Использование нейроморфных технологий в интерфейсах “Мозг-Компьютер”

Добро пожаловать на нашу презентацию

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Kaspersky Neuromorphic AI

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КАКИЕ БЫВАЮТ НЕЙРОИНТЕРФЕЙСЫ

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СУТЬ ПРОБЛЕМЫ

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≠

Классический одноxват

Многохватный протез руки

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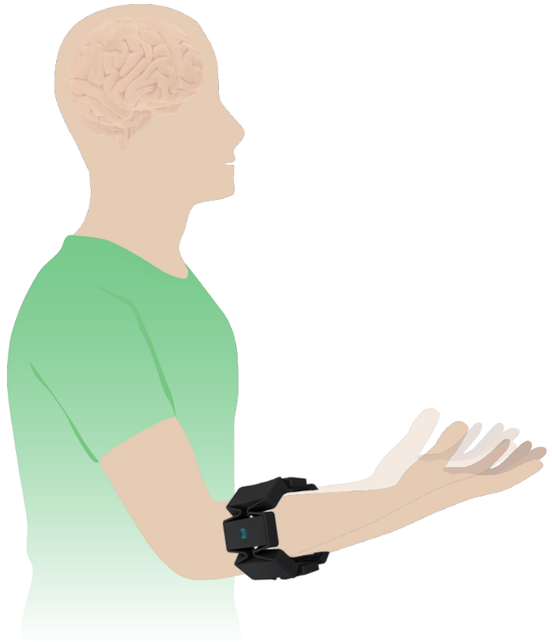
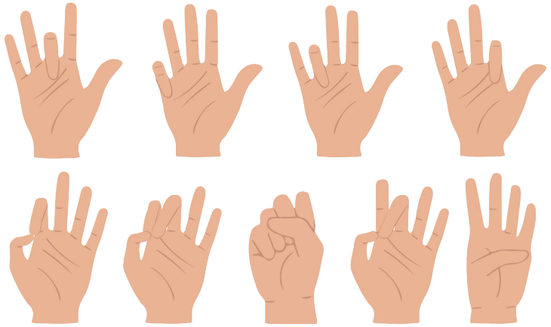
СБОР ДАТАСЕТОВ ПРИ ПОМОЩИ EMG БРАСЛЕТА

