Title: Synergy-based Control of Hand Prosthetics and Exoskeletons
Indian PI: Dr. Nayan M. Kakoty, Professor, Tezpur University, India. PI in the grand project on collaborative robotics for rehabilitation in the I-Hub Foundation for Cobotics (IHFC), India.
US PI: Dr. Ramana Vinjamuri, Assistant Professor, University of Maryland, Baltimore County, US. PI on NSF CAREER Award titled Synergy-based brain-machine interfaces.

Amputation or paralysis in upper limb has a catastrophic impact on the social and professional lives of individuals all over the world. For such individuals, electromyogram (EMG) controlled prosthetic hands and exoskeletons are promising for partial recovery. However, control of higher degrees of freedom (DoF) in hand prosthetics and exoskeletons to bring near natural functionality is still a great challenge. In this project, the concept of synergy has been proposed by the US PI (Vinjamuri) as an intelligent motor control paradigm to mimic the hand functionality in prostheses and exoskeletons. Accordingly, a computational model of the neural circuit of the cerebellum and basal ganglia primarily responsible for human hand control, has been developed by the India PI (Kakoty). A preliminary validation of the model was performed using human hand synergies and electroencephalographic (EEG) cortical activities. The computational models derived as part of this collaborative project will enable near natural function of the prosthetic hand called ENRICH developed by the India PI (Kakoty) and hand exoskeleton called HEXOES developed by US PI (Vinjamuri).

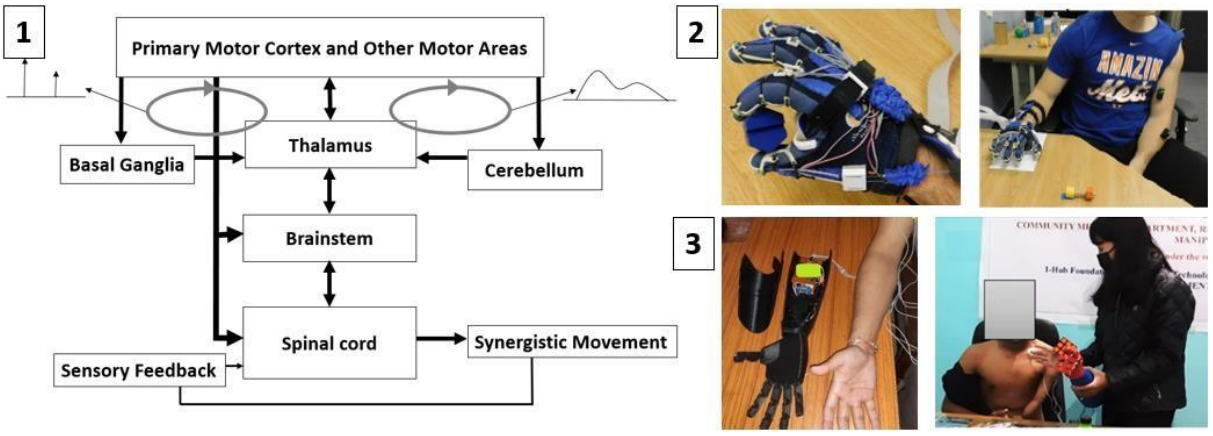

Fig.1. (1) At the core of this work is the formulation of a new biomimetic computational model of synergy-based movement generation by neural modeling of cerebellum and basal ganglia. (2) Validation in control of a hand exoskeleton (HEXOES) developed by the US PI (Vinjamuri) (3) Validation in control of a prosthetic hand (ENRICH) developed by the India PI (Kakoty).