

# Upper-Limb Prosthetic Control Using Wearable Sensors

## Overview

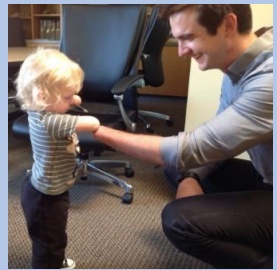
Due to the nature of the residual upper-limb of trans-humeral amputees, a reliable physiological signal source to facilitate prosthetic control for upper limb amputees has been viewed as a challenge.

Since its early adoption in the 1940's Electromyography (EMG) has been seen to be the most used non-invasive physiological sensor used in Upper-Limb prosthetics. In this research we aim to overcome the limitations of EMG in physiological signal acquisition enhance the signal source by fusing its estimates with Near Infrared (NIR) sensing, which will ultimately allow for monitoring of muscle flexions from both an electrophysiological and haemodynamic perspective.

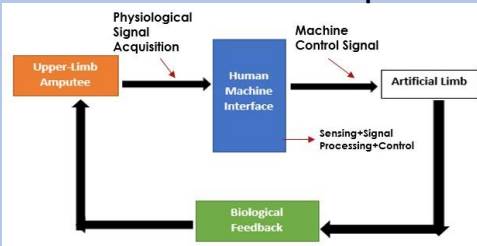
Offline Ultrasound imaging will also be performed on study participants in order to intrinsically study the anatomical layout of various types of amputees.

## Research Aims

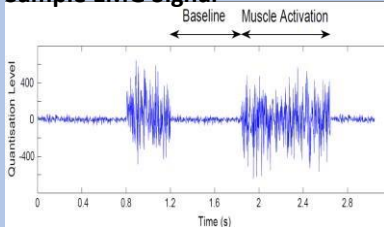
- Design of a pattern recognition-based control system using wearable EMG and NIR sensors
- Validation of control system on a broad cohort of participants (amputee and non-amputees)
- Validation and prototyping of control algorithm on an artificial limb



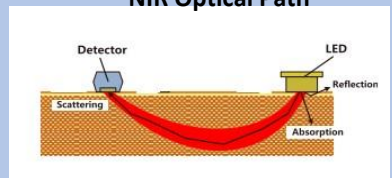
## Human-Machine Feedback Loop



## Sample EMG Signal



## NIR Optical Path



## Wearable EMG Armband



## NIR Armband