IMU & EMG БРАСЛЕТ



СБОР ДАТАСЕТОВ

ОТКРЫТАЯ ЛАДОНЬ



ТИПЫ ЖЕСТОВ

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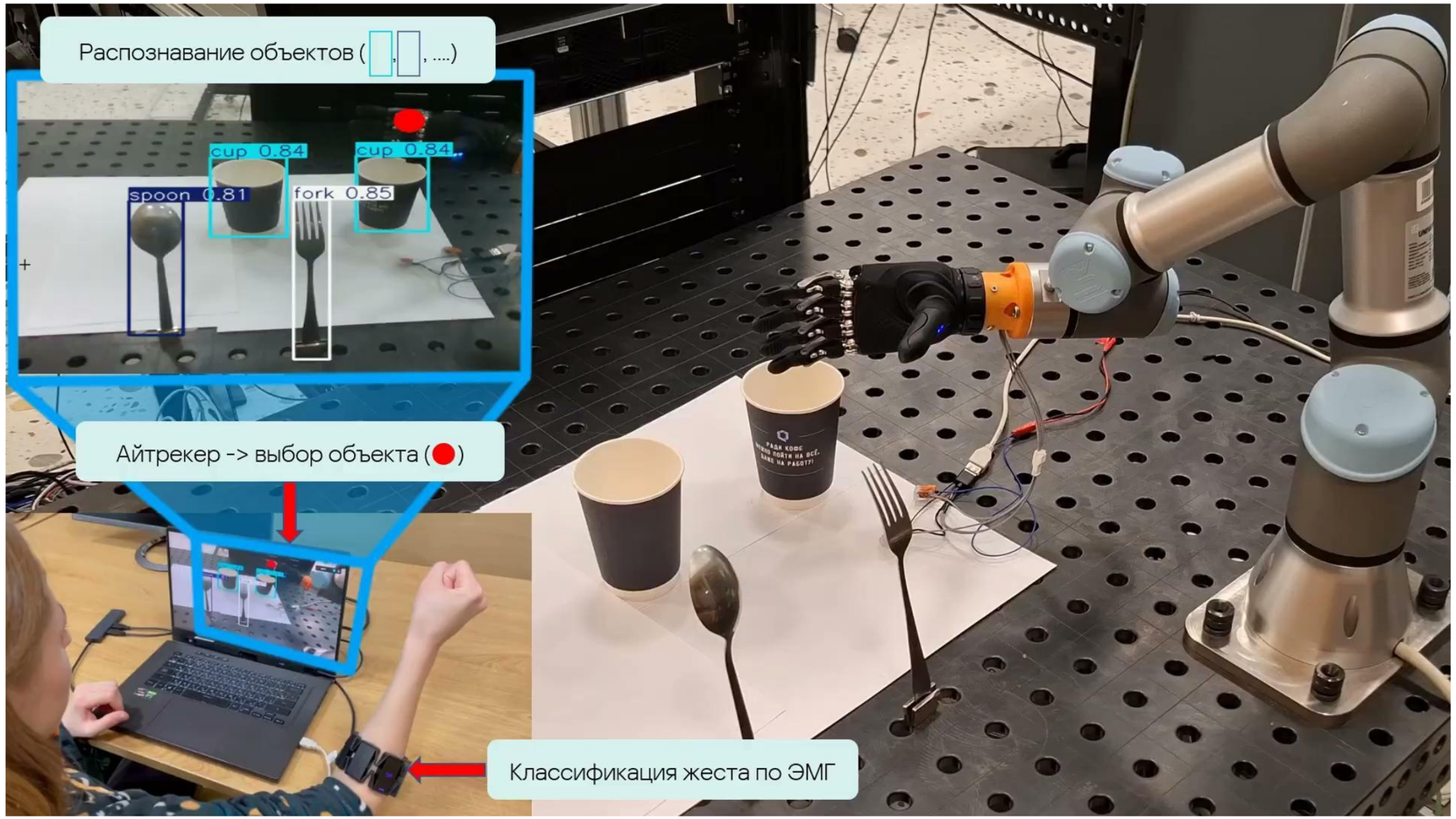
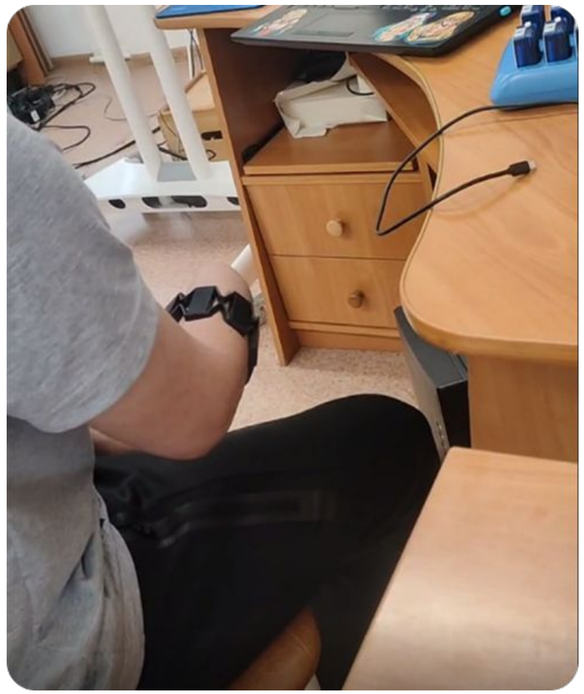
Видео


Распознавание объектов (, , ...)
cup 0.84
cup 0.84
spoon 0.81
fork 0.85
Айтрекер -> выбор объекта ( )
Классификация жеста по ЭМГ

ВЕДЕТСЯ РАБОТА



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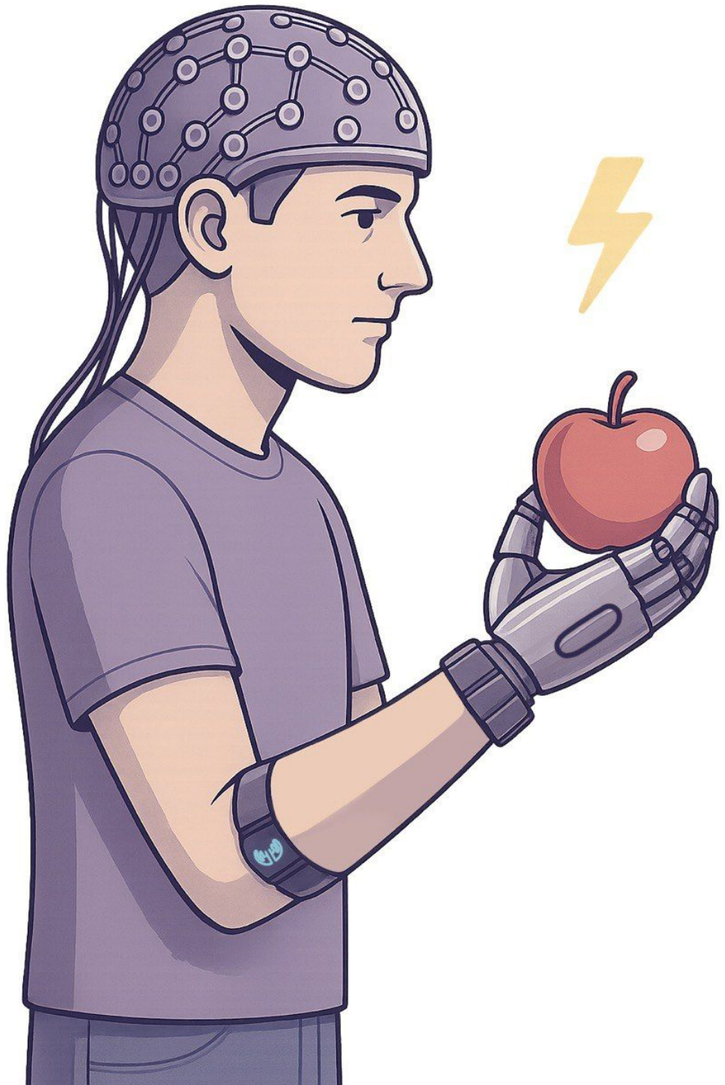
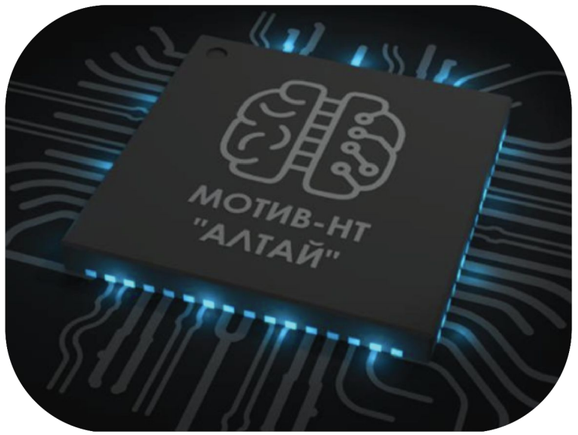
ПРЕДЛАГАЕМОЕ РЕШЕНИЕ





