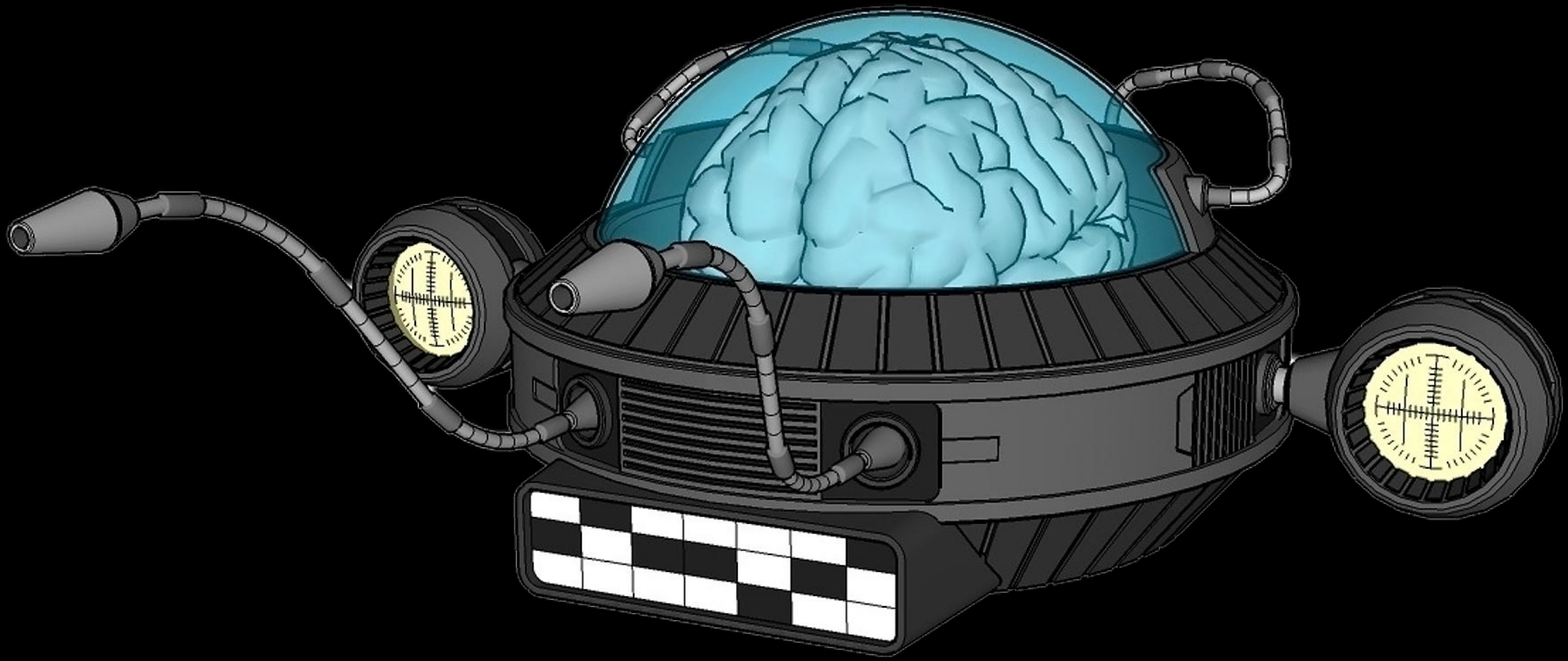
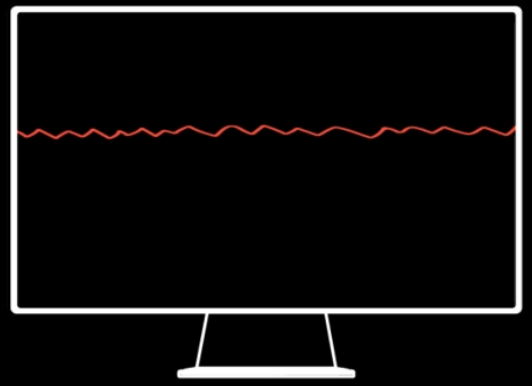
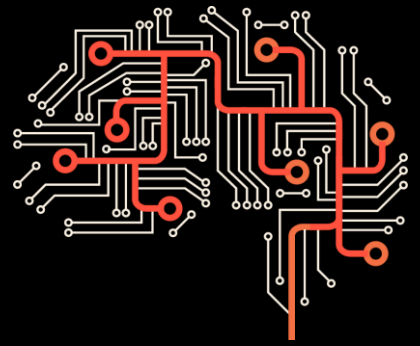


