

International Research Training Group on Soft Tissue Robotics

*University of Auckland & University of Stuttgart
25-29 March 2019
Auckland, New Zealand*



Meeting kindly supported by



Mon 25 March

Afternoon: Tours of ABI or Mechanical Engineering Facilities available on request.

6:15pm: Reception (Mudbrick Vineyard & Restaurant, Waiheke Island)
Welcome & Information discussions

Tue 26 March (Room 423-340, Conference Center, 22 Symonds St)

9:15 am **Welcome & Housekeeping**
Leo Cheng, Peter Xu

9:30 am **Student Demonstrator Project Presentations**

Haptic Robot Team: David, Amy, Sivakumar, Massi, Nastaran, Jalil, Zixiao, Florian, Markus, Johnathan, Ruth

Muscle Parameters Team: Naser, Jaime, Homayoon, Ben, Christoph, Johannes W, Johannes K, Shuva, Benjamin, Harry, Annika

10:30 am Short Break

10:45 am **Overview Presentations on Focus Area A: Simulation Technologies**

Peter Hunter: The ABI and Challenges in Computational Physiology

Simona Galliani: Soft Tissue Robotics Focus Area A: Stuttgart's Perspective

Discussion

12:00 pm Lunch & Informal Discussions

1:00 pm

PhD Student Milestone/Progress Presentations

[20 mins + 10 mins questions]

1:00 Benjamin Maier: Highly-parallel multi-physics simulation of skeletal muscles

1:30 Homayoon Zarshenas: EMG based control method for assistive robots

2:00 Johannes Köhler: Development of Model Predictive Control (MPC) trajectory tracking formulations for soft-tissue robotics

2:30 Shahnewaz Shuva: Feedback control of coupled solid and elastic system by Reduced Basis Algebraic Riccati Equation

3:00 **Short break**

3:10 Harnoor Saini: Computational skeletal muscle models for signal identification and sensor development

3:40 Annika Sahrman: Soleus muscle weakness in cerebral palsy: Muscle architecture revealed with Diffusion Tensor Imaging

Nastaran Saffaryazdi: TBC

Jallil Shahabi: TBC

After 4pm

Live Demonstration of Haptic Robot Project (Room 201-5xx, Engineering Labs, Human Science Building 10 Symonds St)

4:30 pm

Conclude for the day

Wed 27 March (Study Hall, Maclaurin Chapel, 18 Princes St)

9:00 am Welcome

9:10 am **Overview Presentations on Focus Area B:
Automation & Control**

Alex Verl: What's new at University of Stuttgart and how does it relate to the IRTG Soft Tissue Robotics.

Peter Xu: Robotic Manipulation of Unstructured Soft Tissues

Markus Henke: Multifunctional Dielectric Elastomers: Towards Soft, Biomimetic Robots of the next Generation

Discussion

10:45 am Short Break

11:00 am **Keynote Presentation:**
Shane Blakett, VP of Software & Technology, Soul Machines

11:40 pm Lunch & Informal Discussions

12:40 pm

Student Milestone/Progress Presentations

[20 mins + 10 mins questions]

12:40 Florian Jaensch: Machine Learning and Policy Optimisation Methods Applied to Robotic Control

1:10 Naser Mostashiri: In-vitro measurement of reaction forces in the temporomandibular joints using a redundantly actuated parallel chewing robot

1:40 Markus Wnuk: Pose and Localisation of Soft Objects

2:10 David Tomzik: Cloud-based and Decentralised Control Systems

2:40 Short Break

2:50 Jonathan Terfurth (presented by Marco Zimmer): Joint actuators for Wearable and Industrial Robots

3:20 Zixiao Chen: Modelling of Soft Actuators for Soft Surface Manipulators

3:50 Christoph Hinze: Distributed Robot Automation Architecture for Process Control with Industrial Robots

4:20 pm

Conclude for the day

Thu 28 March (Study Hall, Maclaurin Chapel, 18 Princes St)

