

# Andrew Holliday

📞 +1 (514) 632 1337 • ✉ andrew.holliday@mail.mcgill.ca  
🌐 aholliday.github.io in andrew-holliday-b1948512 🐙 aholliday

## Publications

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**2024: Andrew Holliday**, Ahmed El-Geneidy, Gregory Dudek. "Learning Heuristics for Transit Network Design and Improvement with Deep Reinforcement Learning". arXiv preprint: <https://arxiv.org/abs/2404.05894>

**2024: Andrew Holliday**, Gregory Dudek. "A Hybrid Neural-Evolutionary Algorithm for Autonomous Transit Network Design". Presented at *IEEE Conference on Robotics and Automation (ICRA)*, IEEE.

**2024:** Faraz Lotfi, Khalil Virji, Farnoosh Faraji, Lucas Berry, **Andrew Holliday**, David Meger, Gregory Dudek. "Uncertainty-aware hybrid paradigm of nonlinear MPC and model-based RL for offroad navigation: Exploration of transformers in the predictive model". Presented at *IEEE Conference on Robotics and Automation (ICRA)*, IEEE.

**2023: Andrew Holliday**, Gregory Dudek. "Augmenting Transit Network Design Algorithms with Deep Learning". Presented at *26th IEEE International Conference on Intelligent Transportation Systems (ITSC)*, pp. 2343-2350, IEEE.

**2021: Andrew Holliday**, Gregory Dudek. "Scale-Invariant Localization Using Quasi-Semantic Object Landmarks". In *Autonomous Robots*, vol. 45, no. 3, pp. 407-420

**2020: Andrew Holliday**, Gregory Dudek. "Pre-trained CNNs as Visual Feature Extractors: A Broad Evaluation". Presented at *17th Conference on Computer and Robot Vision (CRV)*, pp. 78-84, IEEE.

**2018: Andrew Holliday**, Gregory Dudek. "Scale-Robust Localization Using General Object Landmarks". *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1688-1694, IEEE.

**2018:** Travis Manderson, **Andrew Holliday**, Gregory Dudek. "Gaze Selection For Enhanced Visual Odometry During Navigation". Presented at *15th Conference on Computer And Robot Vision (CRV)*, pp. 110-117, IEEE.

**2017: Andrew Holliday**, Mohammadamin Barekatain, Johannes Laurmaa, Chetak Kandaswamy, Helmut Prendinger. "Speedup of Deep Learning Ensembles for Semantic Segmentation Using a Model Compression Technique". In *Computer Vision and Image Understanding*, vol. 164, pp. 16-26.

## Research Experience

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### Mobile Robotics Laboratory at McGill University

Graduate Student

Montreal, Canada

2014-Present

- Researched the use of reinforcement learning and graph neural nets to the design of public transit systems, resulting in two publications to date and a 2.8% improvement over SOTA
- Researched robotic visual localization and mapping, resulting in several publications and a 70% improvement over SOTA in challenging long-distance localization cases
- Coordinated with researchers at multiple institutions to design and carry out robotics experiments in challenging oceanic and terrestrial environments

**Samsung AI Center****Montreal, QC***Research Intern*

2019

- Developed and enhanced a visual localization algorithm for real-world outdoor and indoor environments using still images and videos
- Designed and ran experiments comparing the algorithm with existing methods, achieving superior accuracy in challenging conditions
- Utilized Python, PyTorch, and OpenCV for algorithm development and experimentation
- Published findings in a paper in the journal *Autonomous Robots*

**National Institute of Informatics****Tokyo, Japan***Research Team Lead*

2016

- Led a team of 4 other graduate students
- Developed an ensemble distillation technique for semantic segmentation that improved mean IU over existing models by 1.7%, and published a journal paper on this work
- Managed construction a novel dataset of aerial images with semantic-segmentation labels

**University of British Columbia****Vancouver, BC***Research Assistant*

2010

- Developed software for a research project applying data-mining techniques to large volumes of online transaction data, with the goal of developing recommender systems

## Technical Skills

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**Coding Languages:** Python, C/C++, Java, Rust**Libraries & Frameworks:** PyTorch, PyTorch Geometric, NumPy, OpenCV, ROS

## Education

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**McGill University****Montreal, QC***PhD, Computer Science*

2017–2024

- Thesis: Applications of Deep Reinforcement Learning to Urban Transit Network Design
- Supervised by Prof. Gregory Dudek and Prof. Ahmed El-Geneidy
- Committee members: Prof. Doina Precup, Prof. Luc Devroye, Prof. Inna Sharf

**McGill University****Montreal, QC***M.Sc, Computer Science*

2014–2017

- Thesis: Object-Features for Localization under Extreme Scale Changes
- Supervised by Prof. Gregory Dudek
- Exchange term at the National Institute of Informatics

**University of British Columbia****Vancouver, BC***B.Sc, Double Major in Physics & Computer Science*

2007–2011

## Awards & Fellowships

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**2020-2022:** Graduate Excellence Award**2020:** MES Perserverance Award**2020:** Lorne Trottier Science Accelerator Fellowship**2019-2021:** NSERC Postgraduate Scholarships-Doctoral Program (PGS-D) Award

## Conference Presentations

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**ICRA 2024:** "A Hybrid Neural-Evolutionary Algorithm for Autonomous Transit Network Design".

**ITSC 2023:** "Augmenting Transit Network Design Algorithms with Deep Learning".

**CRV 2020:** "Pre-trained CNNs as Visual Feature Extractors: A Broad Evaluation".

**IROS 2018:** "Scale-Robust Localization Using General Object Landmarks".

## Professional Activities

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- Chair of ITSC 2023 session on public transport modelling
- Reviewed for conferences from 2018 to present including CoRL, RSS, IROS, ITSC, and ICRA
- Student Fellow of the NSERC Canadian Robotics Network (NCRN)

## Other Experience

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### **Kinsol Research Inc.**

**Victoria, BC**

*Machine Learning Consultant*

*2017-2019*

- Designed and implemented neural network architectures and training pipelines for visual object recognition and instance discrimination, time series prediction, and fast estimation of slow exact calculations
- Developed a dataset and annotation pipeline for training an object detection neural network, including the design of a human annotation process and clustering algorithm for final annotation refinement
- Maintained and improved a state-estimation system for tracking parking availability

### **In Motion Technology**

**New Westminster, BC**

*Software Developer*

*2011-2013*

- Gathered requirements, designed, and developed applications and core functions for embedded platforms and web servers