ORTHOPAEDIC TECHNOLOGIES & BIOMECHANICS LAB

Overview of Research

Dr Joshua Giles

Research Streams

- Research in my lab is divided into three streams
  - Each stream is independent but seeks to build integrated results
  1. Experimental Biomechanics
  2. Computational Biomechanics
  3. Biomedical Mechatronic Device Design

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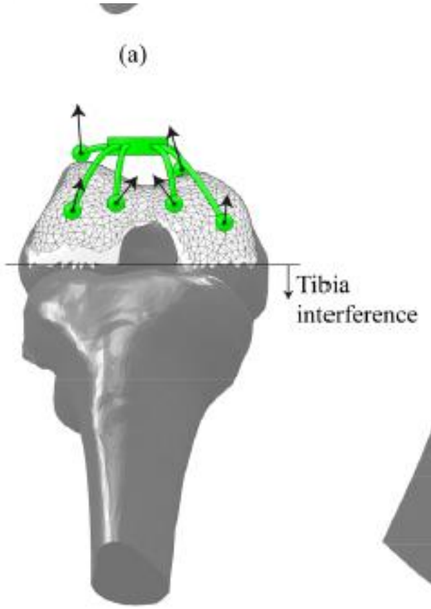
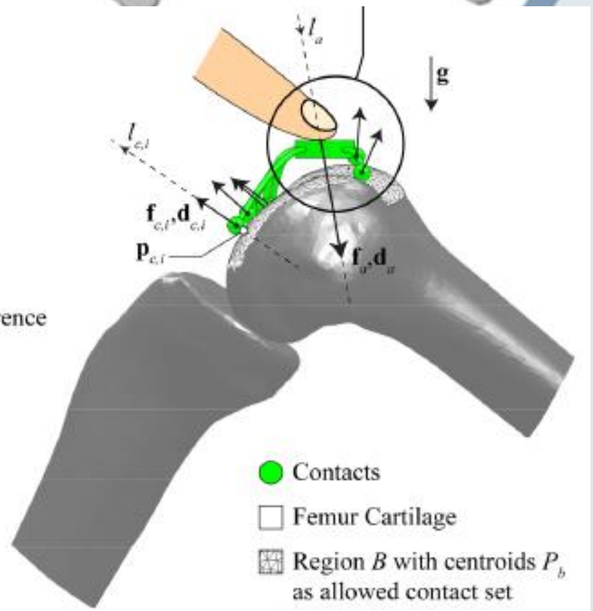
Current Research