8:20am Welcome

8:30am **Overview Presentations Focus Area C: Integration**

Syn Schmitt: Learning to control a redundant musculo-skeletal system

Iain Anderson: Soft Sensors for Robots

Discussion

9:30 am **Student Milestone/Progress Presentations**
[20 mins + 10 mins questions]

9:30 Ben Chang: Development of a Bio-inspired Robot Arm Hand System

10:00 Sivakumar Kandasamy: Comparison of high and low modulus elastomeric fibre-reinforced soft fluidic actuator

10:30 Masoumeh Hesam: Actuators and Soft Compression Sensors

11:00 am Short Break

11:15 am **Keynote Presentation:**
Mark Billinghurst, Empathic Computing Lab, ABI

12:00 pm Lunch & Information Discussions

1:00 pm

Student Milestone/Progress Presentations

[20 mins + 10 mins questions]

1:00 Jaime Lara: High-Density-EMG: Development, methods and applications towards myoelectric control

1:30 Ruth Corkill: A simulation based approach to evaluating potential medical applications of nitrogen-vacancy centre magnetometry

2:00 Johannes Walter: Quantitative comparison of biological and technical concepts of motion generation

2:30 Amy Garrett: Making Muscles Do More Work

3:00 pm

Short Break

3:10 pm

Concluding Session:

Oliver Rohrle, Peter Xu, Alex Verl, Leo Cheng
Prize Giving, IRTG "Townhall" Discussion,
What should be the next steps?

4:00 pm

Conclude for the day

6:00 pm

Farewell Dinner (TBC)

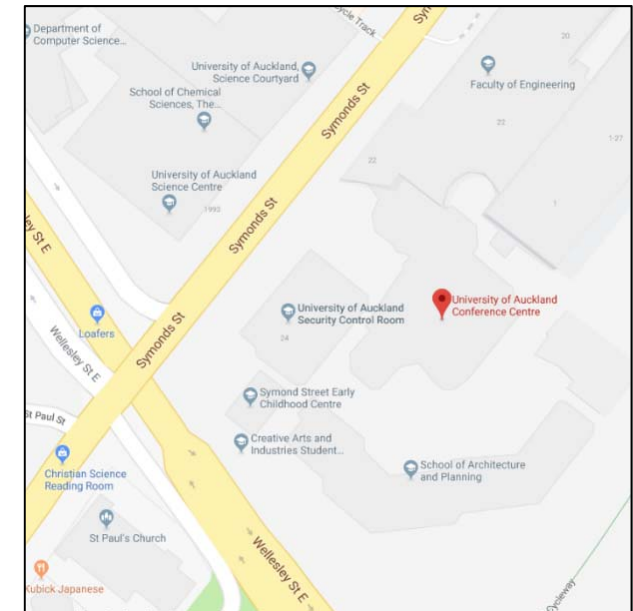
Friday 29 March

Free time for individual project discussions.

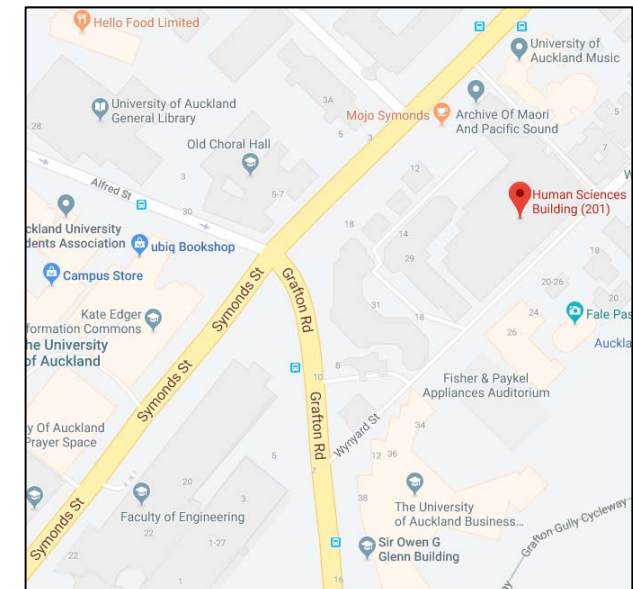
Lab visits to ABI, Mechanical Engineering, Electrical Engineering, available on request.

