Biomedical Engineering Research at Carleton

Dr. Andy Adler
Canada Research Chair
Biomedical Engineering
Systems and Computer Engineering
Carleton University
Researcher: Yuu Ono

Systems and Computer Engineering

Research Areas:
- Sensors development and applications
- Biomedical monitoring, diagnosis, and characterization
- Ultrasonic imaging and acoustic microscopy
- Piezoelectric / Ultrasound sensors
Piezoelectric/Ultrasonic Sensors for Biomedical Applications

Health Condition Monitoring

Flexible piezoelectric/ultrasonic film sensor

Medical Imaging & Diagnosis

Ultrasonic signals from bone

Pulse wave

Breathing curve
Researcher: Don Russell

Mechanical and Aerospace Engineering

Research Areas:

- Design and Control of Advanced Prosthetic Arms
- Control and Dynamics of Artificial Hearts and Ventricular Assist Devices
- Biomechanics of Musculoskeletal Injury in Skilled Musicians
- Modelling of Interacting Dynamic Systems
Researcher: Peter Liu

Systems and Computer Engineering
Canada Research Chair in Interactive Network Computing and Teleoperation

Research Areas:
- Robotic Surgery
- Telemedicine
- Haptics
Robotic Surgery

- Surgical simulation and training
  - Haptic modelling
  - Tissue modelling
- Telesurgery
  - Stability under transmission time delays
  - Enhancement of haptic fidelity
  - Networking protocols and data transmission

Surgery Simulator
Researcher: James Green

Systems and Computer Engineering

Research Areas:

◆ Bioinformatics, toxicogenomics, proteomics, and prediction of protein structure & function
◆ Biomedical pattern classification
◆ Development of novel assistive technology and devices
Researcher: Rafik Goubran

Systems and Computer Engineering
Acting Dean, Faculty of Engineering and Design

Research Areas:

- Technology Assisted Friendly Environment for the Third Age (TAFETA) Smart Apartment
- Heart and Lung Sound Analysis
Researcher: Thomas Garvey

School of Industrial Design

Research Areas:

- Acuity Adaptable Patient Room
Researcher: Monique Frize

Systems and Computer Engineering

Research Areas:
- Case-Based Reasoning Systems for Monitoring Infants
- Intelligent Systems - Neural Networks
- Thermal Imaging
Intelligent Systems for Monitoring Infants

Data analysis and modelling to estimate outcomes

- Neonatal and adult intensive care units
- Perinatal and obstetric data
- Childhood injuries
Thermal imaging

Thermal medical image analysis applications

- Assessing pain in infants
- Neuromuscular injuries from piano-playing
- Breast cancer
- Rheumatoid arthritis (various types)

Thermal image of hand of pianist
Researcher: Adrian Chan

Systems and Computer Engineering

Research Areas:
- Biological signal processing
- Electronic nose
- Non-invasive devices
- Assistive devices
Biological applications of electronic nose technology

- Detection and identification of bacteria
- Rapid screening for food-borne bacteria
- Provide timely and low-cost diagnosis of diseases
- Continuous monitoring (e.g. wound infections)
Biological applications of electronic nose technology

- Detection and identification of bacteria
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Researcher: Adrian Chan

Myoelectric control of upper arm prosthesis

- Enable continuous control that is reliable, natural, and intuitive
- Multifunctional control

Virtual Arm controlled by muscle signals
Researcher: Mojtaba Ahmadi

Mechanical and Aerospace

- Robotic prosthetic limbs
- Machine and biological locomotion
- How robots can be used for artificial legs or walking aids
Researcher: Andy Adler

Systems and Computer Engineering
Canada Research Chair in Biomedical Engineering

- Electrical Impedance Tomography
- Medical Imaging algorithms
- Lung function monitoring
Electrical Impedance Tomography

Block Diagram

Images of Breathing
Detection and compensation for “bad” electrodes

“Bad” Electrode

Compensated
Lung tissue movement in asthma model

Computational model