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Aim and goal

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Aim: To create an adaptive biohybrid system capable of **functional self-repair.**

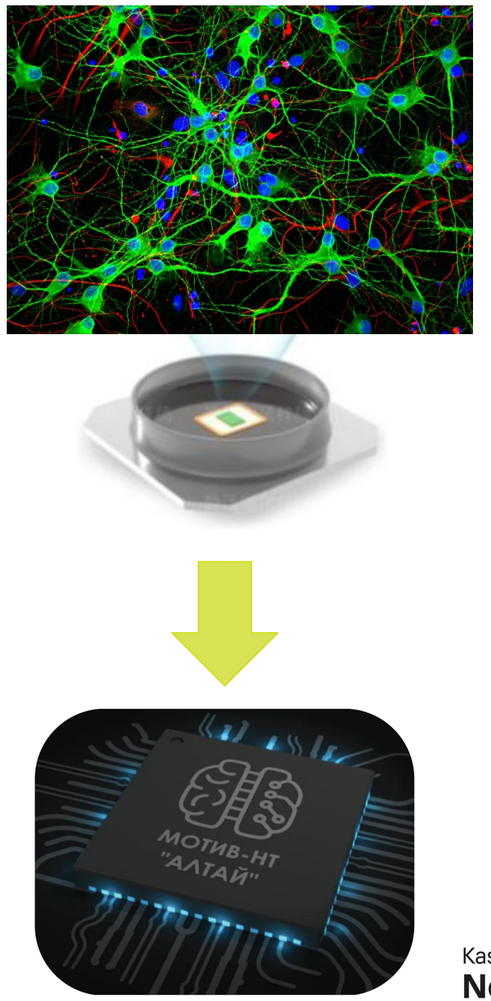
Build: Integrate living neurons with the "Altai-3" neuromorphic chip.

Train: Develop algorithms for adaptive network training to compensate for damage.

Validate: Demonstrate recovery of computational function after neuron loss.

Identify: Pinpoint genetic markers of controlled plasticity via scRNA-seq.

Scale: Advance from 2D cultures to 3D brain organoids.



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Experimental Platform: From Biology to Signal