Venues

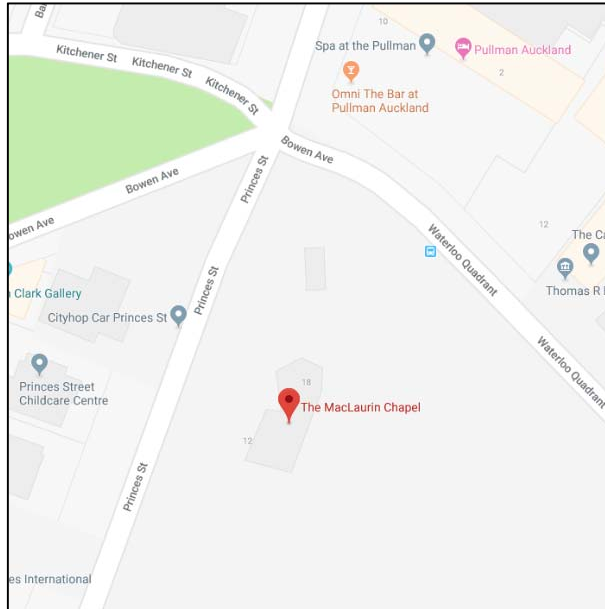
Tuesday 26th March
**Room 423-340,
Conference Centre**
22 Symonds St.



Tuesday 26th March
4pm
Haptic Robot
Demonstration
**Room 201-5xx,
Human Science
Building**
10 Symonds St.



Wednesday 27th &
Thursday 28th March
**Study Hall, MaClaurin
Chapel**
18 Princes St.



Things to do:

- <https://www.aucklandnz.com/visit/discover/top-10s/top-10-free-things-to-do-in-auckland>
- Albert Park
- Waiheke Island
- Auckland War Memorial Museum, Domain & Wintergardens
- New Zealand Maritime Museum
- Wynyard Quarter/Viaduct Basin

Restaurants Nearby:

- Eight at Cordis (\$\$\$), Polished, modern buffet restaurant featuring 8 food stations featuring a wide selection of global specialties & desserts.
- Number 5 Restaurant (\$\$). Upscale restaurant serving French-inspired New Zealand cuisine in an elegant, old-world space.
- Angus Steak House (\$\$). Classic, casual venue for select-your-own steaks & chops, plus seafood, sides & a salad bar.
- Depot (\$\$), Energetic, industrial-chic spot offering creative NZ dishes, an oyster bar & a sophisticated wine list.

Restaurants near the Sea:

- Soul Bar & Bistro (\$\$\$), Stylish, contemporary locale with inventive dishes, a lively bar scene & views of Viaduct Harbour.
- Baduzzi (\$\$\$), Indoor-outdoor eatery with a vibrant, retro-chic atmosphere featuring modern takes on Italian food.
- Wildfire (\$\$\$), Upscale restaurant on Viaduct Harbour featuring Brazilian churrascaria-style meats carved tableside.
- Jack Tar (\$\$), Easygoing haunt with a popular waterfront terrace featuring updated burgers, pizzas, mains & drinks.

Special Thanks To:



AUCKLAND
BIOENGINEERING
INSTITUTE

<http://abi.auckland.ac.nz>



I Measure U

<https://imeasureu.com/>

FlexiMap

<http://fleximap.co.nz>

REX
BIONICS

<https://www.rexbionics.com/>

soul
machines

<https://www.soulmachines.com/>

MedTech CoRE

<https://www.cmdt.org.nz/>

DFG Deutsche
Forschungsgemeinschaft
German Research Foundation

<http://www.dfg.de/>