AI THAT LEARNS FROM THE HUMAN BRAIN



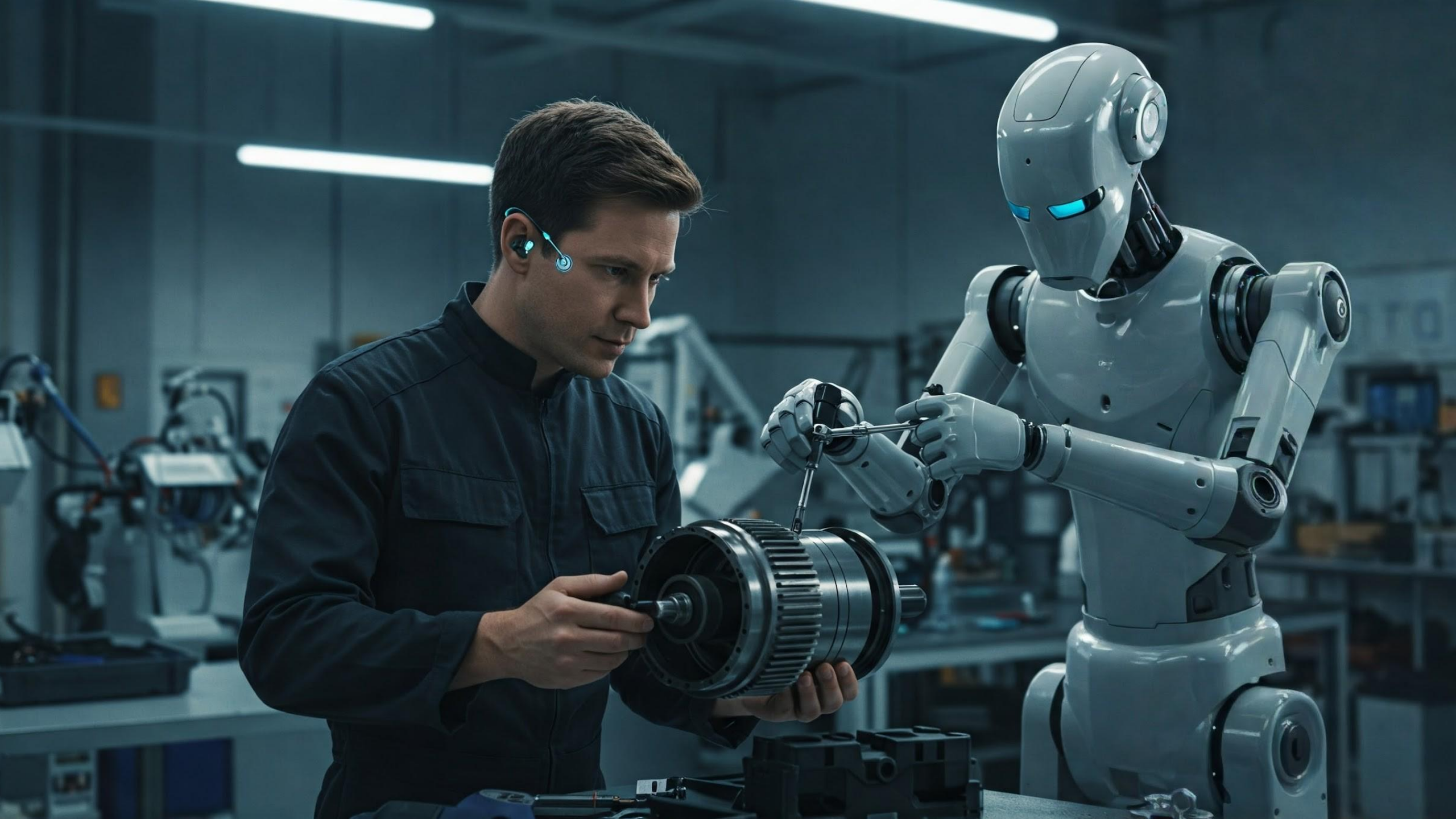


THE QUALIA PROBLEM

PASSIVE BRAIN-COMPUTER INTERFACE

Enables a machine to adapt to humans implicitly, potentially even without their awareness.

Zander, T. O., & Kothe, C. (2011). Towards passive Brain–Computer Interfaces: Applying Brain–Computer Interface technology to Human–Machine Systems in general. *Journal of Neural Engineering*, 8(2), 025005.

