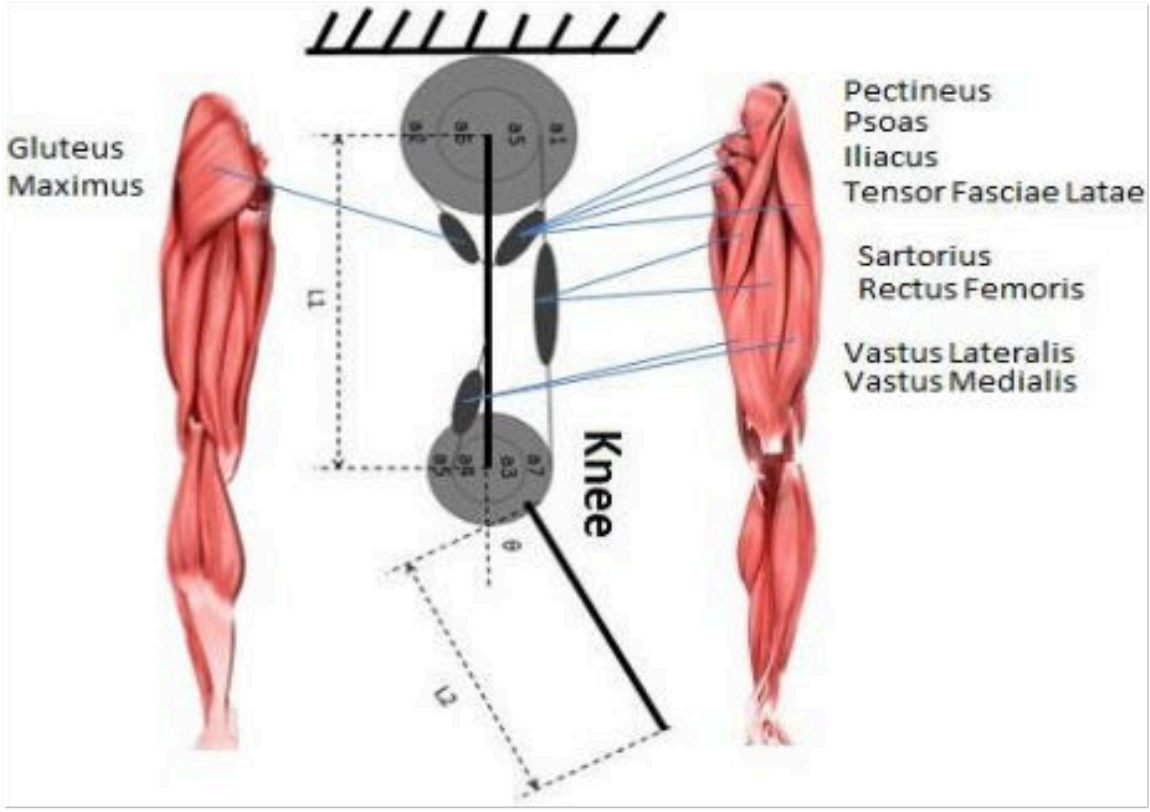
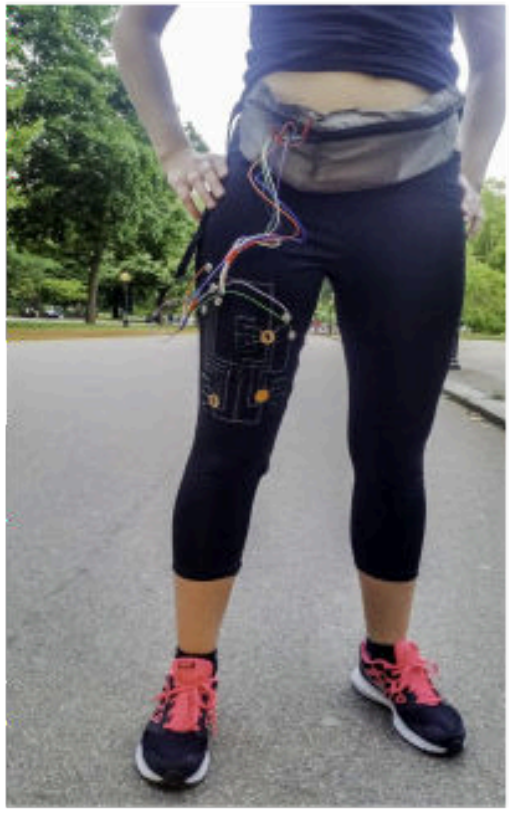
Muscular Activity in Long Distance Running



