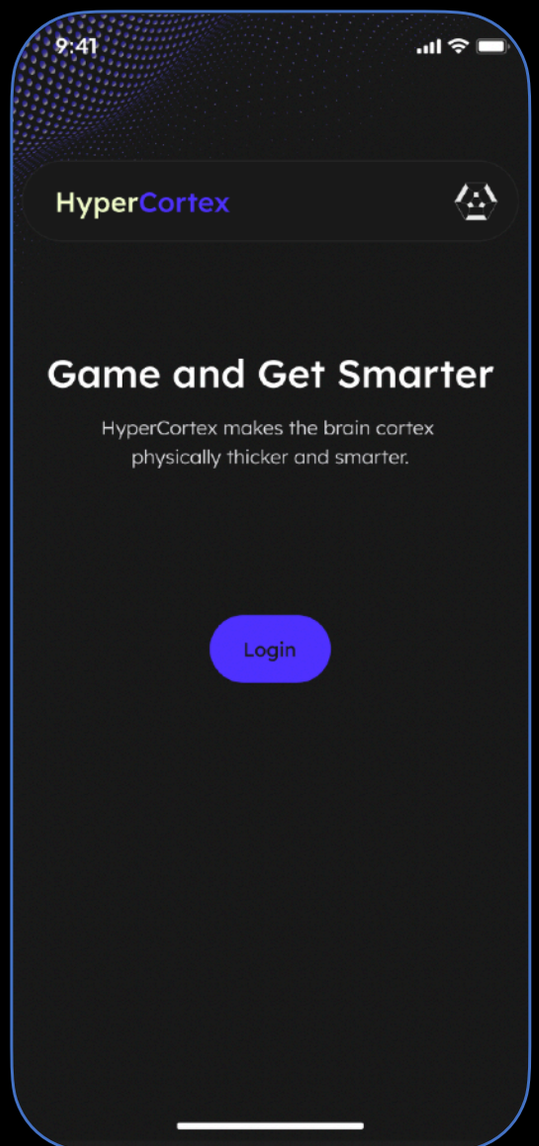
(6) AI.
The brain signal is processed directly on a smartphone, PC or directly on the device (Hermes Pro). AI is represented by generative, recurrent and spiking neural networks with proprietary and inheritable architecture.

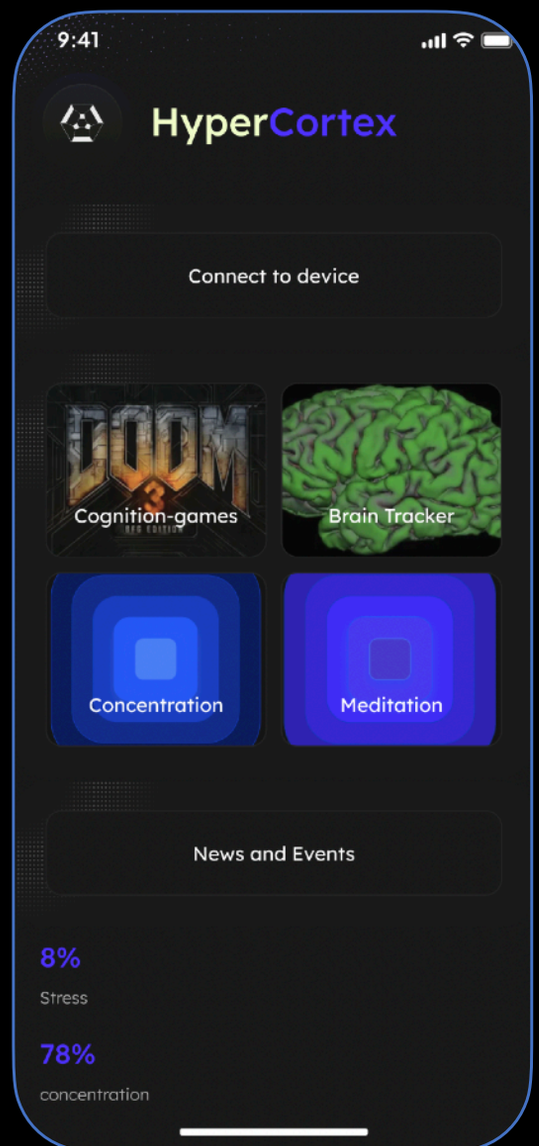
(7) Data storage and AI training.
With the user's consent, activity data (signal and action tags) are logged to the AI server for personalized model training. Online additional training of the model on the Hermes Pro device is also supported.

