

# Deep Reinforcement Learning Method for Shaping Neural Activity and Augmenting or Restoring Neural Function

**This technology offers augmented or restored brain and nervous system function by adaptively transforming neural signals from one area to stimulate another area of the nervous system to achieve a rehabilitation outcome in stroke survivors.**

## What is the Problem?

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Approximately 700,000 people in the United States suffer a stroke each year, and a large proportion of those people suffer motor or other deficits as a result. Current rehabilitation approaches lead to limited recovery of function, and there have been few developments of novel and effective pharmacological or surgical options for rehabilitation. Nevertheless, recent advances in neural technologies 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. Using these recent advances in neural technologies for stroke recovery poses an interesting challenge and opportunity.

## What is the Solution?

The solution is a method for augmenting or restoring brain and nervous system function by adaptively transforming neural signals from one area to stimulate another area of the nervous system to achieve a desired functional outcome. The method uses deep reinforcement learning to transform specific patterns of neural activity from an area being recorded to appropriate stimulation patterns in another area in the nervous system. By delivering appropriate activity-dependent stimulation patterns and solving the “temporal credit assignment” problem, the method can be used for steering neural activity to desirable future neural states or behavioral outcomes and promoting neuroplasticity between artificially connected neural regions. This rewires brain regions and other regions of the nervous system for achieving desired outcomes. The innovation can be used for both neurorehabilitation after neurological injury and/or disease, as well as augmentation of natural human function.

## What is the Competitive Advantage?

### Technology ID

BDP 8698

### Category

Device/Other

Selection of Available

Technologies

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Current rehabilitation approaches lead to limited recovery of function, such as physical therapy. This method retrains the brain such that the patient will regain the ability to control their limbs after a stroke, or other neurorehabilitation enabled benefits.

### **Patent Information:**

[US20230137595A1](#)

### **References**

1. Rajesh P. N. Rao(2021) , <https://arxiv.org/ftp/arxiv/papers/2012/2012.03378.pdf>, Handbook of Neuroengineering