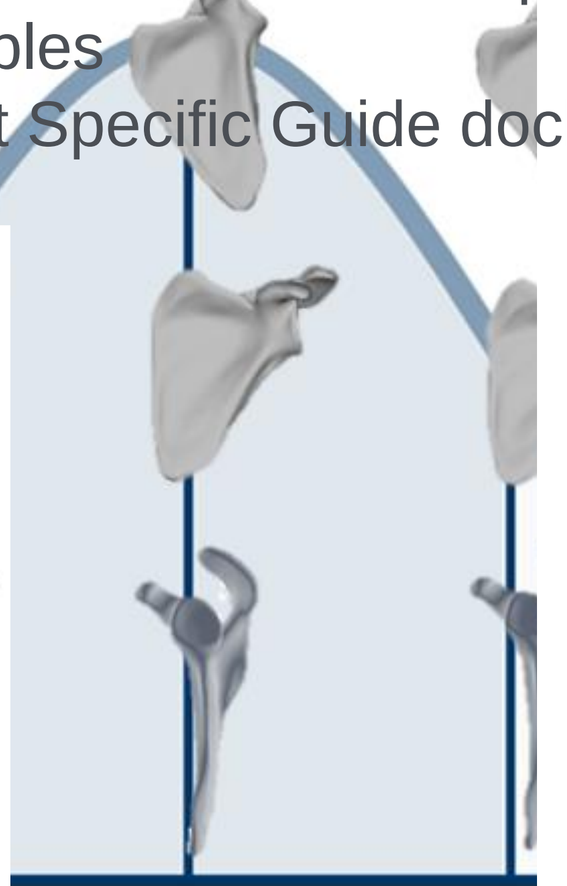
Dr Joshua Giles

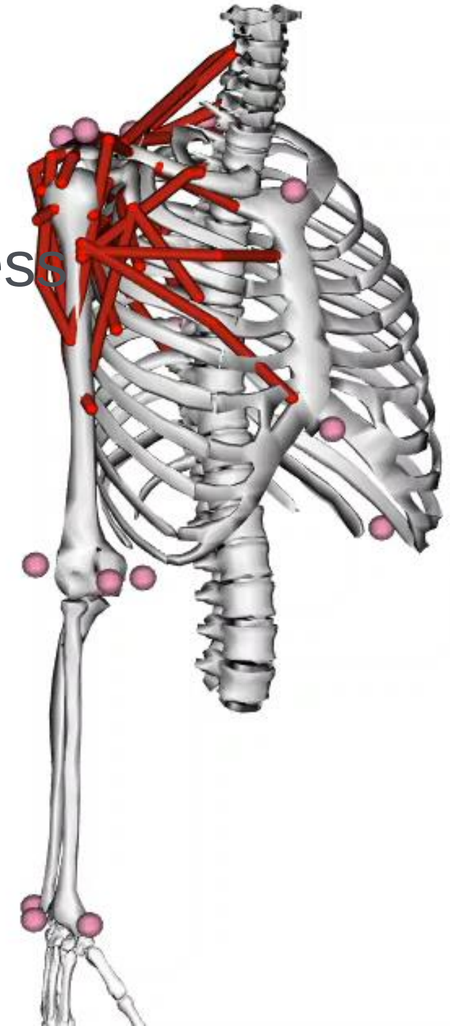
Biomechanical-Mechatronic Research

- Biomechanical investigations of the interactions between patient anatomy and Reverse TSA design
  - First, develop a Statistical Shape Model that describes anatomical variation in patient population
  - Second, develop MSk model of shoulder incorporating SSM & implant design variables
- Development of model of Patient Specific Guide docking robustness