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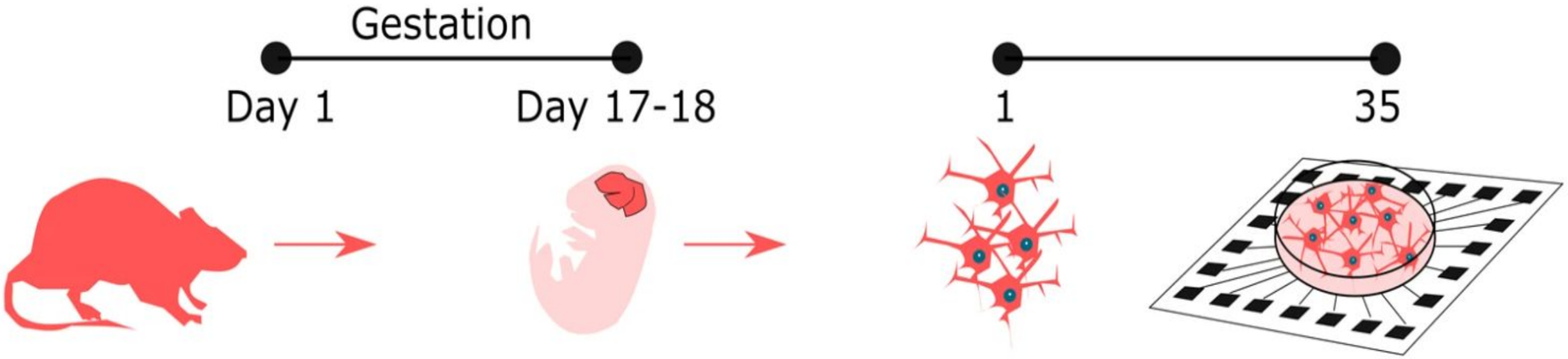
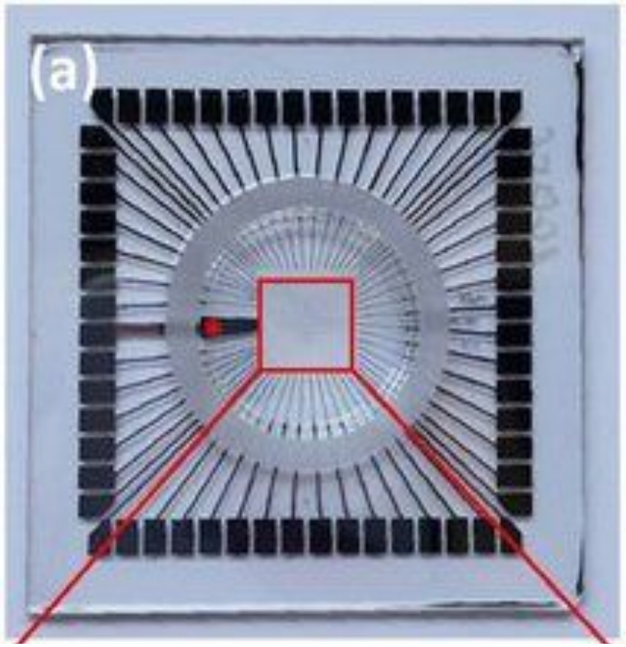
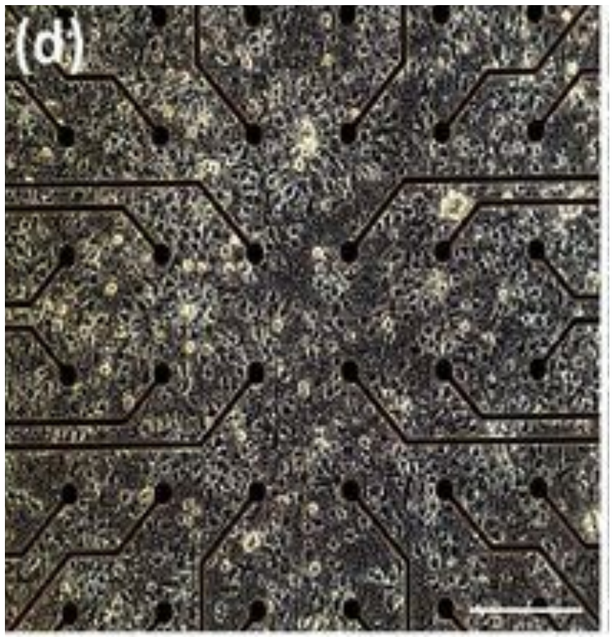


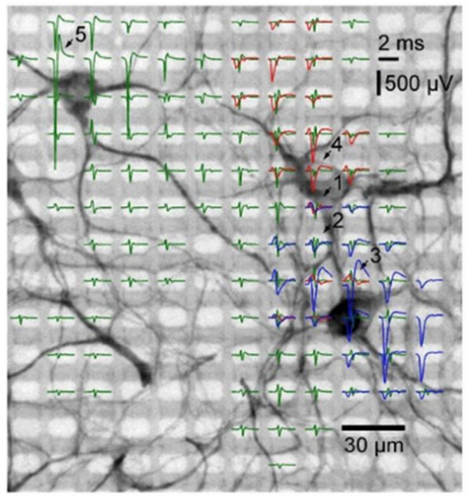
Rat embryonic cortical neurons



MEA



NEURONS ON THE MEA



HEATMAP MATRIX OF THE NEURON'S ACTIVITY

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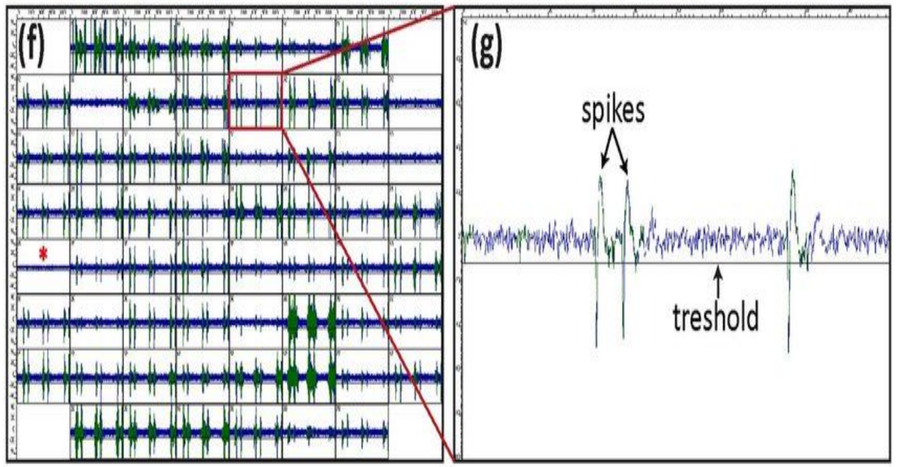
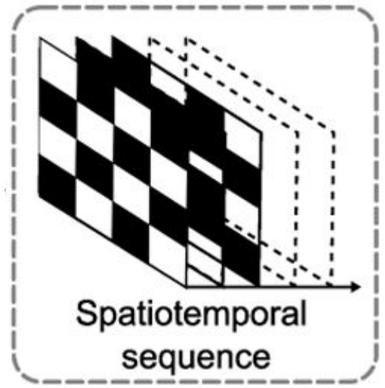
From Signal to Data