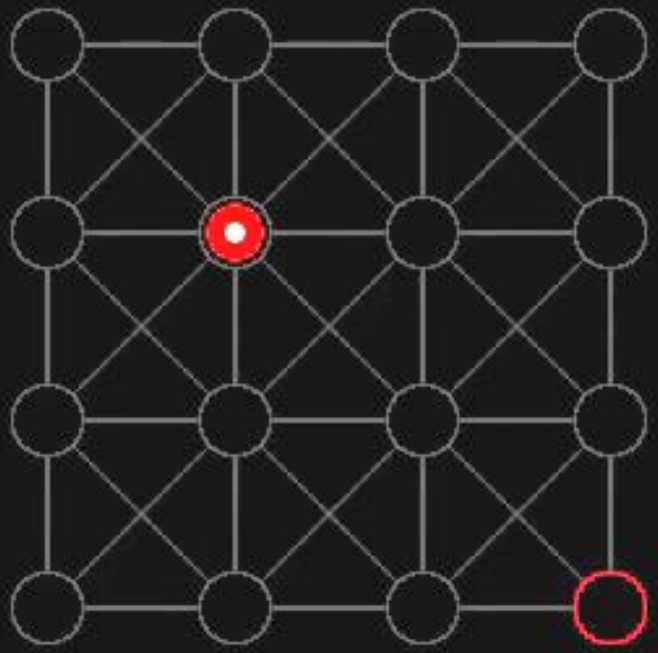


NEUROADAPTIVE REINFORCEMENT LEARNING

Multiple pBCI dimensions

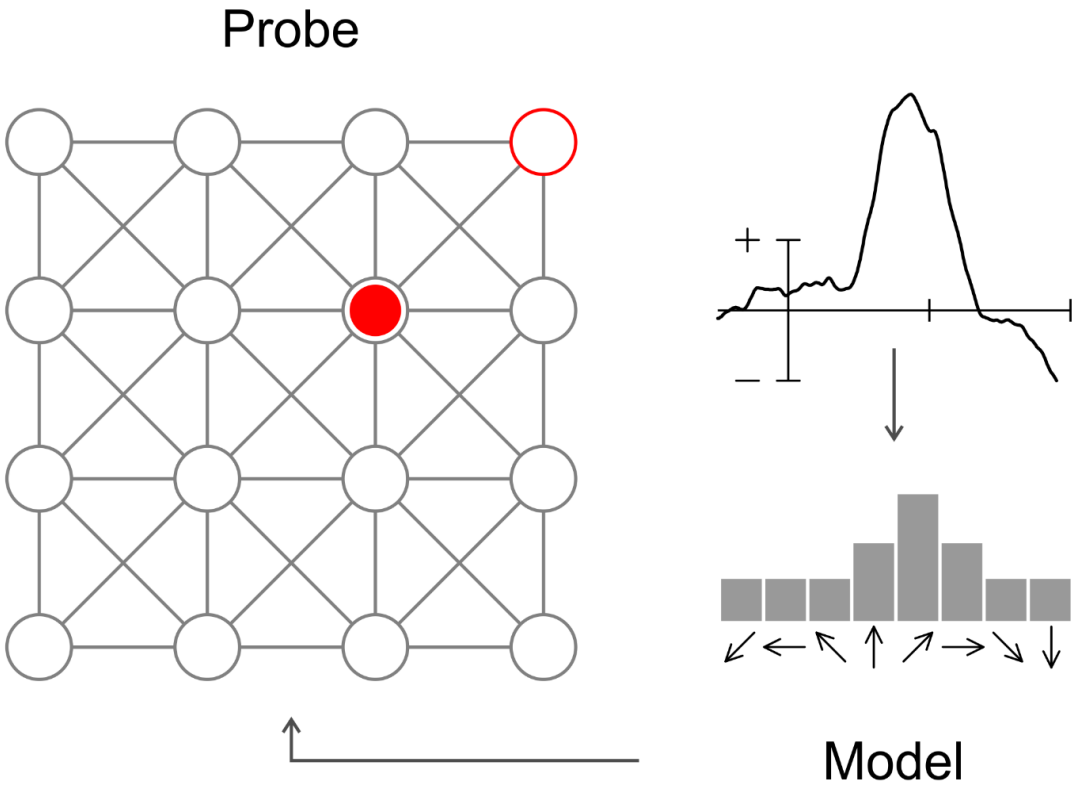
X_1 Level of surprise
X_2 Degree of error
X_3 Current workload
⋮ ⋮

