Modular, Full-Body Exoskeleton

An integrated modular, full-body exoskeleton system designed to enhance overall mobility, consisting of lower limb assistance with variable stiffness, a flexible spine for natural movement, an adaptable lower limb exoskeleton with soft actuators, and a lightweight upper limb exoskeleton featuring a single motor and gimbal-style mechanism.

Collectively provides comprehensive and customizable mobility solutions for individuals with physical disabilities or conditions, fostering independence, rehabilitation, and improved daily life activities.

Utilizing advanced materials and a compact control system, it aims to significantly improve mobility and comfort at an affordable cost, potentially revolutionizing home-based rehabilitation and assistance.

Efficient Control and Lightweight Design: Smart control mechanisms, such as advanced gyro-accelerometers for overall motion tracking, combined with lightweight materials like PLA, TPU, PETG, and carbon fiber minimize complexity, allowing for practical daily use and effective rehabilitation.

Adaptability and Adjustability: System offers adaptability through modular design, accommodating various body types and sizes, while adjustable components such as length, stiffness, and joint positioning cater to individual user needs.

Cost-Effectiveness: By leveraging 3D printing and affordable materials, this exoskeleton offers an accessible solution, potentially reducing the financial burden of assistive devices.

Rehabilitation and Physical Therapy: Assists individuals recovering from spinal cord injuries, strokes, or other traumatic incidents, offering targeted support during the recovery process in regaining mobility and strength.

Activities of Daily Living (ADLs): Supports users in performing essential tasks such as walking, standing up, and sitting down, enhancing their independence.

Chronic Condition Management: Helps elderly individuals with chronic conditions maintain mobility and quality of life, reducing the risk of complications related to inactivity.

Home-Based Assistance: Provides a practical solution for long-term home use, potentially reducing the need for constant caregiver support and promoting a more self-sufficient lifestyle.

Fig 1. Hip Exoskeleton
Fig 2. Upper Limb Exoskeleton
Fig 3. Combined Knee and Hip Exoskeleton