Brent Huchuk, Ph.D., EIT

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Profile

Experienced researcher/data scientist applying machine and deep learning to real-world domains and problems – particularly related to optimization and control within the built environment. Previous involvement in building practical, ready-for-production data-driven products and large scale building performance simulation investigations.

Relevant Experience

- **National Research Council Canada** — Ottawa, ON
  Research Associate — *Mar 2021 - present*
  - Developed novel data-driven models for building automation and diagnostic systems for small and medium buildings based on smart thermostat data.
  - Designed a multi-building proof of concept study for deployable IoT sensors evaluating fault detection, indoor air quality, and occupant well-being.
  - Produced client facing reports and peer-reviewed publications based on the findings and approaches for small commercial buildings.

  National Research Council Canada — Ottawa, ON
  Student Researcher — *Sep 2020- Mar 2021*
  - Conducted a formal review of building Weatherization programs as part of future national building code development.
  - Oversaw and conducted an evaluation of savings for a building portfolio from partner organizations.

- **University of Toronto** — Toronto, ON
  Research Associate — *Sept 2017 - Sept 2021*
  - Developed novel data-driven methods based on the Donate Your Data data regarding occupant preferences, presence prediction, thermal modelling, and control optimization.
  - Developed population-level control testbed using OpenStudio, EnergyPlus and the Python-EMS API.
  - Participated in simulation studies as part of IEA-EBC Annex 79.

- **ecobee, Inc.** — Toronto, ON
  Data Scientist — *May 2017 - Mar 2020*
  - Designed and prototyped over 25 equipment control, and diagnostics methods utilizing existing thermostat time-series data.
  - Implemented and conducted hundreds of cloud-based analytic investigations (using both Python, AWS, and GCP) regarding savings, comfort, and user-behaviours across the entire device fleet.
  - Oversaw and managed the release of the Donate Your Data thermostat as the program grew by tenfold.
  - Active participant in the energy metric working group for the EPA's a connected thermostat ENERGY STAR specification which was the first to be consumer-data driven.

  ecobee, Inc. — Toronto, ON
  Building Energy Analyst — *Apr 2015 - May 2017*
  - Performed analysis on building data for diagnostic and insights to be used by product, marketing, and sales teams within the organization including the validation of 23% runtime savings.
  - Generated two white papers and reports based on energy and user data.
  - Reviewed and provided official positions and comments on more than 10 M&V studies.

Education

- **University of Toronto** — Toronto, ON
  Ph.D., Mechanical and Industrial Engineering — *2017 - 2021*
  - **3.74/4.0** cumulative GPA
  - Thesis: A Data-driven Study of Connected Residential Thermostats to Investigate user Behavior, Thermal Modelling, and Optimal Control of HVAC Systems
  - Awards: ASHRAE Grant-in-Aid
  - Relevant courses: Structured Learning Inference, Operations Research for Engineering Management, Non-linear Optimization
- **Carleton University** — Ottawa, ON
  M.A.Sc., Civil and Environmental Engineering — *2012 - 2014*
  - **11/12** cumulative GPA
  - Thesis: Predictive Shade Controls for Commercial Buildings *(Senate Medal Nominated)*
  - Relevant courses: Convective and Radiative Heat Transfer, Indoor Air Quality, Directed Study on Daylighting and Glare
- **Queen's University** — Kingston, ON
  B.Sc., Engineering Physics (Mechanical Engineering Option — *2008 - 2012*
  - **3.24/4.3** cumulative GPA
  - Thesis: Infrasound Detection for Wind Turbines on Wolfe Island

Select Journal Publications

H.B. Gunay, J. Bursill, **B. Huchuk,** and S. Shillinglaw. "Inverse model-based detection of programming logic faults in multiple zone VAV AHU systems," *Building and Environment*, 2022.

B. Huchuk, S. Sanner, and W. O'Brien. "Development and evaluation of data-driven controls for residential smart thermostats," *Energy and Buildings*, 2021.

B. Huchuk, S. Sanner, and W. O'Brien. "Evaluation of data-driven thermal models using residential smart thermostats," *Journal of Building Performance Simulation*, 2021.

B. Huchuk, W. O'Brien, and S. Sanner. "Exploring smart thermostat users' schedule override behaviors and the energy consequences," *Science and Technology for the Built Environment*, 2020.

B. Hobson, **B. Huchuk**, H. Gunay, and W. O'Brien, "A workflow for evaluating occupant-centric controls using building simulation," *Journal of Building Performance Simulation*, 2020.

H. Stopps, **B. Huchuk**, M.F. Touchie, and W. O'Brien, "Is anyone home? A critical review of occupant-centric smart HVAC controls implementations in residential buildings," *Building and Environment*, 2020.

B. Huchuk, S. Sanner, and W. O'Brien. "Comparison of machine learning models for occupancy prediction in residential buildings using connected thermostat data," *Building and Environment*, 2019.

B. Huchuk, W. O'Brien, and S. Sanner. "A longitudinal study of thermostat behaviors based on climate, seasonal, and energy price considerations using connected thermostat data," *Building and Environment*, 2018.

H.B. Gunay, W. Shen, **B. Huchuk**, C. Yang, S. Bucking, and W. O'Brien. "Energy and comfort performance benefits of early detection of building sensor and actuator faults," *Building Services Engineering Research and Technology*, 2018.

H.B. Gunay, C. Yang, Z. Shi, W. Shen, and **B. Huchuk**. 'A Preliminary Study on Text Mining Operator Logbooks to Develop a Fault-Frequency Model," *ASHRAE Transactions*, 2018.

B. Huchuk, H.B. Gunay, W. O'Brien, and C.A. Cruickshank. "Model-based predictive control of office window shades," *Building Research & Information*, 2016.