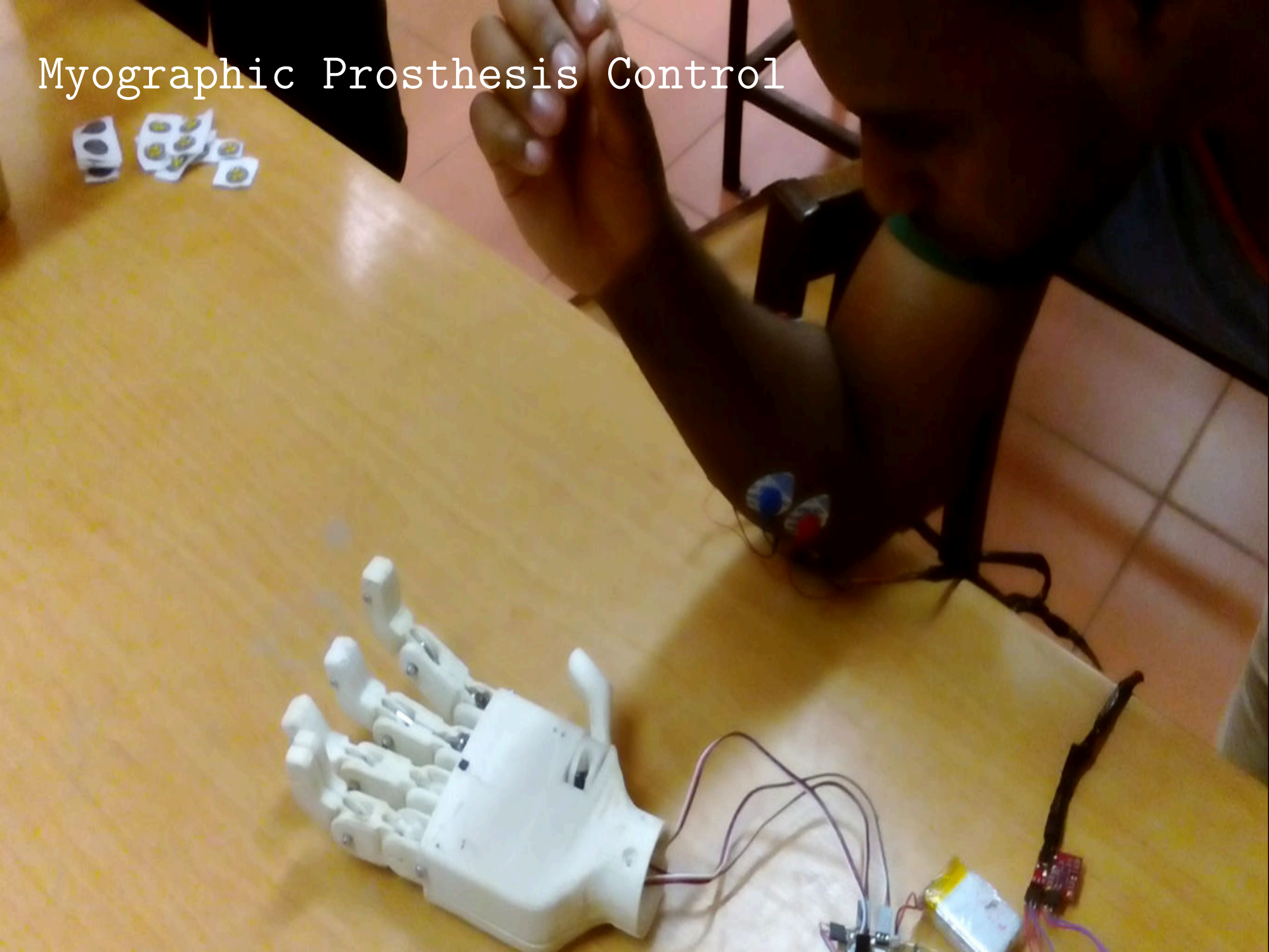


PERCENTAGE INCREASE IN IARV

Muscle	Asphalt	Sand	Athletics Track
Vastus Medialis	100.04%	127.71%	54.9%
Rectus Femoris	100.02%	126.75%	121.22%
Vastus Lateralis	99.14%	100.07%	35.9%

R. B. R. Manero, et al. Wearable embroidered muscle activity sensing device for the human upper leg. *EMBC* 2016

Myographic Prosthesis Control



Why is this important?