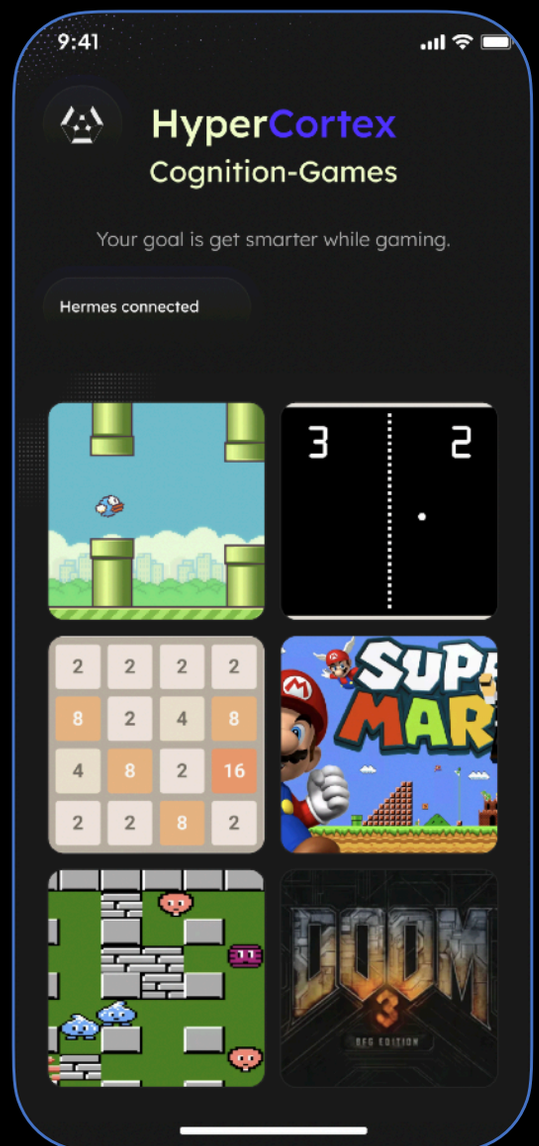
Software: HyperCortex App

HyperCortex is a mobile application for control/navigation and neurorehabilitation.
Control in the App is carried out using brain-computer interfaces and in a classic manual way.
The application shows progress on morpho-functional tests.



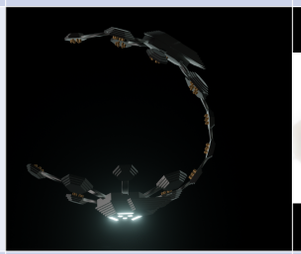
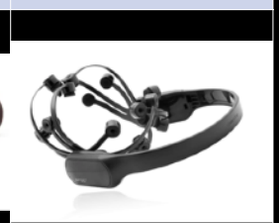






Competitors

The technique of directed neuroplasticity is unique.
The number of recognized mental commands is the largest in the world.

Company	REBIS LLC	NeuroMD	Neiry LLC	Neurosity Inc	InteraXon Inc.	Emotiv
						
Name	CortexGame + Hermes/Nero	«BrainBit NeuroFit»	MindTracker	Neurosity Crown	Muse	NeuroFit
Link	https://aicumene.com/	https://store.neuromd.ru/sistema-dlya-neirokorrekfii-brainbit-neurofit/?hash=1404_1230	https://neiry.ru/	https://neurosity.co/	https://market.yandex.ru/product--pribor-dlia-meditatsii-muse-s-gen-2-vtoroe-pokolenie/194414861422?sponsored=1&sku=102413012439&do-waremd5=5QcrNaJFbnsmd58Trl5mvc&uniqueId=723523	https://www.emotiv.com/
Cognition App	Yes	No	No	No	No	No
Gaming and remote control	30 mental commands	No	No	No	No	4 mental commands
Meditation App	Yes	Yes	Yes	Yes	Yes	Yes
Group gaming	Yes	No	No	No	No	No
Channels	8, 16, 32	4	4	8	4	5, 14, 32
Channel material	Gold-plated	Metal	Gold-plated	Silver-plated	Plastic+metal	Plastic
ADC	28	16	24	16	16	16
Connection	BLE 5.2	BLE 4.2	BLE 5	BLE 4.2	BLE 4.2	BLE 4
Price	$1.9K $3.5K	$2K	$1K $2K	$1.2K	$800 $2K	$1.5K

Competitors

- Openbci (https://openbci.com/) is an open source and open devices project with a focus on research activities. There is no solution for cognitive training and rehabilitation. There is no accurate recognizer of mental commands.

