EBRAINS

Robotics | AI | Neuroscience | Computer science

Neurorobotics Platform

The only simulation platform that enables its users to choose and test the right brain model for their robots.

The Neurorobotics Platform (NRP) is an integrative **simulation framework**: it enables *in silico* experimentation and **embodiment** of brain models inside virtual agents interacting with **realistic simulated environments**. Testing procedures that can otherwise be difficult to implement on a physical setup - like testing of safety-critical situations or scenarios that could result in damage to the robot - can now be performed in the NRP without incurring any risk.

Drawing upon the potential of both **neurosciences** and **Artificial Intelligence** in robotics, the NRP allows its users to observe, analyse and test the **emergence of behavioural patterns** in virtual agents controlled by state-of-the-art models of brain architecture and functions. The result is an unprecedented approach to simulation in which theoretical brain models can be checked against data-driven models thanks to simulations that take into account the dynamics of both the environment and of the agent itself.

We believe that this approach is essential to develop novel robotic control technologies that are **robust**, **adaptable** and comparable **to biological systems**.

USERS

- **Neuroscientists** who want to test and refine their models of brain functions in closed loop experiments.
- **Roboticists** who strive to deliver on the promises of neuroscience-based embodied Artificial Intelligence.
- **Anyone** who believes that embodiment is the way forward for both brain research and robotics.

Human Brain Project

Co-funded by the European Union

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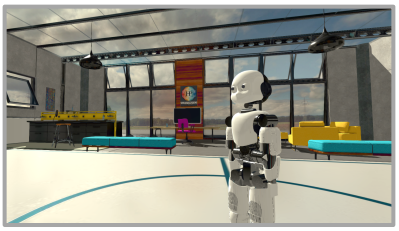
FEATURES

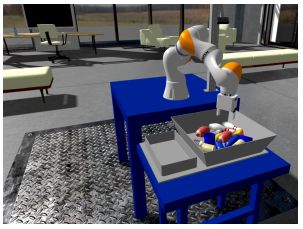
- ✓ Open source and open access.
- ✓ Fully customizable models and environments.
- ✓ High performance computing resources available for experiments online.
- ✓ Ready-to-use model library: from rigid/body robots to compliant tendon-driven robots and musculoskeletal simulations.
- ✓ Multiple simulators (e.g. NEST, TensorFlow, Nengo) support brain simulations with spiking neurons, controllers synthesized through deep learning, custom hybrid controllers, etc.
- ✓ Interoperability with HBP model repositories.

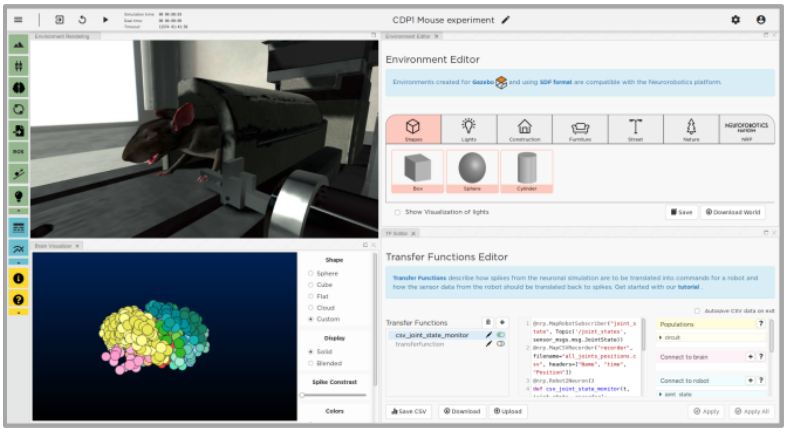
TECHNOLOGY READINESS LEVEL

1 2 3 4 5 6 **7** 8 9

Examples of experiments implemented on the NRP







APPLICATIONS

***In silico* neuroscience**, to improve and refine novel models of brain architecture and functions.

Cognitive robotics, i.e. robots with enhanced contextual awareness and decision-making capabilities for use in autonomous exploration (deep sea, space), search and rescue in disaster areas, and more.

Testing and verification of robotic behavior, even under safety-critical situations.

Co-design of robotic body and controller for advanced robotics.

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