1. Spike Detection

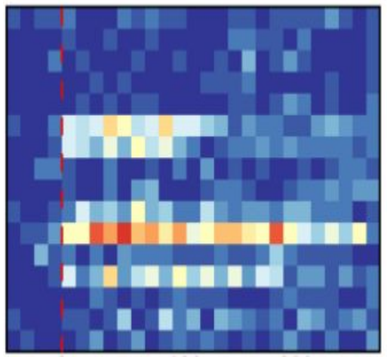


Raw spikes

2. Feature Extraction



Coding Matrix



Activity Matrix
(Heatmap)

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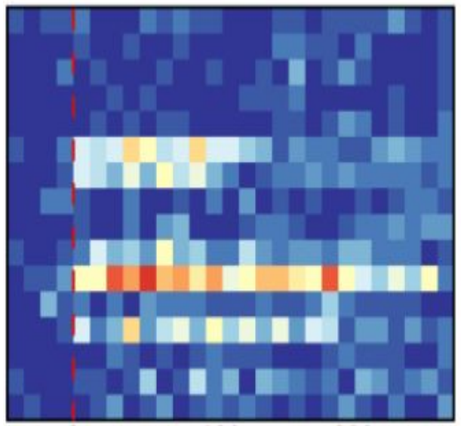
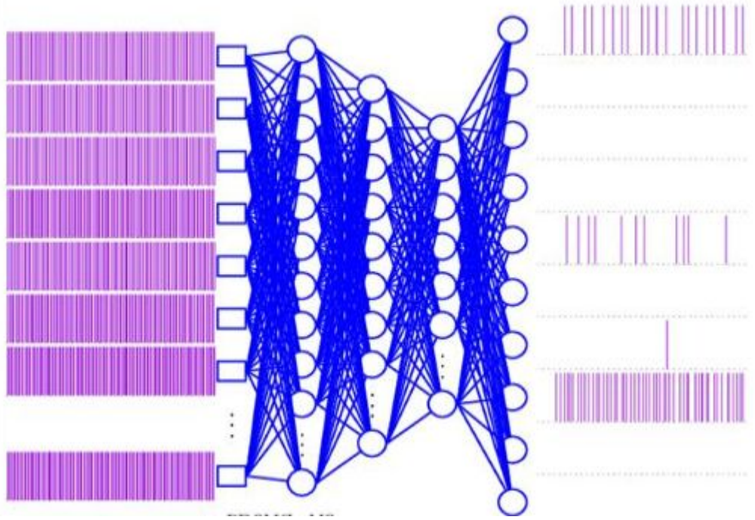
Neuromorphic Processing and Control

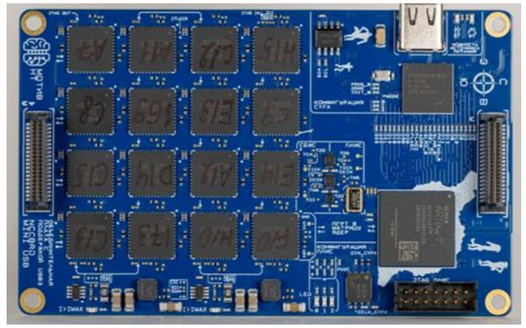
ANN2SNN



Activity Matrix (Heatmap)