- NeuroSky (https://store.neurosky.com/) is a wearable two-channel device that cannot be used in complex control and rehabilitation systems.

- Natus Medical Incorporated (https://natus.com/products-services/EEG-aEEG-Electroencephalography) - stationary multi-channel solutions without a focus on gaming and cognitive training.

- G.Tec Medical Enginneering Gmbh (https://www.gtec.at/shop/) provides several devices (for rehabilitation and research): the wearable one has 8 channels, and the stationary one has 256 channels. Signal processing on a stationary PC, without the possibility of processing on the device, which makes the device server-dependent.

- Emotiv (https://www.emotiv.com/) - Multiple wellness and exploration devices. Evolving good software. No focus on cognitive training, no focus on gaming.

Competitive advantages

Московский инновационный кластер

1) The technique of directed neuroplasticity – a unique author's method of cognitive adaptable training in a game form.

2) Quality of device materials: ADC, electrodes, data transfer interface with own microcontrollers.

3) Brain commands recognition SOTA accuracy. At the moment, there are no devices that recognise such a number of mental commands and brain states.

4) There are no other devices that integrate with so many games as Rebis LLC.

5) There are no other devices capable of controlling complex games.

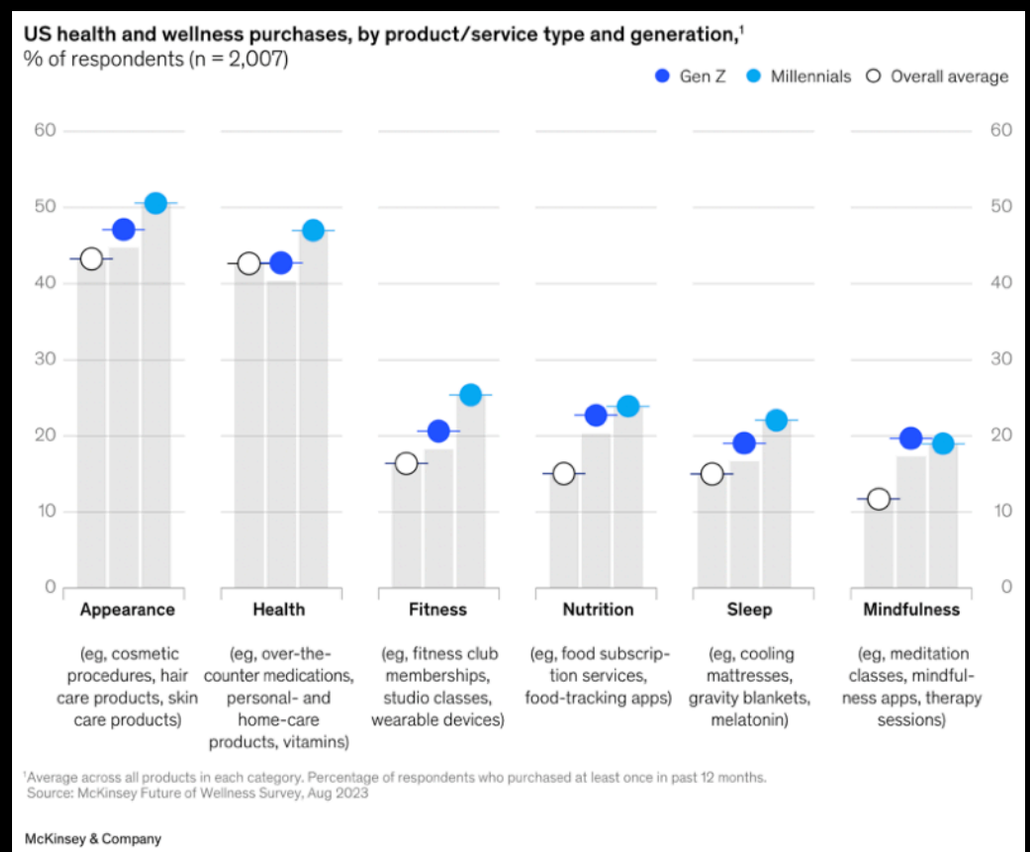
6) Design.