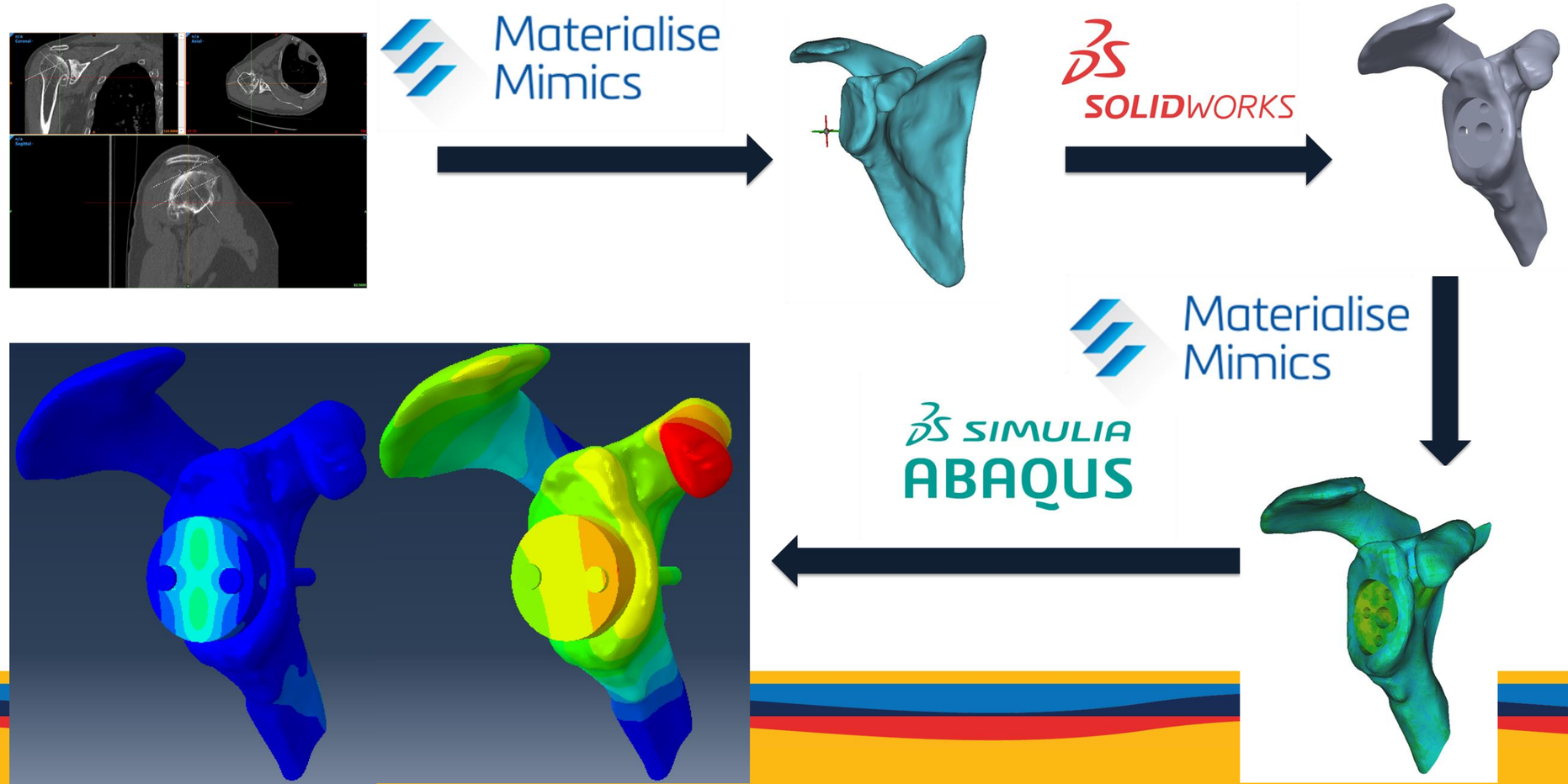






Biomechanical-Mechatronic Research

- Biomechanical investigations of implant design optimization
  - First, using patient specific FEA models
  - Second, using Statistical Shape and Density Derived Models