IMPLICIT CURSOR CONTROL



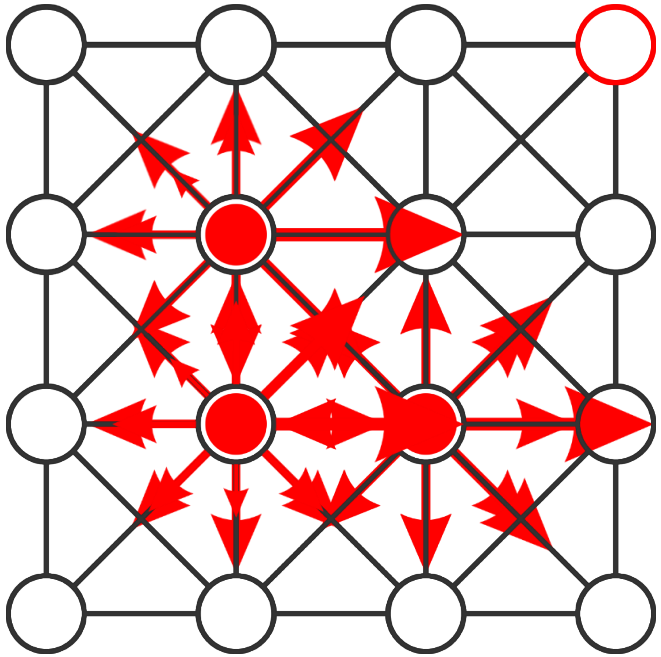
GENERATING A MODEL OF HUMAN PERSPECTIVE

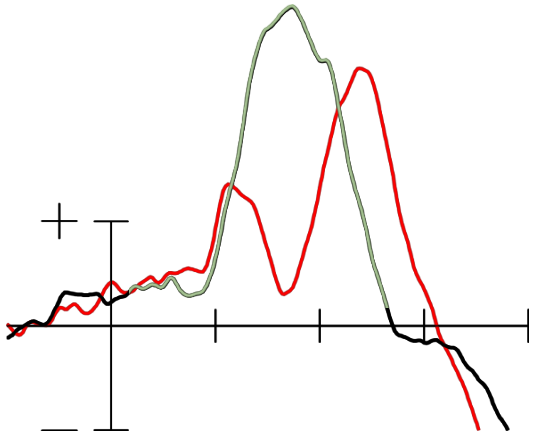
A model of directional preferences



NEUROADAPTIVE REWARD FUNCTION

Reinforcement learning with a brain-based reward function



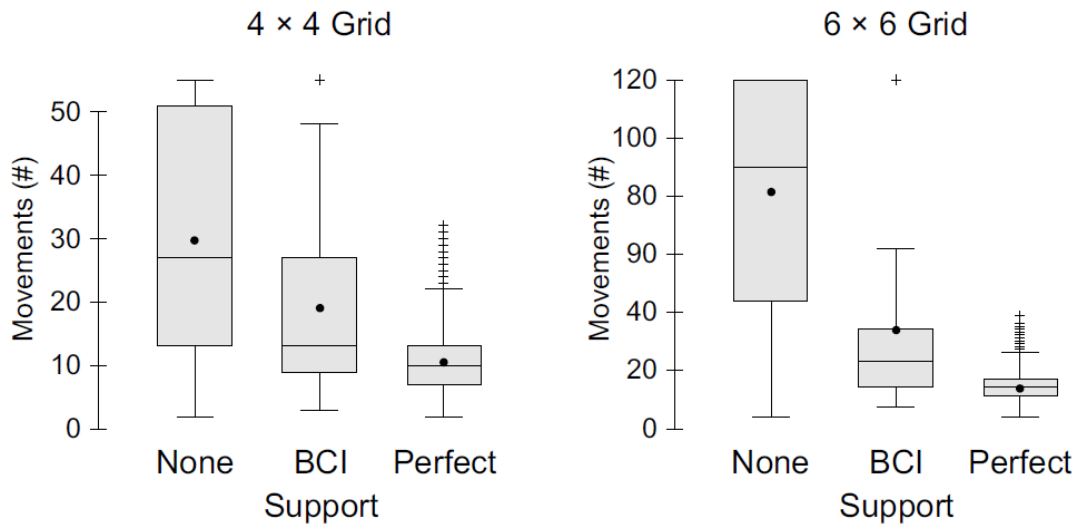


IMPLICIT CURSOR CONTROL

Replay:
11-6x6-4.csv

PERFORMANCE

Measure: Number of steps to reach a target



Median:	27	13	10	90	23	14

MAIN OBSTACLES FOR TRANSITIONING TO THE REAL WORLD

5-15 min

