



# Remotely Operated Reconfigurable Walker Robots for Eldercare



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<https://darbelofflab.mit.edu/nri-eldercare/>

Over 600,000 elderly people have died of COVID-19; older adults comprise approximately 3 out of 4 COVID-19 deaths. In-person care at home and nursing facilities has been severely impacted, with patient isolation resulting in mental and physical disorders, and even deaths. This project aims to transform in-person care to remote interactive care based on tele-robotics and human-robot systems supported by clinical evaluation.

### Challenges

- Provide older adults with support for activities of daily living without the physical presence of caregivers.
- Balancing and mobility support: develop a novel reconfigurable robot design for safely supporting the body within a confined space.
- Technology acceptance and engagement: a robotic caregiver must gain a cooperative attitude from older adults in assisting them.

### Scientific Impact

- Model, analyze, and predict the effectiveness of physical aids on musculoskeletal and cognitive functions of older adults.
- Predict and assess human balance and prevent a fall.
- Guide and engage an older adult through verbal and physical interactions and estimate his/her mental state in cooperating with a robotic aid supervised by a remote caregiver.

### Approach, Innovation, Contributions

- Develop a reconfigurable robot that can provide older adults with a support beam (“handrail”) in a spatial location that is most effective for augmenting physical strength and balancing function.
- Human gait is complex, governed by hybrid dynamics.

We aim to establish a global, unified dynamic model based on Dynamic Mode Decomposition to characterize gait stability and predict risk of a fall.

- Establish a stochastic model for estimating the mental state of an older adult by observing responses to physical and verbal cues.

### Impact on Society

- Pandemic-resilient eldercare technology will allow us to deliver needed care safely and effectively to older adults at home and nursing facilities.

### Education and Outreach

- Workforce development: Training of caregivers, care managers, and home care service providers.
- Educate technology leaders and users in remote eldercare and telemedicine.

### Quantifiable Broader Impact

- Reduction of disrupted care services and extended isolation cases of older adults due to pandemics and other factors impacting in-person services.
- The subscription number of workforce development training courses.