Processing: Spiking Neural Network



Hardware: 'Altai-3' Chip

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Online learning

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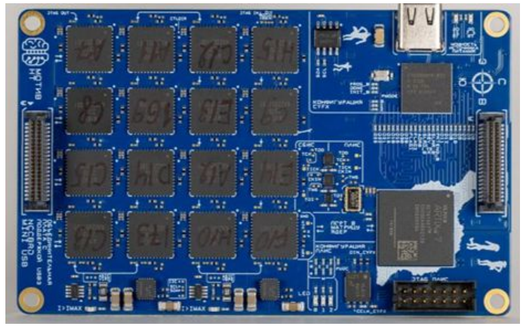
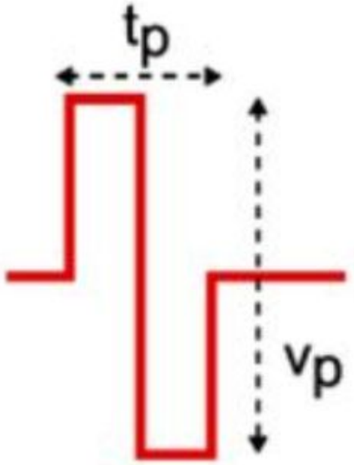
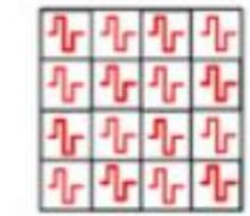
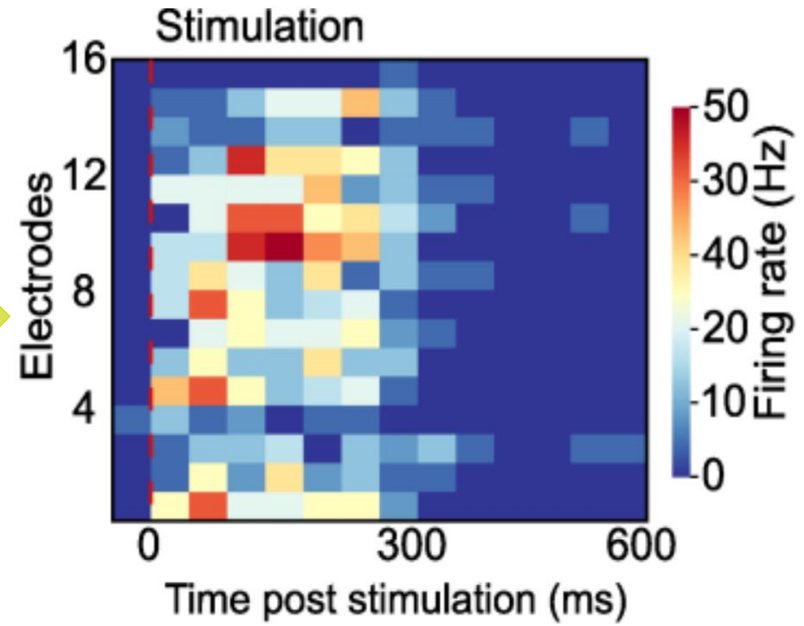
Starting of the back stimulation from the SNN working chip:



Constant online learning approach by the SNN







Stimulation of the neurons by parallel calculations during signal reading

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Transition to organoid training