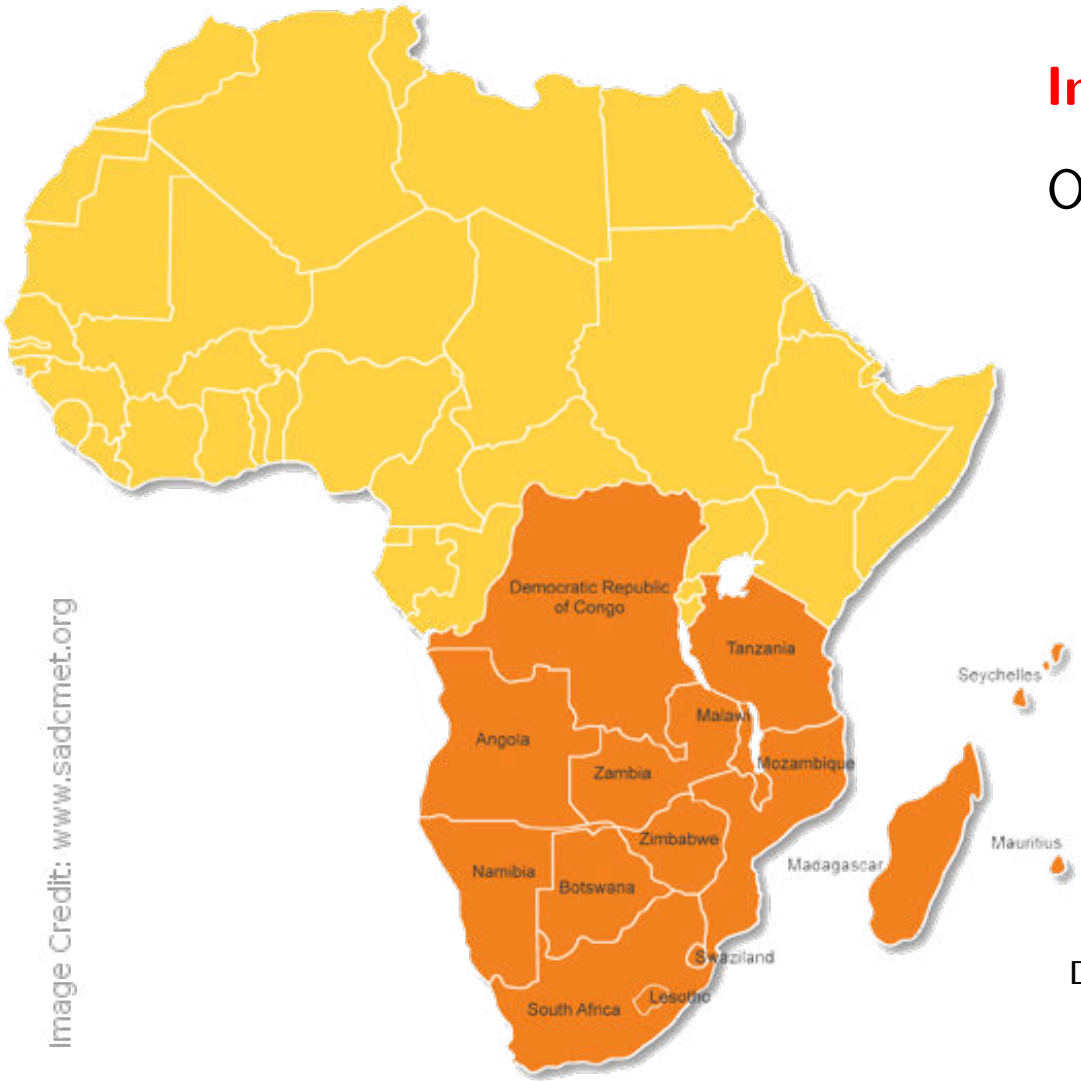


Image Credit: www.sadcmet.org

Improving access to healthcare

One billion people globally have a disability, 80% of these live in developing countries.

