



# B-CRATOS

Design and implementation of  
HPC for training of new AI/ML  
models

**WP4**

# AI Module brain ↔ hand

How to **translate the signal from brain implants into commands for a prosthesis?**

B-CRATOS researchers from **LINKS** work on an AI module in charge of translating and relaying signals between the brain and a prosthetic hand (MIA hand) with artificial skin, **functioning both ways, in real time:**

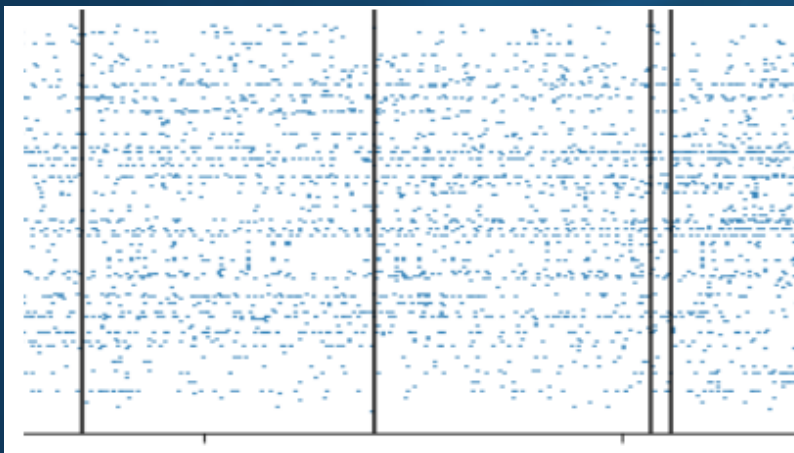
- **Brain to hand** (downstream): the data coming from the brain motor cortex implant is translated into commands for the hand.
- **Hand to brain** (upstream): the signal of the artificial skin and the hand is encoded, creating a perceptual model for closed-loop feedback to the sensory cortex stimulation implant.



# Brain to hand decoding

That said, how to do to get a signal from the brain “decoded” for the prosthesis? We can sum up three main steps of the process:

- The brain electrodes **pick up analogue signals** from large neuron populations;
- Post-processing is applied to **convert the signal to “spike-trains”**: multi-channel time series of binary data
- A decoding algorithm is applied to **convert the signal into a command** for the prosthesis, like “grasp”, “move” and so on.



Neural signal

Decoder  
→



Intended outcome

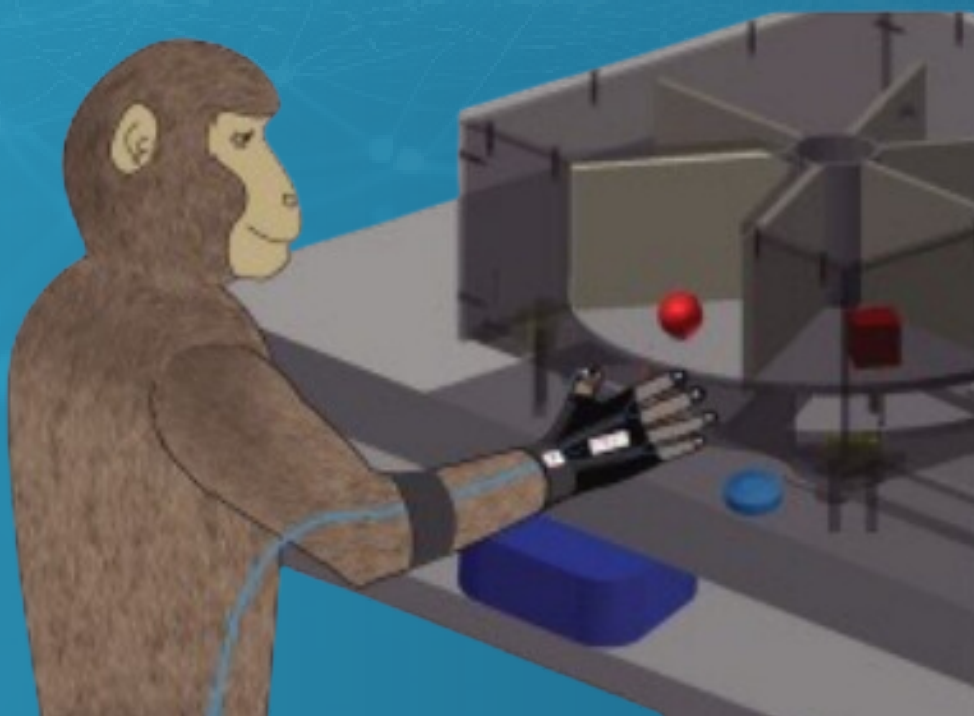
It might sound easy but...



not really!

*Does the signal belongs to a grasp action? Which kind?* **The algorithm should be able to determine it** and send the relevant command to the MIA hand prosthesis.

To do this we need data: **the algorithm needs to be trained**, which will be done on neural data collected from a monkey by a team at the **German Primate Center (DPZ)**.



The monkey will be trained to perform a grasping task, thus helping to gather crucial data.



# Hand to brain encoding

Let's say we managed to send a command to the brain and grab something.

Now, **how do we feel**, how do we know we *touch* something?

Thanks to its sensors, the **artificial skin** will transmit two parameters to the brain:

- position of the “touch”
- pressure

Then, the idea is to create a stimulation map for the brain. There will be hard limits to prevent pain.

This stimulation protocol needs to be **secured against hacking attempts**. It would be “read-only datas” so it can't be modified by a process.



To know more and follow our progresses, you can check our public reports!



- Design and implementation of HPC for training of new AI/ML models - preliminary report (month 12)

**[www.b-cratos.eu](http://www.b-cratos.eu)**