Functional loss of limb control in individuals with spinal cord injury or stroke can be caused by transection of descending and ascending pathways those connects cortical to spinal network, although neural circuits above and below the impaired site remains their function. An artificial neural connection that bridges the lost pathway has potential to restore the functional loss. I will show an artificial neuronal connection that bridges supra-spinal system and spinal network beyond the lesion site restore lost function. The artificial connection was produced by a brain-computer interface that can detect the neural activity and converted in real-time to activity-contingent electrical stimuli delivered to nervous system. A promising application is to bridge impaired biological connections, as demonstrated for cortically controlled electrical stimulation to a spinal site. Our results document that monkey utilized artificial connection to restore hand function, instead of physiological connections. A second application of the artificial connection is the volitional walking can be restored by muscle-controlled non-invasive magnetic stimulation to lumbar spinal cord in human. Subject could initiate, stop walking and change the step cycles volitionally through artificial connection. These paradigms have numerous potential applications, depending on the input signals, the computed transform and the output targets.