User training

The user learns how to generate appropriate control signals

10-45 min

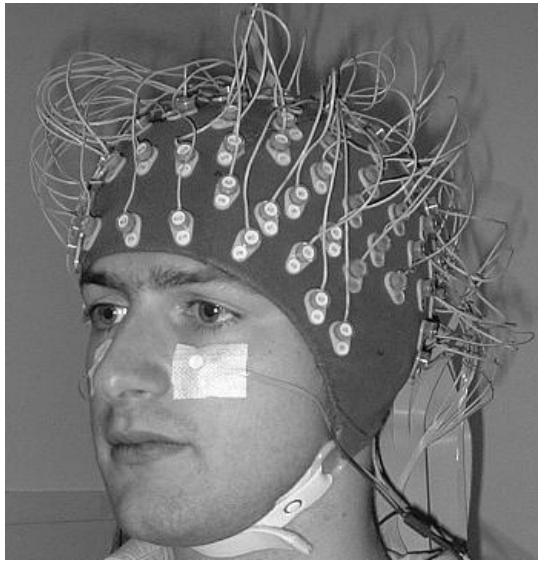
Machine training

The machine learns to detect these signals on labeled data

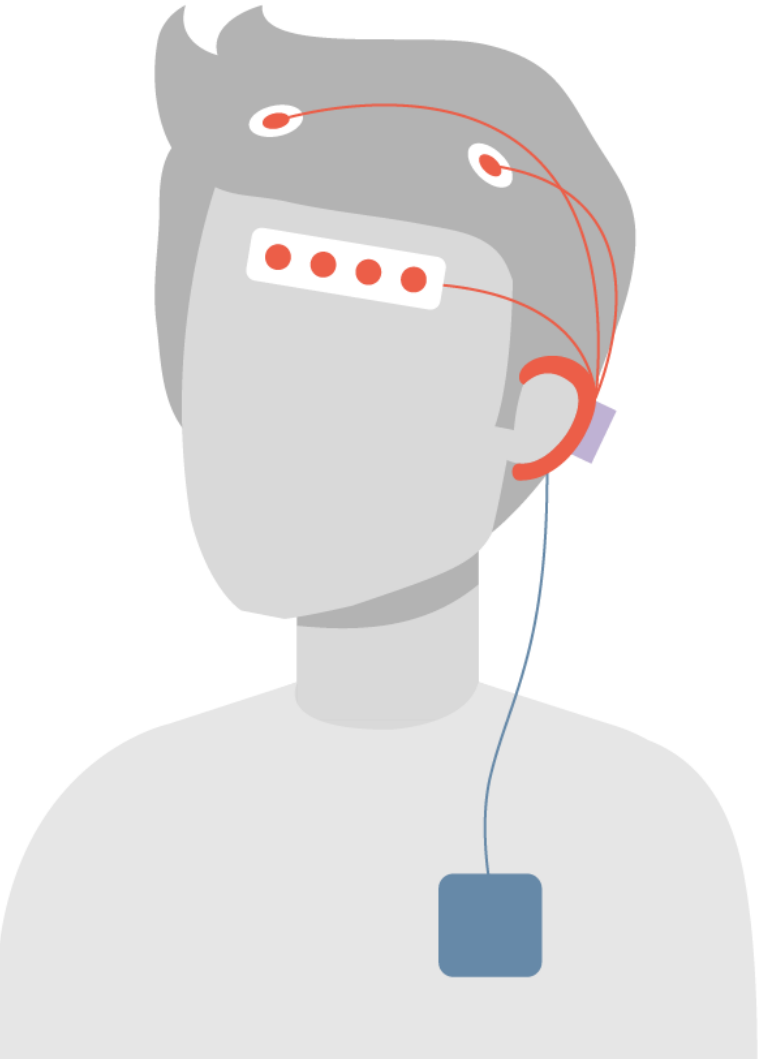
Long term

Application

The machine interprets the EEG data online



REAL-WORLD APPLICABLE HARDWARE



EEG

- → Unobtrusive
- → Modular
- → Self-applicable

Amplifier

- → Behind the ear
- → Miniaturized

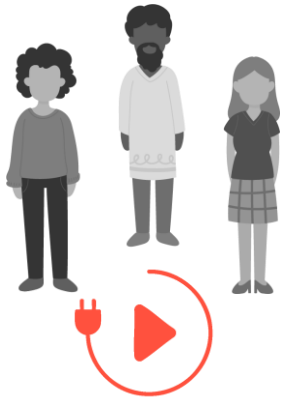
System-on-a-chip (SoC)