People with disabilities are over-represented amongst the persistently poor, and are less likely to be able to move themselves out of poverty.

World report on disability. WHO, 2011
Republic of South Africa country strategy paper 2013-2017. African Development Bank, 2013
Disability framework: Leaving no one behind. DfID, 2014

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Exploiting Fabric for Activity Recognition

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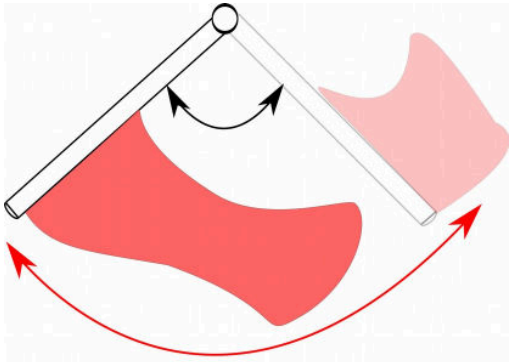
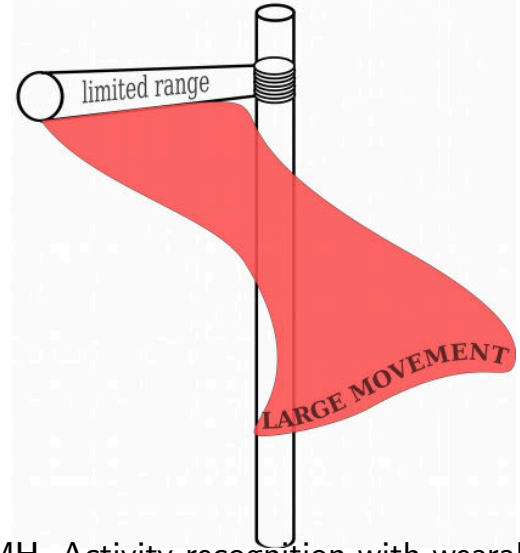
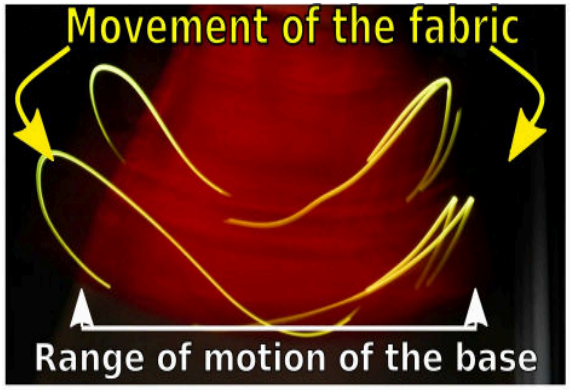
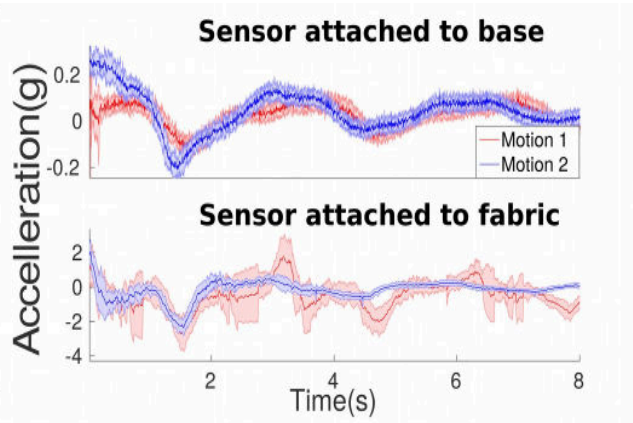
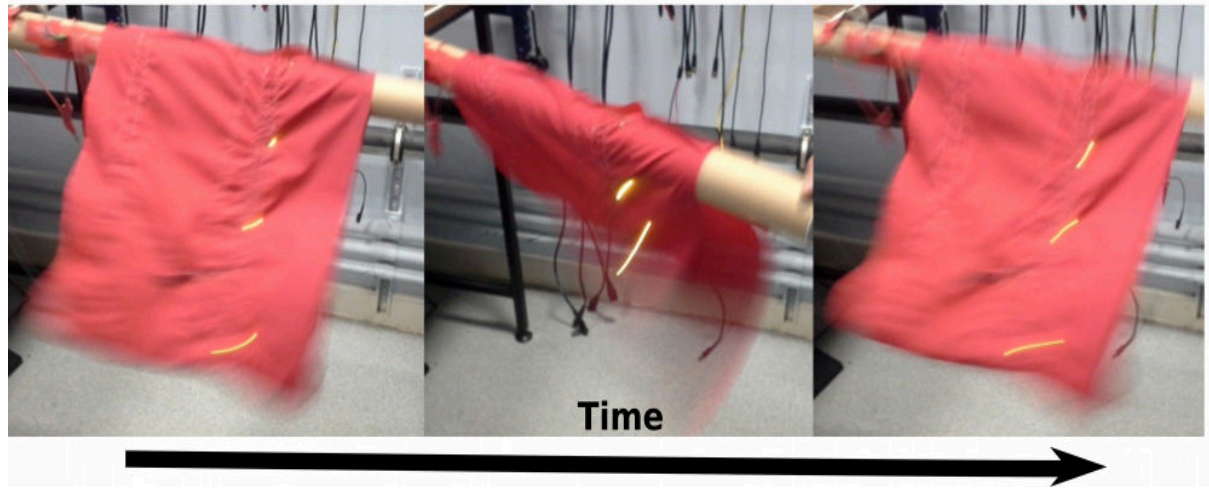
Example