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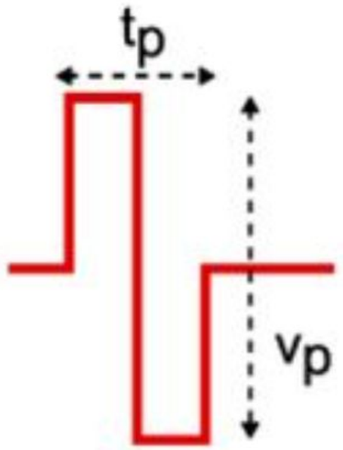
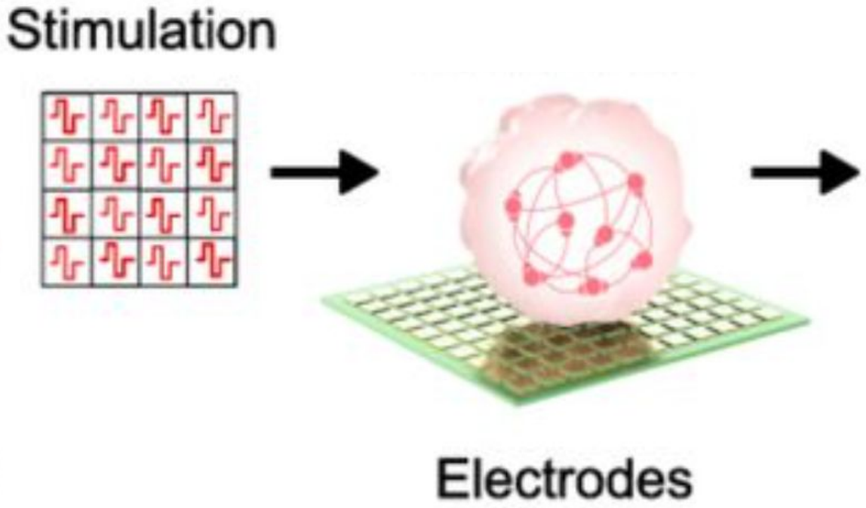
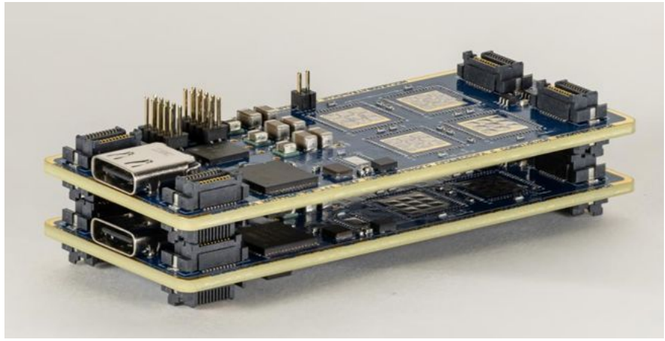
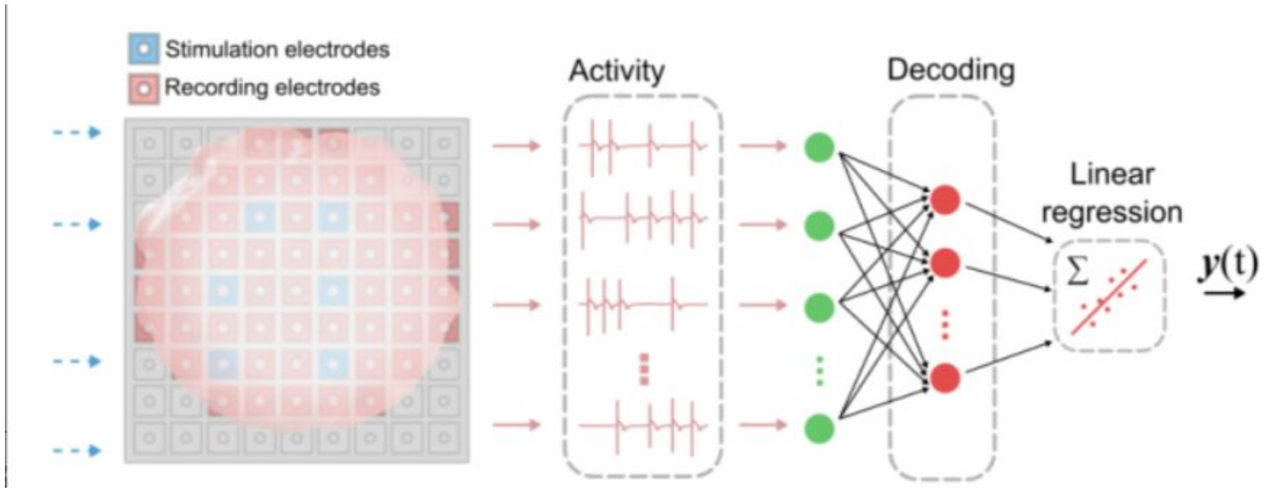
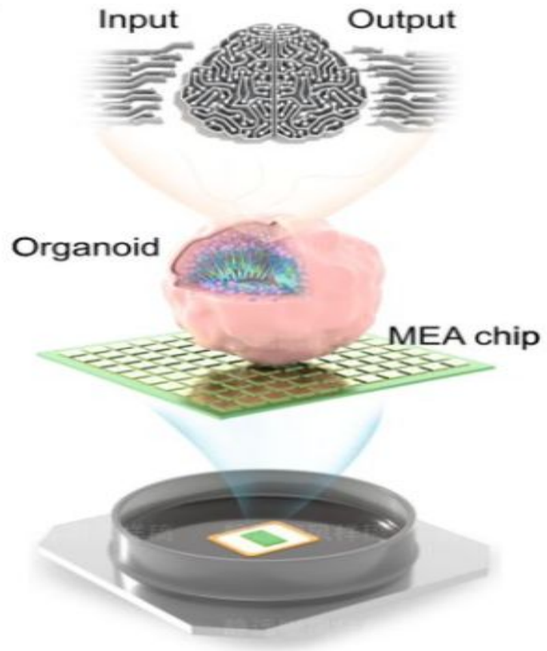