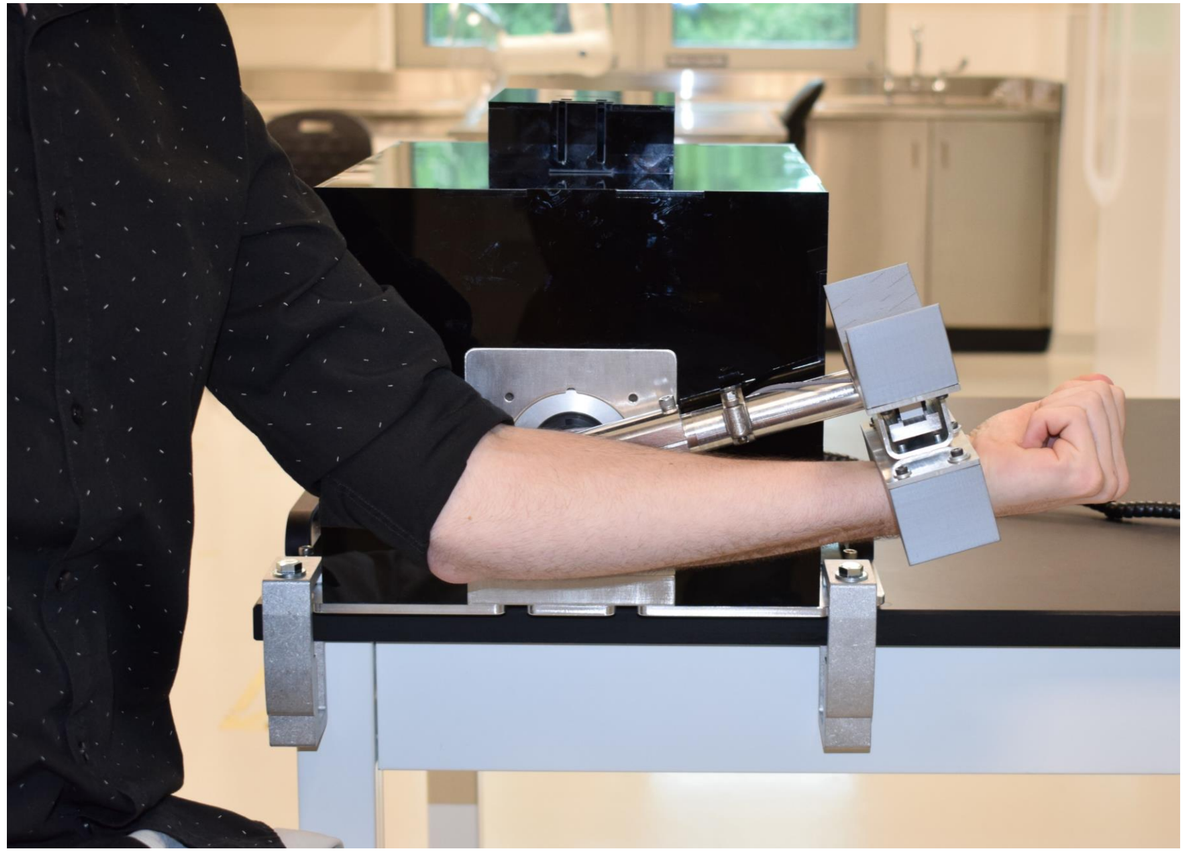


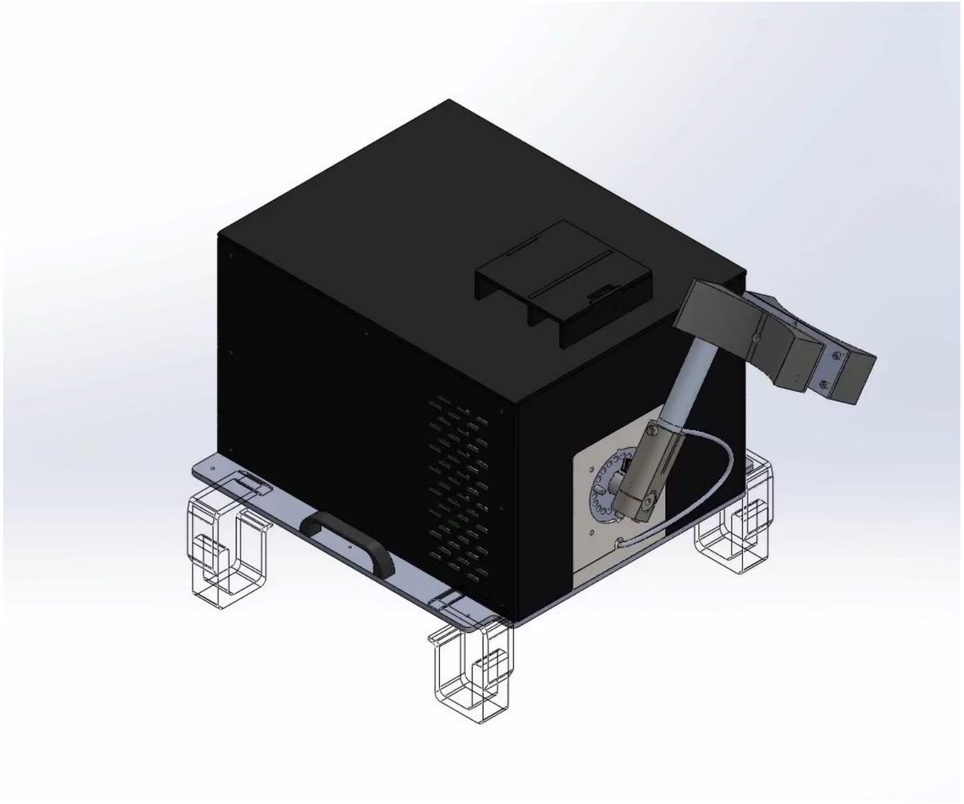
Biomechanical-Mechatronic Research

- Development of biofeedback sensor system to improve rehabilitation following Achilles injury and for spasticity after stroke.

Biomechanical-Mechatronic Research