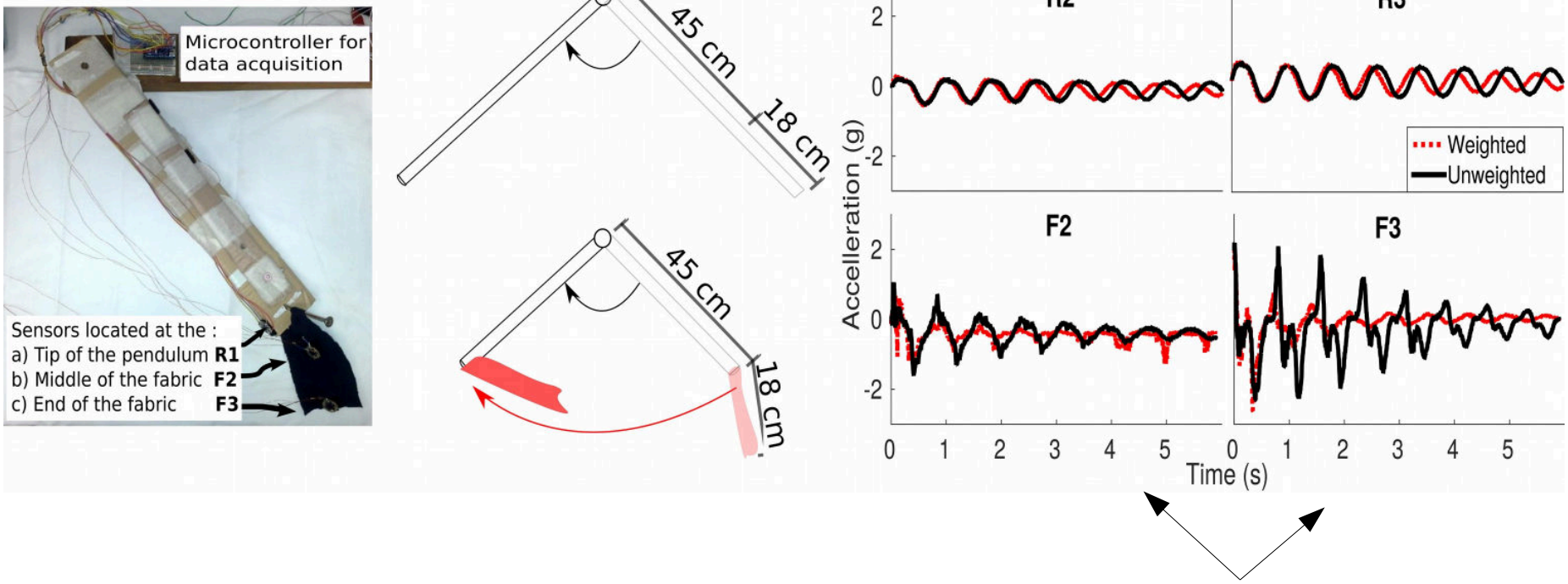






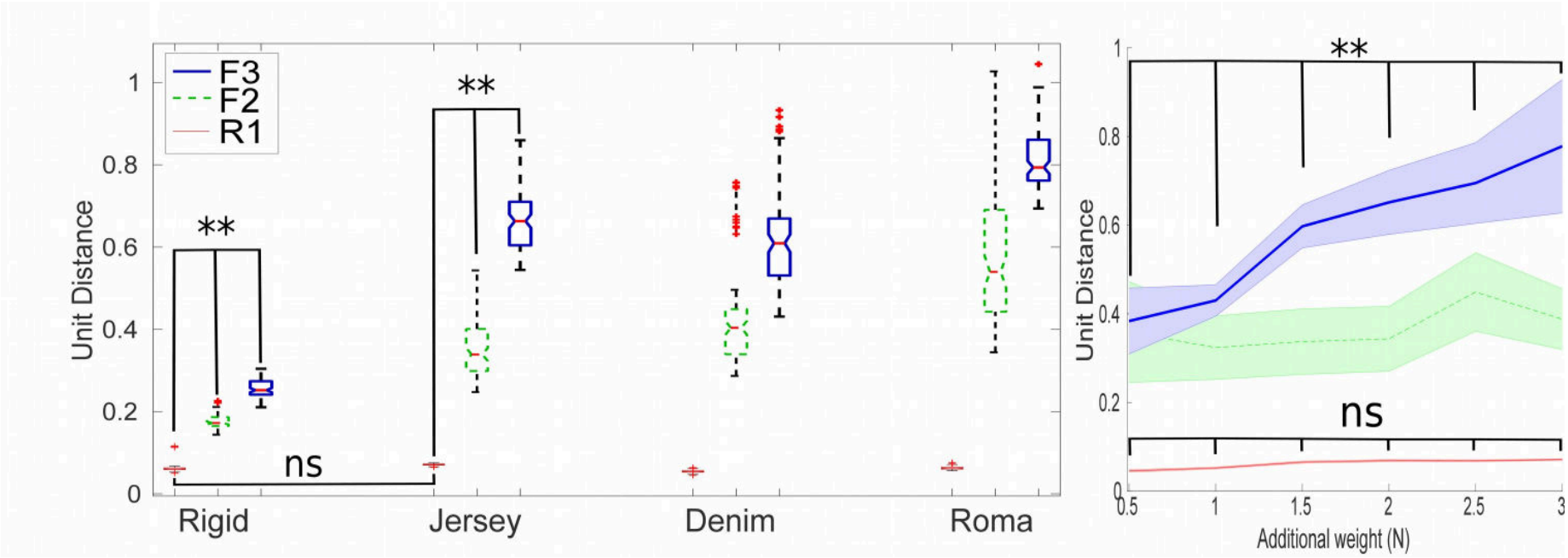
& MH. Activity recognition with wearable sensors on loose clothing. *PLoS One*, 12(10), 2017