- → Digital signal processor
- → Artifact rejection
- → pBCI classifiers

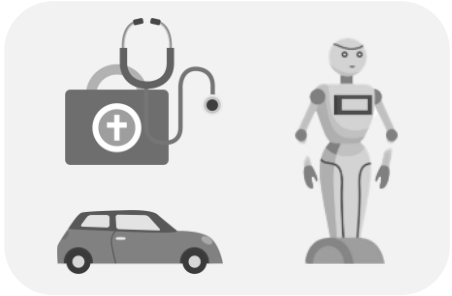
Zypher©

UNIVERSAL CLASSIFICATION

Generalize over large amounts of data



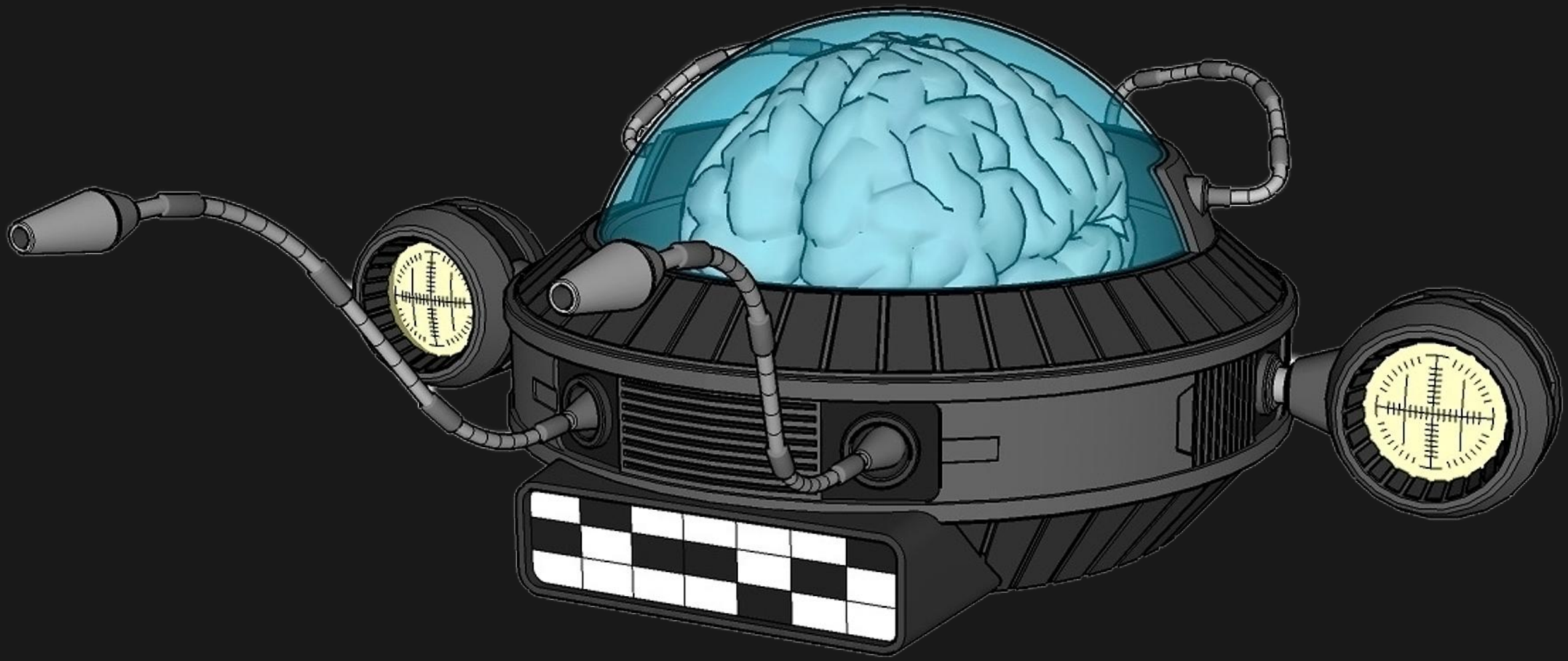
Plug & play application



Applicable in all contexts

Agnostic of sensor systems


CHANGING THE WORLD




THE FUTURE
IS YOURS