- Development of muscle dynamometer to improve diagnosis and rehabilitation of Spinal Cord Injury patients.
  - Enables Isometric & Isokinetic tests of shoulder and elbow





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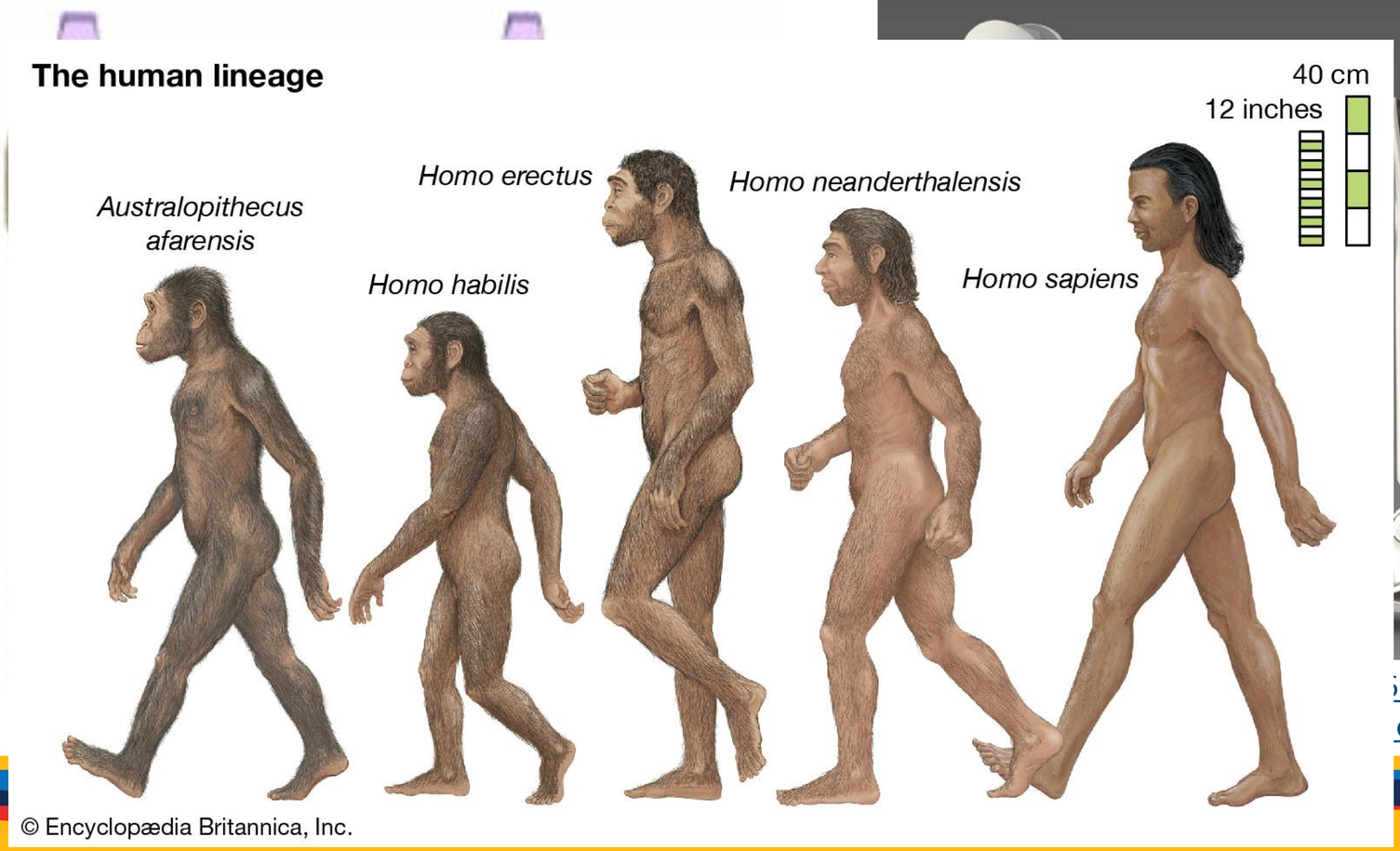
Biomechanical Research Collaborations