Effect on Sensed Motion Signal



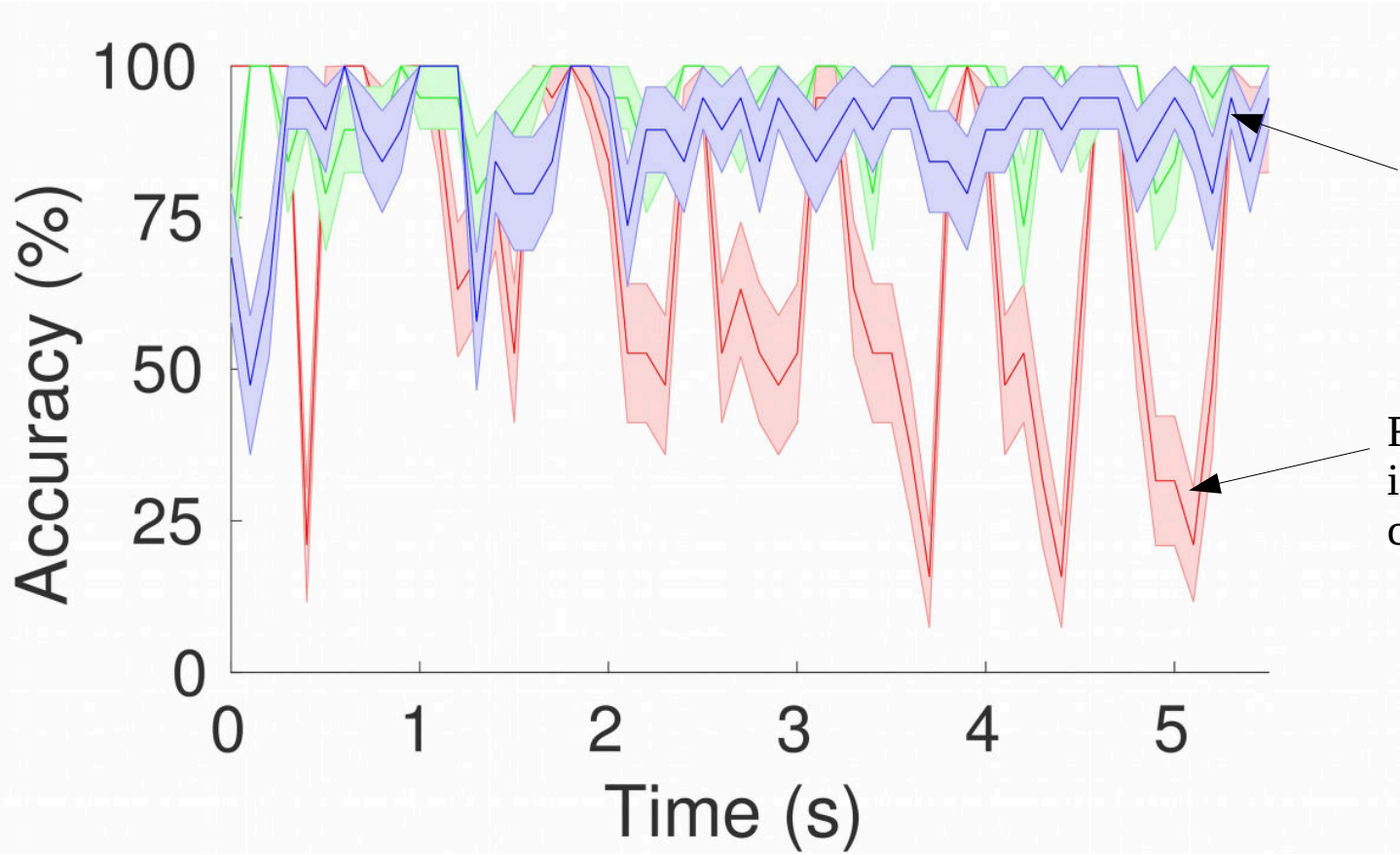
B. Michael & MH. Activity recognition with wearable sensors on loose clothing. *PLoS One*, 12(10), 2017

Effect on Classification Algoritms



& MH. Activity recognition with wearable sensors on loose clothing. *PLoS One*, 12(10), 2017

Activity Recognition



Deformable substrate allows for greater variation between classes

Rigid pendulum moves in and out of phase between classes

B. Michael & MH. Activity recognition with wearable sensors on loose clothing. *PLoS One*, 12(10), 2017

Summary

Textiles represent an opportunity to measure human movement in a natural and non-invasive way.

$\rightarrow$ Many new opportunities, especially in affordable healthcare.

However, textile behaviour requires a rethink of how we tackle classic modelling problems.

$\rightarrow$ Can't just throw data at a machine learning algorithm!

Wearables to find **useful** (as opposed to **most accurate**) information.

$\rightarrow$Tight-fitting clothing is not always beneficial!

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