The target audience

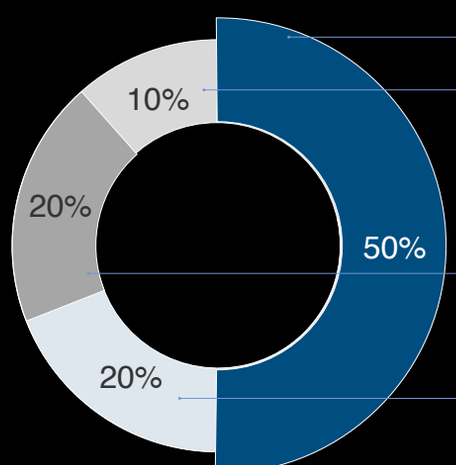
B2C:
- Gamers;
- People who want to enhance the cognitive abilities;
- People with special needs.

Generations: Millennials and Zoomers;
70% are male;
Tech and marketing;
Income: from 150k/yr.

B2B, B2G:
- sports centers and training centers;
- rehabilitation centers;
- companies.



Monetisation



Hardware:

50%

- Nero: $2K
- Hermes: $4k

Software:

20%

- CortexGame: subscription $1.5K/year.
- HyperCortex: $5K per course.

10%

Personal training: $30K

20%

Peripheral devices service
(IoT, Ai home automation, construction)

Market

CAGR: 16.7%

TAM

Market Size in 2022: USD 2.13 Billion
Market Size by 2032: USD 9.44 Billion

SAM

BRICS+ in 2023: 500 M $
BRICS+ in 2032: 1.500 M $

EU in 2023: 650 M $
EU in 2032: 2.300 M $

US and Canada in 2023: 800 M $
US and Canada in 2032: 3.500 M $

SOM

2026: 100 M $.
~10% of total SAM in 2032: 700 M $.

The potential presence

The Biggest market: North America.
The Top growing market: Asia and the Pacific.

The dynamics of the market development

2032 North American share of revenue: 40.1%.

Non-invasive interfaces prevail over invasive ones (such as Neuralink) and in 2032 will account for 81.3% of the revenue share.

Share of revenue from device sales: 63.4% of total revenue share in 2022. The trend will continue.

Share of revenue from the sale of software for neural interfaces: 37.6% of the total revenue share in 2022.

The medical segment will generate 47.4% of the total revenue in 2032.

Source:
Precedence Research. Brain Computer Interface Market Size, Report 2023-203 https://www.precedenceresearch.com/brain-computer-interface-market

Road Map

Q3 2022 - Q4 2023
Start

- MVP
- IP
- Lab testing.

Q1 2024

- TOP-100 Strong ideas.
- TOP-100 Hub71 Abu-Dhabi

Q2 2024

- Self-sufficiency.
- 50 devices.
- Skolkovo resident.
- TOP-10 AI awards BeeLine.

2024

- Self-sufficiency.
- 500 devices.
- 5,000 CortesGames App.
- MENA Market
- Clinical study.

2028

- Self-sufficiency.
- 100,000 devices.
- 100,000 Apps.
- IPO.

The Team

The project team consists of strong specialists in the field of medicine, mathematics, programming and robotics.
The team has experience in business, marketing and sales.
The team has world-class external expert surgeons.

Alexandra Bernadotte

Founder and CEO

System Architect, Data Analyst, AI specialist, system architect.

>30 scientific papers.

MD, PhD in Medicine, PhD in Mathematics (Moscow State University, HSE, Harvard University, Karolinska Institutet).

Experience in managing technological (Sber) and scientific teams 7+ years.

Ivan Menshikov

CTO
Development team leader.

Master's degree in Mathematics, MIPT.

5+ years of experience in managing a development team.

Pavel Gorbokonenko

Engineering team leader

Master of Nanotechnology.
Studied at MIREA.

15+ years of development experience.
5+ years of team management experience.

Software/Hardware development and data science team: 10 people.

The level of education is > bachelor's degree.

aicumene.com

Go Game and get Smarter

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