Brett C. Hannigan
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Education

ETH Zürich   Zürich, Switzerland
PhD Candidate — Health Sciences and Technology   *September 2021 – Present*

- Scientific assistant at the Biomedical and Health Technology (BMHT) Lab.

Simon Fraser University   Burnaby, Canada
PhD Candidate — Mechatronic Systems Engineering   *January 2019 – September 2021*

- 4.08 out of 4.33 cumulative GPA.
- Faculty of Applied Sciences Graudate Fellowships — *Spring 2020, Spring–Summer 2021*.
- Some relevant courses: deep learning systems, design optimization

University of British Columbia   Vancouver, Canada
Master of Applied Science — Electrical and Computer Engineering   *September 2016 – December 2018*

- 91% cumulative average.
- Graduate student at UBC's Electrical and Computer Engineering in Medicine group.
- Research trainee at B.C. Children's Hospital Research Institute's Digital Health Innovation Lab.
- Faculty of Applied Science graduate award — *Winter 2016*
- Thesis topic: applying optimal control theory to the problem of designing high-performance analog-to-digital converter circuits while maintaining stability.
- Some relevant courses: adaptive control, multivariable feedback control, advanced biophotonics.

Simon Fraser University   Burnaby, Canada
Bachelor of Applied Science (Honours) — Engineering Science   *September 2016 – December 2018*

- 3.81 out of 4.33 cumulative GPA, first class honours standing.
- Recipient of SFU undergraduate open scholarships — *Fall 2011, Spring 2012 – Spring 2014*.
- President's honour roll standing — *Spring 2013, Fall 2015*.
- Recipient of the Summit entrance scholarship — *June 2009*.
- Some relevant courses: biomedical instrumentation, medical image acquisition, image processing, VLSI design, microelectronic fabrication laboratory, molecular biology, clinical neuroscience.

Experience

ESS Technology   Kelowna, Canada
Mitacs Accelerate Fellowship   *November 2017 – November 2018*

- Applied M.A.Sc. research to the industry project: high fidelity data converters for medical electronics.
- Delivered software tools and complete documentation to enable the design of high-performance data converters, reducing the amount of computationally-expensive simulation time required over empirical methods.

University of British Columbia   Vancouver, Canada
Teaching Assistant   *September 2016 – April 2018*

- Teaching assistant for the Electrical and Computer Engineering department Capstone Project course.
- Ran weekly meetings with project groups, gave technical feedback and mentorship, and evaluated project progress milestones.

Lungpacer Medical   Burnaby, Canada
Software Developer   *January 2015 – August 2016*

- Designed control algorithms for optimizing phrenic nerve stimulation using a prototype medical device.
- As part of a small team of software developers, implemented the logic and GUI for controlling the device with a desktop application.
- Devised and ran pre-clinical experiment protocols used to evaluate algorithms then presented experimental results within the company to guide development.
- Developed experiment data acquisition and processing software allowing real-time synchronization, calculation, display, and logging of experiment data collected from many independent sources.

Lungpacer Medical   Burnaby, Canada
Biomedical Engineering Co-op   *April 2014 – December 2014*

- Worked with the Biomedical Team to collect physiological signals during a series of pre-clinical experiments in order to publish a study on diaphragm pacing efficacy.
- Performed large physiological signal processing and statistical data analysis tasks in order to evaluate algorithms, investigate stimulation efficacy, assist with publications, and produce reports.
- Wrote and improved many data analysis and testing software scripts.

MENRVA Research Group — Menon Lab   Burnaby, Canada
Research Co-op   *May 2013 – September 2013*

- Improved the design and fabrication process of electroactive polymer pressure cuff devices intended to treat orthostatic hypotension.

Publications

[1] T. J. Cuthbert, B. C. Hannigan, A. Shokurov, and C. Menon, "HACS: Helical Auxetic Yarn Capacitive Sensors that Go Beyond the Theoretical Sensitivity Limit," *Advanced Materials*, vol. 35, no. 10, 2023. DOI: 10.1002/adma.202209321. [Online]. Available: https://onlinelibrary.wiley.com/doi/10.1002/adma.202209321.