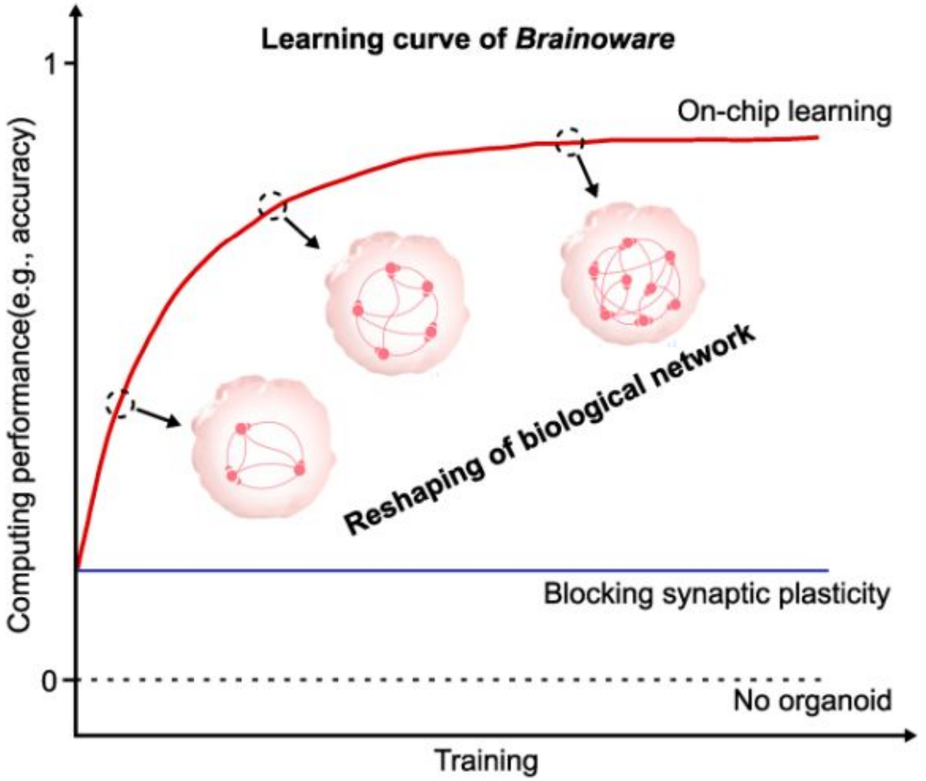


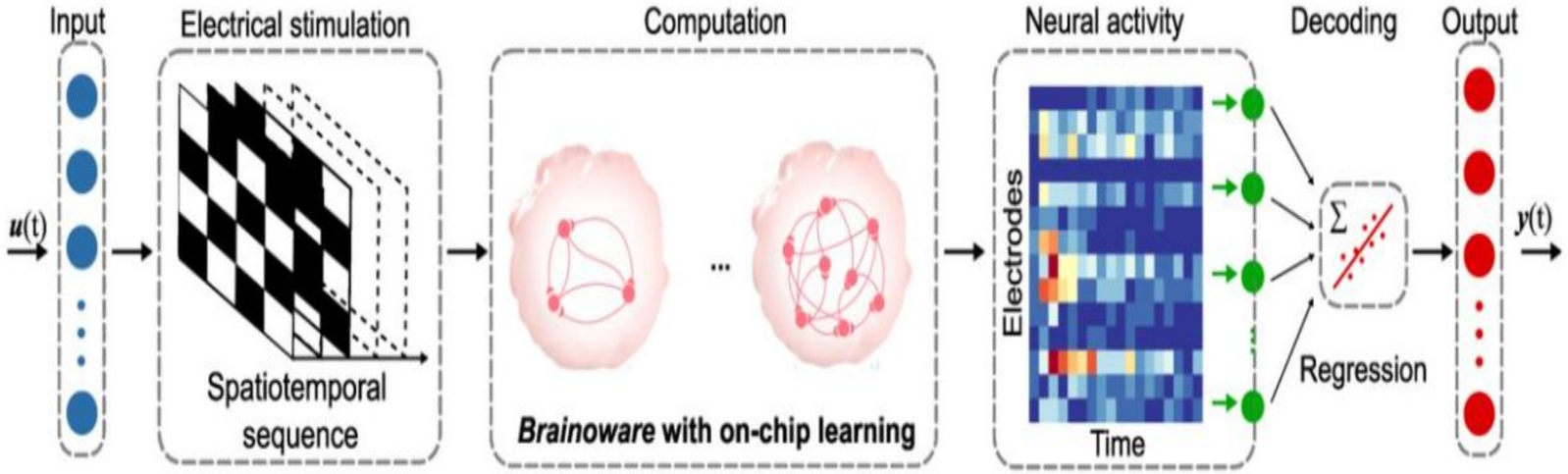


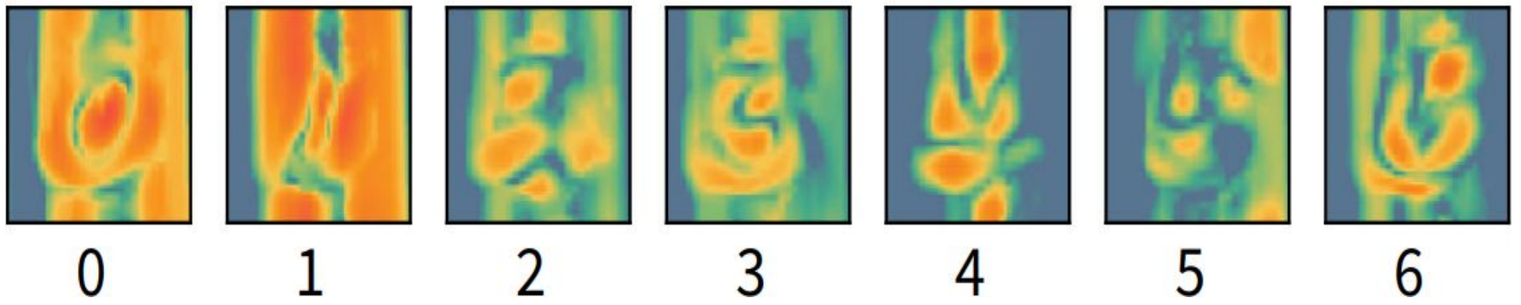




Expecting results: Constant solving of an issue







Brain organoids on MEAs can function as computational hardware (Proof-of-concept: Cai et al., 2023).

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Thx

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