- Investigation of the Sex-based differences in Amputee gait and implications for prosthesis design
- Investigation of the effects of morphological differences across hominid/primate evolution on walking and climbing efficiency using OpenSim



5/almost-genius-
on-accessories

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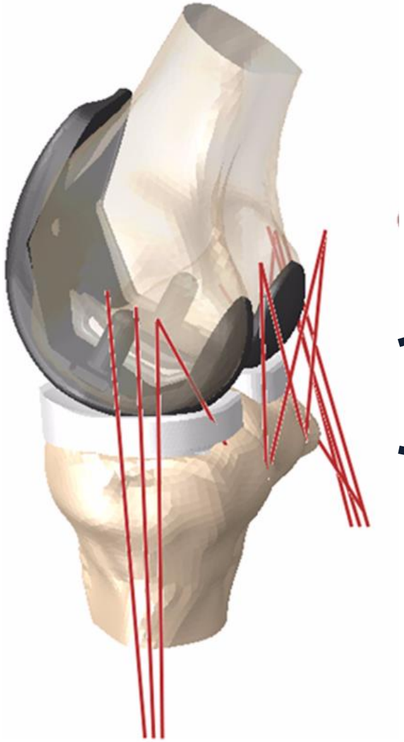
Future Research

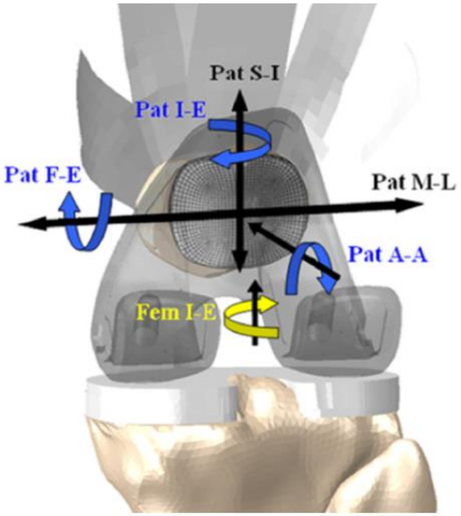
Dr Joshua Giles

Biomechanically Informed Planning

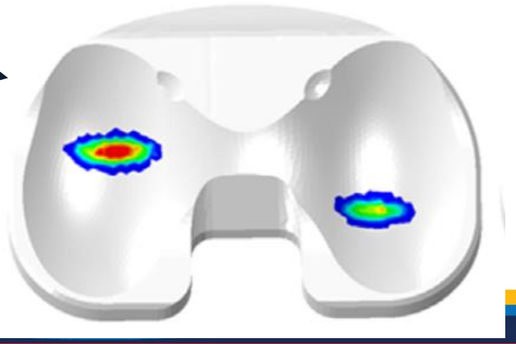
- Develop a method that couples wearable sensor technologies with MSk computational modelling and Deep-Learning to predict surgical outcomes for a given procedure based on pre-op anatomy and function



Joint Kinematics



Contact Mechanics



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Thank You

Funders

NSERC

Island Health

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island health

Rebalance MD

MECHANICAL ENGINEERING

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