[2] V. Galli, S. K. Sailapu, T. J. Cuthbert, C. Ahmadizadeh, B. C. Hannigan, and C. Menon, "Passive and Wireless All-Textile Wearable Sensor System," *Advanced Science*, vol. 10, no. 22, pp. 1–13, 2023. DOI: 10.1002/advs.202206665. [Online]. Available: https://onlinelibrary.wiley.com/doi/full/10.1002/advs.202206665.

[3] B. C. Hannigan, T. J. Cuthbert, W. Geng, and C. Menon, "Understanding the Impact of Machine Learning Models on the Performance of Different Flexible Strain Sensor Modalities," *Frontiers in Materials*, vol. 8, no. 44, pp. 1–23, 2021. DOI: https://doi.org/10.3389/fmats.2021.639823. [Online]. Available: https://www.frontiersin.org/articles/10.3389/fmats.2021.639823/full.

[4] K. Merry, C. Napier, V. Chung, *et al.*, "The validity and reliability of two commercially available load sensors for clinical strength assessment," *Sensors*, vol. 21, no. 24, pp. 1–15, 2021, ISSN: 14248220. DOI: 10.3390/s21248399. [Online]. Available: https://www.mdpi.com/1424-8220/21/24/8399.

[5] C. Napier, R. W. Willy, B. C. Hannigan, R. McCann, and C. Menon, "The effect of fixation location and footwear type on peak impact accelerations from a consumer-grade IMU during running," in *XXVIII International Society of Biomechanics*, Stockholm, 2021.

[6]   C. Napier, R. W. Willy, B. C. Hannigan, R. Mccann, and C. Menon, "The effect of footwear, running speed, and location on the validity of two commercially available inertial measurement units during running," *Frontiers in Sports and Active Living*, vol. 3, 2021. DOI: `https://doi.org/10.3389/fspor.2021.643385`. [Online]. Available: `https://www.frontiersin.org/articles/10.3389/fspor.2021.643385/full`.

[7]   B. C. Hannigan, C. L. Petersen, A. M. Mallinson, and G. A. Dumont, "An Optimization Framework for the Design of Noise Shaping Loop Filters with Improved Stability Properties," *Circuits, Systems, and Signal Processing*, vol. 39, no. 12, pp. 6276–6298, 2020, ISSN: 15315878. DOI: `10.1007/s00034-020-01460-4`. [Online]. Available: `https://link.springer.com/article/10.1007/s00034-020-01460-4`.

[8]   X. Jiang, C. Napier, B. Hannigan, J. J. Eng, and C. Menon, "Estimating vertical ground reaction force during walking using a single inertial sensor," *Sensors*, vol. 20, no. 15, pp. 1–13, 2020, ISSN: 14248220. DOI: `10.3390/s20154345`. [Online]. Available: `https://www.mdpi.com/1424-8220/20/15/4345`.

[9]   B. C. Hannigan, "On the Design of Stable, High Performance Sigma Delta Modulators," MASc, University of British Columbia, 2018, p. 73. [Online]. Available: `https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0375830`.

[10]   S. C. Reynolds, R. Meyyappan, V. Thakkar, *et al.*, "Mitigation of Venitlator-Induced Diaphragm Atrophy by Transvenous Phrenic Nerve Stimulation," *Am J Respr Crit Care Med*, no. 310, pp. 1–49, 2016. DOI: `10.1165/rcmb.2011-0115OC`. [Online]. Available: `http://www.atsjournals.org/doi/abs/10.1164/rccm.201502-0363OC`.

[11]   S. Reynolds, R. Meyyappan, M. Nolette, *et al.*, "C14 frontiers in assisted ventilation: Novel transvenous phrenic nerve pacing system prevents diaphragm atrophy during mechanical ventilation: Pre-clinical validation in a porcine model," *American Journal of Respiratory and Critical Care Medicine*, vol. 191, p. 1, 2015. [Online]. Available: `https://www.atsjournals.org/doi/abs/10.1164/ajrccm-conference.2015.191.1_MeetingAbstracts.A3900`.