

Augmenting the Brain and Nervous System with Self-Learning Artificial Networks for Rewiring Neural Circuits

This technology offers a system for restoring or enhancing neural function by inducing new neural connections in the nervous system of a subject that directly records and/or stimulates the brain. The computing device implements self-learning deep recurrent neural networks as the two artificial networks.

What is the Problem?

The human brain is one of the world's most powerful autonomous computers, but nevertheless remains a fragile organ that can be difficult to train and repair. The parallel functions of and similarities between the brain and typical silicon computers have prompted considerable interest in the field of brain-computer interfaces. Brain-computer interfaces may be able to address some of the limitations of the human brain as well as bolster the understanding of an organ with many functions and operations that remain to be understood. Specifically, the computational capabilities of biological neural networks and silicon computers are complementary. For example, human brains commonly transfer information with computers through normal sensory and motor channels. However, transferring information through direct recording of neural activity and electrical stimulation of brain sites is much more challenging.

What is the Solution?

The solution is a system for restoring or enhancing neural function by inducing new neural connections in the nervous system of a subject. This consists of a stimulating component coupled to a computing device. The stimulating component is implanted within or worn externally by a subject and is configured to receive a stimulation pattern and stimulate the first region of the nervous system based on the received stimulation pattern to induce a behavioral output from the subject. This behavioral output could be a motor function, a sensory function, a memory function, or another function that is intended to be restored or enhanced. The computing device implements self-learning deep recurrent neural networks as the two artificial networks. The first artificial network receives inputs associated with the nervous system, generates the stimulation pattern based on the received inputs, and outputs the stimulation pattern to the stimulating component. The second artificial network receives the stimulation pattern and predicts the behavioral output from the subject. The computing device can further generate an error signal based on the induced behavioral output and the predicted behavioral output and adjust parameters of the first artificial network based on the error signal.

Technology ID

BDP 8695

Category

Device/Other

Selection of Available

Technologies

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What Differentiates it from Solutions Available Today?

Recent advances in interface technologies, computing systems, and the understanding of the human brain have sparked new investigations into the potential of brain-computer interfaces that directly record and/or stimulate the brain. These remain investigational and can have inconsistencies with the expected output and the induced output. This system can adjust parameters based on an error signal, allowing for alignment of the expected and induced behavioral output.

Patent Information:

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