**Title:** Advanced BCI enhanced real-time shared control of wearable exoskeletons for rehabilitation and human assistance applications

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**US PI**: Prof. Jingang Yi, Professor, Rutgers University

The joint project involves BCI for brain-hand connection and hand exoskeleton to provide exercise to enhance recovery from the India side while the US side has BCI to make brain-leg connection to reduce delays (via intention detection) and leg exoskeleton to provide support for construction workers. The project has progressed well and BCI to detect user intent to move (open/close ) hand , based on visual cue paradigm has been completed. The BCI provides  an I/O signal to the exoskeleton controller (thinking / not thinking correctly) while the controller used impedance control to actuate the hand exoskeleton. US side would develop a dynamic model of finger closing – opening as well as  apply machine learning methods to operate the exoskeleton in place of impedance control. The US side has a knee exoskeleton and its controller would be interfaced with a BCI system to detect user intent to move and it would also be fused with other sensory feedback. India side would provide the BCI-based intent detection system for reducing the delays for the human-exoskeleton actuation.
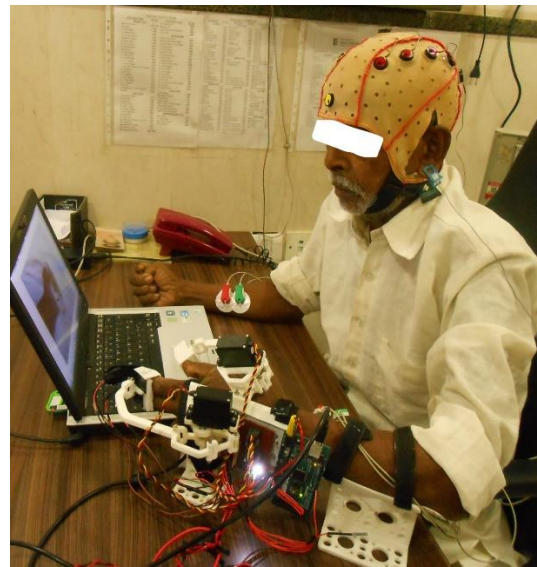


Fig. 1. Knee exoskeleton (US PI)



Fig. 2. Hand exoskeleton (Indian PI)